## CロTEK

SD Series User's Manual

SD2500 / SD3500 PURE SINE WAVE INVERTER

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## 1.Important Safety Information



## WARNING!

Before using the inverter, read and save the safety instructions.

## 1-1. General Safety Precautions

1-1-1. Do not expose the Inverter to rain, snow, spray, bilge or dust.
To reduce risk of hazard, do not cover or obstruct the ventilation openings. Do not install the inverter in a zero-clearance compartment. Overheating may take place.

1-1-2. To avoid a risk of fire and electric shock, please make sure that existing wiring is in good electrical condition; and that wire size is not undersized. Do not operate the Inverter with damaged or substandard wiring.

1-1-3. This equipment contains components which can produce arcs or sparks. To prevent fire or explosion do not install in compartments containing batteries or flammable materials or in locations which require ignition protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, joints, fittings, or other connection between components of the fuel system.

1-1-4. An over current protection at the time of installation shall be provided by others for the AC output circuit.

1-1-5. Additional breakers suitable for 20 A branch circuit protection shall be provided for the GFCI receptacles.

## 1-2. Precautions When Working with Batteries

1-2-1. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately wash eyes with running cold water for at least 20 minutes and get medical attention immediately.

1-2-2. Never smoke or allow a spark or flame in vicinity of battery or engine.
1-2-3. Do not drop a metal tool on the battery. The resulting spark or short-circuit on the battery or other electrical part may cause an explosion.

1-2-4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery.
A lead-acid battery produces a short-circuit current high enough to weld a ring or similar item to metal causing a severe burn.

## 1-3. Installation

The power inverter should be installed in a location that meets the following requirements :
Dry - Do not allow water to drip or splash on the inverter.
Cool - Ambient air temperature should be between $-20^{\circ} \mathrm{C}$ and $50^{\circ} \mathrm{C}$, but he cooler the better.
Safety - Do not install batteries in the compartment or other areas here flammable fumes existence such as fuel storage areas or engine compartments.
Ventilated - Allow at least one feet of clearance around the Inverter for air flow.
Ensure the ventilation shafts on the rear and bottom of the unit are not obstructed.
Dust-free - Do not install the Inverter in dusty environments here dust, wood particles or other filings/shavings are present. The dust can be pulled into the unit when the cooling fan is in operation.
Close to batteries - Avoid excessive cable lengths but do not install the inverter in the same compartment as batteries.
Use the recommended wire lengths and sizes (refer to section 4.DC wiring connections).
Do not mount the inverter where it is exposed to the gases produced by the battery. These gases are very corrosive and prolonged exposure will damage the inverter.

## WARNING!

Shock Hazard. Before proceeding further, carefully check that the inverter is NOT connected to any batteries, and that all wiring is disconnected from any electrical sources. Do not connect the output terminals of the inverter to an incoming AC source.

## 2.Functional Characteristics

## 2-1. General Information

SD-series is new generation power inverter equipped with $\mathrm{N}+1$ parallel power function, 3-phase capability, and AC transfer switch. SD series is suitable for RV, Marine and Emergency appliances.

## Features

- Parallel redundancy design for power expansion
- Multiple industrial applications that create 1Ф3W / 3Ф4W power systems
- User-friendly remote control
- Automatic master mechanism to eliminate single point failure and optimize reliability
- Built-in ATS and AC circuit breaker
- Optional STS module, transfer time is less than 4 ms .
- RS-232 communication
- Input \& output fully isolation
- Output voltage / power saving mode is selectable by DIP switch and remote control (CR-10)
- Input Protection : Reverse Polarity (Fuse) / Under Voltage / Over Voltage Protection
- Output Protection: Short Circuit / Overload / Over Temperature / Over Voltage Protection
To get the most out of the power inverter, it must be installed and used properly. Please read the instructions in this manual before installation and operation of this model.


## 2-2. Application

2-2-1. Power tools-circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors.

2-2-2. Office equipment - computers, printers, monitors, facsimile machines, scanners.

2-2-3. Household items - vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines.

2-2-4. Kitchen appliances - coffee makers, blenders, ice markers, toasters.
2-2-5. Industrial equipment - metal halide lamp, high pressure sodium lamp.
2-2-6. Home entertainment electronics - television, VCRs, video games, stereos, musical instruments, satellite equipment.

2-2-7. Vehicle, yacht and off-grid solar power systems.

## 2-3. Electrical Performance

## 2-3-1. SD2500 Specification

| MODEL | SD2500-112 | SD2500-124 | SD2500-148 | SD2500-212 | SD2500-224 | SD2500-248 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Output |  |  |  |  |  |  |
| Rating Power | 2500 W (de-rating after $40^{\circ} \mathrm{C}$, refer to de-rating curve) |  |  |  |  |  |
| Peak Power (3Sec.) | 3000W |  |  |  |  |  |
| Surge Power (<0.2Sec.) | 4000W |  |  |  |  |  |
| Waveform | Pure Sine Wave |  |  |  |  |  |
| Efficiency (Max.) | 88\% | 89\% | 90\% | 88\% | 88\% | 90\% |
| Output Voltage (@rated VDC) | 100 / 110 / $115 / 120 \mathrm{VAC} \pm 3 \%$ |  |  | $200 / 220$ / 230 / 240VAC $\pm 3 \%$ |  |  |
| Output Frequency | $50 / 60 \mathrm{~Hz} \pm 0.1 \%$ |  |  |  |  |  |
| Total Harmonic Distortion (THD) | < 3\% @ under condition : greater than 1.15 times of the rated VDC, $110 \mathrm{~V} /$ linear load) |  |  | < 3\% @ under condition : greater than 1.15 times of the rated VDC, 230V / linear load) |  |  |
| DC Input |  |  |  |  |  |  |
| DC Voltage | 12VDC | 24VDC | 48VDC | 12VDC | 24VDC | 48VDC |
| Voltage Range | 10.0~16.0 VDC | 20.0~32.0 VDC | 40.0~64.0 VDC | 10.0~16.0 VDC | 20.0~32.0 VDC | 40.0~64.0 VDC |
| No load Power Consumption | @12VDC | @24VDC | @48VDC | @12VDC | @24VDC | @48VDC |
| On Mode @ Save Mode | 0.9A | 0.35A | 0.3A | 1.1A | 0.7A | 0.4A |
| On Mode @ No Load Mode | $<2.9 \mathrm{~A}$ | $<1.4 \mathrm{~A}$ | $<0.8 \mathrm{~A}$ | $<3.6 \mathrm{~A}$ | $<1.8 \mathrm{~A}$ | $<1 \mathrm{~A}$ |
| Fuse | $404 \times 9$ | 20Ax9 | 15Ax6 | 40Ax9 | 20Ax9 | 15Ax6 |
| AC Input |  |  |  |  |  |  |
| AC Range | 100 / 110 / 115 / 120VAC $\pm 12.5 \%$ |  |  | 200 / 220 / 230 / $240 \mathrm{VAC} \pm 12.5 \%$ |  |  |
| Frequency Selectable | $50 / 60 \mathrm{~Hz}$ |  |  |  |  |  |
| Synchronous Frequency | 47~57 / 53~63 Hz |  |  |  |  |  |
| Circuit Breaker | 35A |  |  | 20A |  |  |
| Transfer Switch ${ }^{(1)}$ | Standard ATS : Inverter to utility AC : 8~10ms.; Utility AC to inverter: 16~50ms. |  |  |  |  |  |
|  | Optional STS module : Single < 4ms; +1 \& 1P3W \& 3P4W < 6 ms |  |  |  |  |  |
| Protection |  |  |  |  |  |  |
| BAT.Low Alarm $\pm$ 3\% | 10.5VDC | 21.0VDC | 42.0VDC | 10.5VDC | 21.0VDC | 42.0VDC |
| BAT.Low Shut-down $\pm 3 \%$ | 10.0VDC | 20.0VDC | 40.0VDC | 10.0VDC | 20.0VDC | 40.0VDC |
| BAT.Low Restart $\pm$ 3\% | 12.5VDC | 25.0VDC | 50.0VDC | 12.5VDC | 25.0VDC | 50.0VDC |
| BAT.High Alarm $\pm 3 \%$ | 15.5VDC | 31.0VDC | 62.0VDC | 15.5VDC | 31.0VDC | 62.0VDC |
| BAT.High Shut-down $\pm 3 \%$ | 16.0VDC | 32.0 VDC | 64.0VDC | 16.0VDC | 32.0 VDC | 64.0VDC |
| BAT.High Restart $\pm$ 3\% | 15.0VDC | 30.0VDC | 60.0VDC | 15.0VDC | 30.0 VDC | 60.0VDC |
| Input Protection | Reverse Polarity (Fuse) / Under Voltage / Over Voltage Protection / AC over current (Breaker) |  |  |  |  |  |
| Output Protection | Short Circuit / Overload / Over Temperature / Over Voltage Protection |  |  |  |  |  |


| MODEL | SD2500-112 | SD2500-124 | SD2500-148 | SD2500-212 | SD2500-224 | SD2500-248 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Environment |  |  |  |  |  |  |
| Working Temp. | $-20 \sim+60^{\circ} \mathrm{C}$; refer SD2500 power de-rating curve |  |  |  |  |  |
| Storage Temp. | $-40 \sim+70^{\circ} \mathrm{C}$ |  |  |  |  |  |
| Relative Humidity | Max. 90\%, non-condensing |  |  |  |  |  |
| Safety \& EMC |  |  |  |  |  |  |
| Safety Standards | Certified (UL only for | UL 458 hardwire) | ---- | Certified EN60950-1 |  |  |
| EMC Standards | Certified FCC Class B |  |  | ${ }^{(2)}$ Certified EN 55014-1, EN 55014-2; EN 61000-3-2, -3-3; EN61204-3; EN 61000-6-1, -6-2, -6-3, -6-4 IEC 61000-4-2, 3, 4, 5, 6, 11 |  |  |
| E-Mark | ---- |  |  | Certified CISPR 25; ISO 7637-2 |  |  |
| Control \& Signal |  |  |  |  |  |  |
| LED Indicator | Input voltage level, faulty status |  |  |  |  |  |
| Remote Control | CR-6, CR-8 and CR-10 |  |  |  |  |  |
| Others |  |  |  |  |  |  |
| Dimension (WxHxD) | $283 \times 128 \times 436 \mathrm{~mm} / 11.14 \times 5.04 \times 17.17 \mathrm{I}$ Inch |  |  |  |  |  |
| Weight | 8 kg |  |  |  |  |  |
| Cooling | Load \& Thermal control fan |  |  |  |  |  |
| Communication Port | RS-232 (RJ-11 type connector), Ethernet (Optional) |  |  |  |  |  |

## Note

The specifications are subject to change without prior notice. All the test environments are conducted under the rated power operation conditions.
(1) Please refer to P. 8 Transfer-Time Table.
(2) EN 55014-1, EN 55014-2 Class B: output cable less than 2 meters.

## 2-3-2. SD3500 Specification

| MODEL | SD3500-112 | SD3500-124 | SD3500-148 | SD3500-212 | SD3500-224 | SD3500-248 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Output |  |  |  |  |  |  |
| Rating Power | 3500W <br> (de-rating after $35^{\circ} \mathrm{C}$, refer to de-rating curve for 12 V ) <br> (de-rating after $40^{\circ} \mathrm{C}$, refer to de-rating curve for 24 V and 48 V ) |  |  |  |  |  |
| Peak Power (3Sec.) | 4500W |  |  |  |  |  |
| Surge Power (<0.2Sec.) | 6000W |  |  |  |  |  |
| Waveform | Pure Sine Wave |  |  |  |  |  |
| Efficiency (Max.) | 90\% | 90\% | 91\% | 90\% | 91\% | 91\% |
| Output Voltage (@rated VDC) | 100 / 110 / 115 / 120VAC $\pm 3 \%$ |  |  | 100 / 110 / 115 / 120VAC $\pm 3 \%$ |  |  |
| Output Frequency | $50 / 60 \mathrm{~Hz} \pm 0.1 \%$ |  |  |  |  |  |
| Total Harmonic Distortion (THD) | < $3 \%$ @ under condition : greater than 1.15 times of the rated VDC, $110 \mathrm{~V} /$ linear load) |  |  | < 3\% @ under condition : greater than 1.15 times of the rated VDC, $110 \mathrm{~V} /$ linear load) |  |  |
| DC Input |  |  |  |  |  |  |
| DC Voltage | 12VDC | 24VDC | 48VDC | 12VDC | 24VDC | 48VDC |
| Voltage Range | 10.0~16.0 VDC | 20.0~32.0 VDC | 40.0~64.0 VDC | 10.0~16.0 VDC | 20.0~32.0 VDC | 40.0~64.0 VDC |
| No load Power Consumption | @12VDC | @24VDC | @48VDC | @12VDC | @ 24 VDC | @48VDC |
| On Mode @ Save Mode | 1.4A | 0.5A | 0.5A | 1.4A | 0.5A | 0.5A |
| On Mode @ No Load Mode | $<2.9 \mathrm{~A}$ | $<1.4 \mathrm{~A}$ | $<0.8 \mathrm{~A}$ | $<3.6 \mathrm{~A}$ | < 1.8A | $<1 \mathrm{~A}$ |
| Fuse | 40 Ax 12 | 20Ax12 | 20Ax6 | 40 Ax 12 | $204 \times 12$ | 20Ax6 |
| AC Input |  |  |  |  |  |  |
| AC Range | 100 / 110 / 115 / 120VAC $\pm 12.5 \%$ |  |  | $200 / 220 / 230 / 240 V A C \pm 12.5 \%$ |  |  |
| Frequency Selectable | $50 / 60 \mathrm{~Hz}$ |  |  |  |  |  |
| Synchronous Frequency | 47~57 / 53~63 Hz |  |  |  |  |  |
| Circuit Breaker | 35A |  |  | 20A |  |  |
| Transfer Switch ${ }^{(1)}$ | Standard ATS : Inverter to utility AC : 8~10ms.; Utility AC to inverter : 16~50ms. |  |  |  |  |  |
|  | Optional STS module : Single < 4ms; $\mathrm{N}+1$ \& 1P3W \& 3P4W < 6 ms |  |  |  |  |  |
| Protection |  |  |  |  |  |  |
| BAT.Low Alarm $\pm$ 3\% | 10.5VDC | 21.0VDC | 42.0VDC | 10.5VDC | 21.0VDC | 42.0VDC |
| BAT.Low Shut-down $\pm 3 \%$ | 10.0VDC | 20.0VDC | 40.0VDC | 10.0VDC | 20.0VDC | 40.0VDC |
| BAT.Low Restart $\pm$ 3\% | 12.5VDC | 25.0VDC | 50.0VDC | 12.5VDC | 25.0VDC | 50.0VDC |
| BAT.High Alarm $\pm$ 3\% | 15.5VDC | 31.0 VDC | 62.0VDC | 15.5VDC | 31.0 VDC | 62.0VDC |
| BAT.High Shut-down $\pm 3 \%$ | 16.0VDC | 32.0 VDC | 64.0VDC | 16.0VDC | 32.0 VDC | 64.0VDC |
| BAT.High Restart $\pm$ 3\% | 15.0VDC | 30.0 VDC | 60.0VDC | 15.0VDC | 30.0 VDC | 60.0VDC |
| Input Protection | Reverse Polarity (Fuse) / Under Voltage / Over Voltage Protection / AC over current (Breaker) |  |  |  |  |  |
| Output Protection | Short Circuit / Overload / Over Temperature / Over Voltage Protection |  |  |  |  |  |


| MODEL | SD3500-112 | SD3500-124 | SD3500-148 | SD3500-212 | SD3500-224 | SD3500-248 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Environment |  |  |  |  |  |  |
| Working Temp. | $-20 \sim+60^{\circ} \mathrm{C}$; refer SD3500 power de-rating curve |  |  |  |  |  |
| Storage Temp. | $-40 \sim+70^{\circ} \mathrm{C}$ |  |  |  |  |  |
| Relative Humidity | Max. 90\%, non-condensing |  |  |  |  |  |
| Safety \& EMC |  |  |  |  |  |  |
| Safety Standards | Certified (UL only for | UL 458 r hardwire) | ---- | Certified EN60950-1 |  |  |
| EMC Standards | Certified FCC Class B |  |  | ${ }^{(2)}$ Certified EN 55014-1, EN 55014-2; EN 61000-3-2, -3-3; EN61204-3; EN 61000-6-1, -6-2, -6-3, -6-4 IEC 61000-4-2, 3, 4, 5, 6, 11 |  |  |
| E-Mark |  | ---- |  | Certified | CISPR 25; ISO | 7637-2 |
| Control \& Signal |  |  |  |  |  |  |
| LED Indicator | Input voltage level, faulty status |  |  |  |  |  |
| Remote Control | CR-6, CR-8 and CR-10 |  |  |  |  |  |
| Others |  |  |  |  |  |  |
| Dimension (WxHxD) | $283 \times 128 \times 496 \mathrm{~mm} / 11.14 \times 5.04 \times 19.53$ inch |  |  |  |  |  |
| Weight | 10 kg |  |  |  |  |  |
| Cooling | Load \& Thermal control fan |  |  |  |  |  |
| Communication Port | RS-232 (RJ-11 type connector), Ethernet (Optional) |  |  |  |  |  |

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## Note

The specifications are subject to change without prior notice. All the test environments are conducted under the rated power operation conditions.
(1) Please refer to P. 8 Transfer-Time Table.
(2) EN 55014-1, EN 55014-2 Class B: output cable less than 2 meters.

## De-rating Curve



Figure 1. SD2500 de-rating curve
Figure 2. SD3500 de-rating curve

| Transfer-Time Table |  |  |
| :---: | :---: | :---: |
| Mode / Transfer Switch | ATS | STS |
| Haphazard | Inverter to utility AC: 8~10ms.; Utility $A C$ to inverter: 16~50ms. | Frequency is synchronized: < 4ms.; <br> Frequency is not synchronized: Inverter to utility AC: < 4ms.; <br> Utility AC to inverter: 16~50ms. |
| Normal | Inverter to utility AC: 8~10ms.; Utility $A C$ to inverter: $16 \sim 25 \mathrm{~ms}$. | $<4 \mathrm{~ms}$ |
| Exacting | Inverter to utility AC: 8~10ms.; Utility AC to inverter: $16 \sim 50 \mathrm{~ms}$. | Inverter to utility AC: <4ms.; Utility $A C$ to inverter: $16 \sim 50 \mathrm{~ms}$. |
| Online | Inverter to utility AC: 8~10ms.; Utility AC to inverter: 16~25ms. | $<4 \mathrm{~ms}$ |

Table 1. SD series transfer-time

## 2-4. Mechanical Drawings



Figure 3. SD series mechanical drawings

| Model | $\mathbf{A}(\mathrm{mm})$ | $\mathbf{B}(\mathrm{mm})$ | $\mathbf{C}(\mathrm{mm})$ | $\mathbf{D}(\mathrm{mm})$ | $\mathbf{E}(\mathrm{mm})$ | $\mathbf{F}(\mathrm{mm})$ | $\mathbf{G}(\mathrm{mm})$ | $\mathbf{H}(\mathrm{mm})$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SD2500 | 436 | 240.0 | 95.6 | 268.6 | 8.5 | 11.5 | 128 | 283 |
| SD3500 | 496 | 240.0 | 125.6 | 268.6 | 8.5 | 11.5 | 128 | 283 |

Table 2. SD series dimension

## 3．Introduction


（4）（5）

## 【Version 1】General Model

Figure 4．SD general model front panel

（4）（5）
【Version 2】UL Model
Figure 5．SD UL model front panel


Figure 6．SD series rear panel

|  | Front Panel／Rear Panel |  |  |
| :--- | :--- | :---: | :--- |
| 1 | Power ON／OFF／REMOTE（Main）switch | 10 | AC output socket |
| 2 | Status LED | 11 | Reset Button |
| 3 | Dip Switch（S1～S8） | 12 | CAN2 Port（only to be used in parallel mode） |
| 4 | DC Input－ | 13 | CAN1 Port（only to be used in parallel mode） |
| 5 | DC Input＋ | 14 | LCM Port（Connection for LCD remote control |
|  |  |  | panel） |
| 6 | Chassis Ground | 15 | Green terminal（Remote and Parallel select） |
| 7 | AC Output | 16 | Remote／RS－232 port |
| 8 | By－pass AC Input | 17 | FAN |
| 9 | AC input circuit breaker |  |  |

Table 3．SD front panel／rear panel introduction

## 3－1．Power ON／OFF／REMOTE（Main）switch

A．Before installing the inverter，please ensure the main switch is in the OFF position．
B．Before using the remote unit，please ensure the main switch is in the REMOTE position．
C．Main switch ON／OFF will not control AC Grid input，therefore for any maintenances please remove the AC Grid connection to prevent damage of SD series，then turn off the Main switch to OFF position for maintenance service．

## 3－2．LED Indicator

| Green LED | LED Signal | Status |
| :---: | :---: | :---: |
| Solid |  | Power OK |
| Slow Blink |  | Power Saving |
| Intermittent Blink | $\square \square \square$ | Bypass |
| Orange LED | LED Signal | Status |
| Fast Blink | －ー ー ー－－－ | OVP |
| Slow Blink | ■ ■ ■ | UVP |
| Red LED | LED Signal | Status |
| Intermittent Blink | －－－－－－－－ | OTP |
| Fast Blink |  | OVP－Shut－down |
| Slow Blink | ローーーーーーーーロッ | UVP－Shut－down |
| Solid |  | OLP |
| Intermittent Blink | －－－－－－－ | Fan Failure |
| Intermittent Blink | －．．．－．．．－．．．－， | Component Failure |

Table 4．SD LED indicator

## 3-3. DIP Switch (S1~S8) Assignment



Table 5. DIP switch (S1~S8) PIN assignment

## 3-3-1. DIP switch set-up

| S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | Scenario |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 0 | X | X | X | X | X | X | AC output voltage : $100 \mathrm{VAC} / 200 \mathrm{VAC}$ |
| 1 | 0 | x | x | X | X | X | X | AC output voltage : $110 \mathrm{VAC} / 220 \mathrm{VAC}$ |
| 0 | 1 | X | X | X | X | X | X | AC output voltage : $115 \mathrm{VAC} / 230 \mathrm{VAC}$ |
| 1 | 1 | X | X | X | X | X | X | AC output voltage : $120 \mathrm{VAC} / 240 \mathrm{VAC}$ |
| X | X | 0 | X | X | X | X | X | AC output frequency : 50 Hz |
| X | X | 1 | X | X | X | X | X | AC output frequency : 60 Hz |
| X | X | X | X | X | X | 0 | X | Power saving mode setting (S4~S6); No master-slave in parallel |
| X | x | X | X | x | X | 1 | X | 3 Phase output setting (S4~S6) |
| X | X | X | x | X | X | X | 0 | Adjust function parameters via LCM port |
| X | X | X | X | X | X | X | 1 | Adjust function parameters via DIP switch |

$1=O N / 0=O F F$
Table 6. DIP switch set-up

## 3-3-2. Power Saving Mode

Power Saving Mode is adjustable and set by the Dip Switches,S4, S5 and S6 on the front panel. Example SD2500 : Saving set 2\%, the load is below 50W 10 sec . will into saving mode, more than 150 W or more leave saving mode.
A. Power device enter the saving mode

The rate power x setting \% = the threshold enter the power saving model In case the load less than threshold value 5 seconds, the power device will enter the saving mode.
B. Power device leaving saving mode(re-start)

Restart threshold $=$ rate power $\times$ setting $\% \times 2 \sim 3$
In case the power over the restart threshold, the power device will re-start and provide the AC power.

| S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | Scenario |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :--- |
| $X$ | $X$ | $X$ | 0 | 0 | 0 | 0 | $X$ | Power saving DISABLE <br> Go in power saving mode when output load is <br> under 2\% of rating power |
| $X$ | $X$ | $X$ | 1 | 0 | 0 | 0 | $X$ |  |
| $X$ | $X$ | $X$ | 0 | 1 | 0 | 0 | $X$ | Go in power saving mode when output load is <br> under 3\% of rating power <br> Go in power saving mode when output load is <br> under 4\% of rating power |
| $X$ | $X$ | $X$ | 1 | 1 | 0 | 0 | $X$ | $X$ |
| $X$ | $X$ | $X$ | 0 | 0 | 1 | 0 | $X$ | Go in power saving mode when output load is <br> under 5\% of rating power |
| $X$ | $X$ | $X$ | 1 | 0 | 1 | 0 | $X$ | Go in power saving mode when output load is <br> under 6\% of rating power <br> Go in power saving mode when output load is <br> under 7\% of rating power |
| $X$ | $X$ | $X$ | 0 | 1 | 1 | 0 | $X$ |  |
| $X$ | $X$ | $X$ | 1 | 1 | 1 | 0 | $X$ | Go in power saving mode when output load is <br> under $8 \%$ of rating power |

$1=\mathrm{ON} / 0=\mathrm{OFF}$
Table 7. Power saving mode set-up

## 3-3-3. S4~S6 Set-up for parallel application

| S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | Scenario |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| X | X | X | 0 | 0 | 0 | 1 | X | Master ( $0^{\circ}$ ); "R" Phase to be used for $1 \varnothing 3 \mathrm{~W}$ output in series connection(Master) or $3 Ø 4 \mathrm{~W}$ output connection("R" Phase) |
| X | X | X | 0 | 0 | 1 | 1 | X | Slave ( $0^{\circ}$ ) with current sharing to be used in parallel connection only |
| X | X | X | 0 | 1 | 1 | 1 | X | Slave $\left(180^{\circ}\right)$, to be used for $1 \varnothing 3 \mathrm{~W}$ output in series connection(L-NN-L) |
| X | X | X | 1 | 0 | 0 | 1 | X | Slave ( $-120^{\circ}$ ), "S" Phase to support "S" Phase be $\left(-120^{\circ}\right)$ in $3 \varnothing 4 \mathrm{~W}$ output connection |
| X | X | X | 1 | 0 | 1 | 1 | X | Slave (120ㅇ), "T" Phase to support "T" Phase be $\left(120^{\circ}\right)$ in $3 Ø 4 \mathrm{~W}$ output connection |
| X | X | X | 1 | 1 | 1 | 1 | X | Disable parallel function |

Table 8. Parallel application set-up

## 3-3-4. Parameter select: " S 8 " select SD's parameter setting by dip switch or LCM port

| Set Value | S8 |
| :--- | :--- |
| LCM port | 0 |
| DIP switch | 1 |

1=ON / 0=OFF
Table 9. Parameter select
3-4. DC Input - (please refer to DC wiring connections on p .17 )

3-5. DC Input + (please refer to DC wiring connections on p. 17)

## 3-6.Chassis Ground : Connect the wire \# 8 AWG to vehicle chassis



## WARNING!

Operating the inverter without a proper ground connection may cause electrical safety hazard.

3-7. AC Output (Please refer to hard wiring installation on $p$. 19)

## 3-8. By-pass AC input (please refer to hard wiring installation on $p$. 19)

## 3-9. AC input circuit breaker

The AC input circuit breaker protects the model from overload. When an overload condition exists, the circuit breaker stops supplying output AC grid power. To reset it, push the circuit breaker switch then the model will be back in normal operation. The source fault should be corrected before you reset it.

3-10. AC output socket (please refer to 4-2-3. on p. 22)
3-11. Reset Button (only to be used for Ethernet interface)
The Reset Button is to be used to resume the IP address to factory default value :
IP : 192.168.100.181
Subnet Mask : 255.255.255.0
3-12. CAN1 and CAN2 Port (only to be used in parallel mode)


Figure 8. CAN1 and CAN2 port

1. Before using parallel mode, you need to ensure the green terminal's parallel jump status is set to ON.
2. Use the RJ-45 line (RJ-45 network cable : parallel connection) to link one of the SD Series CAN1 (CAN2) port to the other CAN1 (CAN2) port.

| PIN\# | LCM port | CAN1 port | CAN2 port |
| :---: | :---: | :---: | :---: |
| 1 | CANH | CAN_H | CAN_H |
| 2 | CANL | CAN_L | CAN_L |
| 3 | P1 | Reserved | Reserved |
| 4 | VCC- | Reserved | Reserved |
| 5 | VCC+ | Reserved | Reserved |
| 6 | DIS | Reserved | Reserved |
| 7 | $5 V S-$ | RND | RND |
| 8 | $5 V S+$ | Reserved | Reserved |

Table 10. LCM, CAN1, CAN2 port : PIN number and signal description


## WARNING!

LCM port is for remote control connection only.
Please make sure the connection is correct. (CAN cable to CAN1 / CAN2 port, Remote cable to LCM port)
If CAN cable is connected to LCM port, or vice versa, the inverter will be damaged.


## 3-13. LCM Port

Connection for LCD remote control panel, you can set and display the SD-series operation status.


Figure 9. LCM port


Figure 10. LCM cable

| LCD Remote Control Panel |  | SD Series |
| :---: | :---: | :---: |
| PIN Num. | Signal Description | PIN Num. |
| 1 | CANH | 1 |
| 2 | CANL | 2 |
| 3 | PON | 3 |
| 4 | VCC- | 4 |
| 5 | VCC+ | 5 |
| 6 | DIS | 6 |
| 7 | $5 V S-$ | 7 |
| 8 | $5 V S+$ | 8 |

Table 11. PIN number and signal description for LCD remote control
Note
The cables should be as short as possible (less than 32.8 feet / 10 meters) so that they can handle the signal.

## 3-14. Green terminal (Remote and Parallel select)



Figure 11. Green terminal

| PIN \# | PIN Assignment |
| :---: | :---: |
| 1 | GND |
| 2 | -ENB |
| 3 | ENB |
| 4 | Parallel Jump |
| 5 | Parallel Jump |

Table 12. Green terminal PIN assignment

3-14-1. Parallel Jump Function (please refer to section 5 for further detailed info.)

1. Before installing the inverter, you need to ensure the main switch is in the OFF position.
2. Use $20 \sim 24$ \#AWG wire to connect the parallel jump terminal.

3-14-2. Remote Control Function

1. Before installing the inverter, please ensure that the main switch is in the OFF position.
2. Before using the remote control terminal, please ensure the main switch is in the REMOTE position.
3. Use $20 \sim 24$ \#AWG wire to connect the remote control terminal.
4. Remote control ON/OFF inverter setup status.


Figure 12. Remote control function setting


Note
The above 4 methods can be used to turn ON/OFF.

## 3-15. RS-232 Port

RS-232 Port : Serial port monitoring and control through computer's interface.


| Figure 14. RS-232 cable |  |  |  |
| :---: | :---: | :---: | :---: |
| SD Series |  | Computer |  |
| PIN Num. | Signal Description | PIN Num. | Signal Description |
| 1 | Not used | 1 | Not used |
| 2 | GND | 5 | GND |
| 3 | RXD | 3 | TXD |
| 4 | TXD | 2 | RXD |
| 5 | Not used |  | Not used |
| 6 | Not used |  | Not used |

Table 13. The connection between SD series and computer
The connection between this SD-series and the computer is as follows :
SD series
Computer

GND
Figure 15.
The connection between SD series and computer

## 3-16. Fan Ventilation

The rear panel must keep the distance at least 1 inch from any surrounding items.

## 3-17. Protections Features

| Model | DC Input (VDC) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Over Voltage |  | Over Voltage | Under Voltage | Under Voltage |  |
|  | Shut-down | Restart | Alarm* | Shut-down | Restart | Alarm |
| 12 V | $16 \pm 0.25$ | $15 \pm 0.25$ | $15.5 \pm 0.25$ | $10 \pm 0.25$ | $12.5 \pm 0.25$ | $10.5 \pm 0.25$ |
| 24 V | $32 \pm 0.5$ | $30 \pm 0.5$ | $31 \pm 0.5$ | $20 \pm 0.5$ | $25 \pm 0.5$ | $21 \pm 0.5$ |
| 48 V | $64 \pm 1$ | $60 \pm 1$ | $62 \pm 1$ | $40 \pm 1$ | $50 \pm 1$ | $42 \pm 1$ |

[^0]
## 4.DC Wiring Connections

Follow the instructions to connect the battery cables to the DC input terminals of the Inverter. The cable should be as short as possible (less than 6 feet / 1.8 meters ideally) so that it can handle the required current in accordance with the electrical codes or application regulations. Inappropriate length of cables will reduce the inverter performance such as poor surge capability, frequent low-input voltage warnings, and shut-down. When under voltage protect condition, please check the cable size and specification (length and diameter should conform to manual requirements) between battery and SD model.

The longer or the narrower the cable is, the more the voltage drops. Increasing your DC cable diameter will help to improve the situation will help improve the situation.

The following are recommended cable diameter for the best performance of the inverter. (Applies to both 120 V and 230 V versions)

| Model No. | Wire AWG | Inline Fuse |
| :---: | :---: | :---: |
| SD2500-112 / 212 | $\#$ 3/0 | 350 A |
| SD2500-124 / 224 | $\# 1$ | 175 A |
| SD2500-148 / 248 | $\# 4$ | 90 A |
| SD3500-112 / 212 | $\# 4 / 0$ | 500 A |
| SD3500-124 / 224 | $\# 0$ | 250 A |
| SD3500-148 / 248 | $\# 2$ | 125 A |
| SD2500-112 / 212 | $\# 3 / 0$ | 350 A |

Table 15. SD series wiring cable diameter and inline fuse
Connect the cables to the power input terminals on the front panel of the inverter. The red terminal is positive (+) and black terminal is negative (-).

Insert the cables into the terminals and tighten the screw to clamp the wires securely.

## WARNING!

1. Make sure all the DC connections are tight (torque to 11 ft -lbs, 15 Nm Max.). Loose connections could overheat and result in a potential hazard.
2. The installation of a fuse must be on the positive cable. Failure to place a fuse on " + " cables running between the inverter and battery may cause damage to the inverter and will void warranty.

Also, only use high quality copper wire and keep the cable length short - maximum of 3-6 feet.


Do not place anything between battery cable lug and terminal surface.
Assemble exactly as shown.

Figure 16. Battery cabling

## WARNING!

During the first installation, it is normal to experience a small spark is a normal phenomenon because the internal capacitors charging. Do not be concerned.

## 4-1. DC Input Terminals

Connect DC input terminals to $12 \mathrm{~V} / 24 \mathrm{~V} / 48 \mathrm{~V}$ battery or other power sources.
[ + ] represents positive, [ - ] represents negative. Reverse polarity connection can blow the internal fuse and may damage the inverter permanently.

| Model | DC Input Voltage |  |
| :---: | :---: | :---: |
|  | Minimum | Maximum |
| 12 V | 10 V | 16 V |
| 24 V | 20 V | 32 V |
| 48 V | 40 V | 64 V |

Table 16. SD series DC input voltage range

## 4－2．Hard－wire Installation

4－2－1．SD series provides the flexibility of hard－wire connection，and this function will make external control panel wiring easier．

## 【Version 1】General model

## Step 1.

Remove the four screws of AC wiring compartment and pull it out with care．


Figure 17．General model setting－Step 1

## Step 2.

Pull the line through the snap bushing of the AC wiring compartment cover then follow below picture operation．


Figure 18．General model setting－Step 2
100VAC～120VAC／200VAC～240VAC System


GND
施 AC INPUT／L
$=\theta_{0}^{\circ}$ AC INPUT／N
目 AC OUTPUT／N
$=\theta$ AC OUTPUT／L


Figure 19．General model setting－AC wiring


## Note

The only difference between 110 V and 220 V is within the AC Input breaker L or N and thus will not affect the wiring configuration．

## $\bar{Z}$

## Note

In case that user wants to install the earth－leakage circuit breaker，COTEK recommend time delay type．The major specification of the circuit breaker is as following ：
Earth－leakage current ：100mA， $300 \mathrm{~mA}, 500 \mathrm{~mA}$
Time ： 0.45 second， 1 second， 2 seconds
Recommend model ：NV50－SN，Time delay type of Shihin Electric

## 【Version 2】UL model

## Step 1.

Use the screwdriver to remove the cover．


Figure 20．UL model setting－Step 1

## Step 2.

AC cable pass through the ring．Wire the AC cable on the terminal．


Figure 21．UL model setting－Step 2


Figure 22. UL model setting-AC wiring

## Step 3.

Use the screwdriver to fix the cover.


Figure 23. UL model setting-Step 3
4-2-2. Connect $A C$ output and $A C$ input wiring to the $S D$ series terminals.
Please take the following information as your reference.

| Terminal |  | Wire Color | Wire Length / Gauge |
| :---: | :---: | :---: | :---: |
| AC OUTPUT | Line (L) | Black |  |
|  | Neutral (N) | White | 200-240VAC $: 12 A W G ~$ <br> $102-120 V A C ~$ 8AWG |

Table 17. Wire Color / Wire Length / Wire Gauge

## CAUTION!

It is advised that all the electrical installation should conform to the local electrical codes and should be carried out by a certified technician.

When the unit is feeding the internally inverted voltage, the current carrying conductors connected to the " L " and " N " terminals of the AC output will be isolated from the metal chassis of the inverter. Hence, during this condition, when the metal chassis of the inverter is connected to the earth ground, the " N " terminal of the AC output will not be grounded (bonded) to the earth ground. Under this condition, the " $N$ " terminal of the AC output will not be a Neutral in the true sense. Do not touch this terminal as it will be at an elevated voltage (almost half the value the AC output voltage) with respect to the metal chassis / earth ground and may produce an electrical shock when touched!

When the unit is transferring power from the AC input source, the grounding condition of the " N " terminal of the AC output will be the same as the condition of the " N " terminal of the AC input source. If the AC input source is the power supplied from the utility, the " $N$ " terminal would be a Neutral in the true sense. It will normally be bonded to the earth ground and will read almost 0 V with respect to the earth ground. In this case, touching this terminal will not be a shock hazard.

4-2-3. AC output and terminals of the SD series, you can use both the front wiring terminal and outlet, as they are connected in parallel.

(1) UL458 only support 112 and 124 model.
(2) Only CE (200-240V Type) and FCC (100-120V Type) standard approve.

Table 18. AC input socket / Wiring terminal
Note
In case the load current over the outlet rated current, please use the hared wire terminal next to the outlets.

Note
Recommend GFCI connector :

- HUBBELL INC WIRING DEVICE DIV, Type GF20 and GFRST20. Rated 125V, 20A
- COOPER WIRING DEVICES, Type VGF20 and SGF20. Rated 125V, 20A
- LEVITON MFG CO INC, Type 7899-W and GFNT2. Rated 125V, 20A
- PASS \& SEYMOUR INC, Type 2097. Rated 125V, 20A


## WARNING!

When using full power, it is recommended to use the wiring terminal.

## 5. Parallel Mode

## 5-1. Prepare for Parallel Usage

1. Before setting, you need to ensure that the main switch is "OFF".
2. Before using the parallel function, you need to set the parallel jump of the green terminal the status of which must be "ON", if the between in another SD is set to "OFF" which is termination resistors.


Figure 24. Parallel jump setting

Example : If three SD inverters are paralleled, setup green terminal.

| Parallel | Unit 1 | Unit 2 | Unit 3 |
| :---: | :---: | :---: | :---: |
| Parallel Jump | ON | OFF* | ON |

*If you parallel $N$ units, the first (unit 1) and the last unit (unit $N$ ) must set parallel jumper in ON position.

Table 19. Jumper setting for parallel usage


Figure 25. Sample - three SD inverters are paralleled


Note
The simple method to determine the terminal resistor: No need to set the terminal resistor when CAN1 and CAN2 port have wiring.


## Note

SD series can be used for $\mathrm{N}+1(\mathrm{~N} \leqq 14)$ redundancy and the ability of enlarge the capacity (Users can install maximum 15 units of inverters together in parallel in order to provide the power expansion).
3. Before using the parallel function, you need to set voltage and frequency of all units' DIP switches to the same selection (refer to section 3-3).
4. Check RJ-45 line connects already.
5. SD series based on master-slave architecture and support auto master function. User only set one SD parameters and other SDs will follow the master SD setting.

## 5-2. Industry Applications

| Type | 1Ф2W | 1Ф3W | 3Ф4W |
| :---: | :---: | :---: | :---: |
| Drawing |  | The SD series create 1Ф3W power system, L1-L2 Voltage is L1-N double. |  |
| Example | Example : <br> SD2500-124 set output 100V / $50 \mathrm{~Hz}$ <br> The L-N : 100V / 50Hz | Example : <br> SD2500-124 set output 100V / <br> 50 Hz <br> The L1-N : 100V / 50Hz | Example : <br> SD2500-124 set output 100V / 50 Hz <br> The phase voltage is $100 \mathrm{~V} /$ $50 \mathrm{~Hz}(\mathrm{~L} 1-\mathrm{N}, \mathrm{~L} 2-\mathrm{N}, \mathrm{~L} 3-\mathrm{N})$ <br> The line voltage:L1-L2, L1-L3, L2-L3 ~ 173V/50Hz |


| Type | 1Ф2W | 1Ф3W | 3Ф4W |
| :---: | :---: | :---: | :---: |
| Waveform |  |  |  |
| Battery <br> Set up |  |  |  |
|  | Transfer Switch STS <br> module : Single < 4ms; N+1 <br> \& 1P3W \& 3P4W < 6ms | Do not support N+1 operation, maximum of two SD inverters, THD < 4\% | Do not support N+1 operation, maximum of three SD inverters, THD < 4\% <br> *DIP switch (S7) must be set to "1" * |
| DIP <br> Switch <br> Setting | Refer to 5-2-1. / 5-2-2. | Refer to 5-2-3. | Refer to 5-2-4. |
| Wiring Diagram | Refer to Figure 30. / Figure 31. | Refer to Figure 32. | Refer to Figure 33. |

Table 20. Parallel industry applications

## 5-2-1. 1Ф2W Switch Table

|  | Master | Slave $\mathbf{0}^{\circ}$ |
| :---: | :---: | :---: |
| S4 | 0 | 0 |
| S5 | 0 | 0 |
| S6 | 0 | 1 |
| S7 | 1 | 1 |
| S8 | 1 | 1 |

Table 21. 1Ф2W switch table

5-2-2. 1Ф2W Switch Table - Auto Master

|  | Auto Master |
| :--- | :---: |
| S4 | 0 |
| S5 | 0 |
| S6 | 0 |
| S7 | 0 |
| S8 | 1 |
| Table 22. 1Ф2W switch table - auto master |  |

## 5-2-3. 1Ф3W Switch Table

|  | Master | Slave $\mathbf{1 8 0}^{\boldsymbol{\circ}}$ |
| :---: | :---: | :---: |
| S4 | 0 | 0 |
| S5 | 0 | 1 |
| S6 | 0 | 1 |
| S7 | 1 | 1 |
| S8 | 1 | 1 |

Table 23. 1Ф3W switch table

5-2-4. 3Ф4W Switch Table

|  | L1 Master | $\mathbf{L 2} \mathbf{- 1 2 0}{ }^{\circ}$ Slave | $\mathbf{L 2} \mathbf{+ 1 2 0}{ }^{\circ}$ Slave |
| :---: | :---: | :---: | :---: |
| S4 | 0 | 1 | 1 |
| S5 | 0 | 0 | 0 |
| S6 | 0 | 0 | 1 |
| S7 | 1 | 1 | 1 |
| S8 | 1 | 1 | 1 |

Table 24. 3Ф4W switch table

## 5-3. Wiring for Parallel Usage

## 5-3-1. Connection method

1. AC OUTPUT connector setup : Line link to Line; Neutral link to Neutral.
2. AC INPUT connector setup: Line link to Line; Neutral link to Neutral.
3. Battery connector setup : POS+ link to POS+; NEG - link to NEG -

## 5-3-2. Connection Diagram




Figure 27. Connection Diagram_2


Figure 28. Connection Diagram_3

## 5-4. AC Wiring Diagram



Figure 29. SD series front panel introduction


Figure 30. 1Ф2W parallel AC wiring diagram

【1Ф2W Auto Master－Wiring Diagram】


Figure 31．1Ф2W parallel AC wiring diagram－auto master


## Note

Auto master can be operated under 1Ф2W mode．
Under 1Ф2W auto master mode，please set up the inverter by Ethernet or Remote control CR－10．


Note
1Ф2W system parallel Max． $\mathrm{N}+1=16$


## Note

If you parallel N units，the first（unit 1）and the last unit（unit N ）must set parallel jumper in ON position．

【1Ф3W - Wiring Diagram】


Figure 32. $1 \Phi 3 W$ parallel $A C$ wiring diagram

【3Ф4W — Wiring Diagram】


Figure 33．3Ф4W parallel AC wiring diagram

| Model | Connection／ Output VAC | 100V | 110V | 115V | 120V | 200V | 220V | 230V | 240V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| SD2500 | L1－to－L2 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L2－to－L3 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L3－to－L1 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L1－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |
|  | L2－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |
|  | L3－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |
| SD3500 | L1－to－L2 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L2－to－L3 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L3－to－L1 | 173 | 191 | 199 | 208 | 346 | 381 | 398 | 416 |
|  | L1－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |
|  | L2－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |
|  | L3－to－N | 100 | 110 | 115 | 120 | 200 | 220 | 230 | 240 |

Table 25．Connection \＆output VAC under 3Ф4W

## 5-5. Remote command for the parallel connection

There are two ways for parallel connection remote setting:1. RS-232, 2. CAN-Bus. The RS-232 communication protocol not support broadcast function. In case of the remote control use the RS-232 port, please follow the setting steps for the SD setting.

RS-232 remote communication setting :

1. Select one SD to be the Master and follow the setting :

| Scenario | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Master | X | X | X | 0 | 0 | 0 | 1 | X |

Table 26. RS-232 remote communication setting
2. Please make sure the RS-232 communication cable connect to Master unit.


## WARNING!

There is only one master in the system.

## 5-6. Remove Parallel Connection

1. Turn off the power.
2. Remove the RJ-45 cable (parallel connection signal cable).
3. Remove the AC parallel connection cable.
4. Remove the DC parallel connection cable.

## 6.RS-232 Command

## 6-1. RS-232 command introduction

6-1-1. RS-232 command :
Command format :
This unit uses high-level language commands with a CR (ODH) and LF (OAH) as the end of the command.
The system would interpret and execute the command only after these two characters are received. After the unit execute the command, it would send a response string to the computer. The response string is as follows :
= > CR LF : Command executed successfully ? > CR LF : Command error, not accepted ! > CR LF : Command correct but execution error (e.g. parameters out of range).
If the command needs any information from the unit, the unit would send the information back to the computer (with CR and LF) and then send the response string to the computer.

6-1-2. RS-232 Command format :
This unit supports the following command format.
There should always be a CR (ODH) and a LF (OAH) appended to the command while sending the command to this unit.

| Command | Function | Command | Function |
| :--- | :--- | :--- | :--- |
| POWER 1 | Power on | VINV? | Show voltage of SD |
| POWER 0 | Power off | IINV? | Show current of SD |
| *RST | Recovery default setting | VGRID? | Show voltage of grid |
| FRQ? | Show frequency of SD | VBAT? | Show voltage of battery |
| PINV? | Show power of SD |  |  |

Table 27. RS-232 command table
Note : A space (ASCII code 20H) is needed between Power and <value> Example : Command to query the Functions No : Format : FUNC? After "Enter", the unit's "Function Code" appears on the PC screen

6-1-3. Command for accessing Setup Menus and adjusting values :

| <Function Code> | Setting Menu | <Function Code> | Setting Menu |
| :---: | :---: | :---: | :---: |
| FUNC0 | OVP Setting | FUNC10 | Shut-down retry |
| FUNC1 | OVP Recovery | FUNC11 | Saving Level |
| FUNC2 | UVP Setting | FUNC12 | Saving Interval |
| FUNC3 | UVP Recovery | FUNC13 | Bypass Relay |
| FUNC4 | UV Alarm | FUNC14 | LCD Contrast |
| FUNC5 | O/P Voltage | FUNC15 | LCD Auto-off |
| FUNC6 | RS-232 Baud rate | FUNC16 | Buzzer Setting |
| FUNC7 | O/P Frequency | FUNC17 | Alert Setting |
| FUNC8 | Sync Frequency | FUNC18 | Language |
| FUNC9 | Overload Alarm |  |  |

Table 28. Command for accessing setup menus and adjusting values

1. Select the Setup Menus with the help of Function Codes :

Format : FUNC <Function Code>
After "Enter", the Setup Menu for the Function Code will be called.
The <Function Code>= 0~18
2. Command to query the Functions No:

Format : FUNC?
After "Enter", the unit's "Function Code" appears on the PC screen.
3. Command to query the set value of the Function :

Format : SETT?
After "Enter", the existing set value of the function appears on the PC screen.
4. Command to set or adjust the value of the Function :

Format : SETT <value>
After "Enter", the new value of the Function is set Choose the <value> of the function.

6-1-4. Setting interface

1. OVP Setting <FUNC0> : Set the Over Voltage Protection (OVP) and shutdown.
Default = 16 VDC @ 12V Model, 32 VDC @ 24V Model, 64 VDC @ 48V
Model

| Model | Setting value range |
| :---: | :---: |
| 12 V | $15 \mathrm{VDC} \sim 16 \mathrm{VDC}$ |
| 24 V | $30 \mathrm{VDC} \sim 32 \mathrm{VDC}$ |
| 48 V | 60 VDC $\sim 64 \mathrm{VDC}$ |

2. OVP Recovery <FUNC1> : When the DC input voltage is higher than the OVP setting, the SD-series shuts-down; once the input voltage falls below the set OVP value, the SD-series will automatically restart.
Default = 15 VDC @ 12V Model, 30 VDC @ 24V Model, 60 VDC @ 48V Model

| Model | Setting value range |
| :---: | :---: |
| 12 V | $13 \mathrm{VDC} \sim 15 \mathrm{VDC}$ |
| 24 V | $26 \mathrm{VDC} \sim 30 \mathrm{VDC}$ |
| 48 V | $52 \mathrm{VDC} \sim 60 \mathrm{VDC}$ |

Table 30. OVP Recovery <FUNC1>
3. UVP Setting <FUNC2> : Setting Under Voltage Protection (UVP) and Shut-down on the inverter operation.
Default = 10 VDC@ 12V Model, 20 VDC @ 24V Model, 40VDC @ 48V Model

| Model | Setting value range |
| :---: | :---: |
| 12 V | $10 \mathrm{VDC} \sim 11 \mathrm{VDC}$ |
| 24 V | $20 \mathrm{VDC} \sim 22 \mathrm{VDC}$ |
| 48 V | $40 \mathrm{VDC} \sim 44 \mathrm{VDC}$ |

Table 31. UVP Setting <FUNC2>
4. UVP Recovery <FUNC3> : When the DC input voltage is below the set UVP value, the SD-series shuts-down; Once the input voltage rises above the set UVP value, the SD-series will automatically restart.
Default = 12.5VDC @ 12V Model, 25 VDC @ 24V Model, 50VDC @ 48V Model

| Model | Setting value range |
| :---: | :---: |
| 12 V | $11.5 \mathrm{VDC} \sim 13.5 \mathrm{VDC}$ |
| 24 V | $23 \mathrm{VDC} \sim 27 \mathrm{VDC}$ |
| 48 V | $46 \mathrm{VDC} \sim 54 \mathrm{VDC}$ |

Table 32. UVP Recovery <FUNC3>
5. UV Alarm <FUNC4> : Setting Under Voltage (UV) alarm. When the input voltage is lower than the set value, the SD-series will sound a "beep" to remind you that the unit is going to shut-down.
Default = 10.5 VDC @ 12 V Model, 21 VDC @ 24 V Model, 42 VDC @ 48 V Model

| Model | Setting value range |
| :---: | :---: |
| 12 V | $10.5 \mathrm{VDC} \sim 11.5 \mathrm{VDC}$ |
| 24 V | $21 \mathrm{VDC} \sim 23 \mathrm{VDC}$ |
| 48 V | $42 \mathrm{VDC} \sim 46 \mathrm{VDC}$ |

Table 33. UV Alarm <FUNC4>

Note
The value of the voltage set for the "UV Alarm" should be equal to or higher than the value set for "UVP" or else the unit will shut-down without any audible warning.
6. O/P Voltage <FUNC5> : Setting the SD-series output voltage on the inverter operation.
Default = 110 VAC @ 110 V Model, 230 VAC @ 230 V Model

| Model | Setting value range |
| :---: | :---: |
| 110 V | 97 VAC $\sim 123$ VAC |
| 230 V | 194 VAC $\sim 246$ VAC |

Table 34. O/P Voltage <FUNC5>
7. RS-232 Baud rate <FUNC6> :

Default setting: 4800

| Setting Menu | SETT<value> |  |
| :---: | :---: | :---: |
|  | 0 | 1200 |
| RS-232 | 1 | 2400 |
| Baud rate | 2 | 4800 |
|  | 3 | 9600 |
|  | 4 | 19200 |

Table 35. RS-232 Baud rate <FUNC6>
8. O/P Frequency <FUNC7> : Setting the SD-series output frequency on the inverter operation.
Default = 60 Hz @ 110 V Model, $50 \mathrm{~Hz} @ 230$ V Model.

| Model | Setting value range |
| :---: | :---: |
| 110 V | $47 \mathrm{~Hz} \sim 63 \mathrm{~Hz}$ |
| 230 V | $47 \mathrm{~Hz} \sim 63 \mathrm{~Hz}$ |

Table 36. O/P Frequency <FUNC7>
9. Sync Frequency <FUNC8> : If a generator is distorted. The output waveform (too low frequency) is used as AC source, the allowed frequency window for the incoming AC power can be enlarged.

## Example1:

AC input $=230$ VAC $/ 50 \mathrm{~Hz}$, User setting Value $=7 \mathrm{~Hz}$
When the SD-series "Output frequency" is within The Range of $43 \mathrm{~Hz} \sim 57 \mathrm{~Hz}$, the internal transfer relay will close. When the output frequency is less than 43 Hz or more than 57 Hz , the internal transfer relay will still open.

## Example2:

When user setting value= Disable, the SD-series "Output frequency" is within the range of $47 \mathrm{~Hz} \sim 63 \mathrm{~Hz}$, the internal transfer relay will close.
Default= 7Hz

| Model | Setting value range |
| :---: | :---: |
| 110 V | $0 \sim 7 \mathrm{~Hz}$ |
| 230 V | $0 \sim 7 \mathrm{~Hz}$ |

Table 37. Sync Frequency <FUNC8>
10. Overload Alarm <FUNC9> : Set the overload alarm. When the SD-series output power is higher than the set value, the SD-series will sound a "beep" to remind you that the unit is going to shut-down. At the same time, the internal Dry Contact Relay will open/close.
Default = 104\%
Setting range $=50 \% \sim 110 \%$
11. Shut-down retry <FUNC10> : When SD-series is shut-down under OVP, UVP, Overload or short circuit conditions, the inverter will automatically try to restart according to the setting value.
Default = 5
Setting range : 0~15
12. Saving Level <FUNC11> : Setting the SD-series to power saving to reduce consumption from the batteries.

Default = 0
Setting range $=0 \sim 7$

| Setting Value | Status |
| :---: | :---: |
| 0 | Default |
| 1 | $2 \%$ |
| 2 | $3 \%$ |
| 3 | $4 \%$ |
| 4 | $5 \%$ |
| 5 | $6 \%$ |
| 6 | $7 \%$ |
| 7 | $8 \%$ |

Table 38. Saving Level <FUNC11>
13. Saving Interval <FUNC12> : When SD-series inverter enters power saving mode, it will detect AC Load periodically.
Default $=2.0$ Seconds
Setting range $=1.0 \mathrm{~S} \sim 2.0 \mathrm{~S}$

If the AC Load is 3 times higher than Saving Level, inverter will recover and output normally to AC Load.
14. Bypass Relay <FUNC13> : The setup is provided in one of the following two ways.
On-line Mode or Off-line Mode ( Exacting, Normal, Haphazard).
Default = Normal (Off line).

| Model | SETT <value> | Transfer Relay <br> Switching Feature |
| :---: | :---: | :--- |
| Haphazard | 0 | The transfer relay will switch "ON" or "OFF". <br> Conformance to, phase and frequency <br> synchronization will not be considered. <br> The transfer relay will be "ON" if AC input (Grid) <br> power is available. The DC-AC inverter will remain <br> synchronized and Phase with the incoming AC power <br> (Grid). The relay will NOT switch off if the grid <br> frequency is beyond the range set under Sync |
| Normal | Frequency window. |  |
| Exacting | The transfer relay will switch "ON" or "OFF" based on <br> conformance to, the Phase and Sync Frequency. |  |
| On-line | Always supplied by battery until which has run down <br> (UVP) then switch to grid. |  |

Table 39. Bypass Relay <FUNC13>


Figure 34. Frequency and phase synchronous

| Transfer-Time Table |  |  |
| :---: | :---: | :---: |
| Mode Transfer Switch | ATS | STS |
| Haphazard | Inverter to utility AC: 8~10ms.; Utility AC to inverter: 16~50ms. | Frequency is synchronized: < 4ms.; <br> Frequency is not synchronized: Inverter to utility AC: < 4ms.; <br> Utility $A C$ to inverter: $16 \sim 50 \mathrm{~ms}$. |
| Normal | Inverter to utility AC: 8~10ms.; Utility AC to inverter: 16~25ms. | $<4 \mathrm{~ms}$ |
| Exacting | Inverter to utility AC: 8~10ms.; Utility AC to inverter: 16~50ms. | Inverter to utility AC: < 4ms.; Utility AC to inverter: 16~50ms. |
| Online | Inverter to utility AC: 8~10ms.; Utility AC to inverter: 16~25ms. | $<4 \mathrm{~ms}$ |

Table 40. SD series transfer time
15. LCD contrast <FUNC14> : Sets the LCD screen contrast.

Default = 50\%
Setting range $=0 \% \sim 100 \%$

| Setting Menu | Status <value> |
| :---: | :---: |
| LCD Contrast | $0 \sim 100$ |

Table 41. LCD contrast <FUNC14>
16. LCD Auto-off <FUNC15> : Sets the LCD screen backlight auto off timer.

Default $=120$ seconds
Setting range $=0 \sim 120$ seconds.

| Setting Menu | Status <value> |
| :---: | :---: |
| LCD Auto-off | $0 \sim 120$ |

Table 42. LCD Auto-off <FUNC15>
17. Buzzer setting <FUNC16> : Set the LCD remote control for the buzzer sound

Default = MSG, Alert, SHDN
Setting range $=0 \sim 7$

| Setting Menu | SETT <value> | Buzzer (Beep sound) |
| :---: | :---: | :---: |
|  | 0 | Disable |
|  | 1 | SHDN |
|  | 2 | Alert |
| Buzzer Setting | 3 | Alert , SHDN |
|  | 4 | MSG |
|  | 5 | MSG , SHDN |
|  | 6 | MSG , Alert |
|  | 7 | MSG , Alert , SHDN |

Table 43. Buzzer setting <FUNC16>
18. Alert Setting <FUNC17> : When alert occurs, the internal dry contact relay will open/close.
Default = Alert, SHDN
Setting range $=0 \sim 3$

| Setting Menu | SETT (RS-232) | Alert (LCD) |
| :---: | :---: | :---: |
| Buzzer Setting | 0 | Disable |
|  | 1 | SHDN |
|  | 2 | Alert |
|  | 3 | Alert , SHDN |

Table 44. Alert Setting <FUNC17>
19. Language <FUNC18> : The SD-series have different languages available and are selectable.
Default = English
Setting : English / Italian / Spanish / French / German

| Model | Setting value |
| :---: | :---: |
| English | 0 |
| Italian | 1 |
| Spanish | 2 |
| French | 3 |
| German | 4 |

Table 45. Language <FUNC18>

## 7.Troubleshooting

| Problems and Symptoms | Possible Cause | Solutions |
| :--- | :--- | :--- |
| A. Power status red light is <br> blinking fast. | Over input voltage. (OVP) | Check input voltage. <br> Reduce input voltage. |
| B. Power status red light is <br> Blinking slowly. | Low input voltage. (UVP) | Recharge battery. Check connections <br> and cables. |
| C. Power status red light is <br> blinking Intermittently. | Thermal shut-down. (OTP) | Improve ventilation. Make sure <br> ventilation, shafts of the inverter are <br> not obstructed. Lower ambient <br> temperature. |
| D. Power status is solid red | Short circuit. <br> Wiring error. <br> Over Loading (OLP) | Check AC wiring for short circuit. <br> Reduce load. |

Table 46. SD series Troubleshooting

## 8. Warranty

We guarantee this product against defects in materials and workmanship for a period of 24 months from the date of purchase. Please contact with your local COTEK authorized distributor for RMA (Return material Authorization) service. Please note that COTEK will ensure our products are operational before delivery and the warranty service is offered to the unit which has defect caused under normal use, in the judgment of COTEK's technician. The warranty is null and void under the following circumstances :
(a) If the unit has been damaged through abuse, misuse, negligence (such as bumping, wetting), fault voltage supply, air/water pollution accidents and natural calamities.
(b) If the serial number has been altered, effaced or removed.

## CロTEに

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[^0]:    *OVA only LED prompt, no beeper alarm.

