



CSI SERIES GRID-TIED PV Inverter
CSI-50KTL-GS-FL & CSI-50KTL-GS
CSI-60KTL-GS & CSI-66KTL-GS
INSTALLATION AND OPERATION MANUAL
VERSION 1.2

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- Product specifications are subject to change without notice. Every attempt has been made to make this document complete, accurate and up-to-date. Individuals reviewing this document and installers or service personnel are cautioned, however, that Canadian Solar reserves the right to make changes without notice and shall not be responsible for any damages, including indirect, incidental or consequential damages caused by reliance on the material presented including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the material provided in this document.
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- The customer is fully liable for any modifications made to the system; therefore, any hardware or software modification, manipulation, or alteration not expressly approved by the manufacturer shall result in the immediate cancellation of the warranty.
- Given the countless possible system configurations and installation environments, it is essential to verify adherence to the following:
 - There is sufficient space suitable for housing the equipment.
 - Airborne noise produced depending on the environment.
 - Potential flammability hazards.
- Canadian Solar will not be held liable for defects or malfunctions arising from:
 - Improper use of the equipment.
 - Deterioration resulting from transportation or particular environmental conditions.
 - Performing maintenance incorrectly or not at all.
 - Tampering or unsafe repairs.
 - Use or installation by unqualified persons.
- This product contains lethal voltages and should be installed by qualified electrical or service personnel having experience with lethal voltages.

1. Introduction	5
1.1 Product Description	5
1.2 Unpacking and storage	6
1.2.1 Storage	7
2. Safety instructions	8
2.1 Safety symbols	8
2.2 General safety instructions	8
2.3 Notice for use	9
2.4 Protection Circuitry and Controls	10
3. Installation	11
3.1 Environmental considerations	11
3.1.1 Select a location for the inverter	11
3.1.1.1 Examples of correct and incorrect installations	12
3.1.2 Other environmental considerations	12
3.1.2.1 Consult technical data	12
3.1.2.2 Vertical wall installation	12
3.1.2.3 Avoiding direct sunlight	12
3.1.2.4 Air circulation	12
3.1.2.5 Flammable substances	13
3.1.2.6 Living area	13
3.2 Product handling	13
3.3 Mounting the inverter	14
3.4 Wiring box configuration	17
3.5 DC connection	18
3.5.1 DC connection high voltage danger and overcharging notice	19
3.5.2 String sizing	19
3.5.3 Recommended fusing section for each channel or connection	19
3.5.3.1 Maximum allowable amperage per fuse and channel	20
3.5.4 Process of connecting DC wires to terminals	20
3.5.4.1 Using spring terminal	20
3.6 Making connections to the AC side of the inverter	21
3.6.1 Connecting the inverter to the utility grid	21
3.6.2 Wiring procedure	22

3.7 External ground connection point	23
4. Communication & Monitoring	24
4.1 RS485	25
4.1.1 Wiring a single inverter and daisy chain inverter	25
4.1.2 Maximum allowable inverters using RS485	25
4.1.3 120-ohm (Ω) resistor placement	25
5. Commissioning	26
5.1 Selecting the appropriate grid standard	26
5.1.1 Verifying grid standard for country of installation	26
5.2 Changing the grid standard	26
5.2.1 Procedure to set the grid standard	26
5.3 Setting a custom grid standard	27
5.4 Preliminary checks	28
5.4.1 DC Connections	28
5.4.2 AC Connections	28
5.4.3 DC configuration	28
5.4.3.1 VOC	28
5.4.3.1.1 Check string voltage	28
5.4.3.2 Leakage to ground	29
5.4.3.2.1 Detection of leakage to ground	29
5.4.4 AC configuration	30
5.4.4.1 Measure VAC	30
5.4.4.2 Phase rotation test	30
5.4.5 AC Secure inverter wiring box	30
5.4.6 Start inverter	30
6. Normal operation	31
6.1 Start-up procedure	31
6.2 Shutdown procedure	31
6.3 Main Menu	32
6.4 Sub-menu:Information	32
6.4.1 Lock screen	33
6.5 Sub-menu:Settings	34
6.5.1 Set time	34

6.5.2 Set Address	34
6.6 Sub-menu:Advanced Info – Technicians only	35
6.6.1 Alarm message	35
6.6.2 Running Message	36
6.6.3 Version	36
6.6.4 Daily Energy	36
6.6.5 Monthly Energy and Yearly Energy	36
6.6.6 Daily Record	37
6.6.7 Communication Data	37
6.6.8 Warning Message	37
6.7 Advanced settings – Technicians only	38
6.7.1 Select standard	38
6.7.2 Grid ON/OFF	39
6.7.3 Clear energy	39
6.7.4 Reset Password	40
6.7.5 Power Control	40
6.7.6 Calibrate Energy	40
6.7.7 Special settings	41
6.7.8 STD Mode Settings	41
6.7.9 Restore Settings	42
6.7.10 HMI Updater	42
6.7.11 Reset HMI	42
6.7.12 Debug Parameter	43
6.7.13 Fan Test	43
7. Maintenance	44
7.1 For inverter model with Fan	44
8. Troubleshooting	47
8.1 Current alarm	47
8.1.1 Running messages	47
8.2 Alarm history	47
8.2.1 Viewing alarm history	47
8.3 Error messages	47
8.3.1 Troubleshooting guide	47
9. Specifications	51
10. Appendices	54

1.1 Product Description

Canadian Solar Three Phase Inverters convert DC power from the photovoltaic (PV) array into alternating current (AC) power that can satisfy local loads as well as feed the power distribution grid.

This manual covers the four (4) Canadian Solar Three Phase Inverter models listed below:
CSI-50KTL-GS-FL CSI-50KTL-GS CSI-60KTL-GS CSI-66KTL-GS

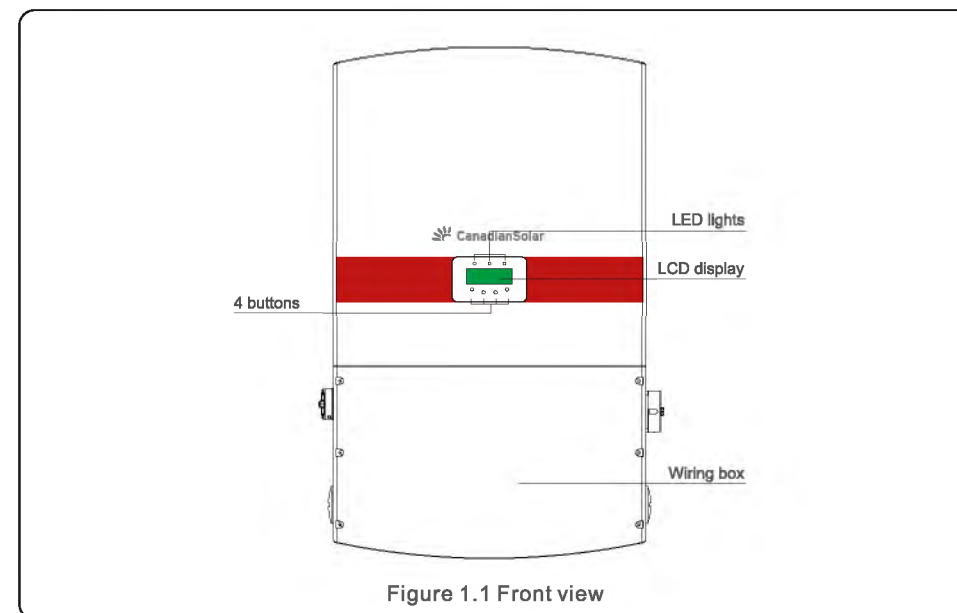


Figure 1.1 Front view

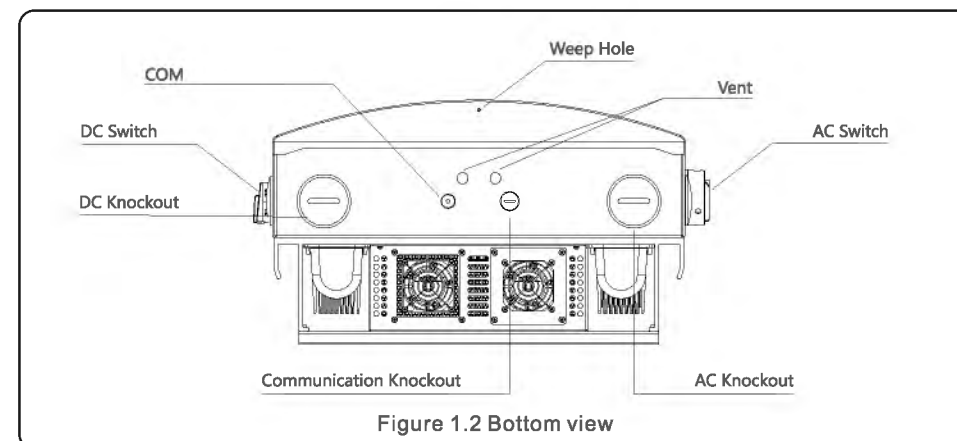
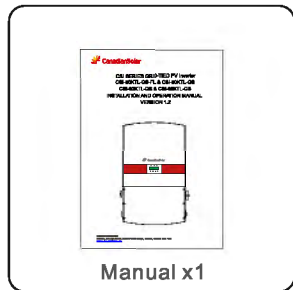
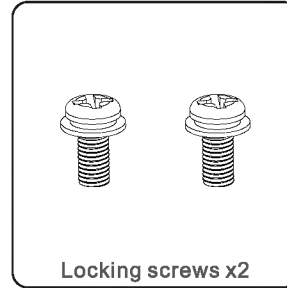
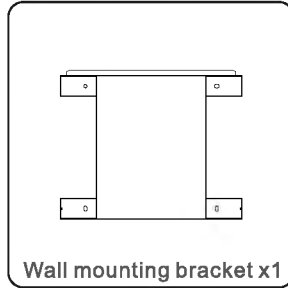
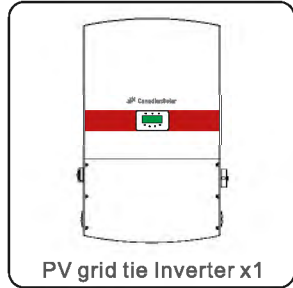


Figure 1.2 Bottom view

1.2 Unpacking and storage

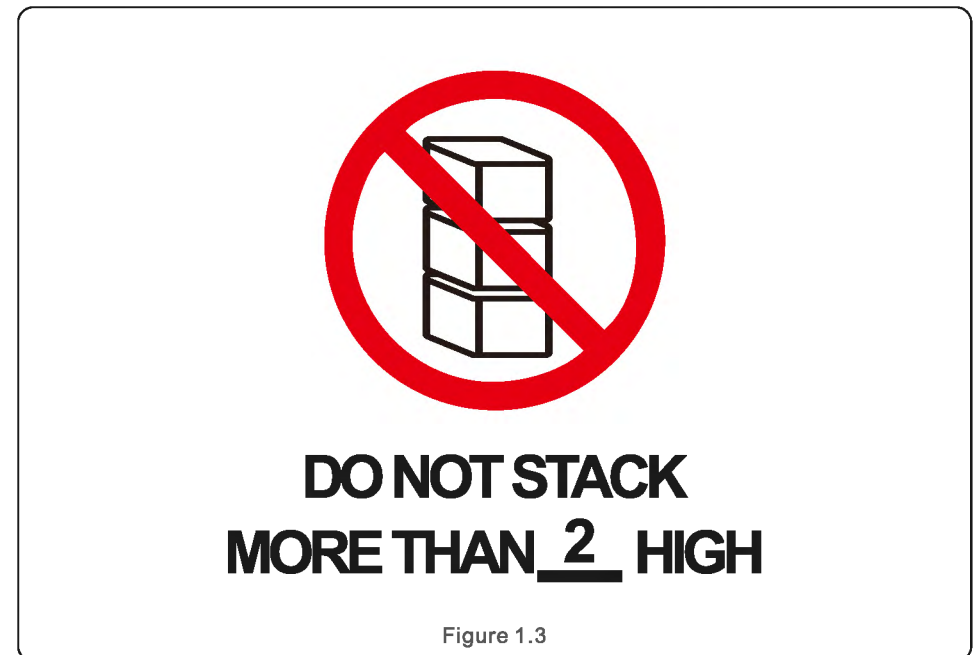
When unpacking the inverter, please verify all the parts listed below are included:



1.2.1 Storage

If the inverter is not installed immediately, storage instructions and environmental conditions are below:

- Use the original box to repackage the inverter, seal with adhesive tape with the desiccant inside the box.
- Store the inverter in a clean and dry place, free of dust and dirt.
- The storage temperature must be between -16 and 140 F (-26 - 60C) and humidity should be between 0 to 100%, non-condensing.
- Do not stack more than two (2) inverters high.
- Keep the box(es) away from corrosive materials to avoid damage to the inverter enclosure.
- Inspect the packaging regularly. If packing is damaged (wet, pest damages, etc.), repackage the inverter immediately.
- Store inverters on a flat, hard surface -- not inclined or upside down.
- After long-term storage, the inverter needs to be fully examined and tested by qualified service or electrical personnel before using.
- Restarting after a long period of non-use requires the equipment be inspected and, in some cases, the removal of oxidation and dust that has settled inside the equipment will be required.



Improper use may result in electric shock hazards or burns. This product manual contains important instructions that are required to be followed during installation and maintenance. Please read these instructions carefully before use and keep them in an easily locatable place for future reference.

2.1 Safety symbols

Safety symbols used in this manual, which highlight potential safety risks and important safety information, are listed below:



WARNING

Symbol indicates important safety instructions, which if not correctly followed, could result in serious injury or death.



NOTE

Symbol indicates important safety instructions, which if not correctly followed, could result in damage to or the destruction of the inverter.



CAUTION, RISK OF ELECTRIC SHOCK

Symbol indicates important safety instructions, which if not correctly followed, could result in electric shock.



CAUTION, HOT SURFACE

Symbol indicates safety instructions, which if not correctly followed, could result in burns.

2.2 General safety instructions



WARNING

Do not connect PV array positive (+) or negative (-) to ground – doing so could cause serious damage to the inverter.



WARNING

Electrical installations must be done in accordance with local and national electrical safety standards.



WARNING

To reduce the risk of fire, branch circuit over-current protective devices (OCPD) are required for circuits connected to the inverter.



CAUTION

The PV array (solar panels) supplies a DC voltage when exposed to light.



CAUTION

Risk of electric shock from energy stored in the inverter's capacitors. Do not remove cover until five (5) minutes after disconnecting all sources of supply have passed, and this can only be done by a service technician. The warranty may be voided if any unauthorized removal of cover occurs.



CAUTION

The inverter's surface temperature can reach up to 75°C (167°F). To avoid risk of burns, do not touch the surface when the inverter is operating. Inverter must be installed out of the reach of children.



WARNING

The inverter can only accept a PV array as a DC input. Using any other type of DC source could damage the inverter.

2.3 Notice for use

The inverter has been constructed according to applicable safety and technical guidelines.

Use the inverter in installations that meet the following requirements ONLY:

- 1). The inverter must be permanently installed.
- 2). The electrical installation must meet all the applicable regulations and standards.
- 3). The inverter must be installed according to the instructions stated in this manual.
- 4). The system design must meet inverter specifications.

To start-up the inverter, the Grid Supply Main Switch (AC) must be turned on, BEFORE the DC Switch is turned on. To stop the inverter, the Grid Supply Main Switch (AC) must be turned off before the DC Switch is turned off.

2.4 Protection Circuitry and Controls

To meet relevant codes and standards, the Canadian Solar three phase inverter line is equipped with protective circuitry and controls. These include Arc Fault Circuit Interrupter (AFCI) and Anti-Islanding Protection.

Arc Fault Circuit Interrupter AFCI:

Edition 2011 of the National Electrical Code®, Section 690.11, requires that all PV plants attached to a building are fitted with a means of detecting and interrupting serial electric arcs in the PV wiring and array. An electric arc with a power of 300W or greater must be interrupted by the AFCI in the time specified by UL 1699B. A triggered AFCI fault may only be reset manually. After clearing the source of the fault, the AFCI can be deactivated via the inverter front panel interface.

Anti-Islanding Protection:

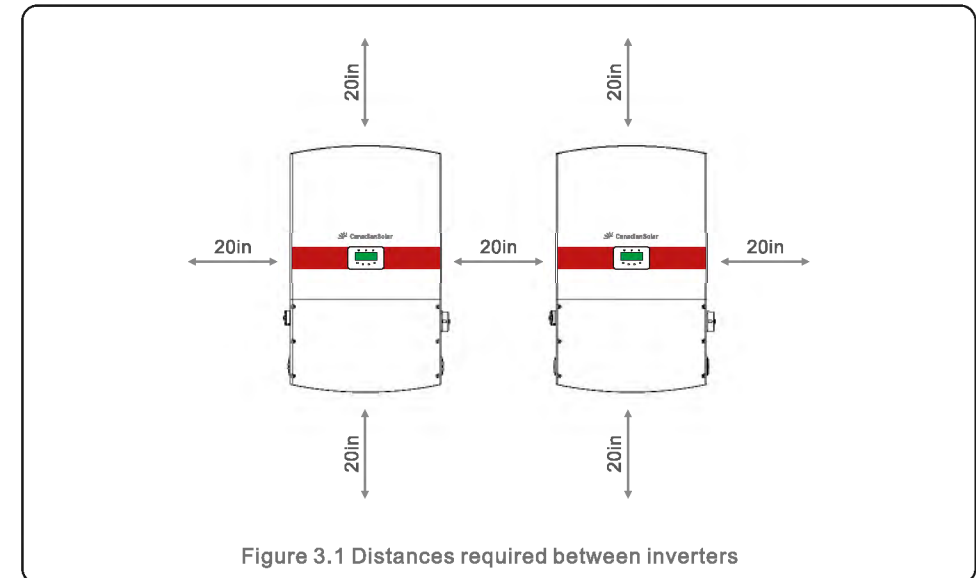
Islanding is a condition where the inverter continues to produce power even when the grid is not present. Circuitry, along with firmware, has been designed to determine if the grid is present by adjusting the output frequency of the inverter. In the case of a 60Hz resonant system where the inverter is partially isolated from the grid, the inverter programming can detect if there is a resonant condition or if the grid is actually present. It can also differentiate between inverters operating in parallel and the grid.

3.1 Environmental considerations

3.1.1 Select a location for the inverter

When selecting a location for the inverter, consider the following:

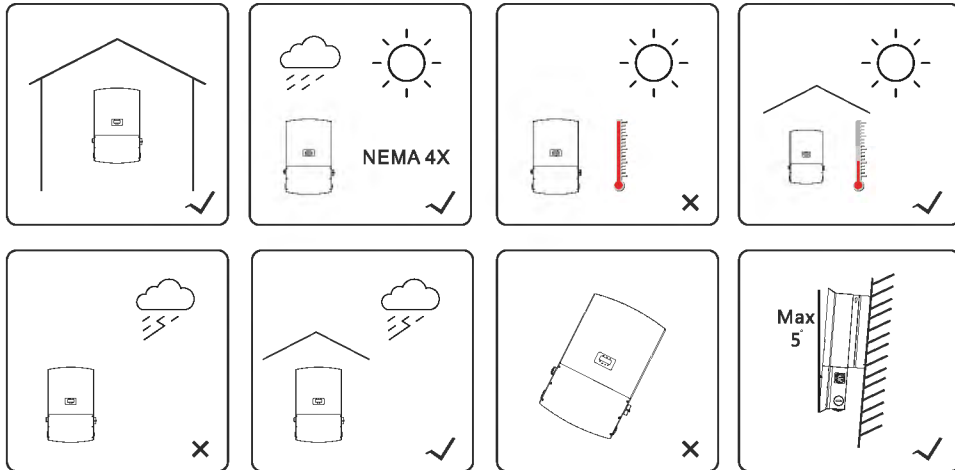
- The temperature of the inverter heat-sink can reach 167°F(75C).
- The inverter is designed to work in an ambient temperature range between -13°F to 140°F(-25 - 60C).
- If multiple inverters are installed on site, a minimum clearance of 20 inches should be kept between each inverter and all other mounted equipment. The bottom of the inverter should be at least 20 inches above of the ground or floor (see Figure 3.1).
- The LED status indicator lights and the LCD located on the inverter's front panel should not be blocked.
- Adequate ventilation must be present if the inverter is to be installed in a confined space.



NOTE

Nothing should be stored on or placed against the inverter.

3.1.1.1 Examples of correct and incorrect installations



NOTE
Units with a fan may be mounted at 15 – 90 degrees off horizontal.

3.1.2 Other environmental considerations

3.1.2.1 Consult technical data

Consult the specifications section (section 9) for additional environmental conditions (protection rating, temperature, humidity, altitude, etc.).

3.1.2.2 Vertical wall installation

Canadian solar inverters are typically convection cooled and must be mounted vertically (90 +/- 5 degrees off horizontal). Units with a fan may be mounted at 15 – 90 degrees off horizontal.

3.1.2.3 Avoiding direct sunlight

Installation of the inverter in a location exposed to direct sunlight should to be avoided.

Direct exposure to sunlight could cause:

- Power output limitation (with a resulting decreased energy production by the system).
- Premature wear of the electrical/electromechanical components.
- Premature wear of the mechanical components (gaskets) and user interface.

3.1.2.4 Air circulation

Do not install in small, closed rooms where air cannot freely circulate. To prevent overheating, always ensure that the air flow around the inverter is not blocked.

3.1.2.5 Flammable substances

Do not install near flammable substances. Maintain a minimum distance of three (3) meters (10 feet) from such substances.

3.1.2.6 Living area

Do not install in a living area where the prolonged presence of people or animals is expected. Depending on where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply, the sound level from the inverter can be quite high.

3.2 Product handling

Please review the instructions below for handling the inverter:

- 1). The red circles below denote cutouts on the product package. Push in the cutouts to form handles for moving the inverter (see Figure 3.2).

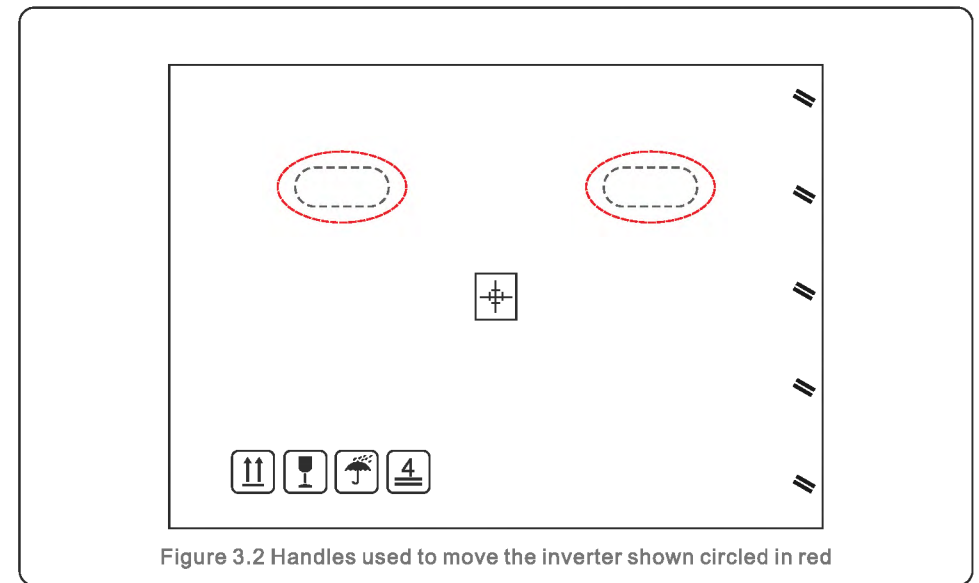


Figure 3.2 Handles used to move the inverter shown circled in red

- 2). Two people are required to remove the inverter from the shipping box. Use the handles integrated into the heat sink to remove the inverter from the box (see Figure 3.3).

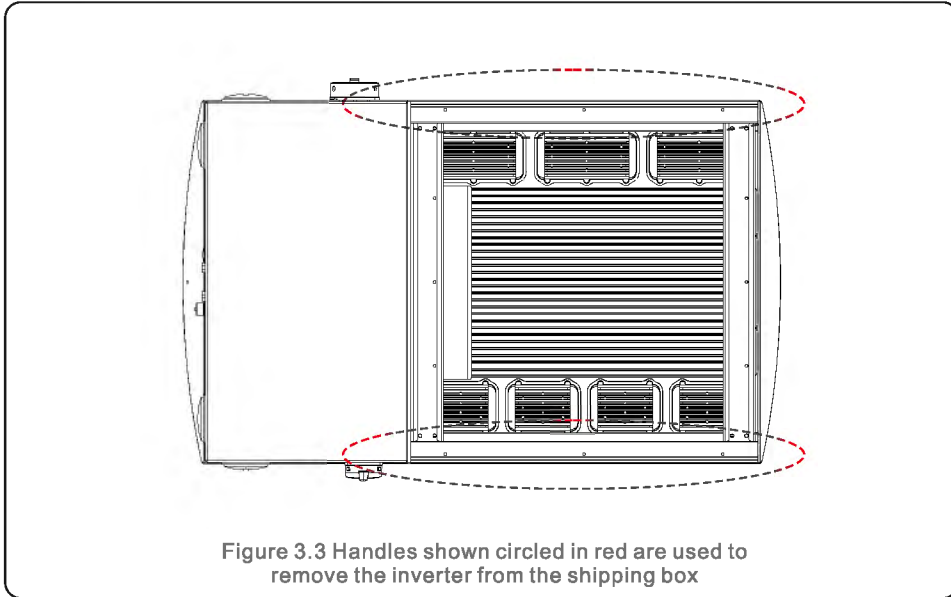


Figure 3.3 Handles shown circled in red are used to remove the inverter from the shipping box



WARNING

Due to the weight of the inverter, contusions or bone fractures could occur when incorrectly lifting and mounting the inverter. When mounting the inverter, take the weight of the inverter into consideration. Use a suitable lifting technique when mounting.

3.3 Mounting the inverter

The inverter can be mounted to a wall or metal array racking. The mounting holes should be consistent with the size of the bracket or the dimensions shown in Figure 3.4.

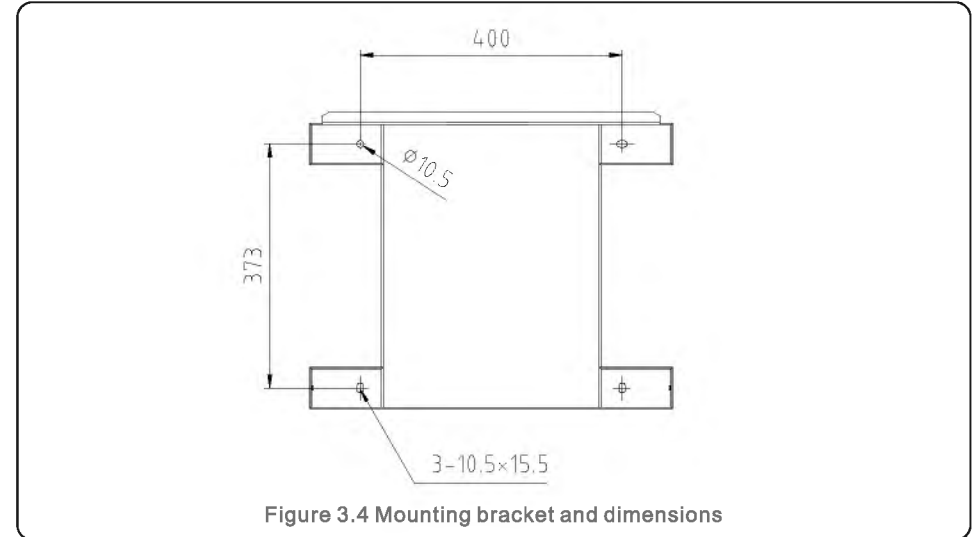


Figure 3.4 Mounting bracket and dimensions

The inverter must be mounted vertically ($\pm 5^\circ$) following the steps below:

Inverters with fans may be mounted at 15-90 degrees off horizontal.

- 1). Referring to Figure 3.4, select the mounting height of the bracket. For brick walls, the position of the holes should be suitable for expansion bolts.
- 2). Ensure the bracket is level and the mounting holes are in the correct positions depending on the mounting surface. Mark the surface through the bracket holes and drill the holes in the wall at the marks.
- 3). Use suitable fasteners and expansion bolts (if required) to attach the bracket to the wall.

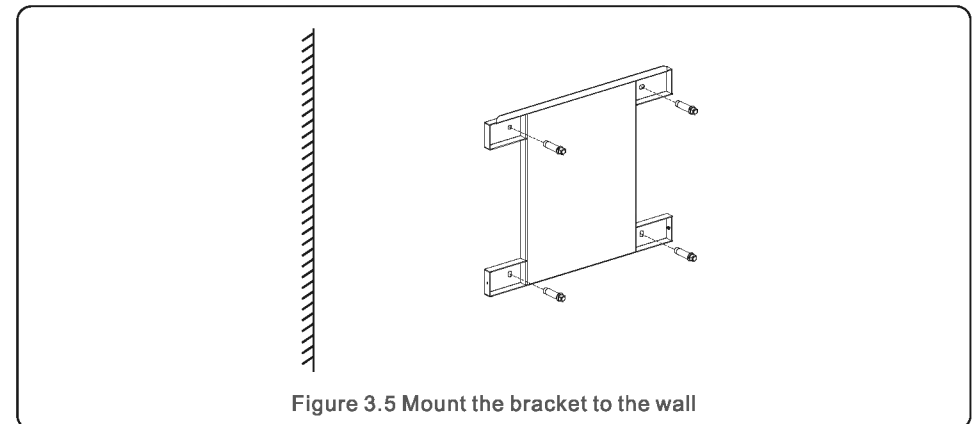


Figure 3.5 Mount the bracket to the wall



WARNING

The inverter must be mounted vertically on a wall. Ensure the bracket is level before mounting inverter. Inverter with fans may be mounted at 15-90 degrees off horizontal.

- 4). Lift the inverter and align the slot on the back of the inverter with the lip on the mounting bracket. Slowly lower the inverter onto the bracket until the inverter is secured on the bracket (see Figure 3.6).

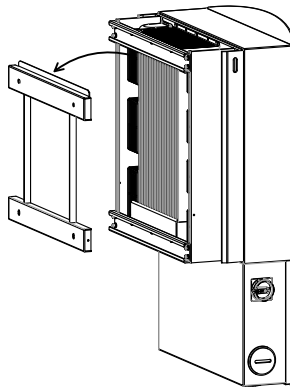


Figure 3.6 Lift and attach the inverter to the mounting bracket

- 5). Use two (2) M4 x 9mm screws (supplied) to secure the inverter to the mounting bracket. Torque to 20 in-lbs (2 N-m).

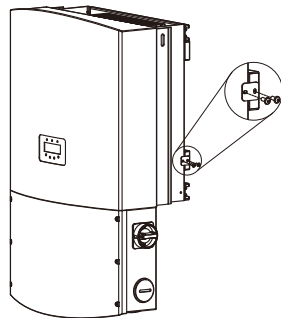


Figure 3.7 Secure the mounting bracket with screws

3.4 Wiring box configuration

The Canadian Solar U.S. Three Phase Inverter wiring box is designed for easy access to all connection terminals, including monitoring communication ports. The wire box features a spacious work area and pre-drilled 2 inch (ID) knockouts on the bottom and sides of the cabinet.

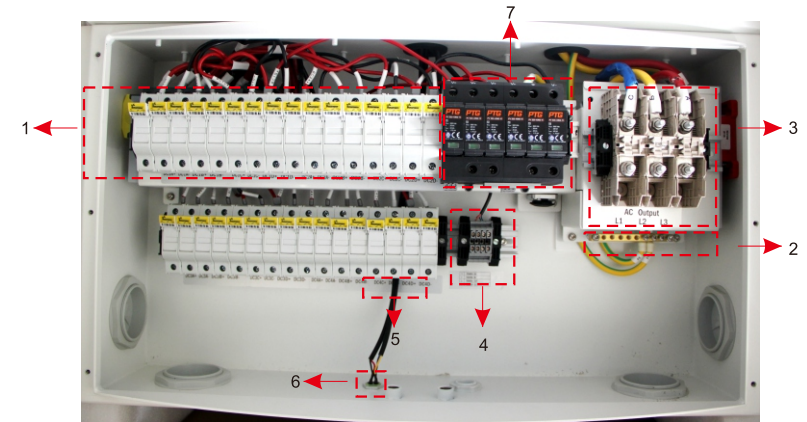


Figure 3.8 Inverter connection area of wiring box

# from Figure 14 above	Parts	Connection	Cable size	Torque
1	DC terminal	PV strings	12-6 AWG	30 in-lbs
2	Ground terminal	DC and AC ground	12-4 AWG	26 in-lbs
3	Grid terminal	Grid	8-2 AWG	26 in-lbs
4	RS-485 terminal	Communication cable	22-12 AWG	3.5-5.3 in-lbs
5	RJ45 terminal	Communication cable	Network cable	NA
6	COM terminal	Wi-Fi/GPRS stick	NA	NA
7	DC surge protection device	NA	NA	NA

Table3.1 Connections list

3.5 DC connection



WARNING

Before connecting the inverter, make sure the PV array open circuit voltage is within the limit of the inverter. Otherwise, the inverter could be damaged.

Maximum 1000Vdc for CSI-50KTL-GS-FL, CSI-50KTL-GS, CSI-60KTL-GS, CSI-66KTL-GS



WARNING

DO NOT connect the PV array positive or PV array negative cable to ground. This can cause serious damage to the inverter!



WARNING

MAKE SURE the polarity of the PV array output conductors matches the DC- and DC+ terminal labels before connecting these conductors to the terminals inside the inverter wiring box.

Please see table 3.1 for acceptable wire sizes and screw torque values for the AC and DC connections. Wire must be copper only.

Both the DC and AC ground wires can be connected to the grounding terminal block (see Figure 3.9).



Figure 3.9 Grounding terminal block on the metal bracket

Requirements for the PV modules per MPPT input:

- All PV modules must be of the same type and power rating.
- All PV modules must be aligned and tilted identically.
- The open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter, even at the coldest expected temperature. (see Section 9 “Specifications” for input current and voltage requirements)
- Each string connected to a single MPPT must consist of the same number of series-connected PV modules.

3.5.1 DC connection high voltage danger notice



CAUTION

RISK OF ELECTRIC SHOCK

Do not touch an energized DC conductor. There are high voltages present when PV modules are exposed to light causing a risk of death due to an electric shock from touching a DC conductor!

Only connect the DC cables from the PV module to the inverter as described in this manual.



CAUTION

POTENTIAL DAMAGE TO THE INVERTER DUE TO OVERVOLTAGE

The DC input voltage of the PV modules must not exceed the maximum rating of the inverter. (see Section 9 “Specifications”)

Check the polarity and the open-circuit voltage of the PV strings before connecting the DC cables to the inverter.

Confirm proper string length and voltage range before connecting DC cable to the inverter.

3.5.2 String sizing

For PV array sizing please refer Section 9 “Specifications” and utilize industry standard string sizing techniques as specified by your local code.

3.5.3 Recommended fusing section for each channel or connection

Canadian Solar 3 phase inverters include an integrated wiring box which performs the combining of DC strings. The fuses and fuseholders in the wiring box are not rated to carry the current of multiple strings, so field combiner boxes should not be used with Canadian Solar 3 phase inverters. Each DC string should be directly connected to the inverter. The sizing of the string fuses must take into account the two following conditions:

- 1). The nominal current rating of the selected fuse must not exceed the maximum fuse rating of the PV panels. Please refer to the applicable specifications for this value.
- 2). The fuse rating is determined based on the PV panel string current and on the sizing guidelines provided by the panel manufacturer or the local electrical code. In addition, the maximum fuse rating must not exceed the maximum input current of the inverter.

3.5.3.2 Maximum allowable amperage per fuse and channel

Figure 3.10 Shows sixteen (16) channels for connecting DC strings. Each channel is protected by a fuse. The included fuses are rated at 15A. Changing fuse size could damage the fuse or leave the module improperly protected. Do not change the fuse size.

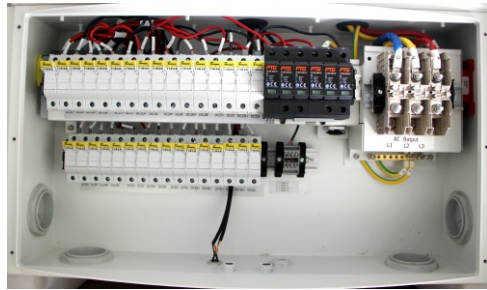


Figure 3.10 Sixteen (16) channels in 2 sections



WARNING

If the amperage per connection is exceeded, the inverter could be damaged. Ensure all wire sizing procedures are completed per local codes and regulations. Ensure the AC grid and DC PV array connections have enough separation to prevent contact with each other.

3.5.4 Process of connecting DC wires to terminals

3.5.4.1 Using fuse terminal

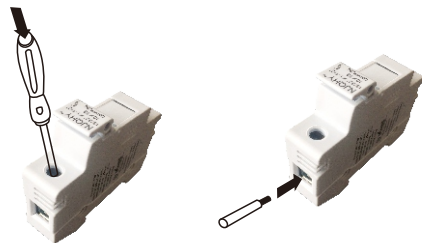


Figure 3.11 Fuse terminal

Loosen the screw to open wire cage. Strip cable insulation about 1/2 inch.
 Check for proper string voltage and polarity.
 Insert the wire and tighten screw to secure wire. Torque to 1.5-1.7Nm.

3.6 Making connections to the AC side of the inverter



WARNING

An automatic over-current device must be used between the inverter and the grid.

- 1). Connect three (3) AC conductors to the three (3) AC terminals marked "L1", "L2" and "L3". Refer to local code and voltage drop tables to determine the appropriate wire size and type.
- 2). Connect the grounding conductor to the terminal marked "PE" (protective earth, the ground terminal).

Over-Current Protection Device (OCPD) for the AC side

To protect the inverter's AC connection line, we recommend installing a device for protection against over-current and leakage, with the following characteristics noted in Table 3.2:



NOTE

Use AL-CU transfer (bi-metallic) terminal if using aluminum cable.

Inverter	Rated voltage(V)	Rated output power (kW)	Current rating for protection device (A)
CSI-50KTL-GS-FL	480V	50	80
CSI-50KTL-GS	480V	50	80
CSI-60KTL-GS	480V	60	90
CSI-66KTL-GS	480V	66	100

Table3.2 Over-current protection device characteristics for Canadian solar inverters

3.6.1 Connecting the inverter to the utility grid

All electrical installations must be carried out in accordance with the local standards and the National Electrical Code® ANSI/NFPA 70 or the Canadian Electrical Code® CSA C22.1. The AC and DC electric circuits are isolated from the enclosure. If required by section 250 of the National Electrical Code®, ANSI/NFPA 70, the installer is responsible for grounding the system.

The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in Section 9 "Specifications".

3.6.2 Wiring procedure



CAUTION

RISK OF ELECTRIC SHOCK. Prior to starting the wiring procedure, ensure that the three-pole circuit breaker is switched off and cannot be reconnected.



NOTE

Damage or destruction of the inverter's electronic components due to moisture and dust intrusion will occur if the enclosure opening is enlarged.



CAUTION

Risk of fire if two conductors are connected to one terminal. If a connection of two conductors to a terminal is made, a fire can occur. NEVER CONNECT MORE THAN ONE CONDUCTOR PER TERMINAL.



NOTE

Use M6 crimp terminals to connect to the inverter AC terminals.

The steps to assemble the AC grid terminals are listed as follows:

A) If using multi conductor cables, strip the end of AC cable outer insulating jacket about 3 inches. Strip the end of each wire . (as shown in figure 3.12)

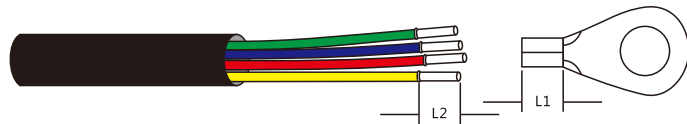


Figure 3.12 Strip AC cable



NOTE

L2 (insulation stripping length) is 1/8 inch longer than L1 (OT cable terminal crimping area)

B) Strip the insulation of the wire past the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp the terminal. The crimped portion of the terminal must be insulated with heat shrinkable tube or insulating tape.

Connect the cable to grid terminal as below:

- 1). Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
- 2). Attach the conduit to the fitting in the enclosure opening.
- 3). Insert the AC cable through the conduit into the inverter.

- 4). Remove the nuts on the AC terminal block.
- 5). Use a maximum torque 3Nm to fasten the nuts.
- 6). Connect the equipment grounding conductor to the ground bar.
- 7). Depending on the grid configuration, connect the optional neutral.
- 8). Connect the conductors with crimp terminals to the AC terminals labeled L1, L2 and L3.
A neutral is not required for inverter operation.(see Figure 3.13).

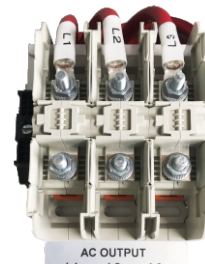


Figure 3.13

3.7 External ground connection point

An OPTIONAL external ground connection (PE) is provided on the right side of the inverter. To use the OPTIONAL external ground connection (see Figure 3.14):

- 1). Prepare the grounding conductor. Crimp a ring or fork (M4 size) terminal onto the grounding conductor.
- 2). Connect the grounding conductor (with crimped terminal) to the external ground connection point on the right side of the inverter. Use a maximum torque of 20 in-lbs (2N-m).

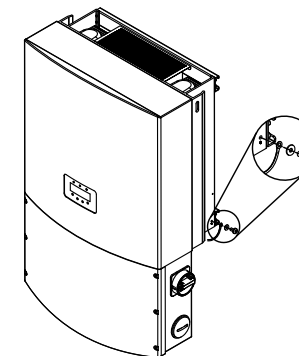


Figure 3.14 Connect the external grounding conductor

Overview

There are three (3) sets of terminals used for RS485 communication.
 Terminal 4 (Figure 3.10) has screw terminals for a multiple inverter communication solution using a standard MODBUS cable such as Belden stranded cable.
 Terminal 5 is a standard RJ45 terminal and is used for creating a daisy chain connection between inverters as well as the wired data monitoring.
 Terminal 6 is a 4-pin connector which is matched with Canadian Solar communication cables.

Monitoring system for multiple inverters

Multiples of inverters can be monitored in series using RS485 (as shown in Figure 4.1). All 3 connectors support this type of inverter connection.

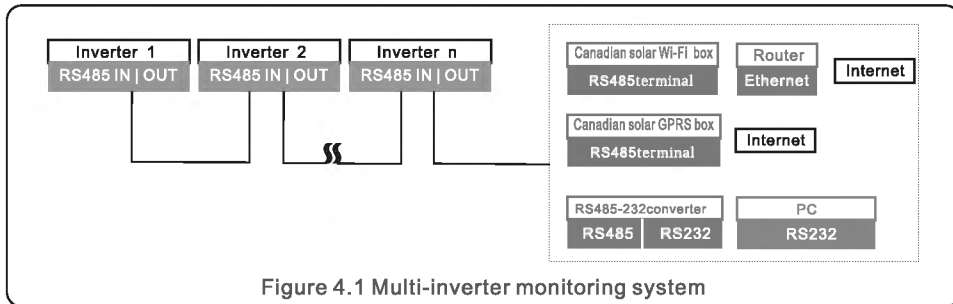


Figure 4.1 Multi-inverter monitoring system

RS485 communication connection of RJ45 network port

When using terminal 5 (RJ45 connector) to connect, use the following wiring sequence.
 Connect the Ethernet cable according to the TIA/EIA 568B standard. Insert the wire into the RJ45 plug and then use a standard network cable crimping tool to crimp connector to the cable.

4.1 RS485

4.1.1 Wiring a single inverter and daisy chain inverters

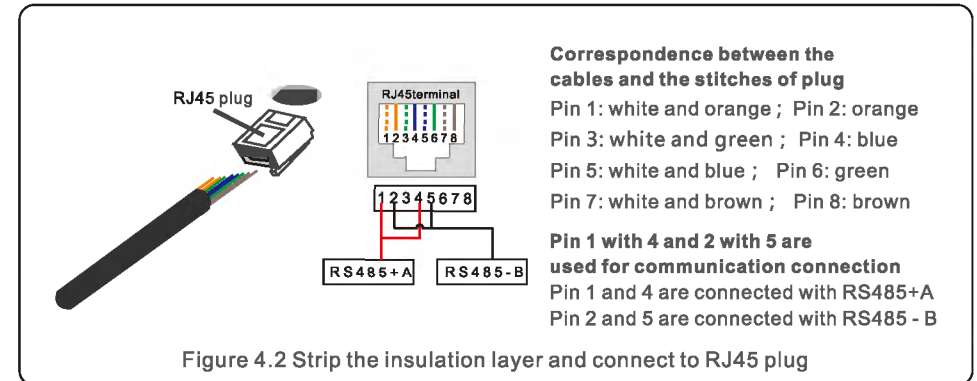


Figure 4.2 Strip the insulation layer and connect to RJ45 plug

4.1.2 Maximum allowable inverters using RS485

The maximum allowable inverters per RS 485 daisy chain is 32 pcs. Please contact monitoring supplier for details.

4.1.3 120-ohm (Ω) resistor placement

120 Ω resistor placement for end of line communication

Please contact monitor supplier for details.

5.1 Selecting the appropriate grid standard

5.1.1 Verifying grid standard for country of installation

Canadian Solar inverters are used worldwide and feature preset standards for operating on any grid. Although the grid standard is set at the factory, it is essential the grid standard be verified for the country of installation before commissioning.

The menu for changing the grid standard or for creating a custom standard is accessible as described in Section 6.7 and below.



WARNING

Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter not operating at all.

5.2 Changing the grid standard

5.2.1 Procedure to set the grid standard



NOTE

This operation is for service technicians only. The inverter is customized according to the local grid standard before shipping. There should be no requirement to set the standard.



NOTE

The "User-Def" function can only be used by the service engineer. Changing the protection level must be approved by the local utility.

- 1). From the main screen on the display, select ENTER. There are 4 sub-menu options, use the UP/DOWN arrows to highlight ADVANCED SETTINGS. Press enter to select.

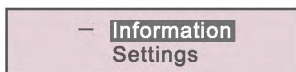


Figure 5.1

- 2). The screen will show that a password is required. The default password is "0010", press the DOWN key to move cursor, press the UP key to change the highlighted digit.

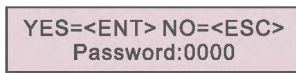


Figure 5.2

- 3). Use the UP/DOWN keys to highlight the SELECT STANDARD option. Press enter to select.

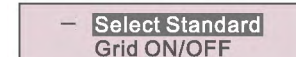


Figure 5.3

- 4). Select the grid standard for the country of installation.



Figure 5.4

Press the UP or DOWN key to select the standard (AS4777, VDE4105, UL-1741, G59/3, CQC, User-Def function, etc.). Press the ENTER key to confirm the setting. Press the ESC key to cancel changes and return to the previous menu.

UL-480 is default setting for the U.S. and Canada markets. UL-480-A is the standard for inverters with AFCI function.

5.3 Setting a custom grid standard



WARNING

- Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter not operating at all.
- Only certified personnel should set the grid standard.
- Only set the grid configuration that is approved by your location and national grid standards.

- 1). Please refer to section 6.7 "Advanced Settings" for procedures to create a custom grid configuration for User-Def menu option.

5.4 Preliminary checks



WARNING

High Voltage.
AC and DC measurements should be made only by qualified personnel.

5.4.1 DC Connections

Verify DC connections.

- 1). Lightly tug on each DC cable to ensure it is fully captured in the terminal.
- 2). Visually check for any stray strands that may not be inserted in the terminal.
- 3). Check to ensure the terminal screws are the correct torque.

5.4.2 AC Connections

Verify AC connections.

- 1). Lightly tug on each AC cable to ensure it is fully captured in the terminal.
- 2). Visually check for any stray strands that may not be inserted in the terminal.
- 3). Check to ensure the terminal screws are the correct torque.

5.4.3 DC configuration

Verify DC configuration.

5.4.3.1 VOC and Polarity

Measure VOC, and check string polarity.

5.4.3.1.1 Check string voltage

To measure the open circuit voltage (VOC) and polarity of the individual strings, perform the following steps:



WARNING

When the fuse holders are closed, parallel strings on the same MPPT are connected together. If there is a voltage difference between the parallel strings such as different string lengths, current will flow between the parallel strings. Opening and closing the fuse holder in this instance is the same as opening and closing under load. Damage to equipment and /or injury to personnel may occur.

- 1). Ensure that all fuse holders are open.
- 2). Connect the positive lead of the meter to the positive string cable of the string under test. Connect the negative lead of the meter to the negative string cable of the string under test.

- 3). Measure the voltage present between the positive and negative wires of each string. If the open circuit voltage of the string is near the maximum value accepted by the inverter, verify the string length. Low ambient temperatures cause an increase in the string voltage causing potential damage to the inverter.
- 4). Check the polarity of the string. All digital meters have a negative ("-") indicator that indicates when a voltage is negative; in this case a string connected in reverse polarity.



WARNING

Input voltages higher than the maximum value accepted by the inverter (see "Specifications" in Section 9) may damage the inverter. Although Canadian Solar inverters feature reverse polarity protection, prolonged connection in reverse polarity may damage these protection circuits and/or the inverter.

5.4.3.2 Leakage to ground

Measure leakage to ground.

5.4.3.2.1 Detection of leakage to ground

Canadian Solar inverters are transformer-less and do not have an array connection to ground. Any measurement of a fixed voltage between ground and either the positive or negative string wiring indicates a leakage (ground fault) to ground and must be corrected prior to energizing the inverter or damage to the inverter may result.

To measure leakage to ground, perform the following steps:

- 1). Ensure that all fuse holders are open.
- 2). Ensure that neither negative nor positive DC conductors are connected to the ground strip.
- 3). Measure each string positive connection to ground.
- 4). Measure each string negative connection to ground.
- 5). Verify the voltage is "floating", not a consistent voltage to ground. Make sure you notice the units of the measurement. mV is not the same as V.
- 6). Do not close the fuse holder and connect the strings if a leakage to ground has been detected. Improper operation and damage to the inverter may result.

Once all DC tests have been completed, close the fuse holders.

5.4.4 AC configuration

Verify AC configuration.

5.4.4.1 Measure VAC and frequency

Measure VAC and verify voltage is within local grid standards.

- 1). Measure each phase to ground (L-G).
- 2). Measure phases to the other phases in pairs (L-L). PHA to PH B, PH B to PH C and PH C to PH A.
- 3). If the meter is equipped, measure the frequency of each phase to ground.
- 4). Ensure each measurement is within local grid standards and the inverter specifications as noted in Section 9 "Specifications".

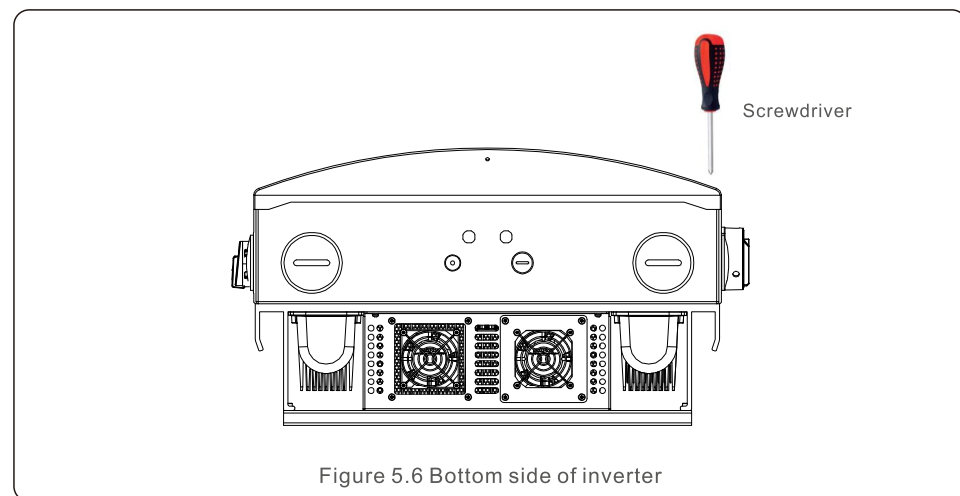
5.4.4.2 Phase rotation test

A phase rotation test is recommended to ensure the phases have been connected in the appropriate order. Canadian Solar inverters do not require a specific phase rotation connection. However, the local utility may require a specific phase rotation or a record of the phase configuration of the installation.

5.4.5 AC Secure inverter wiring box

Close the Canadian Solar inverter wiring box inverter.

Place the wiring box cover on the wiring box ensuring it is oriented correctly and start the screws. Apply pressure to the cover and tighten the screws in a cross pattern. Tighten screws to the appropriate torque setting.



6.1 Start-up procedure

To start-up the inverter, it is mandatory that the steps below are followed in the exact order outlined.

- 1). Ensure the commissioning checks in Section 5 have been performed.
- 2). Switch the AC switch ON.
- 3). Switch the DC switch ON. If the PV array (DC) voltage is higher than the inverter's start-up voltage, the inverter will turn on. The red DC POWER LED and LCD will be continuously lit.
- 4). Canadian Solar inverters are powered from the DC side. When the inverter detects DC power that is within start-up and operating ranges, the inverter will turn on. After turn-on, the inverter will check internal parameters, sense and monitor AC voltage, hertz rate and the stability of the supply grid. During this period, the green OPERATION LED will flash and the LCD screen will show INITIALIZING. This tells the operator that the inverter is preparing to generate AC power.
- 5). After the locally mandated delay (300 seconds for IEEE-1547 compliant inverters), the inverter will start generating AC power. The green OPERATION LED will light continuously and the LCD screen will show GENERATING.

CAUTION

The inverter's surface temperature can reach up to 75°C (167°F). To avoid risk of burns, do not touch the surface when the inverter is in the operational mode. Additionally, the inverter must be installed out of the reach of children.

6.2 Shutdown procedure

To stop the inverter, it is mandatory that the steps below are followed in the exact order outlined.

- 1). Switch AC switch OFF.
- 2). Wait approximately 30 seconds (during this time, the AC side capacitors are dissipating energy). If the inverter has DC voltage above the start-up threshold, the red POWER LED will be lit. Switch the DC switch OFF.
- 3). Confirm all LED's switch OFF (~one (1) minute).

CAUTION

Although the inverter DC disconnect switch is in the OFF position and all the LED's are OFF, operators must wait five (5) minutes after the DC power source has been disconnected before opening the inverter cabinet. DC side capacitors can take up to five (5) minutes to dissipate all stored energy.

During normal operation, the LCD shows the current status of the inverter. The LCD will display current power generation, total generation, current AC power in watts and other data in rotation (See Table 6.1). Press the button labeled ESC to switch from the "home dashboard" (i.e., the initial interface for owners and operators) to other screens showing details of daily and monthly generation. Press the ENTER button to switch to the Main Menu. Pressing the ESC button will always return to the previous screen. See Figure 6.1 for an operational flow overview.

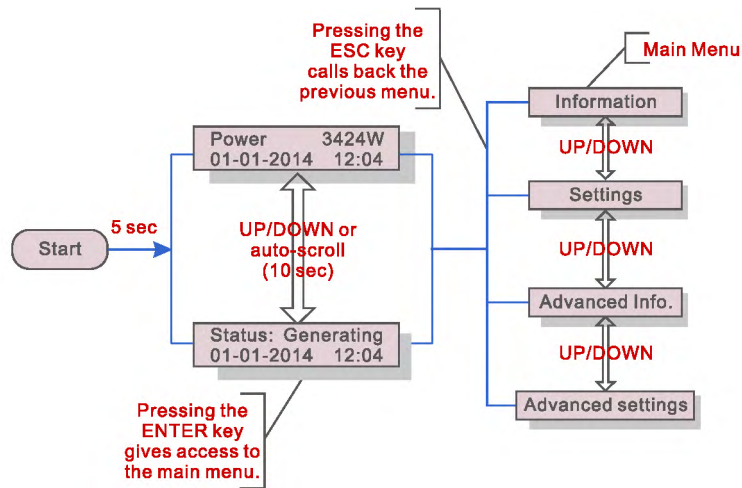


Figure 6.1 Operation Overview

6.3 Main Menu

There are four sub-menu options in the Main Menu (see Figure 6.1):

1. **Information.**
2. **Settings.**
3. **Advanced Info.**
4. **Advanced Settings.**

6.4 Sub-menu: Information

The Canadian Solar inverter main menu provides access to operational data and information. The information is displayed by selecting "Information" from the menu and then by scrolling up or down.

Display	Duration	Description
V_DC1 350.8V I_DC1 5.1A	10 sec	V_DC1: Shows input 01 voltage value. I_DC1: Shows input 01 current value.
V_DC4 350.8V I_DC4 5.1A	10 sec	V_DC4: Shows input 02 voltage value. I_DC4: Shows input 02 current value.
V_GridA 230.4V I_GridA 8.1A	10 sec	V_GridA: Shows the grid's voltage value. I_GridA: Shows the grid's current value.
V_GridD 230.4V I_GridD 8.1A	10 sec	V_GridD: Shows the grid's voltage value. I_GridD: Shows the grid's current value.
Status: Generating Power: 1488W	10 sec	Status: Shows instant status of the Inverter. Power: Shows instant output power value.
Grid Frequency F_Grid 50.06Hz	10 sec	F_Grid: Shows the grid's frequency value.
Total Energy 0258458 kwh	10 sec	Total generated energy value.
This Month: 0123kwh Last Month: 0123kwh	10 sec	This Month: Total energy generated this month. Last Month: Total energy generated last month.
Today: 15.1kwh Yesterday: 13.5kwh	10 sec	Today: Total energy generated today. Yesterday: Total energy generated yesterday.
Inverter SN 0000000000000	10 sec	Display series number of the inverter.

Table 6.1 Information list

6.4.1 Lock screen

Pressing the ESC key returns to the Main Menu. Pressing the ENTER key locks (Figure 6.2(a)) or unlocks (Figure 6.2 (b)) the screen.



Figure 6.2 Locks and Unlocks the Screen of LCD

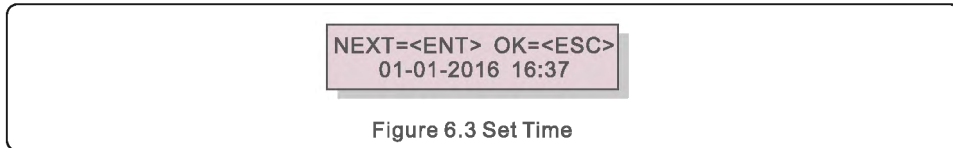
6.5 Sub-menu: Settings

The following sub-menus are displayed when the Settings menu is selected:

1. Set Time.
2. Set Address.

6.5.1 Set Time

This function allows time and date setting. When this function is selected, the LCD will display a screen as shown in Figure 6.3.



Press the UP/DOWN keys to set time and date. Press the ENTER key to move from one digit to the next (from left to right). Press the ESC key to save the settings and return to the previous menu.

6.5.2 Set Address

This function is used to set the address when multiple inverters are connected to single monitor. The address number can be assigned from "01" to "99" (see Figure 6.4). The default address is "01".



Press the UP/DOWN keys to set the address. Press the ENTER key to save the settings. Press the ESC key to cancel the change and return to the previous menu.

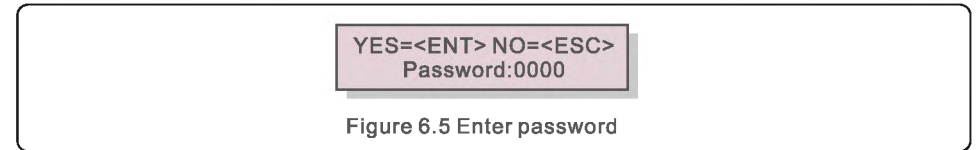
6.6 Sub-menu: Advanced Info - Technicians Only



NOTE:

Access to this area is for fully qualified and accredited technicians only. A password is required to access "Advanced Info" and "Advanced Settings"

Select "Advanced Info." from the Main Menu. The screen will require a password as below.



The default password is "0010". Press "down" to move the cursor to the next digit, press "up" to change the digit.

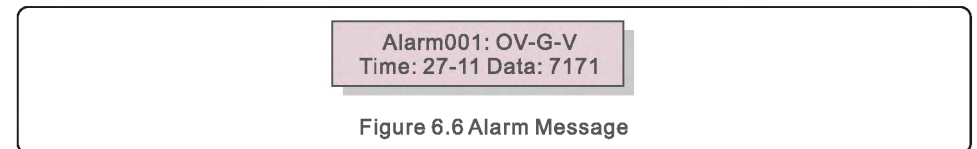
After entering the correct password, the LCD will display the following options:

1. Alarm Message
2. Running message
3. Version
4. Daily Energy
5. Monthly Energy
6. Yearly Energy
7. Daily Record
8. DSP Communication Data
9. Warning Message

The screen can be scrolled manually by pressing the UP/DOWN keys. Pressing the ENTER key gives access to a sub-menu. Press the ESC key to return to the Main Menu.

6.6.1 Alarm Message

The display shows the 100 latest alarm messages (see Figure 6.6). Screens can be scrolled manually by pressing the UP/ DOWN keys. Press the ESC key to return to the previous menu.



6.6.2 Running Message

This function is for maintenance personnel to get operational data such as internal temperature, Standard NO. etc.

Screens can be scrolled manually by pressing the UP/DOWN keys.

6.6.3 Version

The screen shows the model version and the software version of the Inverter (see Figure 6.7).

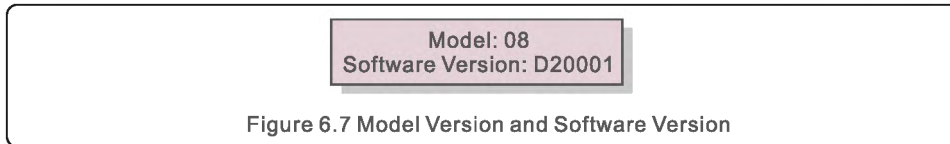


Figure 6.7 Model Version and Software Version

6.6.4 Daily Energy

This option is for viewing the energy generation for a specific day.

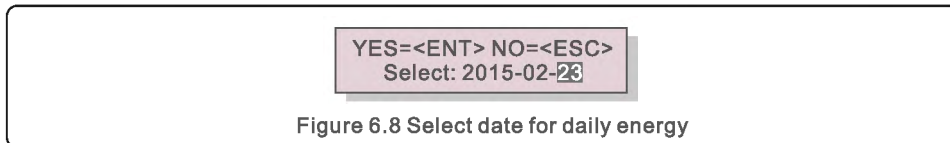


Figure 6.8 Select date for daily energy

Press DOWN key to move the cursor to day, month or year, press UP key to change the digit.

Press Enter after the date is selected to display energy for that date.

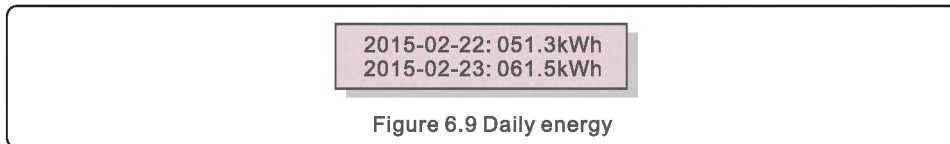


Figure 6.9 Daily energy

Press UP/DOWN key to move one date from another.

6.6.5 Monthly Energy and Yearly Energy

These two options are for viewing the energy generation for selected month or year.

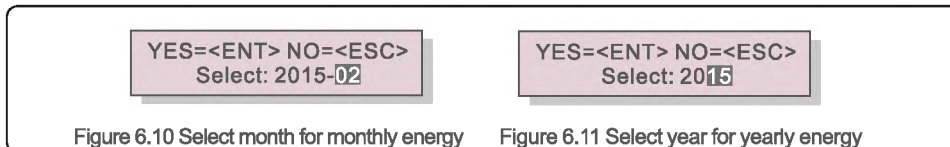


Figure 6.10 Select month for monthly energy

Figure 6.11 Select year for yearly energy

Press DOWN key to move the cursor, press UP key to change the digit.

Press Enter after the month/year is selected.

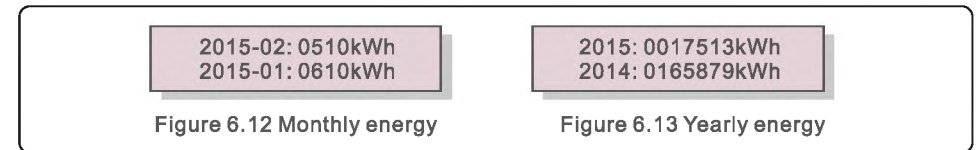


Figure 6.12 Monthly energy

Figure 6.13 Yearly energy

Press UP/DOWN key to move from one date from another.

6.6.6 Daily Record

The screen shows history of setting changes. It is only for maintenance personnel.

6.6.7 Communication Data

The screen shows the internal data of the Inverter (see Figure 7.14), which is for service technicians only.

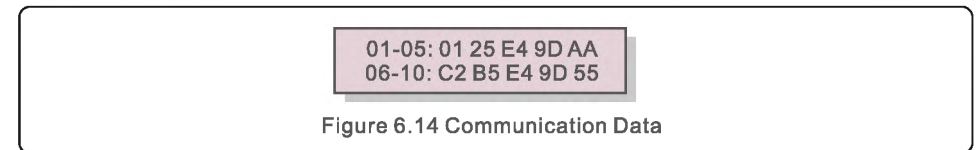


Figure 6.14 Communication Data

6.6.8 Warning Message

The screen shows the internal data of the Inverter (see Figure 7.15), which is for service technicians only.

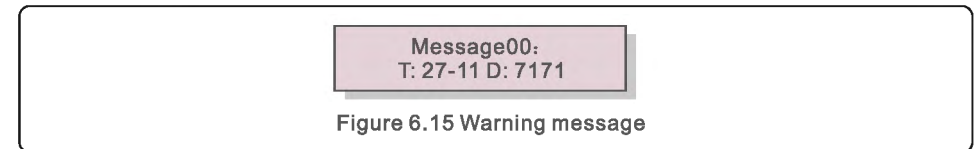


Figure 6.15 Warning message

6.7 Advanced Settings - Technicians Only



NOTE:

Access to this area is for fully qualified and accredited technicians only. Please follow 7.4 to enter password to access this menu.

Select Advanced Settings from the Main Menu to access the following options:

1. Select Standard
2. Grid ON/OFF
3. Clear Energy
4. Reset Password
5. Power Control
6. Calibrate Energy
7. Special Settings
8. STD. Mode Settings
9. Restore Settings
10. HMI Updater
11. Reset HMI
12. Debug Parameter
13. Fan test

6.7.1 Selecting Standard

This function is used to select the grid reference standard (see Figure 6.16).

YES=<ENT> NO=<ESC>
Standard:AUS-Q-0.8

Figure 6.16

Selecting the "User-Def" menu will access the following sub-menu (see Figure 6.17).

— OV-G-V1: 260V
OV-G-V1-T: 1S

Figure 6.17

Below is the range for each setting for use in the User-Def function. You may change the limit manually thus creating a custom grid profile by using this function.

CSI-50KTL-GS-FL / CSI-50KTL-GS / CSI-60KTL-GS / CSI-66KTL-GS	
OV-G-V1: 236---335V	OV-G-F1: 60.2-63Hz
OV-G-V1-T: 0.1---9S	OV-G-F1-T: 0.1---9S
OV-G-V2: 248---341V	OV-G-F2: 61-63Hz
OV-G-V2-T: 0.1---1S	OV-G-F2-T: 0.1---9S
UN-G-V1: 173---236V	UN-G-F1: 57-59.5Hz
UN-G-V1-T: 0.1---9S	UN-G-F1-T: 0.1---9S
UN-G-V2: 132---219V	UN-G-F2: 57-59Hz
UN-G-V2-T: 0.1---1S	UN-G-F2-T: 0.1---9S

Table 6.2 Setting ranges for User-Def



NOTES

The initial value of the User-Def standard is for reference only. It does not represent a correct value suitable for use.

6.7.2 Grid ON/OFF

This function is used to start or stop the power generation of the inverter. (see Figure 6.18).

— Grid ON
Grid OFF

Figure 6.18 Set Grid ON/OFF

Select the desired function by pressing the UP/DOWN keys. Press the ENTER key to save the setting. Press the ESC key to return to the previous menu.

6.7.3 Clear Energy

Clear Energy can reset the historical yield of inverter to zero.



These two functions are applicable by maintenance personnel only, wrong operation will prevent the inverter from working properly.

6.7.4 Reset Password

This function is used to set a new password for menu “Advanced info.” and “Advanced information” (see Figure6.19).

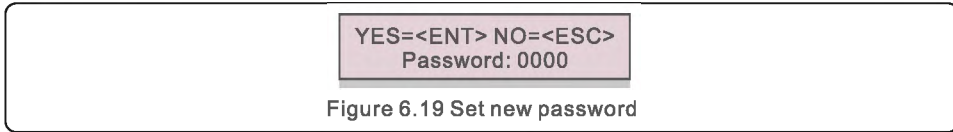


Figure 6.19 Set new password

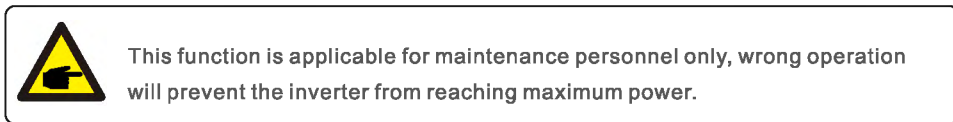
Enter the current password before setting a new password. Press the DOWN key to move the cursor to the next digit, press the UP key to revise the value. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.

6.7.5 Power Control

Active and reactive power can be set through this sub-menu option.

There are 5 item for this sub menu:

1. Set output power
2. Set Reactive Power
3. Out_P With Restore
4. Rea_P With Restore
5. Select PF Curve



6.7.6 Calibrate Energy

Maintenance or replacement could clear or cause a different value to display for total energy.

Use this function to allow the technician to reset or adjust the total energy.

Press the UP/DOWN keys to change the value, Enter to save, ESC to cancel changes.

(see Figure 6.20).

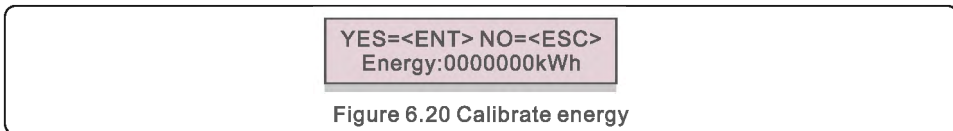
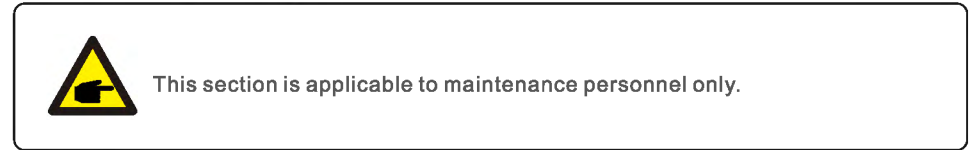


Figure 6.20 Calibrate energy

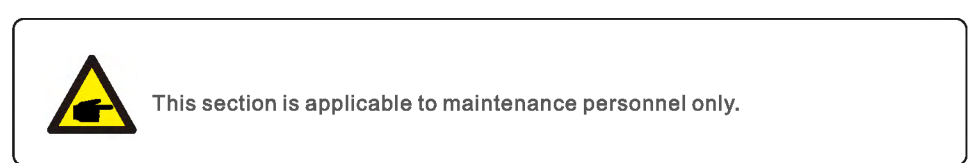
6.7.7 Special settings



Selecting “Special Settings” displays the sub-menu shown below:

1. Grid Filter Set
2. Relay_Protect Set
3. ILeak_Protect Set
4. Ground_Protect Set
5. GRID INTF.02 Set
6. Multiple MPPT Set
7. Voltage MPPT Set
8. LVRT Set
9. IgZero_COMP. Set
10. PI Set

6.7.8 STD Mode Settings



Selecting “STD Mode. Settings” displays the sub-menu shown below:

1. Working Mode Set
2. Power Rate Limit
3. Freq Derate Set
4. 10mins Voltage Set
5. Initial Settings

6.7.9 Restore Settings



This section is applicable to maintenance personnel only.

Selecting “Restore Settings” displays the option shown below:

```
Are you sure?
YES=<ENT> NO=<ESC>
```

Figure 6.21

Press the ENTER key to reset to factory defaults. Press the ESC key to return to the previous menu.

6.7.10 HMI Updater



This section is applicable to maintenance personnel only.

Selecting “HMI Updater” displays the sub-menu shown below:

```
HMI Current Ver.: 02
YES=<ENT> NO=<ESC>
```

Figure 6.22

HMI Updater is for updating LCD firmware. Press the ENTER key to start the process. Press the ESC key to return to the previous menu.

6.7.11 Reset HMI

This function reboots the HMI and LCD display.

6.7.12 Debug Parameter



This section is applicable to maintenance personnel only.

Debug Parameter as shown as below:

```
- U16DAT1: +0000
U16DAT2: +0000
U16DAT3: +0000
U16DAT4: +0000
U16DAT5: +0000
U16DAT6: +0000
U16DAT7: +0000
U16DAT8: +0000
```

Figure 6.23

Press the UP/DOWN keys to scroll through items. Press the ENTER key to select. Press the DOWN key to scroll and press the UP key to change the value. Press the ENTER key to save the setting. Press the ESC key to cancel changes and return to the previous menu.

6.7.13 Fan Test



This section is applicable to maintenance personnel only.

Selecting “Fan Test” displays the sub-menu shown below:

```
Are you sure?
YES=<ENT> NO=<ESC>
```

Figure 6.24

Fan Test is a factory test function. Press the ENTER key to start the test. Press the ESC key to return to the previous menu.

The Canadian Solar U.S. Three Phase series inverters do not require any regular maintenance. However, cleaning the dust off the heat sink will help dissipate heat away from the inverter, which will increase the life of the inverter.



CAUTION

Do not touch the surface when the inverter is operating. Some parts may be hot and cause burns. Turn OFF your inverter (refer to Section 6.2) and let it cool down before any maintenance or cleaning is performed on the inverter.

The status indicator lights and LCD cover can be cleaned with a soft cloth if they are too dirty to read.



NOTES

Never use any solvents, abrasives or corrosive materials to clean the inverter.

7.1 Inverter models with fan-assisted cooling

The function of the fan is to assist the convection cooling of the inverter. If the fan fails or is not working properly, the output power will be curtailed. It is important to ensure the fan runs efficiently and replace any damaged fan.

Replacement steps are as follows:

- 1). Turn AC switch to the "OFF" position
- 2). After 30 seconds, switch the DC switch to the 'OFF' position.
- 3). Wait for at least 5 minutes.

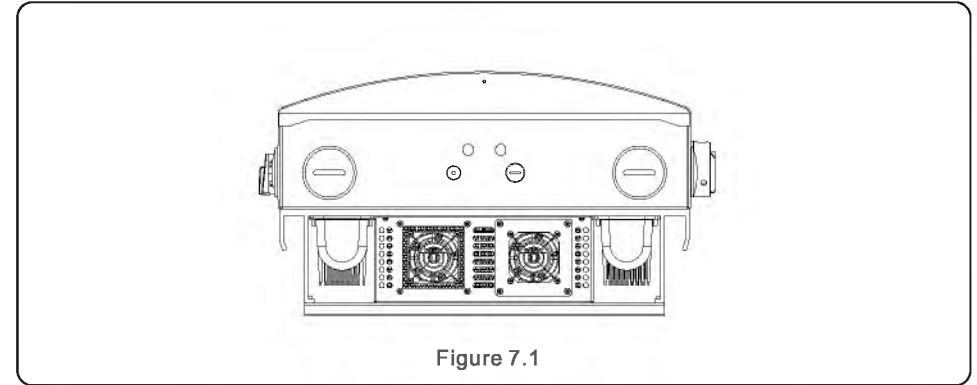


Figure 7.1

- 4). Loosen the screws and remove the fan plate carefully from the bottom of inverter.

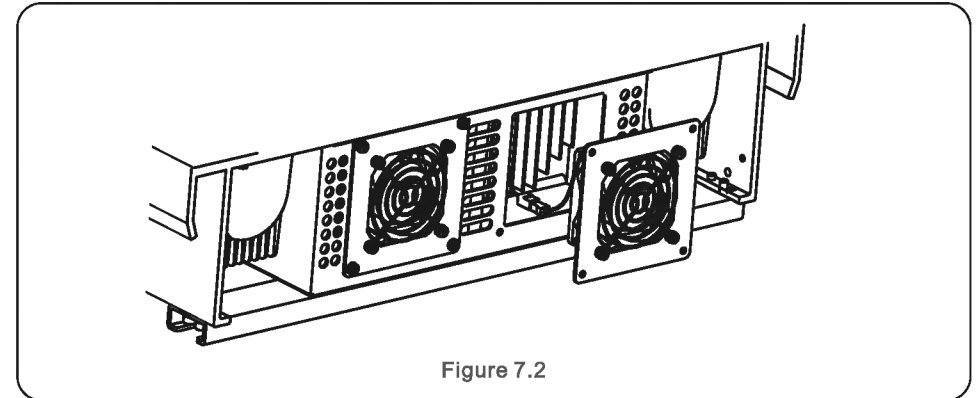


Figure 7.2

- 5). Disconnect the power cable and remove the fan assembly from the inverter.

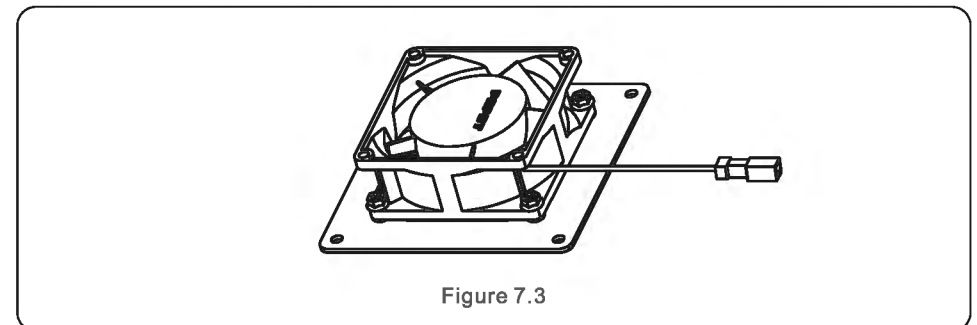


Figure 7.3

6). Remove the screws holding the fan to the fan plate. Replace or clean the fan as required.

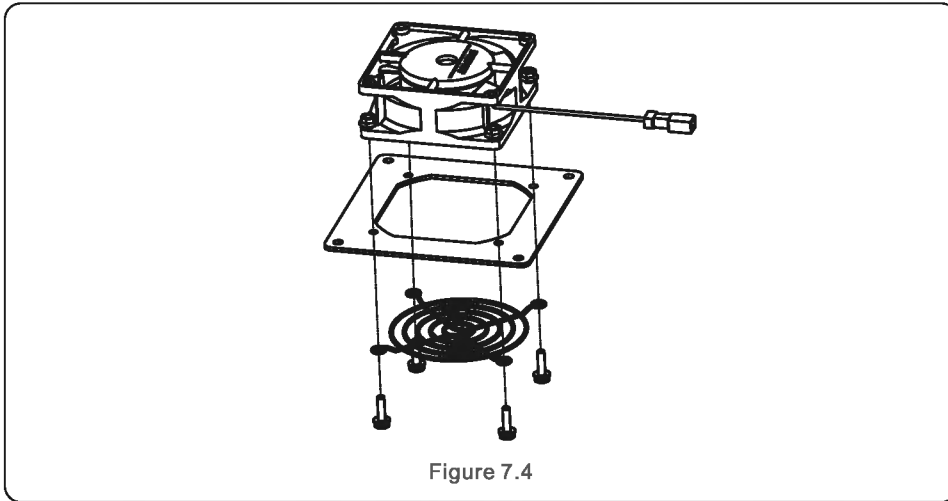


Figure 7.4

7). Reassemble the fan assembly.

8). Reconnect the electrical connections and reinstall the fan assembly.

9). Start the inverter by switching the AC switch ON then the DC switch ON.

8.1 Current alarm

8.1.1 Running messages

Running messages can be viewed on the screen including any current alarms.

8.2 Alarm history

8.2.1 Viewing alarm history

Refer to LCD Operation 6.6.8 for instructions on viewing Alarm History.

8.3 Error messages

NOTES



The first step to clearing alarms as listed in Table 9, is to reset the inverter. To reset the inverter, turn off the inverter (refer to Section 6.2) and wait for five (5) minutes before restarting it (refer to Section 6.1). If the failure persists, please first contact your local distributor and then Canadian Solar Support Service.

If you need to contact Canadian solar Support Service at
North, South & Central America Canadian Solar Inc.

Attn: Customer Service Department 3000 Oak Road, Suite 400

Walnut Creek, CA 94597

Tel: +1 855 315 8915

E-mail: service.ca@canadiansolar.com

Please have the following information available when contacting technical support:

- 1). Inverter serial number
- 2). The inverter distributor/dealer (if available)
- 3). Installation date
- 4). The description of problem (e.g., the alarm message displayed on the screen and the status of the screen status indicator lights. Other readings obtained from the Information sub menu (refer to Section 6.4) will also be helpful.)
- 5). PV array configuration (e.g. number of panels, panel capacity, number of strings, etc.)
- 6). Your contact details

8.3.1 Troubleshooting guide

Canadian Solar inverters are designed in accordance with international grid standards, safety standards and electromagnetic compatibility requirements. Before delivery to the customer, the inverter has been subjected to intensive testing to ensure its optimal operation and reliability.

In case of failure, the screen may display an alarm message, stop feeding energy into the grid or both. Typical failure descriptions and their corresponding alarm messages are listed in Table 9 on the following pages.

Alarms	Cause	Solution
No Information (Blank Screen)	<ul style="list-style-type: none"> • Input voltage low/missing • Polarity reversed • Main board damaged 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check PV connections • Check polarity • Check voltage >120V Single, >350V three <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check voltage >120V Single, >350V three • If DC voltage is "0" replace inverter
Initializing (Inverter stuck in this mode)	<ul style="list-style-type: none"> • Inverter is waiting for driving signal 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check PV connections • Check polarity • Check voltage >120V Single, >350V three <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check voltage >120V Single, >350V three • A cable may have been damaged or loosened in shipping replace inverter
OV-G-V: Over Grid Voltage	<ul style="list-style-type: none"> • Inverter detects grid voltage as too high 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter • If AC measures high, adjust upper limit with permission from utility <p>Test – DC Switch ON, full power</p> <ul style="list-style-type: none"> • Check AC at inverter test points • Compare with LCD • If AC measures high, cables between inverter and interconnect are too small • Check ampacity and voltage drop calculations
UN-G-V: Under Grid Voltage	<ul style="list-style-type: none"> • Inverter detects grid voltage as too low 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter test points • If AC measures low, adjust lower limit with permission from utility • Check LCD voltage reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter

Alarms	Cause	Solution
OV-G-F: Over Grid Frequency	<ul style="list-style-type: none"> • Inverter detects grid Frequency as too high 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check frequency at the inverter test points • If Frequency measures high, adjust upper limit with permission from utility • Check LCD reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter
NO-GRID	<ul style="list-style-type: none"> • Inverter does not detect the grid 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check AC at the inverter test points • L-L, L-GND • Do NOT tell me 240VAC • Check LCD reading, may be a bad measurement circuit <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check grid standard • Replace inverter
OV-DC: DC voltage is too high	<ul style="list-style-type: none"> • Inverter detects High DCV 	<p>Test – DC switch OFF</p> <ul style="list-style-type: none"> • Check DC at the inverter test points • If DCV is high, too many panels in the string <p>Test – DC Switch ON</p> <ul style="list-style-type: none"> • Check LCD reading, may be a bad measurement circuit • Replace inverter
OV-BUS: DC BUS voltage is too high	<ul style="list-style-type: none"> • Inverter detects High DCV on internal bus 	<p>Test</p> <ul style="list-style-type: none"> • Measure DC and AC voltages • Compare with LCD • Replace Inverter • Internal damage • Wire came loose during shipping
UN-BUS: DC BUS voltage is too low	<ul style="list-style-type: none"> • Inverter detects low DCV on internal bus 	<p>Test</p> <ul style="list-style-type: none"> • Measure DC and AC voltages • Compare with LCD • Replace Inverter • Internal damage • Wire came loose during shipping

Alarms	Cause	Solution
GRID-INTF: Grid unstable	• Inverter detects grid instability, internal fault current high	Test – With DC Switch OFF <ul style="list-style-type: none"> • Measure AC voltage • Test AC line for THD Test – With DC Switch ON Test AC line for THD <ul style="list-style-type: none"> • Multiple inverters/turn one off • Impedance matching adjustment or box • Internal damage • Wire came loose in shipping
INI-PRO: Initialization Protection	• Master and Slave DSP have different values	Reset Inverter <ul style="list-style-type: none"> • DC switch OFF • Wait until all lights/LCD turn off • DC switch ON • Replace inverter
TEM-PRO: Temperature Protection	• Inverter detects high ambient temperature >60C	Inspect installation <ul style="list-style-type: none"> • Check heatsink for obstructions/ventilation • Is inverter in direct sunshine • Measure ambient temperature near inverter • If temp is in range replace inverter
GROUND-PRO: Ground Protection	• Inverter detects low DC insulation resistance	Inspect installation <ul style="list-style-type: none"> • Reset inverter • Note weather conditions when alarm occurs • Measure insulation resistance • If normal, measure in SAME weather as alarm • Physically check cables • Replace inverter
ARC-FAULT	• Inverter detects arc in DC circuit	Inspect installation <ul style="list-style-type: none"> • Check cable with string tester • Physically check cables • Inspect panel junction boxes • Inspect cable connections • Reset inverter • Replace inverter

Table 8.1 Fault messages and descriptions

Model	CSI-50KTL-GS-FL
Max DC input voltage	1000Vdc
MPPT operation range	200~850Vdc
Max DC input current	88A (22A per MPPT)
Number of MPPT/strings per MPPT	4/3
Rated output power	50kW
Max. output power	50kW
Rated grid voltage	480Vac
Grid voltage range	422. 4~528Vac
Operation phase	Three phase
Rated grid output current	60.2Aac
Output power factor range	0.8leading ... 0.8lagging
Grid current THD	<3%
DC injection current	<50mA
Rated grid frequency	60Hz
Max. Efficiency	>98.8%
Protection	DC class II and AC class III(optional)
Size(inch)	24.8W*40.7H*13.9D
Weight	165lb
Topology	Transformerless
Internal consumption	<1W(Night)
Running temperature	-25~60°C
Ingress protection	NEMA 4X
Interface	RS485 WIFI GPRS(Optional)
Design lifetime	>20years
Operating Range Utility Frequency	59.5-60.5Hz
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B
Operation Surroundings Humidity	0~100% Condensing
Connections	4 knockout for 2" conduit at bottom and side. DC Input - Copper only 12-6AWG AC Input - Copper or aluminum 8-2AWG Aluminum requires bi-metallic compatible terminal

9. Specifications



Model	CSI-50KTL-GS
Max DC input voltage	1000Vdc
MPPT operation range	200~850Vdc
Max DC input current	114A (28.5A per MPPT)
Number of MPPT/strings per MPPT	4/3
Rated output power	50kW
Max. output power	50kW
Rated grid voltage	480Vac
Grid voltage range	422. 4~528Vac
Operation phase	Three phase
Rated grid output current	60.2Aac
Output power factor range	0.8leading ... 0.8lagging
Grid current THD	<3%
DC injection current	<50mA
Rated grid frequency	60Hz
Max. Efficiency	>98.8%
Protection	DC class II and AC class III(optional)
Size(inch)	24.8W*40.7H*13.9D
Weight	172lb
Topology	Transformerless
Internal consumption	<1W(Night)
Running temperature	-25~60°C
Ingress protection	NEMA 4X
Interface	RS485 WIFI GPRS(Optional)
Design lifetime	>20years
Operating Range Utility Frequency	59.5-60.5Hz
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B
Operation Surroundings Humidity	0~100% Condensing
Connections	4 knockout for 2" conduit at bottom and side. DC Input - Copper only 12-6AWG AC Input - Copper or aluminum 8-2AWG Aluminum requires bi-metallic compatible terminal



9. Specifications

Model	CSI-60KTL-GS	CSI-66KTL-GS
Max DC input voltage	1000Vdc	
MPPT operation range	200~850Vdc	
Max DC input current	114A (28.5A per MPPT)	
Number of MPPT/strings per MPPT	4/4	
Rated output power	60kW	66kW
Max. output power	60kW	66kW
Rated grid voltage	480Vac	
Grid voltage range	422. 4~528Vac	
Operation phase	Three phase	
Rated grid output current	72.2Aac	79.4Aac
Output power factor range	0.8leading ... 0.8lagging	
Grid current THD	<3%	
DC injection current	<50mA	
Rated grid frequency	60Hz	
Max. Efficiency	>98.8%	
Protection	DC class II and AC class III(optional)	
Size(inch)	24.8W*40.7H*13.9D	
Weight	172lb	
Topology	Transformerless	
Internal consumption	<1W(Night)	
Running temperature	-25~60°C	
Ingress protection	NEMA 4X	
Interface	RS485 WIFI GPRS(Optional)	
Design lifetime	>20years	
Operating Range Utility Frequency	59.5-60.5Hz	
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B	
Operation Surroundings Humidity	0~100% Condensing	
Connections	4 knockout for 2" conduit at bottom and side. DC Input - Copper only 12-6AWG AC Input - Copper or aluminum 8-2AWG Aluminum requires bi-metallic compatible terminal	

10. Appendices

10.1 Appendix A

Part	Torque
AC Terminal	3-6 Nm
DC Fuse Terminal	1.5-1.7 Nm
Screw For Wiring Box Cover	1.8-2.0 Nm
Ground Terminal	3 Nm

Figure 10.1

PROJECT NAME _____

LOCATION _____ NUMBER _____



INSTALLATION AND COMMISSIONING CHECKLIST

3 PHASE STRING INVERTERS (KTL SERIES)

Warning: This checklist is not a replacement for the user manual. Please read the user manual prior to inverter site selection and installation.

Step	No.	Content	Details	Values / Notes	Conclusion
INSTALLATION	1	Installation environment	Ensure installation site meets environmental and physical constraints.		<input type="checkbox"/> Good <input type="checkbox"/> Poor
	2	Unpacking	Check inverter condition after unpacking.		<input type="checkbox"/> Good <input type="checkbox"/> Poor
	3	Mounting bracket installation	Install inverter mounting bracket according to installation instructions in user manual. For allowable tilt angle refer to the installation manual.		<input type="checkbox"/> Completed Record Tilt Angle in Notes
	4	Inverter installation	Carefully install the inverter to the mounting bracket and ensure it is firmly attached. Ensure the inverter has proper clearances and are properly ventilated.		<input type="checkbox"/> Completed
	5	Serial number	Record the product serial numbers located on the side label.		Serial Numbers; attached list
	6	Solar modules	Confirm PV module installation completion. Record the total power of the PV modules.		<input type="checkbox"/> Completed Record kWp in Notes
	7	DC input and AC output connection	Switch off the DC and AC distribution unit, connect DC to PV terminals of inverter, and connect AC to AC terminals of inverter. Ensure proper polarity and cable size. Torque to specifications.		<input type="checkbox"/> Completed Record Torque in Notes
	8	PV voltage	Measure and record DC voltage. Ensure voltage and polarities are correct. Confirm the voltages are within 5% tolerance to what was tested.		<input type="checkbox"/> Completed Record V_{DC} in Notes
	9	AC grid	Measure and record AC voltage and frequency. Confirm the V_{AC} voltages are within 5% tolerance to what was tested.		<input type="checkbox"/> Completed Record V_{AC} in Notes
	10	Grounding cable	Ensure ground cable is firmly attached to grounding lug.		<input type="checkbox"/> Good <input type="checkbox"/> Poor

PROJECT NAME _____

LOCATION _____ NUMBER _____



INSTALLATION AND COMMISSIONING CHECKLIST

3 PHASE STRING INVERTERS (KTL SERIES)

Warning: This checklist is not a replacement for the user manual. Please read the user manual prior to inverter site selection and installation.

Step	No.	Content	Details	Values / Notes	Conclusion
COMMISSIONING	1	Communication cable (if function is used)	Connect the RS485 cable to the communication port.		<input type="checkbox"/> Completed
	2	Supply DC / AC power	<p>CSI-xx-KTL-CT:</p> <ol style="list-style-type: none"> Switch on the DC switch first. The LCD and "Power" LED indicator will be green lighted. The "Run" LED will be off. The "Grid" LED will be lashing. The "Fault" LED will be lashing and the inverter begins self-checking. Initially, "GridV.Outlimit" and "GridF.Outlimit" will be displayed, then the inverter will switch to "Standby" mode. Switch on the AC switch. The Grid faults will clear automatically. In "Standby" mode, the "Power" LED is solid green, the "Run" LED is off, the "Grid" LED is solid green and the "Fault" LED is off. 		<input type="checkbox"/> Completed Record LEDs status in Notes
			<p>CSI-xx-KTL-GS:</p> <ol style="list-style-type: none"> Switch the grid supply main Switch (AC) ON first. Switch the DC switch ON. If the voltages of PV arrays are higher than start up voltage, the inverter will turn on. The red LED power will be continuously lit. When both the DC and the AC sides supply to the inverter, it will be ready to generate power. Initially, the inverter will check both its internal parameters and the parameters of the AC grid, to ensure that they are within the acceptable limits. At the same time, the green LED will lash and the LCD displays the information of INITIALIZING. 		<input type="checkbox"/> Completed Record LEDs status in Notes

PROJECT NAME _____

LOCATION _____ NUMBER _____



INSTALLATION AND COMMISSIONING CHECKLIST

3 PHASE STRING INVERTERS (KTL SERIES)

Warning: This checklist is not a replacement for the user manual. Please read the user manual prior to inverter site selection and installation.

Step	No.	Content	Details	Values / Notes	Conclusion
COMMISSIONING	3	Waiting time	CSI-xx-KTL-CT: A standard 5 minute delay is required before the inverter generates any power to the grid. In normal operation mode, the "Power", "Run", and "Grid" LEDs are solid green and the "Fault" LED is off.		<input type="checkbox"/> Completed Record LEDs status in Notes
			CSI-xx-KTL-GS: After 30-180 seconds (depending on local requirement), the inverter will start to generate power. The green LED will be on continuously and the LCD displays the information of GENERATING.		<input type="checkbox"/> Completed Record LEDs status in Notes
	4	Power generation	After grid connection, record power output of inverter.		<input type="checkbox"/> Completed Record power in Notes
	5	Date & Time setting	Set the current date and time using the front panel interface.		<input type="checkbox"/> Completed Record current date/time in Notes
	6	Communication setting (if avail.)	Set communication with a unique address for each inverter.		<input type="checkbox"/> Completed Record address in Notes
	7	Machine version	For maintenance and reference, please record the firmware revisions if applicable.		<input type="checkbox"/> Completed Record with serial numbers
	8	Operating parameter	Record operating parameters of the inverter. Verify IEEE1547 or UL1741 setting is selected. De-rate inverter and attach de-rate sticker as required.		<input type="checkbox"/> Completed Record operating parameters in Notes
	9	Testing	Open and close the DC breaker to confirm whether the inverter reboots and shuts down automatically.		<input type="checkbox"/> Reboot successful <input type="checkbox"/> Not rebooting
	10	Completion	Installation and commissioning is complete if no abnormality.		<input type="checkbox"/> Good <input type="checkbox"/> Issues detected

PROJECT NAME _____

LOCATION _____ NUMBER _____



INSTALLATION AND COMMISSIONING CHECKLIST

3 PHASE STRING INVERTERS (KTL SERIES)

Warning: This checklist is not a replacement for the user manual. Please read the user manual prior to inverter site selection and installation.

System Owner: _____

Address / Location: _____

Inverter model: _____

Number of inverters: _____ Inverter mounting tilt: _____

Output power*: _____ Input DC voltage: _____

Grid: V Max: _____ V Min: _____ Frequency Max: _____ Min: _____

Configuration: MPPT Individual _____ MPPT Parallel _____

Monitoring: RS485: _____ Ethernet: _____

PV module manufacturer: _____ PV model: _____

DC cable size: _____ AC cable size: _____

Number of series connected modules in PV strings: _____

Number of PV strings in parallel per MPPT: _____

Total System size (DC Watts): _____

Note site typical arrangements and variances

Inverter firmware revision: DSP: _____ LCD: _____

Insulation limit (K): _____ PV start-up voltage: _____

Reactive compensation: _____ +/- PF

Monitoring equipment and supplier: _____

Transformer ratings, supplier: _____

*Specify de-rated power and add nameplate power in parenthesis

GENERAL COMMENTS / OBSERVATIONS:

PROJECT NAME _____

LOCATION _____ NUMBER _____



INSTALLATION AND COMMISSIONING CHECKLIST

3 PHASE STRING INVERTERS (KTL SERIES)

Warning: This checklist is not a replacement for the user manual. Please read the user manual prior to inverter site selection and installation.

Inverter serial numbers:

1
 2
 3
 4
 5
 6
 7
 8
 9
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 41
 42

INSTALLER'S NAME _____

INSTALLER'S SIGNATURE _____

COMPANY _____

DATE _____