BADGER RD SOLAR
GRID–TIE SOLAR ELECTRIC SYSTEM
2605 BADGER RD
NORTH POLE, AK 99705

SCOPE OF WORK

THE PROJECT SCOPE INCLUDES THE INSTALLATION OF A GRID–TIED SOLAR PHOTOVOLTAIC SYSTEM AT THE BADGER RD SOLAR PROPERTY IN NORTH POLE, AK.

THE INSTALLATION CONSISTS OF A GROUND MOUNT SOLAR ARRAY, 8 STRING–INVERTER(S), AND RELATED ELECTRICAL METERING AND SAFETY EQUIPMENT. ALL EQUIPMENT WILL BE INSTALLED AS REQUIRED BY APPLICABLE CODES AND THE LOCAL UTILITY COMPANY. DURING DAYLIGHT HOURS THIS PHOTOVOLTAIC SYSTEM (SOLAR ELECTRIC) WILL PROVIDE ELECTRICITY IN PARALLEL WITH THE LOCAL UTILITY SERVICE PROVIDER.

SYSTEM DESCRIPTION

FACILITY SERVICE VOLTAGE: 480Y/277V, 3 PHASE, 4 WIRE
(2160) SEG, SEG–550–BMA–TB, 550WDC, PERC MONO, CEC PTC RATING: WDC
(8) SMA, SHP 125–US–21, 125kVA, STRING–INVERTER(S), 480VAC, 3ϕ

1188.000kW DC
1000.000kW AC

GENERAL NOTES

ALL ELECTRICAL WORK TO BE INSTALLED BY A QUALIFIED AND LICENSED ELECTRICAL CONTRACTOR.

ALL SOLAR MODULES SHALL BE UL LISTED 61730 & CEC APPROVED. ALL INVERTERS SHALL BE UL LISTED 1741 CERTIFIED & CEC APPROVED. ALL ELECTRICAL COMPONENTS AND MATERIALS SHALL BE LISTED FOR IT'S PURPOSE AND AND INSTALLED IN A WORKMAN LIKE MANNER. ALL OUTDOOR EQUIPMENT SHALL MEET APPROPRIATE NEMA STANDARDS.

THE ELECTRICAL CONTRACTOR IS ADVISED THAT ALL DRAWINGS AND COMPONENT MANUALS ARE TO BE UNDERSTOOD PRIOR TO INSTALLATION. THE CONTRACTOR IS ADVISED TO HAVE ALL SWITCHES IN THE "OFF" POSITION AND FUSES REMOVED PRIOR TO INSTALLATION OF FUSE–BEARING COMPONENTS.

THIS SYSTEM IS INTENDED TO BE OPERATED IN PARALLEL WITH THE UTILITY SERVICE PROVIDER. ANTI–ISLANDING PROTECTION IS A REQUIREMENT OF UL 1741 AND IS INTENDED TO PREVENT THE OPERATION OF THE PV SYSTEM WHEN THE UTILITY GRID IS NOT OPERATIONAL.

PERMISSION TO OPERATE THE SYSTEM IS NOT AUTHORIZED UNTIL FINAL INSPECTIONS AND APPROVALS ARE OBTAINED FROM THE LOCAL AUTHORITY HAVING JURISDICTION AND THE LOCAL UTILITY SERVICE PROVIDER.

THE METHOD OF ATTACHMENT CREATES A UNIFIED STRUCTURE TO MEET DEAD LOAD, WIND LOAD, AND SEISMIC REQUIREMENTS. SOLAR MODULES WILL BE SECURED AS SPECIFIED ON THE STRUCTURAL SHEETS. ALL STRUCTURAL DESIGN AND INSTALLATION COMPONENTS ARE THE RESPONSIBILITY OF OTHERS AND OUTSIDE THE SCOPE OF THIS DOCUMENT.

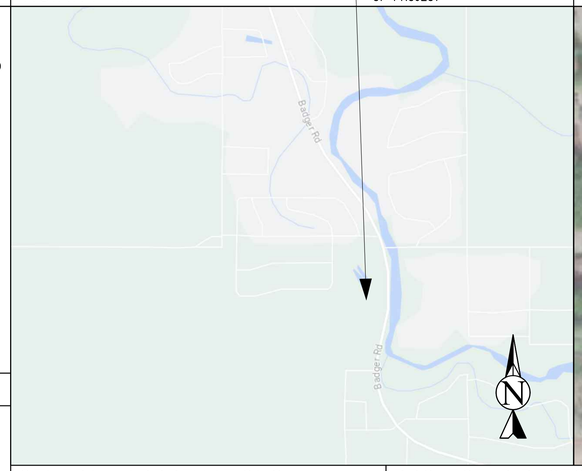
ALL FASTENERS SHALL BE CORROSION RESISTANT APPROPRIATE FOR SITE CONDITIONS. CONNECTORS SHALL BE TORQUED PER DEVICE LISTING OR ENGINEERING RECOMMENDATIONS.

ALL LAYOUT DIMENSIONS ARE SHOWN TO THE NEAREST 1 INCH U.O.N.

APPLICABLE CODES

INTERNATIONAL BUILDING CODE, 2018
NATIONAL ELECTRICAL CODE, 2020

VICINITY MAP



AERIAL IMAGE

GENERAL ABBREVIATIONS

(E)	EXISTING
AHJ	AUTHORITY HAVING JURISDICTION
AL	ALUMINUM
APPROX	APPROXIMATE
ARY	ARRAY
ASHRAE	AMERICAN SOCIETY OF HEATING REFRIGERATING AND AIR CONDITIONING ENGINEERS
BLDG	BUILDING
CL	CENTERLINE
DAS	DATA ACQUISITION SYSTEM
DIA	DIAMETER
DO	DITTO
EW	EAST–WEST
FBO	FURNISHED BY OTHERS
FF	FORWARD FACING
GALV	GALVANIZED
HDG	HOT DIP GALVANIZED
HVAC	HEATING VENTILATION AND AIR CONDITIONING
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
MFR	MANUFACTURER
MOD	SOLAR MODULE
NEC	NATIONAL ELECTRICAL CODE
NS	NORTH–SOUTH
NTS	NOT TO SCALE
OAE	OR APPROVED EQUIVALENT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PV	PHOTOVOLTAIC
PVC	POLY VINYL CHLORIDE
SCH	SCHEDULE
SS	STAINLESS STEEL
SSS	SOLAR SUPPORT STRUCTURE
STC	STANDARD TEST CONDITIONS
TBD	TO BE DETERMINED
TOF	TILT AND ORIENTATION FACTOR
TP	TAMPER PROOF
TSRF	TOTAL SOLAR RESOURCE FACTOR
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
WP	WEATHER PROOF

PROJECT DIRECTORY

UTILITY
GOLDEN VALLEY ELECTRIC

PROJECT TEAM

CONTRACTOR
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CONTACT: DAVE MESSIER
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SYSTEM DESIGNER
FIRM: MAYFIELD RENEWABLES
CONTACT: GREG KAMPS
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SHEET INDEX

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STAMP:

NOT FOR CONSTRUCTION

GRID–TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
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PROJECT NUMBER:
23–3688U

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
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	11/21/23	GK	BB CD IFR – ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:
T–1
TITLE PAGE

PRINT DATE: 5/29/2024 9:00 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23–3688u – north pole\working set\T–1_TitlePage.dwg

ELECTRICAL SPECIFICATIONS

GENERAL: (GRID-TIE, NEC 2020)

1. THIS PROPOSED SOLAR ELECTRIC SYSTEM IS INTENDED TO OPERATE IN PARALLEL WITH POWER RECEIVED FROM THE UTILITY SERVICE PROVIDER.
2. THE INVERTER FOR THE PROPOSED SOLAR ELECTRIC SYSTEM SHALL BE IDENTIFIED AND LISTED AS A UTILITY INTERACTIVE INVERTER FOR USE IN SOLAR PHOTOVOLTAIC SYSTEMS.
3. THIS SYSTEM IS INTENDED TO CONNECT TO THE EXISTING FACILITY POWER SYSTEM AT ONE POINT, POINT OF CONNECTION (POC). THIS CONNECTION SHALL BE IN COMPLIANCE WITH EITHER NEC ARTICLE 705.11 "SUPPLY-SIDE SIDE SOURCE CONNECTIONS" OR 705.12 "LOAD-SIDE SOURCE CONNECTIONS."
4. ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION FOR TESTING AND ISOLATION.
5. ALL DISCONNECTS AND COMBINERS SHALL BE SECURED FROM UNAUTHORIZED/UNQUALIFIED PERSONNEL BY LOCK OR LOCATION.
6. ALL DISCONNECTS, COMBINERS, PULL/SPLICE BOXES, AND ENCLOSURES SHALL BE LISTED FOR ITS PURPOSE.
7. EQUIPMENT SHALL BE INSTALLED IN A SECURE AREA. INVERTER PERFORMANCE MAY BE AFFECTED IF INSTALLED IN DIRECT SUNLIGHT.
8. THE INVERTER TO POINT OF CONNECTION (POC) HAS BEEN DESIGNED FOR NO MORE THAN 2% VOLTAGE RISE BASED ON NOMINAL VOLTAGE AND CURRENT VALUES.

WIRING METHODS:

1. ALL WIRING METHODS AND INSTALLATION PRACTICES SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC), LOCAL STATE CODES, AND OTHER APPLICABLE LOCAL CODES. THE INTERIOR OF RACEWAYS INSTALLED BELOW GRADE AND IN WET LOCATIONS ABOVE GRADE SHALL BE CONSIDERED WET LOCATIONS, NEC 300.5(B) AND 300.9.
2. EXPOSED PV SOURCE CIRCUIT WIRING SHALL BE USE-2 OR PV WIRE, 90 DEGREE C, WET RATED AND UV RESISTANT. ALL EXPOSED CABLES, SUCH AS MODULE LEADS SHALL BE SECURED WITH MECHANICAL OR OTHER SUNLIGHT RESISTANT MEANS.
3. FOR ALL FUNCTIONALLY GROUNDED PV SYSTEMS, ALL PV SOURCE AND OUTPUT CIRCUIT CONDUCTORS SHALL BE RED FOR POSITIVE, BLACK FOR NEGATIVE AND GREEN FOR GROUND.
4. ALL FIELD WIRING THAT IS NOT COLOR CODED SHALL BE MARKED AT BOTH ENDS WITH PERMANENT WIRE MARKERS TO IDENTIFY POLARITY, INVERTER NUMBER AND CIRCUIT IDENTIFICATION. SOURCE CIRCUITS SHALL BE IDENTIFIED AT ALL POINTS OF TERMINATION, CONNECTION AND SPLICES.
5. CONDUIT TYPES USED IN THE PV INSTALLATION SHALL BE APPROVED FOR THEIR SPECIFIC APPLICATION AND SUPPORTED PROPERLY PER NEC.
6. STRAIGHT CONDUIT RUNS SHALL HAVE EXPANSION FITTINGS PER NEC 300.7, IF EXPOSED TO WEATHER AND MORE THAN ¼" OF EXPANSION AND CONTRACTION IS EXPECTED.
7. ALL BURIED CONDUITS SHALL HAVE LIQUITITE OR FLEX FITTING WITH SUFFICIENT FLEX/BEND TO ALLOW FOR GROUND MOVMNET BETWEEN BURIED CONDUIT AND FIXED ELECTRICAL BOXES. SEE E-1.3.
8. IF USED, ALL WIRENUTS ARE TO BE INSTALLED PER LOCATION REQUIREMENTS AND MANUFACTURERS SPECIFICATIONS BY A QUALIFIED/CERTIFIED PERSON. WIRENUTS SHALL NOT BE USED ON DC CONDUCTORS.
9. FUSES AND WIRES SUBJECT TO TRANSFORMER INRUSH CURRENT SHALL BE SIZED ACCORDINGLY.
10. ALL DC MATERIALS SHALL BE LISTED WITH A DC VOLTAGE RATING GREATER THAN OR EQUAL TO THE MAXIMUM PV SYSTEM VOLTAGE.
11. ALL INTERCONNECT WIRING AND POWER CONDUCTORS INTERFACING THE UNIT MUST BE IN ACCORDANCE WITH THE NEC ANSI/NFPA 70 AND ANY APPLICABLE LOCAL CODES. CONDUCTORS MUST CONFORM TO THE MINIMUM BEND RADIUS SPECIFIED IN THE SPECIFIC NEC ARTICLE. KEEP ALL WIRE BUNDLES AWAY FROM ANY SHARP EDGES TO AVOID DAMAGE TO WIRE INSULATION. ALL CONDUCTORS SHOULD BE MADE OF COPPER AND RATED FOR 90 DEGREE C MINIMUM UNLESS OTHERWISE NOTED. FOR OUTDOOR INSTALLATIONS, ALL INTERCONNECT CONDUITS AND FITTINGS MUST BE PROPERLY NEMA RATED AS REQUIRED BY THE NEC.
12. CONNECTORS TO BE TORQUED PER DEVICE LISTING OR MANUFACTURERS RECOMMENDATIONS.
13. ALL AC WIRING SHALL BE COPPER WIRE, RATED AT 90 DEGREE CELSIUS, AND RATED FOR 600 VAC UNLESS OTHERWISE NOTED.
14. PROPERLY SUPPORT ALL EXPOSED PV SOURCE CIRCUITS TO MAINTAIN THE INTEGRITY OF THE CONDUCTOR'S INSULATION.
15. ALL CONDUIT THAT IS MOUNTED ON THE ROOF SHALL BE MOUNTED WITH FLASHED CONDUIT SUPPORTS PER NEC 386.30.
16. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNATED AND LISTED FOR SUCH USE, AND MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE PER NEC 110.2, 110.3(A), 110.3(B)
17. CONDUCTORS SHALL BE SUPPORTED PER NEC 300.19 AS REQUIRED.
18. ALL FIELD MADE CONNECTORS FOR PV QUICK CONNECTS SHALL BE THE SAME TYPE AND MANUFACTURER AS THE PV MODULES AND USE THE MANUFACTURER SPECIFIED CRIMPING TOOL.
19. WHERE MATING CONNECTORS ARE NOT OF THE IDENTICAL TYPE AND BRAND, THEY SHALL BE LISTED AND IDENTIFIED FOR INTERMATEABILITY, AS DESCRIBED IN THE MANUFACTURER'S INSTRUCTIONS.
20. ALL CONDUCTORS TO BE XHHW-2 OR PV WIRE UNLESS OTHERWISE NOTED.

GROUNDING:

1. ONLY ONE CONNECTION TO DC CIRCUITS AND ONE CONNECTION TO AC CIRCUITS WILL BE USED FOR SYSTEM GROUNDING (REFERENCED TO THE SAME POINT). THIS WILL NORMALLY BE LOCATED AT THE INVERTER.
2. EQUIPMENT GROUNDING CONDUCTORS AND SYSTEM GROUNDING CONDUCTORS WILL HAVE AS SHORT A DISTANCE TO GROUND AS POSSIBLE AND A MINIMUM NUMBER OF TURNS.
3. NON-CURRENT CARRYING METAL PARTS SHALL BE CHECKED FOR PROPER EQUIPMENT GROUNDING; NOTING THAT TERMINAL LUGS BOLTED ON AN ENCLOSURE'S FINISHED SURFACE MAY BE INSULATED BECAUSE OF PAINT/FINISH. PAINT/FINISH AT POINT OF CONTACT SHALL BE PROPERLY REMOVED.
4. MODULES SHALL BE BONDED WITH EQUIPMENT GROUNDING CONDUCTORS BONDED TO A LOCATION APPROVED BY THE MANUFACTURER WITH A MEANS OF BONDING LISTED FOR THIS PURPOSE. RACKING SYSTEMS THAT COMPLY WITH UL2703 SHALL BE USED TO BOND MODULES TO RACKING SYSTEMS.
5. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, INCLUDING BUT NOT LIMITED TO GROUND RODS, GROUNDING LUGS, GROUNDING CLAMPS, ETC.

GROUND FAULT PROTECTION:

1. PHOTOVOLTAIC SYSTEM DC CIRCUITS THAT EXCEED 30 VOLTS OR 8 AMPERES SHALL BE PROVIDED WITH DC GROUND FAULT PROTECTION MEETING THE REQUIREMENTS OF 690.41(B)(1) AND (B)(2) TO REDUCE FIRE HAZARDS.

DISCONNECTING MEANS:

1. MEANS SHALL BE PROVIDED TO DISCONNECT THE PV SYSTEM FROM ALL WIRING SYSTEMS INCLUDING POWER SYSTEMS, ENERGY STORAGE SYSTEMS, AND UTILIZATION EQUIPMENT AND ITS ASSOCIATED PREMISES WIRING.
2. THE DISCONNECTING MEANS SHALL NOT BE REQUIRED TO BE SUITABLE AS SERVICE EQUIPMENT AND SHALL BE RATED IN ACCORDANCE WITH ARTICLE 690 PART III, DISCONNECTING MEANS.
3. A SINGLE DISCONNECTING MEANS SHALL BE PERMITTED FOR THE COMBINED AC OUTPUT OF ONE OR MORE INVERTERS IN AN INTERACTIVE SYSTEM.

REQUIRED SAFETY SIGNS AND LABELS:

1. THE MARKING SHALL ADEQUATELY WARN OF THE HAZARD USING EFFECTIVE WORDS AND/OR COLORS AND/OR SYMBOLS. NEC 110.21
2. THE LABEL SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN. NEC 110.21
3. THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21
4. LABELS AND MARKINGS SHALL BE APPLIED TO THE APPROPRIATE COMPONENTS IN ACCORDANCE WITH THE NEC.
5. SOLAR MODULES AND INVERTERS ARE SUPPLIED FROM THE MANUFACTURER WITH MARKINGS PRE-APPLIED TO MEET THE REQUIREMENTS OF NEC 690.51 & 690.41(B)(1).
6. DESIGN REQUIREMENTS FOR NEC REQUIRED LABELS, WHERE COLOR IS INDICATED, ARE SHOWN ON THE LABELS AND MARKINGS SHEET.
7. UNLESS OTHERWISE STATED ON LABEL SPECIFIC NOTES (SEE NOTE 6), OSHA 1910.145 AND ANSI Z535 RECOMMENDED SPECIFICATIONS ARE AS FOLLOWS:
   a. ROUNDED OR BLUNT CORNERS FREE OF SHARP EDGES.
   b. VISIBLE AT A MINIMUM DISTANCE OF 5ft OR GREATER.
   c. "DANGER" HEADER; RED BACKGROUND WITH WHITE LETTERING.
   d. "WARNING" HEADER; ORANGE BACKGROUND WITH BLACK LETTERING.
   e. "CAUTION" HEADER; YELLOW BACKGROUND WITH BLACK LETTERING.
   f. "NOTICE" LABEL HEADER TO BE IN BLUE WITH WHITE LETTERING.
   g. ALL OTHER TEXT TO BE BLACK ON A WHITE BACKGROUND.

GENERAL NOTES FOR TRANSFORMERLESS INVERTERS:

1. TRANSFORMERLESS (NON-ISOLATED) INVERTERS ARE NOT SUPPLIED WITH AN INTEGRAL HIGH EFFICIENCY ISOLATION TRANSFORMER AS PART OF THE INVERTER ASSEMBLY.
2. TRANSFORMERLESS INVERTERS SHALL HAVE AN EQUIPMENT GROUNDING CONDUCTOR BONDED TO THE EXISTING GROUNDING SYSTEM. A GROUND CONNECTION FOR THE INVERTER MUST BE INSTALLED AND CONNECTED TO THE UNIT AS DESCRIBED IN THE INSTALLATION MANUAL. THE AC AND DC GROUND BUS BARS ARE CONNECTED TO THE MAIN INVERTER ENCLOSURE. THE GROUND FAULT PROTECTION IS MONITORED AND THE INVERTER IS DISCONNECTED FROM THE GRID IN THE EVENT OF A GROUND FAULT. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED PER NEC 250.122.
3. INVERTER OPERATING CONDITIONS ARE DESIGNED TO BE INSTALLED IN EITHER AN INDOOR OR OUTDOOR ENVIRONMENT. ALLOWABLE OPERATING TEMPERATURE RANGE AND CLEARANCE REQUIREMENTS FOR PROPER AIR FLOW FOR THE UNITS ARE SPECIFIED BY THE MANUFACTURER.

ELECTRICAL SAFETY FEATURES:

1. THE UNIT HAS ONLY ONE MODE OF OPERATION, LINE LINKAGE MODE (GRID EXPORT MODE). THE OUTPUT VOLTAGES AND CURRENTS ARE SINUSOIDAL WITH LOW TOTAL HARMONIC DISTORTION MEETING IEEE 1547 HARMONIC STANDARDS. THE ANTI-ISLANDING TRIP TIME IS LESS THAN (2) SECONDS AS PER UL 1741 STANDARDS. THE INVERTER UNIT WILL AUTOMATICALLY DISCONNECT FROM THE UTILITY.

RACEWAY LEGEND

- FIBER CABLE
- CAT-5 ETHERNET
- RS-485 DATACOM
- DC CONDUCTOR/CONDUIT
- MEDIUM VOLTAGE CONDUCTOR/CONDUIT
- AC CONDUCTOR/CONDUIT
- COMMUNICATION CONDUCTOR/CONDUIT
- OVER HEAD WIRE

POWER LEGEND

- STRING OF SOLAR MODULES
- INVERTER
- DC — DC SIDE OF INVERTER
- AC — AC SIDE OF INVERTER
- EQUIPMENT GROUNDING LOCATION
- GROUND OR GROUNDING ELECTRODE
- SPLICE OR TAP
- CIRCUIT BREAKER
- FUSE
- SWITCH
- N.O. — RELAY OR CONTACT N.O.
- N.C. — RELAY OR CONTACT N.C.
- CURRENT TRANSFORMER
- TRANSFORMER
- M — METER
- HH — HANDHOLE
- C — CAMERA
- TELEPHONE OR DATA OUTLET
- DUPLEX CONVENIENCE OUTLET, 120V, 20A, GROUNDING TYPE SPECIFICATION GRADE
- J — JUNCTION-BOX
- OMITTED MODULE
- SPARE MODULE
- NON-ACTIVE MODULE
- DAS — DATA AQUISITION SYSTEM
- THERMO COUPLE TEMPERATURE SENSOR
- PYRANOMETER – SOLAR RADIATION
- CELL/ MODULE TEMPERATURE SENSOR
- ANEMOMETER
- BAROMETRIC PRESSURE SENSOR
- HUMIDITY SENSOR
- RAIN GAUGE

ABBREVIATIONS

A	AMPERE(S)
AC	ALTERNATING CURRENT
ACSW	AC SWITCH
AF	AMPERE FRAME, AMP FUSE
AFCI	ARC FAULT CIRCUIT INTERRUPTER
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
AS	AMPERE SWITCH
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BOS	BALANCE OF SYSTEM
C	CONDUIT
CB	CIRCUIT BREAKER
CBR	COMBINER BOX
CBSS	CIRCUIT BREAKER SAFETY SWITCH
CMIL	CIRCULAR MIL
COM	COMMUNICATIONS
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DCCT	DC CONTACTOR
DCSW	DC SWITCH
EC	ELECTRICAL SUBCONTRACTOR
EGC	EQUIPMENT GROUNDING CONDUCTOR
EMT	ELECTRICAL METALLIC TUBING
FMC	FLEXIBLE METAL CONDUIT
FO	FIBER-OPTIC CABLE
GE	GROUNDING ELECTRODE
GEC	GROUNDING ELECTRODE CONDUCTOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFDI	GROUND FAULT DETECTION AND INTERRUPTION
GND	GROUND
GOAB	GROUP OPERATED AIR BREAK
HH	HANDHOLE
HVAC	HEATING VENTILATION AND AIR CONDITIONING
IMC	INTERMEDIATE METAL CONDUIT
IMP	MAXIMUM POWER CURRENT
INV	INVERTER
ISC	SHORT CIRCUIT CURRENT (AVAILABLE)
JB	JUNCTION BOX
K	THOUSAND
LA	LIGHTNING ARRESTER
LB	LOAD BREAK
LFMC	LIQUID-TIGHT FLEXIBLE METAL CONDUIT
LI	LOAD INTERRUPTER
LTG	LIGHTING
M	MILLION
MBJ	MAIN BONDING JUMPER
MC4	MULTI-CONTACT TYPE 4 (SOLARLINE2)
MCB	MAIN CIRCUIT BREAKER
MDSS	MULTIPLE DISCONNECT SAFETY SWITCH
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
MPC	MINI POWER CENTER
MPPT	MAXIMUM POWER POINT TRACKING
MSD	MAIN SERVICE DISCONNECT
MTR	METER
MV	MEDIUM VOLTAGE
N	NEUTRAL
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NGR	NEUTRAL GROUNDING REACTOR
OCPD	OVER CURRENT PROTECTION DEVICE
P	POLE
PB	PULL BOX
PH	PHASE
PME	PAD MOUNTED ENCLOSURE
PNL	PANEL BOARD
POC	POINT OF CONNECTION
PT	POTENTIAL TRANSFORMER
PTC	PVUSA TEST CONDITIONS
PVCB	PHOTOVOLTAIC CIRCUIT BREAKER
PWR	POWER
RCBR	RE-COMBINER BOX
RCL	RECLOSER
RECT	RECTIFIER
RGS	RIGID GALVANIZED STEEL
RMC	RIGID METAL CONDUIT
RPVT	REMOTE PV TIE
RSD	RAPID SHUTDOWN DEVICE/SWITCH
RTU	REMOTE TERMINAL UNIT
SBJ	SYSTEM SIDE BONDING JUMPER
SCH	SCHEDULE
SPD	SURGE PROTECTIVE DEVICE
SS	STAINLESS STEEL
SSBJ	SUPPLY-SIDE BONDING JUMPER
STR	STRING
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TBD	TO BE DETERMINED
TEL	TELEPHONE CABLE
TP	TAMPER PROOF
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT(S)
VA	VOLT-AMP
VD	VOLTAGE DROP
VIF	VERIFY IN FIELD
VMP	MAXIMUM POWER VOLTAGE
VOC	OPEN CIRCUIT VOLTAGE
W	WATT(S)
WH	WATT-HOUR
WP	WEATHER PROOF
XFMR	TRANSFORMER

VECTOR ENGINEERS®
651 W. GALENA PARK BLVD. STE. 101
DRAPER, UTAH 84020
PHONE (801) 990-1775
WWW.VECTORSE.COM

ELECTRICAL ONLY

STATE OF ALASKA
49TH
(Affix Original Signature Here)
DEAN P. LEVORSEN
No. AEL EE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355

VSE Project Number: U1944.0137.241

The contractor must notify Vector Structural Engineering, LLC, should discrepancies between the as-built electrical system and what is shown on the permit plans be found. Vector Structural Engineering shall be notified of any changes from the approved design before installation. Vector Structural Engineering assumes no responsibility for improper installation of the solar system.

Mayfield Renewables

2210 NW Hayes Ave
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E-0.0

ELECTRICAL NOTES

PRINT DATE: 5/29/2024 9:00 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23-3688u – north pole\working set\E-0.0 ELECTRICAL NOTES.dwg

SHEET NOTES

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE ALL UNDERGROUND UTILITIES MARKED PRIOR TO CONSTRUCTION
2. CONNECTORS SHALL BE BY THE SAME MANUFACTURER AS THOSE ON THE MODULES UNLESS PERMISION IS OTHERWISE GIVEN IN WRITING BY TCC.
3. CONTRACTOR SHALL ENSURE THE EXACT OUTER DIAMETER OF THE PROVIDED HOME RUN WIRING MEETS CONNECTOR SPECIFICATIONS.
4. ALL DIMENSIONS ARE FOR REFERENCE ONLY. PLEASE REFER TO MANUFACTURERS DRAWINGS TO CONFIRM ALL DIMENSIONS. ALL DIMENSIONS DISPLAYED ON THIS SHEET ARE ROUNDED TO THE NEAREST 1" U.O.N.

ELECTRICAL SITEPLAN

SCALE: 1/32" = 1'-0"

0 32' 64'

Mayfield Renewables

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Corvallis, OR 97333
541.754.2001

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ELECTRICAL SITEPLAN

VECTOR ENGINEERS
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ELECTRICAL ONLY

STATE OF ALASKA
49TH
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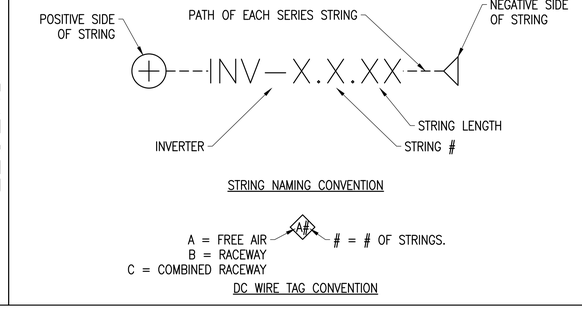
LEGEND



WIRING SCHEDULE

TAG	CIRCUIT TYPE	DESCRIPTION	CONDUIT TYPE	FILL %
AX	PV SOURCE CIRCUIT (DC, CU, PV WIRE 2kV)	(16) #8, (1) #6 EGC, FREE AIR	FREE AIR	–
BX	PV OUTPUT CIRCUIT (DC, CU, PV WIRE 2kV)	(16) #8, (1) #6 EGC, (1) 3" CONDUIT	HDPE	20.48%
C	COMBINED DC OUTPUT CIRCUIT (DC, AL, XHHW-2)	(2) #500, (1) #1 EGC, (1) 3" CONDUIT	HDPE	20.99%
F	MV XFMR-1 OUTPUT CIRCUIT (AC, CU, URO-J)	(3) #2, (1) 3" CONDUIT	HDPE	36.58%
G	SHUNT TRIP AND BREAKER POSITION CIRCUIT (AC, CU, XHHW-2)	(5) #12, (1) #10 EGC, (1) 1" CONDUIT	HDPE	17.97%

SHEET NOTES

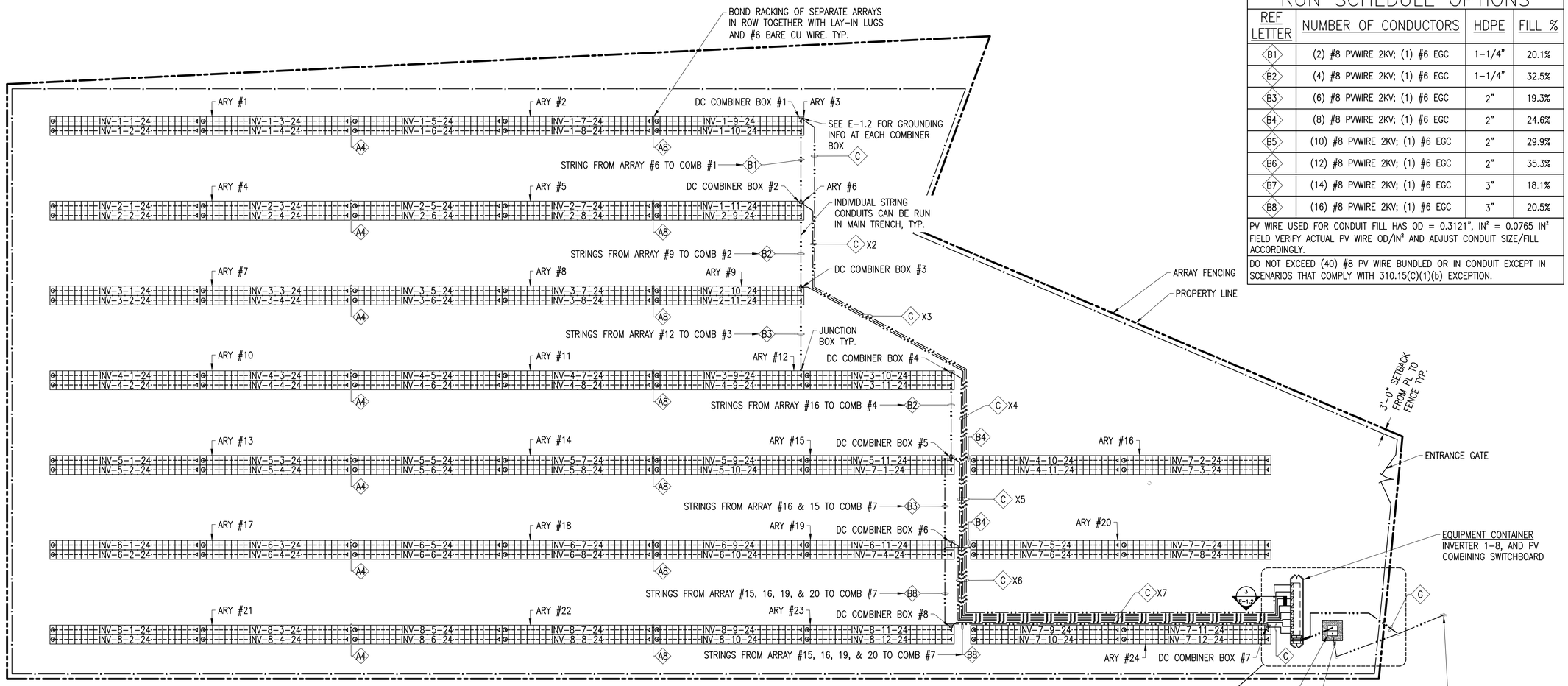
1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE ALL UNDERGROUND UTILITIES MARKED PRIOR TO CONSTRUCTION
2. CONNECTORS SHALL BE BY THE SAME MANUFACTURER AS THOSE ON THE MODULES UNLESS PERMISION IS OTHERWISE GIVEN IN WRITING BY TCC.
3. CONDUIT RUNS SHOWN ARE INDICATIVE OF PATH AND CONVEY ORIGIN AND TERMINATION. CONTRACTOR TO DETERMINE BEST ROUTE PER FIELD CONDITIONS. FINAL CONDUIT PATH SHALL BE APPROVED WITH CONTRACTOR SITE SUPERVISOR PRIOR TO INSTALLATION.
4. CONTRACTOR SHALL ENSURE THE EXACT OUTER DIAMETER OF THE PROVIDED HOME RUN WIRING MEETS CONNECTOR SPECIFICATIONS.
5. ALL DIMENSIONS ARE FOR REFERENCE ONLY. PLEASE REFER TO MANUFACTURERS DRAWINGS TO CONFIRM ALL DIMENSIONS. ALL DIMENSIONS DISPLAYED ON THIS SHEET ARE ROUNDED TO THE NEAREST 1" U.O.N.

SOURCE CIRCUIT HOME RUN SCHEDULE OPTIONS

REF LETTER	NUMBER OF CONDUCTORS	HDPE	FILL %
B1	(2) #8 PVWIRE 2KV; (1) #6 EGC	1-1/4"	20.1%
B2	(4) #8 PVWIRE 2KV; (1) #6 EGC	1-1/4"	32.5%
B3	(6) #8 PVWIRE 2KV; (1) #6 EGC	2"	19.3%
B4	(8) #8 PVWIRE 2KV; (1) #6 EGC	2"	24.6%
B5	(10) #8 PVWIRE 2KV; (1) #6 EGC	2"	29.9%
B6	(12) #8 PVWIRE 2KV; (1) #6 EGC	2"	35.3%
B7	(14) #8 PVWIRE 2KV; (1) #6 EGC	3"	18.1%
B8	(16) #8 PVWIRE 2KV; (1) #6 EGC	3"	20.5%

PV WIRE USED FOR CONDUIT FILL HAS OD = 0.3121", IN² = 0.0765 IN² FIELD VERIFY ACTUAL PV WIRE OD/IN² AND ADJUST CONDUIT SIZE/FILL ACCORDINGLY.

DO NOT EXCEED (40) #8 PV WIRE BUNDLED OR IN CONDUIT EXCEPT IN SCENARIOS THAT COMPLY WITH 310.15(C)(1)(b) EXCEPTION.



VECTOR engineers®
651 N. 400 W. PARK BLVD., STE. 101 DRAPER, UTAH 84020 PHONE (801) 990-1775 www.vectorse.com

ELECTRICAL ONLY

STATE OF ALASKA 49TH
(APE Original Signature Here)
DEAN P. LEVORSEN / P.E.
U.S. / No. AEL EE 13300 / P.E.
PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355
VSE Project Number: U1944.0137.241

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ELECTRICAL GROUND PLAN

SCALE: 1/32" = 1'-0"

0 32' 64'

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

PROJECT NUMBER: 23-3688U

SCALE: AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	UTILITY INTERCONNECTION SET
	11/21/23	BB	CD IFR - ISSUED FOR REVIEW
	05/24/24	GK	CD IFP - ISSUED FOR PERMIT
		PK	
		BB	

SHEET NO. & NAME:
E-1.1
ELECTRICAL GROUND PLAN

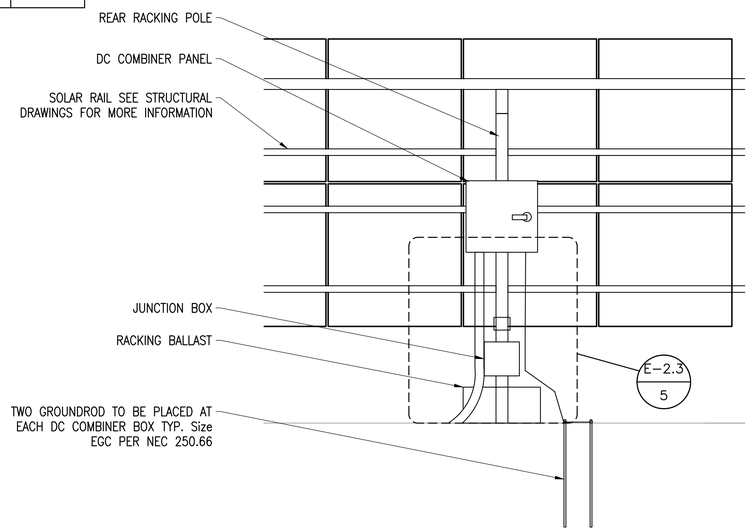
PRINT DATE: 5/29/2024 9:00 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23-3688u - north pole\working set\E-1.1 ELECTRICAL GROUND PLAN.dwg

WIRING SCHEDULE

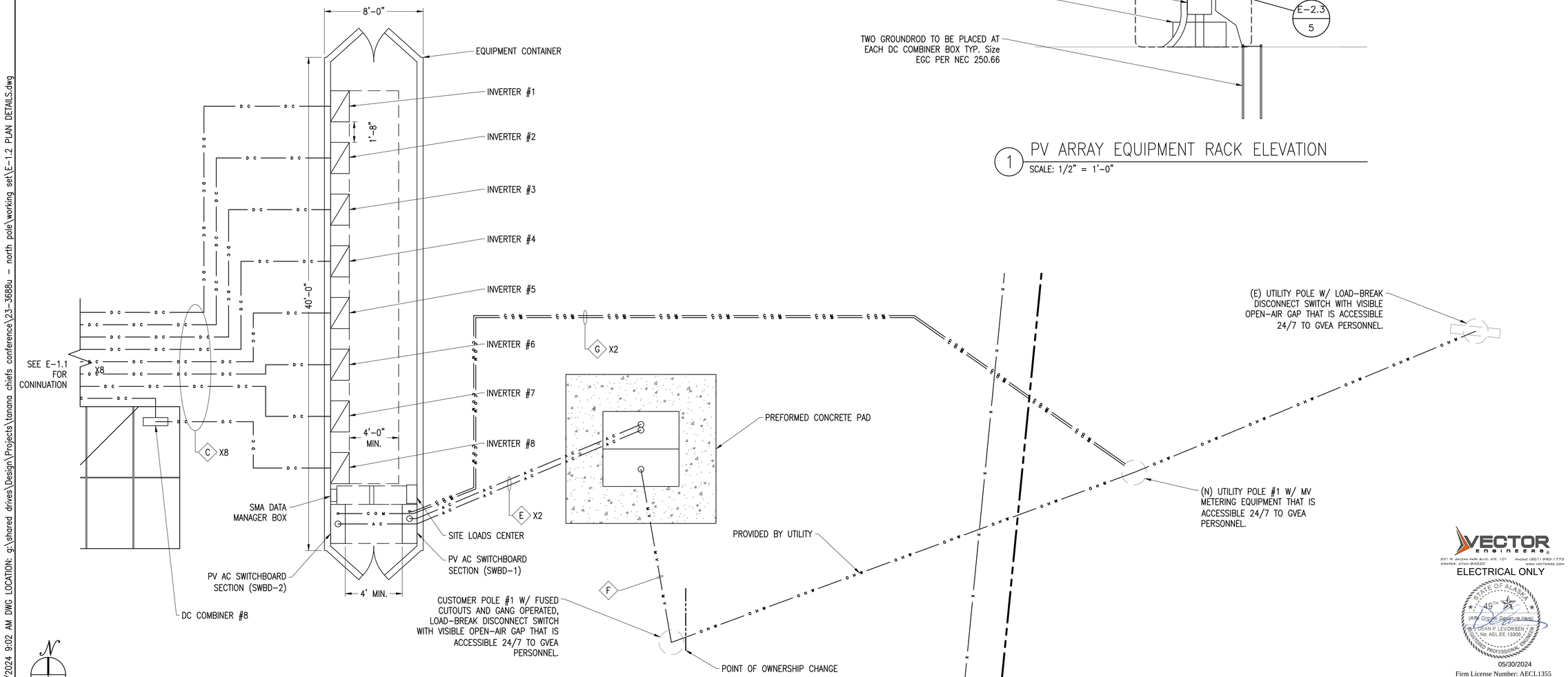
TAG	CIRCUIT TYPE	DESCRIPTION	CONDUIT TYPE	FILL %
C	COMBINED DC OUTPUT CIRCUIT (DC, AL, XHHW-2)	(2) #500, (1) #1 EGC, (1) 3" CONDUIT	HDPE	20.99%
E	COMBINED INVERTER CIRCUIT (AC, AL, XHHW-2)	3X PARALLEL SETS, 1 SET PER RACEWAY: (3) 400, (1) 3/0 NEU, (1) 3/0 EGC, (1) 3" CONDUIT	HDPE	32.92%
F	MV XFMR-1 OUTPUT CIRCUIT (AC, CU, URO-J)	(3) #2, (1) 3" CONDUIT	HDPE	36.58%
G	SHUNT TRIP AND BREAKER POSITION CIRCUIT (AC, CU, XHHW-2)	(5) #12, (1) #10 EGC, (1) 1" CONDUIT	HDPE	17.97%

SHEET NOTES

1. ALL EQUIPMENT DIMENSIONS ARE APPROXIMATE, VERIFY ALL DIMENSIONS WITH APPROVED EQUIPMENT RECORD DRAWINGS PRIOR TO POURING CONCRETE PADS.
2. CONDUIT ROUTES SHOWN ARE DIAGRAMMATIC AND DO NOT REFLECT ALL OBSTRUCTIONS. SUBCONTRACTOR TO DETERMINE EXACT ROUTING BASED ON SITE CONDITIONS.
3. CONTRACTOR TO COORDINATE ALL PLANNED CONDUIT ROUTES PRIOR TO INSTALLATION.
4. SEE E-2.1 FOR WIRE SCHEDULE INFORMATION.



1 PV ARRAY EQUIPMENT RACK ELEVATION
SCALE: 1/2" = 1'-0"



2 PV ARRAY EQUIPMENT AREA DETAIL
SCALE: 1/4" = 1'-0"

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STAMP:

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GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	BB UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR - ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP - ISSUED FOR PERMIT

PROJECT NUMBER: 23-3688U

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

VECTOR ENGINEERS
651 W. GALENA PARK BLVD, STE. 101 DRAPER, UTAH 84020 PHONE (801) 990-1775 www.VECTORSE.com

ELECTRICAL ONLY

STATE OF ALASKA
49TH
(Affix Original Signature Here)
GLEN DEAN P. LEVORSEN JR.
Lic. No. AEL EE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355
VSE Project Number: U1944.0137.241

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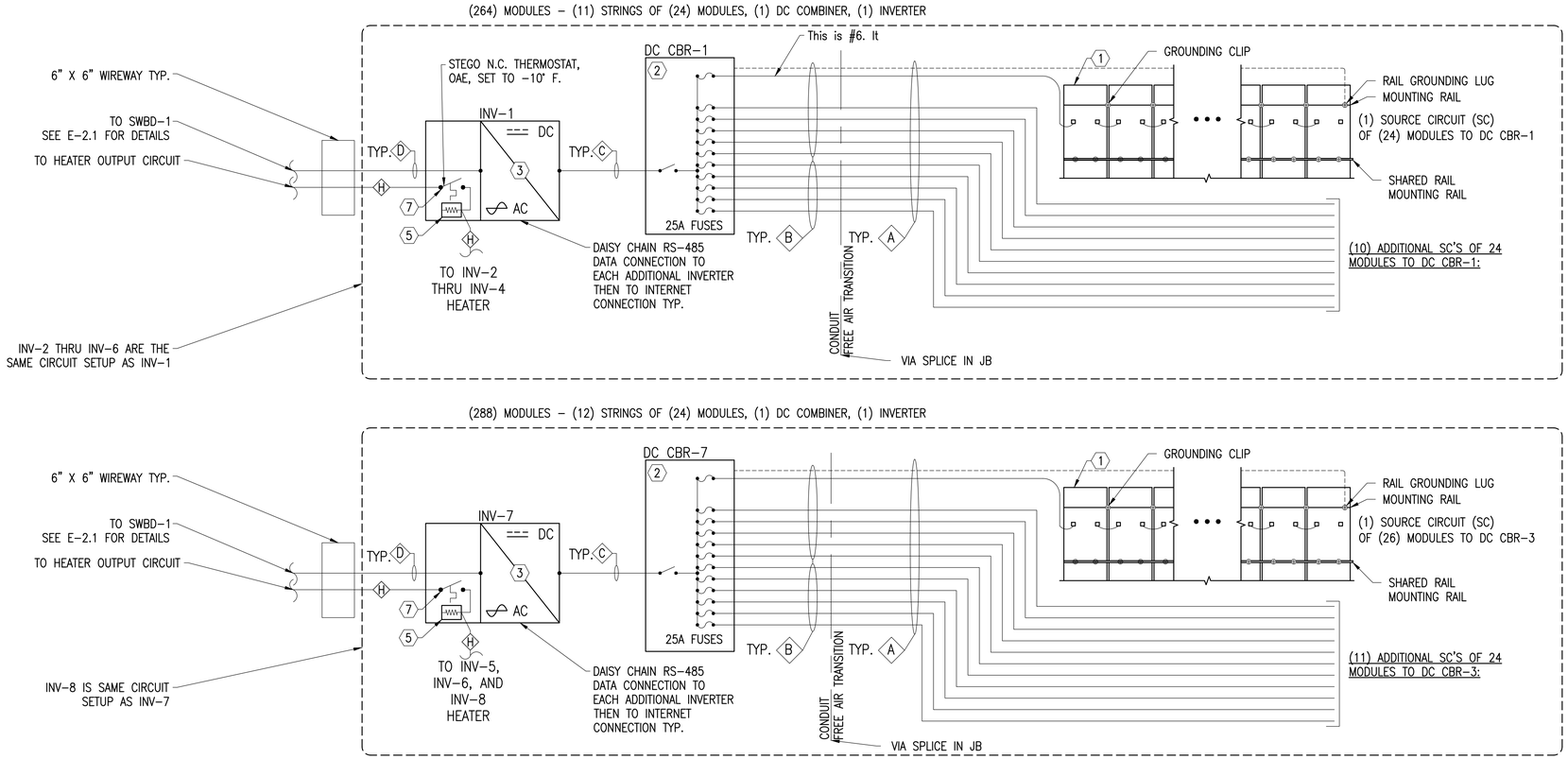
SHEET NO. & NAME:
E-1.2
PLAN DETAILS

PRINT DATE: 5/29/2024 9:02 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23-3688u - north pole\working set\E-1.2 PLAN DETAILS.dwg



SHEET NOTES

1. ALL CONDUCTORS TO BE COPPER (CU) UNLESS NOTED OTHERWISE.
2. CONNECTORS SHALL BE BY THE SAME MANUFACTURER AS THOSE ON THE MODULES.

ELECTRICAL EQUIPMENT SCHEDULE

TAG	QTY.	DESCRIPTION
1	2160	SEG SEG-550-BMA-TB 550WDC SOLAR MODULE
2	8	TERRASMART (OAE) DC DISCONNECT/COMBINER, 300A, 12 INPUT, 25A FUSES, NEMA 4X
3	8	SMA SHP 125-US-21 STRING-INVERTER, 480VAC, 151.00AAC, 3PH, 3W, NEMA 4X, UL1741 CERTIFIED
5	2	STEGO THERMOSTAT N.C 120VAC, EXACT PART TBD, -XX TO XXX DEG F TEMP RANGE (SET TO -10 DEG F.), OAE.
7	8	STEGO 120VAC, 250W PTC FAN HEATER, OAE

WIRING SCHEDULE

TAG	CIRCUIT TYPE	DESCRIPTION	CONDUIT TYPE	FILL %
AX	PV SOURCE CIRCUIT (DC, CU, PV WIRE 2kV)	(16) #8, (1) #6 EGC, FREE AIR	FREE AIR	–
BX	PV OUTPUT CIRCUIT (DC, CU, PV WIRE 2kV)	(16) #8, (1) #6 EGC, (1) 3" CONDUIT	HDPE	20.48%
C	COMBINED DC OUTPUT CIRCUIT (DC, AL, XHHW-2) 2 kV	(2) #500, (1) #1 EGC, (1) 3" CONDUIT	HDPE	20.99%
D	INVERTER OUTPUT CIRCUIT (DC, CU, XHHW-2)	(3) 3/0, (1) #6 EGC, (1) 2" CONDUIT	HDPE	25.75%
H	HEATER CIRCUIT (AC, CU, XHHW-2) 2K	(1) #12, (1) #12 NEU, (1) #12 EGC, (1) 3/4" CONDUIT	EMT	8.79%

DC SINGLE LINE DIAGRAM

SCALE:

VECTOR ENGINEERS®
651 N. BALDY PARK BLVD., STE. 101 DRAPER, UTAH 84020
PHONE (801) 990 1775
WWW.VECTORSE.COM

ELECTRICAL ONLY

STATE OF ALASKA
49TH
(Affix Original Signature Here)
DEAN P. LEVORSEN
No. AEL EE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355
VSE Project Number: U1944.0137.241

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Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

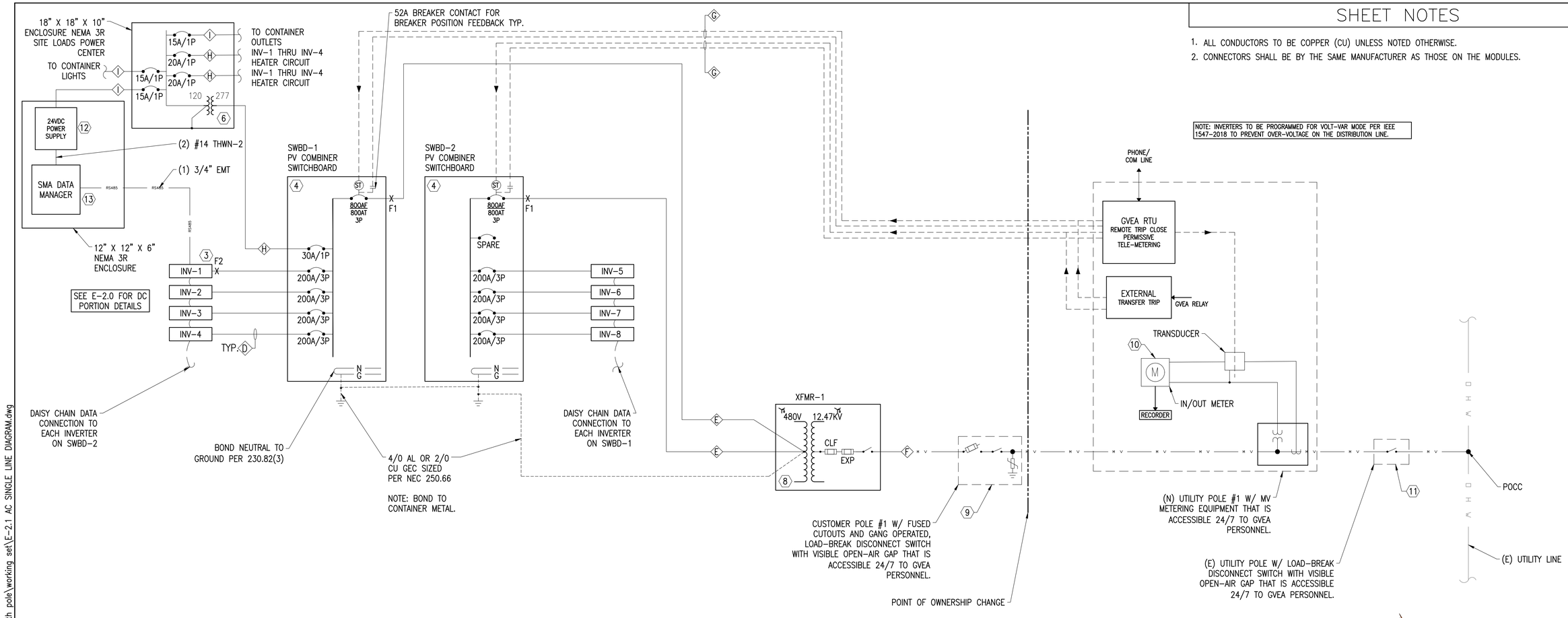
PROJECT NUMBER:
23-3688U

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	BB UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR – ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:

E-2.0
DC SINGLE LINE DIAGRAM



SHEET NOTES

1. ALL CONDUCTORS TO BE COPPER (CU) UNLESS NOTED OTHERWISE.
2. CONNECTORS SHALL BE BY THE SAME MANUFACTURER AS THOSE ON THE MODULES.

ELECTRICAL EQUIPMENT SCHEDULE

TAG	QTY.	DESCRIPTION
3	8	SMA SHP 125-US-21 STRING-INVERTER, 480VAC, 151.00AAC, 3PH, 3W, NEMA 4X, UL1741 CERTIFIED
4	2	PV AC SWITCHBOARD (SWBD-1) AND (SWBD-2), 480/277V, 800A, MB (WITH SHUNT TRIP CONTROL), 3 PHASE, 4 WIRE, NEMA 3R, 25kAIC
6	1	SITE LOADS PANEL W/ DIN RAIL BREAKERS INCLUDING 5KVA, OPEN CORE, TRANSFORMER, 277 TO 120VAC, HPS SP5000MQMJ, OAE.
8	1	PV STEP UP TRANSFORMER (XFMR-1) 480 GROUNDED WYE-12.47KV GROUNDED WYE, 1000KVA, W/ BAY-O-NET ELF FUSE, NEMA 3R
9	1	PV MV AC FUSED CUTOUT AT CUSTOMER POLE #1, 12.47KV, 3 POLE, 4 WIRE, 110A FUSES, NEMA 3R (OWNED AND OPERATED BY CUSTOMER)
10	1	UTILITY AC GENERATION METER, 3 PHASE 4 WIRE, CT RATIO xx (OWNED AND OPERATED BY GVEA)
11	1	UTILITY AC CUTOUT AT POC, 12.47KV, LOCKABLE, GANG OPERATED, VISIBLE OPEN, MODEL (ED-711R4) OAE. (OWNED AND OPERATED BY GVEA)
12	1	SWITCHING POWER SUPPLY, RHINO PSM12-078S, OAE, 120VAC:12VDC, 78W, 6A MAX OUTPUT.
13	1	SMA DATA MANAGER M, DAS SYSTEM, 12VAC, RJ45 COMMS

WIRING SCHEDULE

TAG	CIRCUIT TYPE	DESCRIPTION	CONDUIT TYPE	FILL %
D	INVERTER OUTPUT CIRCUIT (DC, CU, XHHW-2)	(3) 3/0, (1) #6 EGC, (1) 2" CONDUIT	HDPE	25.75%
E	COMBINED INVERTER CIRCUIT (AC, AL, XHHW-2)	3X PARALLEL SETS, 1 SET PER RACEWAY: (3) 400, (1) 3/0 NEU, (1) 3/0 EGC, (1) 3" CONDUIT	HDPE	32.92%
F	MV XFMR-1 OUTPUT CIRCUIT (AC, CU, URO-J)	(3) #2, (1) 3" CONDUIT	HDPE	36.58%
G	SHUNT TRIP AND BREAKER POSITION CIRCUIT (AC, CU, XHHW-2)	(5) #12, (1) #10 EGC, (1) 1" CONDUIT	HDPE	17.97%
H	HEATER CIRCUIT (AC, CU, XHHW-2) 2K	(1) #12, (1) #12 NEU, (1) #12 EGC, (1) 3/4" CONDUIT	EMT	8.79%
I	LOAD CIRCUITS (AC, CU, XHHW-2)	(1) #12, (1) #12 NEU, (1) #12 EGC, (1) 3/4" CONDUIT	EMT	8.79%
J	LOAD OUTPUT CIRCUIT (AC, CU, XHHW-2)	(1) #10, (1) #10 NEU, (1) #10 EGC, (1) 3/4" CONDUIT	EMT	12.47%

AC SINGLE LINE DIAGRAM

SCALE: NTS

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

VECTOR ENGINEERS
651 W. GALENA PARK BLVD. STE. 101 DRAPER, UTAH 84020 PHONE (801) 990-1775 www.vectorse.com

ELECTRICAL ONLY

STATE OF ALASKA 49TH
(Affix Original Signature Here)
DEAN P. LEVORSEN JR.
No. AEL EE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355

VSE Project Number: U1944.0137.241

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PROJECT NUMBER: 23-3688U

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"

0 ½" 1"

v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	BB UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR - ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:

E-2.1
AC SINGLE LINE DIAGRAM

SITE SPECIFIC INFORMATION:
SITE LOCATION: NORTH POLE, AK 99705
TEMPERATURE DESIGN LOCATION:
FAIRBANKS/EIELSON
ASHRAE 2% HIGH TEMPERATURE: 30.0°C
ASHRAE LOWEST EXPECTED TEMPERATURE:
−44.0°C

MODULE INFORMATION:
SEG, SEG−550−BMA−TB, 550WDC (STC)
CELL TYPE: PERC MONO
Voc: 49.70VDC (58.96VDC AT −44.0°C)
Vmp: 42.05VDC (37.63VDC AT 30.0°C)
Isc: 14.00ADC
Imp: 13.80ADC
SERIES FUSE RATING: 25ADC
Voc CORRECTION (%/°C): −0.270%
Vmp CORRECTION (%/°C): −0.350%
MODULE DIMENSIONS: 89.69" X 44.65" X
1.38"

1 ELECTRICAL SPECIFICATIONS
SCALE: NTS

INVERTER INFORMATION:
SMA, SHP 125−US−21, STRING−INVERTER,
480V, 3ϕ
CEC WEIGHTED EFFICIENCY (PTC): 98.5%
START VOLTAGE: 684VDC
MPPT MINIMUM VOLTAGE: 705VDC
MPPT MAXIMUM VOLTAGE: 1450VDC
MAXIMUM DC INPUT VOLTAGE: 1500VDC
NOMINAL POWER INPUT: 250000WDC
MAXIMUM POWER OUTPUT: 125000WAC
MAXIMUM CURRENT OUTPUT: 151.00AAC
AC NOMINAL VOLTAGE OUTPUT: 480VAC
MAX. AC OVERCURRENT PROTECTION
ALLOWED: 200AAC

ARRAY SPECIFICATIONS
MODULES: 2160
INVERTERS: 8
(12) SOURCE CIRCUITS OF 24 MODULES

ARRAY ELECTRICAL SPECIFICATIONS
(VALUES BASED ON 24 MODULES PER
STRING MAX., 12 STRING(S) IN PARALLEL
MAX.)
MAXIMUM SYSTEM VOLTAGE: 1415.02VDC @
−44.0°C
RATED MAX POWER POINT VOLTAGE:
1009.20VDC
ADJ. VMP OF ARRAY AT 30.0°C HIGH TEMP
(BASED ON 24 MODULES IN SERIES):
903.23VDC
RATED ISC OF ARRAY: 168.00ADC
MAXIMUM SHORT CIRCUIT CURRENT:
210.00ADC
RATED MAX POWER POINT CURRENT:
165.60ADC

VOLTAGE CALCULATIONS: NEC 690.7
LOW TEMPERATURE FOR DESIGN (ASHRAE
LOW TEMP) = −44.0°C
ARRAY Voc AT STC: 49.70VDC X 24 MODULE
IN SERIES = 1192.80VDC
TEMPERATURE ADJUSTED Voc:
[1192.80VDC X (1 + ((−44.0°C − 25°C
) X (−0.270%)))] = 1415.02VDC
MAX. Voc PER INVERTER MANUFACTURER
REQ. = 1500VDC
1415.02VDC ≤ 1500VDC (OK)

INVERTER STRING SCHEDULE
SHP 125−US−20 − INV−1 TO INV−6

STR #	MOD QTY	WATTS
1	24	15,600
1	24	15,600
3	24	15,600
4	24	15,600
5	24	15,600
6	24	15,600
7	24	15,600
8	24	15,600
9	24	15,600
10	24	15,600
11	24	15,600
# OF STR	MOD QTY	WATTS/INV
11	264	171,600
	ILR%	137.28%
	ILR% MAX	150%

INVERTER STRING SCHEDULE
SHP 125−US−20 − INV−7 TO INV−8

STR #	MOD QTY	WATTS
1	24	15,600
1	24	15,600
3	24	15,600
4	24	15,600
5	24	15,600
6	24	15,600
7	24	15,600
8	24	15,600
9	24	15,600
10	24	15,600
11	24	15,600
12	24	15,600
# OF STR	MOD QTY	WATTS/INV
12	288	187,200
	ILR%	149.76%
	ILR% MAX	150%

3 INVERTER STRING SCHEDULE
SCALE: NTS

SWITCHBOARD SCHEDULE
SWBD−1, 800AMP MAIN BREAKER 480VAC, 3ϕ, 4W & GND
INTERRUPTING CAPACITY 25 kA RMS SYMMETRICAL SURFACE MOUNT

LOAD DESCRIPTION	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	CB/ PHASE	CKT. NO.	ϕ	CKT. NO.	CB/ PHASE	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	LOAD DESCRIPTION
SITE LOADS AND DAS	5			30/1P	1	A	2					INTENTIONALLY LEFT BLANK
					3	B	4					
					5	C	6					
INV−1	41.66			200/3P	7	A	8	200/3P	41.66			INV−2
		41.66			9	B	10			41.66		
			41.66		11	C	12				41.66	
INV−3	41.66			200/3P	13	A	14	200/3P	41.66			INV−4
		41.66			15	B	16			41.66		
			41.66		17	C	18				41.66	
	88.3	83.3	83.3	SUB−TOTAL					83.3	83.3	83.3	

PHASE A 172 KVA
PHASE B 167 KVA TOTAL LOAD 505 KVA
PHASE C 167 KVA

SWITCHBOARD SCHEDULE
SWBD−2, 800AMP MAIN BREAKER 480VAC, 3ϕ, 4W & GND
INTERRUPTING CAPACITY 25 kA RMS SYMMETRICAL SURFACE MOUNT

LOAD DESCRIPTION	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	CB/ PHASE	CKT. NO.	ϕ	CKT. NO.	CB/ PHASE	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	LOAD DESCRIPTION
SPARE				20/1P	1	A	2					INTENTIONALLY LEFT BLANK
					3	B	4					
					5	C	6					
INV−5	41.66			200/3P	7	A	8	200/3P	41.66			INV−6
		41.66			9	B	10			41.66		
			41.66		11	C	12				41.66	
INV−7	41.66			200/3P	13	A	14	200/3P	41.66			INV−8
		41.66			15	B	16			41.66		
			41.66		17	C	18				41.66	
	83.3	83.3	83.3	SUB−TOTAL					83.3	83.3	83.3	

PHASE A 167 KVA
PHASE B 167 KVA TOTAL LOAD 500 KVA
PHASE C 167 KVA

2 ELECTRICALSWITCHBOARD SCHEDULES
SCALE: NTS

FULLY RATED SHORT CIRCUIT CALCULATIONS SUMMARY

POINT	EQUIP.	LENGTH	VOLT	WIRE SIZE	CONDUCTOR MATERIAL	CONDUIT	VOLTAGE CLASS (V)	# OF CABLES (S or T)	C VALUE *	# OF PARALLEL RUNS	Isc AVAILABLE UPSTREAM	f *	M *	Isc (FAULT) *
F1	PV COMBINER PNL 1&2	25	480	400.0	A	N	600	S	18,505	3	22,600	0.037	0.965	21,800
F2	INVERTER	20	480	3X	C	S	600	S	12,843	1	21,800	0.123	0.891	19,420
	* AUTOMATICALLY CALCULATED													
	UTILITY TRANSFORMER SIZE: 1000KVA													
	MAX AVAILABLE (SYMMETRICAL) FAULT AT THE SECONDARY: 22,600AMPS													

4 SHORT CIRCUIT CALCULATIONS
SCALE: NTS

CONDUCTOR CALCULATION SUMMARY

TAG	DESCRIPTION	VOLTAGE	CIRCUIT AMPERAGE	MIN. OCPD AMPACITY	STD OCPD SIZE	PARALLEL SETS	CCC SIZE	NEU SIZE	EGC SIZE	CONDUCTOR MATERIAL	WIRE TEMP RATING	TYPE	CONDUIT SIZE OR BUNDLED	TYPE	FILL %	AMPACITY (75 DEG C)	LENGTH (FT)	AMPACITY (90 DEG C)	QTY CCC	QTY NEU	QTY EGC	FILL DERATE NEC 310.15(C)(1)	TEMP DERATE NEC 310.15(B)(1)	DERATED AMPACITY	VOLTAGE DROP
AX	PV SOURCE CIRCUIT	1009VDC	17.5	21.88	25	1	#8	N/A	#6	CU	90	PV WIRE	FREE AIR	FREE AIR	−	70	93	80	16	0	1	0.5	0.96	38.4	0.25%
BX	PV OUTPUT CIRCUIT	1009VDC	17.5	21.88	25	1	#8	N/A	#6	CU	90	PV WIRE	3"	PVC SCH.80	20.48%	50	310	55	16	0	1	0.5	0.96	26.4	0.85%
C	COMBINED DC OUTPUT CIRCUIT	1009VDC	210	262.50	300	1	500	N/A	#1	AL	90	XHHW−2	3"	PVC SCH.80	20.99%	310	561	350	2	0	1	1	0.96	336	1.00%
D	INVERTER OUTPUT CIRCUIT	480VDC	151	188.75	200	1	3/0	N/A	#6	CU	90	XHHW−2	2"	PVC SCH.80	25.75%	200	15	225	3	0	1	1	0.96	216	0.06%
E	COMBINED INVERTER CIRCUIT	480VAC	604	755.00	800	3	400	3/0	3/0	AL	90	XHHW−2	3"	PVC SCH.80	32.92%	270 X6	30	305 X6	3	1	1	1	0.96	292.8	0.11%
F	MV XFMR−1 OUTPUT CIRCUIT	12470VAC	46.5	58.13	60	1	#2	N/A	N/A	CU	90	URO−J	3"	PVC SCH.80	36.58%	115	40	130	3	0	0	1	0.96	124.8	0.08%
G	SHUNT TRIP AND BREAKER POSITION CIRCUIT	120VAC	5	6.25	15	1	#12	N/A	#10	CU	90	XHHW−2	1"	PVC SCH.80	17.97%	25	40	30	5	0	1	0.8	0.96	23.04	0.08%
H	HEATER CIRCUIT	277VAC	16	20.00	20	1	#12	#12	#12	CU	90	XHHW−2	3/4"	EMT	8.79%	25	25	30	1	1	1	1	0.96	28.8	0.06%
I	LOAD CIRCUITS	120VAC	12	15.00	15	1	#12	#12	#12	CU	90	XHHW−2	3/4"	EMT	8.79%	25	10	30	1	1	1	1	0.96	28.8	0.06%
J	LOAD OUTPUT CIRCUIT	277VAC	24	30.00	30	1	#10	#10	#10	CU	75	XHHW−2	3/4"	EMT	12.47%	35	10	40	1	1	1	1	0.96	33.6	0.06%

5 CONDUCTOR CALCULATION SCHEDULE
SCALE: NTS

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID−TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

VECTOR Engineers
651 W. GALENA PARK BLVD. STE. 101 DRAPER, UTAH 84020 PHONE (801) 990-1775 WWW.VECTORSE.COM

ELECTRICAL ONLY

STATE OF ALASKA 49TH
(Affix Original Signature Here)
DEAN P. LEVORSEN
No. AELEE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355
VSE Project Number: U1944.0137.241

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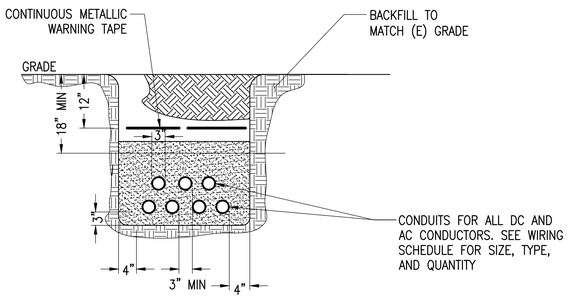
PROJECT NUMBER: 23−3688U

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR − ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP − ISSUED FOR PERMIT

SHEET NO. & NAME:
E−2.2
ELECTRICAL SPECIFICATIONS

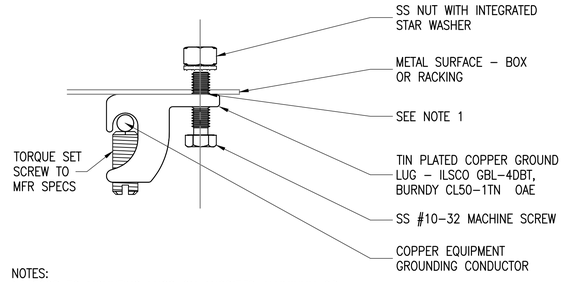
PRINT DATE: 5/29/2024 9:06 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23−3688u − north pole\working set\E−2.1 ELECTRICAL SPECIFICATIONS.dwg



NOTES:
1. MAINTAIN A MINIMUM DISTANCE OF 1' BETWEEN CONDUIT WITH COMMUNICATION WIRING AND ANY CONDUIT WITH ELECTRIC POWER CONDUCTORS. POWER AND DATA CONDUITS MAY CROSS AND THE 1' MIN. MAY BE REDUCED FOR TRENCH SECTIONS LESS THAN 10' AND NEAR EQUIPMENT STUB-UPS.
2. DIAGRAM SHOWN ABOVE DOES NOT REFLECT EXACT CONDUITS IN EACH TRENCH AND SHALL BE USED AS A TEMPLATE FOR SPACING CONSTRAINTS AND TO BE VERIFIED ON SITE BY CONTRACTOR AND APPROVED BY OWNER.

4 TYPICAL TRENCH

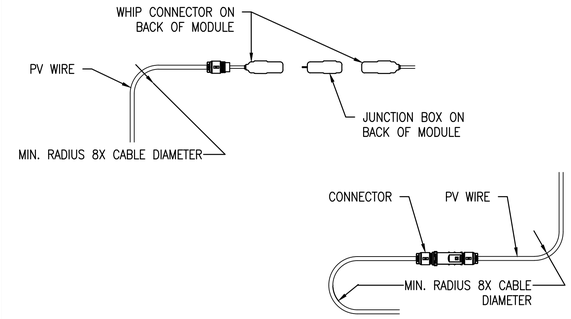
SCALE: NTS
XD_ELEC_TYPICAL_TRENCH 2023-03-07



NOTES:
1. PRIOR TO MOUNTING LUGS ON ANODIZED ALUMINUM OR PAINTED METAL SURFACES, THE SURFACE MUST BE STRIPPED AND THEN COVERED WITH BURNDY PENETROX A-13 ANTI-OXIDANT COMPOUND BELOW THE LUG TO ENSURE CONDUCTIVITY.
2. ON ANODIZED AL SURFACES, THE ANODIZATION SHALL BE GROUND OFF.
3. ON PAINTED SURFACES, THE PAINT LAYER SHALL BE GROUND OR SCRATCHED OFF.

2 GROUNDING METAL BOXES / RACKING

SCALE: NTS
XD_ELEC_GROUNDING METAL BOXES OR RACKING 2023-02-28

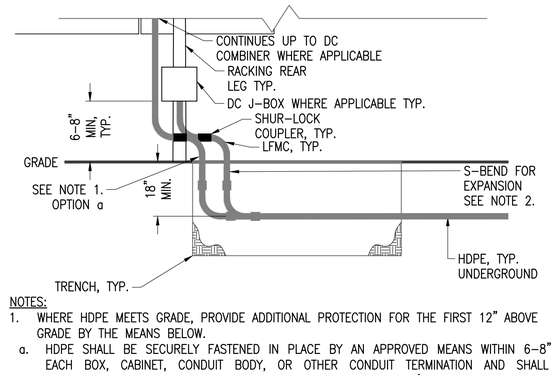


NOTES:
1. OBSERVE MIN. BENDING RADIUS REQUIREMENTS WHEN BUNDLING AND SECURING SOURCE CIRCUIT CONDUCTORS TO MODULES AND RACKING.
2. SEE MODULE SPEC SHEET OR CABLE SPECIFICATIONS FOR CABLE DIAMETER.

1 PV WIRE BENDING REQUIREMENTS

GREATER THAN 600V

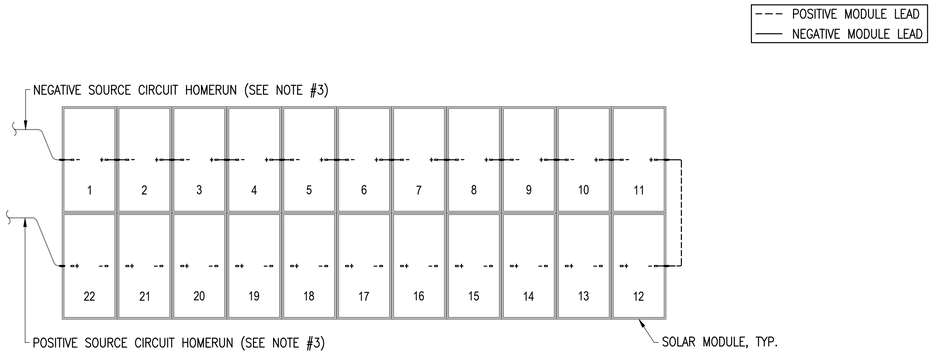
SCALE: NTS
XD_ELEC_PV WIRE BENDING REQUIREMENTS_GREATER THAN 600V 2023-02-28



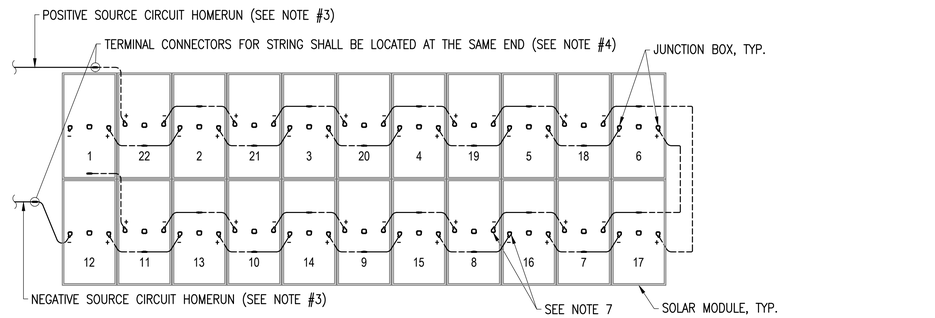
NOTES:
1. WHERE HDPE MEETS GRADE, PROVIDE ADDITIONAL PROTECTION FOR THE FIRST 12" ABOVE GRADE BY THE MEANS BELOW.
   a. HDPE SHALL BE SECURELY FASTENED IN PLACE BY AN APPROVED MEANS WITHIN 6-8" OF EACH BOX, CABINET, CONDUIT BODY, OR OTHER CONDUIT TERMINATION AND SHALL BE SUPPORTED AND SECURED AT INTERVALS NOT TO EXCEED 4.5'. LISTED CABLE TIES ARE PERMITTED TO BE USED FOR SECUREMENT AND SUPPORT.
2. WHERE MORE THAN 4 QUARTER (360°) BENDS ARE MADE BETWEEN PULL POINTS, CONTRACTOR SHALL INSTALL CONDUIT BODIES AND OR TRANSITION BOXES WHERE NECESSARY.
3. HDPE SHALL BE INSTALLED WHERE IT IS NOT SUBJECT TO PHYSICAL DAMAGE AND CAN BE USED IN EXPOSED AND OR CONCEALED LOCATIONS.

5 CONDUIT DETAIL

APPROX. SCALE: NTS
XD_ELEC_CONDUIT DETAIL 2023-09-07



550W 24 MODULE STRING
NOT LEAPFROG WIRING



550W 24 MODULE STRING
LEAPFROG WIRING

NOTES:
1. ALL STRINGS ARE 22 MODULES PER STRING
2. WIRING PATHS SHOWN ARE DIAGRAMMATIC ONLY.
3. ORIENTATION OF POSITIVE AND NEGATIVE JUNCTION BOX POLES ARE REPRESENTATIONAL ONLY. ACTUAL ORIENTATION SHALL BE CONFIRMED WITH THE SPECIFIC MODULE TYPE ON A PER PROJECT BASIS.
4. POSITIVE POLARITY HOMERUN SHALL HAVE A NEGATIVE CONNECTOR INSTALLED ON THE FIELD ASSEMBLED WIRING SO AS TO CONNECT WITH THE POSITIVE MODULE LEAD. NEGATIVE POLARITY HOMERUN SHALL HAVE A POSITIVE CONNECTOR INSTALLED ON THE FIELD ASSEMBLED WIRING SO AS TO CONNECT WITH THE NEGATIVE MODULE LEAD.
5. WIRING SHALL BE CONFIGURED SUCH THAT TERMINAL CONNECTORS FOR BEGINNING/END OF EACH STRING ARE LOCATED CLOSEST TO DOWNSTREAM EQUIPMENT.
6. SECURE SOURCE CIRCUIT WIRING TO MODULE FRAMES WITH CABLE TIES OR WIRE MANAGEMENT CLIPS.
7. EVERY-OTHER 550W SEG MODULE TO BE ROTATED 180 DEGREES IN THE FIELD.

3 MODULE-TO-MODULE WIRING

GROUND MOUNT

SCALE: NTS
XD_ELEC_GM_WIRING_LEAPFROG 2023-7-28

VECTOR engineers
651 W. GALENA PARK BLVD, STE. 101 DRAPER, UTAH 84020
PHONE (801) 892-1775 www.vectorse.com

ELECTRICAL ONLY

STATE OF ALASKA 49TH
(Affix Official Signature Here)
CHRISTOPHER P. LEVORSEN
No. AELEE 13355
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355
VSE Project Number: U1944.0137.241

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Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

PROJECT NUMBER: 23-3688U

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36" SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	BB UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR – ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:
E-2.3
ELECTRICAL DETAILS

PRINT DATE: 5/29/2024 9:07 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23-3688u - north pole\working set\E-2.3 ELECTRICAL DETAILS.dwg

4"

MANUAL DISCONNECT FOR PARALLEL GENERATION

3/8 MIN. TEXT

3" (RED BACKGROUND)

LABEL TO BE LOCATED ON THE PV SYSTEM AC DISCONNECT. LABEL TO BE ENGRAVED PLASTIC. (1) TOTAL

NEC 2020 690.13(B), 690.54

NOTICE

PHOTOVOLTAIC SYSTEM AC DISCONNECT AND POWER SOURCE

RATED OUTPUT CURRENT: 604AAC

NOMINAL OPERATING VOLTAGE: 480VAC

LABEL TO BE LOCATED ON THE PV SYSTEM AC DISCONNECT. (1) TOTAL

NEC 2020 690.13(B), 690.54

NOTICE

PHOTOVOLTAIC SYSTEM AC DISCONNECT AND POWER SOURCE

RATED OUTPUT CURRENT: 604AAC

NOMINAL OPERATING VOLTAGE: 480VAC

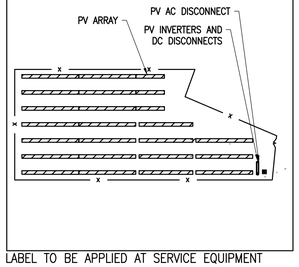
LABEL TO BE LOCATED ON THE PV SYSTEM AC DISCONNECT. (1) TOTAL

NEC 2020 705.10, 690.4(D), 690.56(B)

CAUTION

MULTIPLE SOURCES OF POWER

DISCONNECTS ARE LOCATED AS SHOWN



LABEL TO BE APPLIED AT SERVICE EQUIPMENT LOCATION OR ON ALL POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED. (1) TOTAL

NEC 2020 705.12(B)(3)(3)

WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES

TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.

PERMANENT WARNING LABEL SHALL BE APPLIED TO DISTRIBUTION EQUIPMENT WHERE THE PV SYSTEM INTERCONNECTS. (1) TOTAL

NEC 2020 690.53

MAXIMUM DC VOLTAGE OF PV SYSTEM

MAXIMUM VOLTAGE: 1415VDC

LABEL TO BE LOCATED ON COVER OF DC DISCONNECTING MEANS. (1) TOTAL

NEC 2020 690.31(D)(2)

WARNING: PHOTOVOLTAIC POWER SOURCE

3/8 MIN.

RED BACKGROUND

LABEL SHALL BE LOCATED ON ALL EXPOSED RACEWAYS, CABLE TRAYS, OTHER WIRING METHODS, COVERS OR ENCLOSURES OF PULL BOXES AND JUNCTION BOXES AND ON CONDUIT BODIES IN WHICH ANY OF THE AVAILABLE CONDUIT OPENINGS ARE UNUSED. LABEL SHALL BE REFLECTIVE, AND ALL LETTERS CAPITALIZED AND SHALL BE MINIMUM HEIGHT OF 3/8" IN WHITE ON A RED BACKGROUND. SPACING BETWEEN LABELS OR MARKINGS, OR BETWEEN A LABEL AND MARKING, SHALL NOT BE MORE THAN 10FT.

SHEET NOTES

1. SEE ELECTRICAL NOTES E-0.0 SHEET "REQUIRED SAFETY SIGNS AND LABELS" FOR ADDITIONAL INFORMATION.
2. THE LABELS AND MARKINGS ARE FOR REFERENCE ONLY AND THE FINAL DESIGN AND CONTENT MAY VARY FROM WHAT IS SHOWN. LABELS PROVIDED BY HELERMANNTYTON OR PV LABELS MAY VARY IN DESIGN, CONTENT AND QUANTITY REQUIRMENTS FROM WHAT IS SHOWN ON THIS SHEET. IT IS UP TO THE CONTRACTOR TO VERIFY FINAL LABEL SELECTION MEETS OR EXCEEDS THE DESIGN AND CONTENT AS SHOWN.
3. HELERMANNTYTON AND PV LABELS PART NUMBERS INCLUDING THE WORDS "CUSTOM" INDICATE THAT THEY ARE ONLY PROVIDING THE LABEL MATERIAL BUT NOT THE DESIGN AS SHOWN.
4. THE MARKING OR LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(A)
5. THE MARKING SHALL ADEQUATELY WARN OF THE HAZARD USING EFFECTIVE WORDS AND/OR COLORS AND/OR SYMBOLS. NEC 110.21(B)(1)
6. THE LABEL SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN. NEC 110.21(B)(2).
7. LABELS AND MARKINGS SHALL BE APPLIED TO THE APPROPRIATE COMPONENTS IN ACCORDANCE WITH THE NEC.
8. SOLAR MODULES ARE SUPPLIED FROM THE MANUFACTURER WITH MARKINGS PRE-APPLIED TO MEET THE REQUIREMENTS OF NEC 690.51.
9. UNLESS OTHERWISE STATED ON LABEL SPECIFIC NOTES, OSHA 1910.145 AND ANSI Z535 RECOMMENDED SPECIFICATIONS ARE AS FOLLOWS:

   A. ROUNDED OR BLUNT CORNERS FREE OF SHARP EDGES.
   B. VISIBLE AT A MINIMUM DISTANCE OF 5FT OR GREATER.
   C. "DANGER" HEADER; RED BACKGROUND WITH WHITE LETTERING.
   D. "WARNING" HEADER; ORANGE BACKGROUND WITH BLACK LETTERING.
   E. "CAUTION" HEADER; YELLOW BACKGROUND WITH BLACK LETTERING.
   F. "NOTICE" LABEL HEADER TO BE IN BLUE WITH WHITE LETTERING.
   G. ALL OTHER TEXT TO BE BLACK ON A WHITE BACKGROUND.

VECTOR ENGINEERS®
651 W. GALENA PARK BLVD. STE. 101 DRAPER, UTAH 84020
PHONE (801) 990-1775
WWW.VECTORSE.COM

ELECTRICAL ONLY

STATE OF ALASKA
49TH
(Affix Original Signature Here)
DEAN P. LEVORSEN
No. AEL EE 13300
REGISTERED PROFESSIONAL ENGINEER

05/30/2024

Firm License Number: AECL1355

VSE Project Number: U1944.0137.241

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STAMP:

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2605 BADGER RD
NORTH POLE, AK 99705

REV	ISSUED	BY	DESCRIPTION
	11/14/23	GK	BB UTILITY INTERCONNECTION SET
	11/21/23	GK	BB CD IFR - ISSUED FOR REVIEW
	05/24/24	GK	PK CD IFP - ISSUED FOR PERMIT

PROJECT NUMBER: 23-3688U

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

SHEET NO. & NAME:

E-3.0
LABELS & MARKINGS

NEW

CanadianSolar

BiHiKu7

BIFACIAL MONO PERC

630 W ~ 670 W

CS7N-630|635|640|645|650|655|660|665|670MB-AG (IEC1000 V)

CS7N-630|635|640|645|650|655|660|665|670MB-AG (IEC1500 V)

MORE POWER

- 670 W: Module power up to 670 W; Module efficiency up to 21.6 %
- Up to 8.9 % lower LCOE; Up to 4.6 % lower system cost
- Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation
- Compatible with mainstream trackers, cost effective product for utility power plant
- Better shading tolerance

MORE RELIABLE

- 40 °C lower hot spot temperature, greatly reduce module failure rate
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa*

* For detailed information, please refer to the Installation Manual.

12 Years Enhanced Product Warranty on Materials and Workmanship*

30 Years Linear Power Performance Warranty*

1st year power degradation no more than 2%
Subsequent annual power degradation no more than 0.45%

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / INMETRO
UL 61730 / IEC 61701 / IEC 62716
Take-e-way

* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

CSI Solar Co., Ltd. is committed to providing high quality solar products, solar system solutions and services to customers around the world. Canadian Solar was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey, and is a leading PV project developer and manufacturer of solar modules, with over 55 GW deployed around the world since 2001.

Canadian Solar MSS (Australia) Pty Ltd.
44 Stephenson St, Cremorne VIC 3121, Australia, sales.au@csisolar.com, www.csisolar.com/au

/ SHP 125-US-21 / SHP 150-US-21 / SHP 165-US-21 / SHP 172-US-21

SMA

Sunny Highpower PEAK3-US

125 / 150 / 165 / 172

A superior distributed generation solution for large-scale power plants

25 YEAR DESIGN LIFE — SMA Smart Connected — c UL us

Cost effective
- Modular architecture reduces BOS and maximizes system uptime
- Compact design and high power density maximize transportation and logistical efficiency

Maximum flexibility
- Scalable 1,500 VDC building block with best-in-class performance
- Flexible architecture creates scalability while maximizing land usage

Simple install, commissioning
- Ergonomic handling and simple connections enable quick installation
- Centralized commissioning and control with SMA Data Manager

Highly innovative
- SMA Smart Connected reduces O&M costs and simplifies field-service
- Powered by award winning ennexOS cross sector energy management platform

The Sunny Highpower PEAK3 1,500 VDC inverter offers high power density in a modular architecture that achieves a cost-optimized solution for large-scale PV integrators.

With fast, simple installation and commissioning, the PEAK3 is accelerating the path to energization. SMA has also brought its field-proven Smart Connected technology to the PEAK3, which simplifies O&M and contributes to lower lifetime service costs. The PEAK3 power plant solution is powered by the ennexOS cross sector energy management platform, 2018 winner of the Intersolar smarter E AWARD.

/ EDMM-10

SMA

SMA Data Manager M

One system.
Many options.
For your individual needs.

Fast and easy to use
- Easy integration of devices
- Centralized commissioning of all integrated components

Future-proof and flexible
- Flexibly expandable anytime
- Access to the energy market of the future based on ennexOS

Functional
- Complies with international grid-integration requirements
- Combine storage systems, energy generators and e-mobility

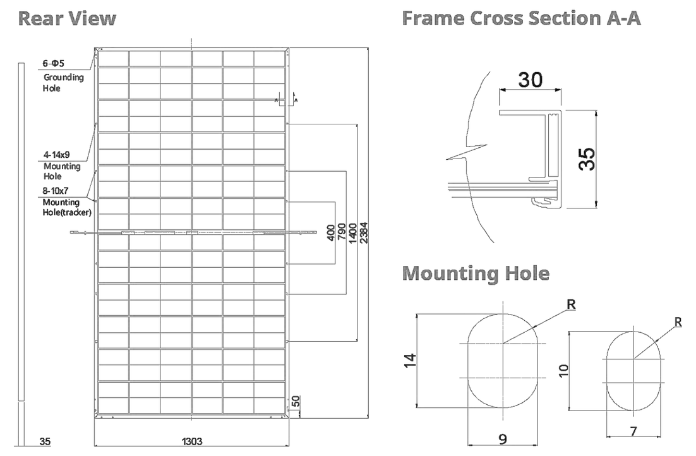
Reliable and convenient
- Remote monitoring and parameterization possible
- Detailed analytics, error messages and reporting through Sunny Portal

In combination with the Sunny Portal powered by ennexOS, the Data Manager M enables monitoring, management and grid-compliant power control in decentralized PV systems.

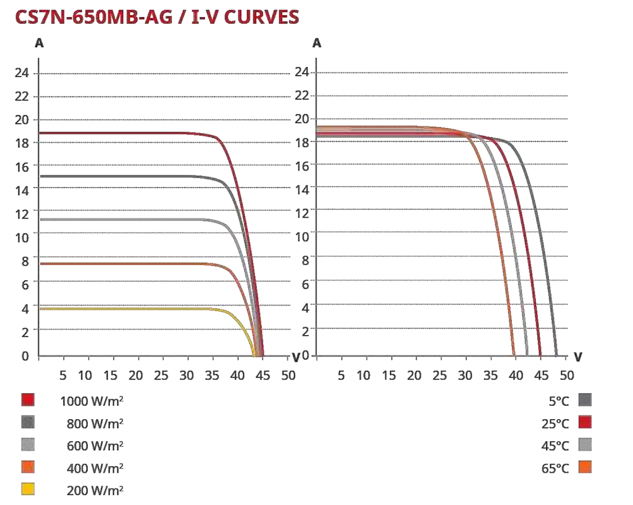
Thanks to flexible expansion options, the Data Manager M is already well-equipped for business models in the energy market of the future. For systems with up to 50 devices and an installed inverter power of 2.5 MVA in closed-loop control mode or 7.5 MVA in open-loop control mode or monitoring mode only—the Data Manager M is the ideal professional system interface for electric utility companies, service technicians and PV system operators.

Coordinated user interfaces and intuitive assistance functions simplify operation, parameterization and commissioning. The Data Manager M is modularly expandable with many additional functions and interfaces.

ENGINEERING DRAWING (mm)



CS7N-650MB-AG / I-V CURVES



ELECTRICAL DATA | STC*

		Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)	Module Efficiency
CS7N-630MB-AG		630 W	37.1 V	16.99 A	44.2 V	18.23 A	20.3%
Bifacial Gain**	5%	662 W	37.1 V	17.85 A	44.2 V	19.14 A	21.3%
	10%	693 W	37.1 V	18.69 A	44.2 V	20.05 A	22.3%
	20%	756 W	37.1 V	20.39 A	44.2 V	21.88 A	24.3%
CS7N-635MB-AG		635 W	37.3 V	17.03 A	44.4 V	18.27 A	20.4%
Bifacial Gain**	5%	667 W	37.3 V	17.89 A	44.4 V	19.18 A	21.5%
	10%	699 W	37.3 V	18.74 A	44.4 V	20.10 A	22.5%
	20%	762 W	37.3 V	20.44 A	44.4 V	21.92 A	24.5%
CS7N-640MB-AG		640 W	37.5 V	17.07 A	44.6 V	18.31 A	20.6%
Bifacial Gain**	5%	672 W	37.5 V	17.92 A	44.6 V	19.23 A	21.6%
	10%	704 W	37.5 V	18.78 A	44.6 V	20.14 A	22.7%
	20%	768 W	37.5 V	20.48 A	44.6 V	21.97 A	24.7%
CS7N-645MB-AG		645 W	37.7 V	17.11 A	44.8 V	18.35 A	20.8%
Bifacial Gain**	5%	677 W	37.7 V	17.97 A	44.8 V	19.27 A	21.8%
	10%	710 W	37.7 V	18.84 A	44.8 V	20.19 A	22.9%
	20%	774 W	37.7 V	20.53 A	44.8 V	22.02 A	24.9%
CS7N-650MB-AG		650 W	37.9 V	17.16 A	45.0 V	18.39 A	20.9%
Bifacial Gain**	5%	683 W	37.9 V	18.03 A	45.0 V	19.31 A	22.0%
	10%	715 W	37.9 V	18.88 A	45.0 V	20.23 A	23.0%
	20%	780 W	37.9 V	20.59 A	45.0 V	22.07 A	25.1%
CS7N-655MB-AG		655 W	38.1 V	17.20 A	45.2 V	18.43 A	21.1%
Bifacial Gain**	5%	688 W	38.1 V	18.06 A	45.2 V	19.35 A	22.1%
	10%	721 W	38.1 V	18.93 A	45.2 V	20.27 A	23.2%
	20%	786 W	38.1 V	20.64 A	45.2 V	22.12 A	25.3%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C. Measurement uncertainty: ±3 % (Pmax).
** Bifacial Gain: The additional gain from the back side compared to the power of the front side at the standard test condition. It depends on mounting (structure, height, tilt angle etc.) and albedo of the ground.

ELECTRICAL DATA

Operating Temperature	-40°C ~ +85°C
Max. System Voltage	1500 V (IEC) or 1000 V (IEC)
Module Fire Performance	CLASS C (IEC61730)
Max. Series Fuse Rating	35 A
Application Classification	Class A
Power Tolerance	0 ~ + 5 W
Power Bifaciality*	70 %

* Power Bifaciality = $Pmax_{rear}$ / $Pmax_{front}$, both $Pmax_{rear}$ and $Pmax_{front}$ are tested under STC, Bifaciality Tolerance: ± 5 %

ELECTRICAL DATA | NMOT*

	Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)
CS7N-630MB-AG	472 W	34.8 V	13.57 A	41.8 V	14.71 A
CS7N-635MB-AG	476 W	35.0 V	13.61 A	42.0 V	14.73 A
CS7N-640MB-AG	480 W	35.2 V	13.64 A	42.2 V	14.77 A
CS7N-645MB-AG	484 W	35.3 V	13.72 A	42.3 V	14.80 A
CS7N-650MB-AG	487 W	35.5 V	13.74 A	42.5 V	14.83 A
CS7N-655MB-AG	491 W	35.7 V	13.76 A	42.7 V	14.86 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	132 [2 x (11 x 6)]
Dimensions	2384 × 1303 × 35 mm (93.9 × 51.3 × 1.38 in)
Weight	37.9 kg (83.6 lbs)
Front / Back Glass	2.0 mm heat strengthened glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 diodes
Cable	4.0 mm² (IEC)
Cable Length (Including Connector)	460 mm (18.1 in) (+) / 340 mm (13.4 in) (-) (supply additional jumper cable: 2 lines / Pallet) or customized length*
Connector	PV-KST4/xy-UR, PV-KBT4/xy-UR (IEC 1000 V) or T4-PC-1 (IEC 1500 V) or PV-KST4-EVO2/XY, PV-KBT4-EVO2/XY (IEC 1500 V)
Per Pallet	31 pieces
Per Container (40' HQ)	527 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.34 % / °C
Temperature Coefficient (Voc)	-0.26 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	41 ± 3°C

PARTNER SECTION

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

Canadian Solar MSS (Australia) Pty Ltd.
44 Stephenson St, Cremorne VIC 3121, Australia, sales.au@csisolar.com, www.csisolar.com/au

* Manufactured and assembled in China, Thailand and Vietnam.

Technical Data	Sunny Highpower PEAK3 125-US	Sunny Highpower PEAK3 150-US	Sunny Highpower PEAK3 165-US	Sunny Highpower PEAK3 172-US
Input (DC)				
Maximum array power 1)	250 kWp	300 kWp	330 kWp	344 kWp
Maximum system voltage	1500 Vdc			
Rated MPP voltage range	705 V ... 1450 V	880 V ... 1450 V	924 V ... 1450 V	968 V ... 1450 V
MPPT operating voltage range	684 V ... 1500 V	855 V ... 1500 V	898 V ... 1500 V	941 V ... 1500 V
MPP trackers	1			
Maximum operating input current	180 A			
Maximum input short-circuit current	325 A			
Output (AC)				
Nominal AC power	125 kW	150 kW	165 kW	172 kW
Maximum apparent power	125 kVA	150 kVA	165 kVA	172 kVA
Output phases / line connections	3 / 3-PE			
Nominal AC voltage	480 V	600 V	630 V	660 V
Compatible transformer winding configuration	Wye-grounded			
Maximum output current	151 A			
Rated grid frequency	60 Hz			
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz			
Power factor at rated power / adjustable displacement	1 / 0.8 leading ... 0.8 lagging			
Harmonics (THD)	<3%			
Efficiency				
CEC efficiency	98.5 %	99.0 %	99.0 %	99.0 %
Protection and safety features				
Ground fault monitoring: Riso / Differential current	● / ●			
DC reverse polarity protection	●			
AC short circuit protection	●			
Monitored surge protection (Type 2): DC / AC	● / ●			
Protection class / overvoltage category (as per UL 840)	I / IV			
General data				
Device dimensions (W / H / D)	770 / 830 / 462 mm (30.3 / 32.7 / 18.2 in)			
Device weight	99 kg (218 lbs)			
Operating temperature range	-25°C ... +60°C (-13°F ... +140°F)			
Storage temperature range	-40°C ... +70°C (-40°F ... +158°F)			
Audible noise emission (full power @ 1m and 25°C)	< 69 dB(A)			
Internal consumption at night	< 5 W			
Topology	Transformerless			
Cooling concept	OptiCool (forced convection, variable speed fans)			
Enclosure protection rating	Type 4X			
Maximum permissible relative humidity (non-condensing)	100%			
Additional information				
Mounting	Rack mount			
DC connection	Terminal lug (up to 600 kcmil CU/AL)			
AC connection	Screw terminal (up to 300 kcmil CU/AL)			
LED indicators (Status/Fault/Communication)	●			
SMA Speedwire (Ethernet network interface)	● (2 x RJ45 ports)			
Data protocols: SMA Modbus / SunSpec Modbus	● / ●			
Integrated Plant Control / Q on Demand 24/7	● / ●			
Off-grid capable / SMA Hybrid Controller compatible	– / ●			
Monitoring				
SMA Sunny Portal (monitoring portal)	No cost for the lifetime of the system			
SMA Smart Connected (monitoring and remote O&M service)	No cost on inverters under warranty			
Supported protocols for outbound data	SMA external API, Modbus, FTP			
Certifications				
Certifications and approvals (pending)	UL 62109, UL 1998, CAN/CSA-C22.2 No.62109			
Manufacturer's Declaration of Design Life	25 years			
FCC compliance	FCC Part 15, Class A			
Grid interconnection standards	IEEE 1547:2018, UL 1741-SA - CA Rule 21, HECO Rule 14H, UL1741SB			
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor			
Warranty				
Standard	5 years			
Optional extensions (total warranty coverage cannot exceed 25 years)	+5 / +10 / +15 / +20 years			
Type designation	SHP 125-US-21	SHP 150-US-21	SHP 165-US-21	SHP 172-US-21

1) Higher DC array power permitted via site inverter load modeling in SMA Sunny Design

● Standard features ○ Optional features – Not available

Toll Free +1 888 4 SMA USA
www.SMA-America.com

SMA America, LLC

SHP-US-DS-en-23 Changes to products and services, including those resulting from country-specific requirements, as well as deviations from technical data are subject to change at any time without notice. SMA assumes no liability for typographical or other errors. Please visit www.SMA-Solar.com for the latest information.

Technical data	SMA DATA MANAGER M
Master data	
Total number of supported devices - of which:	50
Maximum number of supported PV inverters	50
Maximum number of supported energy meters (electric current and gas), generators from energy meters, I/O systems, sensors	50
Maximum nominal system power of PV and battery inverters (nominal AC power)	2.5 MVA (closed-loop control) 7.5 MVA (open-loop control or only monitoring)
Automatic data recording for virtual generators from energy meters (PV inverter, combined heat and power plant, gas meter, diesel generator, hydroelectric power plant)	●
Connections	
Voltage supply	2-pin connection, MINI COMBICON
RS485	6-pin connection, MINI COMBICON
Network (LAN)	2 x RJ45, switched, 10 BaseT/100 BaseT
USB (for product updates)	1 x USB 2.0, type A
Wi-Fi access point for commissioning and access to the user interface	▲
Voltage supply	
Voltage supply	External power supply unit
Input voltage	10 V to 30 V DC
Power consumption	Typically 4 W
Ambient conditions during operation	
Environment	Restricted class 3K7 reg. IEC60721-3-3
Ambient temperature	−20 °C to +60 °C / −4 °F to +140 °F
Permissible range for relative humidity (non-condensing)	5% to 95%
Maximum operating altitude above MSL	0 m to 3,000 m (≥70 kPa)
Degree of protection according to IEC 60529	IP20 (NEMA 1)
General data	
Dimensions W/H/D in mm (in)	161.1 / 89.7 / 67.2 (6.34 / 3.53 / 2.64)
Weight in g (lb)	220 (0.485)
Mounting location	Indoors
Mounting type	DIN rail mounting
Status display	LEDs for system and communication status
Equipment	
Warranty	2 years
Certificates and approvals (more available upon request)	www.SMA-Solar.com
Accessories (optional, from third-party suppliers)	
DIN rail power supply unit	Input: 100 V to 240 V AC / 45 Hz to 65 Hz / Output: 24 V DC
I/O system by Moxa Europe GmbH	ioLogik E1214 (6DI/6 relay outputs) ioLogik E1242 (4AI/4DI/4DIO) ioLogik E1260 (6 PT-100)
I/O system by WAGO Kontakttechnik GmbH & Co. KG	WAGO-I/O-SYSTEM 750 (8DI, 8DO, 4AI, 4AO, 2 PT-100)
Communication / protocols	
FTP push (daily / hourly)	● / ●
Wi-Fi access to the customer network	–
SMA Data2+ / SMA Data	● / ●
Client: Modbus/RTU, Modbus/TCP (also Sunspec)	●
Server: Modbus/TCP	●
Commissioning	
Assistant for local commissioning of connected devices	●
Assistant for parameterization of SMA products connected via Speedwire	●
Remote parameterization of SMA devices locally and with ennexOS Sunny Portal	●
Updates	
Self-update and connected Speedwire devices via the EDMM USB interface	●
Self-update and connected Speedwire devices via SMA Update Portal	●
Grid management services	
Closed-loop control and open-loop control of other SMA Data Managers	●
Compatible configuration with a grid-connection energy meter (at point of interconnection)	●
Grid Management Service with open-loop and closed-loop control of active and reactive power	●
Manual inputs or inputs transferred via Modbus	●
Specifications via analog and digital inputs	via external I/O systems
Open-loop and closed-loop active power control (digital inputs)	via 5 digital inputs on the device or via external I/O systems
Closed-loop active power control	●
Open-loop and closed-loop reactive power control (Q(U), Q(P))	●
Fast shutdown via the digital input	●

Mayfield Renewables

2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID–TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

PROJECT NUMBER: 23–3688U

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"

v.1.9

REV	ISSUED	BY	✓	DESCRIPTION
	11/14/23	GK	BB	UTILITY INTERCONNECTION SET
	11/21/23	GK	BB	CD IFR – ISSUED FOR REVIEW
	05/24/24	GK	PK	CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:

E–5.0
DATA SHEETS

1-800-633-0405

For the latest prices, please check AutomationDirect.com.

Hammond Transformers

Hammond Power Solutions

Imperator | Fortress | Spartan

Get years of reliable service from a quality transformer at a practical price

HPS Imperator™ control transformers for industrial applications

HPS Imperator control transformers from Hammond are designed for high inrush applications requiring reliable output voltage stability. Designed for industrial applications where electromagnetic devices such as relays, solenoids, etc. are used, they maximize inrush capability and output voltage regulation when electromagnetic devices are initially energized.

HPS Imperator control transformers use Mylar, Nomex and other high-quality insulating materials to electrically insulate turn-to-turn windings, layer-to-layer windings, primary-to-secondary windings and ground. These transformers are vacuum impregnated with VT polyester resin and oven-cured, which seals the surface and eliminates moisture. Filling the entire unit provides a strong mechanical bond and offers protection from the environment. This design utilizes superior insulation systems and is constructed with high quality silicon steel laminations, which provide optimum performance and reliability.

The custom injection-molded cover, with its unique fin-shaped design, provides excellent cooling properties while protecting the coils and terminations from moisture, dirt and other industrial airborne contaminants.

The heavy steel mounting feet are welded to the core, providing maximum strength and low noise in a compact design.

The HPS Imperator's unique terminal block design (patent pending) allows for the quick and easy installation of standard secondary or optional primary 13/32" x 1 1/2" midget/type CC fuse clips on every unit. This is the simplest and most inexpensive fusing installation provided on any industrial control transformer in the market today.

The windings and internal terminations of the HPS Imperator are encapsulated, which protects them from moisture, dirt and other airborne contaminants. The custom molded coil covers with their unique fin-shaped design combine superior transformer cooling properties with a clean bold look.

The HPS Imperator utilizes custom serrated terminals in combination with standard SEMS washer screws for easier assembly and quicker installation as well as superior connection strength when connecting with bare, solid, or stranded wire. It also allows for ring or spade termination connectors with a maximum width of 0.37 in (9.4 mm).

HPS Fortress™ commercial potted transformers

The HPS Fortress commercial potted transformers provide an innovative design with commercial applications where quality, ease of installation, and low cost are key.

All Fortress units are encapsulated with electrical grade silica sand and resin compounds, which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.

HPS Spartan™ open core and coil control transformers

The HPS Spartan line of industrial open-style control transformers is ideally suited for general purpose, industrial and light duty loads.

Designed for applications with lower inrush and where less demanding environmental protections are needed, HPS Spartan models offer an efficient and economical solution. They feature molded terminal blocks up to 3000VA or 30A. Optional finger guards and a fuse block adapter kit are available.

Superior quality and value

- Compact, efficient design
- Easy installation and hook-up
- Inexpensive while maintaining superior quality in materials and workmanship
- Wall mounting

Applications

- Lighting
- Motor control circuits
- HVAC
- Signal and alarm systems
- Circuit isolation
- Schools
- Office buildings

PSM12-078S Cut Sheet

AUTOMATIONDIRECT www.automationdirect.com

RHINO SELECT PSM series switching power supply, 12 VDC @ 6.5A/78W (adjustable), 120/240 VAC nominal input, 1-phase, enclosed, metal housing, 35mm DIN rail mount, removable screw terminal.

For complete product information, please see this item on our store at the following link:

https://www.automationdirect.com/pn/PSM12-078S

Technical Specifications

Brand	RHINO SELECT
Item	Power supply
Series	PSM
Power Supply Type	Switching
Efficiency	81% @115 VAC, 82% @230 VAC
Output Configuration	Single output
Output	12 VDC @ 6.5A/78W (adjustable)
Output Voltage Range	12-14 VDC
Input voltage range	85-264 VAC
Number of Input Phases	1
Protection Type(s)	• overvoltage • short circuit • over-temperature
Remote On/Off	Yes
Voltage Monitoring	Yes
Enclosure Type	Enclosed
Housing Material	Metal
IP Rating	IP20
Mounting	35mm DIN rail
Connector Type	Removable screw terminal
NEC Class 2	No
Integrated UPS Battery Control	No
Operating Temperature	-25 to 70 deg C

Agency Approvals

UL Listed File #	E197592
UL Recognized File #	E198298
UL Hazardous File #	None
CE	View CE declarations
CSA File #	229285
RoHS Status	Yes (See CE Doc)
EU REACH	View EU REACH document

1-800-633-0405

For the latest prices, please check www.automationdirect.com.

150W to 450W Touch-Safe PTC Fan Heaters

STEGO

Panel Mount Fan Heaters

DIN Mount Fan Heaters

Applications

These fan heaters are designed to prevent the formation of condensation and ensure an evenly distributed interior air temperature in enclosures. The heater is connected using the internal terminal connectors. The desired temperature can be set and maintained by an external thermostat (available separately) and the high-performance axial fan provides forced air circulation. The heater design minimizes side surface temperatures of the housing. The small size of these heaters makes them ideal for use in enclosures where space is at a premium.

Features

- Compact fan heater
- Quiet operation
- Heating power adjusts to ambient temperature
- Models available that are both DIN rail mountable as well as panel mounted

cULus CE

150W to 450W Touch-Safe PTC Fan Heaters Specifications

	DIN Mount	Panel Mount
Heating Element	PTC Resistor - Temperature limiting	
Axial Fan,Ball Bearing	Service life 40,000h at 104°F [40°C]	
Connection	2-pole terminal 14 AWG [2.5mm], max. solid wire or stranded wire with wire end ferrule, 0.8 N m max. clamping torque	
Housing	Plastic, UL 94V-0, black	
Mounting	Clip for 35mm DIN rail, EN 60715	Screw mount
Mounting Position	Vertical (exhaust up)	
Recommended Mounting Distance	Sides: 0.79in [20 mm] Bottom/above: 3.94in [100 mm]	
Operating / Storage Temperature	-49 to 158°F [-45 to 70°C]	
Operating / Storage Humidity	Max. 90% RH (non-condensing)	
Protection Class	II (double insulated)	
Protection Type	IP20	
Approvals	CE, UL Recognized File No. E234324, RoHS 2 compliant	

Note: To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page at www.automationdirect.com

150W to 450W Touch-Safe PTC Fan Heaters

Part Number DIN Mount	Price	Part Number Panel Mount	Price	Heating Capacity[1]	Operating Voltage	Max. current (inrush)	Air flow,free blowing	Weight (approx.)
028009-00	$119.00	028009-01	$119.00	150W	120V AC, 50/60 Hz	6.0 A	8 cfm [13.8 m³/h]	10.6 oz [301g]
028000-00	$119.00	028000-01	$119.00		230V AC, 50/60 Hz	12.0 A		
028119-00	$137.00	028119-01	$137.00	250W	120V AC, 50/60 Hz	6.0 A	32 cfm [54 m³/h]	17.6 oz [499g]
028110-00	$137.00	028110-01	$137.00		230V AC, 50/60 Hz	9.0 A	26 cfm [45 m³/h]	
028109-00	$151.00	028109-01	$151.00	400W	120V AC, 50/60 Hz	9.0 A	32 cfm [54 m³/h]	
028100-00	$151.00	028100-01	$151.00		230V AC, 50/60 Hz	15.0 A	26 cfm [45 m³/h]	

Note: [1]At 68°F [20°C] ambient temperature @ 60Hz

1-800-633-0405

For the latest prices, please check www.automationdirect.com.

Compact Thumbwheel Thermostats

STEGO

011159-00 and 011150-00

011169-00 and 011160-00

Applications

Normally Closed (N.C.)
Normally Closed thermostats have a red adjustment thumbwheel and contacts that open when the air temperature rises above the setpoint. Uses may include regulating heaters or switching signal devices when temperature falls below the setpoint value.

Normally Open (N.O.)
Normally Open thermostats have a blue adjustment thumbwheel and contacts that close when the air temperature rises above the setpoint. Uses may include regulating cooling devices (heat exchangers, filter fans, vortex coolers, etc) or for include switching signal devices when temperature rises above the maximum setpoint.

Features

- Compact design
- Adjustable thumbwheel setting
- DIN rail mounting
- SPST regulator with small hysteresis
- Housing design ensures optimized circulation around sensor element

cULus CE

Compact Thumbwheel Thermostats Specifications

Switching Difference	7°F [4K]
Switching Tolerance	±5.4°F [±3K]
Sensor Element	Thermostatic bimetal
Contact Type	Snap-action contact
Contact Resistance	<10 mΩ
Service Life	>100,000 cycles
Max. Switching Capacity	15A resistive / 2A inductive @ 120 VAC 10A resistive / 2A inductive @ 250 VAC DC 30W (24-72 VDC)
Max. Inrush Current	AC 16A for 10 sec.
Minimum Load	20mA (all voltages)
Connection	2-pole terminal,1 Nm max. clamping torque 14 AWG [2.5mm] max. solid wire or stranded wire with wire end ferrule
Housing	Plastic, UL 94V-0, light gray
Mounting	Clip for 35mm DIN rail, EN 60715
Mounting Position	Vertical
Operating / StorageTemperature	-49 to 176°F [-45 to 80°C]
Weight	1.8 oz [50 g]
Protection Type	IP20
Approvals	Recognized File No. E164102, CE, VDE, EAC, RoHS 2 compliant

Compact Thumbwheel Thermostats

Part Number	Price	Contact	Setting Range
011159-00	$28.50	N.C.	32 to 140°F
011150-00	$28.50		0 to 60°C
011169-00	$28.50	N.O.	32 to 140°F
011160-00	$28.50		0 to 60°C

1-800-633-0405

For the latest prices, please check AutomationDirect.com.

HPS Spartan™ 240x480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Features

- Multi-voltage primary and secondary models increase range of application per unit
- Standard molded terminal blocks or primary and secondary up to 3000VA (30A) units
- Solid terminal block with standard combination screw connection
- 50/60 Hz
- Copper-wound coils with high dielectric strength insulation
- Bolted core construction
- Bolt-on mounting brackets
- Vacuum impregnated with polyester resin and oven cured
- Seismically certified in accordance with IBC 2009; Section 1613 Earthquake Loads, for SDS ≤ 2.00g , z/h = 1.0, and IP = 1.5
- Superior insulating materials. The HPS Spartan series transformers offer the following insulation systems:
- 130°C (80°C rise) up to 1500 VA
- 180°C (115°C rise) 2000 VA to 5000 VA
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- All terminal blocks utilize a combination slot/ Phillips #6-32 screw with a SEMS washer (suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire). Coil face terminations utilize a ¼-20 UNC X 0.50 in combination slot/Phillips screw and a spring lock washer.
- All units supplied with primary and secondary voltage links/jumpers
- Optional finger guards available, up to and including 3000VA or 30 amps
- Optional fuse block adapter kit available, up to and including 3000VA or 30 amps
- Supplied with trilingual installation and wiring instruction sheets
- **15 year warranty**

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394 (Models/Type 3AH)
- CE Mark standard on all units
- CSA LR39902
- RoHS Compliant

HPS Spartan 240x480 / 120x240 Open Core and Coil Control Transformer Specifications

Part Number	Price	Volt-Amp Rating	CE Volt-Amp	Mtg. Fig.	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 120/240 VAC	Impedance % VA	Impedance % %z	Total Heat Dissipation (Watts)**	Weight lb [kg]
SP50MQMJ	$45.00	50	50	A	240x480 230x460 220x440	120x240 115x230 110x220	0.420.21	50	8.3	14	1.7 [0.77]
SP100MQMJ	$54.00	100	100	A			0.830.42	100	6.9	24	3 [1.36]
SP150MQMJ	$64.00	150	150	A			1.250.63	150	8.4	29	4.3 [1.95]
SP250MQMJ	$86.00	250	160	A			2.081.04	250	7.8	40	6.5 [2.95]
SP350MQMJ	$116.00	350	250	A			2.921.46	350	7.0	48	8.2 [3.72]
SP500MQMJ	$139.00	500	300	A			4.172.08	500	5.0	61	11 [4.99]
SP750MQMJ	$188.00	750	500	A			6.253.13	750	4.9	75	16 [7.26]
SP1000MQMJ	$213.00	1000	650	A			8.334.17	1000	3.7	90	21 [9.53]
SP1500MQMJ	$277.00	1500	1000	A			12.56.25	1500	3.9	122	28 [12.70]
SP2000MQMJ	$396.00	2000	1300	A			16.78.33	2000	4.0	194	35 [15.88]
SP3000MQMJ	$648.00	3000	2000	A			25.0012.5	3000	2.5	206	64 [29.03]
SP5000MQMJ	$1,032.00	5000	3000	B			41.7020.8	5000	2.5	319	97 [44.00]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
Note: The impedance values listed in the table above are calculated typical values only. Actual measured impedance values may vary based on a specific design.

1-800-633-0405

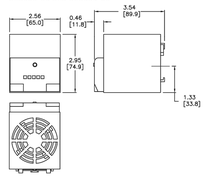
For the latest prices, please check www.automationdirect.com.

150W to 450W Touch-Safe PTC Fan Heaters

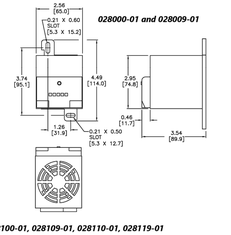
STEGO

Dimensions

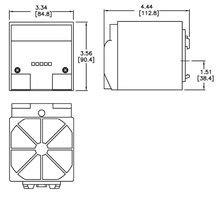
028000-00 and 028009-00



028000-01 and 028009-01



028100-00, 028109-00, 028110-00, 028119-00



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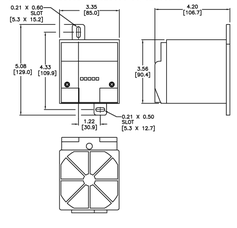
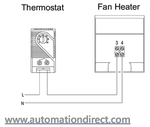


Wiring Diagram



Note: When wiring 230 volt units for North American installations "L" (line) and "N" (neutral) will be used as"L1" (line1) "L2" (line2) respectively with no neutral connection.

1-800-633-0405

For the latest prices, please check www.automationdirect.com.

Adjustable Thermostats

STEGO

111000-00, 111000-01, 111000-02, 111009-00, and 111009-01

111010-00, 111010-01, 111010-02, 111019-00, and 111019-01

Applications

Normally Closed (N.C.)
Normally Closed adjustable thermostats have a red adjustment dial and contacts that open when the air temperature rises above the setpoint. Uses may include regulating heaters or switching signal devices when temperature falls below the setpoint value.

Normally Open (N.O.)
Normally Open adjustable thermostats have a blue adjustment dial and contacts that close when the air temperature rises above the setpoint. Uses may include regulating cooling devices (heat exchangers, filter fans vortex coolers, etc), or switching signal devices when temperature rises above the setpoint value.

Features

- Compact design
- Wide adjustment range
- Color coded temperature dials
- DIN rail mounting
- Push-in terminals for tool-free installation
- For use up to 16,400 ft. [5000 m] altitude

cULus CE

General Specifications

Switching Difference	12.6°F [7K]
Switching Tolerance	±7°F [±4K]
Sensor Element	Thermostatic bimetal
Contact Type	Snap-action contact
Service Life	>100,000 cycles
Max. Inrush Current	AC 16A for 10 sec.
Max. Operating Voltage	250 VAC
Connection	2-pole terminal, push-in terminal 14 AWG [2.5mm] max. solid/stranded wire
Housing	Plastic, UL 94V-0, light gray
Mounting	Clip for 35mm DIN rail, EN 60715
Mounting Position	Variable
Operating / Storage Temperature	-49 to 176°F [-45 to 80°C]
Weight	0.09 lb [40 g]
Protection Type	IP20
Approvals	CE, CSA, VDE, EAC, UL Recognized File No. E164102; RoHS 2 compliant

Note: When using stranded wire, wire-end ferrules (square or trapezoid crimp) must be used.

Adjustable Thermostats

Part Number	Price	Contact	Setting Range	Max. Switching Capacity	Drawing Link
111000-00	$21.00	N.C.	0 to 60°C	15A resistive / 2A inductive at 120 VAC, 10A resistive / 2A inductive at 250 VAC, 30W DC	PDF
111000-01	$21.00		-10 to 50°C		PDF
111000-02	$21.00		20 to 80°C	3A resistive / 2A inductive at 120 VAC, 3A resistive / 2A inductive at 250 VAC, 30W DC	PDF
111009-00	$21.00		32 to 140°F		PDF
111009-01	$21.00		14 to 122°F	15A resistive / 2A inductive at 120 VAC, 10A resistive / 2A inductive at 250 VAC, 30W DC	PDF
111010-00	$21.00	N.O.	0 to 60°C		PDF
111010-01	$21.00		-10 to 50°C	3A resistive / 2A inductive at 120 VAC, 3A resistive / 2A inductive at 250 VAC, 30W DC	PDF
111010-02	$21.00		20 to 80°C		PDF
111019-00	$21.00		32 to 140°F	15A resistive / 2A inductive at 120 VAC, 10A resistive / 2A inductive at 250 VAC, 30W DC	PDF
111019-01	$21.00		14 to 122°F		PDF

Mayfield Renewables

2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

REV	DESCRIPTION	BY
ISSUED	UTILITY INTERCONNECTION SET	
11/14/23		GK
BB		
11/21/23	ISSUED FOR REVIEW	GK
BB		
05/24/24	ISSUED FOR PERMIT	GK
CD		PK
CD		
IFR		
IFP		

PROJECT NUMBER: 23-3688U

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

SHEET NO. & NAME:

E-5.1
DATA SHEETS

PRINT DATE: 5/29/2024 9:08 AM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\23-3688u - north pole\working set\E-5.1 DATA SHEETS.dwg

e) Bonding and Grounding

A full row of modules is bonded together via purlins and splice plates (Figure 31). If necessary, tables can be grounded together using typical grounding lugs and ground wire as specified by a local Authority having Jurisdiction (AHJ). It's the installer's responsibility to make sure the bonding washers are installed properly as per the IFC drawings and this installation manual. It is the installer's responsibility to check local codes and the AHJ to verify electrical requirements. For effective electrical bonding, bonding components SHOULD NOT be re-used. In the event of module replacement or system rectifications new grounding components are required.

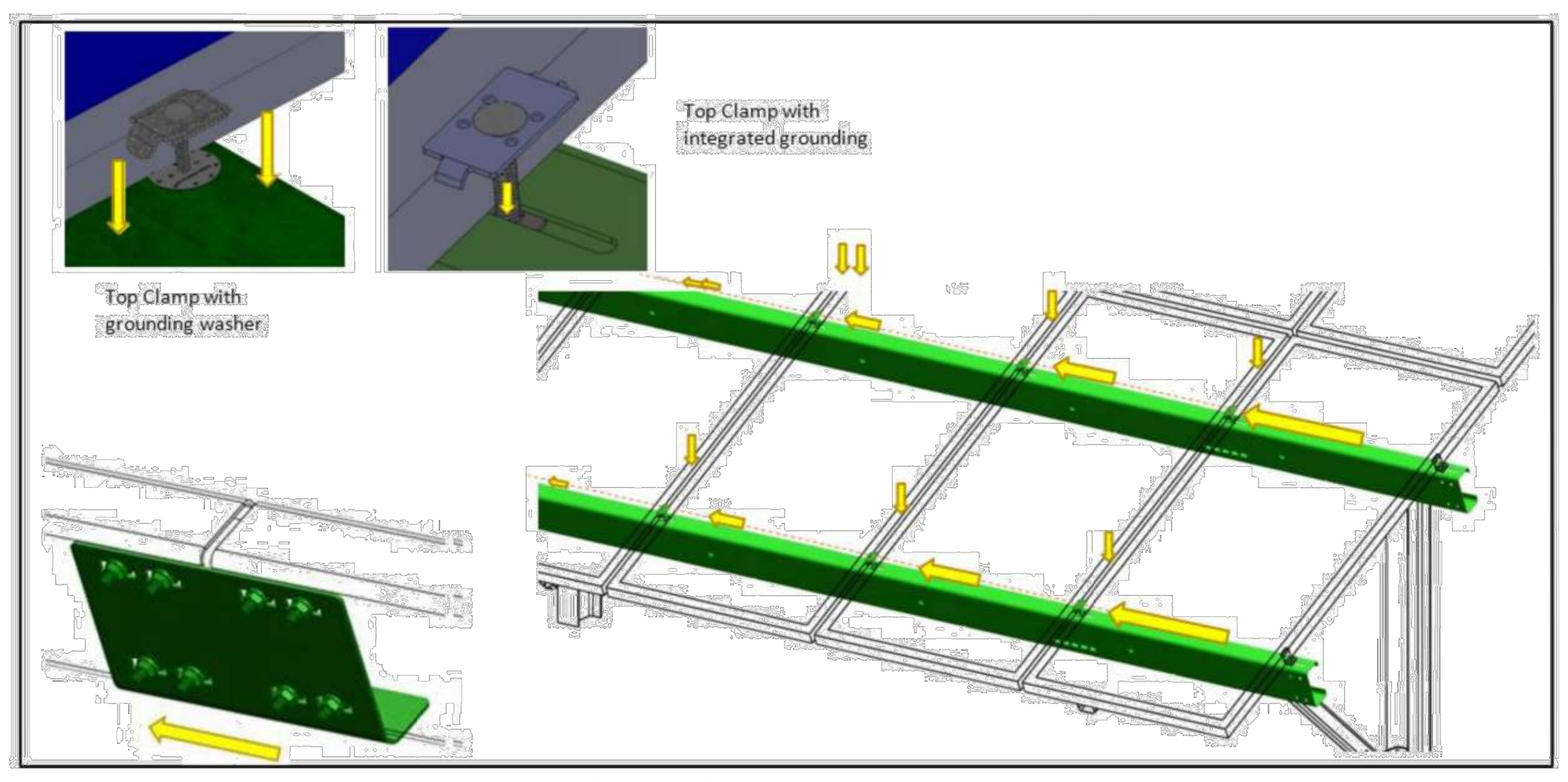


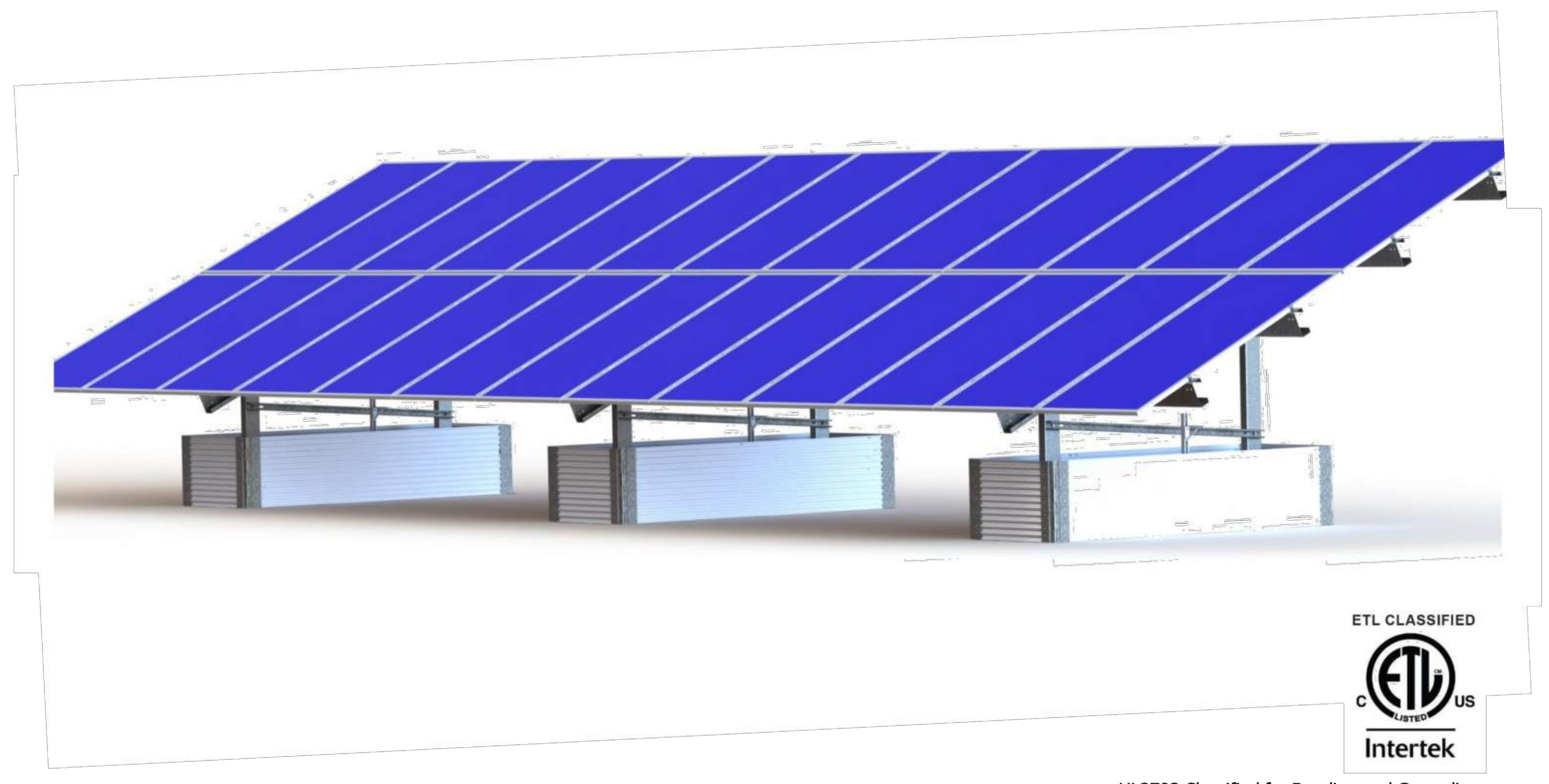
Figure 25: Typical table bonding path.

Grounding using Intermodular Clamps (Top Clamps)

When using self-grounding inter-module clamps a grounding washer is not required, since the grounding path will be achieved through the inter-module clamp itself. Typical location of inter-module clamps is shown below in green. The gap between modules is to be less than 21.34mm for standard top clamps, and less than 10mm when using self-grounding inter-module clamp or star washer.

POLAR RACKING

CORE - INSTALLATION MANUAL
BALLASTED PORTRAIT SYSTEM



ETL CLASSIFIED
Intertek
UL2703 Classified for Bonding and Grounding

6. List of Approved PV Modules for Bonding and Grounding

Table 1: Approved PV modules

MANUFACTURER	MODEL. "XXX" IS THE MODULE POWER RATING
Adani	Asa-b-c(xxx)-d Where "a" can be M, P; "b" can be 7, 14; "c" can be PERC, or blank; "d" can be 72, 144;
Astronergy Solar	aaSMbbyyC/zz-xxx Where "aa" can be CH or A; "bb" can be 60, 66, or 72; "yy" can be blank, 10 or 12; "C" can be M, P, M(BL)-HC, P-HC, M(DG), or M(DGT); and "zz" can be blank, HV, F-B, or F-BH
Boviet Solar	BVM66aMb (xxx) c-d Where "a" can be 12, or 13; "b" can be M(L), M9(L), or M; "c" can be S, S-H, or S-H-HC; "d" can be BF or BF-DG.
Canadian Solar	CSbY-xxxZ Where "b" can be 3, 6, or 7; "Y" can be H, K, L, N, P, U, V, W, X, or Y; and "Z" can be M, P, MS, PX, M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, MS-SD
CSUn	CSUN xxx a-b Where "a" can be 60 or 72; "b" can be P or M.
ET Solar	ET-YZZZZxxxAA Where "Y" can be P, L, or M; "ZZZ" can be 660, 6608H, 672, 672BH, 754BH, 766BH, 772BH; and "AA" can be GL, TB, TW, WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO, or BBAC
GCL	GCL-a-(xxx)-b Where "a" can be M3, M6, P3, or P6; "b" can be 72, or 72H
Hansol	ND-AN3 (300, 305, 310, 315, 320, 325, 330) HS (290, 295, 300, 305, 310, 315, 320, 325, 330) ME-V001
Hanwha Solar (Q Cells)	B.LINE PLUS L G4.1 (317-347) B.LINE PLUS L G4.2 (317-347) Q.p L-G(xxx)b Where "p" can be Peak, Peak DUO, Plus, Plus DUO, or Pro; "a" can be 4, 4.1, 4.2, 5, 5.2, 5.3, 6, 6.1, 6.2, 6.3, 7, 7.1, 7.2, 7.3, 7.4, 7.7, 8, 8.1, 8.2, 8.3, 9, 9.1, 9.2, or 9.3; "b" can be blank or /BF.
Heliene	72-a (xxx) Where "a" can be M, P, BLK

MANUFACTURER	MODEL. "XXX" IS THE MODULE POWER RATING
JA Solar	JAMabc(xxx)d Where "a" can be 60, or 72; "b" can be D, or S; "c" can be 00, 30, or 09; "d" can be BP, MB, PR.
Jinko Solar	JKM (xxx) a-b Where "a" can be P, PP, or M; "b" can be 72, 72-J4, 72-V, 72H-V, 7RL3-TV, or 7RL3-TV-A3-US.
LG	LG(xxx)a-A5 - Where "a" can be N2W, N2T, or S2W
Longi	LRn-bc(xxx)d Where "n" can be 4,5, or 6; "b" can be 60 or 72; "c" can be HBD, HPB, HPH, HPM, HPB/HIB, HPH/HIH/ or BP; "d" can be M or Blank.
Panasonic	SC(xxx) B2
Seraphim	SRP-(xxx)BMA-BG
SEG	SEG-(xxx)BMA-BG
S-Energy	SD20/25-72BDE (xxx)
Silfab	SYY-Z-xxxAb Where "YY' can be IL, SA, LA, SG or LG; "Z" can be blank, M, P, or X; "A" can be blank, B, H, M, N; and "b" can be A, C, G, K, L, N, T, U, or X
Suniva	OPTxxx-AA-B-YYY-Z Where "AA' is either 60 or 72; "B' is either 4 or 5; "YYY" is either 100, 101, 700, 180, or 181, and "Z" is blank or B
Sunpower	E20-(320-327)-COM
Talesun	TP572 - (320-330) TPH6H72M-360, 365, 370, 375, 380
Trina Solar	TSM-PD14(xxx), TSM-PE14A(xxx), TSM-PE15H, TSM-ab(II)(xxx), TSM-DEGab.20(II)(xxx)
Vsun	VSUN(xxx)-ab-c Where "a" can be 60, 72, or 144; "b" can be M, or BMH; "c" can be BB, DG, or blank
Vikram Solar	VSMa.72(xxx).05 - Where "a" can be DT, or DHT
Znshine	ZXMa-bc(xxx)Where "a" can be 6, or 7; "b" can be LDD, NH, NHLDD, NHDB, SH, SHLDD, or SHDB; "c" can be 72-144.

4. Racking Overview

a) Concrete Ballasted

1. Back Leg
2. Front Leg
3. Brace
4. North-South Beam
5. East-West Bracket
6. East-West Beam
7. Mid Clamp
8. End Clamp
9. PV Module
10. Ballast or Basket Assembly
11. Base Plate (Gabion Basket Only)

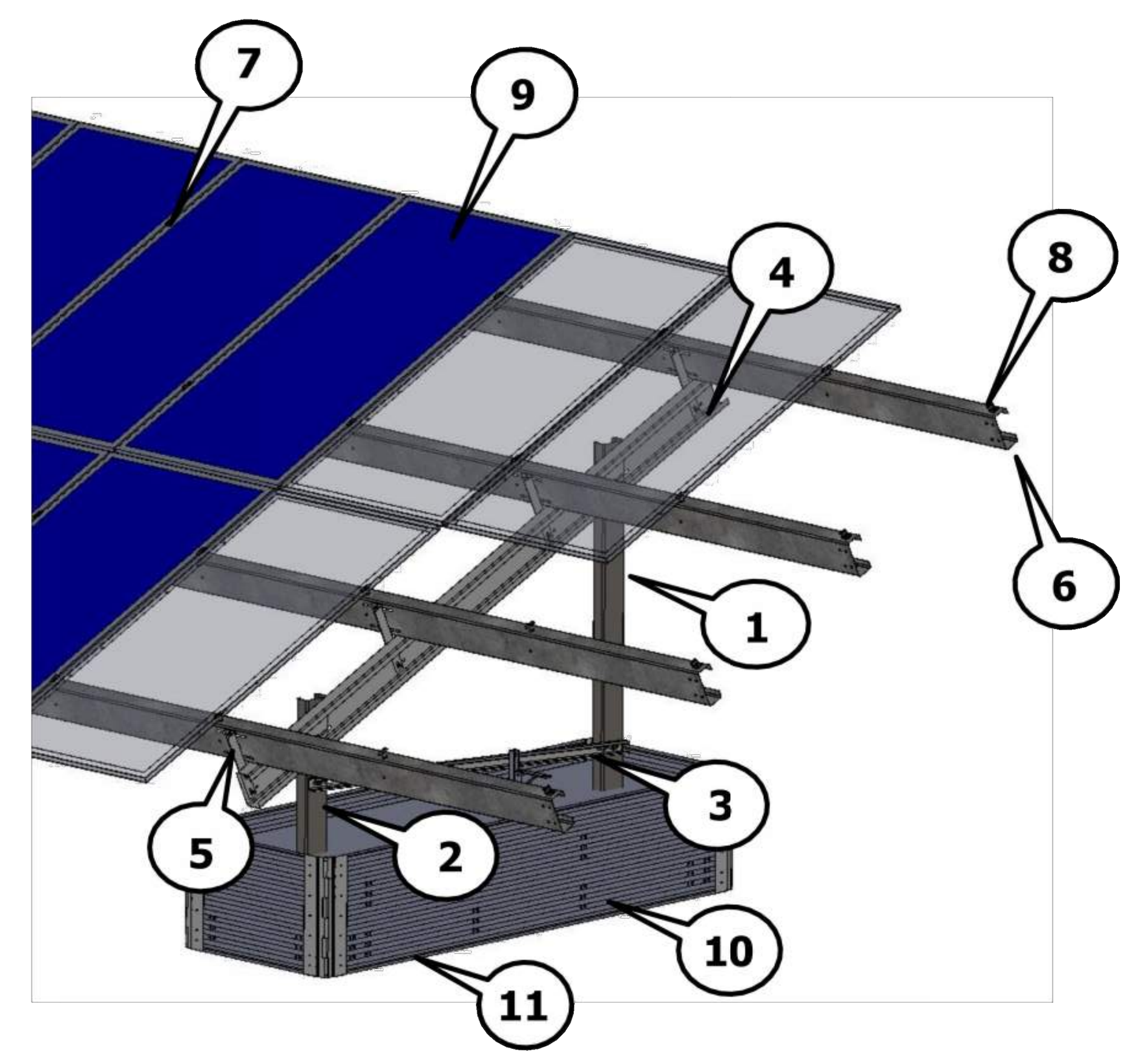


Figure 5: Ballasted Dual leg racking overview.

REV	ISSUED	BY	✔	DESCRIPTION
	11/14/23	GK	BB	UTILITY INTERCONNECTION SET
	11/21/23	GK	BB	CD IFR – ISSUED FOR REVIEW
	05/24/24	GK	PK	CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:
E-5.2
DATA SHEETS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"
SCALE
NTS
PROJECT NUMBER:
23-3688U

GRID-TIE SOLAR ELECTRIC SYSTEM
BADGER RD SOLAR
2605 BADGER RD
NORTH POLE, AK 99705

NOT FOR CONSTRUCTION

STAMP:

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