

## Troubleshooting guide for Growatt SPF3k-5kTL HVM off-grid Inverter

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VER.1.0	2018-6-04	First Draft	Darren
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## 1 General

This document is applicable for Growatt SPF3000TL HVM and SPF5000TL HVM models off grid inverters.

An error message will be displayed on the LCD screen while fault occurs. The faults can be categorized as error and warning . All faults with error code will stop inverter power generation. Accompanied with red LED indicator ON immediately, and showing consistent until the fault had been cleared.

When a Warning message is shown on inverter LCD display, the inverter will continue working but will be accompanied by flashing red LED indicator.

You may be advised to contact Growatt in some circumstance, please provide the following information.

Information concerning the inverter:

- Serial number
- Model number
- Error or warning message on LCD
- Brief description of the problem
- Grid voltage measured
- DC input voltage
- Battery specification
- Load capacity and list
- Can you reproduce the failure? If yes, how to?

Did the problem occur before?

What were the ambient conditions when the problem occurred?

Information concerning the PV panels:

Manufacturer name and model number of the PV panel

Output power of the panel

Voc of the panel

Vmp of the panel

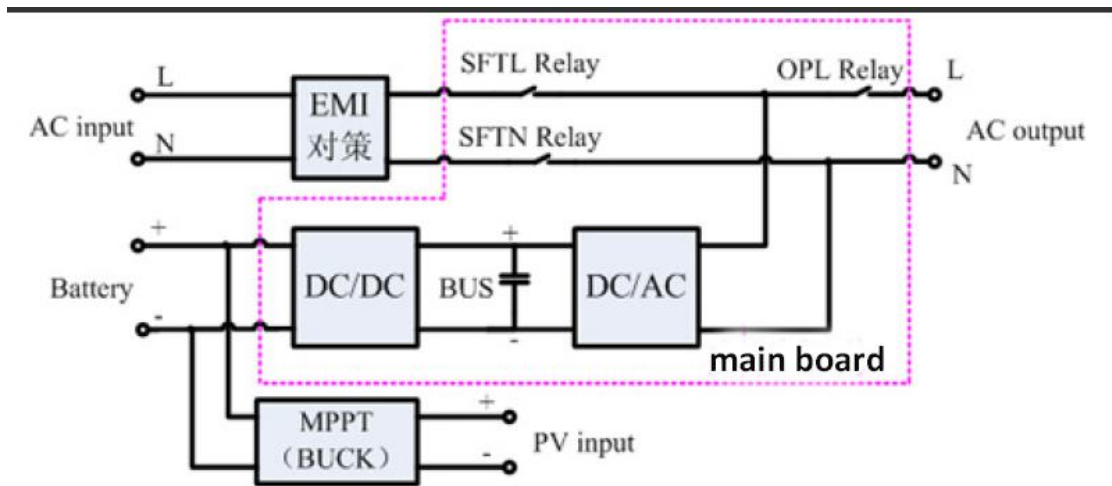
Imp of the panel

Number of panels in each string

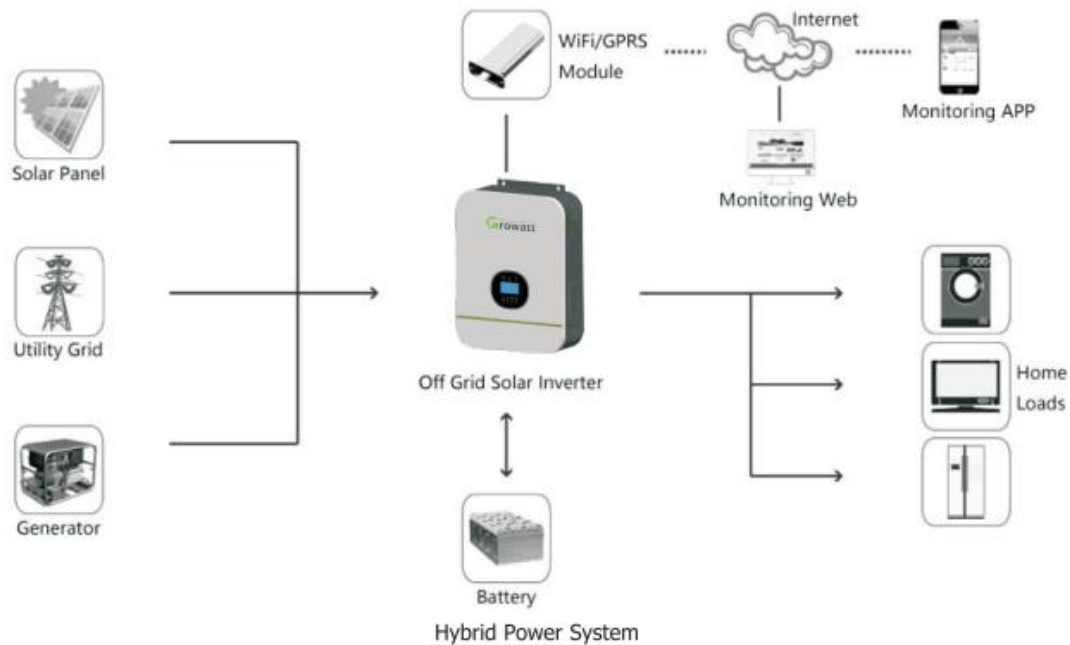
How many strings connected in one MPP tracker

If it is necessary to replace the unit, please ship it with the original box.

### 1.1 Off grid SPF inverter logic diagram



## 2 Off-grid system wiring diagram



As shown in above system diagram, Growatt SPF3000TL HVM/SPF5000TL HVM/SPF5000TL HVM-WPV is used to power common house appliances including some inductive load such as light, refrigerator. Also, diesel generator and power grid can be compensation in which solar energy is insufficient as well as to charge the battery.

## 3Warning messages

### 3.1 warning 01

**Fault description:**Fan is locked when inverter is on.

**Analysis:**

1. The cable of fan is loosed.
2. The fan is stucked by obstruction or the fan is damaged.
3. power supply of the fan is abnormal.

**Suggestions:**

1. Turn off DC switch and AC breaker, and check the fan. If there is an obstruction of the

- fan, please remove it and clean the fan well. Turn on the inverter to check whether the warning still exists or not.
2. If the warning still exists after step 1, turn off DC switch and AC breaker again, remove the fan from inverter with screw driver to do cleaning or replacement.
    - a. Remove the protect baffle of the fan with hex wrench.;
    - b. Disconnect the cables from fan with screwdriver;
    - c. Remove the screws from the protect plate on the fan, clear up dust and sundries on the fan.;
    - d. If cleaning does not help, please replace the fan with a new one.
  3. If the problem still remains, please contact Growatt Service for further solutions.

## 3.2 warning 02

**Fault description:**Over temperature.

**Analysis:**

1. The NTC cable inside the SPF is abnormal.
2. It may be that the machine is placed in an environment where the temperature exceeds the allowable temperature range of SPF.
3. Internal temperature of component is over 100°C.

**Suggestions:**

1. Check if the installation environment of the machine is conducive to heat dissipation.
2. Open the front cover of the inverter to check if the NTC cable is well connected.there are four NTC inside, there is special software can help locate which NTC is broken.
3. If the NTC cable is firm and the error code is still shows on the LCD, replace the inverter.
4. Check if the air flow of the unit is blocked or the ambient temperature is too high.

## 3.3 warning 03

**Fault description:**Battery is over-charged.

**Analysis:**

1. It may be that the battery voltage is not within the specified range, please refer to user manual
2. It may be that the connection line of the battery is not firm, or the distance is too far, and the line is too small, causing excessive impedance on the line when charging, and the machine detection port voltage is too high.
3. Battery is over-charged.
4. The battery voltage is too high.

**Suggestions:**

1. Check if the battery voltage is normal by multi-meter.
-

2. If the actual value is higher than 60V, replace the battery.
3. Check if spec and quantity of batteries meet requirements. sometimes customer connect 24V battery with 48V inverter model, please make sure the voltage is suitable.

### 3.4 warning 04

**Fault description:**Low battery.

**Analysis:**

1. It may be that inverter communication protocol is different from lithium icon battery communication protocol, only some models of Pylon、Dy Ness brand lithium icon battery can build communication with our inverter.
2. it may be that battery discharge too much, battery voltage is really low.

**Suggestions:**

4. if use lithium icon battery that can build communication with inverter, but still warn 04 fault, normally this fault comes with 20 fault, please arrange to upgrade inverter software using ISP tool program software.

inverter new firmware software version: F2809\_GW500.07\_20191227\_B.

inverter new BMS software version: F030\_sk022\_05\_20191220.

please don't forget to reset factory setting after upgrading every software.

- 2.If battery voltage is really low, please contact battery supplier to help charge battery to normal state. don't let battery discharge too much in future.

### 3.5 warning 07

**Fault description:**Overload.

**Analysis:**

1. Output load is higher than 5500W.
2. It may be the problem inductive load on the machine, and at startup, it will cause excessive shock current, which will protect the machine and pay attention to the impact of such inductive load.
3. Could be a short circuit on the load and needs to be checked.
4. The inverter is overload 110% and time is up.

**Suggestions:**

1. Check if there are some inductive load on the output, if this fault appears at the startup, it caused by shock current of load, you need reduce the load and resrtart inverter.
2. Reduce the connected load by switching off some equipment.

### 3.6 warning 10

**Fault description:**Output power derating.

**Analysis:**

1. the voltage of the AC input is too low.

**Suggestions:**

1. Check whether your AC input voltage is below 170V or not. if it's below, there is still AC output with inverter, but warning code occurs on inverter screen and beep.
2. inverter will still have 20% AC output rate power at least, but it's very hard to provide 5kw power to the load even its rate power is 5kw.
3. Disconnect some load with inverter AC output.

### 3.7 warning 13

**Fault description:**Solar charger stops due to high pv voltage.

**Analysis:**

1. Pv panels configuration is wrong.

**Suggestions:**

1. SPF5000TL HVM model, suggest connect 3 pcs in series 4 parallel (330W panel), make sure pv open circuit is below 145V.

### 3.8 warning 14

**Fault description:**Solar charger stops due to overload.

**Analysis:**

1. There is too much load connected with inverter AC output, it's more than 5kw, inverter will send an order to stop solar charger.

**Suggestions:**

1. Don't connect too much load with inverter AC output, it's more than 5kw, please disconnect some.
2. Check if there are some inductive load on the output, if this fault appears at the startup, it caused by shock current of load, you need reduce the load and resrtart inverter.



### 3.9 warning 15

**Fault description:**Parallel input utility grid different.

**Analysis:**

1. There may be some phases lost in three phase system.

**Suggestions:**

1. Check your AC iutput cable wiring connection, all inverters neutral line should connect to the same neutral line together, P1 phase inverters should connect to L1 line together, P2 phase inverters should connect to L2 line together, P3 phase inverters should connect to L3 line together.

### 3.10 warning 16

**Fault description:**Parallel input phase error.

**Analysis:**

1. There may be some phases lost in three phase system.

**Suggestions:**

1. Check AC input cable wiring connections, make sure N、L1、L2、L3 lines connected well, there are details shown in the user manual, power connection and communication connection.

### 3.11 warning 17

**Fault description:**Parallel onput phase loss.

**Analysis:**

1. There may be some phases lost in three phase system.

**Suggestions:**

1. Check your AC output cable wiring connection, all inverters neutral line should connect to the same neutral line together, P1 phase inverters should connect to L1 line together, P2 phase inverters should connect to L2 line together, P3 phase inverters should connect to L3 line together.

### 3.12 warning 20

**Fault description:**Bms communication error.

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**Analysis:**

1. battery communication protocol is different from our inverter communication protocol.

**Suggestions:**

1. if it's Dyness brand lithium icon battery (B4850), please set L01 in program 05 setting. if it's Pylon brand lithium icon battery (US2000/US3000), please set L02 in program 05 setting. if error message still exist, please arrange to upgrade inverter firmware software and BMS software  
( <https://drive.google.com/open?id=12ttv9oCoC2rowUPDdsjfs0P4fz9DuSVt>, <https://drive.google.com/open?id=1MFgsuwvJ2BRs-uHHITshcjliOsQIPYBt>), there is a software, a video that guide you to upgrade software, a SOP file that guide you to upgrade step by step, and a video that guide you to reset inverters factory setting including.
2. if it's other brand lithium icon battery, please also arrange to upgrade inverters firmware software and BMS software, don't forget to reset factory setting after upgrading, then select US2 in program 05 setting for it. USE is designed for lead acid battery, US2 is especially designed for lithium icon battery.
3. if inverter work with Pylon/Dyness icon battery, get 20 and 04 fault at the same (won't allow to change program 05 setting in this situation), and it's hard to get a charger to charge battery back to normal state, you can consider to reupgrade software to remove 20 fault first, then change program 01 setting to UTI and change program 14 setting to SNU, in this way will avoid battery to discharge and charge battery as soon as possible.

### 3.13 warning 33

**Fault description:**Bms communication loss.

**Analysis:**

1. Bms communication loss.

**Suggestions:**

1. Check the communication cable wiring connection between inverter and battery, you can disconnect it and reconnect again.
2. Change a new cable.

### 3.14 warning 34

**Fault description:**Cell over voltage.

**Analysis:**

1. Battery cell voltage is high.

**Suggestions:**

1. Test battery cell real voltage, check pv panels configuration if it's really high, for

SPF5000TL HVM model, suggest connect with 3 pcs in series, 4 parallel (330W panel) .

2. Check battery specification, whether it's suitable for inverter model or not.
3. Ask battery supplier for help.

### 3.15 warning 35

**Fault description:**Cell under voltage.

**Analysis:**

1. Battery cell voltage is low.

**Suggestions:**

1. Test battery cell real voltage, check load capacity if it's really low, disconnect some load.
2. If connect with some special load, like water pump, its rate power should be below 1.5kw (connect with SPF5000TL HVM model) , because normally it needs 3 times of rate power when it startup.

### 3.16 warning 36

**Fault description:**Total over voltage.

**Analysis:**

1. Battery voltage is high.

**Suggestions:**

1. Test battery real voltage, check pv panels configuration if it's really high, for SPF5000TL HVM model, suggest connect with 3 pcs in series, 4 parallel (330W panel) .
2. Check battery specification, whether it's suitable for inverter model or not.
3. Ask battery supplier for help.

### 3.17 warning 37

**Fault description:**Total under voltage.

**Analysis:**

1. Battery voltage is low.

**Suggestions:**

1. Test battery real voltage, check load capacity if it's really low, disconnect some load.
-

2. If connect with some special load, like water pump, its rate power should be below 1.5kw (connect with SPF5000TL HVM model), because normally it needs 3 times of rate power when it startup.

### 3.18 warning 38

**Fault description:**Discharge over current.

**Analysis:**

1. Battery discharge current is high.

**Suggestions:**

1. Check load capacity if it's over battery maximum output current, please disconnect some load if it's.

### 3.19 warning 39

**Fault description:**Charge over current.

**Analysis:**

1. Battery charging current is over battery accepted charging current.

**Suggestions:**

1. check pv panels configuration if it's really high, for SPF5000TL HVM model, suggest connect with 3 pcs in series, 4 parallel (330W panel) .
2. Check battery specification, whether it's suitable for inverter model or not.
3. Ask battery supplier for help.

### 3.20 warning 40

**Fault description:**Discharge over temperature.

**Analysis:**

1. Battery discharge current is high.

**Suggestions:**

1. Check load capacity if it's over battery maximum output current, please disconnect some load if it's.

### 3.21 warning 41

**Fault description:**Charge over temperature.

**Analysis:**

1. Battery charging current is over battery accepted charging current.

**Suggestions:**

1. check pv panels configuration if it's really high, for SPF5000TL HVM model, suggest connect with 3 pcs in series, 4 parallel (330W panel) .
2. Check battery specification, whether it's suitable for inverter model or not.
3. Ask battery supplier for help.

### 3.22 warning 43

**Fault description:**Battery over temperature.

**Analysis:**

1. Battery charging current is over battery accepted charging current.

**Suggestions:**

1. check pv panels configuration if it's really high, for SPF5000TL HVM model, suggest connect with 3 pcs in series, 4 parallel (330W panel) .
2. Check battery specification, whether it's suitable for inverter model or not.
3. Ask battery supplier for help.

### 3.23 warning 44

**Fault description:**Battery under temperature.

**Analysis:**

1. Battery temperature is low.

**Suggestions:**

1. Check battery specification, whether it's suitable to work on this site or not.
2. Ask battery supplier for help.

### 3.24 warning 45

**Fault description:**System shut down.

**Analysis:**

1. System will shut down.

**Suggestions:**

1. Check battery SOC and voltage, whether it's close to the voltage point of program 21 setting.

## 4 Inverter fault

### 4. 1 Error 01

**Fault description:**Fan is locked.

**Analysis:**

1. The cable of fan is loosed.
2. The fan is stucked by obstruction or the fan is damaged.
3. power supply of the fan is abnormal.

**Suggestion:**

1. Turn off DC switch and AC breaker, and check the fan. If there is an obstruction of the fan, please remove it and clean the fan well. Turn on the inverter to check whether the warning still exists or not.
2. If the warning still exists after step 1, turn off DC switch and AC breaker again, remove the fan from inverter with screw driver to do cleaning or replacement.
  - a. Remove the protect baffle of the fan with hex wrench.;
  - b. Disconnect the cables from fan with screwdriver;
  - c. Remove the screws from the protect plate on the fan, clear up dust and sundries on the fan.;
  - d. If cleaning does not help, please replace the fan with a new one.
3. If the problem still remains, please contact Growatt Service for further solutions.

### 4. 2 Error 02

**Fault description:**Over temperature.

**Analysis:**

1. The NTC cable inside the SPF is abnormal.
2. It may be that the machine is placed in an environment where the temperature exceeds the allowable temperature range of SPF.
3. Internal temperature of component is over 100°C.

**Suggestion:**

1. Check if the installation environment of the machine is conducive to heat dissipation.
-

2. Open the front cover of the inverter to check if the NTC cable is well connected. there are four NTC inside, there is special software can help locate which NTC is broken.
3. If the NTC cable is firm and the error code is still shows on the LCD, replace the inverter.
4. Check if the air flow of the unit is blocked or the ambient temperature is too high.

## 4.3 Error 03

**Fault description:** Battery voltage is too high

**Analysis:**

1. It may be that the battery voltage is not within the specified range, please refer to user manual
2. It may be that the connection line of the battery is not firm, or the distance is too far, and the line is too small, causing excessive impedance on the line when charging, and the machine detection port voltage is too high.
3. Battery is over-charged.
4. The battery voltage is too high.

**Suggestion:**

1. Check if the battery voltage is normal by multi-meter.
2. If the actual value is higher than 60V, replace the battery.
3. Check if spec and quantity of batteries meet requirements. sometimes customer connect 24V battery with 48V inverter model, please make sure the voltage is suitable.

## 4.4 Error 04

**Fault description:** Battery voltage/soc is too low.

**Analysis:**

3. It may be that inverter communication protocol is different from lithium icon battery communication protocol, only some models of Pylon、Dy Ness brand lithium icon battery can build communication with our inverter.
4. it may be that battery discharge too much, battery voltage is really low.

**Suggestion:**

2. if use lithium icon battery that can build communication with inverter, but still warn 04 fault, normally this fault comes with 20 fault, please arrange to upgrade inverter software using ISP tool program software.

inverter new firmware software version: F2809\_GW500.07\_20191227\_B.

inverter new BMS software version: F030\_sk022\_05\_20191220.

please don't forget to reset factory setting after upgrading every software.

---

3. If battery voltage is really low, please contact battery supplier to help charge battery to normal state, don't let battery discharge too much in future.

## 4. 5 Error 05

**Fault description:** Output short circuited is detected by internal converter components

**Analysis:**

1. Output short circuited has been detected by internal converter components.

**Suggestion:**

1. Check if wiring is connected well and remove abnormal load.
2. You can test inverter AC output voltage directly, check whether it's correct or not.

## 4. 6 Error 06

**Fault description:** Output voltage is too high

**Analysis:**

1. AC output voltage sample circuit is damaged.
2. Output abnormal, inverter voltage below than 190Vac or is higher than 260Vac.

**Suggestion:**

1. Check the output voltage by multi-meter.
2. Turn off PV, batteries and grid to power off the inverter completely till there is nothing displayed on LCD and restart, observe whether the error code is cleaned.
3. If the error code is not cleared when restarted, replace main board to fix it.
4. Reduce the connected load.

## 4. 7 Error 07

**Fault description:** Overload time out

**Analysis:**

1. Output load is higher than 5500W.
2. It may be the problem inductive load on the machine, and at startup, it will cause excessive shock current, which will protect the machine and pay attention to the impact of such inductive load.
3. Could be a short circuit on the load and needs to be checked.
4. The inverter is overload 110% and time is up.

**Suggestion:**



1. Check if there are some inductive load on the output, if this fault appears at the startup, it caused by shock current of load, you need reduce the load and resrtart inverter.
2. Reduce the connected load by switching off some equipment.

## 4. 8 Error 08

**Fault description:** Bus voltage is too high

**Analysis:**

1. DC-DC diode or driver circuit is damaged.
2. Battery can't build communication with inverter.

**Suggestion:**

1. Turn off PV, batteries and grid to power off the inverter completely till there is nothing displayed on LCD and restart, observe whether the error code is cleaned.
2. please arrange to upgrade inverter software using ISP tool program software.  
inverter new firmware software version: F2809\_GW500.07\_20191227\_B.
3. If fault still exist after upgrading software or it's not convenient to upgrade software , please change some settings below:  
program 02: 40A  
program 05: USE  
program 19: 52V  
program 20: 51V  
If it's still not work, please also try to set lower settings for it:  
program 02: 30A  
program 05: USE  
program 19: 51.5V  
program 20: 51V
4. For lithium icon battery , strongly suggest try to upgrade software , US2 is especially designed for lithium icon batteries that can't build communication with inverter. USE is designed for lead acid batteries. this is also the difference between USE and US2.
5. Please check your pv panels configuration , for SPF5000TL HVM model : suggest connect with 12 pcs (330W) , 3 in series, 4 parallel.

## 4. 9 Error 09

**Fault description:** Bus soft start failed.

**Analysis:**

1. Battery mode setting wrong.
  2. The inverter diode or the IGBT on the high voltage side of DC/DC is damaged.
-

3. Bus soft-start failed circuit on the main board is damaged.

**Suggestion:**

1. Check if battery mode setting on SPF is same with the battery type you connecting.if no, change it and restart system.
2. Turn off PV, batteries and grid to power off the inverter completely till there is nothing displayed on LCD and restart, observe whether the error code is cleaned.
3. If the error code is not cleared, replace main board to fix it.

## 4. 10 Error 51

**Fault description:** Over current or surge.

**Analysis:**

1. Output load is higher than 5000W.
2. It may be the problem inductive load on the machine, and at startup, it will cause excessive shock current, which will protect the machine and pay attention to the impact of such inductive load.
3. Could be a short circuit on the load and needs to be checked.
4. Output current sample circuit is damaged.

**Suggestion:**

1. Check if there are some inductive load on the output, if this fault appears at the startup,it caused by shock current of load, you need reduce the load and resrtart inverter.
2. Check the output load, if more than 5kw, switch off some load and restart inverter to remove the fault message.
3. If the error code is not cleared after restarted, replace the main board to fix it.

## 4. 11 Error 52

**Fault description:** Bus voltage is too low

**Analysis:**

1. there may be too much load start at the same time, the instantaneous load is too large to pull down the bus voltage

**Suggestion:**

1. please start special machine first if there is some linear load connected with inverter AC output.it takes almost 3 times rate power while starting up , such as water motor.SPF5000TL HVM is only possible to supply a 1.5kw water motor.
2. Restart inverter, take turn to startup loads.

## 4. 12 Error 53

**Fault description:** Inverter soft start failed

**Analysis:**

1. MPPT voltage is always below expected voltage in 20s when inverter start.
2. There is something wrong with inverter switch tube.
3. There is something wrong with DCDC in DC side.

**Suggestion:**

1. please try to restart inverter, check whether fault will disappear or not.
2. Please check your pv panels configuration, for SPF5000TL HVM model: suggest connect with 12 pcs (330W), 3 in series, 4 parallel.
3. Change the main board.

## 4. 13 Error 55

**Fault description:** Over DC voltage in AC output.

**Analysis:**

1. Output voltage is unbalanced.
2. This fault is caused by the internal failure of the machine and may be caused by the regulation control.

**Suggestion:**

1. Turn off PV, batteries and grid to power off the inverter completely till there is nothing displayed on LCD and restart, observe whether the error code is cleaned.
2. If the error code is not cleared, replace main board to fix it.
3. If replace the main board still shows error code on the LCD of the inverter, please contact Growatt service center for help.

## 4.14 Error 56

**Fault description:** Battery connection is open.

**Analysis:**

1. The communication line is not plugged in or poor connection.
2. Lithium battery is not approved by Growatt.
3. The lithium battery is switched off.
4. The battery is broken.
5. Fuse is burnt.

**Suggestion:**

1. Check the lithium Battery is on or off.
-

2. Check if the battery is approved by Growatt.
3. Check the connection of lithium Battery and inverter is firm and correct.
4. switch off the whole system, especially switch off the main grid, make sure that the cable wiring connection between inverter and battery is stable, restart the system.

## 4.15 Error 58

**Fault description:** Output voltage is too low.

**Analysis:**

1. Output abnormal, inverter voltage below than 190Vac or is higher than 260Vac.

**Suggestion:**

1. Reduce the connected load.
2. Please start linear load first, let it run stable, then start the others.

## 4.16 Error 60

**Fault description:** Negative power fault.

**Analysis:**

1. AC output wiring connected wrongly.
2. There is negative power more than 3kw exceed 100ms.

**Suggestion:**

1. if there is only one inverter run alone, Disconnect AC input and AC output wiring connection, connect AC input and AC output wiring connection correctly.
2. if there are several inverters run in parallel, please check whether current sharing cable wiring connection is correct or not.
3. there may be phase difference among inverters in parallel system.

## 4.17 Error 80

**Fault description:** CAN fault.

**Analysis:**

1. Communication cable between inverter and battery doesn't connect well.

**Suggestion:**

1. Disconnect communication cable, wait for a while, then reconnect it again.
2. You can find cable wiring connection details in user manual, Red is communication cable, green is current sharing cable, make sure red cable connected correctly.

## 4.18 Error 81

**Fault description:** Host loss.

**Analysis:**

1. In three phase system, inverters under P1 phase should start first.

**Suggestion:**

1. if there is only 1 inverter under P1 phase, this inverter should start first.
2. if there are 2 inverters under P1 phase, normal operation is: switch on battery first, let inverter switch、pv switch、AC input switch keep off, switch on P1 phase inverters switch at the same time, then switch on inverters under P2 phase, switch on P3 phase inverters at the end.

## 4.19 Error 20

**Fault description:** BMS communication error.

**Analysis:**

1. battery communication protocol is different from our inverter communication protocol.

**Suggestion:**

1. if it's Dyness brand lithium icon battery (B4850), please set L01 in program 05 setting. if it's Pylon brand lithium icon battery (US2000/US3000), please set L02 in program 05 setting. if error message still exist, please arrange to upgrade inverter firmware software and BMS software  
(<https://drive.google.com/open?id=12ttv9oCoC2rowUPDdsjfs0P4fz9DuSVt>, <https://drive.google.com/open?id=1MFgswuvvJ2BRs-uHHITshcjliOsQIPYBt>), there is a software, a video that guide you to upgrade software, a SOP file that guide you to upgrade step by step, and a video that guide you to reset inverters factory setting including.
3. if it's other brand lithium icon battery, please also arrange to upgrade inverters firmware software and BMS software, don't forget to reset factory setting after upgrading, then select US2 in program 05 setting for it. USE is designed for lead acid battery, US2 is especially designed for lithium icon battery.
4. if inverter work with Pylon/Dyness icon battery, get 20 and 04 fault at the same (won't allow to change program 05 setting in this situation), and it's hard to get a charger to charge battery back to normal state, you can consider to reupgrade software to remove 20 fault first, then change program 01 setting to UTI and change program 14 setting to SNU, in this way will avoid battery to discharge and charge battery as soon as possible.

## 5 Contact

For warranty claim or technical support please contact our service center:

Headquarter: Service hot line: +86 755 27471942

Email: [service@ginverter.com](mailto:service@ginverter.com)

Growatt New Energy Technology Co.,Ltd

Address: Building B, Jiayu Industrial Zone, 28 Guangming Road, Longteng  
Community, Shiyan, Baoan District, Shenzhen

Website: [www.growatt.com](http://www.growatt.com)

Subsidiary contact:

Australia T: 0061 2 80651298,

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