# OPTI-Solar

**SP Efecto & Brilliant RS232 communication Protocol**

**RJ45 to RS232 cable between computer and device**



The connection between P1 and P2

| P1 | wire color | P2 | Function |
|----|-----------|----|---------| 
| 1 | white and orange | 2 | TXD |
| 2 | blue | 3 | RXD |
| 8 | white and green | 5 | GND |
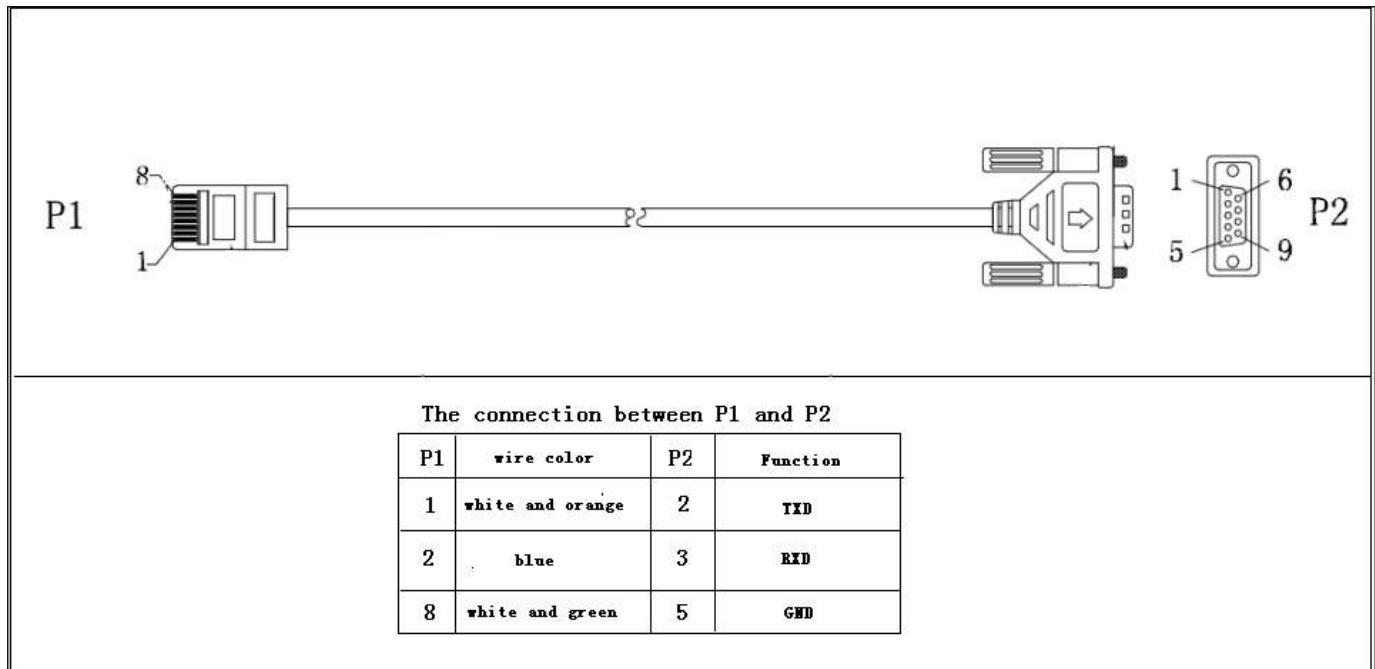
# 1  Communication format

| Baud rate | Start bit | Data bit | Parity bit | Stop bit |
|-----------|-----------|----------|------------|----------|
| 2400 | 1 | 8 | N | 1 |

# 2  Inquiry Command

## 2.1  QPI<cr>: Device Protocol ID Inquiry

Computer: QPI<CRC><cr>

Device: (PI<NN> <CRC><cr>

N is an integer number ranging from 0 to 9.

Function: To request the device Protocol ID.

Protocol ID distribution: 30 for this model.

## 2.2  QID<cr>: The device serial number inquiry

Computer: QID <CRC><cr>

Device: (XXXXXXXXXXXXXX <CRC><cr>

## 2.3  QVFW<cr>: Main CPU Firmware version inquiry

Computer: QVFW<CRC><cr>

Device: (VERFW:<NNNNN.NN><CRC><cr>

<N> is a HEX number from 0...9 or A…F.

Example:

Computer: QVFW<CRC><cr>

Device: (VERFW:00123.01<CRC><cr>

00123: firmware series number；01：version

## 2.4  QVFW2<cr> :Another CPU Firmware version inquiry

Computer: QVFW2<CRC><cr>

UPS: (VERFW2: <NNNNN.NN><CRC><cr>

<N> is a HEX number from 0...9 or A…F.

## 2.5  QPIRI<cr>: Device Rating Information inquiry

Computer: QPIRI<CRC><cr>

Device: (BBB.B CC.C DDD.D EE.E FF.F HHHH IIII JJ.J KK.K JJ.J KK.K LL.L O PP Q0 O P Q R SS T U<CRC><cr>

|   | Date | Description | Notes |
|---|------|-------------|-------|
| A | ( | Start byte | |
| B | BBB.B | Grid rating voltage | B is an integer ranging from 0 to 9. The units is V. |
| C | CC.C | Grid rating current | C is an Integer ranging from 0 to 9. The unⅰts is   A. |
| D | DDD.D | AC output rating voltage | D is an Integer ranging from 0 to 9. The units is V. |
| E | EE.E | AC output rating frequency | E is an Integer ranging from 0 to 9. The units is Hz. |
| F | FF.F | AC output rating current | F is an Integer ranging from 0 to 9. The unit is A. |
| H | HHHH | AC output rating   apparent power | H is an Integer ranging from 0 to 9. The unit is VA. |
| I | IIII | AC   output   rating   active power | I is an Integer ranging from 0 to 9. The unit is W. |
| J | JJ.J | Battery rating voltage | J is an Integer ranging from 0 to 9. The units is V. |
| K | KK.K | Battery re-charge voltage | K is an Integer ranging from 0 to 9. The units is V. |

| l | JJ.J | Battery under voltage | J is an Integer ranging from 0 to 9. The units is V. |
|---|---|---|---|
| M | KK.K | Battery bulk voltage | K is an Integer ranging from 0 to 9. The units is V. |
| N | LL.L | Battery float voltage | L is an Integer ranging from 0 to 9. The units is V. |
| O | O | Battery type | 0: AGM<br>1: Flooded<br>2: User |
| P | PP | Current max AC charging current | P is an Integer ranging from 0 to 9 The units is A. |
| Q | Q0 | Current max charging current | Q is an Integer ranging from 0 to 9. The units is A. |
| O | O | Input voltage range | 0: Appliance(90Vac ~ 280Vac)<br>1: UPS(170Vac ~ 280Vac) |
| P | P | Output source priority | 0: Utility first<br>1: Solar first<br>2: SBU first |
| Q | Q | Charger source priority | 0: Utility first<br>1: Solar first<br>2: Solar + Utility<br>3: Only solar charging permitted |
| R | R | Reserved | |
| S | SS | Machine type | 01: Off Grid; |
| T | T | Reserved | Only valid for 4kVA and 5kVA model |
| U | U | Output mode | Only valid for 4kVA and 5kVA model<br>00: single machine output<br>01: parallel output<br>02: Phase 1 of 3 Phase output<br>03: Phase 2 of 3 Phase output<br>04: Phase 3 of 3 Phase output |
| V | VV.V | Battery re-discharge voltage | Only valid for 4kVA and 5kVA model<br>V is an Integer ranging from 0 to 9. The units is V. |

## 2.6 QFLAG<cr>: Device flag status inquiry

ExxxDxxx is the flag status. E means enable, D means disable

| x | Control setting |
|---|---|
| **A** | Enable/disable silence buzzer or open buzzer |
| **B** | Enable/Disable overload bypass function |
| **J** | Enable/Disable power saving |
| **K** | Enable/Disable LCD display escape to default page after 1min timeout |
| **U** | Enable/Disable overload restart |
| **V** | Enable/Disable over temperature restart |
| **X** | Enable/Disable backlight on |
| **Y** | Enable/Disable alarm on when primary source interrupt |
| **Z** | Enable/Disable fault code record |

Computer: QFLAG <CRC><cr>

Device: (ExxxDxxx <CRC><cr>

## 2.7 QPIGS<cr>: Device general status parameters inquiry

Computer: QPIGS <CRC><cr>

Device: (BBB.B CC.C DDD.D EE.E FFFF GGGG HHH III JJ.JJ KK OOO TTTT EEEE UUU.U WW.WW PPPPP b7b6b5b4b3b2b1b0 <CRC><cr>

| | Data | Description | Notes | |
|---|---|---|---|---|
| a | ( | Start byte | | |
| b | BBB.B | Grid voltage | B is an Integer number 0 to 9. The units is V. | |
| C | CC.C | Grid frequency | C s an Integer number 0 to 9. The units is Hz. | |
| D | DDD.D | AC output voltage | D is an Integer number 0 to 9. The units is V. | |
| E | EE.E | AC output frequency | E is an Integer number from 0 to 9. The units is Hz. | |
| F | FFFF | AC output apparent power | F is an Integer number from 0 to 9. The units is VA | |
| G | GGGG | AC output active power | G is an Integer ranging from 0 to 9. The units is W. | |
| H | HHH | Output load percent | DEVICE: HHH is Maximum of W% or VA%. VA% is a percent of apparent power. W% is a percent of active power. The units is %. | |
| I | III | BUS voltage | I is an Integer ranging from 0 to 9. The units is | |

| | | | V. | |
|---|---|---|---|---|
| j | JJ.JJ | Battery voltage | J is an Integer ranging from 0 to 9. The units is V. | |
| k | KK | Battery charging current | K is an Integer ranging from 0 to 9. The units is A. | |
| o | OOO | Battery capacity | X is an Integer ranging from 0 to 9. The units is %. | |
| P | TTTT | Inverter heat sink temperature | T is an integer ranging from 0 to 9. The units is ℃（NTC A/D value for 1~3K） | |
| r | EEEE | PV Input current for battery. | E is an Integer ranging from 0 to 9. The units is A. | |
| t | UUU.U | PV Input voltage 1 | U is an Integer ranging from 0 to 9. The units is V. | |
| u | WW.WW | Battery voltage from SCC | W is an Integer ranging from 0 to 9. The units is V. | |
| w | PPPPP | Battery discharge current | P is an Integer ranging from 0 to 9. The units is A. | |
| x | b7b6b5b4 b3b2b1b0 | Device status | b7: Reserved<br>b6: configuration status: 1: Change 0: unchanged<br>b5: SCC firmware version 1: Updated 0: unchanged<br>b4: Load status: 0: Load off    1:Load on<br>b3: reserve<br>b2: Charging status( Charging on/off)<br>b1: Charging status( SCC charging on/off)<br>b0: Charging status(AC charging on/off)<br>b2b1b0:<br>000: Do nothing<br>110: Charging on with SCC charge on<br>101: Charging on with AC charge on<br>111: Charging on with SCC and AC charge on | |

## 2.8  QMOD<cr>: Device Mode inquiry

Computer: QMOD<CRC><cr>

Device: (M<CRC><cr>

| MODE | CODE(M) | Notes |
|---|---|---|
| Power On Mode | P | Power on mode |

| Standby Mode | S | Standby mode |
|---|---|---|
| Line Mode | L | Line Mode |
| Battery Mode | B | Battery mode |
| Fault Mode | F | Fault mode |
| Power saving Mode | H | Power saving Mode |

Example:

Computer: QMOD<CRC><cr>

DEVICE: (L<CRC><cr>

Means: the current DEVICE mode is Grid mode.

## 2.9   QPIWS<cr>: Device Warning Status inquiry

Computer: QPIWS<CRC> <cr>

Device: (a0a1…..a30a31<CRC><cr>

a0,…,a31 is the warning status. If the warning is happened, the relevant bit will set 1, else the relevant bit will set 0. The following table is the warning code.

| bit | **Warning** | Description |
|---|---|---|
| a0 | Reserved | |
| a1 | Inverter fault | Fault |
| a2 | Bus Over | Fault |
| a3 | Bus Under | Fault |
| a4 | Bus Soft Fail | Fault |
| a5 | LINE_FAIL | Warning |
| a6 | OPVShort | Warning |
| a7 | Inverter voltage too low | Fault |
| a8 | Inverter voltage too high | Fault |
| a9 | Over temperature | Compile with a1, if a1=1,fault, otherwise warning |
| a10 | Fan locked | Compile with a1, if a1=1,fault, otherwise warning |
| a11 | Battery voltage high | Compile with a1, if a1=1,fault, otherwise warning |
| a12 | Battery low alarm | Warning |
| a13 | Reserved | |
| a14 | Battery under shutdown | Warning |
| a15 | Reserved | Warning |
| a16 | Over load | Compile with a1, if a1=1,fault, otherwise warning |

| a17 | Eeprom fault | Warning |
| --- | --- | --- |
| a18 | Inverter Over Current | Fault |
| a19 | Inverter Soft Fail | Fault |
| a20 | Self Test Fail | Fault |
| a21 | OP DC Voltage Over | Fault |
| a22 | Bat Open | Fault |
| a23 | Current Sensor Fail | Fault |
| a24 | Battery Short | Fault |
| a25 | Power limit | Warning |
| a26 | PV voltage high | Warning |
| a27 | MPPT overload fault | Warning |
| a28 | MPPT overload warning | Warning |
| a29 | Battery too low to charge | Warning |
| a30 | Reserved | |
| a31 | Reserved | |

## 2.10  QDI<cr>: The default setting value information

Computer: QDI<CRC><cr>

Device: (BBB.B CC.C 00DD EE.E FF.F GG.G HH.H II J K L M N O P Q R S T U V W<CRC><cr>

| | Data | Description | Notes | Remark |
| --- | --- | --- | --- | --- |
| A | ( | Start byte | | |
| B | BBB.B | AC output voltage | B is an Integer ranging from 0 to 9. The units is V. | |
| C | CC.C | AC output frequency | C is an Integer ranging from 0 to 9. The units is Hz. | |
| D | 00DD | Max AC charging current | D is an Integer ranging from 0 to 9. The unit is A. | |
| E | EE.E | Battery Under voltage | E is an Integer ranging from 0 to 9. The unit is V. | Only for 4kVA/5kVA model |
| F | FF.F | Charging float voltage | F is an Integer ranging from 0 to 9. The unit is V. | Only for 4kVA/5kVA model |
| G | GG.G | Charging bulk voltage | G is an Integer | Only for 4kVA/5kVA model |

| | | | ranging from 0 to 9. The unit is V. | |
|---|---|---|---|---|
| H | HH.H | Battery default re-charge voltage | H is an Integer ranging from 0 to 9. The units is V. | . |
| I | II | Max charging current | I is an Integer ranging from 0 to 9. The units is A. | |
| J | J | AC input voltage range | J is an Integer ranging from 0 to 1. No unit | |
| K | K | Output source priority | K is an Integer ranging from 0 to 1. No unit | |
| L | L | Charger source priority | L is an Integer ranging from 0 to 1. No unit | |
| M | M | Battery type | M is an Integer ranging from 0 to 1. No unit | |
| N | N | Enable/disable silence buzzer or open buzzer | N is an Integer ranging from 0 to 1. No unit | |
| O | O | Enable/Disable power saving | O is an Integer ranging from 0 to 1. No unit | |
| P | P | Enable/Disable overload restart | P is an Integer ranging from 0 to 1. No unit | |
| Q | Q | Enable/Disable over temperature restart | Q is an Integer ranging from 0 to 1. No unit | |
| R | R | Enable/Disable LCD backlight on | R is an Integer ranging from 0 to 1. No unit | |
| S | S | Enable/Disable alarm on when primary source interrupt | S is an Integer ranging from 0 to 1. No unit | |
| T | T | Enable/Disable fault code record | T is an Integer ranging from 0 to 1. No unit | |
| U | U | Overload bypass | U is an Integer ranging from 0 to 1. No unit | |

| | | Enable/Disable LCD display escape to default page after 1min timeout | V is an Integer ranging from 0 to 1. No unit | |
|---|---|---|---|---|
| V | V | | | |
| W | W | Output mode | W is an Integer ranging from 0 to 4. No unit | |
| Y | YY.Y | Battery re-discharge voltage | W is an Integer ranging from 0 to 9. The unit is V | |

## 2.11 QMCHGCR\<cr>: Enquiry selectable value about max charging current

Computer: QMCHGCR\<CRC>\<cr>

Device: (AAA BBB CCC DDD······\<CRC>\<cr>

More value can be added, make sure there is a space character between every value.

## 2.12 QMUCHGCR\<cr>: Enquiry selectable value about max utility charging current

Computer: QMUCHGCR\<CRC>\<cr>

Device: (AAA BBB CCC DDD······\<CRC>\<cr>

More value can be added, make sure there is a space character between every value

## 2.13 QOPM\<cr>: Enquiry output mode

Computer: QOPM\<CRC>\<cr>

Device: (nn\<CRC>\<cr>

nn:

00: single machine output

01: parallel output

02: Phase 1 of 3 Phase output

03: Phase 2 of 3 Phase output

04: Phase 3 of 3 Phase output

Only for 4kVA/5kVA model

# 3   Setting parameters Command

## 3.1  PE\<XXX>/PD\<XXX>\<CRC>\<cr>: setting some status enable/disable

Computer: PE\<XXX>/PD\<XXX>\<CRC>\<cr>

Device: (ACK\<CRC>\<cr> if DEVICE accepts this command, otherwise, responds (NAK\<cr>

PExxxPDxxx set flag status. PE means enable, PD means disable

| x | Control setting |
|---|---|
| **A** | Enable/disable silence buzzer or open buzzer |
| **B** | Enable/disable overload bypass |
| **J** | Enable/Disable power saving |
| **K** | Enable/Disable LCD display escape to default page after 1min timeout |
| **U** | Enable/Disable overload restart |
| **V** | Enable/Disable over temperature restart |
| **X** | Enable/Disable backlight on |
| **Y** | Enable/Disable alarm on when primary source interrupt |
| **Z** | Enable/Disable fault code record |

### 3.2  PF<cr>: Setting control parameter to default value

Computer: PF<CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

All Device parameters set to default value.

Note: The correct default value can be gain by QDI command.

### 3.3  MCHGC<nnn><cr>: Setting max charging current

Computer: MCHGC<nnn><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

Setting value can be gain by QMCHGCR command.

### 3.4  MUCHGC<nnn><cr>: Setting utility max charging current

Computer: MUCHGC<nnn><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

Setting value can be gain by QMUCHGCR command.

### 3.5  F<nn><cr>: Setting device output rating frequency

Computer: F<nn><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

Set UPS output rating frequency to 50Hz.or 60Hz

### 3.6    POP<NN><cr>: Setting device output source priority

Computer: POP<NN><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

Set output source priority, 00 for utility first, 01 for solar first, 02 for SBU priority

### 3.7    PBCV<nn.n><cr>: Set battery re-charge voltage

Computer: PBCV<nn.n><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

12V unit: 11V/11.3V/11.5V/11.8V/12V/12.3V/12.5V/12.8V

24V unit: 22V/22.5V/23V/23.5V/24V/24.5V/25V/25.5V

48V unit: 44V/45V/46V/47V/48V/49V/50V/51V

### 3.8    PBDV<nn.n><cr>: Set battery re-discharge voltage

Computer: PBDV<nn.n><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

12V unit: 00.0V/12.5V/12.8V/13V/13.3V/13.5V/13.8V/14V/14.3V/14.5

24V unit: 00.0V/25V/25.5V/26V/26.5V/27V/27.5V/28V/28.5V/29V

48V unit: 00.0V/50V/51V/52V/53V/54V/55V/56V/57V/58V

00.0V means battery is full(charging in float mode).

### 3.9    PCP<NN><cr>: Setting device charger priority

Computer: PCP<NN><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

Set output source priority, 00 for utility first, 01 for solar first, 02 for solar and utility, 03 for only solar charging

### 3.10   PGR<NN><cr>: Setting device grid working range

Computer: PGR<NN><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<cr>

Set device grid working range, 00 for appliance, 01 for UPS

### 3.11   PBT<NN><cr>: Setting battery type

Computer: PBT<NN><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds

(NAK<CRC><cr>

Set device grid working range, 00 for AGM, 01 for Flooded battery,02 for user

## 3.12 POPM<nn ><cr>: Set output mode

Computer: POPM <nn ><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

nn:

00: single machine output

01: parallel output

02: Phase 1 of 3 Phase output

03: Phase 2 of 3 Phase output

04: Phase 3 of 3 Phase output

Only for 4kVA/5kVA model

## 3.13 PSDV<nn.n><cr>: Setting battery cut-off voltage

Computer: **PSDV** <nn.n><CRC><cr>

Device: (ACK<CRC><cr> if device accepts this command, otherwise, responds (NAK<CRC><cr>

nn.n: 40.0V ~ 48.0V

Only for 4kVA/5kVA model

# 4 Appendix

## 4.1 CRC calibration method



CRC. c