

# HKN-90

## INFANT RADIANT WARMER

Service Manual

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DAVID

Guidance and manufacture's declaration – electromagnetic emissions-
for all EQUIPMENT and SYSTEMS

| Guidance and manufacture's declaration – electromagnetic emission | | |
|---|---|---|
| The HKN-90 Infant Radiant Warmer is intended for use in the electromagnetic environment specified below. The customer of the user of the HKN-90 Infant Radiant Warmer should assure that it is used in such and environment. | | |
| Emission test | Compliance | Electromagnetic environment – guidance |
| RF emissions<br>CISPR 11 | Group 1 | The HKN-90 Infant Radiant Warmer uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF emission<br>CISPR 11 | Class A | The HKN-90 Infant Radiant Warmer is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions<br>IEC 61000-3-2 | Class A | |
| Voltage fluctuations/<br>flicker emissions<br>IEC 61000-3-3 | Complies | |

Guidance and manufacture's declaration – electromagnetic immunity –
for all EQUIPMENT and SYSTEMS

| Guidance and manufacture's declaration – electromagnetic immunity | | | |
|---|---|---|---|
| The HKN-90 Infant Radiant Warmer is intended for use in the electromagnetic environment specified below. The customer or the user of HKN-90 Infant Radiant Warmer should assure that it is used in such an environment. | | | |
| Immunity test | IEC 60601 test level | Compliance level | Electromagnetic environment - guidance |
| Electrostatic discharge (ESD) IEC 61000-4-2 | ±6 kV contact<br>±8 kV air | ±6 kV contact<br>±8 kV air | Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%. |
| Electrical fast transient/burst IEC 61000-4-4 | ±2 kV for power supply lines | ±2kV for power supply lines | Mains power quality should be that of a typical commercial or hospital environment. |
| Surge IEC 61000-4-5 | ±1 kV differential mode<br>±2 kV common mode | ±1 kV differential mode<br>±2 kV common mode | Mains power quality should be that of a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11 | <5% $U_T$<br>(>95% dip in $U_T$)<br>for 0.5 cycle<br><br>40% $U_T$<br>(60% dip in $U_T$)<br>for 5 cycles<br><br>70% $U_T$<br>(30% dip in $U_T$)<br>for 25 cycles<br><br><5% $U_T$<br>(>95% dip in $U_T$)<br>for 5 sec | <5% $U_T$<br>(>95% dip in $U_T$)<br>for 0.5 cycle<br><br>40% $U_T$<br>(60% dip in $U_T$)<br>for 5 cycles<br><br>70% $U_T$<br>(30% dip in $U_T$)<br>for 25 cycles<br><br><5% $U_T$<br>(>95% dip in $U_T$)<br>for 5 sec | Mains power quality should be that of a typical commercial or hospital environment. If the user of the HKN-90 Infant Radiant Warmer requires continued operation during power mains interruptions, it is recommended that the HKN-90 Infant Radiant Warmer be powered from an uninterruptible power supply or a battery. |
| NOTE $U_T$ is the a.c. mains voltage prior to application of the test level. | | | |

Guidance and manufacture's declaration – electromagnetic immunity –
for EQUIPMENT and SYSTEMS that are LIFE-SUPPORTING

## Guidance and manufacture's declaration – electromagnetic immunity

The HKN-90 Infant Radiant Warmer is intended for use in the electromagnetic environment specified below. The customer or the user of HKN-90 Infant Radiant Warmer should assure that it is used in such an environment.

| Immunity test | IEC 60601 test level | Compliance level | Electromagnetic environment - guidance |
|---|---|---|---|
| Conducted RF<br>IEC 61000-4-6 | $3V_{rms}$<br>150 kHz to 80 MHz<br>outside ISM bands [a] | $3\ V_{rms}$ | Portable and mobile RF communications equipment should be used no closer to any part of the HKN-90 Infant Radiant Warmer, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.<br>Recommended separation distance<br>$d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$ |
| | $10\ V_{rms}$<br>150 kHz to 80 MHz<br>in ISM bands | $10\ V_{rms}$ | $d = \left[\frac{12}{V_2}\right]\sqrt{P}$ |
| Radiated RF<br>IEC 61000-4-3 | 10 V/m<br>80 MHz to 2.5 GHz | 10 V/m | $d = \left[\frac{12}{E_1}\right]\sqrt{P}$ 80 MHz to 800 MHz<br>$d = \left[\frac{23}{E_1}\right]\sqrt{P}$ 800 MHz to 2.5 GHz<br>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). [b]<br>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[c] should be less than the compliance level in each frequency range.[d]<br>Interference may occur in the vicinity of equipment marked with the following symbol:<br> |

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] The ISM(industrial, scientific and medical) bands between 150kHz and 80MHz are 6.765MHz to 6.795MHz; 13.553 MHz to 14.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

[b] The compliance levels in the ISM frequency bands between 150kHz and 80MHz and in the frequency range 80 MHz to 2.5GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.

[c] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the HKN-90 Infant Radiant Warmer is used exceeds the applicable RF compliance level above, the HKN-90 Infant Radiant Warmer should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the HKN-90 Infant Radiant Warmer.

[d] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

## Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM – for EQUIPMENT or SYSTEM that are LIFE-SUPPORTING

**Recommended separation distances between portable and mobile RF communications equipment and the HKN-90 Infant Radiant Warmer**

The HKN-90 Infant Radiant Warmer is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the HKN-90 Infant Radiant Warmer can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the HKN-90 Infant Radiant Warmer as recommended below, according to the maximum output power of the communications equipment.

| Rated maximum output power of transmitter (W) | Separation distance according to frequency of transmitter (m) | | | |
|---|---|---|---|---|
| | 150 kHz to 80 MHz outside ISM bands $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$ | 150 kHz to 80 MHz in ISM bands $d = \left[\frac{12}{V_2}\right]\sqrt{P}$ | 80 MHz to 800 MHz $d = \left[\frac{12}{E_1}\right]\sqrt{P}$ | 800 MHz to 2.5 GHz $d = \left[\frac{23}{E_1}\right]\sqrt{P}$ |
| 0.01 | 0.1167 | 0.12 | 0.12 | 0.23 |
| 0.1 | 0.3689 | 0.3795 | 0.3795 | 0.7273 |
| 1 | 1.1667 | 1.2 | 1.2 | 2.3 |
| 10 | 3.6893 | 3.7947 | 3.7947 | 7.2732 |
| 100 | 11.6667 | 12 | 12 | 23 |

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 The ISM(industrial, scientific and medical) bands between 150kHz and 80MHz are 6.765MHz to 6.795MHz; 13.553 MHz to 14.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.

NoTE 3 An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz to decrease the likelihood that mobile/portable communications equipment could couse interference if it is inadvertently brought into patient areas.

NOTE 4 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

# WARRANTY

The product being described in this manual is warranted against defects in materials or workmanship for one year from the date of shipment, with the following exceptions.

1. All consumable and disposable products are guaranteed to be free from defects upon shipment only.

2. Calibrations are considered normal maintenance and are not included in the 1-year warranty. During the warranty period any defective parts other than those listed above will be replaced at no charge to the customer. This warranty is rendered void and our company cannot be held liable for conditions resultant there from if:

1. Damage to the unit is incurred as a result of mishandling.

2. The customer fails to maintain the unit in a proper manner.

3. The customer uses any parts, accessories, or fittings not specified or sold by our company.

4. Sale or service is performed by the non-certified service/dealer agency.

This warranty is in lieu of all other warranties, expressed or implied, and our company shall in no event be liable for incidental or consequential damages including loss of use, property damage, or personal injury resulting from breach of warranty.

Please test each piece of equipment prior to initial use and at least annually thereafter. To comply with this standard, we recommend that you participate in our training program before selling it. This service can be performed by certified technicians through our Product Service Group and authorized dealers.

# SERVICE

For optimal performance, product service should be performed only by authorized and qualified service personnel. The user may contact the local authorized agent of the company for repair, or contact the company directly, and the company will send someone to repair. Customers outside China should contact their local factory-authorized distributor for service.

# COMPLEMENTARY NOTICE

Since our factory, conducts a continuous product improvement program, circuit and component improvements are sometimes incorporated into equipment before they can be incorporated into the printed manuals. So the parts of the device maybe differ from those in this manual, but it does not affect the capability of product. When this occurs, we will provide you the transformation with leaflet. Please understand if it troubles you.

This manual contains proprietary information, repairs and authorized modifications should be performed only by qualified service personnel to maintain your warranty and to avoid creating safety hazards. We cannot assume responsibility for any conditions affecting the proper operation of this equipment which may result from unauthorized repair modification.

The lifetime for the infant radiant warmer is 8 years. The device, accessories and the packaging have to be disposed of waste correctly at the end of the usage. Please follow Local Ordinances or Regulations for disposal.

# TABLE OF DEFNITION AND SYMBOLS

## TECHNICAL DEFINITIONS

SKIN TEMPERATURE SENSOR: A sensing device including the link with the equipment intended to measure the infant's baby temperature.

PRE-WARM MODE: A warm mode which can keep the mattress at a properly temperature. The heater output will work automatically according to the set programmer in this mode.

MANUAL MODE: A operation mode of in which the heater output is either at a fixed level or a proportion of its maximum output set by the operator.

BABY MODE: A mode of operation in which the power output varies automatically in response to the temperature of the baby, to achieve a temperature close to a value set by the operator.

STEADY TEMPERATURE CONDITION: A condition which is reached when the temperature, measured at the center of the TEST DEVICE positioned on the mid point of the EQUIPMENT mattress, does not vary by more than 1℃ over a period of 1 hour.

TEMPERATURE ALARM CHECKOUT STATE: The difference between the indicated temperature and control temperature is within ±0.5℃ and such state lasts for over 10 minutes. When checkout the temperature alarm function, operation should be enter this state.

APGAR TIMER: It offers the functions of three periods alarming indication: 1min, 5min, and 10min for clinical treatment.

LIFETIME OF PRODUCT：The period of the product is from sell-by date to the date of discarding as useless.

# NOTE, IMPORTANT, CAUTION AND WARNING

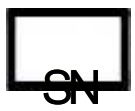
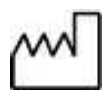
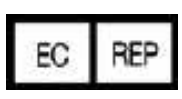
NOTE: A note is inserted in text to point out procedures or conditions, which may otherwise be misinterpreted or overlooked. A note may also be used to clarify apparently contradictory or confusing situations.

IMPORTANT: Similar to a Note but be used where greater emphasis is required.

CAUTION: A caution is inserted in text to call attention of a procedure which, It not followed exactly, can lead to damage or destruction of the equipment.

WARNING: A warning is inserted in text to call attention to dangerous or hazardous conditions inherent to the operation, cleaning, and maintenance of the equipment which may result in personal Injury or death of the operator or patient.

# SYMBOLS

| | | | |
|---|---|---|---|
|  | Refer to instruction manual |  | Non-ionizing radiation |
| CLASS I | Class I Equipment |  | Type BF applied part |
|  | On (Power: connect to the mains) |  | Off (Power: connect to the mains) |
|  | On (only for a part of equipment) |  | Off (only for a part of equipment) |
|  | Off (only for a part of equipment) | F4AH/250V | Type F Fuse 4AH/250V |
| 220-230V~/50Hz | Input power | 220-230V~/50Hz MAX:3.5A | Auxiliary Mains Output, MAX：3.5A |
|  | Heating Power Indicator | DC 12V MAX: 0.5A | Lamp Power Output, MAX：0.5A |
| RS232 | Data communication connector |  | Weight limit |
|  | Silence /Reset key |  | Keypad lock key |
|  | Set up key |  | Set down key |
|  | Timer key |  | APGAR timer key |
|  | Calibration key |  | Mode select key |
|  | Serial Number |  | Date Of Manufacture |
|  | Protective Earth (Ground) | T 3.15AL/250V | Fuse Type T 3.15AL/250V |
|  | General warning sign |  | Manufacturer |
|  | CE Marking |  | Authorized representative in the European community |
|  | Caution, scald | T 800mAL/250V | Fuse Type T 800mAL/250V |

## SEASONAL SAFETY CHECK

1. Please clean the plug of power cord at least once a year. Too much dust on plug may cause the fire.

2. The skin temperature sensor should be calibrated every half year by authorized and qualified service personnel.

3. The following safety checks should be performed at least every 12 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests. The data should be recorded in an equipment log.

①. Inspect the equipment and accessories for mechanical and functional damage.

②. Inspect the safety relevant labels for legibility.

③. Inspect the fuse to verify compliance with rated current and breaking characteristics.

④. Verify that the device functions properly as described in the instructions table 3.1 for use.

⑤. Test the protection earth resistance according IEC 60601-1:2005: Limit 0.1Ω.

⑥.Test the earth leakage current according IEC 60601-1:2005: Limit: NC less than 5mA, SFC less than 10mA.

⑦Test the enclosure leakage current according to IEC 60601-1:2005: Limit: NC less than 100μA, SFC less than 500μA.

⑧. Test the patient leakage current according IEC 60601-1:2005: Limit: for AC less than 100μA, for DC less than 10μA.

⑨. Test the patient leakage current under single fault condition according IEC 60601-1:2005: Limit: for AC less than 500μA, for DC less than 50μA.

⑩. Test the patient leakage current under single fault condition (with mains voltage on the applied part) according IEC 60601-1:2005 less than 5000μA.

⑪. Test the patient auxiliary leakage current according IEC 60601-1:2005: Limit: NC for AC less than 100μA, for DC less than10μA. SFC for AC less than 500μA, for DC less than 50μA.

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# SECTION 1
# GENERAL INTRODUCTION

## 1.1 INTRODUCTION

This manual provides instructions for installation and maintenance of Infant Radiant Warmer.

This manual provides the guidance for the qualified service personnel. If for the product guidance, please refer to the operator's manual.

## 1.2 DESCRIPTION

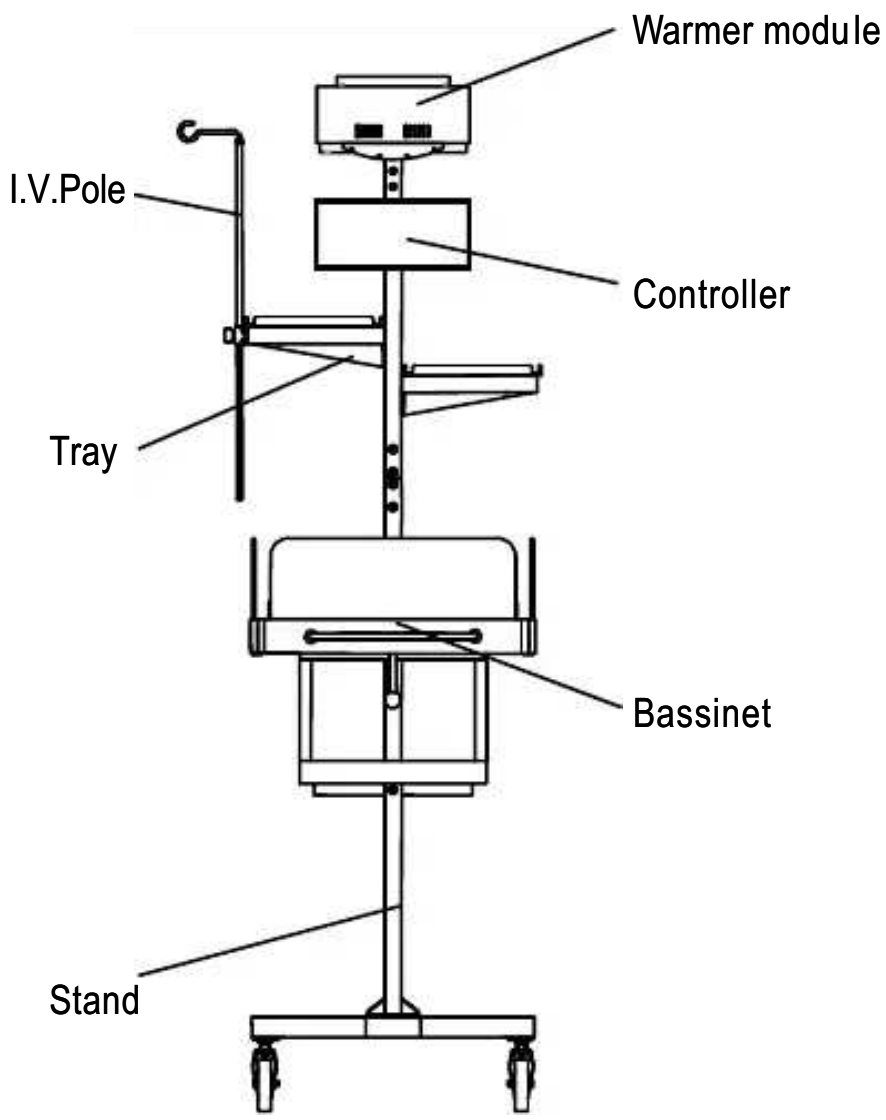
The Infant Radiant Warmer adopts 3 kinds of control mode: Pre-warm mode, Manual mode and Baby mode. Once the device starts working, it can enter into the Pre-warm mode automatically without pressing any key.

The set temperature and baby temperature can be indicated separately. Baby temperature display window display the temperature measured by the skin temperature sensor.

Except for the listed parts in 1.3, the warmer also has the lamp and 4pcs casters (Two of them with brakes) for clinical operate.

## 1.3 COMPOSITION OF PRODUCTS

The following diagram shows the main parts of the infant radiant warmer:




1-1

| DESCRIPTION OF PART | EXPLANATION |
|---|---|
| Warmer Module | This main part is composed of the Heater, Reflective Cover and so on, it is intended to provide the radiation for electromagnetic spectrum infrared range with weight of 10Kg, and its angle can be adjusted horizontal in two ways.<br>The lifetime of heater is 2000hrs. |
| I.V. Pole | A kind of bearing part, which is used for hanging the infusion bottle.<br>Max. Load: 2Kg |
| Controller | The core part with three control mode: pre-warm mode, manual mode, baby mode, APGAR timer, timing function, and it is used for automatic controlling of infrared radiation heat output, please refer to the user's manual. |
| Tray | A kind of bearing part, which is used for putting some small objects.<br>Max. Load: 2 Kg |
| Bassinet | It is used for place the infant. The bassinet can be tilted. Max. Load: 10 Kg. This bassinet is equipped with 4pcs of panels to avoid the patient falling off. |
| Stand | It provides a mounting for the Warmer Module and Bassinet. |



The maximum bearing weight of shelf and other accessories is described in the table. Please do not overload to avoid damages to accessories.

# SECTION 2
# INSTALLATION

## 2.1 UNPACKING

Generally, the WARMER is usually packed into one carton. When taking out the equipment from the cartons, take care not to damage the spare parts or accessories of the WARMER.

## 2.2 INSTALLATION

At least two professionals are required to do the installation of the WARMER with spanners.

Installation steps:

**A. Install the upper column groupware (upper column + warmer module + controller)**

① Insert the plywood into the column as the direction indicated in figure 2.1, and fix them with bolt M8X16, Spring washerΦ8, Flat washerΦ8.

② Install the plywood with upper column groupware and fix them with bolt M8X16, Spring washerΦ8, Flat washerΦ8.

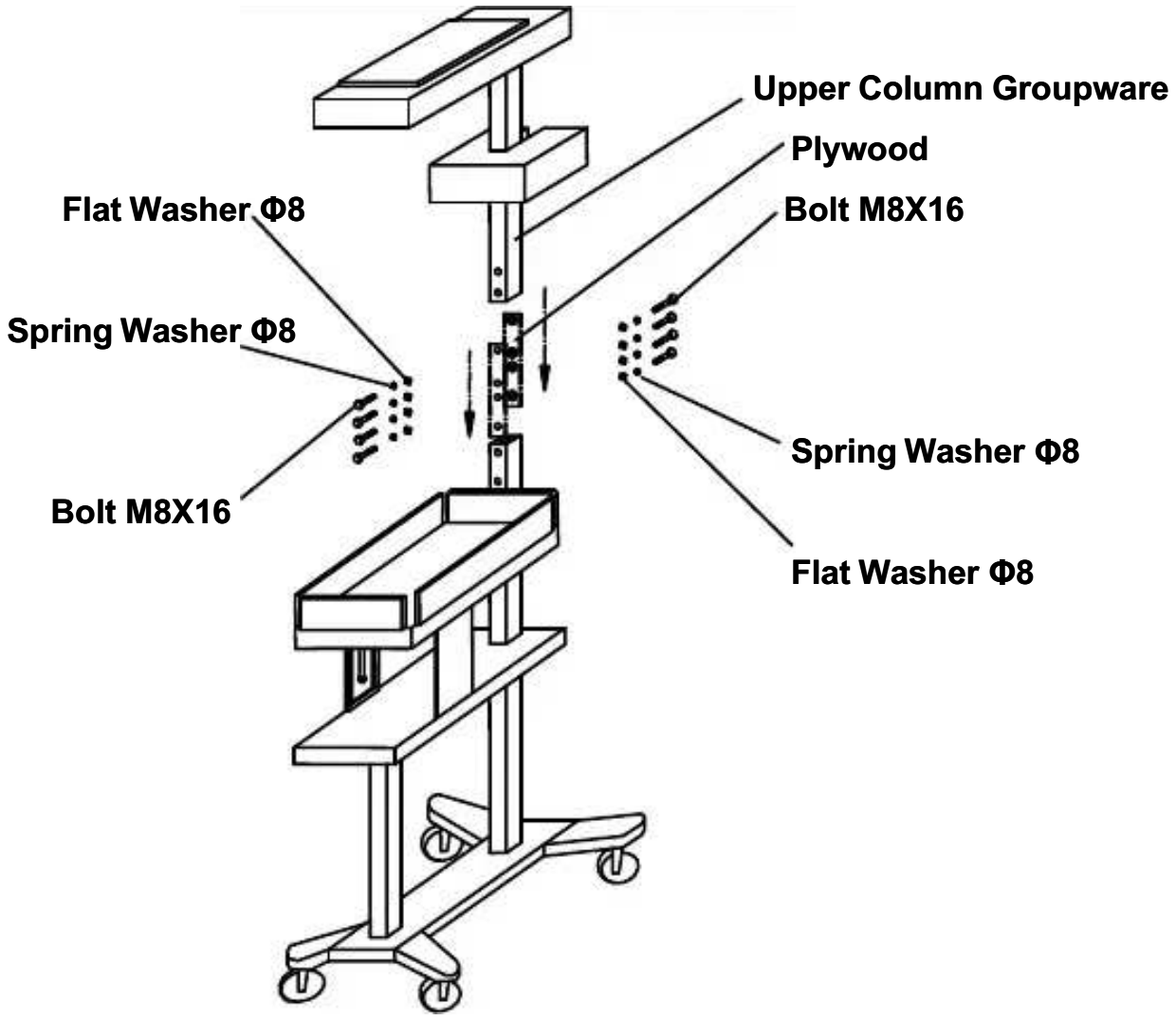



**FIGURE 2.1**

**IMPORTANT: Please make sure that the upper column and the stand are vertical, or else, it will affect the temperature uniformity on the mattress.**

**B. Install the panel**

Insert the panel into the fixed seat as the arrow indicates in figure 2.2.

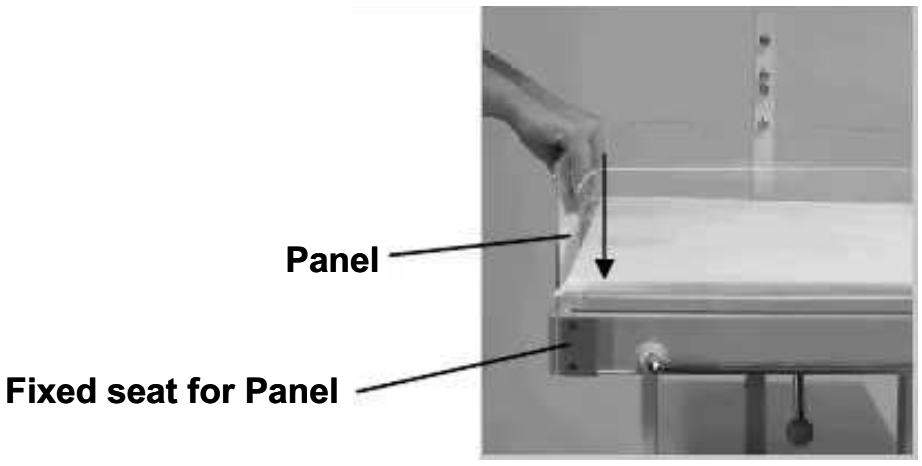



**FIGURE 2.2**

**C. Install I.V. Pole**

Please See figure 2.3, install the I.V. Pole on to its seat, adjust the proper height, and tighten the bolt.

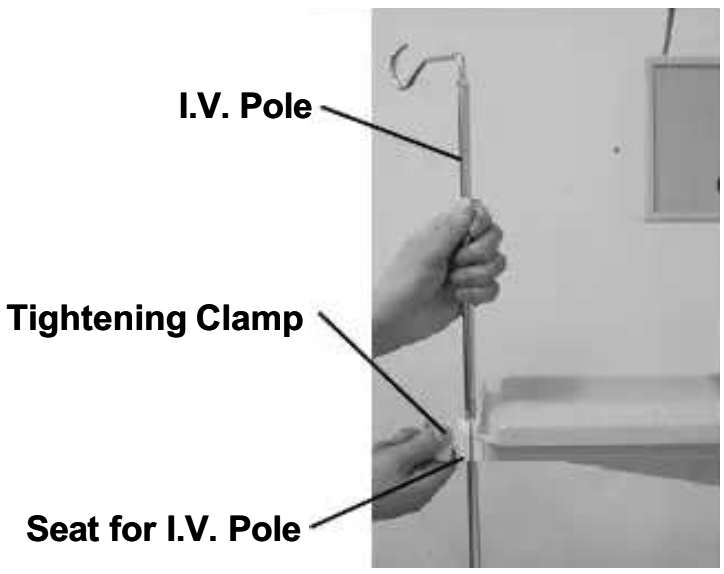



**FIGURE 2.3**

**D. Install the support board of bassinet**

Please see figure 2.4, unscrew the cross groove pan head bolt, spring washer, and flat washer on the lower column with screwdriver, and then fix the support board of bassinet with the previous mentioned bolts and washers.

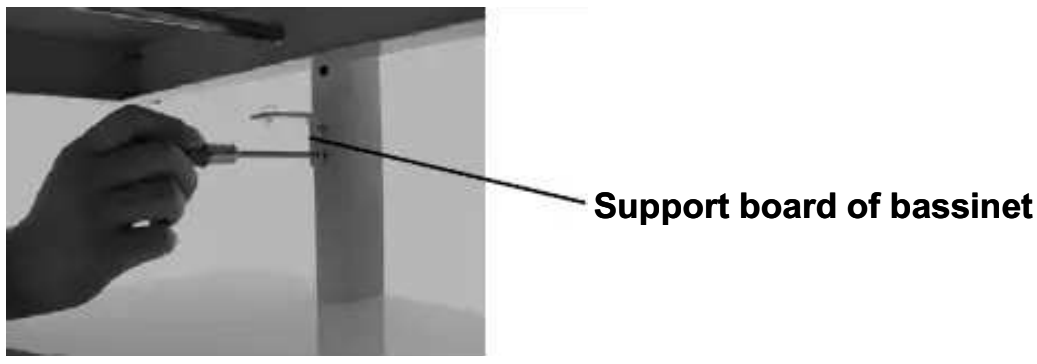



**FIGURE 2.4**

**E. Insert the power cord**

Insert the power cord of whole unit, the power cord for heater, and power cord for illumination light into its relevant socket.

Check the WARMER according to the instruction in section 2.3.

**NOTE: The warmer's general power switch is on the back of the controller, please make sure place the device at the easy to operate position.**

## 2.3 OPERATION CHECKOUT PROCEDURE

**WARNING: 1. Once some function of the device lost or the front panel or other correlative devices have faults, please stop using it.**
**2. Set temperature must be high 3℃ than ambient temperature. And then you can proceed this checkout procedure.**

Radiant warmer should be only operated by trained personnel which knows familiar about the general risk of operating the radiant warmer and under the instructions of medical practitioner.

Before using you should proceed the following checking procedure each time. The operator should operate the device within 20cm ahead，the specific distance depends on the comfort when operating.

**A. CHECK CASTERS**

Check whether the caster can drop when lifting the radiant warmer 2cm above the ground. The drop of the caster will cause danger during transporting. Before replacing the loose casters, please do not use the radiant warmer.

**B. CHECK POWER FAILURE ALARM**

When the general power supply and the switch of controller are turned off, pull off the power cord of whole unit, the device occur "POWER" alarm, red alarm indication light flash, the device gives continuous alarm sound; "POWER" alarm indication light is on.

This operation is used for checking if the power failure is normal or not. Insert the power cord again or switch off the controller to silence alarming after finishing checking.

**IMPORTANT: Please make sure that the internal charging battery is full before use it. If it is not full, it may cause the power failure without any alarming. If the battery is full, and there is no hint when disconnect the power cord, please refer to the qualified service personnel for repair.**

**C. START-UP THE CONTROLLER**

Turn on the switch of the main power supply and controller, the controller performs a short sound "di". All indicators are on, at this time, the device can do self-test automatically for 5s. After then, the

**Set temperature** indicator will display "--.-", at the same time, the **Baby temperature** indicator displays the baby temperature, and the **Timer Key** indicates the current time, and the controller can enter into the pre-warm mode automatically, and the pre-warm light will be on. If it not pass the self-test or no sound "di", please refer to the qualified service personnel.

**D. CHECK HEATING FUNCTION**

Control the environment temperature at range 21℃～25℃, and set the setting value at 33.0℃,all the heating power indicator should light on, the heating indicator is full power output.

**NOTE: The warmer work at the above setting condition and continue the follow operational checkout.**

**E. CHECK WORKING MODE**

① Place the skin sensor on the central of mattress, and record the baby temperature in the cold state, and then start the warmer to make the device enter into the pre-warm mode automatically for 30min, and please read the baby temperature to compare the indicated temperature after pre-warm and the one in the cold state, it should not less than 4℃. If not, please replace the heater.

② Please select the manual control mode, the system default of heat output proportion is 30% (3grades in the heat indicator), at the setting condition, the operator press Up or Down key to adjust the value within range of 0%-100%.

Please use the warmer after set the heat output proportion ＞30%. There is alarm every 15min, the device should give a high priority alarm sound and the **Set temperature** indicator displays alarm code E09, the alarm character should be consistent with the description of section 3.3. Press the **Silence/Reset key** to silence the alarming will be stopped, the warmer can also operate according to the current working mode and the output power; When **"CHECK"** alarm actives, please do not press any key to ensure the safety of patient, after 1min, the system will limit the heating output to 30%. If the function failed to achieve, you need to have the controller repaired.

③ Pull off the skin temperature sensor in **Baby Mode**, the device should give a high priority Alarm sound and the **set temperature** indicator will show alarm code E01. The alarm character should be consistent with the description of section 3.3. Press the Silence / Reset key to turn off the alarm sound for 4min. Connect again the skin sensor; the device will come back to the normal working condition.

**F. CHECK SETTING ALARM**

In Baby mode, put the skin sensor into the water cup at temperature lower 3.5℃ than the Set temperature for 2min, the device should give a high priority alarm sound and the **set temperature** indicator will show alarm code E07. The alarm character should be consistent with the description of section 3.3.

Set the temperature at 36℃, after the device enters into the **temperature alarming checkout state**, put the skin sensor into the water cup at temperature 35.3℃±0.1℃ for 3min, the device should give a high priority alarm sound and the **set temperature** indicator will show alarm code E08. The alarm character should be consistent with the description of section 3.3

**G. CHECK DEVIATION ALARM**

In **Baby Mode**, set the temperature at 35.0 ºC. Enter **temperature alarm checkout state**; put the skin sensor into the water cup at 37 ºC. When the indicated temperature reaches 36.1 ºC, the device should give a high priority alarm sound and the **set temperature** indicator should show alarm code E05; The alarm character should be consistent with the description of section 3.3.Set the temperature at 35.0℃, after the device enters into the **temperature alarming checkout state**, put the skin sensor into the water cup at temperature 33℃, when the indicated temperature decreases to 33.9 ºC, the device should give a high priority alarm sound and the **set temperature** indicator should show alarm code E06. The alarm character should be consistent with the description of section 3.3.

**NOTE: If the system cannot enter into the temperature alarm checkout state or the baby temperature does vary ±1℃ than the setting temperature, the deviation alarm Can not occur.**

**H. CHECK OVER-TEMPERATURE ALARM**

In baby mode, put the skin sensor into the water cups at 39.5℃±0.5℃, the device should give a high priority alarm sound and the set temperature indicator should show alarm code E04. The alarm character should be consistent with the description of section 3.3. Reduce the baby temperature and press Silence/Reset key to silence alarming.

**I. CHECK APGAR TIMER**

When the controller is under the normal working state, press the **APGAR Timer** key, the timer start to indicate from 0s, when the timer indicates 50”～1’, 4’50”～5’, 9’50”～10’, it sounds “du…”, at the same time, the **APGAR timer** is flashing. If it cannot work, please repair the controller.

**J. CHECK THE TIMER**

Under the normal working condition, press the **Timer key**, and it will indicate the current time, If the indicated time is not accurate, please reset it, and the specific setting method is as follows:

Press the **Timer key**, at the same time, turn on the controller for 3S, loosen the key when the indicated setting interface appears.

At this time, **Set temperature** indicator shows the setting code, **Skin temperature** indicator will indicate the relevant value (as for setting code, setting item and setting range, please refer to the following table ), the timer indicator will indicates P002(it means it has entered into the setting interface). Operator can choose the setting items by pressing the **Timer key** or **APGAR Timer key**,

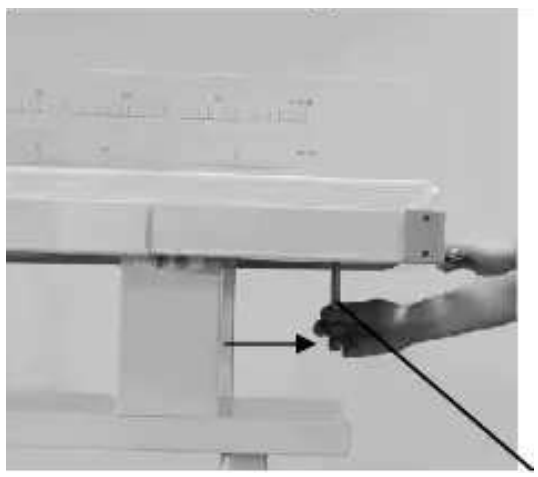
and press the **Up key** and **Down key** to choose the data setting. After then, press the **keypad lock key** to store the setting value, or you can press the **Silence/Reset key** to store and exit after finishing all setting procedure. If turn off the power supply without pressing the **Silence/Reset key**, and this setting is invalid, and system will store the previous setting value.

**TIME SET CODE**

| SETTING CODE | INDICATED ITEM | SET RANGE |
|---|---|---|
| 001 | The former two figure of year | 19 ~20 |
| 002 | The latter two figure of year | 00 ~99 |
| 003 | month | 01 ~12 |
| 004 | date | 01 ~31 |
| 005 | week | 01~07（01means Sunday） |
| 006 | hour | 00~23(24hrs) |
| 007 | minute | 00~59 |
| 008 | second | 00~59 |

**K. CHECK BASSINET TILT MACHANISM**

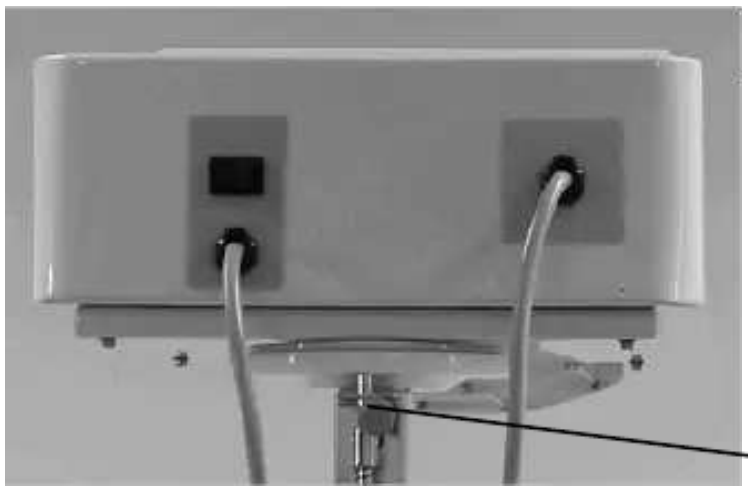
The mattress of the bassinet is the applied part of the device .Pull the pull handle as the arrow indicates to adjust the bassinet tilt.




**L.CHECK THE ADJUSTMENT FUNCTION OF ANGLE OF HEATER MODULE**

Pull the handle for lock downward to rotate the heater module at horizon angle.

**NOTE: The heater module only at 0° is the most stable, and the mattress is heated evenly.**




**M.CHECK ILLUMINATION LIGHT**

Turn on the power switch of illumination light, and the light will be on.

**M. CHECK THE PANEL**

Push and pull the panel and check if the panels are firm or not.

**O.CHECK I.V. POLE AND TRAY**

Check if the I.V. Pole stand and tray is tightening or not.

**P. END**

# SECTION 3
# TECHNICAL INFORMATION

## 3.1 SPECIFICATION

This product's classification as follows:

By the electric shock protection type classification: Type I equipment.

By the degree of shock proof classification: Type BF application part
By the specified of IEC60529 for liquid protection degree classification: IPX0.

By the manufacturers recommended disinfection and sterilization method classification: Use neutral disinfection solvents or solution to clean.

By the air mixer of flammable gas or with oxygen or nitrous oxide mixture of flammable anesthetic gas safety degree classification: It should not use in air mixer of flammable gas or with oxygen or nitrous oxide mixture of flammable anesthetic gas.

By operational mode classification: Continuous operation.

The performance indicators of the incubator are shown on the table 3.1. All the indicators may changed with no previous notice. The changed indoor air flow and infant bed tilt angle, or using product heat equipment near the incubator all may effect the relationship of bed surface temperature uniformity, display temperature or skin temperature.

TABLE 3.1 SPECIFICATION

| | |
|---|---|
| Power Requirements | AC220V-230V，50Hz，600 VA |
| Maximum Heater Power Output | 540W/240V |
| Illuminating Lamp Power Output | DC 12V，MAX. CURRENT 0.5A |
| Auxiliary Mains Power Output | AC220V-230V/50Hz，MAX. CURRENT 3.5A |
| Heater power display | 0 to 100%, adjustable in 10% increments |
| Protective earthed resistance | ≤0.1Ω |
| Earth leakage current | N.C.: ≤0.5mA |
| | S.F.C.: ≤1mA |
| Patient leakage current | N.C.: ≤0.1mA |
| | S.F.C.: ≤0.5mA |
| Patient Leakage Current (MAINS VOLTAGE ON THE APPLIED PART) | S.F.C: ≤5mA |
| Temperature control mode | Pre-warm mode |
| | Manual mode |
| | Baby mode |
| Temperature control range | 34.5℃~37.5℃ |
| Skin Temperature sensor display rang | 5℃~65℃ |
| Deviation between skin temperature and control temperature | ≤0.5℃ |
| Accuracy of skin temperature sensor | within±0.2℃ |
| Temperature uniformity of mattress | ≤2℃ |

TABLE 1.1 SPECIFICATIONS (continued)

ALARM (See table 3.2)……power alarm
Sensor alarm
Deviation alarm
Over-temp alarm
Setting alarm
Check alarm
System alarm

ENVIRONMENT TEMP (Not to use in the environment exceed specified)

Operating Range……18℃~30℃

Storage and transport range……-40℃～+55℃

ENVIRONMENT HUMIDITY

Operating Range……30%RH～75%RH

Storage and transport range……≤93%RH

ATMOSPHERE PRESSURE

Storage and transport atmospheric pressure range……500hPa~1060hPa

Working atmospheric pressure range……800hPa~1060hPa

Application environment altitude……≤2000m

Overvoltage category……II

Pollution degree……2

AIR FLOW RATE

Ambient air movement rate……<0.3M/S

## OTHER SPECIFICATION

Working noise……Ambient noise≤40dB(A), working noise≤50dB(A)

APGAR Timer……Audible and visible alarm when the device runs to 50″～1′, 4′50″～5′, 9′50″～10′

ALARM NOISE…… ≤80dB(A) on mattress

The lifetime ……8 years

## 3.2 WORKING PRINCIPLE

### 3.2.1 GENERAL

This section covers the function and the working principles, as for the figure of control system, please refer to figure 3.2 and 3.3.

As the figure 3.1 shows, the heat from the radiant module heating source radiant to the mattress for the patient uniform by high reflectivity of parabolic reflector.

In manual mode, the radiant heater outputs in the way of fixed proportion to make the body temperature of patient resume; in Baby mode, the device will adjust the heat output proportion automatically by comparing the baby temperature and the set temperature to keep the heat balance.

NOTE: During the process of getting the radiation and heat, the losing heat in convection, evaporation, radiation, conduction will affect the heat balance. Therefore, to make the baby decrease the dissipation, it is necessary to use the device in the environment of no rapid air flowing ,and cover waterproof velum (polyethylene velum) the naked skin or to use the waterproof net to increase the humidity around the skin to decrease the water evaporation.

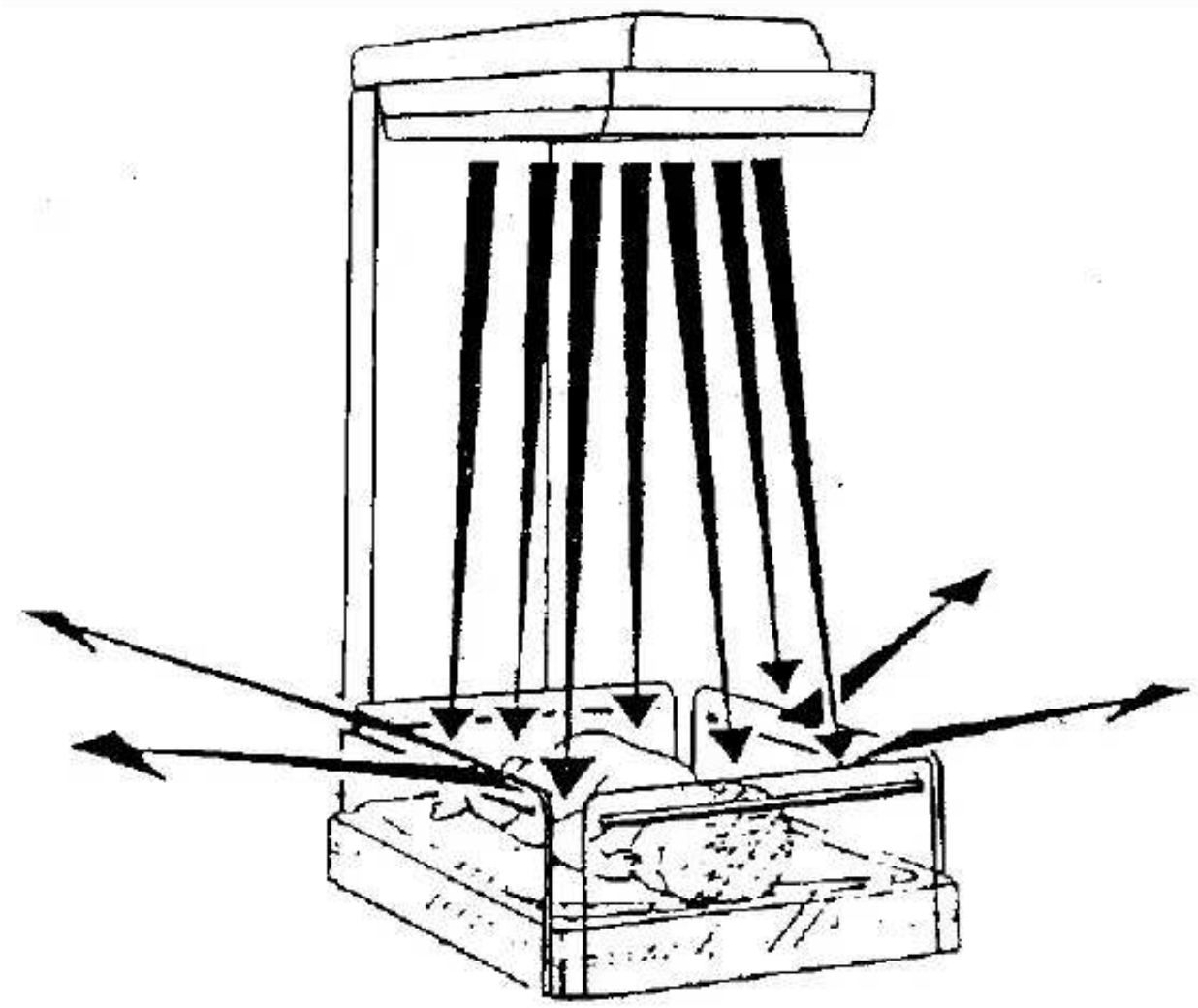


FIGURE 3.1 RADIATION PRINCIPLES

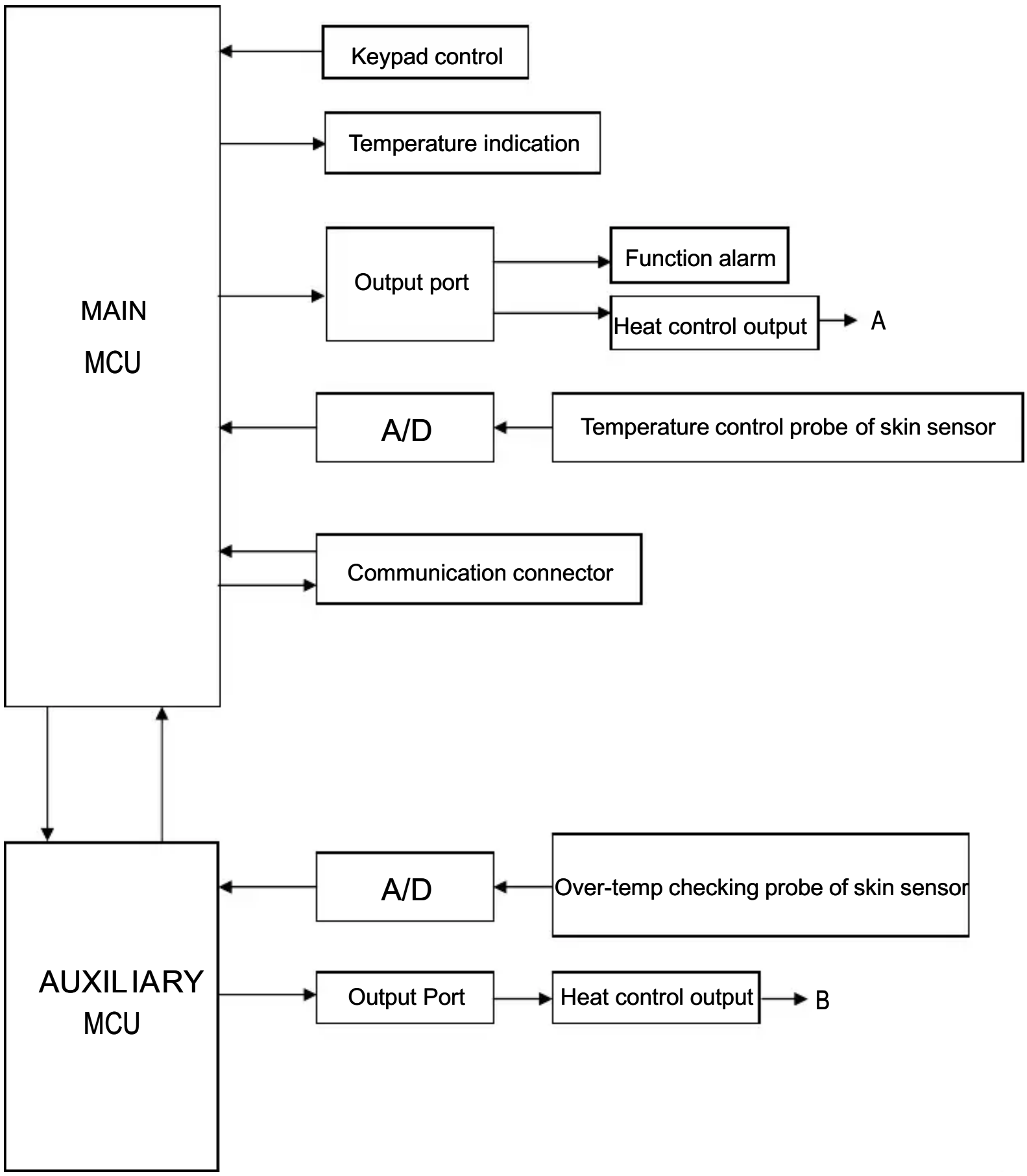



FIGURE 3.2 CONTROL BLOCK DIAGRAM

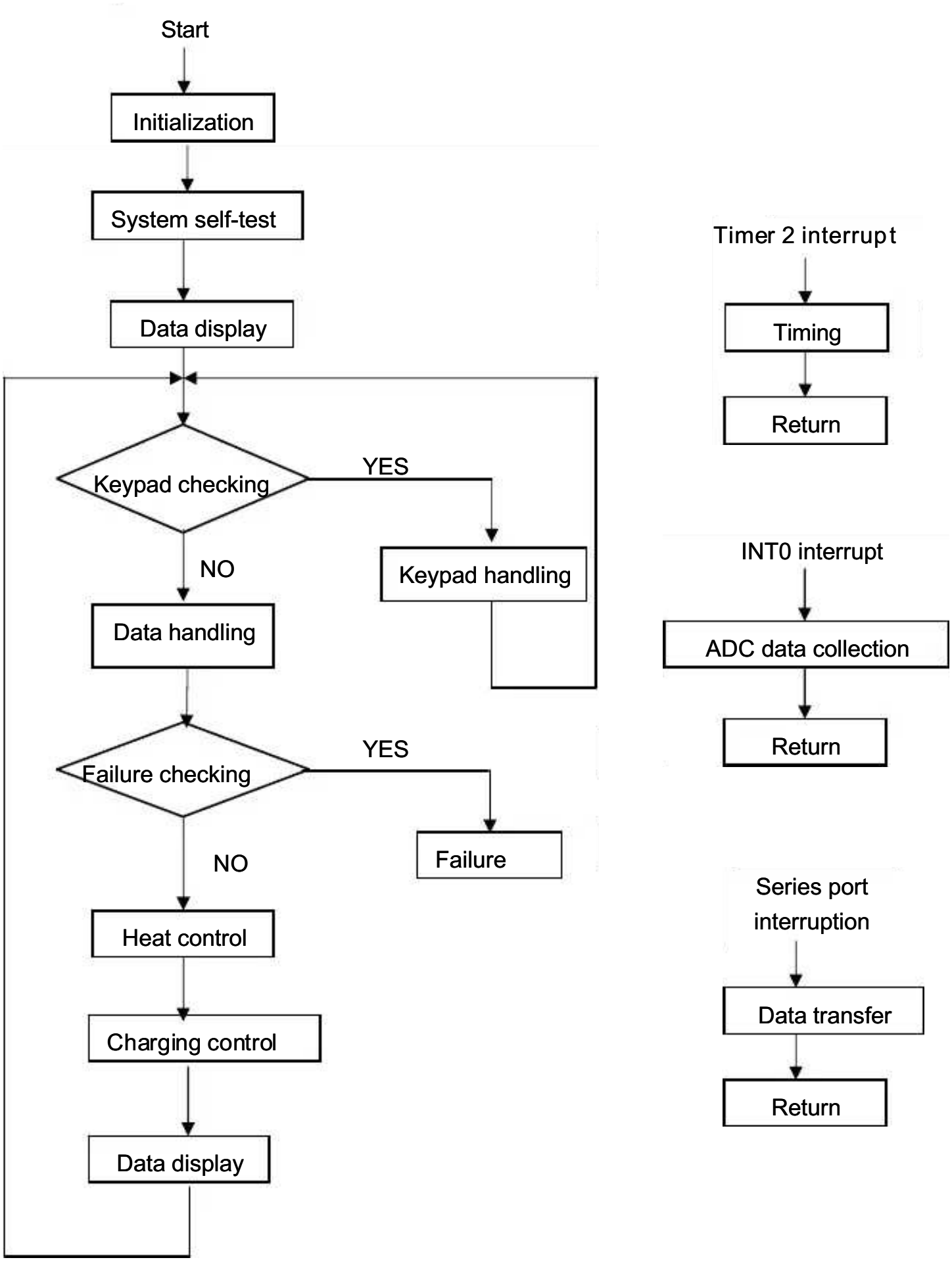



FIGURE 3.3 PROGRAMMED BLOCK DIAGRAM

### 3.2.2 Temperature Control

Incubator temperature is adjusted through the compurgation between the baby temperature and the set temperature. The Infant Radiant Warmer adopts 3 kinds of control mode: Pre-warm mode, Manual mode and Baby mode, and the different mode had different way of heating. The user can choose the wanted control mode by pressing the keys on the controller.

Pre-warm mode: system will output the heat according to the programme, after a while, the system will output the heat at 30% to maintain the temperature on the mattress until the mode changes.

Manual mode: system will output the fixed heat according to the heat output proportion to make the temperature on the mattress reach the wanted value so as to make the body temperature of patient resume. The system default of heat output proportion is 30%.

Baby mode: System will adjust through the heat output proportion according to the baby temperature and the set temperature to keep the heat balance of patient.

## 3.3 ALARM

State

1. Alarm information

High priority: The most urgent information, red alarm light flashing, alarm sounds more than 65dB (A).

Five tones order alarm, ring twice, and every 2.5 seconds to repeat again

NOTE: The sound of power failure alarm is different from the other high priority alarm which sound source is a single buzzer.

Medium priority: medium priority information, yellow alarm light flashing, alarm sounds more than 65dB (A).

Three tones order alarm, and every 7.5 seconds to repeat again.

2. The alarm preference is arranged according to the alarm serial number, the bigger the serial number is, the lower level is. When various failures appear, the alarm prompts according to the priority, the sound is different too

Table 3.2 Alarm introduction

| Alarm No. | Alarm information | Alarm character | Alarm activate condition | Control mode | The state of heater | Alarm level | Alarm delay time |
|---|---|---|---|---|---|---|---|
| 1 | Power failure alarm | “Power” alarm light is on, red alarm light flashes, sound alarm start | Turn on the switch when no power supply | All | Off | High priority | <5s |
| 2 | Main machine ROM failure alarm | Red alarm light flashes, set indicator shows “H02”, sound alarm start | Main MCU internal ROM failure | All | Off | High priority | <50S |
| 3 | Main machine internal system failure alarm | Red alarm light flashes, set indicator shows “H01”, sound alarm start | Main MCU internal RAM failure | All | Off | High priority | <10S |
| 4 | Communication failure alarm between main machine and slave machine | Red alarm light flashes, set indicator shows “H03”, sound alarm start | Communication failure between main machine and slave machine | All | Off | High priority | <10S |
| 5 | Slave machine ROM failure alarm | Red alarm light flashes, set indicator shows “H06”, sound alarm start | Slave machine MCU internal ROM failure | All | Off | High priority | <10S |
| 6 | Slave machine internal system failure alarm | Red alarm light flashes, set indicator shows “H05”, sound alarm start | Slave machine MCU internal RAM failure | All | Off | High priority | <10S |
| 7 | Main machines internal EEPROM fault | Red alarm light flashes, set indicator shows “H04”, sound alarm start | Main machine internal EEPROM failure | All | Off | High priority | <10S |
| 8 | SRAM fault alarm | Red alarm light flashes, set indicator shows “H09”, sound alarm start | SRAM failure （including system bus fault） | All | Off | High priority | <10S |
| 9 | ADC1 fault alarm | Red alarm light flashes, set indicator shows “H07”, sound alarm start | ADC1 fault （main machine system TLV2544,including the sampling error, chip damage, no reaction, etc） | All | Off | High priority | <10S |
| 10 | ADC2 fault alarm | Red alarm light flashes, set indicator shows “H08”, sound alarm start | ADC2 fault （slave machine system TLV2544,including the sampling error, chip damage, no reaction, etc） | All | Off | High priority | <10S |

Table 3.2 Alarm introduction (continued)

| Alarm No. | Alarm information | Alarm character | Alarm activate condition | Control mode | The state of heater | Alarm level | Alarm delay time |
|---|---|---|---|---|---|---|---|
| 11 | The heating circuit fault alarm | Red alarm light flashes, set indicator shows “H11”, sound alarm start | The heating circuit fault（heater, solid relay, mechanical relay and the respective circuit fault controlled by them） | All | Off | High priority | <20S |
| 12 | Skin sensor failure alarm | “Sensor” alarm light is on, red alarm light flashes, set indicator shows “E01”, sound alarm start | Short circuit, open circuit or bad connection occurs inside the skin temperature sensor | Baby | Off | High priority | <5s |
| 13 | Skin isolated sensor failure alarm | “Sensor” alarm light is on, red alarm light flashes, set indicator shows “E02”, sound alarm start | Short circuit, open circuit or bad connection occurs inside the isolated temperature sensor | Baby | Off | High priority | <15s |
| 14 | Skin sensor difference failure alarm | “Sensor” alarm light is on, red alarm light flashes, set indicator shows “E03”, sound alarm start | The difference between the main probe and isolated probe of skin sensor is over 0.8℃ | Baby | Off | High priority | <50s |
| 15 | Over temp alarm | “Over” alarm light is on, red alarm light flashes, set indicator shows “E04”, sound alarm start | The temperature measured by the skin temperature sensor is more than 38.5℃ | Baby | Off | High priority | <10s |
| 16 | Alarm deviation | “H/L” alarm light is on, red alarm light flashes, set indicator shows “E05”, sound alarm start | The displayed skin temperature is higher than set temperature 1℃ | Baby | Off | High priority | <5s |
| | | “H/L” alarm light is on, red alarm light flashes, set indicator shows “E06”, sound alarm start | The displayed skin temperature is lower than set temperature 1℃ | Baby | On | High priority | <5s |

Table 3.2 Alarm introduction (continued)

| Alarm No. | Alarm information | Alarm character | Alarm activate condition | Control mode | The state of heater | Alarm level | Alarm delay time |
|---|---|---|---|---|---|---|---|
| 17 | Set alarm | “SET” alarm light is on, red alarm light flashes, set indicator shows “E07”, sound alarm start | The temperature measured by skin sensor is lower than set temperature 3.5℃ above, and lasts for 2 mins. | Baby | Off | High priority | <2min |
| | | “SET” alarm light is on, red alarm light flashes, set indicator shows “E08”,sound alarm start | When temperature stable state, if the temperature is out of the stable state over 0.4℃by accident or unreasonable action and do not back to the stable state in 3 mins and do not occur the deviation alarm. | Baby | Off | High priority | <3min |
| 18 | Check alarm | “CHECK” alarm light is on, red alarm light flashes, set indicator shows “E09”, sound alarm start | Appears every 15 minutes. | Manual | Off | High priority | <15min |
| 19 | Real time clock failure alarm | Red alarm light flashes, set indicator shows “E10”, sound alarm start | the real time clock RTC fault or not accurate of the internal system | All | Off | High priority | <15s |
| 20 | Keyboard fault alarm | Yellow alarm light flashes, set indicator shows “H12”, sound alarm start | Keypad short-circuit fault | All | Off | Medium priority | <15s |
| 21 | Battery fault alarm | Yellow alarm light flashes, set indicator shows “H13”, sound alarm start | Short circuit, open circuit or bad connection occurs inside rechargeable battery of the controller | All | Off | Medium priority | <10s |

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NOTE: 1. All the above alarms except the deviation alarm and skin over temperature alarm in baby mode are belong to physiological alarm status, the power failure alarm belongs to other alarm status; the others are all technology alarm status.

2. Except for the power failure alarm, the other alarms are all can silence by pressing silence/reset key, the time for silence is 4mins. When the silence time is over, if the alarm condition is still not solved, the alarm will have to activate. If occur multiple alarm at the same time, the device will give an alarm firstly for the higher grade. Press the twice of silence /reset key can cancel the alarm state then the equipment back to the set condition to monitor the alarm.

3. If checking alarm active, and the operator doesn't press the silence/reset key, the heater output will be limited to 30% automatically. This does not mean there is something wrong with the equipment, but for giving a hint that the operator should check and monitor the body temperature of patient.

4. The power failure alarm lasts at least 10 mins, when power supply recover before the alarm indication, the equipment will back to the setting before power failure alarm.

5. Alarm system will save the all the alarm logs automatically. When the equipment is outage, the saved log contents did not changed

ARNING: When using the infant radiant warmer in any independent place, if use different alarm preset, there will be the potential risk.

# SECTION 4
# PREVENTIVE MAINTENANCE

## 4.1 GENERAL

The section provides cleaning and maintenance instructions. Service required in this section should only be operated by qualified personnel.

## 4.2 CLEANING

> WARNING: Please cut off all power connection and turn off all switches before cleaning and maintenance.

This device must be cleaned and sterilized for the first time for initial use, or after used it for one week.

### 4.2.1 DISASSEMBLY BEFORE CLEANING

A. Please cut off the main power connection and turn off all switches before cleaning.

B. Take out the skin temperature sensor from the temperature controller.

C. Take out the mattress from the bassinet.

D. Please disassemble the panel from the bassinet according to the contrary sequence as the step B of 2.2 in section 2. Then remove the soft tubing from the panel.

### 4.2.2 CLEANING PROCEDURE

Please use neutral disinfectant-detergent (e.g.84 disinfector), and please follow the instruction for detergent usage. Please process the following procedure after cleaning all dirt on the disassembled parts. Please dry them after cleaning.

CAUTION:Some chemical detergent will conduct electricity or leave some remains so as to the accumulation of dust that is easy conduct electricity. Please keep the detergent away from all electric parts. Please do not leave the detergent on these parts.

A. Clean the skin temperature sensor.

Use neutral disinfectant-detergent to thoroughly clean all surfaces (including the probe); then disinfect it with neutral disinfectant or ultraviolet.

CAUTION: 1. Do not put the sensor into the disinfectant-detergent. Single patient use skin temperature sensor is only for the same patient’s use, after using please discard.

2. skin temperature sensor suggest to be changed every two years, to avoid the damage of sensor surface and strong impact for long-time use and disinfection.

B. Clean the mattress

Use neutral disinfectant-detergent (e.g.84 disinfector) to thoroughly clean all surfaces; then dry with a clean cloth or paper towel.

C. Clean the panel

NOTE: Alcohol can cause crazing of the clear Acrylic panel. Do not use alcohol, acetone or any organic solvents for cleaning. Do not expose the panel assembly to direct ultraviolet radiation.

Use neutral disinfectant-detergent (e.g.84 disinfector) to thoroughly clean all surfaces; then dry with a clean cloth or paper towel.

D. Clean the soft tubing, bassinet, tray and the I.V pole

Use neutral disinfectant-detergent to thoroughly clean all surfaces; then dry with a clean cloth or paper towel.

E. Clean the surface of the device

Use neutral disinfectant-detergent to thoroughly clean all surfaces, including all the corner and sunken place, then dry with a clean cloth or paper towel.

NOTE: You should wait for the heater head became cooling completely, then the surface of it can be cleaned.

CAUTION: 1. Please avoid the liquid flowed into the device during cleaning.

2. The reflective cover is an important part which is used to reflect the infrared radiation heat onto the mattress. It is easy to damage or scratch the surface or disform the shape, and please be careful to clean it.

4.2.3 ASSEMBLE AFTER CLEANING

NOTE: Before install the parts onto the radiant warmer, please check each parts carefully and to see whether there is any broken. If there is any broken, it should be replaced immediately.

A. Please assemble the panel into the bassinet according to the step B of 2.2 in section

NOTE: The soft tubings must be put back before installing the panel. The opening of soft tubings should be outward.

B. Put the mattress back to the bassinet.

C. Put the skin temperature sensor into the sensor socket.

## 4.3 MAINTENANCE

WARNING: To ensure the safety of using the equipment is not affected, the modified of infant radiant warmer is forbidden.

### 4.3.1 RECHARGEABLE BATTERY MAINTENANCE.

Please check the condition of the build-in rechargeable battery before the first use of device or in the alternation of device using.

A. Operate the unit for a period of 12 to 24 hours.

B. Trigger a power failure alarm by disconnecting the AC power cord.

C. The power failure alarm should activate and continue to alarm for at least 10 minutes.

D. Reconnect the unit to the AC line and recharge the battery.

If the power failure alarm cannot last more than 10 minutes, please replace the rechargeable battery. Please refer to the section 5.2.1 to replace the rechargeable battery.

NOTE: 1.Only the rechargeable battery provided by our company can be used, or will reduce the safety of the device.

2. The replaced rechargeable battery will affect the environment if discard, so need to be recover according to the regulations.

### 4.3.2 HEATER MAINTENANCE

In order to ensure the effect of the infrared radiant, when the lifetime of heater ends, it must be replaced even it can still work. The reason is:

The electromagnetism spectrum infrared radiance of the heater will be reduced with the long working time. This will make the device not achieve the standard as table 3.1 in this manual. Therefore, the previous effect will not be good when the doctor uses it to keep the patient warm.

For the heater's replacing, please refer to section 5.

### 4.3.3 ACCURACY CALIBRATUON OF BABY TEMPERATURE SENSOR

Skin temperature sensor must be calibrated every half a year. The reason is:

With aging of skin temperature sensor, and the accuracy of sensor will changes a little to make the baby temperature and the real temperature different so that the output heat can not meet the clinical need heat.

Calibration method: in working state, put the skin sensor into the water cup at 36℃±0.1℃ or inset the 36℃ calibration device on the socket of skin sensor, press the calibration key until the baby temperature indicator displays "--,--" for 10s, after the flashing stops, the calibration will end when it indicates 36℃, and the you can continue to use the skin sensor. When it indicates "EL.L", it means the calibration error, please replace the skin temperature sensor.

NOTE: The temperature of the water cup must keep at 36℃±0.1℃ during calibration.

# SECTION 5
# SERVICE

## 5.1 GENERAL

This section provides system setting procedure and the troubleshooting procedure of controller, replacement of illumination light, Quartz heater, Fuse, Internal charging battery.

## 5.2 REPLACEMENT OF CHARGING BATTERY, FUSE, QUARTZ HEATER, AND ILLUMINATION LIGHT

### 5.2.1 REPLACEMENT OF INTERNAL CHARGING BATTERY

Open Controller and replace internal battery. See figure 5.1, disonnect the battery fastener and the internal charing battery, and take out the plastic washer to replace the battery.

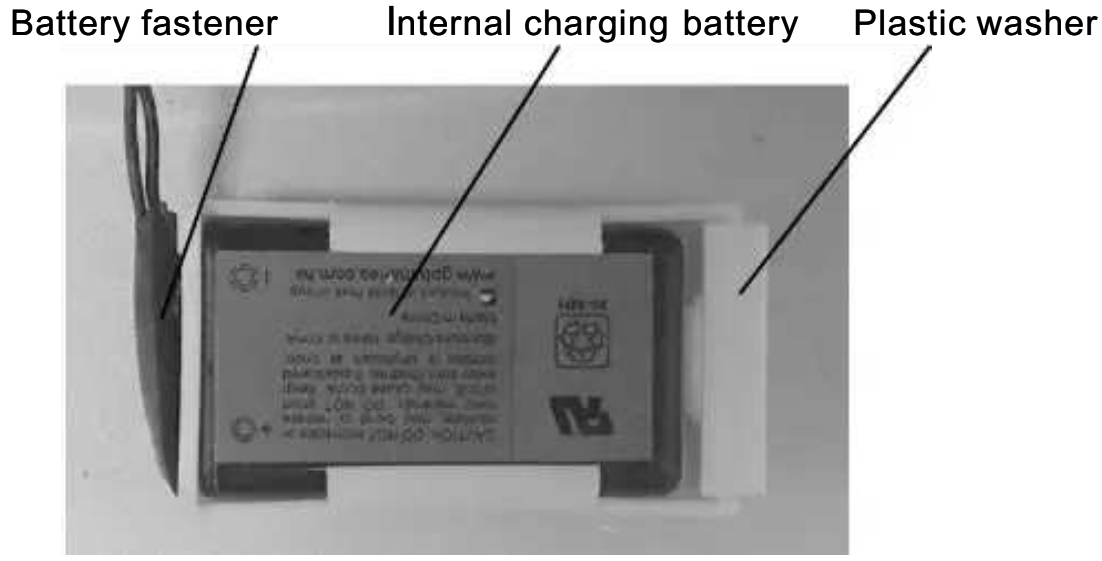



FIGURE 5.1

NOTICE: 1. During replacing the internal battery, the plastic washer should be placed the originalposition, and keep correct connection between the anode/ cathode of battery and its fastener; the faulty connection will cause the damage to the battery and no hont for power failure alarm.

2. Please replace the internal battery after using it for three years.

3. Battery will be automatically charged when the temperature controller works, charging the battery outside of the incubator is forbidden.

4. The charging battery inside the wartmer is GP17R8H Ni-MH8.4V/170mAh; to ensure safety, do not disassemble battery. Connect the battery correctly; do not use other type battery.

5. It will not influence battery charging and the battery capacity when the battery is full. (Switch on controller)

6. Please do not throw the old battery into fire or water to avoid explosion or leakage.

7. Plrease dispose the Old battery accoring to local law, and please do not throw

them away randomly.



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5.2.2 REPLACEMENT OF FUSE

A. See figure 5.2, open the fuse's cover to replace 2 fuses F4AH/250V.



FIGURE 5.2

B. See figure 5.3, open the controller. Screw off the fuse cover of the T3.15AL/250V at the controller internal switch power input to replace the fuse. Open the top cover of warmer module, replace the illumination light of T800mAL/250V fuse.

NOTE: The fuse only can be replaced by authorized qualified maintenance personnel. Please cut off the power supply and do not touch the metal parts and patients at the same time before replacing the fuse according to the stipulated specification.




FIGURE 5.3

5.2.3 EPLACEMENT OF QUARTZ HEATER

See section 5.4, open the protective cover of warmer module, unscrew the cable of two sides for quartz heater and the mounting nut for bracket, take out the spring, and disassemble the bracket to take out the quartz heater.

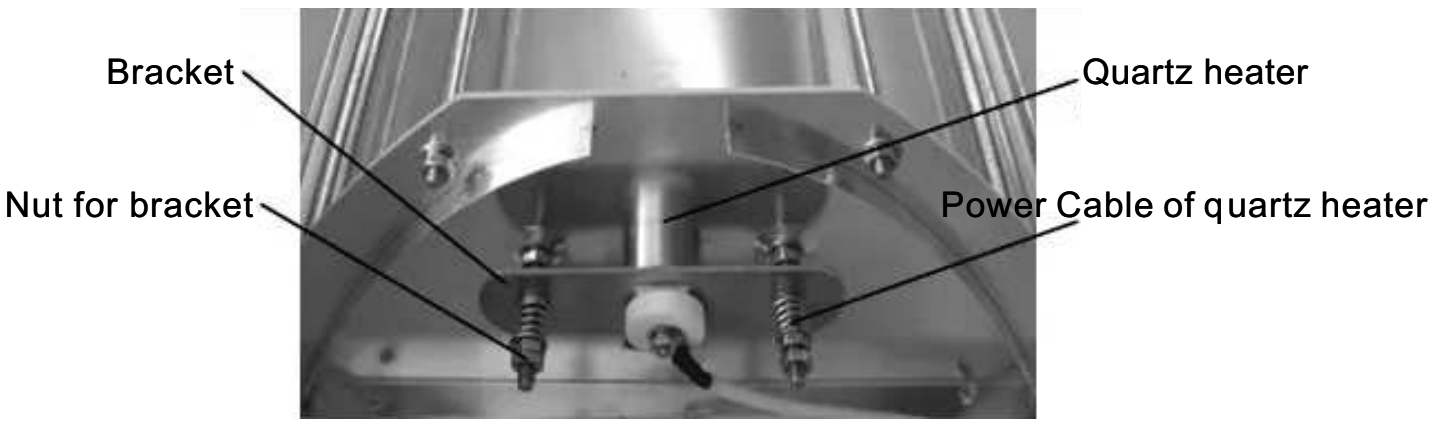



FIGURE 5.4

NOTE: Replacing of the quartz heating pipe must after it is cooled down.

5.2.4 REPLACEMENT OF ILLUMINATION LIGHT

See section 5.5, open the defending cover of the warmer module, disconnect the power cable of examination light, screw the fix bolt loose on the light cover and take the cover away. Then replace the light.

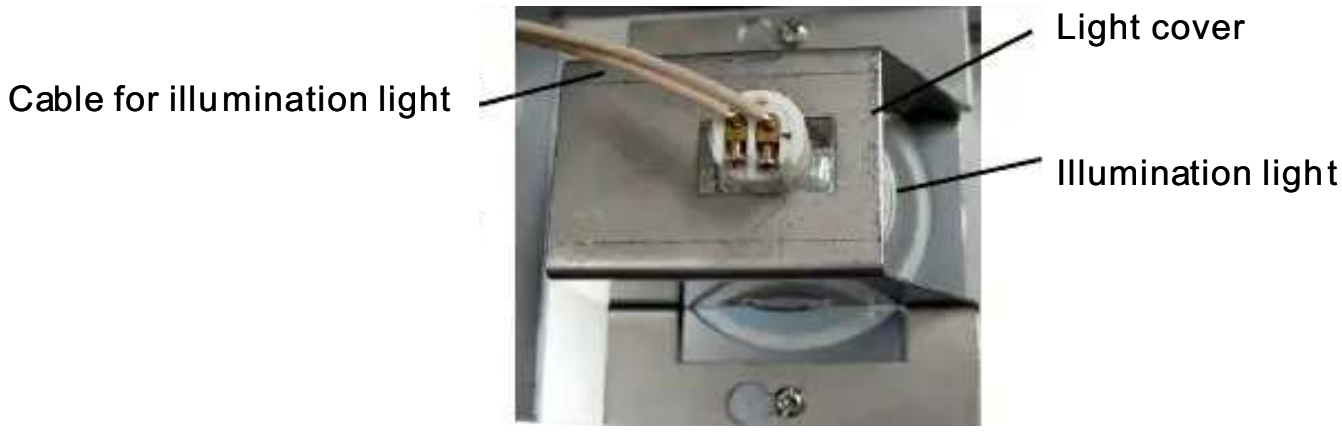



FIGURE 5.5

## 5.3 SYSTEM SETTING PROCEDURES

### 5.3.1 GENERAL

This paragraph provides controller system setting procedure. This procedure is only available to the qualified service personnel.

NOTICE: Please follow by the procedures of item 5.3.3. If it is unnecessary, please do not change data of system setting to avoid hazards.

### 5.3.2 BRIEF INTRODUCTION

Controller system setting procedures listed below:

1. Brightness
2. Spare
3. Baby temperature compensation
4. Machine Number
5. High deviation of baby temperature
6. Low deviation of baby temperature

7. Upper limit of baby temperature set

8. Lower limit of baby temperature set

9. Over- temperature alarm value

CODE 00.1BRIGHTNESS

Stipulate the brightness of the indicators and the set range is 00.0~01.5. The higher the value is, the brighter the data is.

CODE 00.3BABY TEMPERATURE COMPENSATION

Stipulate the compensationof the baby temperature and the set range is -5.0~05.0. The first figure for set means increasing or decreasing. Example: 00.2℃ means that the baby temperature will be added 0.2℃ as compensation. -1.3℃ means that the baby temperature will be reduced 1.3℃ ascompensation.

CODE 00.4 MACHINE NUMBER

Set range is 00.1~04.0. Example 00.1 means No.1 machine, 01.5 means No.15 machine.

CODE 00.5 HIGH DEVIATION OF BABY TEMPERATURE

Set high deviation under baby mode, set range is 00.0~03.0. Example: the data 01.0 means high deviation 1.0 ℃.

CODE 00.6 LOW DEVIATION OFBABY TEMPERATURE

Set low deviation under baby mode, set range is 00.0~03.0. Example: the data 01.0 means low deviation 1.0 ℃.

CODE 00.7 UPPER LIMIT OF BABY TEMPERATURE SET

Set Max set value of baby temperature, set range is 35.0~38.0. Example: the data 37.5 means Maximum set value 37.5 ℃.

CODE 00.8 LOWER LIMIT OF BABY TEMPERATURE SET

Set Min. set value of baby temperature, set range is 25.0~35.0. Example: the data 25.0 means Minimum set value 25.0 ℃.

CODE 00.9 OVER-TEMPERATURE ALARM SET

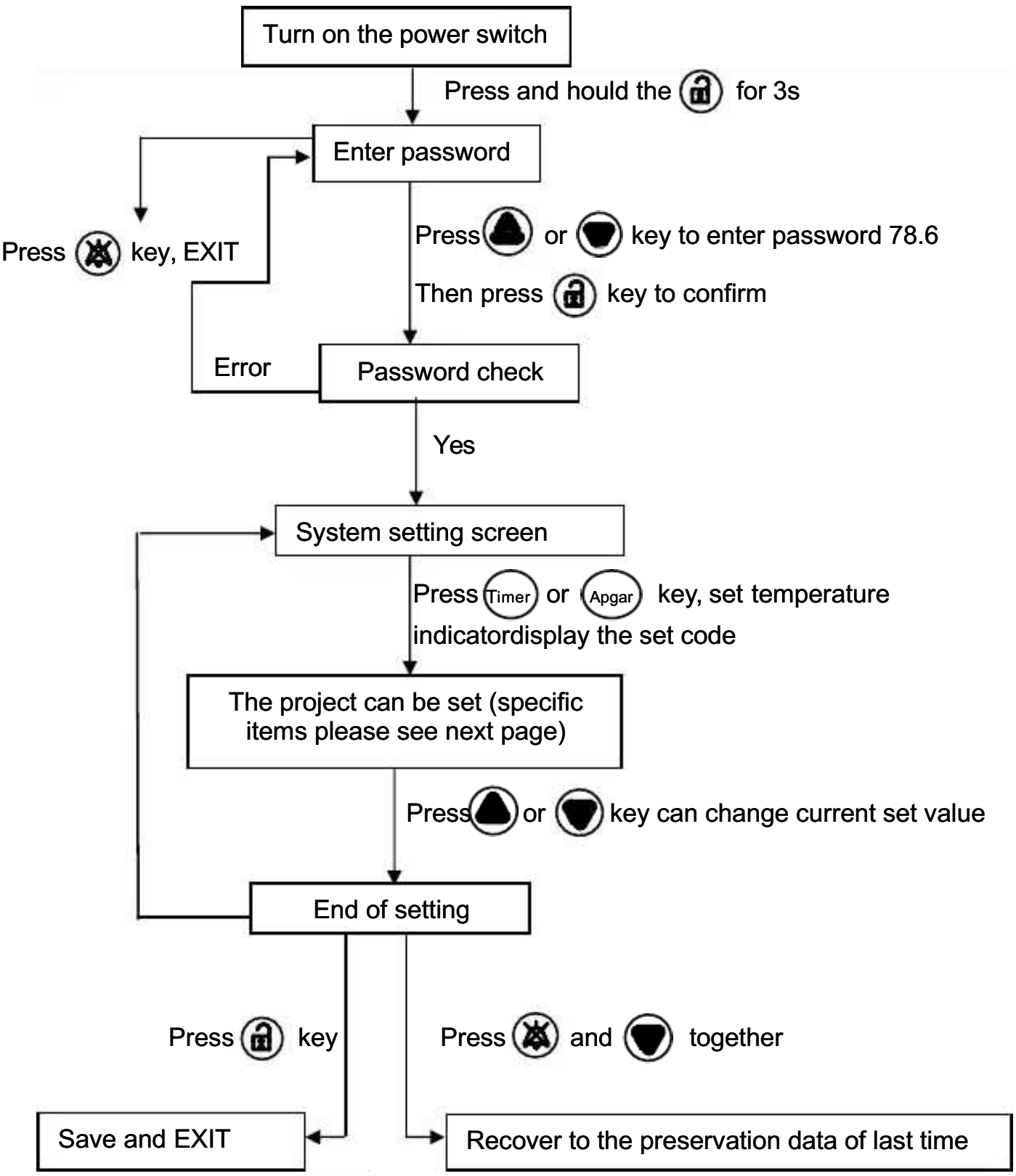
Set range is 37.0~41.0. Example 38.5 means that alarm value of over temperature is 38.5.℃.

5.3.3 PROCEDURE

WARNING: 1.The set of the system can not be changed at will.
2.The maintenance personnel can not reveal the system entering password to the others, and also can not place the service manual at will, and make the operator can get the password so easy.

At first, connected power supply, press and hold for 3s as soon as switch on until baby temperature indicator displays “00.0”, and no display on Set temprature indicator. And then, press or until baby temperature indicator displays “78.6”, after then, press to enter into the system set screen, or press to exit.

After entering into the set screen, time indicator displays P001, set temprature indicator displays set code, baby temperature indicator displays the specific set data.




FLOW CHART 5.1 SYSTEM SET PROCEDURE FLOW CHART

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## 5.4 TROUBLESHOOTING PROCEDURES

### 5.4.1 GENERAL

Troubleshooting guides for the Controller are provided in Paragraph 5.4.3 and Paragraph 5.4.4. Paragraph 5.4.3 provides the alarm code when the controller alarms. Paragraph 5.4.4 provides troubleshooting in the form of flowcharts.

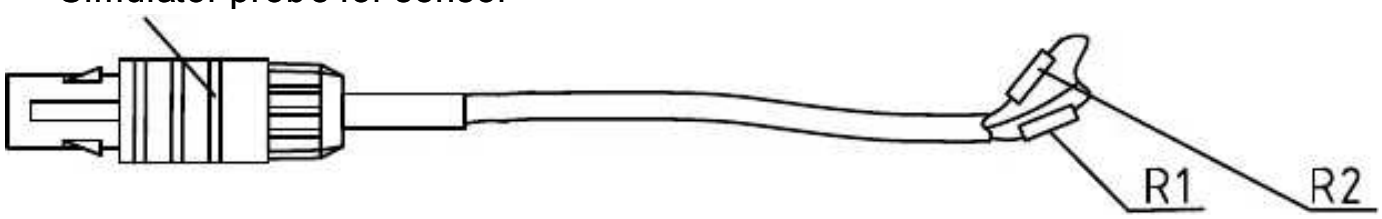
- It is confirmed that the system settings are correct before troubleshooting.

### 5.4.2 TEST EQUIPMENT REQUIRED

The test devices listed below are required for troubleshooting the Controller. Equivalent test device may be substituted.

- Digital VOM, FLUKE 17B
- 31.0℃ Baby Temperature Simulation

Simulator probe for sensor




Resistor R1,R2=23166Ω±182Ω/0.25W/0.5%

### 5.4.3 TROUBLESHOOTING

All alarms have the relevant alarm code except for the power faillure alarm, please refer to table 5.1.

Table5.1 ERROR CODES

| TYPE | ALARM CODE | EXPLANATION AND CORRECTIVE ACTION |
|---|---|---|
| Main RAM failure alarm | H01 | Replace main MCU |
| Main ROM failure alarm | H02 | Replace main MCU |
| Double MCU communication failure alarm | H03 | 1. Check the connection of circuit between the main MUC and auxiliary MCU<br>2. Replace main MUC and auxiliary MCU |
| $E^2$PROM failure alarm linside of main MCU | H04 | 1. See 5.3.3, system recover to the preservation data of last time<br>2. Replace main MCU |
| RAM failure alarm inside of auxiliary MCU | H05 | Replace auxiliary MCU |
| ROM failure alarm inside of auxiliary MCU | H06 | Replace auxiliary MCU |
| Main ADC failure alarm | H07 | Check the U8ADC and connections. |

TABLE 5.1 ERROR CODES(continued)

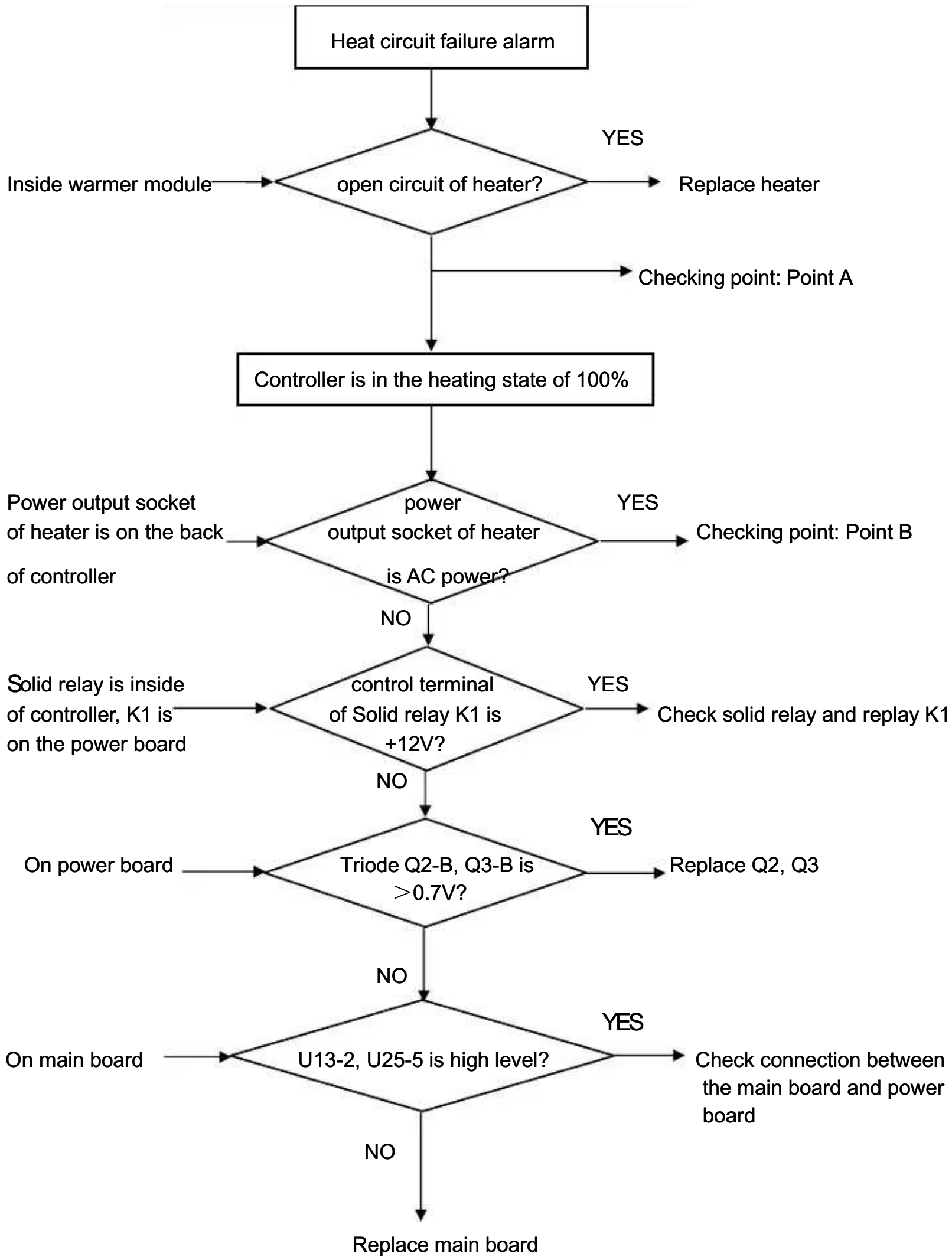
| TYPE | | ALARM CODE | EXPLANATION AND CORRECTIVE ACTION |
|---|---|---|---|
| Auxiliary ADC failure alarm | | H08 | Check the U9ADC and its connect wire |
| SRAM failure alarm | | H09 | 1.Check the connection between SRAM and microcontroller MCU<br>2 .Replace SRAM (main board U12) |
| Real timer RTC failure alarm | | H10 | 1.Check the connection between RTC and microcontroller MCU<br>2.Replace RTC (main board U17) |
| Heat circuit failure alarm | | H11 | Refer to Flow chart 5.1 |
| Keyboard fault alarm | | H12 | When the key board of the control panel on the controller occurs short-circuit alarms, please replace the control panel. |
| Battery failure alarm | | H13 | Inner storage battery failure alarm:<br>1.Check the wire connection between the inner storage battery and the power board.<br>2. Replace the inner storage battery. |
| Skin temperature sensor failure alarm | | E01 | Refer to Flow chart 5.2 |
| | | E02 | Refoer to Flow chart 5.3 |
| | | E03 | Refer to Flow chart 5.4 |
| Over-temp alarm | | E04 | Refer to Flow chart 5.5 |
| Deviation alarm | Upper deviation | E05 | 1.Check the position of sensor<br>2.Check the ambient temperature<br>3.Make the device far away the heat resource |
| | Lower deviation | E06 | |
| Set alarm | | E07 | Please set the temperature or change the control mode correctly |
| | | E08 | Please check the condition of probe and the patient's skin |
| Power failure alarm | | NO | Refer to Flow chart 5.6 |

5.4.4 TROUBLE SHOOTING FLOW CHART

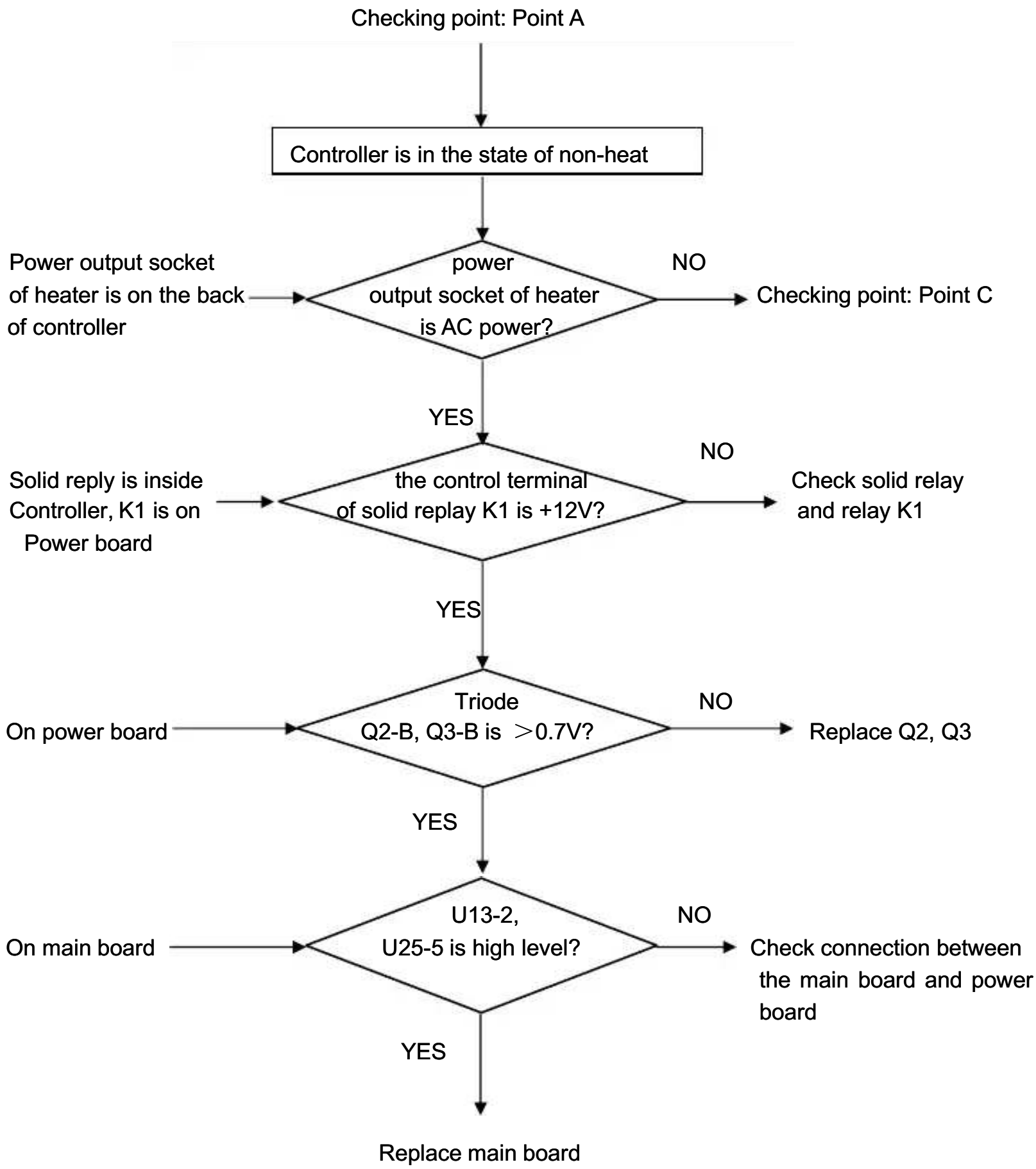
Before troubleshooting, first, please switch off, and disconnect the power cable, and then open the top cover of warmer module and the back cover of column. And then connect the power cable and turn on the switch, at the same time, make sure that power +5V, +12V of controller, element, and all cables are in good condition.In working state, press  Key and  Key, and the Baby temperature indicator displays the temperature measured by the Over-temp probe inside skin sensor,

and Set temperature indicator displays the voltage of battery, so it is easy to find the reason of failure.

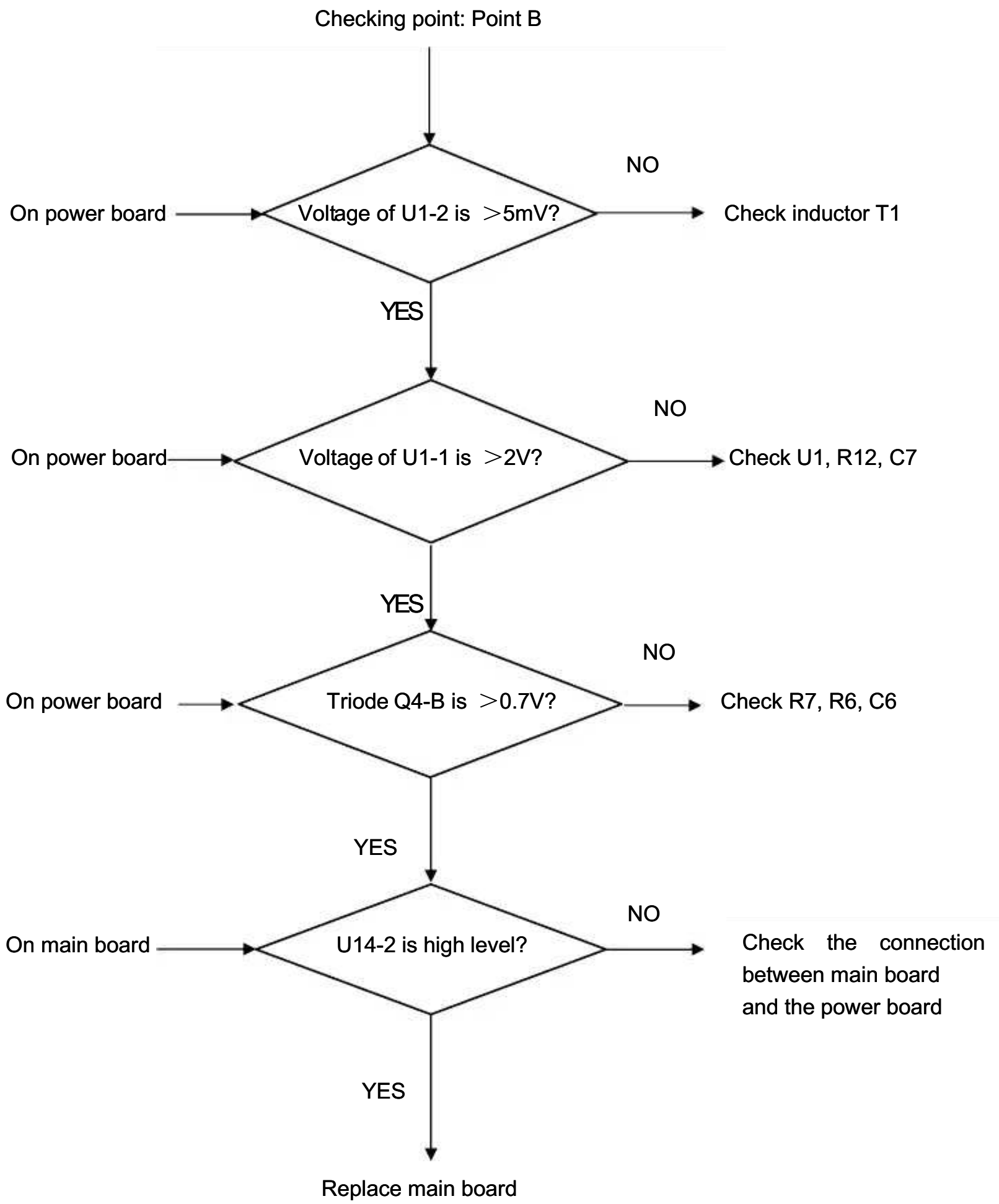




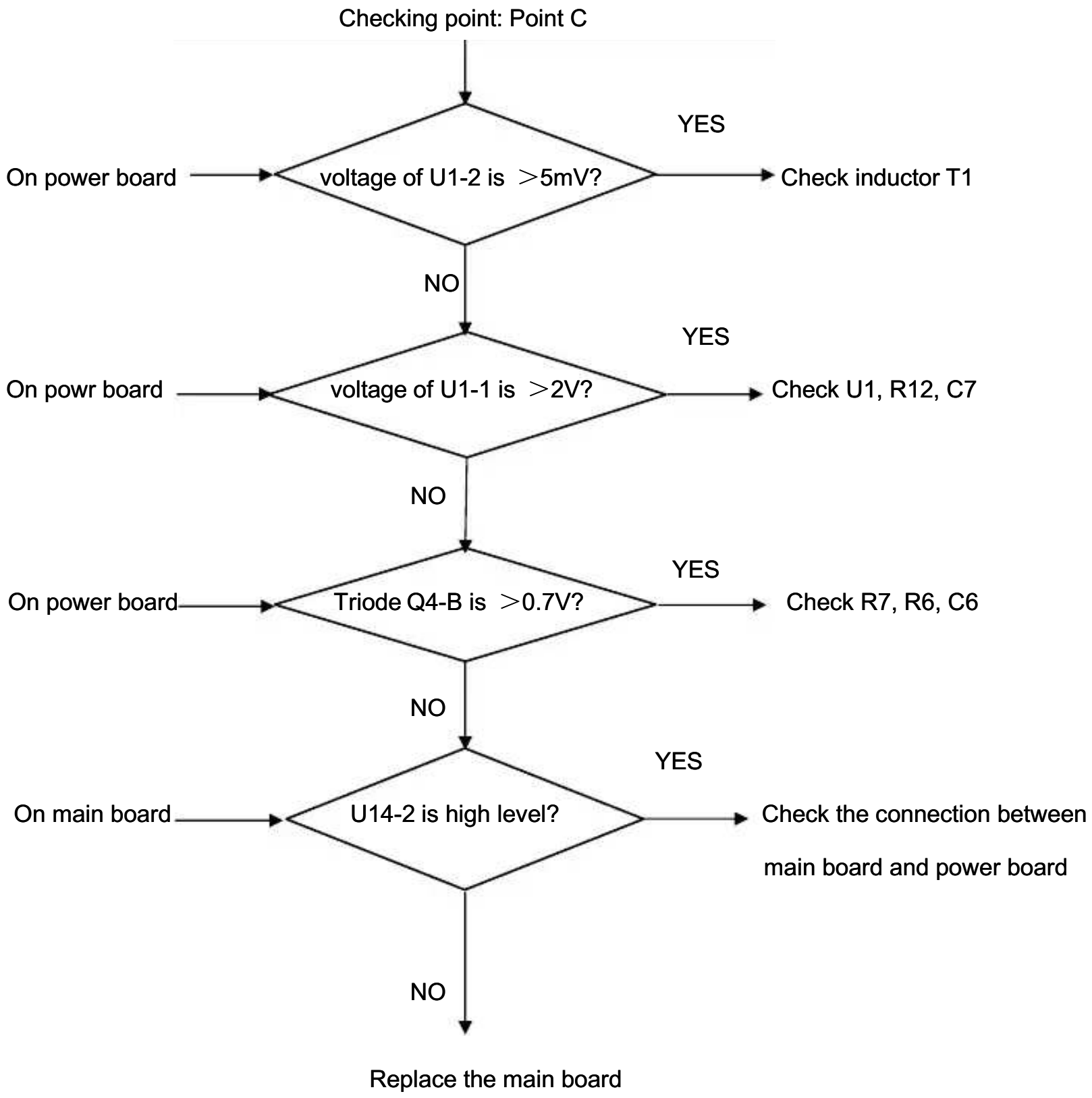

FLOW CHART 5.1 HEAT CIRCUIT FAILURE ALARM (Sheet 1 of 4)



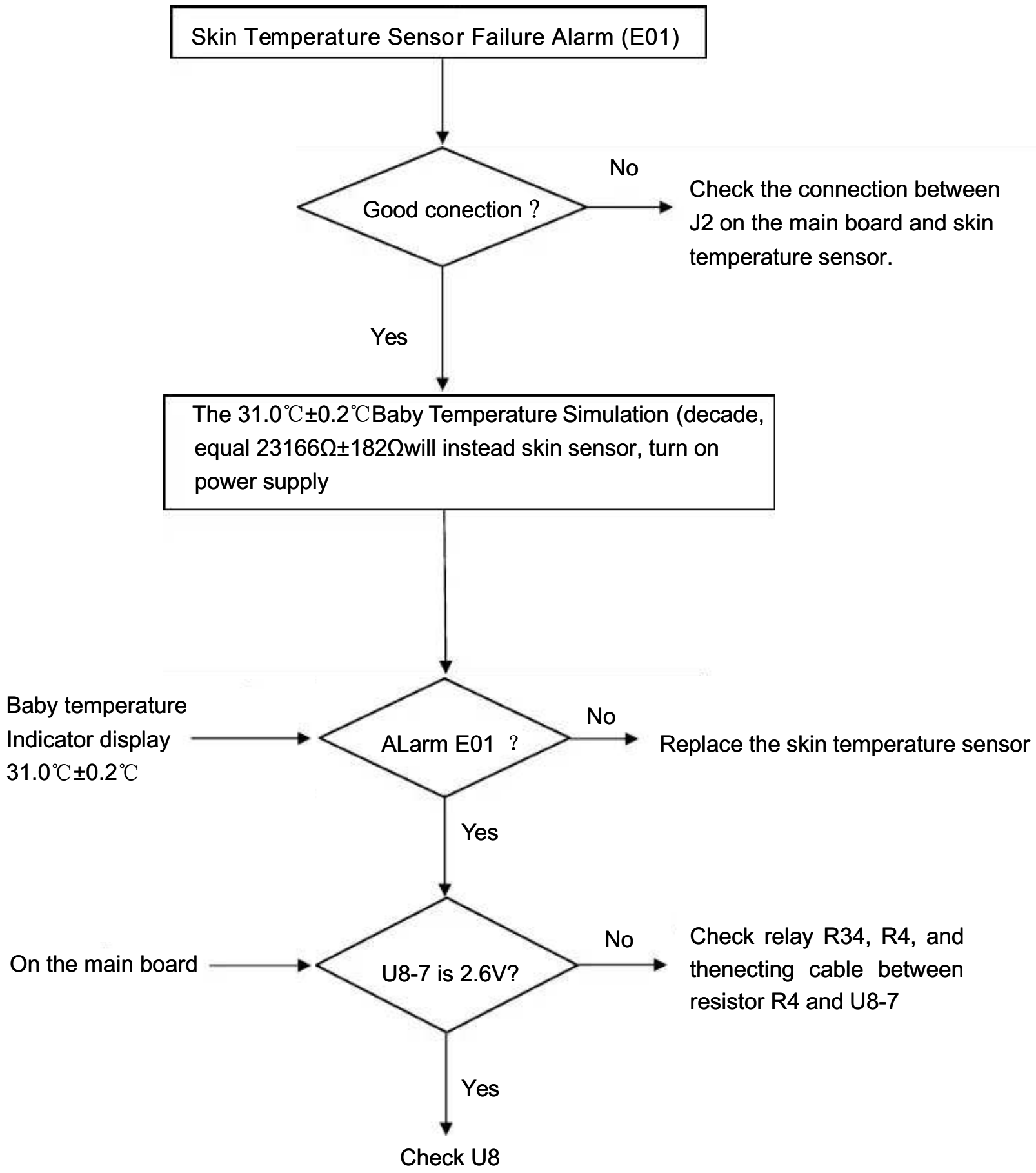

FLOW CHART 5.1 HEAT CIRCUIT FAILURE ALARM (Sheet 2 of 4)



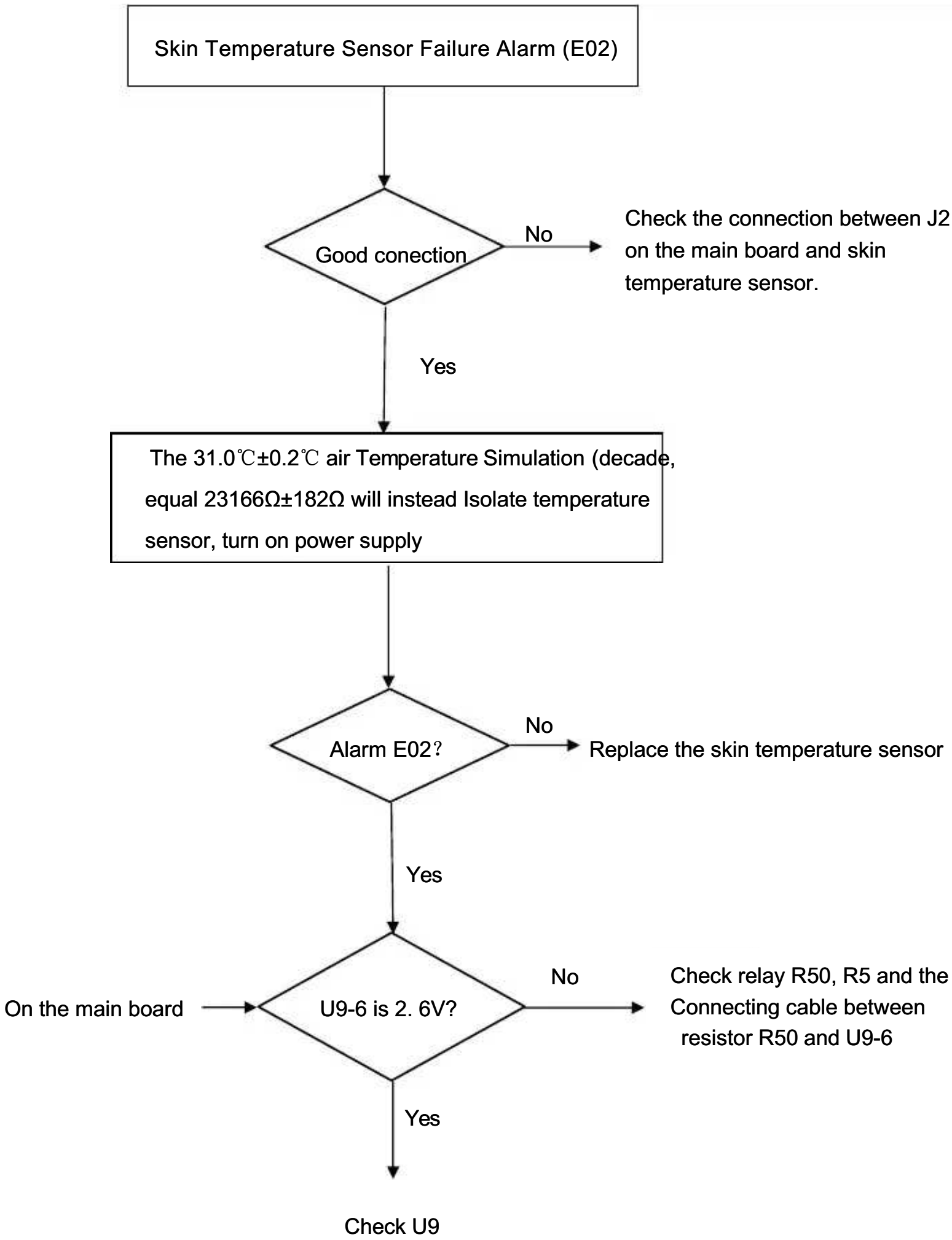

FLOW CHART 5.1 HEAT CIRCUIT FAILURE ALARM (Sheet 3 of 4)



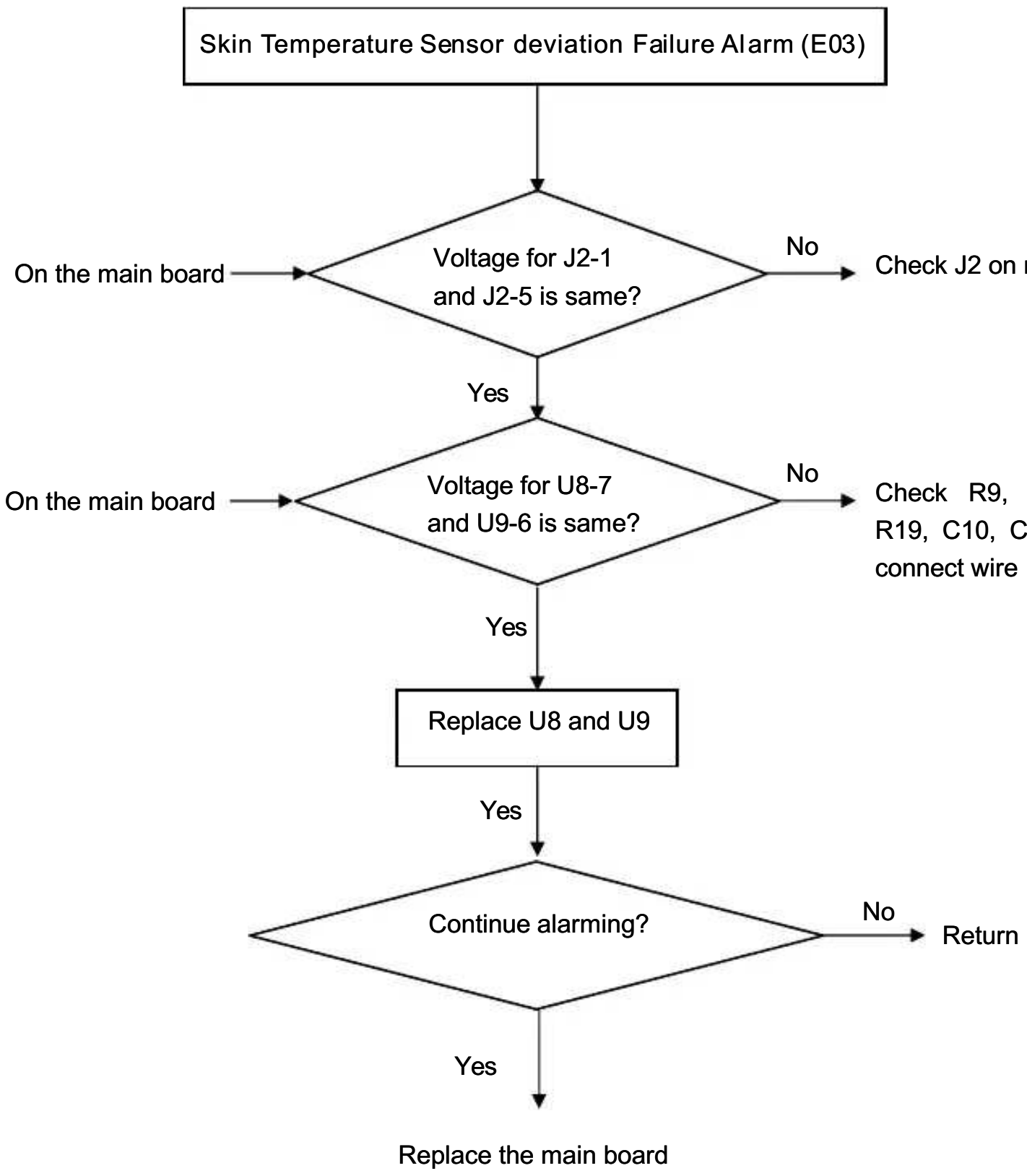

FLOW CHART 5.1 HEAT CIRCUIT FAILURE ALARM (Sheet 4 of 4)



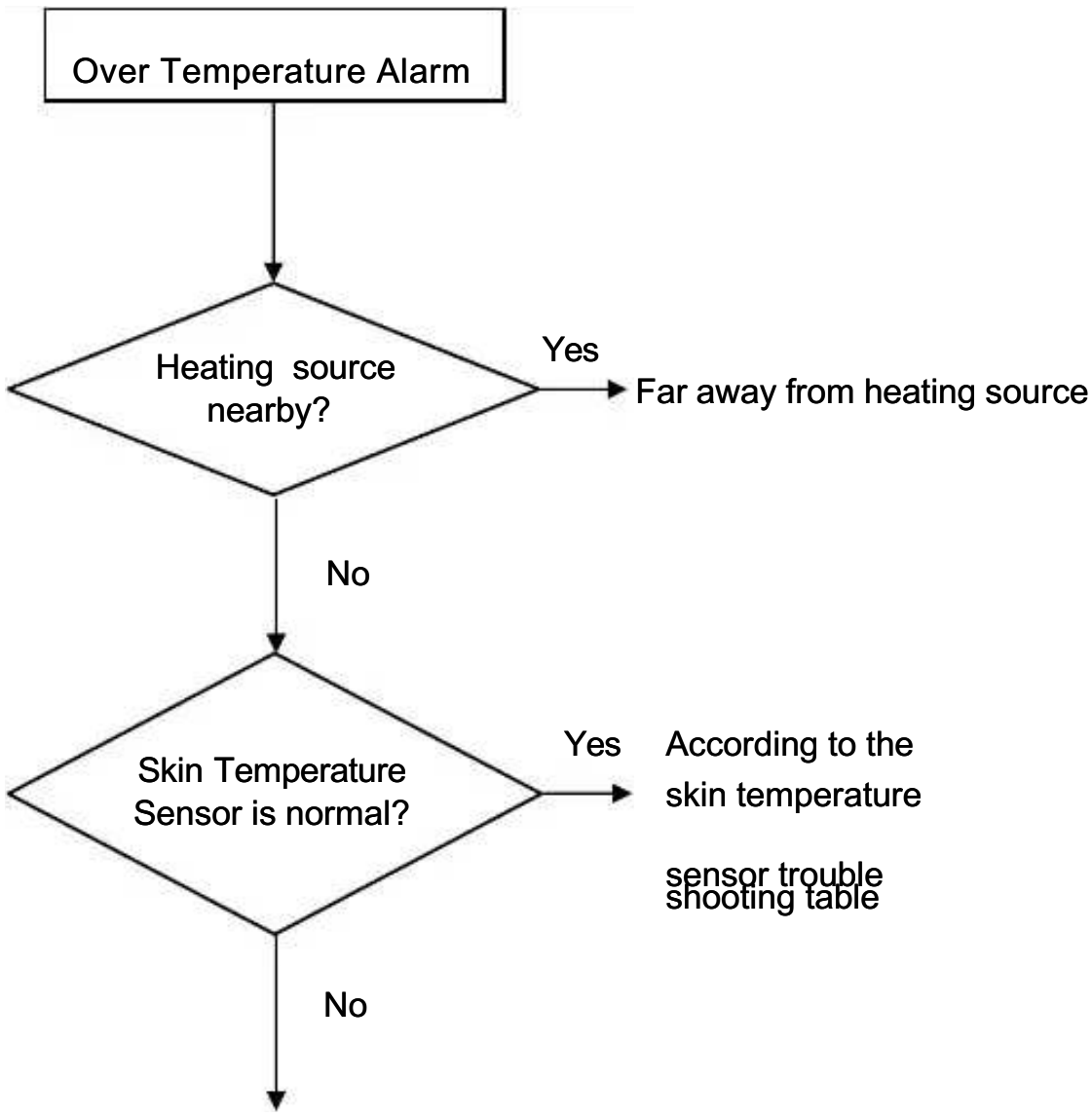

FLOW CHART 5.2 Skin Temperature Sensor Failure Alarm



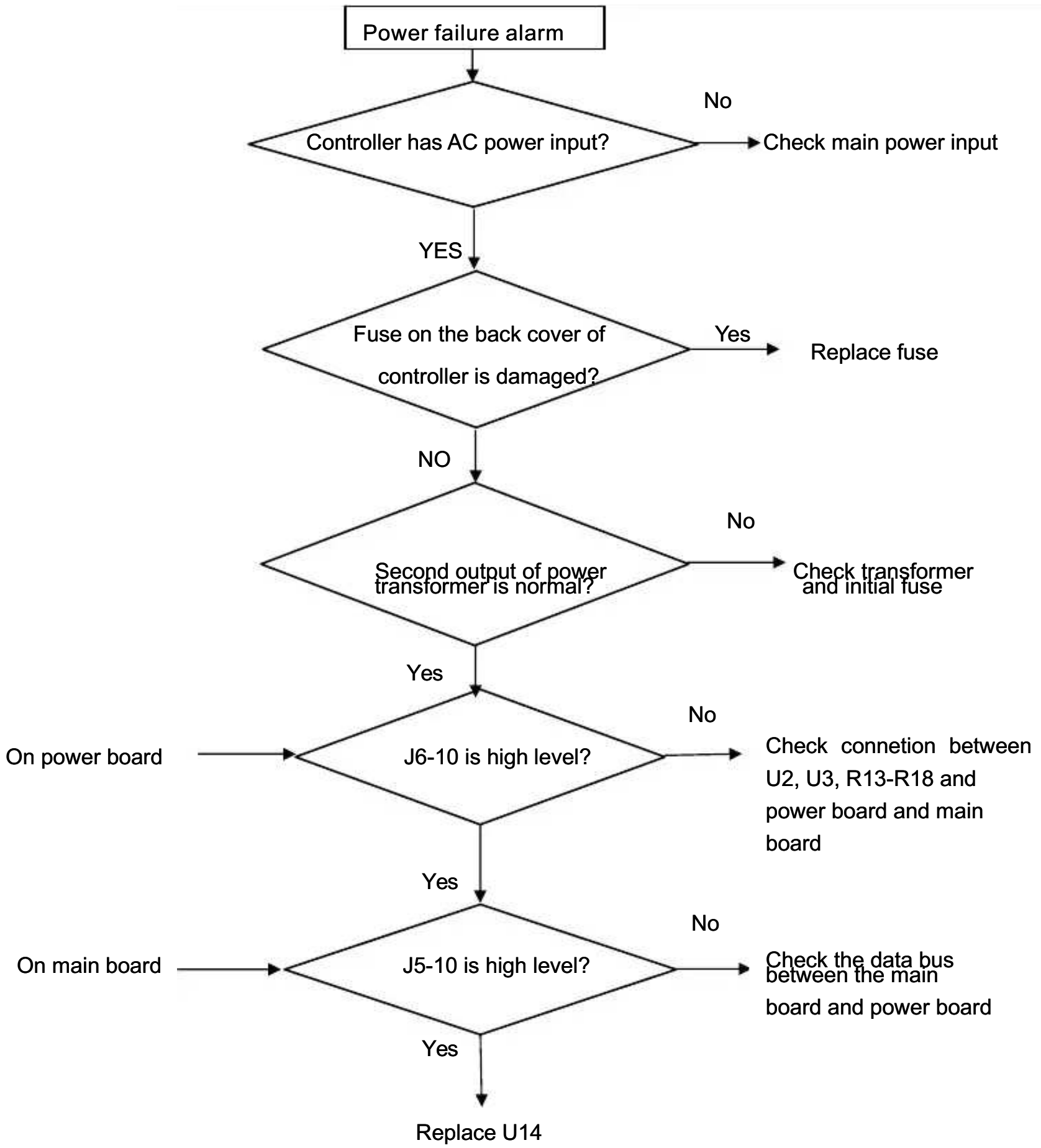

FLOW CHART 5-3 Skin Temperature Sensor Failure Alarm




FLOW CHART 5.4 Skin Temperature Sensor deviation Failure Alarm




FLOW CHART 5.5 Over-Temperature Alarm




FLOW CHART 5.6 Power Failure Alarm

# SECTION 6
# MAIN PARTS LIST AND PARTS NUMBER

## 6.1 GENERAL

This section provides the parts list of infant radiant warmer.

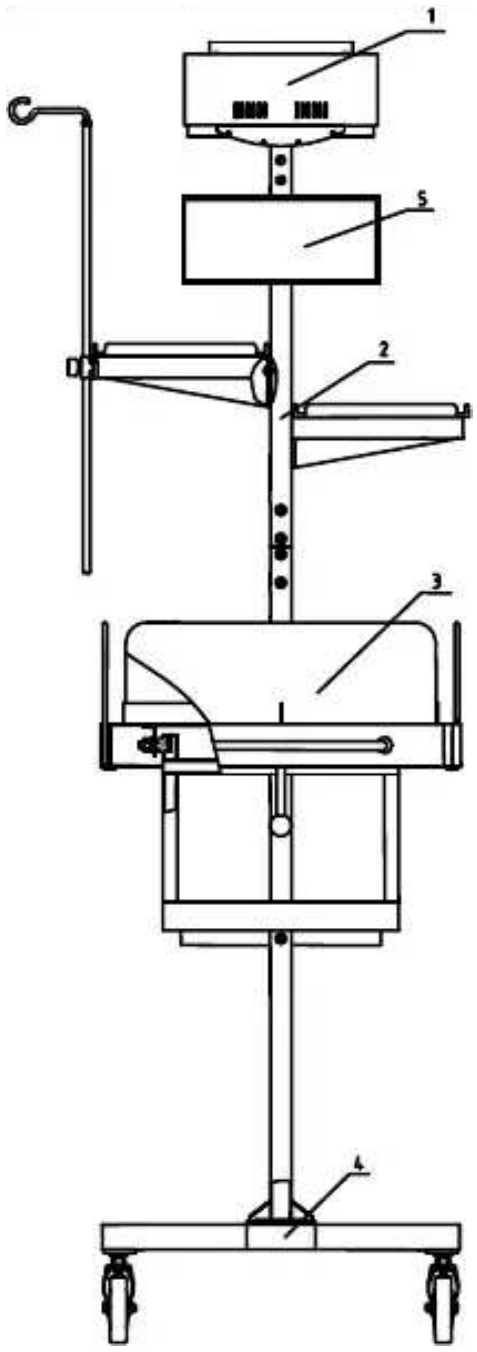



Figure 6.1 Parts Location Diagram, Whole unit

Table 6.1 Replacement Parts List, Whole unit

| ITEM No | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Warmer module | 21.38.009.02S |
| 2 | Column | 21.15.015.00 |
| 3 | Bassinet | 21.03.004.03 |
| 4 | Stand | 21.08.001.00 |

| | | |
|---|---|---|
| 5 | Controller | 21.40.028.02 |



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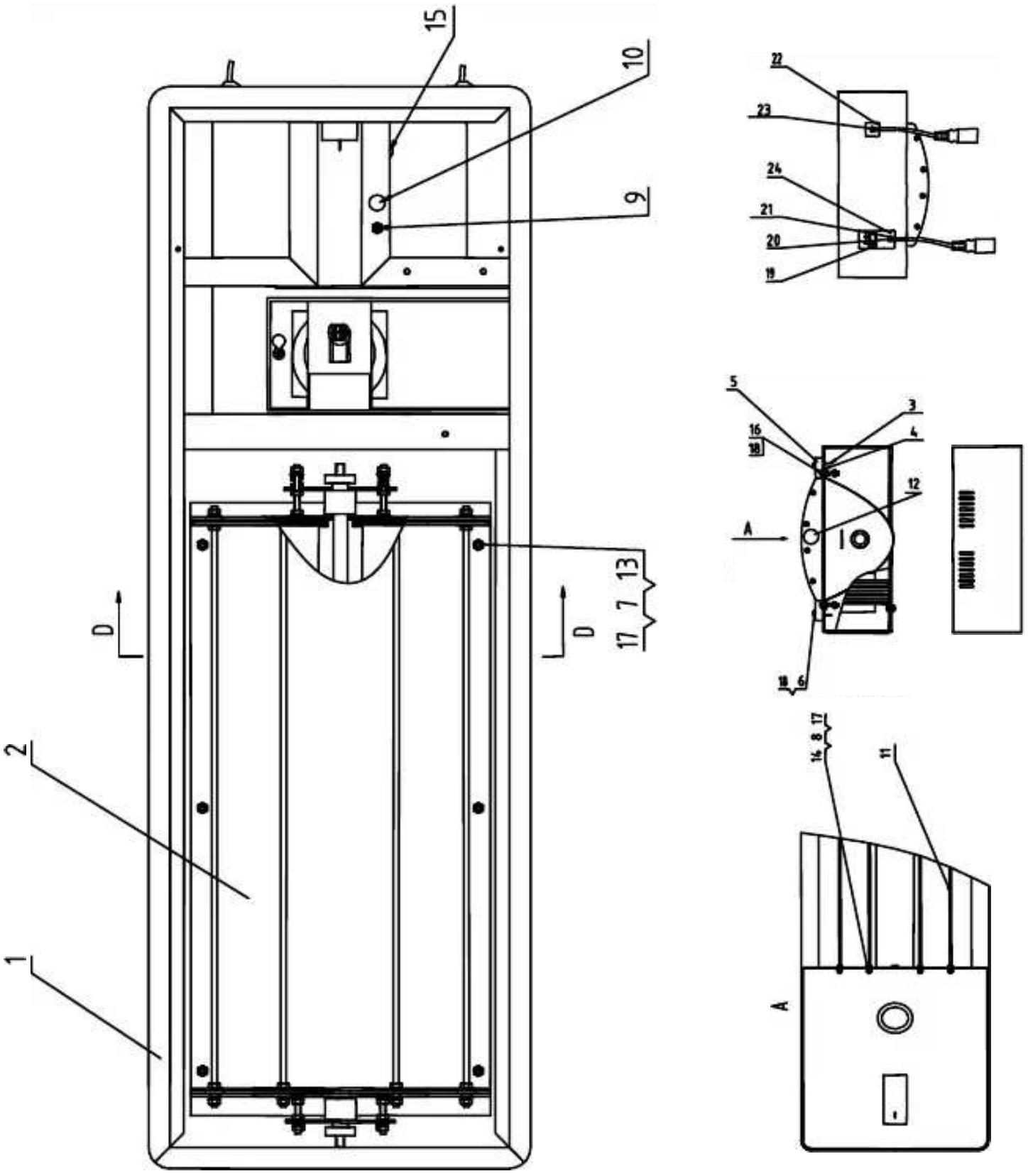



Figure 6.2 Parts Location Diagram, Warmer Module

Table 6.2 Replacement Parts List, Warmer Module

| ITEM No | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Shell of radiant box | 21.14.005.01 |
| 2 | Reflective cover groupware | 21.38.005.00S |
| 3 | Plywood B | 21.14.033.00 |
| 4 | Plywood A | 21.14.032.00 |
| 5 | Square board groupware | 21.14.025.02S |
| 6 | Cross groove small pan heat bolt, flat spring washer component M3X20 | 86.01.075.00 |
| 7 | Flat washer 3 | 86.44.440.00 |
| 8 | Spring washer 3 | 86.44.412.00 |
| 9 | Cross groove small pan heat bolt, flat spring washer component M3X25 | 86.01.080.00 |
| 10 | Earthed lable | 12.07.047.00 |
| 11 | Crash bar | 21.14.034.01 |
| 12 | High temperature warning label | 13.04.070.00 |
| 13 | Compressed spring | 13.10.007.00 |
| 14 | Acorn nut M3 | 86.44.379.00 |
| 15 | Coils | 86.45.023.00 |
| 16 | Cross groove small pan heat bolt, flat spring washer component M3X25 | 86.01.088.00 |
| 17 | Hexagon nut M3 | 86.44.334.00 |
| 18 | External teeth serrated lock washers 3 | 86.44.394.00 |
| 19 | Switch SWA-VLK54 | 86.31.001.00 |
| 20 | Wiring clip 6N-4 | 86.45.001.00 |
| 21 | Triphrase plug | 86.46.095.00 |
| 22 | Heater power lable | 21.14.047.01 |
| 23 | Illumination light lable | 21.14.049.01 |
| 24 | Heater power line component | 21.50.069.00 |

| | | |
|---|---|---|
| 24 | Heater power line component | 21.30.005.00 |



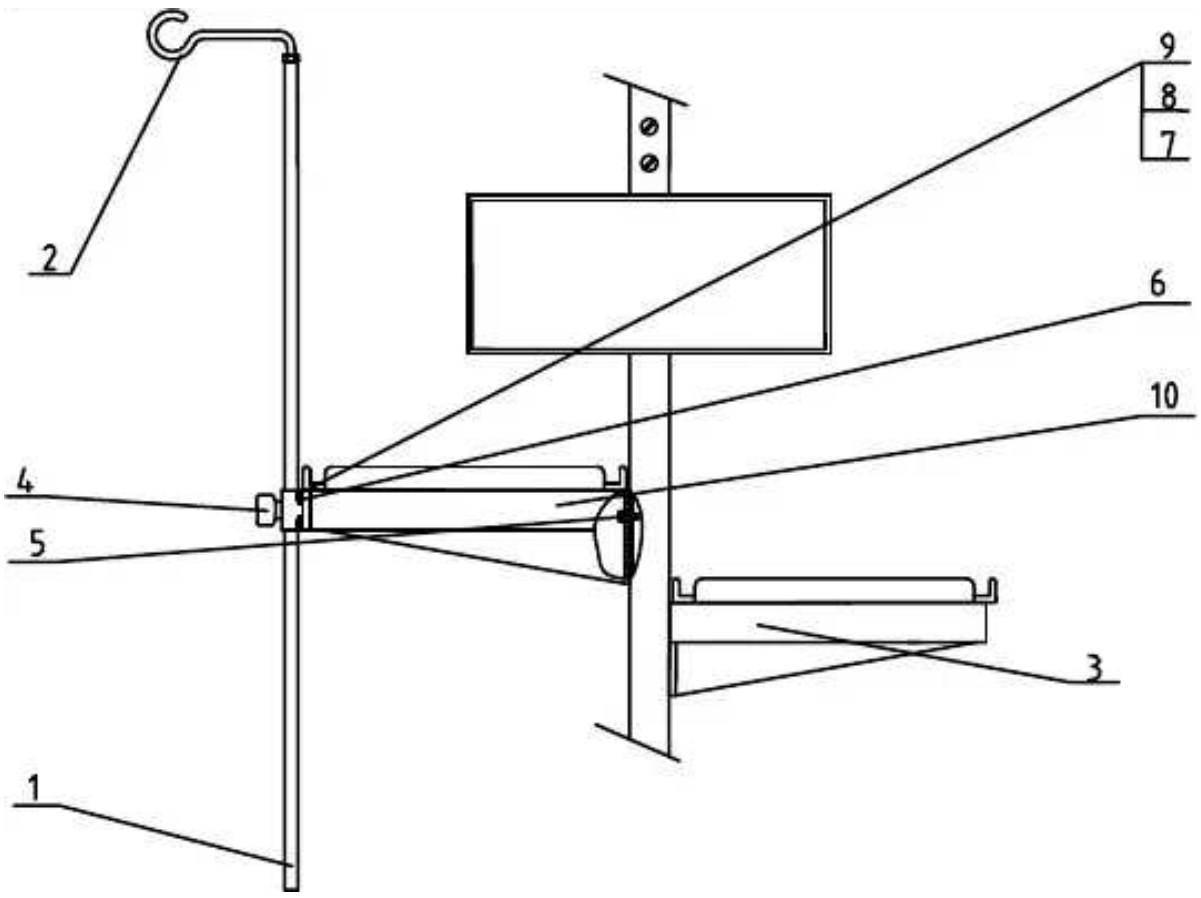



Figure 6.3 Parts Location Diagram, Column

Table 6.3 Replacement Parts List, Column

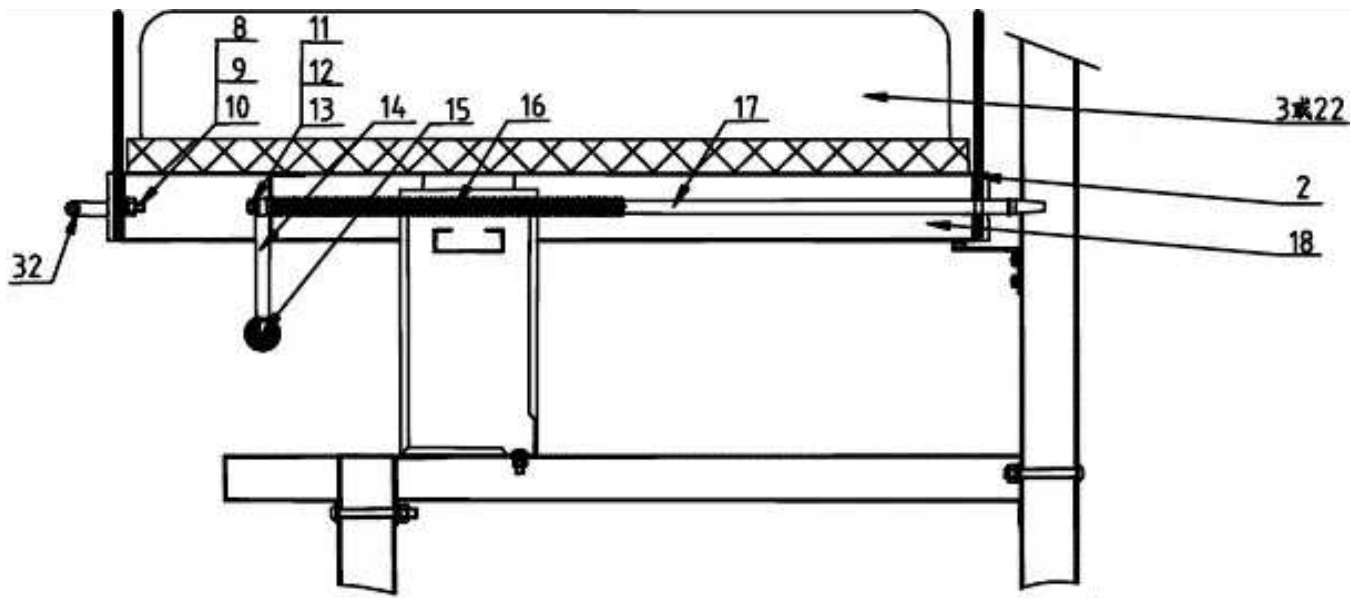
| ITEM No | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Infusion rod | 21.11.002.00 |
| 2 | Cross arm of I.V. Pole | 23.11.002.01 |
| 3 | Right tray | 21.12.001.01S |
| 4 | Tightening Clamp | 21.11.003.00 |
| 5 | Cross groove small pan heat bolt, flat spring washer component M4X12 | 86.01.080.00 |
| 6 | Spring washer4 | 86.44.414.00 |
| 7 | Flat washer4 | 86.44.442.00 |
| 8 | Seat of I.V. Pole | 21.11.005.01 |
| 9 | Cross groove pan head bolt M5×18 | 86.44.185.00 |
| 10 | Spring washer5 | 86.44.415.00 |
| 11 | Hexagon nut M5 | 86.44.337.00 |

| | | |
|---|---|---|
| 12 | Left tray | 21.12.004.01S |



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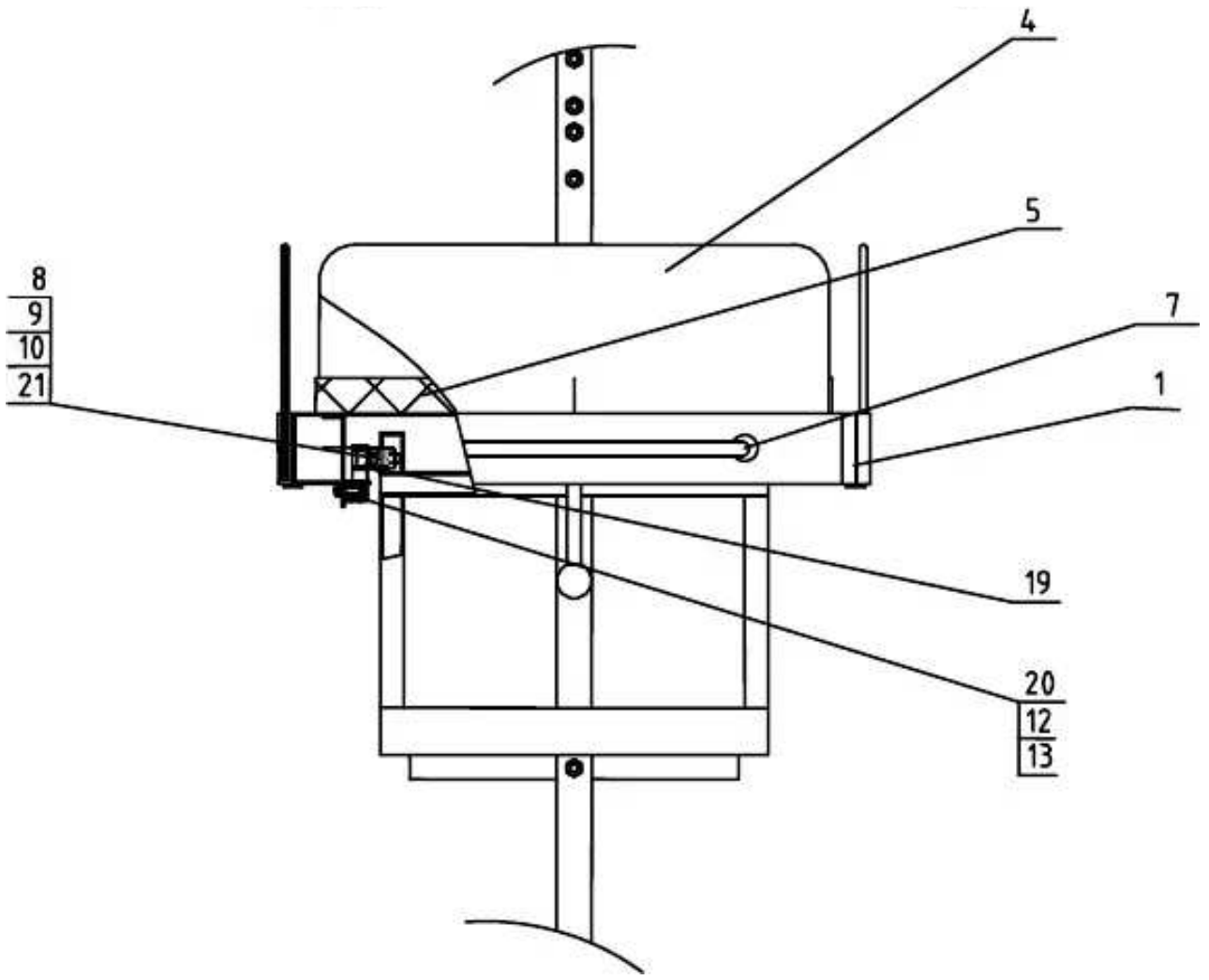




Figure 6-4 Parts Location Diagram, Bassinet

Figure 6.4 Parts Location Diagram, Bassinet



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Table 6.4 Replacement Parts List, Bassinet

| ITEM No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Plastic socket | 21.03.013.03 |
| 2 | Back panel | 21.03.016.00 |
| 3 | Side panels（Left） | 21.50.004.00 |
| 4 | Front panel | 21.03.018.00 |
| 5 | Mattress | 21.03.022.02 |
| 6 | Handle | 21.03.003.01 |
| 7 | Handle washer | 05.04.016.00 |
| 8 | Hexgon nut M8 | 86.44.342.00 |
| 9 | Spring washer 8 | 86.44.422.00 |
| 10 | Flat washer 8 | 86.44.447.00 |
| 11 | Hexgon nut M6 | 86.44.339.00 |
| 12 | Spring washer 6 | 86.44.420.00 |
| 13 | Flat washer 6 | 86.44.446.00 |
| 14 | Tie bar | 23.14.015.00 |
| 15 | Handle ball | 21.50.063.00 |
| 16 | Cylindroid compression spring 1.6×1.6×400 | 86.44.517.00 |
| 17 | Mandri | 21.03.010.00 |
| 18 | Head of mandri | 21.03.002.00 |
| 19 | Supporting angle | 21.03.028.00 |
| 20 | Cross groove pan head bolt M6×16 | 86.44.200.00 |
| 21 | Hexagon socket head cap screws M8×30 | 86.44.114.00 |
| 22 | Side panels（Right） | 21.50.003.00 |

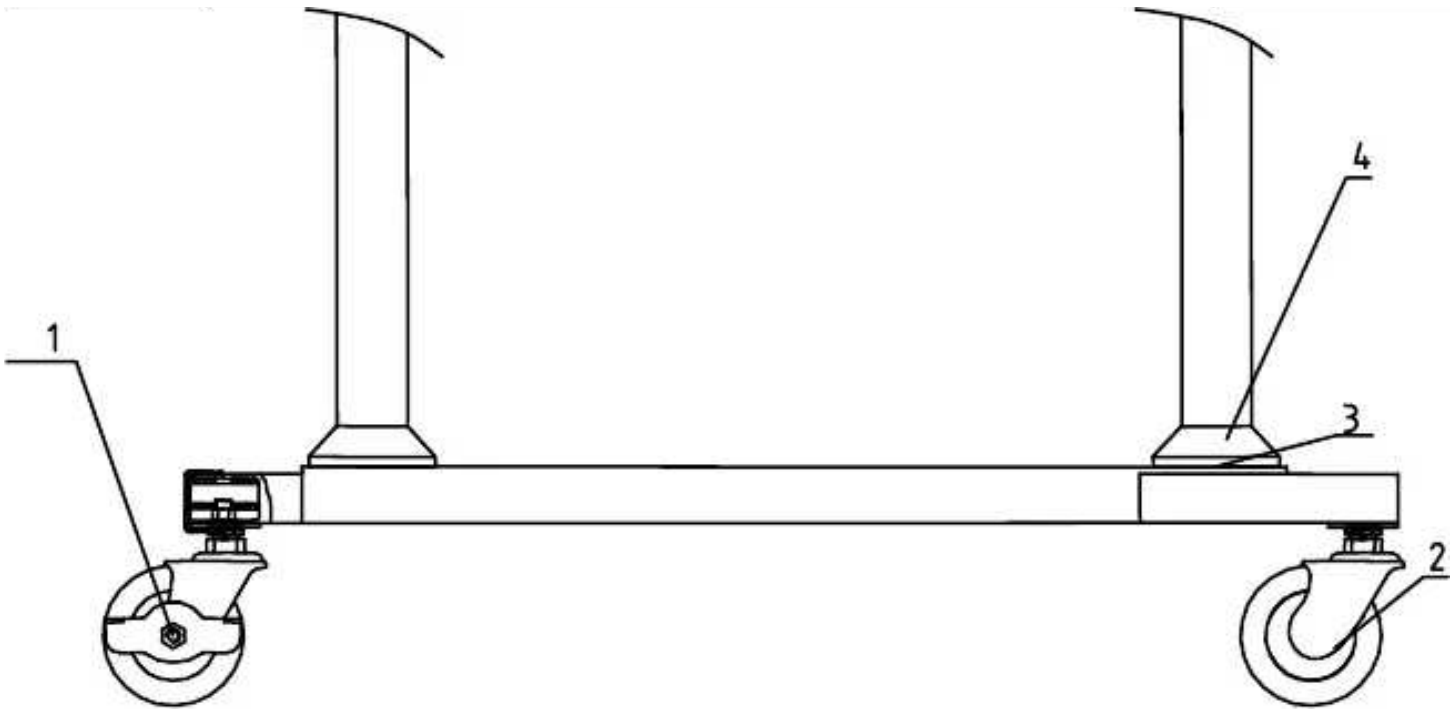



Figure 6.5 Parts Location Diagram, Stand

Table 6.5 Replacement Parts List, Stand

| ITEM No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Flat bearing caster with brake | 86.52.010.00 |
| 2 | Flat bearing caster | 86.52.005.00 |
| 3 | Cross groove small pan heat bolt, flat spring washer component M6X16 | 86.01.155.00 |
| 4 | Spring washer 6 | 86.44.419.00 |

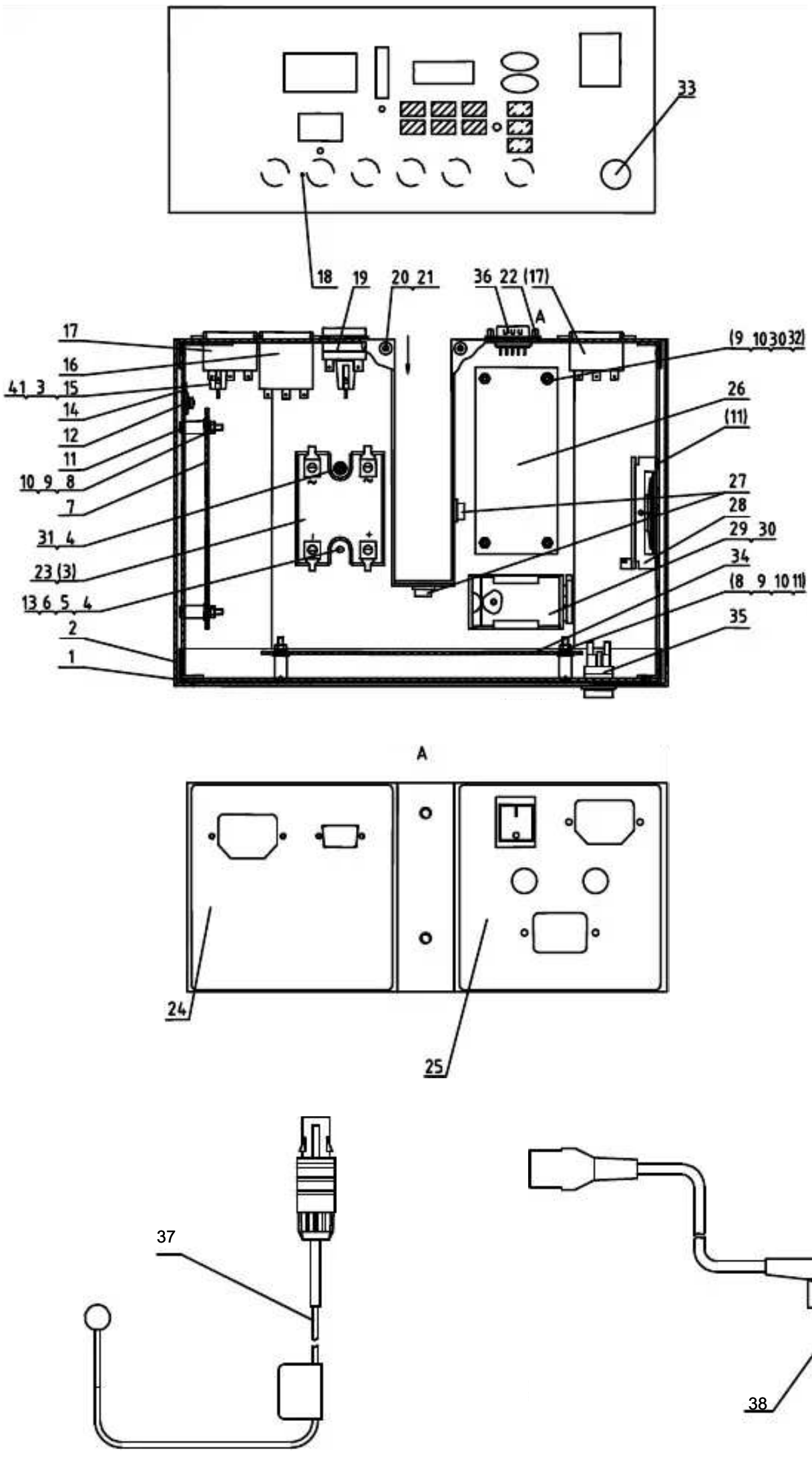

33
18
19
20 21
36 22 (17)
A
17
16
41 3 15
14
12
11
10 9 8
7
31 4
23 (3)
13 6 5 4
2
1
(9 10 30 32)
26
(11)
27
28
29 30
34
(8 9 10 11)
35
A
24
25
37
38

Figure 6.6 Parts Location Diagram, Controller



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Table 6.6 Replacement Parts List, Controller

| ITEM No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Middle frame | 21.40.021.02 |
| 2 | Cover piece | 21.40.023.00 |
| 3 | Fuse | 86.59.049.00 |
| 4 | Cross groove pan head bolt M4×12 | 86.44.162.00 |
| 5 | Spring washer 4 | 86.44.414.00 |
| 6 | Hexagon nut M4 | 86.44.336.00 |
| 7 | Power board | 21.07.034.04 |
| 8 | Hexagon insulation column HTS-308 | 86.45.013.00 |
| 9 | Plastic washer | 13.07.008.00 |
| 10 | Hexagon nut M3 | 86.44.334.00 |
| 11 | Cross groove countersunk head bolt M3×8 | 86.44.216.00 |
| 12 | Cross groove small pan heat bolt, flat spring washer component M4X6 | 86.01.176.00 |
| 13 | Flat washer 4 | 86.44.442.00 |
| 14 | Earthed label | 12.07.047.00 |
| 15 | Fuse’s seat | 86.59.017.00 |
| 16 | power filter 10EAH1 | 86.20.003.00 |
| 17 | Power socket SS-8B | 86.55.094.00 |
| 18 | Operation panel of controller | 21.07.007.03 |
| 19 | Power switch | 86.57.027.00 |
| 20 | Cross groove small pan heat bolt, flat spring washer component M3X10 | 86.01.074.00 |
| 21 | Internal teeth serrated lock washers 3 | 86.04.015.00 |
| 22 | British screw | 86.62.488.00 |
| 23 | Solid state relay | 86.28.007.00 |
| 24 | Electrical nameplate | 21.07.010.03 |

| | | |
|---|---|---|
| 24 | Electrical nameplate | 21.07.010.03 |



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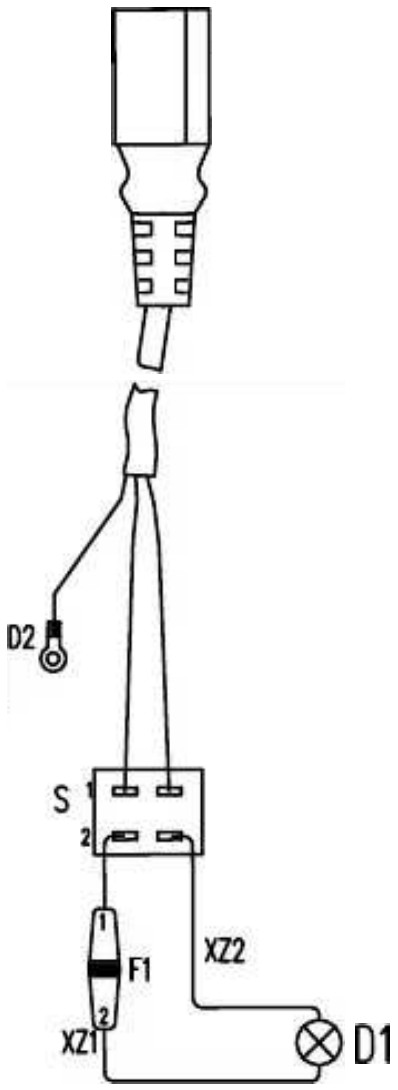
Table 6.6 Replacement Parts List, Controller (continued)

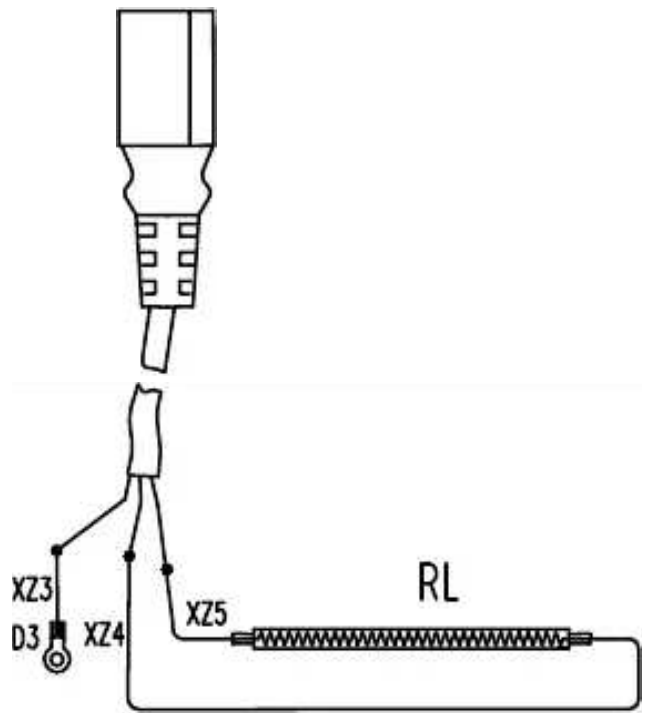
| ITEM No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 25 | Label | 21.07.015.02 |
| 26 | Power switch | 86.60.127.00 |
| 27 | Adjustable wiring damp | 86.45.032.00 |
| 28 | Buzzer | 05.40.072.01S |
| 29 | Battery box components | 12.07.089.01S |
| 30 | Cross groove pan head bolt M3×6 | 86.44.158.00 |
| 31 | Horse shoe pieces | 12.40.021.01 |
| 32 | Hexagon insulation column HTP-306 | 86.45.007.00 |
| 33 | Skin temperature sensor socket assembly | 21.40.066.00 |
| 34 | Main board | 21.40.025.00 |
| 35 | Power switch | 86.57.017.00 |
| 36 | RS232 components | 21.40.065.00 |
| 37 | Skin temperature sensor | 88.06.005.01 |
| | Single patient use skin temperature sensor | 88.08.005.00 |
| 38 | Power code | 86.46.012.00 |

# SECTION 7
# DIAGRAMS

## 7.1 GENERAL

The section provides wiring diagrams for Infant radiant warmer, parts location diagrams, and schematic diagrams of controller.



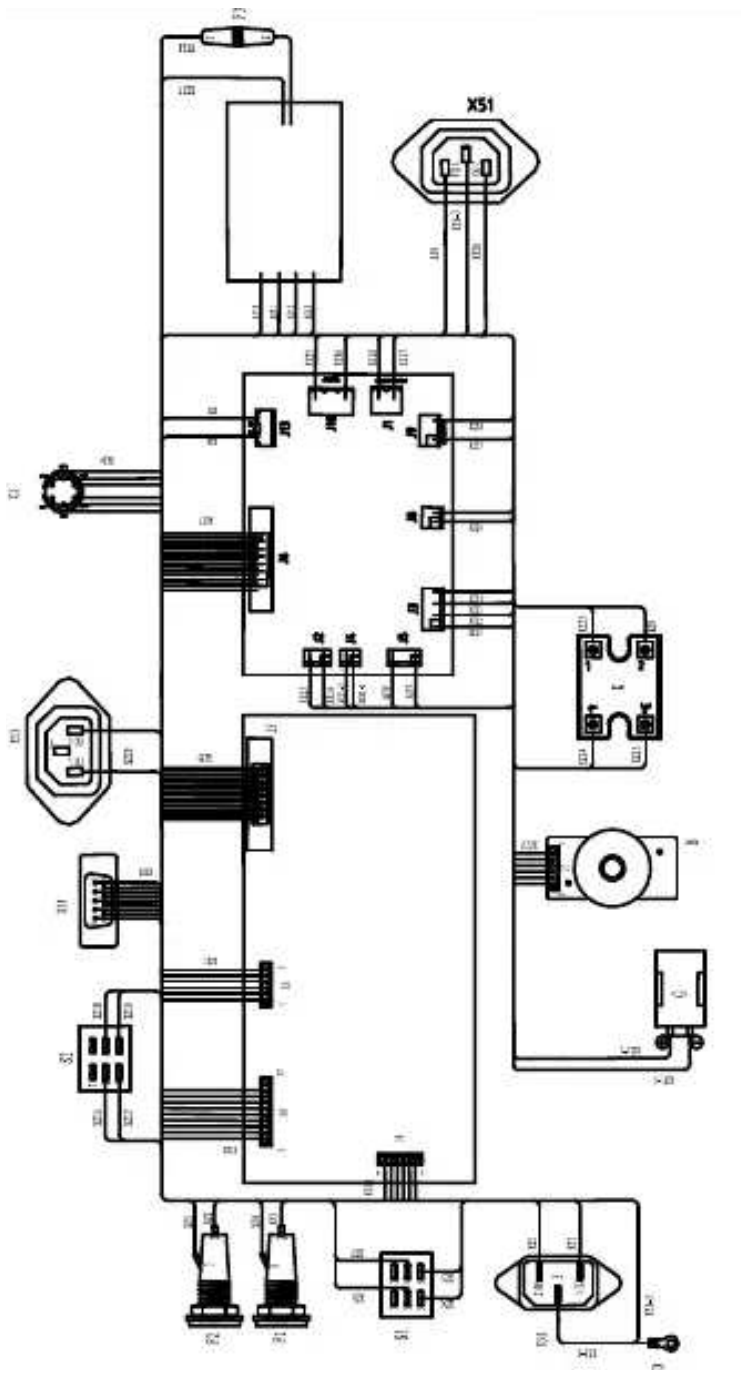

WIRING DIAGRAM OF WARMER MODULE

PARTS LIST OF WARMER MODULE

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | S | Switch for illumination light SW206A | 86.57.033.00 |
| 2 | D1 | Warm white cold light lamp SD-MR16-12V4*1W | 86.21.036.00 |
| 3 | RL | Heater 540W/240V | 21.14.051.01 |
| 4 | D2,D3 | Earthed slice | 86.55.130.00 |
| 5 | F1 | T type fuse 800mAL/250V | 86.59.034.00 |

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## SERVICE MANUAL FOR INFANT RADIANT WARMER




WIRING DIAGRAMS OF CONTROLLER

PARTS LIST OF CONTROLLER

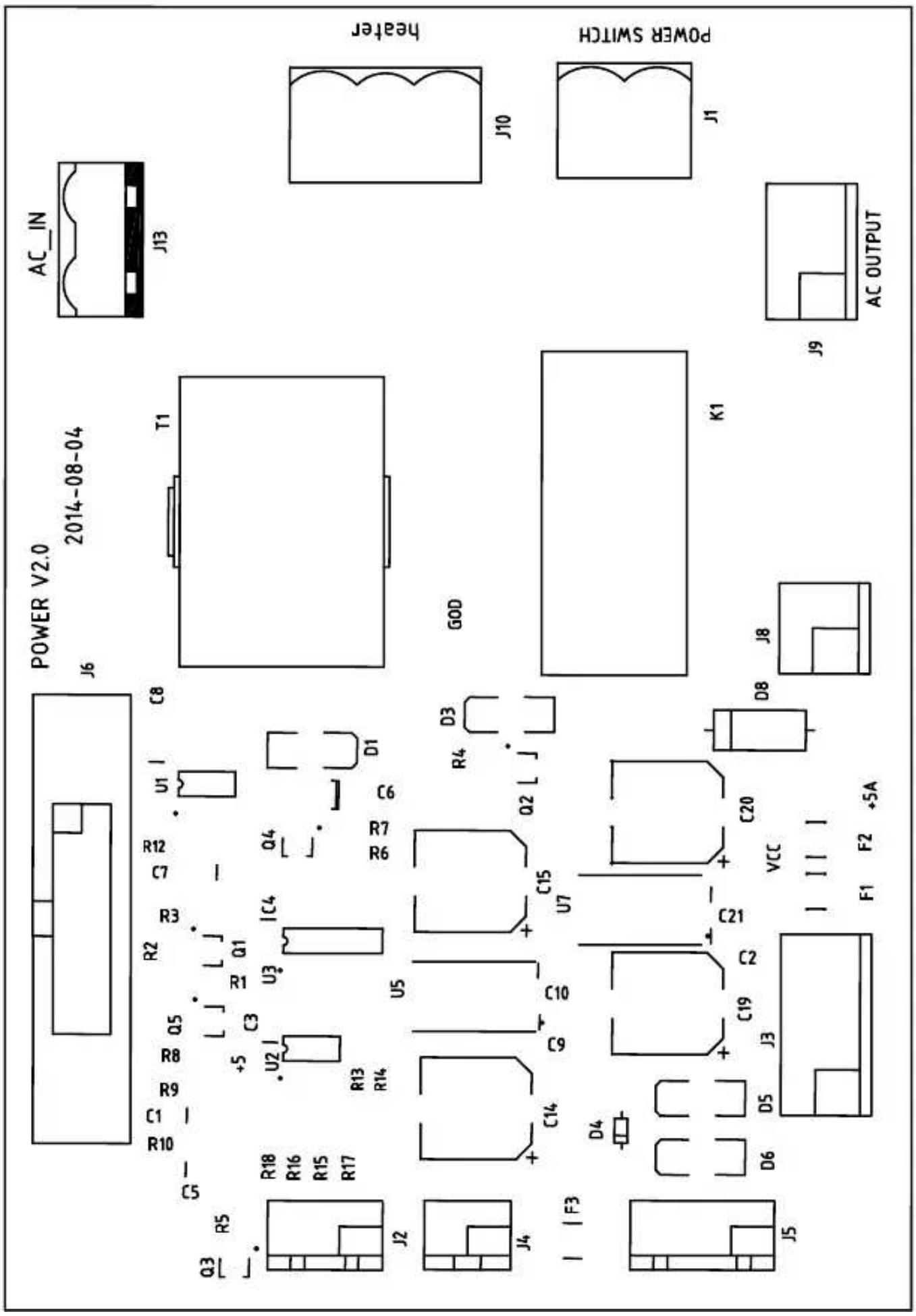
| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | D | Wiring slice OT1.5-4 | 86.55.130.00 |
| 2 | T | Switching power supply | 86.57.017.00 |
| 3 | K | Solid relay GN84137010-25A | 86.60.045.00 |
| 4 | S1 | Power switch 129-432 | 86.57.027.00 |
| 5 | S2 | Controller switch RK1-01C/2×2 | 86.57.027.00 |
| 6 | G | Battery（GP17R8H） | 86.60.012.00 |
| 7 | F1,F2 | F type fuse 4AH /250V | 86.59.049.00 |
| 8 | F3 | T Type fuse 3.15AL/250V | 86.59.025.00 |
| 9 | B | Alarm components | 05.40.075.00S |
| 10 | X50 | Power filter FN9222-10-06 | 86.60.021.00 |
| 11 | X51, X53 | Output socket SS-8B | 86.55.094.00 |

| | | | |
|---|---|---|---|
| 12 | X52 | RS232 connector | 86.55.086.00 |
| 13 | X53 | Output socket SS-8B | 86.55.094.00 |



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PARTS LOCATION DIAGRAM FOR POWER BOARD

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PARTS LIST OF POWER BOARD

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | R8 | Resistor 0805-100Ω±5% | 86.54.002.00 |
| 2 | R4～R5,R7 | Resistor 0805-1KΩ±5% | 86.54.011.00 |
| 3 | R13～R15 | Resistor 0805-2KΩ±1% | 86.54.015.00 |
| 4 | R18 | Resistor 0805-3KΩ±1% | 86.54.019.00 |
| 5 | R17 | Resistor 0805-7.5KΩ±1% | 86.54.025.00 |
| 6 | R1,R2,R3,R6,R12 | Resistor 0805-10KΩ±5% | 86.54.003.00 |
| 7 | R10 | Resistor 0805-10KΩ±1% | 86.54.068.00 |
| 8 | R9 | Resistor 0805-30KΩ±1% | 86.54.069.00 |
| 9 | R16 | Resistor 0805-2.2KΩ±1% | 86.54.072.00 |
| 10 | C5 | Capacitor 0805-0.01uF±20% | 86.51.001.00 |
| 11 | C1～C4,C8～C10,C21 | Capacitor 0805-0.1uF±20% | 86.51.003.00 |
| 12 | C6 | Capacitor 1210-25V-10uF±20% | 86.51.064.00 |
| 13 | C14～C15,C19～C20 | Capacitor SMD-25V-150uF±20% | 86.51.063.00 |
| 14 | C7 | Capacitor 0805-2200PF±20% | 86.51.007.00 |
| 15 | U1,U2 | Integrated circuit LM358D | 86.58.111.00 |
| 16 | U3 | Integrated circuit SN74AHCT00D | 86.58.085.00 |
| 17 | U5,U7 | Integrated circuit MC7805BDTG | 86.58.065.00 |
| 18 | Q5 | Triode MMBT3906LT1 | 86.58.150.00 |
| 19 | Q1～Q4 | Triode MMBT3904LT1 | 86.58.149.00 |
| 20 | D1,D3,D5,D6 | Diode SM4007-DO214 | 86.58.148.00 |
| 21 | D4 | Diode HZ11B1 | 86.58.164.00 |
| 22 | D8 | Diode 1N5339B | 86.58.163.00 |
| 23 | J6 | Connetor Receptacle R-230-16 | 86.10.032.00 |

| | | | |
|---|---|---|---|
| 24 | J4 | Connetor Receptacle XY2.5-2S | 86.55.099.00 |
| 25 | J2 | Connetor Receptacle XY2.5-3S | 86.55.101.00 |



W1

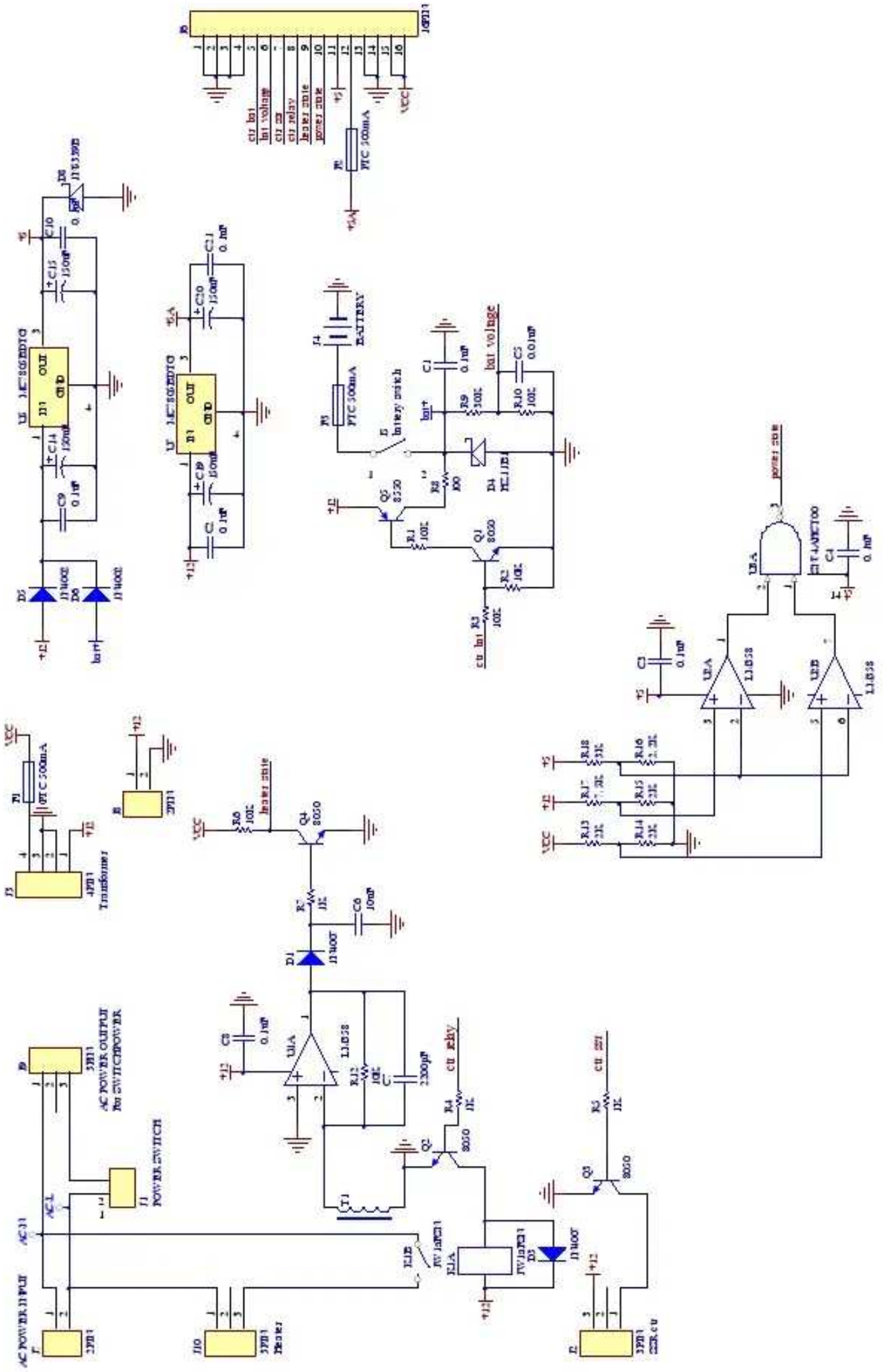


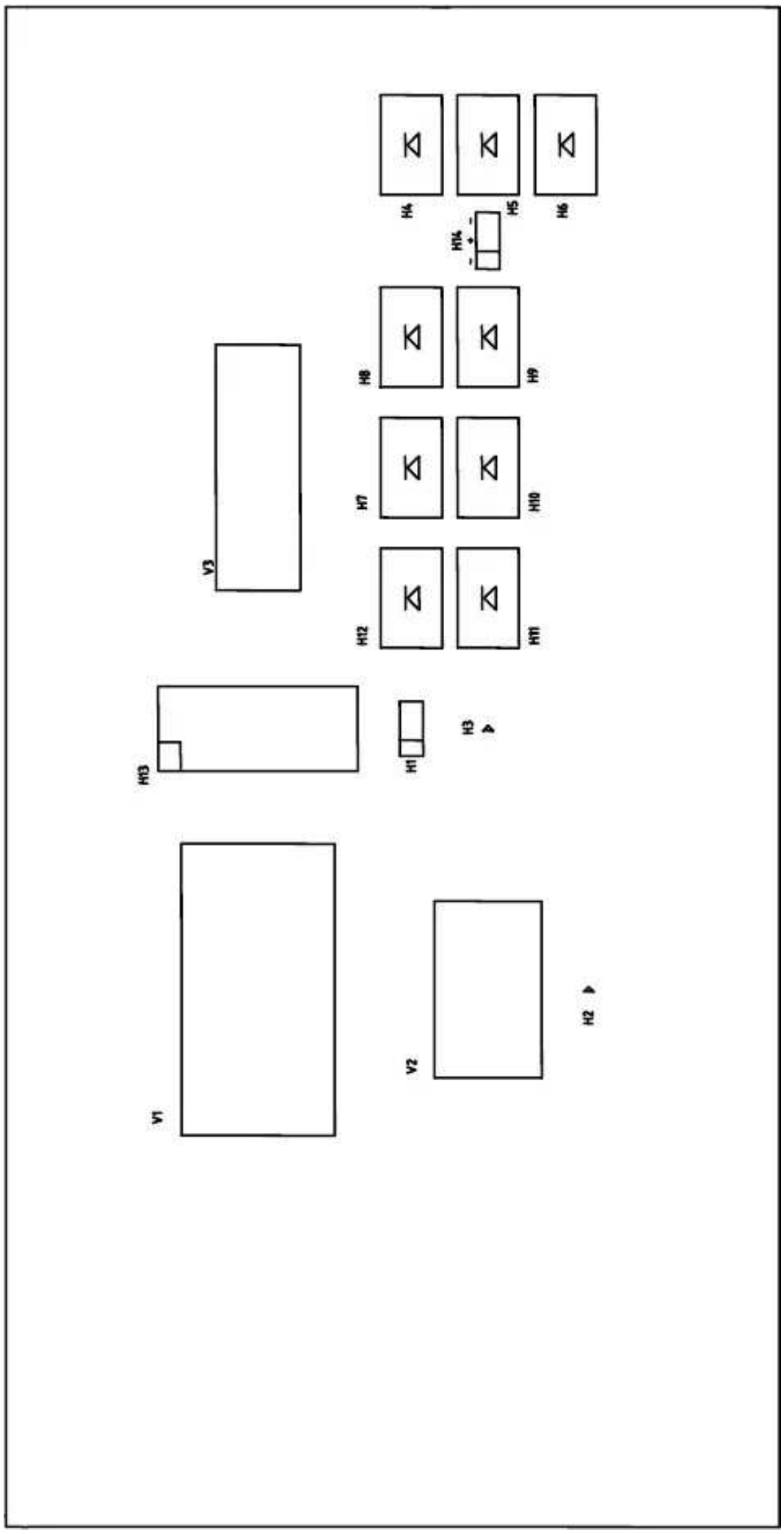
PARTS LIST OF POWER BOARD (CONTINUE)

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 26 | J5 | Connetor Receptacle XY2.5-4S | 86.55.103.00 |
| 27 | J3 | Connetor Receptacle XY4-4S | 86.55.114.00 |
| 28 | J1 | Connetor Receptacle ME040-50802 | 86.55.067.00 |
| 29 | J13 | Connetor Receptacle ME040-76202 | 86.55.071.00 |
| 30 | J8 | Connetor Receptacle XY4-2S | 86.55.110.00 |
| 31 | J9 | Connetor Receptacle XY4-3S | 86.55.112.00 |
| 32 | J10 | Connetor Receptacle ME040-50803 | 86.55.068.00 |
| 33 | K1 | Relay JW1aFSN-DC12V | 86.56.013.00 |
| 34 | F1, F2, F3 | Fuse 1812L050-C | 86.59.040.00 |
| 35 | T1 | Inductor TVA1421-01 | 86.56.007.00 |
| 36 | | Copper core PVC cable | 86.46.118.00 |

W1




JGPH11
bat voltage
heater state
power state
PTC 500mA
BATTERY
battery switch
bat+
bat voltage
LM1117-VOLTAGE
LM358
AC POWER OUTPUT
for SWITCHPOWER
POWER SWITCH
AC POWER INPUT
Transformer
Heater
Fan
Transformer

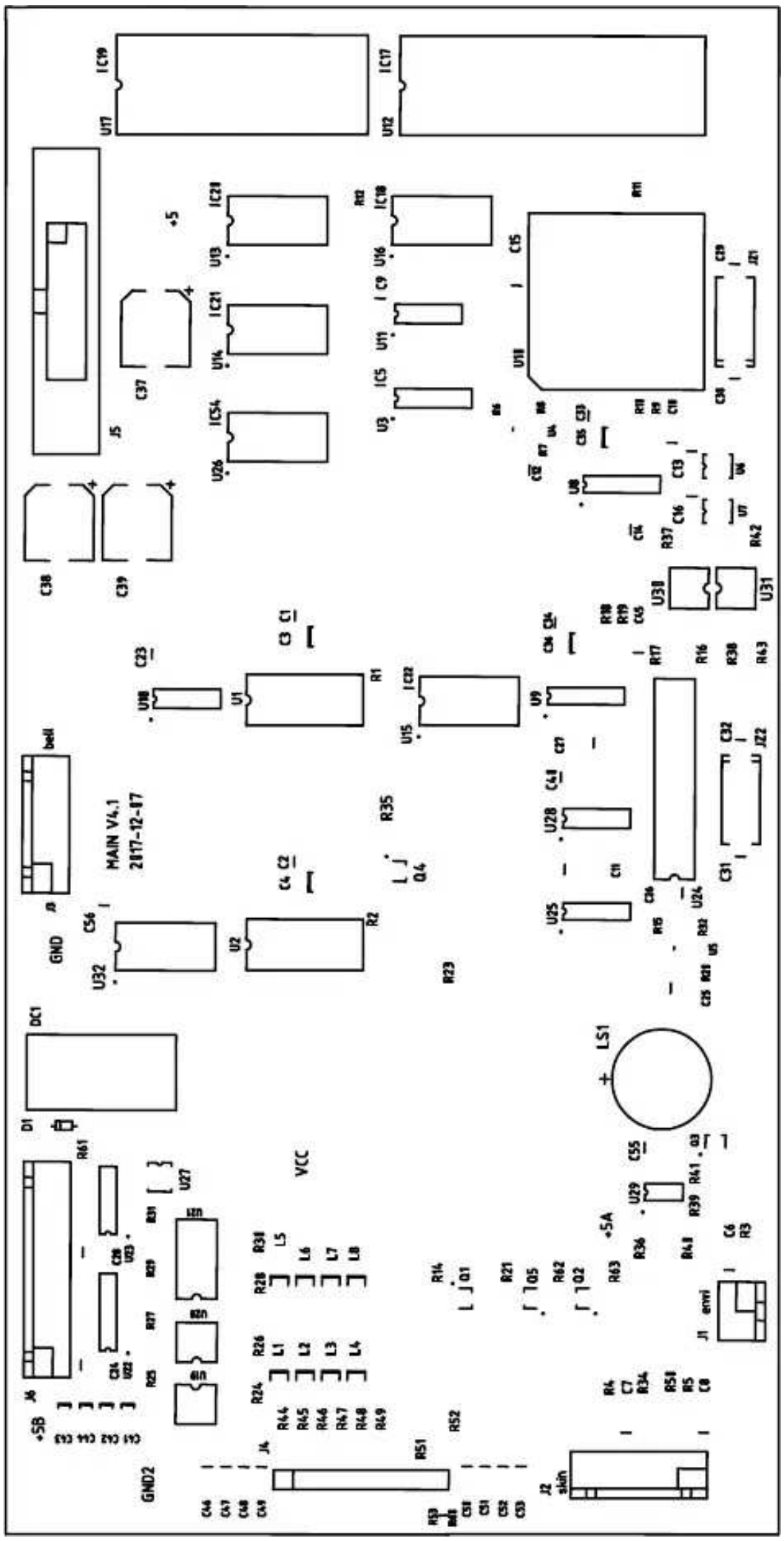

H4
H5
H6
H14
H8
H9
H7
H10
V3
H12
H11
H13
H1
H3
V1
V2
H2

PARTS LOCATION DIAGRAM OF MAIN BOARD 1



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PARTS LIST OF MAIN BOARD

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 1 | R25~R26,R28,R30,R37, R43,R61 | Resistor 0805-200Ω±5% | 86.54.012.00 |
| 2 | R41 | Resistor 0805-510Ω±5‰ | 86.54.022.00 |
| 3 | R21,R23,R24,R27,R29,R31 R33,R38,R39,R42, R44~R49,R51,R52 | Resistor 0805-1KΩ±5% | 86.54.011.00 |
| 4 | R40 | Resistor 0805-15.4KΩ±1‰ | 86.54.076.00 |
| 5 | R6~R8,R11,R12,R14~R17, R20,R32,R35,R53~R60, R62,R63 | Resistor 0805-10KΩ±5% | 86.54.003.00 |
| 6 | R1,R2 | Resistor 0805-24KΩ±5% | 86.54.014.00 |
| 7 | R3~R5,R9,R10,R18,R19, R36 | Resistor 0805-20KΩ±1‰ | 86.54.077.00 |
| 8 | R34,R50 | Resistor 0805-100Ω±5% | 86.54.002.00 |
| 9 | C6～C8,C10,C45～C53 | Capacitor 0805-0.01uF±20% | 86.51.001.00 |
| 10 | C1,C2,C5,C9,C11～C28, C33, C34,C40,C54~C56 | Capacitor 0805-0.1uF±20% | 86.51.003.00 |
| 11 | C29～C32 | Capacitor 0805-22PF±20% | 86.51.008.00 |
| 12 | C41～C44 | Capacitor CA45A-25V-1uF±20% | 86.51.026.00 |
| 13 | C3～C4,C35～C36 | Capacitor CA45B-16V-10uF±20% | 86.51.028.00 |
| 14 | C37～C39 | Capacitor SMD-25V-150uF±20% | 86.51.063.00 |
| 15 | U4,U5 | Integrated circuit TPS3824-50 | 86.58.103.00 |
| 16 | U6,U7,U27 | Integrated circuit SN74LVC1G3157DBVR | 86.58.105.00 |
| 17 | U8,U9 | Integrated circuit TLV2544CD | 86.58.086.00 |
| 18 | U10 | Integrated circuit AT89C51ED2-UM | 86.58.055.00 |
| 19 | U11 | Integrated circuit SN74AHCT32D | 86.58.092.00 |
| 20 | U12 | Integrated circuit DS1230Y-100 | 86.58.094.00 |

| | | | |
|---|---|---|---|
| 21 | U13 | Integrated circuit SN74AHCT273DW | 86.58.107.00 |
| 22 | U14,U15,U26 | Integrated circuit SN74LS244 | 86.26.012.00 |



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PARTS LIST OF MAIN BOARD (CONTINUE)

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 23 | U16 | Integrated circuit SN74AHCT373DW | 86.58.109.00 |
| 24 | U17 | Integrated circuit DS12C887 | 86.58.093.00 |
| 25 | U18 | Integrated circuit SN74AHCT04D | 86.58.090.00 |
| 26 | U19,U20,U30,U31 | Integrated circuit K1010 | 86.58.059.00 |
| 27 | U21 | Integrated circuit KP1020 | 86.58.058.00 |
| 28 | U22 | Integrated circuit MAX232CSE | 86.58.087.00 |
| 29 | U23 | Integrated circuit MAX489CSD | 86.58.110.00 |
| 30 | U24 | Integrated circuit AT89C4051-24PU | 86.26.011.00 |
| 31 | U25 | Integrated circuit SN74AHCT74D | 86.58.136.00 |
| 32 | U1,U2 | Integrated circuit MAX7221CWG | 86.58.114.00 |
| 33 | U3 | Integrated circuit SN74AHCT139D | 86.58.115.00 |
| 34 | U29 | Integrated circuit LM358D | 86.58.111.00 |
| 35 | U28 | Integrated circuit SN74AHC08D | 86.58.067.00 |
| 36 | U32 | Integrated circuit SN74AHCT574DW | 86.58.113.00 |
| 37 | JZ1,JZ2 | crystal oscillator HC-49/S-SMD-11.0592MHz | 86.60.080.00 |
| 38 | L1～L8 | inductor NLV32T-220J | 86.19.002.00 |
| 39 | D1 | Diode HZ6B1 | 86.27.002.00 |
| 40 | Q1~Q5 | Triode MMBT3904LT1 | 86.58.149.00 |
| 41 | DC1 | DC-DC F0505S-1W | 86.60.077.00 |
| 42 | V1 | nixietube NET-5631AG | 86.58.024.00 |
| 43 | V2 | nixietube NET-3631AG | 86.88.025.00 |

| | | | |
|---|---|---|---|
| 44 | V3 | nixietube NEQ-2841AG | 86.58.032.00 |
| 45 | H4～H6 | LED NEA-L10ZAG | 86.58.044.00 |





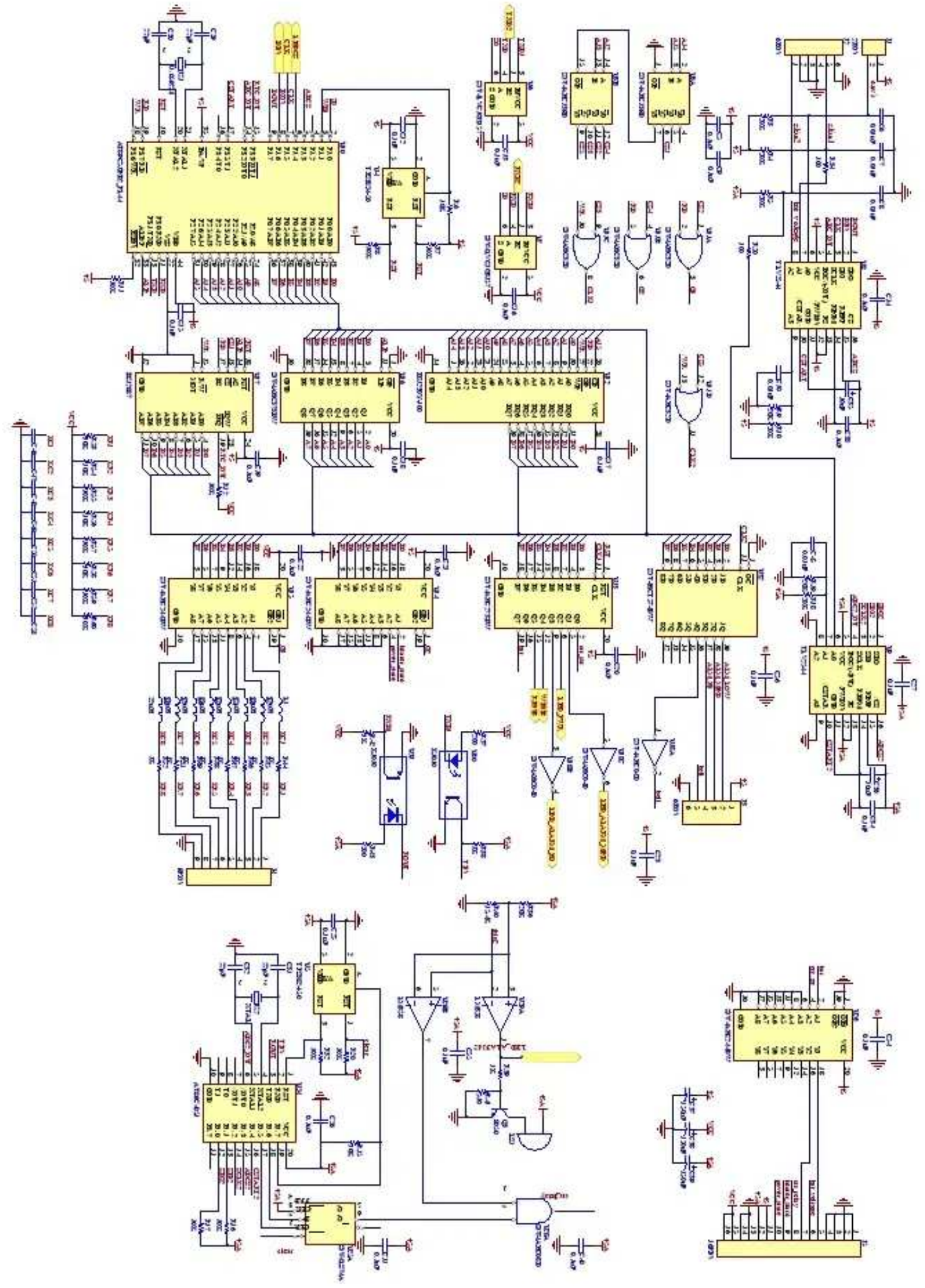


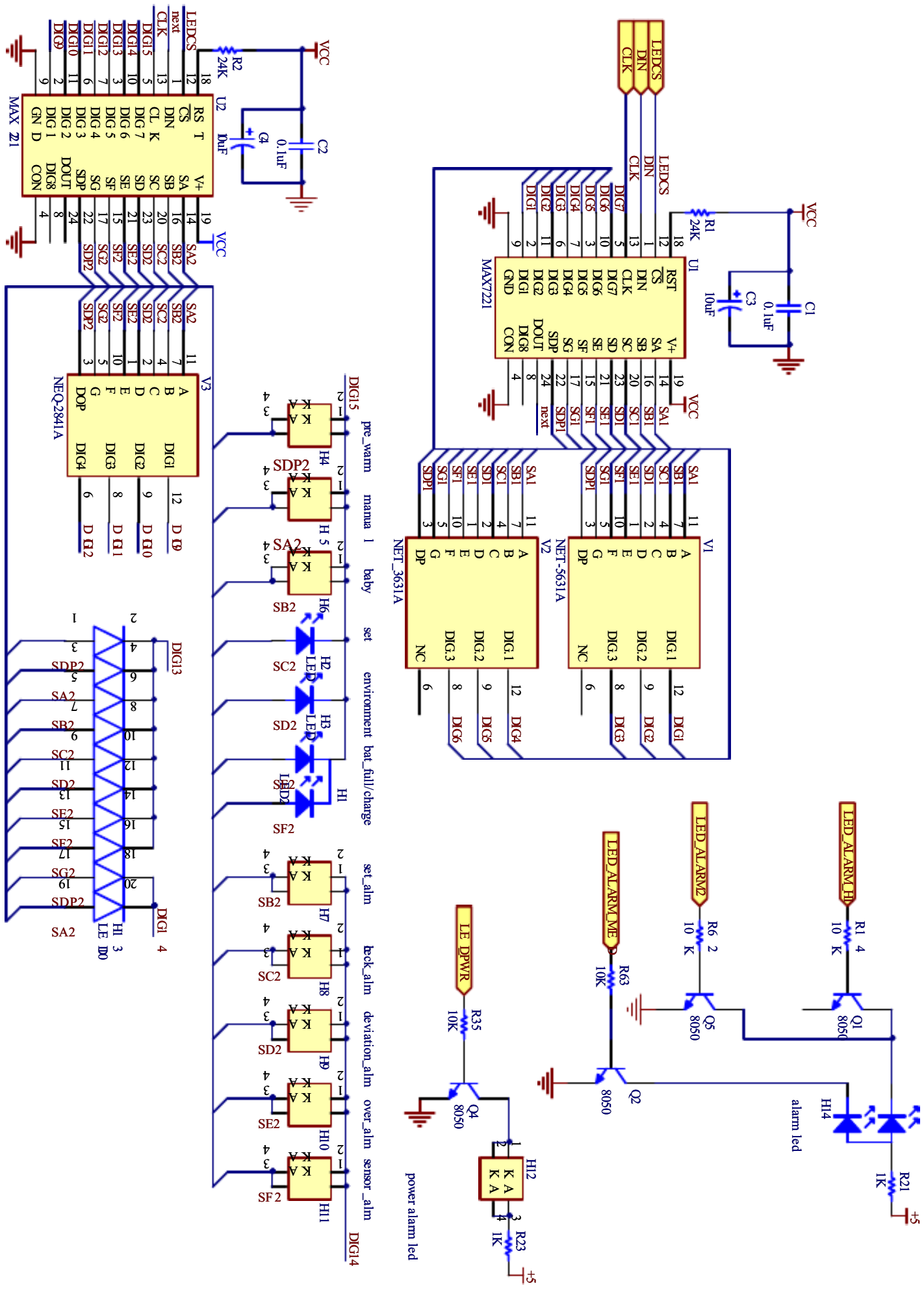
PARTS LIST OF MAIN BOARD (CONTINUE)

| ITEM No. | CODE | DESCRIPTION | PART NUMBER |
|---|---|---|---|
| 46 | H7～H12 | LED NEA-L10ZAD | 86.58.023.00 |
| 47 | H13 | LED NEA-B10ZAG | 86.58.019.00 |
| 48 | H14 | LEDΦ5-R | 86.21.034.00 |
| 49 | H1 | LED Φ5-G/Y | 86.58.035.00 |
| 50 | H2 | LED Φ5-G | 86.58.034.00 |
| 51 | UZ1 （U10） | Integrated circuit socket PLC-44 | 86.55.082.00 |
| 52 | J3 | Socket XY2.5-6S | 86.55.107.00 |
| 53 | J2 | Socket XY2.5-6S | 86.55.107.00 |
| 54 | J6 | Socket XY2.5-10S | 86.55.097.00 |
| 55 | J5 | Socket R-230-16 | 86.10.032.00 |
| 56 | J4 | Single row DPCZ-60T | 86.55.047.00 |
| 57 | UZ2(U17) | Integrated circuit socket IC-24J | 86.55.056.00 |
| 58 | UZ3(U12) | Integrated circuit socket IC-28J | 86.55.057.00 |
| 59 | LS1 | Buzzer TMB12A05 | 86.60.073.00 |

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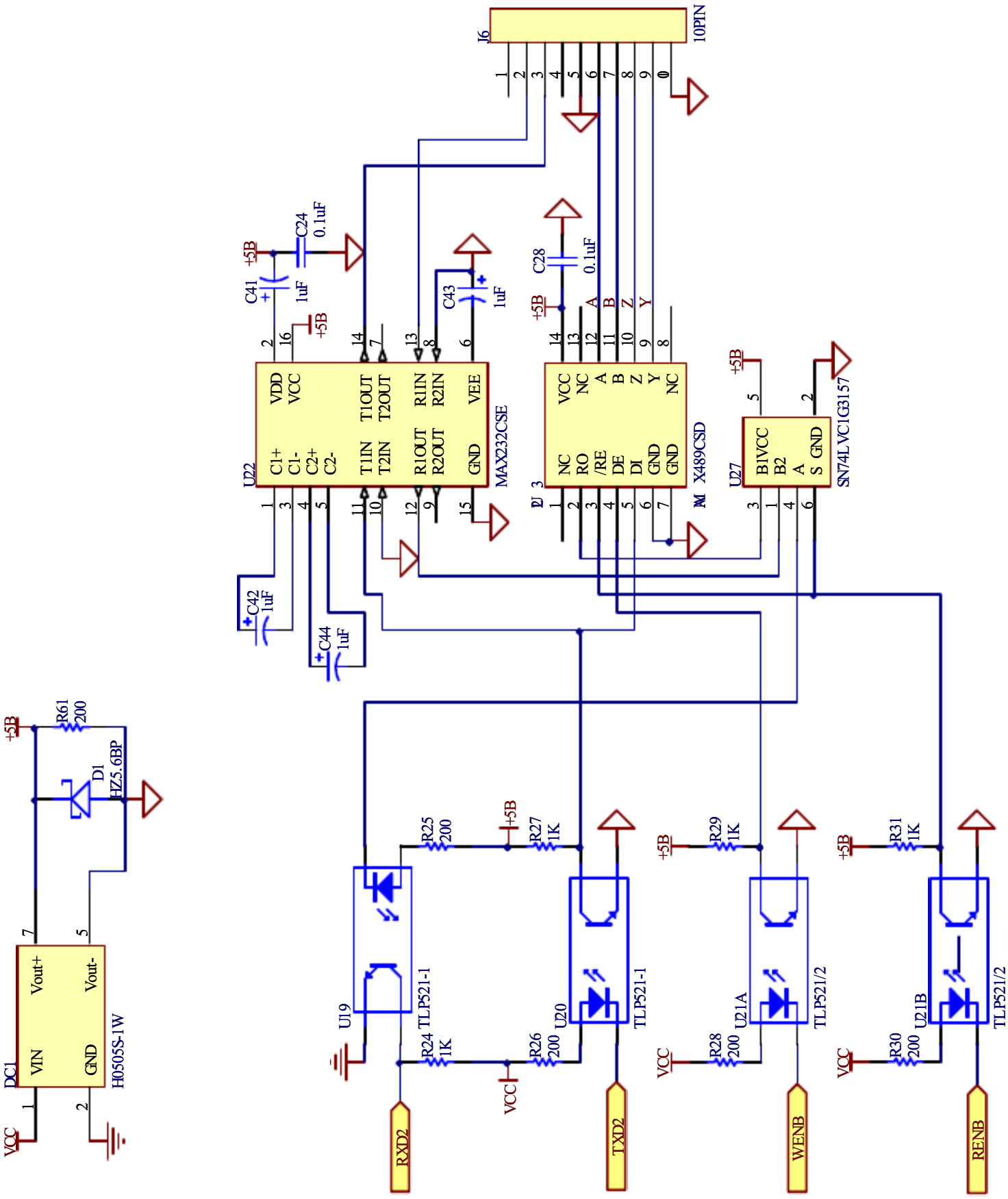

MAX7221
U1
LEDCS
DIN
CLK
RST
CS
DIG7
DIG6
DIG5
DIG4
DIG3
DIG2
DIG1
GND
DOUT
DIG8
SDP
SG
SF
SE
SD
SC
SB
SA
V+
R1
24K
C3
10uF
C1
0.1uF
VCC
LED_ALARM_HI
R1 4
10 K
Q1
8050
H14
alarm led
R21
1K
+5
LED_ALARM2
R6 2
10 K
Q5
8050
LED_ALARM_ME
R63
10K
Q2
8050
LE DPWR
R35
10K
Q4
8050
power alarm led
H12
R23
1K
NET_3631A
V1
NET-5631A
V2
A
B
C
D
E
F
G
DP
NC
DIG.1
DIG.2
DIG.3
DIG1
DIG4
DIG5
DIG6
SA1
SB1
SC1
SD1
SE1
SF1
SG1
SDP1
SA2
SB2
SC2
SD2
SE2
SF2
SG2
SDP2
NEQ-2841A
V3
DIG13
DIG14
pre_warm
manua l
baby
set
environment
bat_full//charge
set_alm
check_alm
deviation_alm
over_alm
sensor _alm
H1
H2
H3
H4
H5
H6
H7
H8
H9
H10
H11
SF 2
MAX 721
U2
RS T
CS
CL K
DIN
DIG 7
DIG 6
DIG 5
DIG 4
DIG 3
DIG 2
DIG 1
GN D
DIG 0
DOUT
DIG8
SDP
SG
SF
SE
SD
SC
SB
SA
V+
R2
24K
C4
10uF
C2
0.1uF
LEDCS
next
CLK
DIG5
DIG4
DIG3
DIG2
DIG1
DIG0
DIG9

SCHEMATIC DISGRAM OF MAIN BOARD (Display part)



W1






SCHEMATIC DISGRAM OF MAIN BOARD (Communication part)

SCHEMATIC DIAGRAM OF MAIN BOARD (Communication part)



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**NINGBO DAVID MEDICAL DEVICE CO., LTD.**

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E-MAIL: sales@nbdavid.com

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