



DEMAND BETTER SOLAR®

SUNPOWER® | Commercial Dealer

ANNEX F – DPT GARAGE ROOFTOP PV ARRAY

information

DPT2021-02 Electric Bus Charging Facility RFP

SunPower System Details for Bus Depot





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ANNEX F – DPT GARAGE ROOFTOP PV ARRAY
information
DPT2021-02 Electric Bus Charging Facility RFP

b. Bus Depot System Description

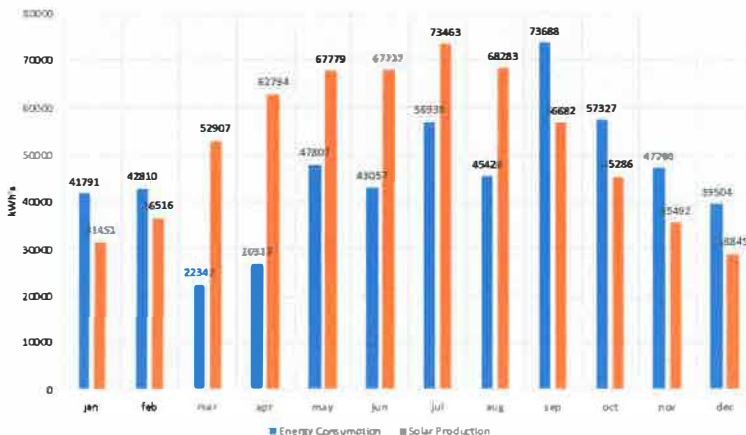


Technical Data

Module	SunPower X22-360-BLK
Cell efficiency rating	24.1%
Module efficiency rating	22.2%
Module Technology	Silicon Cell + copper
Module Dimensions	41.4" x 61.4"
Module Area (sqft)	17.65
Number of Modules	1188
Module Capacity (wDC)	360
System Area (sqft)	20,968
System Capacity (kW)	427.68
Year 1 Energy (kWh)	627,224
25 Year Energy (kWh)	15,166,844



Bus Depot



- AES proposes to install 1188 of the SunPower 360 watt, 22% efficient world record holding panels
- This system will produce approximately \$219,528 per year for the Government.
- It is recommended that Government offset the energy consumption at other locations by generating and exporting excess energy from the Bus Depot



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c. Key equipment details and description

Description

- **Solar Panels** - AES proposes to install 1188 of the SunPower X22 360 watt solar panels on the south facing roof sections as shown in the preceding photograph. Spec sheet follows.
- **Inverters** – AES proposes to install 6 of the 60kW Delta inverters to the 480v electrical system. Spec sheet to follow.
- **Racking** – AES will use the Unirac SM rail system to mount the panels and inverters. Spec sheet follows.
- **Roof Attachments** – AES will use the S-5 Corru-bracket to attach the rails to the roof of the Bus Depot



More than 22% Efficiency

Captures more sunlight and generates more power than conventional panels.²

Maximum Performance

Designed to perform in demanding real-world conditions of high temperatures, partial shade from overhead wires, and low light.^{2,3,5}

Commercial Grade

Intended for commercial sites where maximum energy production is critical.



Maxeon® Solar Cells: Fundamentally better
Engineered for performance, designed for reliability.

Engineered for Peace of Mind

Designed to deliver consistent, trouble-free energy over a very long lifetime.^{4,5}

Designed for Reliability

The SunPower® Maxeon® Solar Cell is built on a solid copper foundation. Virtually impervious to the corrosion and cracking that degrade conventional panels.⁴

Same excellent durability as E-Series panels.
#1 Rank in Fraunhofer durability test.¹⁰
100% power maintained in Atlas 25+ comprehensive durability test.¹¹



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d. Layout of Installation



3 x 60KW
Delta Inverters

1188 x 360KW
SunPower
22% efficient
panels.
Panels are
connected to
the Unirac SM
rail system
and attached
to the roof
using the S-5
Corru-brackets

3 x 60KW
Delta Inverters



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[g. Specifications for Equipment Procurement and Installation](#)

The following 10 pages contain the information listed below:

- Panels spec sheets (2)
- Inverter spec sheets (4)
- Unirac SM introduction Spec Sheet (4)

SunPower® X-Series Commercial Solar Panels | X22-360-COM

SunPower Offers The Best Combined Power And Product Warranty



More guaranteed power: 95% for first 5 years,
-0.4%/yr. to year 25⁸



Combined Power and Product defect 25-year coverage
that includes panel replacement costs⁹

Electrical Data

	SPR-X22360-COM
Nominal Power (P _{nom}) ¹²	360 W
Power Tolerance	+5/-3%
Avg. Panel Efficiency ¹³	22.2%
Rated Voltage (V _{mpp})	60.6 V
Rated Current (I _{mpp})	5.94 A
Open-Circuit Voltage (V _{oc})	69.5 V
Short-Circuit Current (I _{sc})	6.48 A
Max. System Voltage	1000 V UL & 1000 V IEC
Maximum Series Fuse	15 A
Power Temp Coef.	-0.30% / °C
Voltage Temp Coef.	+167.4 mV / °C
Current Temp Coef.	3.5 mA / °C

REFERENCES:

- Helix-compatible modules may not be compatible with other racking systems
- All comparisons are SPR-X21-345 vs. a representative conventional panel: 250 W, approx. 1.6 m², 15.3% efficiency.
- Typically 8–10% more energy per watt, BEW/DNV Engineering "SunPower Yield Report," Jan 2013.
- SunPower 0.25%/yr degradation vs. 1.0%/yr conv. panel. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, Feb 2013; Jordan, Dirk "SunPower Test Report," NREL, Q1-2015.
- "SunPower Module 40-Year Useful Life" SunPower white paper, May 2015. Useful life is 99 out of 100 panels operating at more than 70% of rated power.
- Highest of over 3,200 silicon solar panels, Photon Module Survey, Feb 2014.
- 1% more energy than E-Series panels, 8% more energy than the average of the top 10 panel companies tested in 2012 (151 panels, 102 companies), Photon International, Feb 2013.
- Compared with the top 15 manufacturers. SunPower Warranty Review, May 2015.
- Some restrictions and exclusions may apply. See warranty for details.
- X-Series same as E-Series, 5 of top 8 panel manufacturers tested in 2013 report, 3 additional panels in 2014. Ferrara, C., et al. "Fraunhofer PV Durability Initiative for Solar Modules: Part 2", Photovoltaics International, 2014.
- Compared with the non-stress-tested control panel. X-Series same as E-Series, tested in Atlas 25+ Durability test report, Feb 2013.
- Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C) NREL calibration Standard: SOMS current, LACCS FF and Voltage.
- Based on average of measured power values during production
- Type 2 fire rating per UL1703:2013, Class C fire rating per UL1703 2002.
- See salesperson for details.

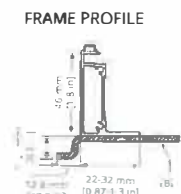
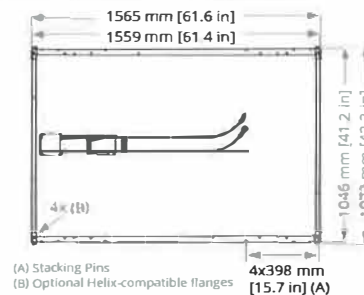
See www.sunpower.com/facility for more reference information.
For more details, see extended data sheet: www.sunpower.com/datasheets.

Tests And Certifications

Standard Tests ¹⁴	UL1703 (Type 2 Fire Rating), IEC 61215, IEC 61730
Quality Certs	ISO 9001:2008, ISO 14001:2004
EHS Compliance	RoHS, OHSAS 18001:2007, lead free, REACH SVHC-163, PV Cycle
Sustainability	Cradle to Cradle Certified™ Silver (eligible for LEED points) ¹⁵
Ammonia Test	IEC 62716
Desert Test	10.1109/PVSC.2013.6744437
Salt Spray Test	IEC 61701 (maximum severity)
PID Test	Potential-Induced Degradation free: 1000 V ¹⁰
Available Listings	UL, TUV, JET, CEC

Operating Condition And Mechanical Data

Temperature	-40° F to +185° F (-40° C to +85° C)
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)
Appearance	Class B
Solar Cells	96 Monocrystalline Moxeon Gen III
Tempered Glass	High transmission tempered anti-reflective
Junction Box	IP-65, MC4 compatible
Weight	41 lbs (18.6 kg)
Max. Load	Wind: 50 psf, 2400 Pa, 244 kg/m ² front & back Snow: 11.2 psf, 5400 Pa, 550 kg/m ² front
Frame	Class 2 silver anodized; stacking pins



(A) Stacking Pins
(B) Optional Helix-compatible flanges

Please read the safety and installation guide
Flanges installed on Helix-compatible modules only
Flanges are not removable and may not be compatible with non-Helix-branded racking.

Document # 516038 REV B /LTR US



The power behind competitiveness

Delta M60U

Grid-tied, 3-phase, dual MPPT transformerless PV Inverter



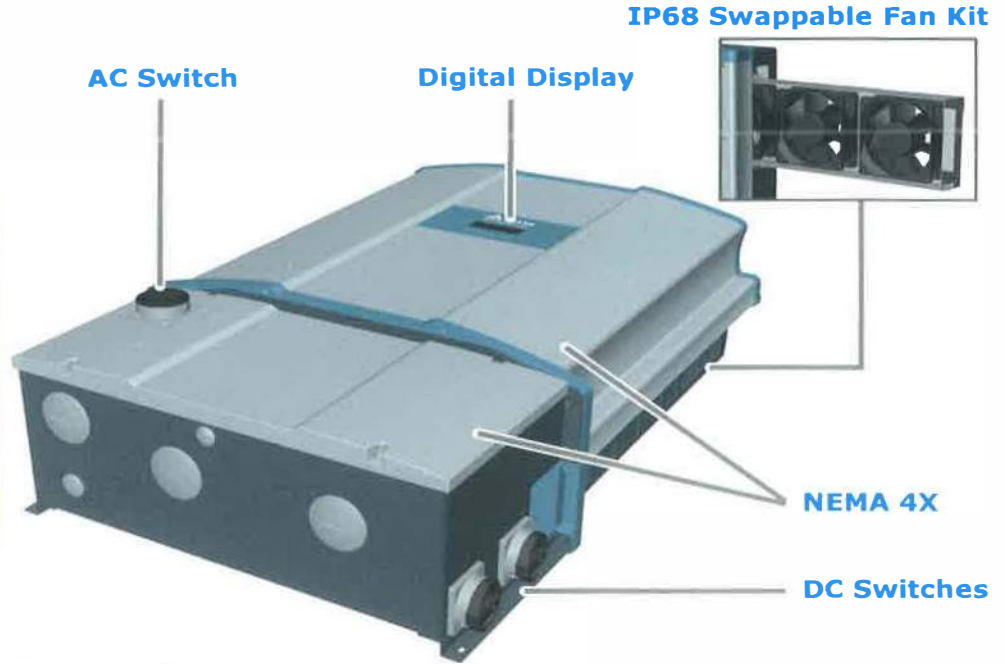
Product Features

- Two stage topology with wide input operation range, 200 to 1000 Vdc
- Allows 0-90° tilt-mount installation
- Dual MPP tracker inputs
- Superior efficiency performance, 98.8% peak & 98.5% CEC
- Wiring box capable of landing up to 18 strings via fused inputs (_122)
- NEMA 4X outdoor rated enclosure
- Ergonomics grip design
- Integral DC Arc fault detector
- Integral AC & DC disconnects
- Integral type 2 SPDs at AC & DC terminals
- Operating temp. range -13°F to 140°F (>122°F derating)
- String monitoring



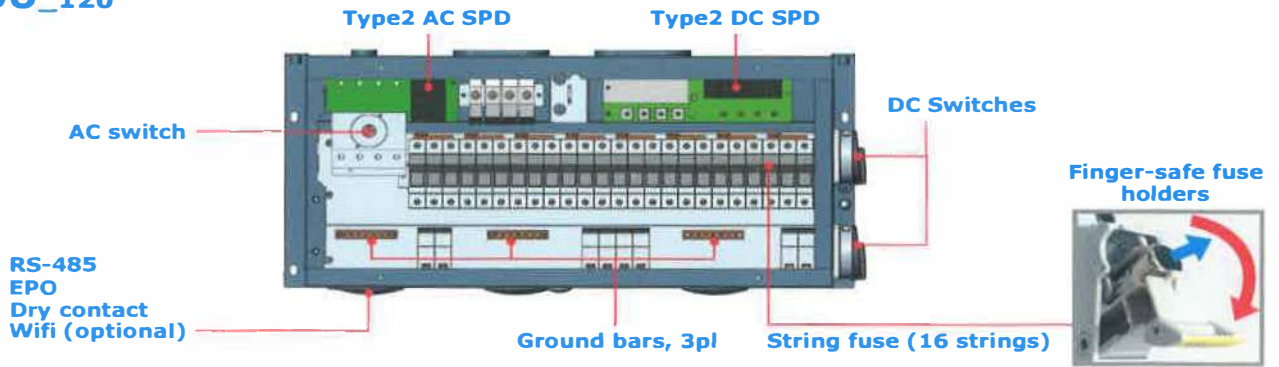
Delta M60U

Horizontal Installation

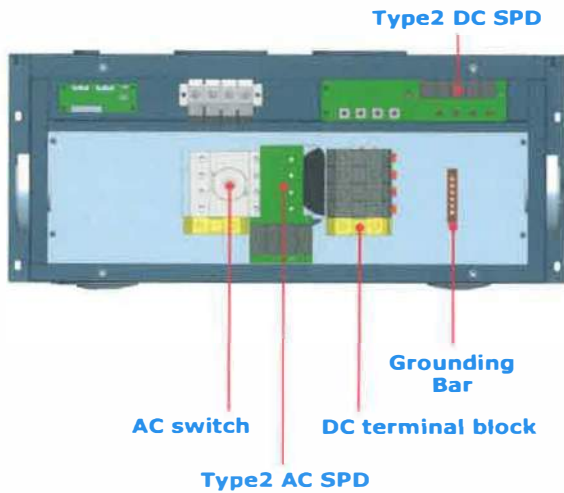


Wiring Box Configurations

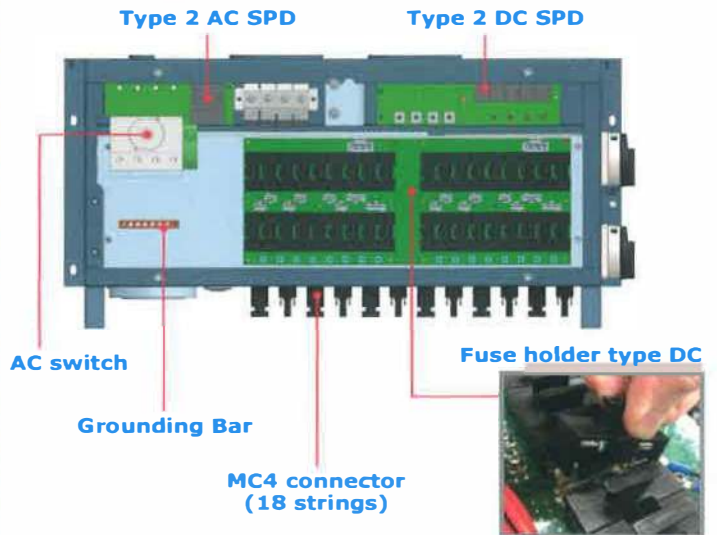
M60U_120



M60U_121



M60U_122





Outstanding performance


M60U have excellent efficiency performance, peak 98.8% and CEC 98.5%.





Benefits with M60U

- 
Multi-application:
 Designed for commercial, industrial and utility applications.

- 
All-In-one Design:
 String fuses, surge protection devices, DC switches and arc fault detection circuit are integrated into the design.

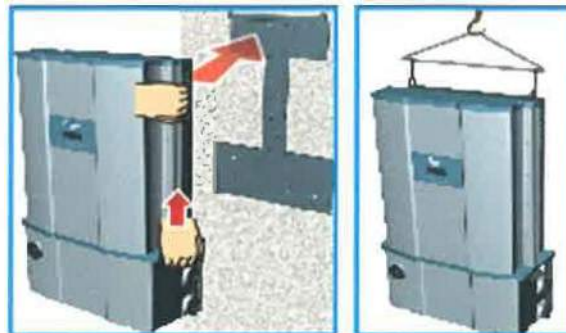
- 
Saving on Space Cost:
 Horizontal mounting allows under array location without need for additional housing.

- 
2 MPP Trackers:
 The use of two MPP trackers provides greater flexibility in PV array configuration leading to a maximized yield.

- 
String monitoring function:
 The string monitoring function can precisely record real-time current value up to 18 strings via RS-485 interface.



- 
Easy Installation:
 Ergonomic grip design provides easy installation or removal by the installer. For additional flexibility, eye bolts are provided to allow for lifting using crane.



Delta Commercial Series

Model	M60U_120	M60U_121	M60U_122
DC Input			
Max. input voltage	1000V (per NEC)		
Operating voltage range	200-1000V		
Start voltage	>250V		
MPP voltage range for rated power	520~800V		
Rated voltage	710V		
MPP tracker	2		
Max. operating current for each MPPT	60A/MPPT		
Max. allowable array Isc for each MPPT	108A/MPPT		
Connection type	16 pairs of 8~14 AWG fuse holder (Cu wire, 90°C rated)	1~3/0 AWG terminal block (Cu/Al wire, 120°C rated)	18 pairs of MC4 connector (90°C rated)
Type 2 SPD	O	O	O
15A string fuses	O	X	O
DC Switch	O	X	O
String monitoring	X	X	O
AC Output			
Rated output power	60kVA (@T _{AMB} ≤ 40°C, V _{IN} ≥ 520VDC)		
Max. output power	66kVA (@T _{AMB} ≤ 40°C, V _{IN} ≥ 600VDC)		
Max. output current	80A		
Grid configuration	480/277V (3P-4W/Y) or 480V (3P-3W/Δ)		
Inverter connection	3W or 4W programmable		
Operating voltage range	±10%		
Operating frequency range	50/60Hz ±5Hz		
Power factor	Unity at rated or max power, 0.8 ind ~ 0.8 cap adjustable		
Protection	Type 2 SPD		
THD	<3%		
Connection type	1-2/0 AWG terminal block (Cu wire, 90°C rated)		
Night time consumption	<3W		
Efficiency			
Peak efficiency	98.8%		
CEC efficiency	98.5%		
Information			
Communication port	RS-485 (Delta or Sunspec Protocol)		
Display	20 x 4 LCD		
Regulation			
	UL1741 SA, UL1741, UL1998, UL 1699B, IEEE1547, IEEE1547.1 CSA C22.2, FCC Part 15 (Class B)		
General Data			
Smart inverter functionality	Voltage/Frequency Ride through, Volt/Var, Volt/Watt, Power curtailment, Frequency/Watt		
Operating temp. range	-13°~140°F (-25°~60°C) (>122°F(50°C) derating)		
Protection level	NEMA 4X		
Operating elevation	<9800ft (<3000m)		
Cooling	Forced air cooling with Smart Fan control		
Dimension (in)	24.2 x 35.4 x 10.8		24.2 x 37.4 x 10.8
Weight (lb)	W/ Wiring box	180.6	171.8
	W/O Wiring box		149.9
	Shipping weight	246.9	242.5
			251.3

- All specifications are subject to change without prior notice.

Delta Electronics Corporation

46101 Fremont Boulevard
Fremont CA 94583
www.delta-americas.com

Customer Service Technical Support

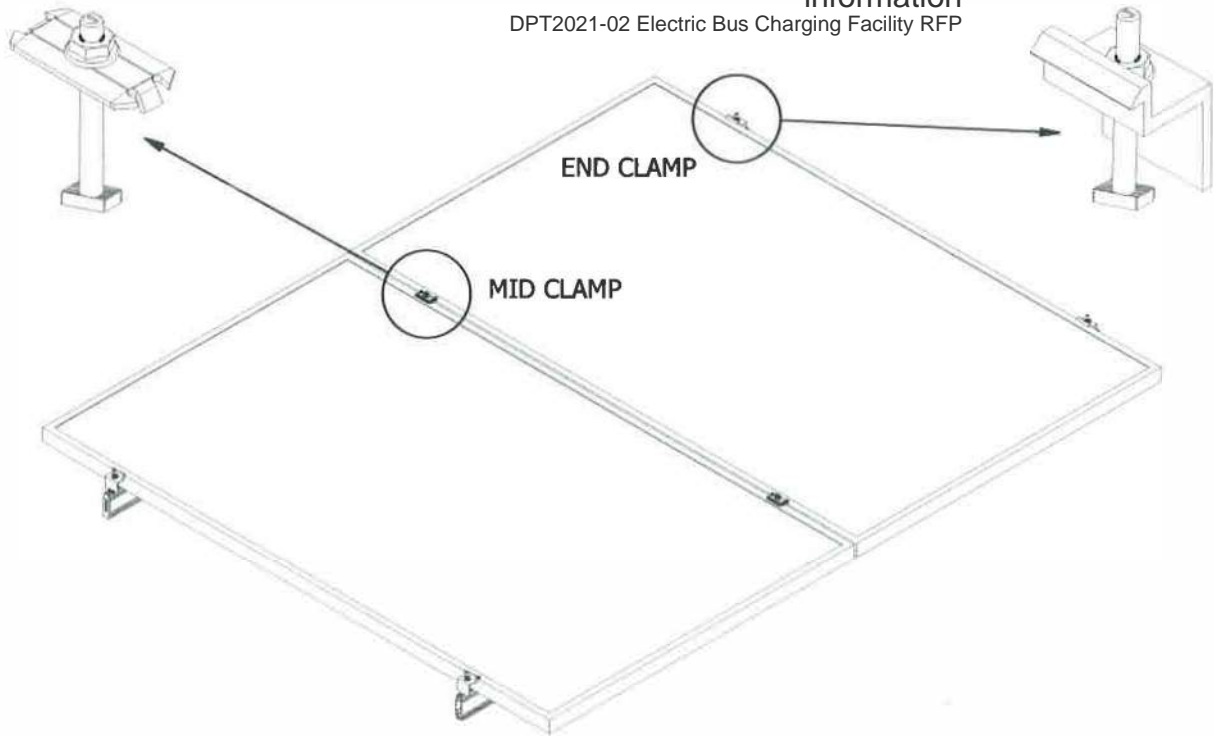
PVI.Support.US@deltaww.com
+1-877-442-4832



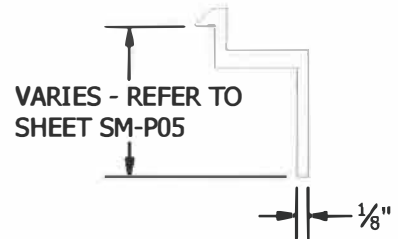
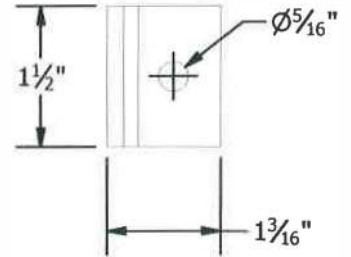
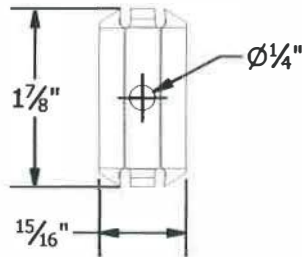
ANNEX F – DPT GARAGE ROOFTOP PV ARRAY

information

DPT2021-02 Electric Bus Charging Facility RFP



PART # TABLE	
P/N	DESCRIPTION
302027C	SM BND MIDCLAMP BC SS
302027D	SM BND MIDCLAMP BC DRK SS
302028C	SM BND MIDCLAMP EF SS
302028D	SM BND MIDCLAMP EF DRK SS
302029C	SM BND MIDCLAMP DK SS
302029D	SM BND MIDCLAMP DK DRK SS
	FOR BONDING END CLAMP REFER TO SHEET SM-P05



BONDING SM MID CLAMP

BONDING SM END CLAMP



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

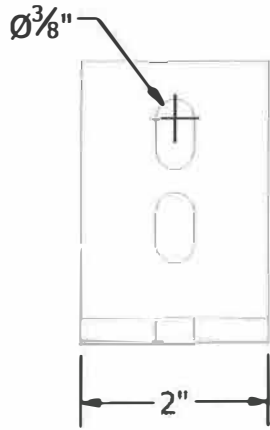
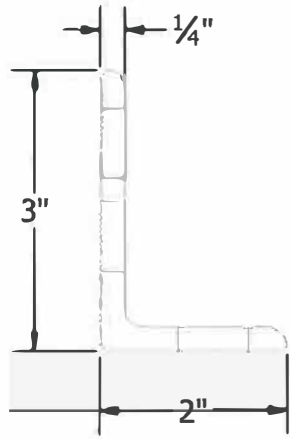
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REVISION DATE:	10/26/2017

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ALL DIMENSIONS ARE
NOMINAL

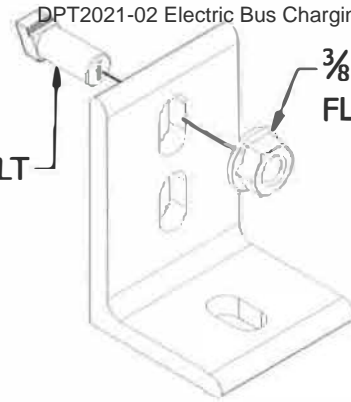
PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A01A

SHEET



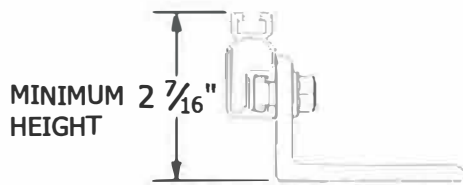
3/8"-16 X 3/4" T BOLT



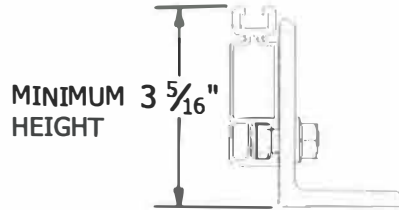
3/8"-16
FLANGE NUT

L-FOOT

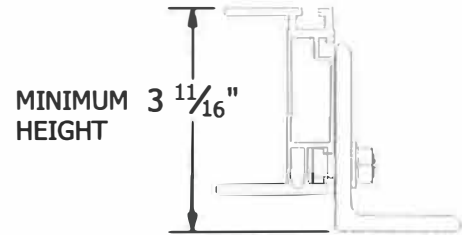
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P/N	DESCRIPTION
304001C	L-FOOT SERR W/T-BOLT CLR
304001D	L-FOOT SERR W/T-BOLT DRK



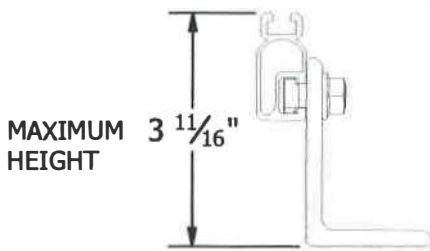
MINIMUM HEIGHT 2 7/16"



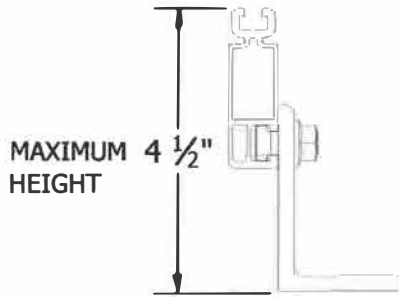
MINIMUM HEIGHT 3 5/16"



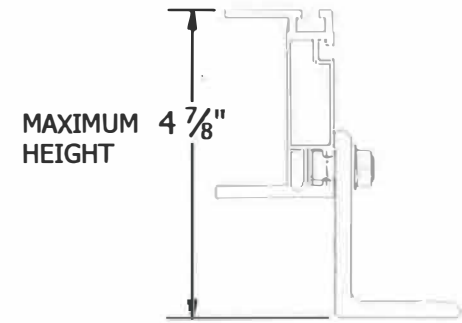
MINIMUM HEIGHT 3 11/16"



MAXIMUM HEIGHT 3 11/16"



MAXIMUM HEIGHT 4 1/2"



MAXIMUM HEIGHT 4 7/8"

SOLARMOUNT LIGHT ON L-FOOT

SOLARMOUNT STANDARD ON L-FOOT

SOLARMOUNT HD ON L-FOOT

NOTES:

1. L-FOOT CAN BE INSTALLED IN TWO ORIENTATIONS, PLEASE REFER TO INSTRUCTIONS IN THE QUICK START GUIDE.



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	L-FOOT
REVISION DATE:	9/27/2017

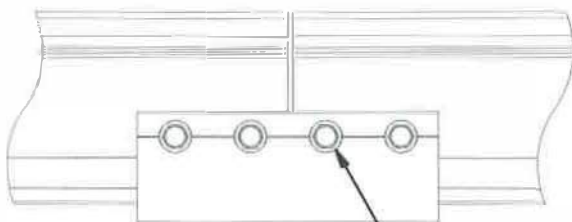
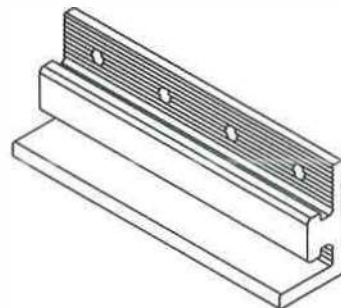
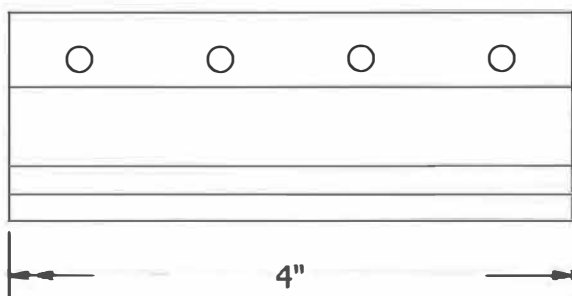
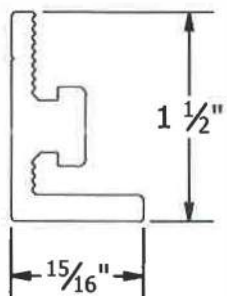
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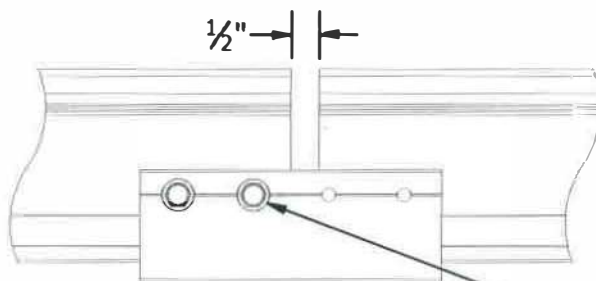
SHEET

BONDING SPLICE BAR



#12 X 3/4" SELF DRILLING SS SCREWS INCLUDED

TYPICAL SPLICE BAR DETAIL



NOTE THAT ONLY 2 SCREWS ARE USED AT AN EXPANSION JOINT. THE SPLICE BAR DOES NOT BOND ACROSS AN EXPANSION JOINT. SEE INSTALLATION GUIDE FOR INSTRUCTION.

TYPICAL EXPANSION JOINT DETAIL

PART # TABLE	
P/N	DESCRIPTION
303018C	BND SPLICE BAR SERRATED CLR
303018D	BND SPLICE BAR SERRATED DRK



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ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING SPLICE BAR
REVISION DATE:	9/27/2017

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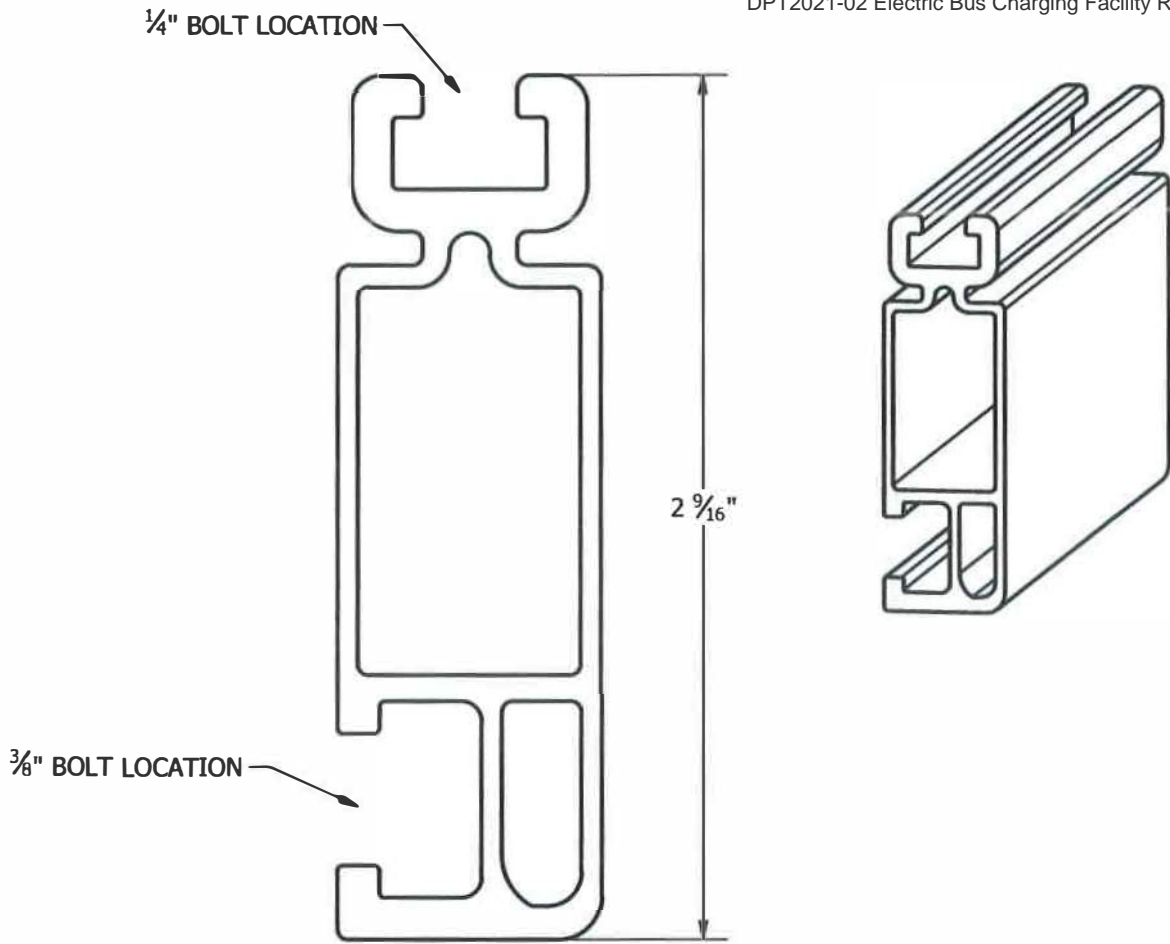
SM-A05

SHEET

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DPT2021-02 Electric Bus Charging Facility RFP



PART # TABLE		
P/N	DESCRIPTION	LENGTH
320132M	SM RAIL 132" MILL	132"
310132C	SM RAIL 132" CLR	132"
320168M	SM RAIL 168" MILL	168"
310168C	SM RAIL 168" CLR	168"
320168D	SM RAIL 168" DRK	168"
320208M	SM RAIL 208" MILL	208"
310208C	SM RAIL 208" CLR	208"
320240M	SM RAIL 240" MILL	240"
310240C	SM RAIL 240" CLR	240"
310240D	SM RAIL 240" DRK	240"



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	STANDARD RAIL
REVISION DATE:	9/11/2017

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SM-P01
SHEET