NATURE INVERTER
TROUBLESHOOTING GUIDE

PIN413C2V31
BIN519C2V31
PIN624C2V321

INVERTER MINI SPLIT SYSTEM
### 10.1 Indoor Unit Error Display

<table>
<thead>
<tr>
<th>Operation lamp</th>
<th>Timer lamp</th>
<th>Display</th>
<th>LED STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☆ 1 time</td>
<td>X</td>
<td>E0</td>
<td>Indoor unit EEPROM parameter error</td>
</tr>
<tr>
<td>☆ 2 times</td>
<td>X</td>
<td>E1</td>
<td>Indoor / outdoor units communication error</td>
</tr>
<tr>
<td>☆ 3 times</td>
<td>X</td>
<td>E2</td>
<td>Zero-crossing signal detection error</td>
</tr>
<tr>
<td>☆ 4 times</td>
<td>X</td>
<td>E3</td>
<td>Indoor fan speed has been out of control</td>
</tr>
<tr>
<td>☆ 5 times</td>
<td>X</td>
<td>E4</td>
<td>Indoor room temperature sensor T1 open circuit or short circuit</td>
</tr>
<tr>
<td>☆ 6 times</td>
<td>X</td>
<td>E5</td>
<td>Evaporator coil temperature sensor T2 open circuit or short circuit</td>
</tr>
<tr>
<td>☆ 7 times</td>
<td>X</td>
<td>EC</td>
<td>Refrigerant leakage detection</td>
</tr>
<tr>
<td>☆ 2 times</td>
<td>O</td>
<td>F1</td>
<td>Outdoor temperature sensor T4 open circuit or short circuit</td>
</tr>
<tr>
<td>☆ 3 times</td>
<td>O</td>
<td>F2</td>
<td>Condenser coil temperature sensor T3 open circuit or short circuit</td>
</tr>
<tr>
<td>☆ 4 times</td>
<td>O</td>
<td>F3</td>
<td>Compressor discharge temperature sensor T5 open circuit or short circuit</td>
</tr>
<tr>
<td>☆ 5 times</td>
<td>O</td>
<td>F4</td>
<td>Outdoor unit EEPROM parameter error</td>
</tr>
<tr>
<td>☆ 1 times</td>
<td>☆</td>
<td>P0</td>
<td>IPM malfunction or IGBT over-strong current protection</td>
</tr>
<tr>
<td>☆ 2 times</td>
<td>☆</td>
<td>P1</td>
<td>Over voltage or over low voltage protection</td>
</tr>
<tr>
<td>☆ 5 times</td>
<td>☆</td>
<td>P4</td>
<td>Inverter compressor drive error</td>
</tr>
</tbody>
</table>
10.2 Outdoor unit error display

- PIN413C2V31-O

There's a LED light on the outdoor PCB which is blue color. After power on, it will be slow flash (0.2Hz) when the unit is in standby and quick flash (2.5Hz) if the unit has some problems, it will be solid light when the unit is running.
LED 1 is a red light and for the PCB POWER display.
LED 2 is a yellow light. After power on, it will be slow flash (0.2Hz) when the unit is in standby and quick flash (2.5Hz) if the unit has some problems.
LED 4(green) and LED3 (red) are two lights controlled by the compressor drive chip. Below are meanings for those lights.

<table>
<thead>
<tr>
<th></th>
<th>standby</th>
<th>operating</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED2</td>
<td>slow flashing(0.2Hz)</td>
<td>on</td>
</tr>
<tr>
<td>LED1</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>

The picture of PCB above is only for reference.
<table>
<thead>
<tr>
<th>No.</th>
<th>Problems</th>
<th>LED4 (Green)</th>
<th>LED3 (Red)</th>
<th>IU display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>standby for normal</td>
<td>O</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Operation normally</td>
<td>X</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IPM malfunction or IGBT over-strong current protection</td>
<td>X</td>
<td>X</td>
<td>P0</td>
</tr>
<tr>
<td>4</td>
<td>Over voltage or too low voltage protection</td>
<td>O</td>
<td>O</td>
<td>P1</td>
</tr>
<tr>
<td>5</td>
<td>Over voltage or too low voltage protection</td>
<td>O</td>
<td>☆</td>
<td>P1</td>
</tr>
<tr>
<td>6</td>
<td>Inverter compressor drive error</td>
<td>X</td>
<td>☆</td>
<td>P4</td>
</tr>
<tr>
<td>7</td>
<td>Inverter compressor drive error</td>
<td>☆</td>
<td>O</td>
<td>P4</td>
</tr>
<tr>
<td>8</td>
<td>Inverter compressor drive error</td>
<td>☆</td>
<td>☆</td>
<td>P4</td>
</tr>
</tbody>
</table>

O (light)  X (off)  ☆ (2.5Hz flash)

PIN624C2V31-O

There's a LED light on the outdoor PCB which is blue color. After power on, it will be slow flash (0.2Hz) when the unit is in standby and quick flash (2.5Hz) if the unit has some problems.
10.3 Diagnosis and Solution
10.3.1 EEPROM parameter error diagnosis and solution (E0/F4)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>E0/F4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>Indoor or outdoor PCB main chip does not receive feedback from EEPROM chip.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Installation mistake  
● PCB faulty |

**Trouble shooting:**

Shut off the power supply and turn it on 5 seconds later. Is it still displaying the error code?

- Yes
  - If the EEPROM chip is welded on main PCB, replace the main PCB directly. Otherwise, check whether the EEPROM chip plugged in main PCB well?
    - No → Correct the connection.
    - Yes → Replace the main PCB.

**EEPROM:** a read-only memory whose contents can be erased and reprogrammed using a pulsed voltage. For the location of EEPROM chip, please refer to the below photos.

Note: The two photos above are only for reference, it's may be not same totally with the ones on your side.
**10.3.2 Indoor / outdoor unit’s communication diagnosis and solution (E1)**

<table>
<thead>
<tr>
<th>Error Code</th>
<th>E1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>Indoor unit does not receive the feedback from outdoor unit during 110 seconds and this condition happens four times continuously.</td>
</tr>
</tbody>
</table>
| Supposed causes | • Wiring mistake  
• Indoor or outdoor PCB faulty |

**Trouble shooting:**

1. **Power off, then turn on the unit 5 seconds later (reconnect the power wire). Is the error still displaying after several minutes?**
   - Yes
   - **Measure** $V_s$, is it moving alternately with positive value? ($V_s$ is the voltage between L2 and S of outdoor unit. Connect the red pin of multimeter with L2 port, black pin with S port)
   - No

2. **Check all the wiring with outdoor units. Is the wiring to the outdoor main PCB connected correctly? Is the reactor connected well?**
   - Yes
   - **Measure the resistance of the reactor (The one without capacitor). If it is zero, follow the below step. If not, replace a new reactor.**
   - No

3. **Replace the outdoor main PCB.**
4. **Power on. Is the error extinguished?**
   - Yes
   - Replace the outdoor main PCB.
   - No
   - **Replace the indoor main PCB.**

5. **Check all the wiring with indoor units. Is the wiring to the indoor main PCB connected correctly?**
   - Yes
   - Replace the indoor main PCB.
   - No
   - **Replace the outdoor main PCB.**

©2015 Innovair Corporation. All Rights Reserved. www.innovair.com
Remark:
Use a multimeter to test the DC voltage between L2 port and S port of outdoor unit. The red pin of multimeter connects with L2 port while the black pin is for S port.

When AC is normal running, the voltage will move alternately between -50V to 50V.

If the outdoor unit has malfunction, the voltage will move alternately with positive value.

While if the indoor unit has malfunction, the voltage will be a certain value.

Remark:
Use a multimeter to test the resistance of the reactor which does not connect with capacitor. The normal value should be around zero ohm. Otherwise, the reactor must have malfunction and need to be replaced.
10.4.3 Zero crossing detection error diagnosis and solution (E2)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>E2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>When PCB does not receive zero crossing signal feedback for 4 minutes or the zero crossing signal time interval is abnormal.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Connection mistake  
● PCB faulty |

Trouble shooting:

Check if the connections and power supply is normal?  

- No → Correct the connections. Turn on the unit when the power supply is good.
- Yes → Indoor main PCB is defective. Replace indoor main PCB.
10.4.4 Fan speed has been out of control diagnosis and solution (E3)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>E3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>When indoor fan speed keeps too low (300RPM) for certain time, the unit will stop and the LED will display the failure.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Wiring mistake  
● Fan ass’y faulty  
● Fan motor faulty  
● PCB faulty |

Trouble shooting:

1. Shut off the power supply and turn it on 5 seconds later. Is it still displaying the error code?  
   - No → The unit operates normally.  
   - Yes → Shut off the power supply, rotate the fan by hand. Does it rotate properly?  
     - No → Find out the cause and have it solved. For example, check whether the fan is blocked or the bearing is broken?  
     - Yes → Check the wires of fan motor. Are all the connections good?  
       - No → Correct the connections.  
       - Yes → Check whether the fan motor is normal through index 1?  
         - No → Replace the fan motor  
         - Yes → Check whether the main PCB is normal through index 2?  
           - No → Replace the main PCB. The malfunction is solved?  
           - Yes → If the malfunction is still existing, replace the main PCB.
Index 1:
1. Indoor AC fan motor
   Measure the resistance value of each winding by using the tester.

   ![Diagram of AC fan motor terminals]

   For the definite value of the resistance, refer to page 61 and page 64.

Index 2:
1: Indoor AC fan motor
   Power on and set the unit running in fan mode at high fan speed. After running for 15 seconds, measure the voltage of pin 1 and pin 2. If the value of the voltage is less than 100V (208~240V power supply) or 50V (115V power supply), the PCB must have problems and need to be replaced.

   ![Diagram of AC fan motor terminals]

2. Outdoor DC Fan Motor (control chip is in outdoor PCB)

   ![Diagram of outdoor DC fan motor terminals]

<table>
<thead>
<tr>
<th>NO.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Orange</td>
<td>Grey</td>
<td>White</td>
<td>Pink</td>
<td>Black</td>
</tr>
<tr>
<td>Signal</td>
<td>Hu</td>
<td>Hv</td>
<td>Hw</td>
<td>Vcc</td>
<td>GND</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color</th>
<th>Red</th>
<th>Blue</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal</td>
<td>W</td>
<td>V</td>
<td>U</td>
</tr>
</tbody>
</table>

1) Release the UVW connector. Measure the resistance of U-V, U-W, V-W. If the resistance is not equal to each other, the fan motor must have problems and need to be replaced. Otherwise, go to step 2.

2) Power on and when the unit is in standby, measure the voltage of pin 4-5 in feedback signal.
connector. If the value is not 5V, change the PCB. Otherwise, go to step 3.

3) Rotate the fan by hand, measure the voltage of pin1-5, pin 2-5 and pin 3-5 in feedback signal connector. If any voltage is not positive voltage fluctuation, the fan motor must has problems and need to be replaced.
10.4.5 Open circuit or short circuit of temperature sensor diagnosis and solution (E5)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>E5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Wiring mistake  
● Sensor faulty |

Trouble shooting:

- Check the connections between temperature sensor and main PCB. Are the connections good?
  - No: Correct the connections.
  - Yes:
    - Check the resistance value of the sensor via table1 (p64) and table 2 (p65), is it normal?
      - Yes: Replace indoor or outdoor main PCB.
      - No: Replace the sensor and check if the problem happen again?

©2015 Innovair Corporation. All Rights Reserved. www.innovair.com
10.4.6 Refrigerant Leakage Detection diagnosis and solution(EC)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Malfunction decision conditions</strong></td>
<td>Define the evaporator coil temp. T2 of the compressor just starts running as Tcool. In the beginning 5 minutes after the compressor starts up, if T2 &lt; Tcool − 2℃ does not keep continuous 4 seconds and this situation happens 3 times, the display area will show “EC” and AC will turn off.</td>
</tr>
</tbody>
</table>
| **Supposed causes** | ● T2 sensor faulty  
● Indoor PCB faulty  
● System problems, such as leakage or blocking. |

**Trouble shooting:**

- Shut off the power supply and turn it on 5 seconds later. Is it still displaying the error code?
  - Yes
  - **Is there cool air blowing out from indoor air outlet?**
    - Yes
    - **Check if T2 sensor is well fixed. Correct the installation or replace T2 sensor. Does the problem remain again?**
      - Yes
      - Replace indoor PCB.
      - No
      - **Is there any leakage? Especially the connection parts, such as the gas valve and the liquid valve.**
        - Yes
        - Repair the leakage and recharge the refrigerant.
        - No
        - **Is there any blocking? (Such as the capillary or the welded points of the pipes.)**
          - Yes
          - Clear the blocking.
          - No
10.4.7 IPM malfunction or IGBT over-strong current protection diagnosis and solution (P0)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>P0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>When the voltage signal that IPM send to compressor drive chip is abnormal, the display LED will show “P0” and AC will turn off.</td>
</tr>
<tr>
<td>Supposed causes</td>
<td>Wiring mistake; IPM malfunction; Outdoor fan ass’y faulty; Compressor malfunction; Outdoor PCB faulty</td>
</tr>
</tbody>
</table>

Trouble shooting:

- Check if the wiring between main PCB and compressor connected by error and if the wires and connectors are broken? **Yes**
  - Correct the connection or replace the wires and connectors.
  - **No**

- IPM continuity check. Check if the IPM terminal resistance values are uniform. Refer to page 64. **No**
  - Replace the IPM board or replace the main PCB if the IPM board and main PCB are integrated together.
  - **Yes**

- Check if the outdoor fan runs properly or the outdoor unit ventilation is good. **No**
  - please refer to the below remark, check whether the resistance of the fan motor is normal. If not, replace the fan motor.
  - **Yes**

- Check if the compressor resistance values are uniform. Refer to page 63. **No**
  - Replace the compressor.
  - **Yes**

- Replace the outdoor main PCB if the main PCB and IPM are separate.
10.4.8 Over voltage or too low voltage protection diagnosis and solution (P1)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>P1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>An abnormal voltage rise or drop is detected by checking the specified voltage detection circuit.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Power supply problems.  
                   ● System leakage or block  
                   ● PCB faulty |

**Trouble shooting:**

- Check if the power supply is normal. 
  - No: Disconnect the unit with power supply and try to restart the unit when power supply gets normal.
  - Yes: Check if all the connections and wires are good?
    - No: Correct the connections or replace the wires.
    - Yes: Power on and when the unit is in standby, check if the voltage between P and N is around DC 310V or 340V or 380V? For different kinds of units, the voltage differs. Consult with technical engineer to get definite value. Then start up the unit, measure the voltage between P and N. Is it in 220V~400V?
      - No: Replace the IPM board if it is separate with main PCB.
      - Yes: Replace outdoor main PCB.

**Remark:**
Measure the DC voltage between P and N port. The normal value should be around 310V.
10.4.9 High temperature protection of compressor top diagnosis and solution(P2)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>If the sampling voltage is not 5V, the LED will display the failure.</td>
</tr>
</tbody>
</table>
| Supposed causes | ● Power supply problems.  
● System leakage or block  
● PCB faulty |

**Trouble shooting:**

- Check if the air flow system of indoor and outdoor units are obstructed?
  - Yes: Clear up the air inlet and outlet or the heat exchanger of indoor and outdoor units.
  - No: Turn off the power supply and turn it on 10 minutes later.

  - Yes: Check if the unit can start normally.
    - Yes: Check if the refrigerant charge volume is normal?
      - Yes: Refrigerant system is blocked, such as capillary or welded point of pipes.
      - No: Recharge the correct refrigerant volume.
    - No: Correct the connection.

  - No: Check if all the connection, especially the connection of OLP (Over Load Protector) sensor is good.
    - Yes: Measure the resistance between the two ports of the OLP. Is it zero?
      - Yes: Replace the outdoor control PCB.
      - No: Replace the OLP.
    - No: Replace the refrigerant charge volume.
10.4.10 Inverter compressor drive error diagnosis and solution (P4)

<table>
<thead>
<tr>
<th>Error Code</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malfunction decision conditions</td>
<td>An abnormal inverter compressor drive is detected by a special detection circuit, including communication signal detection, voltage detection, compressor rotation speed signal detection and so on.</td>
</tr>
<tr>
<td>Supposed causes</td>
<td>Wiring mistake; IPM malfunction; Outdoor fan ass’y faulty Compressor malfunction; Outdoor PCB faulty</td>
</tr>
</tbody>
</table>

Trouble shooting:

1. Check if the wiring between main PCB and compressor connected by error and if the wires and connectors are broken?
   - Yes: Correct the connection or replace the wires and connectors.
   - No: IPM continuity check. Check if the IPM terminal resistance values are uniform. Refer to page 64.
     - Yes: please refer to the below remark, check whether the resistance of the fan motor is normal. If not, replace the fan motor.
     - No: Replace the IPM board or replace the main PCB if the IPM board and main PCB are integrated together.

2. Check if the outdoor fan runs properly or the outdoor unit ventilation is good.
   - Yes: Check if the compressor resistance values are uniform .Refer to page 63.
     - Yes: Replace the outdoor main PCB if the main PCB and IPM are separate.
     - No: Replace the compressor.
   - No: Please refer to the below remark, check whether the resistance of the fan motor is normal. If not, replace the fan motor.
Main parts check

1. Temperature sensor checking

   Disconnect the temperature sensor from PCB, measure the resistance value with a tester.

   Tester

   Temperature Sensors.
   Room temp.(T1) sensor,
   Indoor coil temp.(T2) sensor,
   Outdoor coil temp.(T3) sensor,
   Outdoor ambient temp.(T4) sensor,
   Compressor discharge temp.(T5) sensor.

   Measure the resistance value of each winding by using the multi-meter.