LOCATION OF INVERTER(S) WITH INTEGRATED DC/AC DISCONNECTS AND LOCUS MONITORING UNIT LOCATED IN PATIO AREA

NEW LOAD CENTER LOCATED IN PATIO AREA

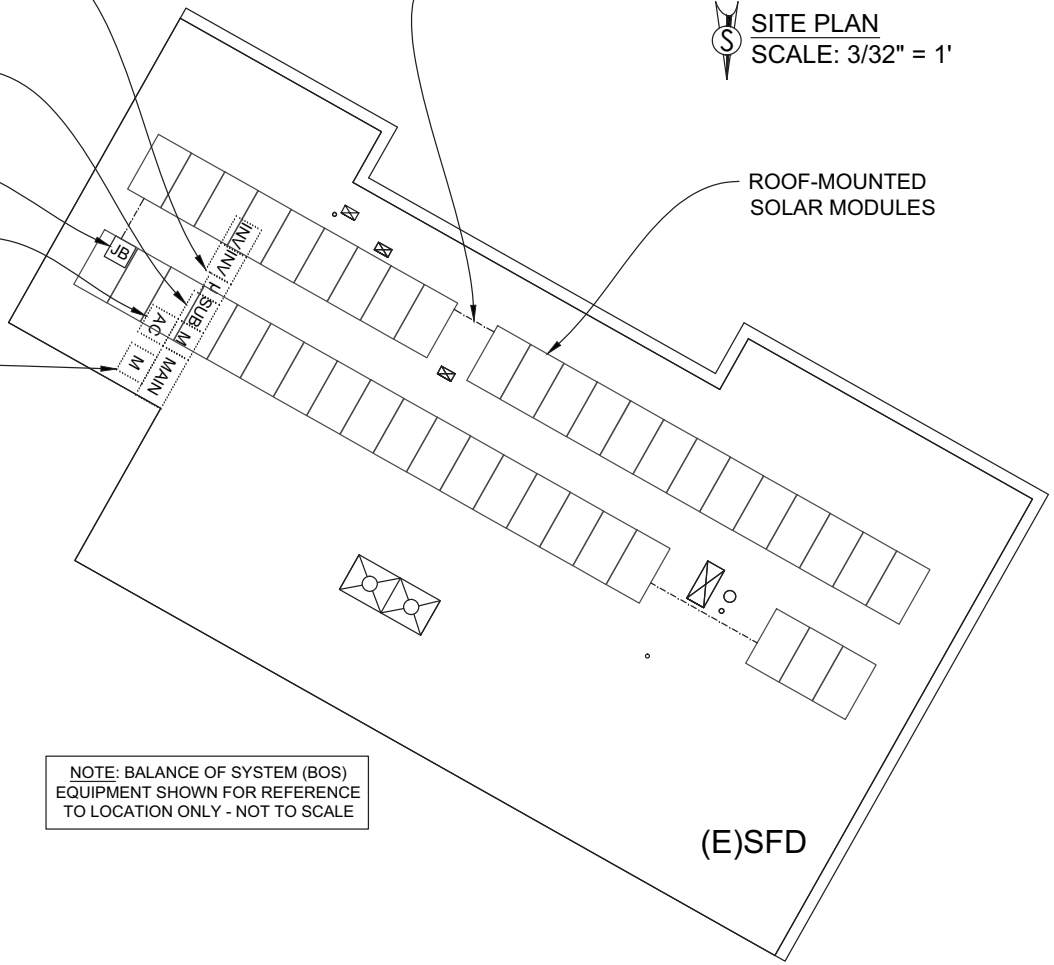
ROOF-MOUNTED JUNCTION BOX

DEDICATED PV AC DISCONNECT AND PRODUCTION METER LOCATED IN PATIO AREA

LOCATION OF MAIN SERVICE ENTRANCE AND UTILITY METER IN PATIO AREA

ROOF-MOUNTED CONDUIT

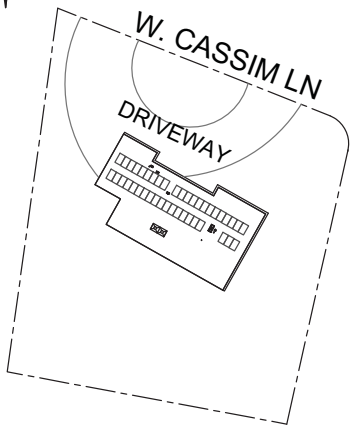
ROOF-MOUNTED SOLAR MODULES



SITE PLAN
SCALE: 3/32" = 1'

NOTE: BALANCE OF SYSTEM (BOS) EQUIPMENT SHOWN FOR REFERENCE TO LOCATION ONLY - NOT TO SCALE

SITE PLAN
SCALE: 1/64" = 1'



THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL BE IN ACCORDANCE WITH THE MOST RECENT NATIONAL ELECTRIC AND BUILDING CODES AND STANDARDS, AS AMENDED BY LOCAL JURISDICTION.

JURISDICTION INFORMATION:

JURISDICTION:	CITY OF TUCSON
ADDRESS:	201 N. STONE AVE TUCSON, AZ 85701
PHONE NUMBER:	520-791-5550

SYSTEM SUMMARY

THIS GRID TIED 9.87 KW DC, 8.49 KW CEC AC

ROOF MOUNTED SOLAR ELECTRIC SYSTEM WITHOUT

ENERGY STORAGE COMPONENTS CONSISTS OF:
(42) SHARP NU-U235F3
(1) KACO BLUEPLANET 5002XI
(1) KACO BLUEPLANET 5002XI

NOTES TO INSTALLER:

CONFIRM ALL CONDUIT AND EQUIPMENT LOCATIONS WITH HOMEOWNER PRIOR TO INSTALL. MONITORING PATH TO BE RUN ON OUTSIDE OF HOUSE.

SHEET NUMBER	SHEET TITLE
0.1	COVER PAGE
1.1	STRUCTURAL
2.1	ELECTRICAL 3 LINE
2.2	ELECTRICAL 1 LINE
3.1	LABELS
4.1	CALCULATIONS

KEY:

PROPERTY LINE	INV INVERTER
CONDUIT RUN	SUB SUBPANEL
STRUCTURES	DC DC DISCONNECT
DRIVEWAY	AC AC DISCONNECT
SOLAR MODULE	JB JUNCTION BOX
MAIN MAIN SERVICE	M MONITORING UNIT
M METER	CB COMBINER BOX

ARIZONA ENERGY PROS
22822 N. 19TH AVE.
PHOENIX, AZ 85027
PHONE: 602-863-6900
LICENSE #: 255816

SITE PLAN AND COVERSHEET

SUNGEVITY
SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET
DESIGNED BY:			ALI FATHI
DESIGNER PHONE:			510.496.5593
REVIEWED BY:			TRAVIS RICHARDSON
SCALE:			LISTED
SHEET SIZE:			11X17

SUNGEVITY INC.
66 FRANKLIN ST
SUITE 310
OAKLAND, CA 94607

PV0.1

KEY:
- MOUNT
- RAIL
- RAFTERS
- ROOF
- SOLAR MODULE
- RAIL SPLICE
- STRING CONFIG.

MODULE SPECS

(42) SHARP NU-U235F3

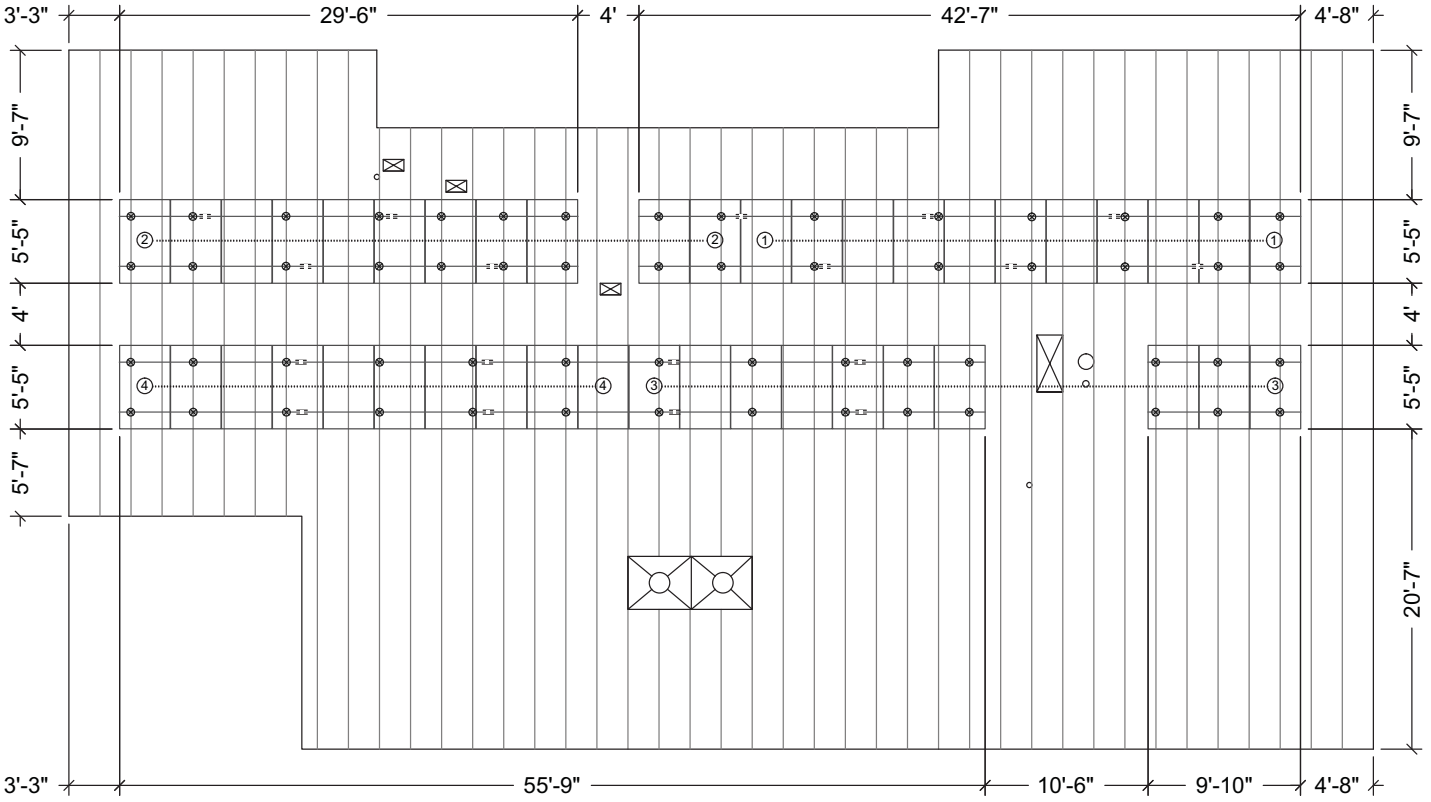
MODULE WEIGHT:	44.1 LBS
MODULE LENGTH:	64.6"
MODULE WIDTH:	39.1"

ROOF SPECS

RAFTER SIZE:	2x10
RAFTER SPAN:	19'-4"
RAFTER SPACING:	24" OC
ROOF MATERIAL:	ROLLED COMPOSITE

ARRAY 1 SPECS

NUMBER OF MODULES:	42
TOTAL MODULE WEIGHT:	1852.2 LBS
RACKING WEIGHT:	346.4 LBS
ARRAY WEIGHT:	2256.6 LBS
ARRAY AREA:	736.7 SQFT
ARRAY DEAD LOAD:	3.1 LBS/SQFT
NUMBER OF MOUNTS:	58
LOAD PER MOUNT:	38.9 LBS
ROOF PITCH:	0°
ROOF HEIGHT (ft):	20'

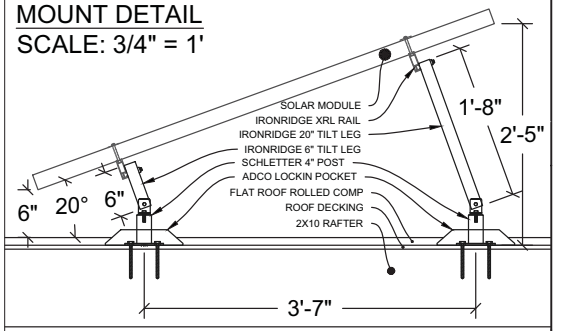


ARRAY LAYOUT
SCALE: 1/8" = 1'
AZIMUTH: 210° TN

STRUCTURAL NOTES:

-MOUNTS ARE APPROXIMATE LOCATION BUT ACCURATELY SPACED.
-MOUNTS SHOULD BE STAGGERED WHEN POSSIBLE TO EVENLY DISTRIBUTE LOAD AMONGST RAFTERS.
-DO NOT SPLICE RAILS WITHIN THE MIDDLE 50% OF THE SPAN BETWEEN TWO MOUNTS.
-ON TRUSS ROOF SYSTEMS, KEEP ATTACHMENTS 6" MIN. FROM NAIL PLATES
-USE APPROVED METHOD(S) FOR LOCATING

MOUNT DETAIL
SCALE: 3/4" = 1'



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ARRAY LAYOUT AND STRUCTURAL

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SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET
DESIGNED BY:	ALI FATHI		
DESIGNER PHONE:	510.496.5593		
REVIEWED BY:	TRAVIS RICHARDSON		
SCALE:	LISTED		
SHEET SIZE:	11X17		

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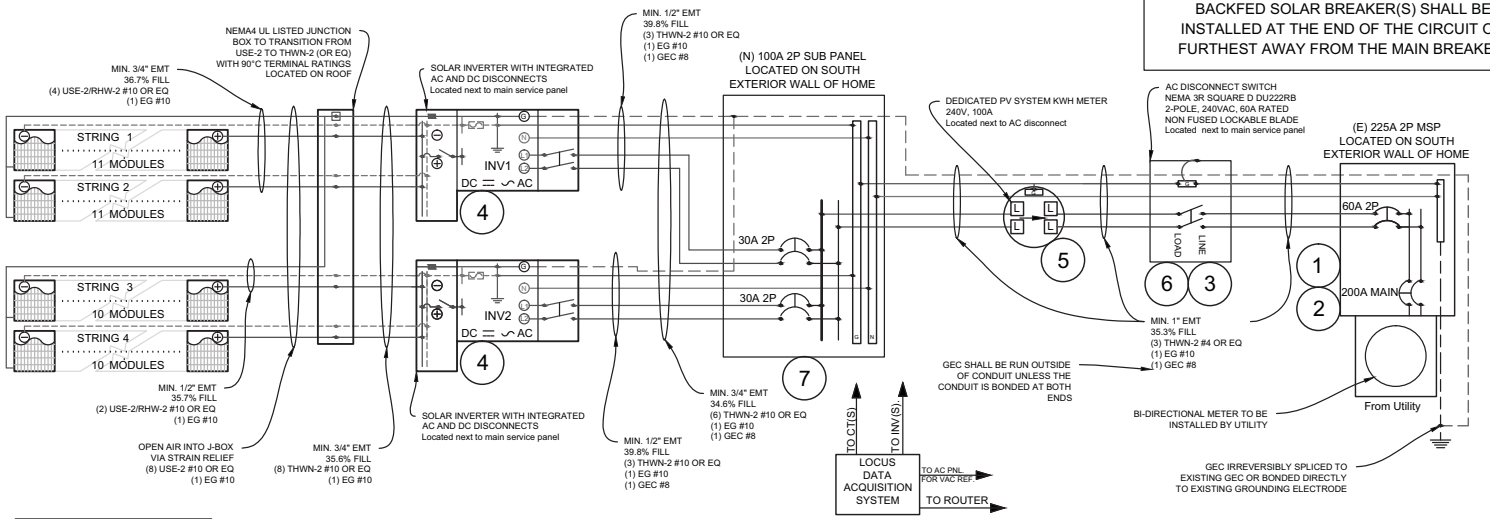
66 FRANKLIN ST
SUITE 310
OAKLAND, CA 94607

PV1.1



IMPORTANT

BACKFED SOLAR BREAKER(S) SHALL BE INSTALLED AT THE END OF THE CIRCUIT OR FURTHEST AWAY FROM THE MAIN BREAKER.

MODULE ELECTRICAL SPECS

(42) SHARP NU-U235F3

SHORT CIRCUIT CURRENT (Isc):	8.5 A
OPEN CIRCUIT VOLTAGE (Voc):	37 V
OPERATING CURRENT (IMP):	7.81 A
OPERATING VOLTAGE (VMP):	30.1 V
MAX SERIES FUSE RATING:	15 A
STC RATING:	235 W
CEC PTC RATING:	211.7 W

DESIGN CONDITIONS

HIGHEST 2% DB DESIGN TEMP. (°C):	40 °C
MIN. MEAN EXTREME ANNUAL DB (°C):	-3 °C

INVERTER 1 SPECS

(1) KACO BLUEPLANET 5002XI

RATED WATTS (EACH):	5000 W
AC OPERATING VOLTAGE:	240 V
AC OPERATING CURRENT:	24 A
MODULES PER STRING:	11
INVERTER EFFICIENCY:	95.5 %

INTEGRATED AC & DC DISCONNECT SWITCH

INVERTER 1 STRINGING (690.53)

MAX POWER POINT CURRENT (IMP):	15.6 A
MAX POWER POINT VOLTAGE (VMP):	331.1 V
MAX SYSTEM VOLTAGE (VOC) 690.7(A)1:	447.0 V
SOURCE CIRCUIT CURRENT (ISC) 690.8(A)1:	10.6 A
MAX SHORT CIRCUIT CURRENT (ISC) 690.8(A)2:	21.3 A

INVERTER 2 SPECS

(1) KACO BLUEPLANET 5002XI

RATED WATTS (EACH):	5000 W
AC OPERATING VOLTAGE:	240 V
AC OPERATING CURRENT:	24 A
MODULES PER STRING:	10
INVERTER EFFICIENCY:	95.5 %

INTEGRATED AC & DC DISCONNECT SWITCH

INVERTER 2 STRINGING (690.53)

MAX POWER POINT CURRENT (IMP):	15.6 A
MAX POWER POINT VOLTAGE (VMP):	301.0 V
MAX SYSTEM VOLTAGE (VOC) 690.7(A)1:	406.4 V
SOURCE CIRCUIT CURRENT (ISC) 690.8(A)1:	10.6 A
MAX SHORT CIRCUIT CURRENT (ISC) 690.8(A)2:	21.3 A

KEY:

- BREAKER
- SWITCH
- SCREW TERMINAL
- FUSE
- SPLICE
- EARTH GROUND
- CHASSIS GROUND
- GEC
- EGC

(OTHER NEC MARKINGS EXIST):

1. "PHOTOVOLTAIC ELECTRIC POWER SOURCE" NEC705.10
2. "BREAKERS ARE BACKFED" AND NEC690.54
3. "PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH" COVER TO BE LOCKED AT ALL TIMES. SWITCH MUST HAVE VISIBLE BLADE AND ACCESSIBLE PER UTILITY REQUIREMENTS AND CONFORM TO NEC705.22
4. "PHOTOVOLTAIC ARRAY DC DISCONNECT SWITCH" NEC690.14(C)(2) AND NEC690.53. SWITCHED TO BE LOCKED OR INACCESSIBLE NEC690.7(D)
5. "PHOTOVOLTAIC POWER SYSTEM DEDICATED KWH METER"
6. "WARNING - ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OFF POSITION" NEC690.17
7. "DEDICATED PV SYSTEM COMBINER PANEL" AND "LOADS NOT TO BE ADDED TO THIS PANEL"

ELECTRICAL NOTES:

1. ALL EQUIPMENT IS LISTED FOR USE.
2. INSTALLER TO FOLLOW NEC AND LOCAL JURISDICTION GUIDELINES.
3. ALL LABELS AND MARKING TO FOLLOW ARTICLE 690 (IV).
4. THE POINT OF CONNECTION COMPLIES WITH CEC/NEC ARTICLE 690.64(B).
5. ALL WIRE, VOLTAGES, AMPERAGES AND EQUIPMENT IS SIZED ACCORDING TO TEMPERATURE DERATING AND LOCATION.
6. DISCONNECTS SHALL BE WIRED SO THAT SOLAR DC WIRES ARE ON THE LINE SIDE AND THE AC UTILITY WIRES ARE ON THE LINE SIDE.
7. MAXIMUM VOLTAGE DOES NOT EXCEED 600VDC.
8. ALL MODULES AND RACKING SHALL BE GROUNDED WITH TIN PLATED DIRECT BURIAL RATED LAY IN LUGS USING STAINLESS STEEL HARDWARE, STAR WASHERS, AND THREAD FORMING BOLTS.
9. ALL EQUIPMENT SHALL BE GROUNDED, INCLUDING BONDING JUMPERS WHERE NECESSARY ACROSS RAIL SPLICE PLATES TO BOND INDIVIDUAL PIECES OF RAIL
10. ONLY COPPER (CU) CONDUCTORS SHALL BE USED. STRANDED OR SOLID WITH PROPERLY RATED CONNECTORS.
11. INVERTER(S) CONTAIN A GROUND FAULT DETECTION AND INTERRUPTION DEVICE.
12. ALL EQUATIONS ACCOUNT FOR WORST CASE CONDITIONS.

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ELECTRICAL 3 LINE

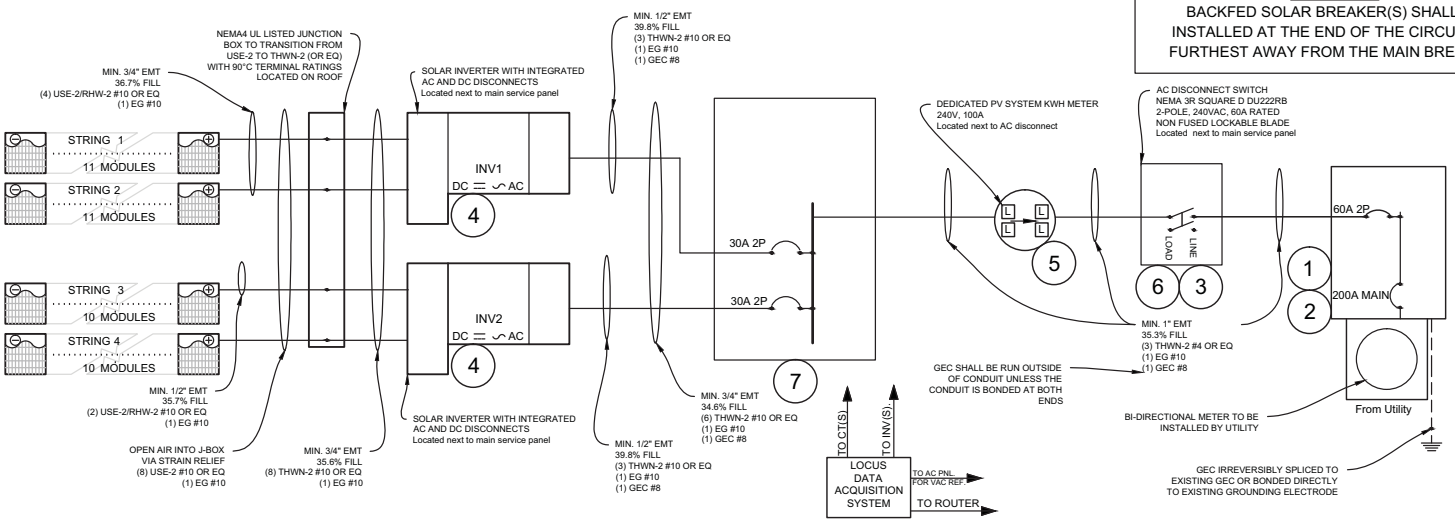
SUNGEVITY
SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET

DESIGNED BY:	ALI FATHI
DESIGNER PHONE:	510.496.5593
REVIEWED BY:	TRAVIS RICHARDSON
SCALE:	NTS
SHEET SIZE:	11X17

SUNGEVITY INC.
66 FRANKLIN ST
SUITE 310
OAKLAND, CA 94607

PV2.1



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MODULE ELECTRICAL SPECS
(42) SHARP NU-U235F3

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OPEN CIRCUIT VOLTAGE (Voc):	37 V
OPERATING CURRENT (IMP):	7.81 A
OPERATING VOLTAGE (VMP):	30.1 V
MAX SERIES FUSE RATING:	15 A
STC RATING:	235 W
CEC PTC RATING:	211.7 W

DESIGN CONDITIONS

HIGHEST 2% DB DESIGN TEMP. (°C):	40 °C
MIN. MEAN EXTREME ANNUAL DB (°C):	-3 °C

INVERTER 1 SPECS
(1) KACO BLUEPLANET 5002XI

RATED WATTS (EACH):	5000 W
AC OPERATING VOLTAGE:	240 V
AC OPERATING CURRENT:	24 A
MODULES PER STRING:	11
INVERTER EFFICIENCY:	95.5 %

INTEGRATED AC & DC DISCONNECT SWITCH

INVERTER 1 STRINGING (690.53)

MAX POWER POINT CURRENT (IMP):	15.6 A
MAX POWER POINT VOLTAGE (VMP):	331.1 V
MAX SYSTEM VOLTAGE (VOC) 690.7(A)1:	447.0 V
SOURCE CIRCUIT CURRENT (ISC) 690.8(A)1:	10.6 A
MAX SHORT CIRCUIT CURRENT (ISC) 690.8(A)2:	21.3 A

INVERTER 2 SPECS
(1) KACO BLUEPLANET 5002XI

RATED WATTS (EACH):	5000 W
AC OPERATING VOLTAGE:	240 V
AC OPERATING CURRENT:	24 A
MODULES PER STRING:	10
INVERTER EFFICIENCY:	95.5 %

INTEGRATED AC & DC DISCONNECT SWITCH

INVERTER 2 STRINGING (690.53)

MAX POWER POINT CURRENT (IMP):	15.6 A
MAX POWER POINT VOLTAGE (VMP):	301.0 V
MAX SYSTEM VOLTAGE (VOC) 690.7(A)1:	406.4 V
SOURCE CIRCUIT CURRENT (ISC) 690.8(A)1:	10.6 A
MAX SHORT CIRCUIT CURRENT (ISC) 690.8(A)2:	21.3 A

(OTHER NEC MARKINGS EXIST):
1. "PHOTOVOLTAIC ELECTRIC POWER SOURCE" NEC705.10
2. "BREAKERS ARE BACKFED" AND NEC690.54
3. "PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH" COVER TO BE LOCKED AT ALL TIMES. SWITCH MUST HAVE VISIBLE BLADE AND ACCESSIBLE PER UTILITY REQUIREMENTS AND CONFORM TO NEC705.22
4. "PHOTOVOLTAIC ARRAY DC DISCONNECT SWITCH" NEC690.14(C)(2) AND NEC690.53. SWITCHED TO BE LOCKED OR INACCESSIBLE NEC690.7(D)
5. "PHOTOVOLTAIC POWER SYSTEM DEDICATED KWH METER"
6. "WARNING - ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OFF POSITION" NEC690.17
7. "DEDICATED PV SYSTEM COMBINER PANEL" AND "LOADS NOT TO BE ADDED TO THIS PANEL"

ELECTRICAL NOTES:
1. ALL EQUIPMENT IS LISTED FOR USE.
2. INSTALLER TO FOLLOW NEC AND LOCAL JURISDICTION GUIDELINES.
3. ALL LABELS AND MARKING TO FOLLOW ARTICLE 690 (IV).
4. THE POINT OF CONNECTION COMPLIES WITH CEC/NEC ARTICLE 690.64(B).
5. ALL WIRE, VOLTAGES, AMPERAGES AND EQUIPMENT IS SIZED ACCORDING TO TEMPERATURE DERATING AND LOCATION.
6. DISCONNECTS SHALL BE WIRED SO THAT SOLAR DC WIRES ARE ON THE LINE SIDE AND THE AC UTILITY WIRES ARE ON THE LINE SIDE.
7. MAXIMUM VOLTAGE DOES NOT EXCEED 600VDC.
8. ALL MODULES AND RACKING SHALL BE GROUNDED WITH TIN PLATED DIRECT BURIAL RATED LAY IN LUGS USING STAINLESS STEEL HARDWARE, STAR WASHERS, AND THREAD FORMING BOLTS.
9. ALL EQUIPMENT SHALL BE GROUNDED, INCLUDING BONDING JUMPERS WHERE NECESSARY ACROSS RAIL SPLICE PLATES TO BOND INDIVIDUAL PIECES OF RAIL
10. ONLY COPPER (CU) CONDUCTORS SHALL BE USED. STRANDED OR SOLID WITH PROPERLY RATED CONNECTORS.
11. INVERTER(S) CONTAIN A GROUND FAULT DETECTION AND INTERRUPTION DEVICE.
12. ALL EQUATIONS ACCOUNT FOR WORST CASE CONDITIONS.

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PHONE: 602-863-6900
LICENSE #: 255816

ELECTRICAL 1 LINE

SUNGEVITY
SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET

DESIGNED BY:	ALI FATHI
DESIGNER PHONE:	510.496.5593
REVIEWED BY:	TRAVIS RICHARDSON
SCALE:	NTS
SHEET SIZE:	11X17

SUNGEVITY INC.
66 FRANKLIN ST
SUITE 310
OAKLAND, CA 94607

PV2.2

1

NEC 690.5(c)
PLACE THIS LABEL ON INVERTER(S) OR NEAR GROUND-FAULT INDICATOR (ON INVERTER(S) U.O.N.)

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

2

NEC 690.17
PLACE THIS LABEL ON ***ALL*** DISCONNECTING MEANS WHERE ENERGIZED IN AN OPEN POSITION

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION

3

NEC 690.64(B)(7)
PLACE THIS LABEL AT P.O.C. TO SERVICE DISTRIBUTION EQUIPMENT (I.E. MAIN PANEL (*AND* SUBPANEL IF APPLICABLE))
THIS LABEL IS ONLY NECESSARY WHEN BREAKERS FEEDING PANEL EXCEEDS 100% OF BUSS RATING.

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

4

NEC 690.53 & NEC 690.14(C)(2)
PLACE THIS LABEL ON ***ALL*** PHOTOVOLTAIC **DC** DISCONNECTING MEANS (ON INVERTER IF INTEGRATED DC DISCONNECTS ***AND*** AT SEPARATE DC DISCONNECT IF APPLICABLE)

INVERTER DISCONNECT 1

RATED MAX POWER POINT CURRENT (I_{MP}):	15.6A
RATED MAX POWER POINT VOLTAGE (V_{MP}):	331.1V
MAX SYSTEM VOLTAGE (V_{OC}):	447.0V
SHORT CIRCUIT CURRENT (I_{SC}):	21.3A

INVERTER DISCONNECT 2

RATED MAX POWER POINT CURRENT (I_{MP}):	15.6A
RATED MAX POWER POINT VOLTAGE (V_{MP}):	301.0V
MAX SYSTEM VOLTAGE (V_{OC}):	406.4V
SHORT CIRCUIT CURRENT (I_{SC}):	21.3A

5

NEC 690.54
PLACE THIS LABEL AT "INTERACTIVE POINT OF INTERCONNECTION" (AT MAIN SERVICE PANEL ***AND*** SUBPANEL IF APPLICABLE)

INTERACTIVE PHOTOVOLTAIC POWER SOURCE	
RATED AC OUTPUT CURRENT (A):	48A
NOMINAL OPERATING AC VOLTAGE (V):	240 V

ALL LABELS AND MARKINGS SHALL BE ATTACHED ACCORDING TO REQUIREMENTS BY NEC AND THE LOCAL AHJ. THE AHJ MAY HAVE SPECIAL LABEL REQUIREMENTS BEYOND THE SCOPE OF THIS DOCUMENT. THIS MAY ENCOMPASS LANGUAGE INCLUDING, BUT NOT LIMITED TO, THAT FOUND IN NEC ARTICLES 690.5 (C), 690.14 (C)(2), 690.17, 690.53,690.53(F), 690.54, 690.64(B)(7) and 705.10

ARIZONA ENERGY PROS
22822 N. 19TH AVE.
PHOENIX, AZ 85027
PHONE: 602-863-6900
LICENSE #: 255816

LABELS

SUNGEVITY
SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET
DESIGNED BY:			ALI FATHI
DESIGNER PHONE:			510.496.5593
REVIEWED BY:			TRAVIS RICHARDSON
SCALE:			NTS
SHEET SIZE:			11X17

SUNGEVITY INC.
66 FRANKLIN ST
SUITE 310
OAKLAND, CA 94607

PV3.1

DC WIRE SIZE:

SOURCE CIRCUIT [690.8(A)(1)] (Isc): Isc * 1.25
OUTPUT CIRCUIT [690.8(A)(2)] (Isc): Isc * 1.25 * # STRINGS
MIN. DC WIRE AMPACITY:
[690.8(a), 690.8(b), 210.19(A)1, 215.2(A), 110.14(C)]:
THE MAXIMUM OF:
1. (Isc * 1.25) / (CONDITIONS OF USE)
2. (Isc * 1.25 * 1.25)
DERATE WIRE FOR TERMINALS DEPENDING UPON TEMP.

AC WIRE SIZE:

INVERTER OUTPUT [690.8(A)] (Isc): INV. OUTPUT * 1.25
MIN. AC WIRE AMPACITY:
[690.8(a), 690.8(b), 210.19(A)1, 215.2(A), 110.14(C)]:
THE MAXIMUM OF:
1. (INV. OUTPUT * 1.25)
2. (INV. OUTPUT) / CONDITIONS OF USE
DERATE WIRE FOR TERMINALS DEPENDING UPON TEMP.

GROUNDING SIZE:

GEC
NEC 690.47
Sized per Table 250.66 for AC
Sized per Table 250.166 for DC
DC EGC
Table 250.122
Use 1.56 * Isc * # strings (if applicable)
AC EGC
NEC 250.122
Sized based on OCPD.

MAXIMUM SYSTEM VOLTAGE:

NEC2008/2011 says to use manufacturers Coefficient if available

Method A: Voc * # of modules in series * NEC Coefficient
Method B: (((T min °C - 25°C) * V/°C) + Voc) * # of modules in series

120% RULE:

NEC2008: [690.64(B)2
NEC2011: 705.12(D)2
MINIMUM BUSBAR OR CONDUCTOR =
TOTAL NUMBER OF BREAKERS FEEDING / 1.2

OCPD SIZING:

MIN DC: ISC * 1.56
MIN AC: INV. OUTPUT * 1.25

VOLTAGE DROP:

(2KID/CM)/VOLTAGE * 100 = VOLTAGE DROP %
K = 12.9 FOR COPPER
I = CURRENT (IMP OR OUTPUT AC)
D = DISTANCE IN FEET, ONE WAY
CM = CIRCULAR MILS

DC wire size	Option 1
Number Strings Combined:	1
Conductors in Raceway:	8
Nipple (less than 24"):	NO
Wire Rating (°C):	90
Terminal Rating (°C):	90
Conduit Height Off of Roof:	0.5" - 3.5"
Conduit Fill derating:	0.7
Corrected Record High Temp (°F):	144
Tempterature Correction factor:	0.58
Maximum Circuit Current {690.8(A)}(IpvMax):	10.63
Method A: 1.25*Continuous Current {215.2} (A):	13.28
Method B: Max. Circuit Current with conditions (A):	26.17
Min. Ampacity required (A):	26.17
Wire sized pre-terminal comparison (AWG):	#12
Wire size ampacity post-terminal comparison (A):	30
Wire Size (AWG):	#12

AC wire size	Inverter 1	Inverter 2	Loadcenter output (auto)	Condcutor 690.64(B)2
Quantity:	1	1	0	
Conductors in Raceway:	3	3	3	
Nipple (less than 24"):	NO	NO	No	
Wire Rating (°C):	90	90	90	90
Terminal Rating (°C):	60	60	60	
Conduit Fill derating:	1	1	1	
Record High Temp (°F):	104	104	104	
Tempterature Correction factor:	0.91	0.91	0.91	
Inverter Rated output Current {690.8(A)}:	24	24	48	
Method A: 1.25*Continuous Current {215.2} (A):	30	30	60.00	
Method B: Max. Circuit Current with conditions (A):	26.37	26.37	52.75	120
Min. Ampacity required (A):	30.00	30.00	60.00	100.00
Wire sized pre-terminal comparison (AWG):	#12	#12	#6	
Wire size ampacity post-terminal comparison (A):	40	40	95	
Wire Size (AWG):	#10	#10	#4	#4

Max. System Voltages	INV 1 MPPT1	INV 2 MPPT1
Modules Per string:	11	10
Record Low temp (°F):	27	27
NEC 2008/2011 temp. correction factor:	1.12	1.12
Manufacturers Cof of Temp (V/°C):	-0.12987	-0.12987
Temperature Difference (°C):	-28	-28
Module Voc (V):	37	37
Max System Voltage w/ Manfacturers Cof.:	455.84	414.4

120% Rule	Amperage
Main Panel OR Sub Buss (A):	225
Main Breaker (A):	200
Allowable Input Breaker (A):	70

DC EGC Size	
Min. amperage:	13.26
Min. EGC size:	#14

AC EGC Size	
Min. amperage:	30.00
Min. EGC size:	#12

DC Fuse Size	
Min. amperage:	13.26
Recommend fuse size:	15A Fuse

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CALCULATIONS

SUNGEVITY
SOLAR HOME SPECIALISTS

DRAWN BY	DATE	REV	COMMENTS
ARF	4/8/2011	1	PLANSET

DESIGNED BY:	ALI FATHI
DESIGNER PHONE:	510.496.5593
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SCALE:	NTS
SHEET SIZE:	11X17

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SUITE 310
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PV4.1

SHARP

solar electricity

235 WATT

RESIDENTIAL MODULE

NEC 2008 Compliant

NU-U235F3

RESIDENTIAL 235 WATT MODULE FROM THE WORLD'S TRUSTED SOURCE FOR SOLAR.

Our most powerful residential module manufactured today, the NU-U235F3 blends high performance with advanced aesthetics. Black backsheet and sleek black frame create a modern silhouette on nearly any roof. Using breakthrough technology, made possible by nearly 50 years of proprietary research and development, this module incorporates an advanced cell surface texturing process to increase light absorption and improve efficiency. Versatile enough to permit installation on nearly any kind of roof, the 235 watt module is the newest innovation in Sharp's residential product offerings.

Sharp's highest-power residential solar module makes a beautiful addition to nearly any roof.

ENGINEERING EXCELLENCE

NU-U235F3 is the perfect combination of high performance and design.

ADVANCED AESTHETICS

Sleek, black frame module provides an elegant appearance that blends beautifully with your home's roofline.

DURABLE

Tempered glass, EVA lamination and weatherproof backskin provide long life and enhanced cell performance.

RELIABLE

25-year limited warranty on power output.

HIGH PERFORMANCE

This module uses an advanced solar cell surface texturing process to increase light absorption and improve efficiency.

Black frame improves aesthetics for residential roof top applications.

Laminated glass construction in a high torsion frame.

SHARP: THE NAME TO TRUST

When you choose Sharp, you get more than well-engineered products. You also get Sharp's proven reliability, outstanding customer service and the assurance of our 25-year limited warranty on power output. A global leader in solar electricity, Sharp powers more homes and businesses than any other solar manufacturer worldwide.

BECOME POWERFUL

235 WATT

NU-U235F1

NEC 2008 Compliant
Module output cables 12 AWG with locking connectors

ELECTRICAL CHARACTERISTICS	
Maximum Power (Pmax)*	235 W
Tolerance of Pmax	+10%/-5%
Type of Cell	Monocrystalline silicon
Cell Configuration	60 in series
Open Circuit Voltage (Voc)	37.0 V
Maximum Power Voltage (Vpm)	30.0 V
Short Circuit Current (Isc)	8.60 A
Maximum Power Current (Ipm)	7.84 A
Module Efficiency (%)	14.4%
Maximum System (DC) Voltage	600 V
Series Fuse Rating	15 A
NOCT	47.5°C
Temperature Coefficient (Pmax)	-0.485%/°C
Temperature Coefficient (Voc)	-0.351%/°C
Temperature Coefficient (Isc)	0.053%/°C

*Measured at (STC) Standard Test Conditions: 25°C, 1 kW/m² insolation, AM 1.5

MECHANICAL CHARACTERISTICS	
Dimensions (A x B x C below)	39.1" x 64.6" x 1.8"/994 x 1640 x 46 mm
Cable Length (I)	43.3"/1100 mm
Output Interconnect Cable**	12 AWG with MC4 Locking Connector
Weight	44.1 lbs / 20.0 kg
Max Load	50 psf (2400 Pascals)
Operating Temperature (cell)	-40 to 194°F / -40 to 90°C

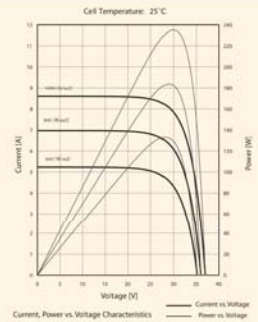
**A safety lock clip (Multi Contact part number PV-SSH4) may be required in readily accessible locations per NEC 2008 690.33 (C)

QUALIFICATIONS	
UL Listed	UL 1703
Fire Rating	Class C

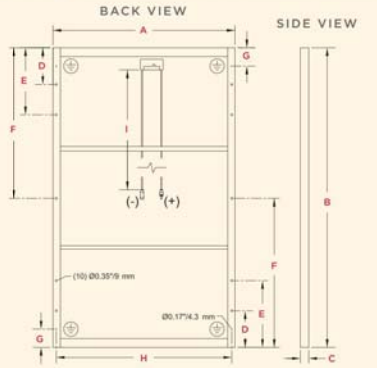
WARRANTY

25-year limited warranty on power output
Contact Sharp for complete warranty information

IV CURVES



DIMENSIONS



A	B	C	D	E
39.1"/994 mm	64.6"/1640 mm	1.8"/46 mm	7.9"/200 mm	14.4"/365 mm
F	**G**	**H**	**I**	
32.3"/820 mm	3.9"/100 mm	37.7"/958 mm	43.3"/1100 mm	

Contact Sharp for tolerance specifications

SHARP

SHARP ELECTRONICS CORPORATION
5901 Bolsa Avenue, Huntington Beach, CA 92647
1-800-SOLAR-06 • Email: sharpsolar@sharpusa.com
www.sharpusa.com/solar

09F-040 • PC-06-09

KACO blueplanet 02xi series grid-tied inverters

1502xi
2502xi
3502xi
5002xi

- Highest efficiency in their class - over 95.5%
- Programmable LCD display with night switch
- Plug and play web monitoring option
- Lockable NEC compliant AC/DC disconnect
- Field selectable grid voltage (240 / 208 V_{AC})
- Field selectable positive or negative grounding
- Convection cooled aluminum housing - high reliability
- NEMA 3R enclosure - for indoor or outdoor installation
- 1/2" or 3/4" knockouts on sides, bottom & rear of unit
- ***easy***Install light weight installation bracket
- ***easy***Link data interface includes RS485 connection
- ***easy***Swap 10 year warranty with service reimbursement

*tested to UL 1741, IEEE 1547, CSA 22.2

TÜV Rheinland of North America, Inc. C US

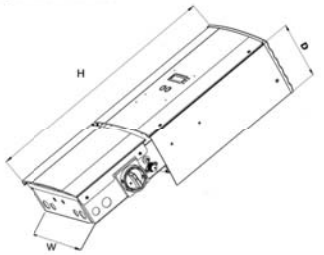
KACO new energy.

The KACO 02xi blueplanet series - the latest generation of PV inverters.

- Refined power electronics increase operational efficiency, increase CEC efficiency to 95.5% on all units and improve reliability.
- All inverters include a factory assembled connection box which includes an NEC compliant AC/DC disconnect switch.
- The inverters can be easily and safely removed from the connection box to allow field service.
- The connection box allows conduit to connect from both sides, the bottom or the rear for increased installation flexibility. Using the rear knockouts will hide all conduits for a clean install.
- Field selectable grid voltages 240 / 208 VAC (220 VAC for Mexico) with or without neutral sensing.
- Field selectable positive or negative grounding simplify installs and create more opportunities to use the KACO blueplanet inverters.
- Convenient PV system monitoring with integrated plug and play ethernet web monitoring option reduces lifetime system costs by ensuring optimal system performance.
- Easy to use push button interface to configure the inverter and access stored PV data on the blueplanet LCD screen. Night illumination switch backlights display for access to production data when the inverter is in standby mode.
- Light weight design makes the inverters less expensive to ship and easier to handle than other comparably sized inverters.

Model number		blueplanet 1502xi	blueplanet 2502xi	blueplanet 3502xi	blueplanet 5002xi
Input data (DC)					
DC operating range (MPP)		125 - 400 V_{dc}	200 - 450 V_{dc}	200 - 510 V_{dc}	200 - 510 V_{dc}
Max. DC input voltage		550 V_{dc}	550 V_{dc}	550/600* V_{dc}	550/600* V_{dc}
Nominal DC input current		14.3 A_{dc}	13.5 A_{dc}	18.5 A_{dc}	26.5 A_{dc}
Max. DC input Isc current		21.45 A_{dc}	21.45 A_{dc}	28 A_{dc}	40 A_{dc}
Output data (AC)					
Max. continuous output power (CEC)		1500 W	2500 W	3500 W	5000 W
Max. over-current protection		15 A	20 A	25 A	30 A
Max. continuous current	240 V	8 A_{ac}	12 A_{ac}	16 A_{ac}	24 A_{ac}
	208 V	8 A_{ac}	12.5 A_{ac}	17 A_{ac}	24 A_{ac}
AC operating range	240 V	211 - 264 V			
	208 V	184 - 226 V			
	220 V	198 - 242 V (for Mexico)			
Frequency		60 Hz (59.3 – 60.5 Hz)			
CEC rated efficiency	240 V	95.5%	95.5%	95.5%	95.5%
	208 V	95%	95%	95.5%	95%
Additional data					
AC/DC disconnect ratings		AC: 300 V - 36 A / DC: 600 V - 40 A			
Cooling		True convection - ultimate reliability (5002xi - fan assisted)			
DC reverse polarity protection		YES			
Ground fault protection		Integrated ground fault detector/interrupter (GFDI)			
Grounding		Field selectable positive or negative ground option			
Visual displays		Backlit LCD w/ convenient night switch & push button controls			
Included accessory interfaces		***easy***Link RS485 & S0 port			
Ambient temp @ max AC power		-5°F - +104°F -20°C - + 40°C			
Thermal protection		Yes			
Noise emissions		< 35 dB (silent operation)			
Night power consumption		0.3 W			
Warranty		Standard ***easy***Swap 10 years			
Certifications					
Safety compliance		UL 1741, IEEE 1547, NEC, CSA 22.2 No.107.1-01			
Communications compliance		FCC Part 15 Class B			

* - Unit will only feed power if the PV voltage is less than 550Vdc.



Mechanical Specifications				
Model	Height (H)	Width (W)	Depth (D)	Weight
1502xi	30 in.	14 in.	8 1/4 in.	42 lbs
2502xi	32 in.	14 in.	8 1/4 in.	52 lbs
3502xi	35 7/8 in.	14 in.	9 1/2 in.	69 lbs
5002xi	35 7/8 in.	14 in.	9 1/2 in.	70 lbs
Enclosure	NEMA 3R			

Download the KACO calc string sizing tool from www.kaco-newenergy.com.

Distributed by:

KACO new energy.

Printed on 100% post consumer material

T: +1 (866) 522 6765 • F: +1 (415) 931 1688
kacoinfo@kaco-newenergy.com • www.kaco-newenergy.com

Locus Smart Monitoring

Our product is a web-based monitoring and performance optimization platform that integrates with any type of distributed energy system.

The Locus Smart Monitoring platform combines revenue-grade metering hardware and web-based software into a scalable energy generation and usage monitoring service. The platform works with any current or future type of power inverter, collecting performance data continuously and uploading it to Locus' servers. Both installation professionals and their end-users can then log on to customized portals giving them real-time access to system information.

Automated SREC and Compliance Reporting

The systems you install are generating valuable Solar Renewable Energy Credits. Normally, these would need to be manually recorded and then transmitted to a state agency or public utility commission on a regular basis for the useful life of the system.

Smart Monitoring enables you to automate this task, while at the same time reducing any requirements for an audit/true-up to ensure that the numbers being recorded match what the system actually is producing.

This revenue-grade accuracy and report automation helps to ensure that the environmental and economic benefits of your installed systems are being maximized.

Performance Optimization

In addition to monitoring, the Locus platform continually runs patent-pending diagnostic algorithms to identify underperforming systems. Catastrophic system degradations such as inverter or string failures are unusual and generally easy to diagnose.

It is the non-catastrophic degradation such as unanticipated shading, pollen/dust accumulation, etc. that can go unnoticed for long periods of time and significantly affect system efficiency.

By providing a set of customizable and automated diagnostics, Locus enables installers to proactively optimize system performance.

Fleet Management

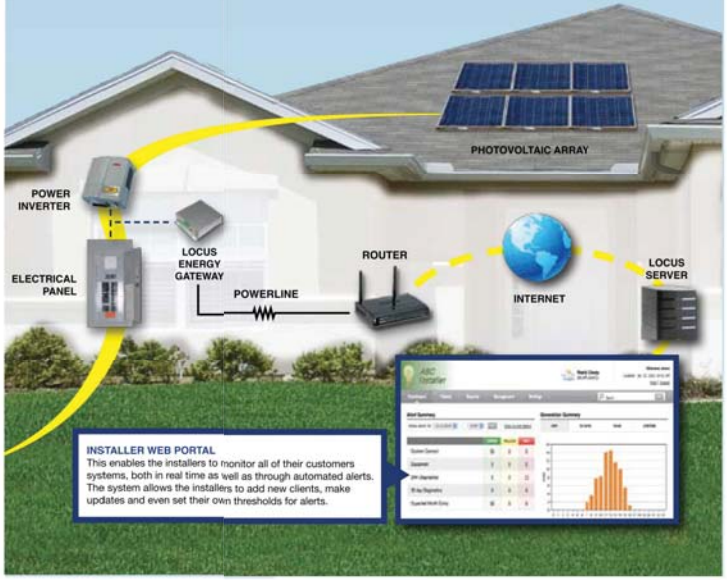
For installers who manage multiple installations, we offer a suite of tools to increase the efficiency of fleet management:

- Customizable system performance alerts
- Quick links to 24-hour, monthly and lifetime fleet data
- Interactive map showing locations of your system fleet

LOCUS ENERGY

www.locusenergy.com
1-877-LOCUS-EN

distributed energy solutions



features	benefits
Plug and Play integration	• Quick setup for new and retrofit installations • Works with any type of power inverter • Gateway can simultaneously measure PV, solar thermal & building demand
Intuitive interface	• Dashboard view displays status of entire install base at a glance • Easy to drill-down to specific clients and systems • White-labeled client portal allows installers to offer branded web-based monitoring to end-users
Robust diagnostics and reporting	• Continuous system performance monitoring and diagnostics - automatically spots degradation • User-configurable voltage and current alerts • Downloadable performance graphs and spreadsheets

technical specs

> Voltage Inputs
- 85-264 Volts Line To Neutral or Line to Line
- Universal Voltage Input
- Input Withstand Capability 4k VAC
- Single Phase

> Current Inputs
- Specified CTs for 0-600 Amps
- Pass through wire diameter: 0.75" or 1.25"

> Communications
- Wired via Ethernet
- Wireless via IEEE 802.g Wi-Fi
- Wireless range – up to 150 feet
- Wired range – up to 1000 feet

> Environmental Rating
- Storage: (-20 to +70)° C
- Operating: (-20 to +70)° C
- Humidity: to 95% RH Non-Condensing Indoor use only without cabinet
- Built in mounting brackets
- NEMA 12 boxes available for exterior use

> Data Storage
- 1 device/5 min. increments: 2 mos
- 1 device/15 min. increments: 6 mos.
- 5 devices/15 min. increments: 2 mos

> Power Supply
- 85 to 264 Volts AC 50/60 Hz Universal Input

> Standard Communications
- RS232 Ports (Back Plate)
- RS485 Modbus Port (Front Plate)
- Ethernet RJ45
- USB

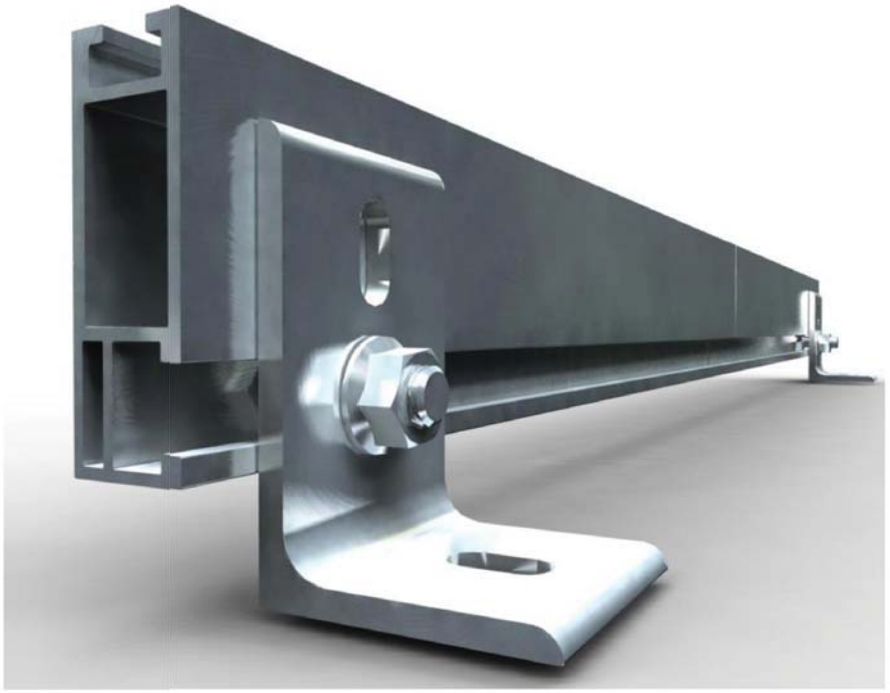
> Dimensions and Shipping
- Weight: 1 lb 10 oz
- Basic Unit: H2.0 x W6.5 x L6.5

> Compliance:
Certified by TUV Rheinland of North America
- ANSI C12.20 (0.5% Accuracy)
- IEC 61010 (Safety)
- FCC 15 Part B
- IEC 60068-2-27 (Mechanical shock)
- IEC 60068-2-6 (Mechanical Vibration)
- CFR 47 ANSI C63.4 (Radiated emissions)

> Warranty:
- 5 years limited warranty for power-meter, data logger

IRONRIDGE

XRL Solar Rail System



IRONRIDGE

Solar Mounting Solutions

June 2009 www.IronRidge.com

Version 1.0

Table 1 - MAXIMUM SPANS

XRL Rail	Wind Speed	Snow Load				
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf
Category B	90	8'-6"	7'-6"	6'-0"	6'-0"	5'-6"
	100	8'-6"	7'-6"	6'-0"	6'-0"	5'-6"
	110	6'-0"	7'-6"	6'-0"	6'-0"	5'-6"
	120	7'-6"	7'-6"	6'-0"	6'-0"	5'-6"
	130	6'-6"	6'-6"	6'-0"	6'-0"	5'-6"
	140	6'-0"	6'-0"	6'-0"	5'-6"	5'-0"
	150	5'-6"	5'-6"	5'-6"	5'-6"	5'-0"
Category C	90	8'-0"	7'-6"	6'-0"	6'-0"	5'-6"
	100	7'-0"	7'-0"	6'-0"	6'-0"	5'-6"
	110	6'-6"	6'-6"	6'-0"	6'-0"	5'-6"
	120	6'-0"	6'-0"	6'-0"	5'-6"	5'-0"
	130	5'-6"	5'-6"	5'-6"	5'-6"	5'-0"
	140	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"
	150	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"

Note – Tabulated values are based on the following criteria:

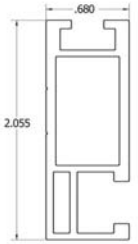
1. Roof wind zone 1
2. Building mean roof height = 30 ft.
3. Roof slope = 6 in. per ft.
4. Solar panel long dimension = 67.5 in.
5. 2 in. clear between roof and rail.
6. End cantilever span = 0.40 x adjacent interior span
7. No rail splices in the middle ½ of the span

Please feel free to contact me at your convenience if you have any questions.

Respectfully yours,

Bruce Swanney, P.E.
Special Projects Engineer

Registered Professional Engineer – Structural
BRUCE W. SWANNEY
No. 37911
Date Signed 4-27-10
ARIZONA, U.S.A.
Expires: 6/30/2010



XRL

Component List

Component List	Qty	Part Number
Tilt Leg Kit	1	51-7206-000
Long Leg	1	51-7200-xxx
Short Leg	1	51-7200-006
U-Foot	2	51-7100-001
3/8-16 x 2.5" SS Hex Head Bolt	4	23-3716-250
3/8" SS Flat Washer	2	25-3702-000
3/8-16 SS Serrated Flange Nut	4	25-2501-016

Assembly

1. Mount all U-Feet to the roof in the desired locations. Please note the orientation of both U-Feet in Figure 1.

   Note: Determine the maximum distance beween U-feet according to engineering specifications. In addition, please be aware that the placement of the XR rails vary by module manufacturer. Set your XR rail spacing (North to South). The maximum distance the XR rails can be placed from the edge of the module is 15% of the module's length, as shown in Figure 2. On the South side, the rail might require placement near the edge of the module to avoid the module 'crashing' into the roof as you tilt the assembly.

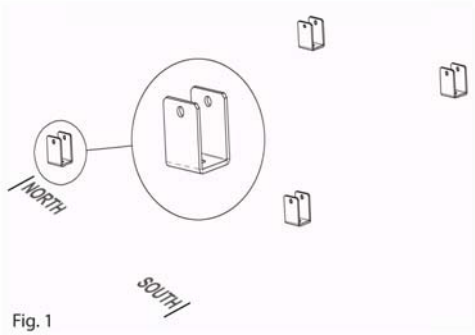


Fig. 1

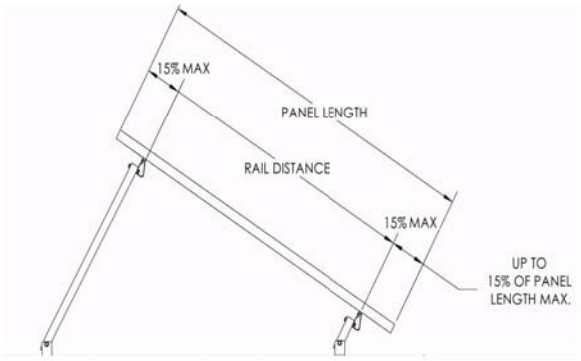


Fig. 2

2. Place the Long Leg in the center of the U-Foot. Align the slot of the Long Leg with the hole in the U-Foot. Insert a 3/8-16 x 2.5" hex head bolt with washer into the hole and loosely attach a 3/8" flange nut. Do not tighten completely. Pivot the Long Leg onto the roof north of the array.

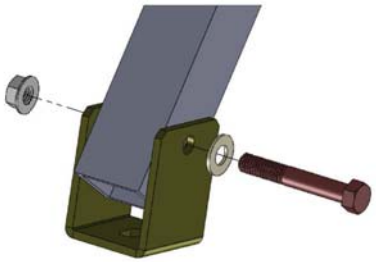


Fig. 3

3. Attach the Short Leg to the front XR rail in your XR assembly (created according to the XR Solar Rail System Installation Manuals) using the normal method of sliding bolts into the 3/8" channel (shown in same Installation Manual). Leave nut finger tight to assist in aligning with U-foot previously attached on roof.

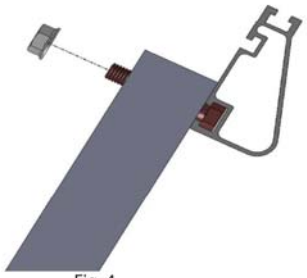


Fig. 4

4. Attach the Short Leg to the U-foot by aligning the hole in U-foot with the slot in Short Leg and inserting a 3/8-16 x 2.5" hex head bolt and washer. Loosely attach 3/8" flange nut as shown in Figure 5.

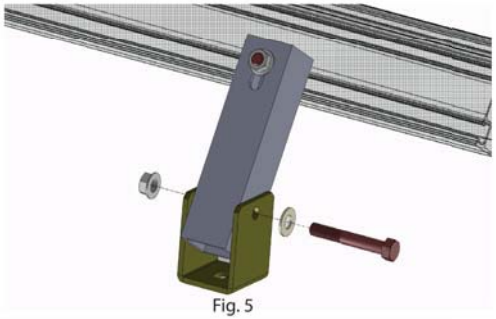


Fig. 5

IronRidge 291 Shell Ln. Willits, CA 95490 (707) 459-9523 Fax (707) 459-1833 www.IronRidge.com

Stand-off

Aluminium mounting console "stand-off" with quality steel thread bolts – height 12"/305mm

400881-004 **Standoff 4**

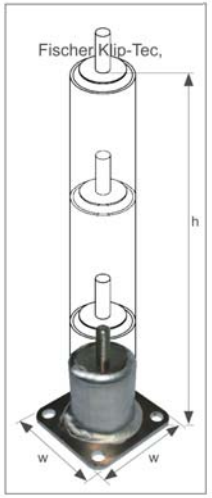
	w	h
mm	80	102
inches	3,15	4

400881-008 **Standoff 8**

	w	h
mm	80	203
inches	3,15	8

400881-012 **Standoff 12**

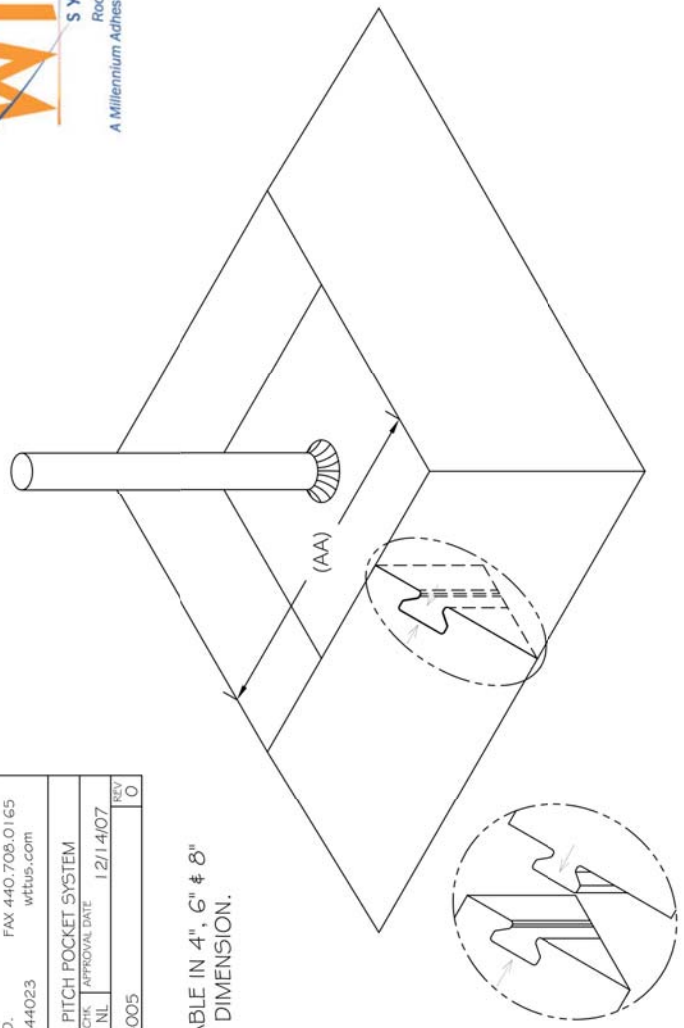
	w	h
mm	80	305
inches	3,15	12



400881-100 **Roof membrane connection**
(for sealing the stand-off aluminum mounting consoles to the roof cladding)

400881-200 **Aluminium mounting traverse** for stand-off mounting consoles
(not required for the connection of triangle supports)

WTT SYSTEMS
Roofing Division
A Millennium Adhesive Company



(AA) AVAILABLE IN 4", 6" & 8"
INSIDE DIMENSION.

NOTES:
1. MAKE SURE SUBSTRATE IS CLEAR OF LOOSE GRAVEL, DIRT, GRANULES OR ALL FOREIGN SUBSTANCES THAT CAN AFFECT ADHESION.
2. PLACE LOCKIN' POCKET IN DESIRED LOCATION, MARK THE OUTSIDE EDGE FOR REFERENCE. LOCKIN' POCKET SHOULD BE PLACED TO ASSURE AT LEAST ONE (1) INCH CLEARANCE FROM INSIDE OF LOCKIN' POCKET AND PENETRATION.
3. PENETRATIONS SHOULD BE PREPARED BY WIRE BRUSHING TO REMOVE LOOSE CEMENTS, SEALERS, RUST OR OTHER CONTAMINTS THAT WOULD PREVENT A POSITIVE SEAL.
4. SEAL BASE OF PENETRATION WITH LPS TO PREVENT THE POTENTIAL OF SEALER FLOWING THROUGH OPENINGS.
5. APPLY A LIBERAL BEAD OF LPS TO THE SUBSTRATE AND SET LOCKIN' POCKET IN PLACE AND APPLY EQUAL PRESSURE TO ASSURE POSITIVE CONTACT WITH ROOF SURFACE. STRIKE AWAY EXCESS SEALANT.
6. DISPENSE WEATHER-TITE HURRICANE FORCE UNIVERSAL SEALER INTO ASSEMBLED LOCKIN' POCKET UNTIL FULL.

CORPORATE OFFICES
17340 MUNN RD.
CHAGRIN FALLS, OHIO 44023
TEL 866.868.0883
FAX 440.708.0165
wttus.com

TITLE: LOCKIN' POCKET - PITCH POCKET SYSTEM
SCALE: NONE | DWN: DMT | CHK: NL | APPROVAL DATE: 12/14/07
DRAWING NUMBER: WTT-005 | REV: 0
FILE NAME: MAP-005 | PLOT DATE: 12/14/07

** USAGE OF THIS DRAWING IS GOVERNED BY THE TERMS OF SERVICE FOR WTT SYSTEMS DETAIL. PLEASE CONSULT THESE TERMS OF SERVICE PRIOR TO UTILIZING THIS DRAWING.