
Service Manual

**HEATED
HUMIDIFIER 6060
Series 50.6060.100**

Manual Code: 204040024
Revision: A (JAN/2001)



DEFINITIONS

Warning

Warns the user as to the possibility of injury, death or other serious adverse reaction associated with the use or misuse of the equipment.

Attention

Warns the user about possible problems with the equipment, associated with its use or misuse, such as equipment malfunction or failure, damage to the equipment or damage to third party property.

Notes:

Underlines important information

THE COMPANY

K. TAKAOKA is a company that for more than 40 years has been dedicated to the hospital equipment industry, always in close cooperation with physicians. Working mainly in the areas of Anesthesia Machines, Pulmonary Ventilators, Monitoring and Oxygenotherapy, **K. TAKAOKA** is proud of its leading position in the market and presents an extensive range of products.

With one of its priorities towards the solid investment into the research and development of new ideas and solutions, **K. TAKAOKA** has distinguished itself because of its continuous introduction of new technology and industrial innovations in its range of products, which puts it on a par with its principal national and international competitors.

Using sophisticated equipment, **K. TAKAOKA** designs and manufactures most of the components used in its machines, which explains the strict quality control they undergo. The company is also concerned in supplying top quality assistance to all customers by means of its Sales and Technical Assistance departments.

With representatives all over the country and being also present in the international market, **K. TAKAOKA** has justly deserved over the years the confidence of its customers in the high-quality standards and great efficiency of its products and services.

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1 IMPORTANT INFORMATION

The heated humidifier 6060 is a piece of medical equipment developed to combine state-of-the-art technology with extreme ease of use. It should only be operated by qualified and trained professionals. All services for preventive or corrective maintenance should be performed by TAKAOKA's qualified professionals. Carefully review all warnings and recommendations in this manual.

Before switching on

- ❖ Read the Operation Manual for the Heated Humidifier 6060.
- ❖ Check that the liquid level does not exceed the maximum level as indicated in the chamber.
- ❖ Check that the chamber lock is in the "closed" position.
- ❖ Check the presence of the sealing ring in the chamber cap and that the chamber cap is tightly closed.
- ❖ Prevent the external and lower metallic parts of the chamber from being in contact with liquids.

When supplying

- ❖ When supplying the chamber, be careful not to overfill it with liquid.
- ❖ Do not fill the humidifying chamber with heated water above 37°C.

Power supply

- ❖ Only connect the power cable to a tap which is properly grounded and approved for hospital use and to a power supply which complies with the ABNT NBR 13534 regulation - "Instalações elétricas em estabelecimentos assistenciais de saúde - Requisitos de segurança". The female tap should be a 3-pin Nema 5-15P female tap.

General

- ❖ Always keep the contact base of the humidifier's body and the metallic surface of the chamber as clean as possible for a seamless contact between the humidifier's body and the chamber, thus allowing a perfect heat interchange.
- ❖ The humidifier chamber should never run out of water.

Service (preventive and corrective maintenance)

- ❖ Any internal service in the Heated Humidifier 6060 must be exclusively performed by a trained technician authorized by **TAKAOKA**. This Service Manual does not exempt the proper training of the technician.
- ❖ Use only TAKAOKA's original replacement parts. The use of non-original parts could risk the patient's safety.
- ❖ The technical features of TAKAOKA's products are subject to changes without prior notice due to their constant technological development.

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2 GENERAL DESCRIPTION

The Heated Humidifier was designed to heat and humidify gases supplied to the patient by an Intensive Therapy Ventilator, an Anesthesia Machine, or other positive pressure respiratory system. The Heated Humidifier is composed of the two parts described below:

Heating Base

The heating base has the heating and temperature control systems. It also has a mechanism for fixing the humidifying chamber.

Humidifying Chamber

Water reservoir where the humidifying process is performed. The humidifying chamber has standardized conical connections for the inlet and outlet of gas flow.

3 OPERATING PRINCIPLE

The Heated Humidifier operates under the principle of gas flow saturation by heated water steam, that is, it warms and saturates with water steam the inspiratory flow which passes through its chamber. Then the gases flow through a path between the chamber outlet and the patient by means of two corrugated tubes with drains.

The air entering the Heated Humidifier is circulated inside a chamber filled with sterile water. This chamber is placed over a base containing a heating board. The board temperature is controlled by an electronic system which automatically and intermittently turns on and off an electric resistance, thus keeping the heating board temperature always constant.

It has an electronic temperature control, a digital thermometer, pilot and electric resistance operation lights, on/off key, and transparent chamber with capacity for 400ml of sterile water. The gas temperature is measured near the patient's mouth by means of an electronic thermometer.

4 COMPONENT IDENTIFICATION

This chapter identifies the parts and components of the heated humidifier and its respective list of materials. Use these figures to find the Humidifier's internal components as well as a reference to perform the assembly and maintenance procedures.

4.1 Front View Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
203010295	Button	1	Part
316030014	Grub screw with inter. hex 3/16"	1	Part
203010424	Pin	1	Part
203010471	Knob	1	Part
316030003	Grub screw with inter. hex NR 8/32Fx1/4"	2	Part
422010004	Linear potentiometer without key 100R	1	Part
310020015	Phillips flat head screw with gap D	8	Part
202020034	Humidifier's case	1	Part
202010970	Full polysulfone chamber	1	Part
203030564	Polysulfone chamber cap	1	Part
203040100	Humidifier chamber plug	1	Part
117050017	Poly. lexan 0.13esp x 914mm x 58mts (exp)	1	Part
416020003	5mm green led	2	Part
203030009	Bushing - ext.dia.8xint.dia.4.5x6esp	2	Part

4.2 Right View Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
406010031	On/off key ITB 24261G0603 (Emicol)	1	Part
421010002	Fuse-holder ref. 11005 or PFP 010606	1	Part
429090023	Supply cable	1	Part
434050001	Press cable ref. S-692	1	Part
429090024	Sensor cable	1	Part
203020449	Right side	1	Part

4.3 Left View Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
203020450	Left side	1	Part

4.4 Rear View Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
203030556	Protector	2	Part
308020009	Phillips head screw with gap 4.2x9.5	2	Part
203100053	Engraved plate	1	Part
202020035	Base	1	Part
314020017	Phillips head screw with gap	4	Part
203030022	PVC feet	4	Part

4.5 Upper View Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
203020178	Lock	2	Part
203010431	Heating board	1	Part
303010029	O'ring ref.2235-N 3000-7B	1	Part
203010434	Sensor	1	Part

4.6 Internal Components

Figure 4.1: Components of the Heated Humidifier 6060

Code	Description	Quantity	Unit
203010425	Lever axis	1	Part
203010426	Protector mat 5840	1	Part
203060127	Retainer ring ref.503040-03	1	Part
203010429	Axis - diameter 3/16"	1	Part
322010102	Spring - ext.dia.8xint.dia.7.2x20.5len.x0.9mmthick.	2	Part
203010081	Threaded pin 1/8"x40Fx15.2mm	8	Part
320010028	Threaded hex nut 1/4"x40F.	12	Part
203020091	Washer - ext.dia.3/8"xint.dia.4.1x1mmthick.	4	Part
203030233	Insulating	4	Part
203010432	Insulating	4	Part
320010004	Threaded hex nut 1/8"x40F.key 1/4"x3thick.	4	Part
314020009	Crosshead screw m3x0.58x5mm	8	Part
432010002	Thermostat 95degrees	1	Part
202010500	Temperature sensor	1	Part
203010433	Cap	1	Part
320010007	Threaded hex nut 1/2"x12F.	4	Part
317010045	Round head screw dia.3/32x48Fx5/8"	2	Part
203060126	Missagra ME-007	2	Part
203020454	Mica paper board 63x32x0.36mm	2	Part
203020453	Mica paper board 63x30x0.36mm	1	Part
445010032	Thermometer board	1	Part
445010062	Temperature control board	1	Part
433010001	Power supply cable	1	Part

5 ELECTRIC/ELECTRONIC DESCRIPTION

The humidifier's electronics consists of three main boards. The voltage source board is bi-volt and externally manufactured, supplying a continuous voltage of 6.5V for the display board.

The heating board is independent from the other two. The temperature sensor board is intended to indicate the temperature of gases supplied to the patient. The figure below shows the humidifier's block diagram.

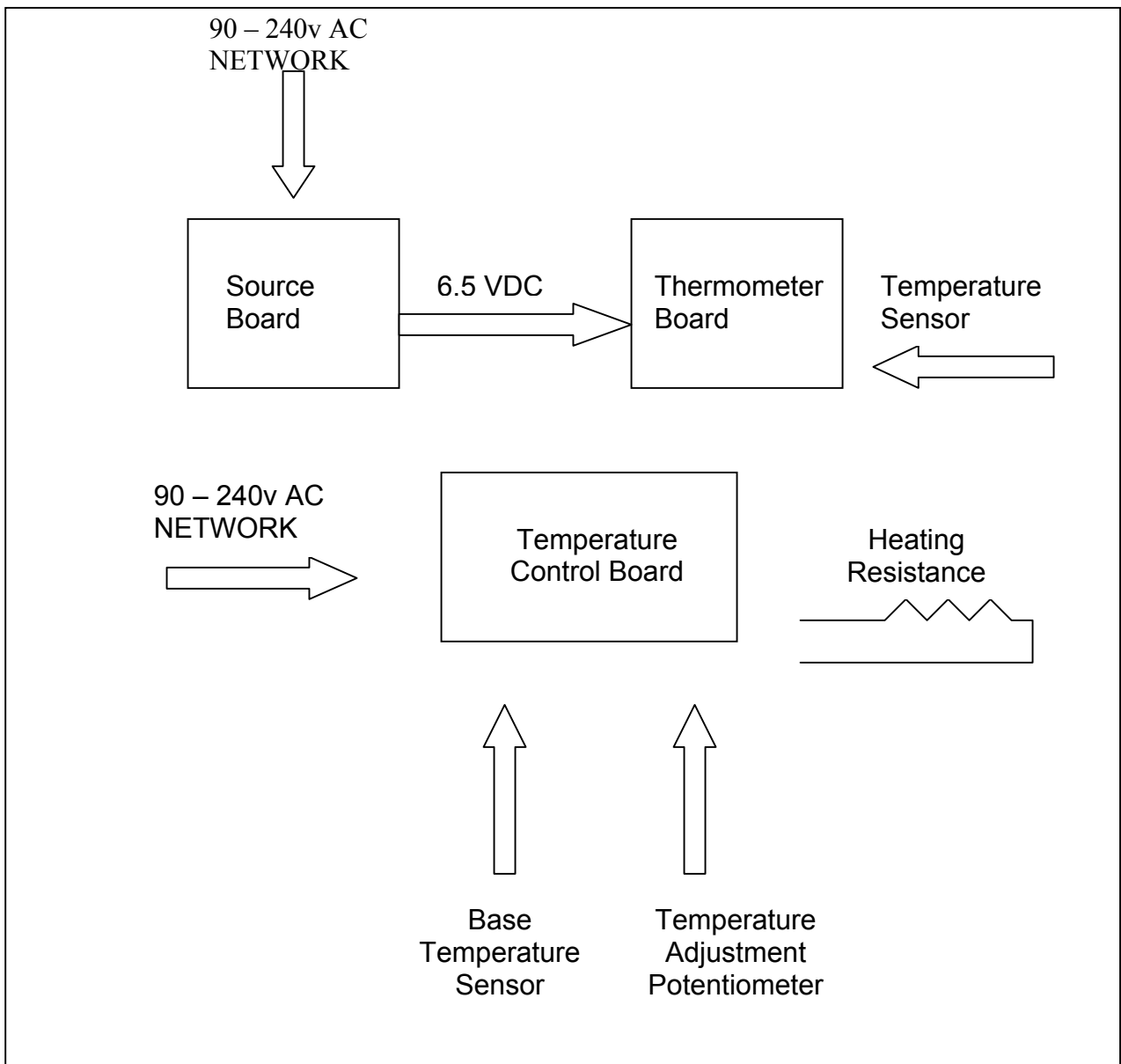
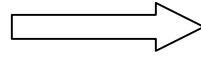
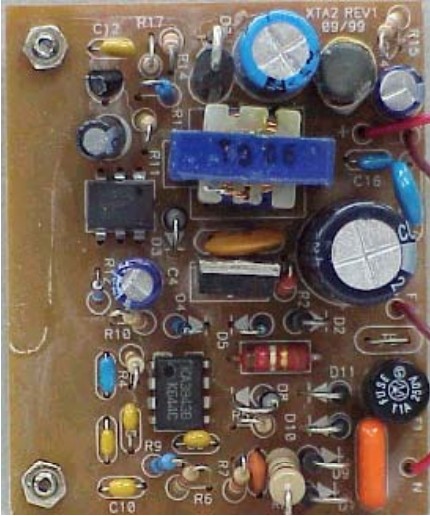


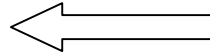
Figure 4.1 – Heated humidifier's block diagram

5.1 Source Board

The source board converts the network voltage to 6.5v DC and only supplies the thermometer board.



Outlet
6.5v DC

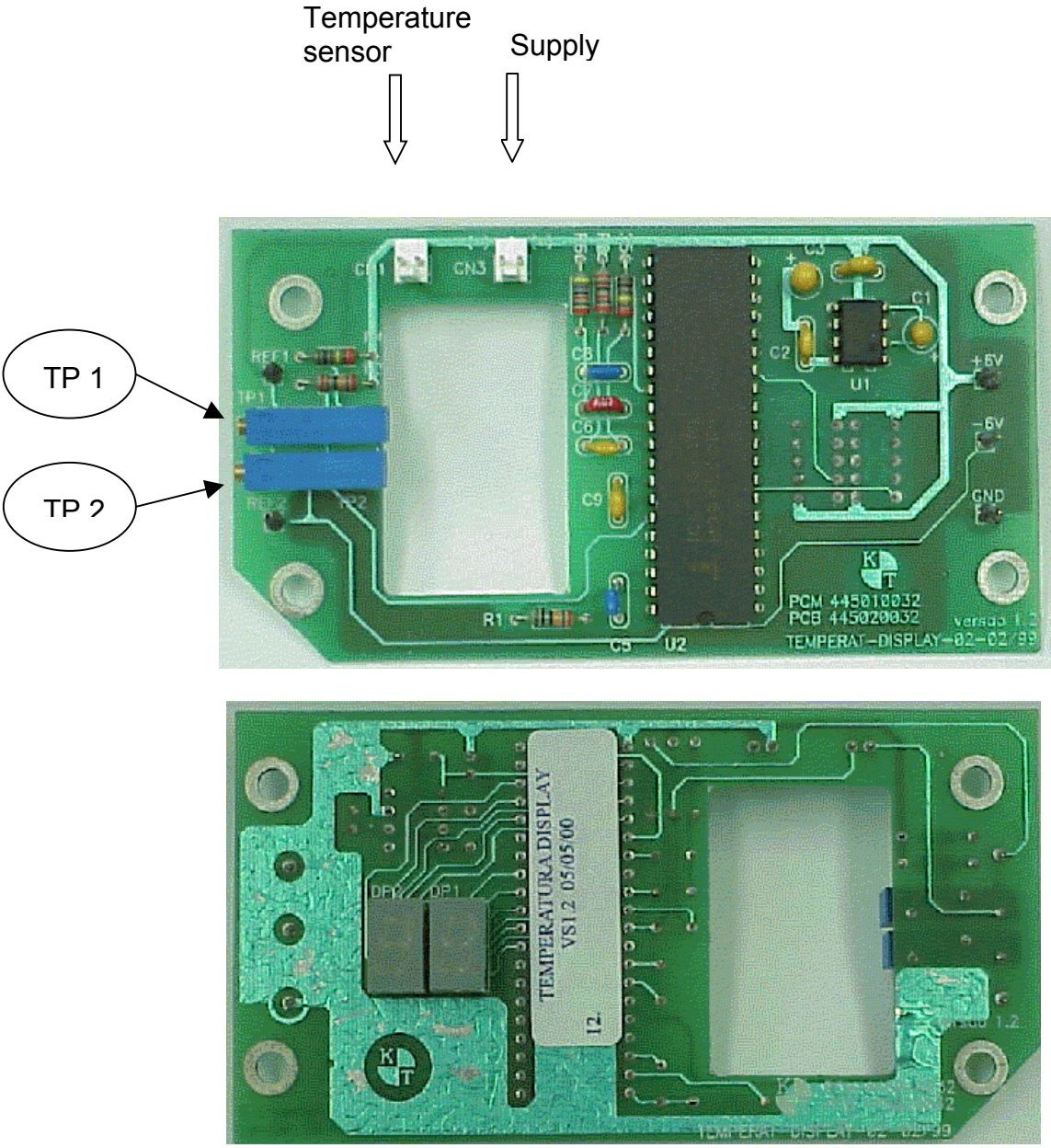


Inlet
90-240v AC

This board may differ according to the humidifier, but it has the same function with the same inlet and outlet.

5.2 Thermometer Board

The thermometer board is intended to indicate by means of a 2-digit LCD the temperature measured by the temperature sensor connected to the Y-shaped part. This thermometer has a 1°C resolution.

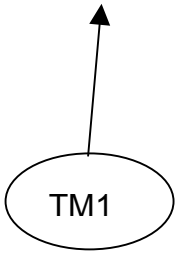
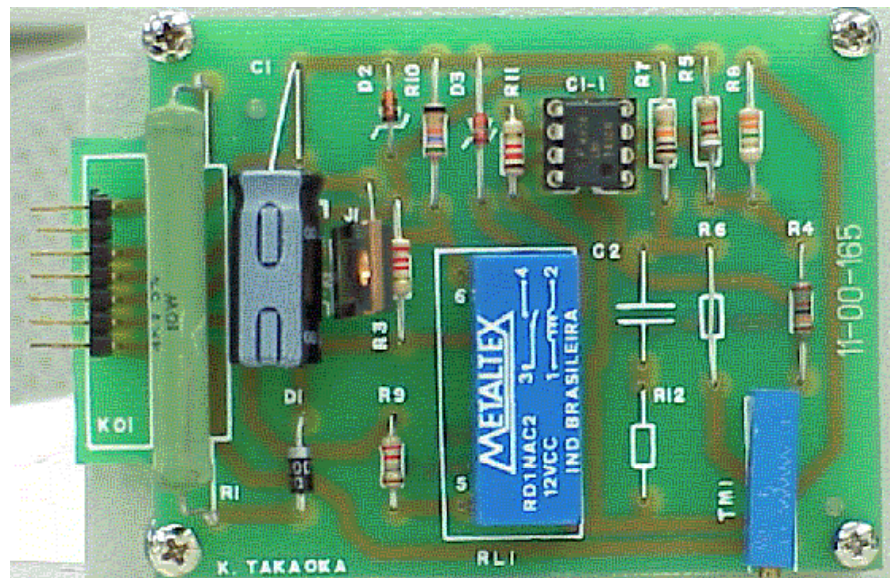
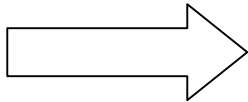


5.3 Temperature Control Board

This board is intended to control the temperature of the aluminum base which will be in contact with the chamber. This base has a thermostat which will disrupt the current supplying the resistance if the temperature in the base reaches 90°C to prevent overheating of the humidifier's chamber.

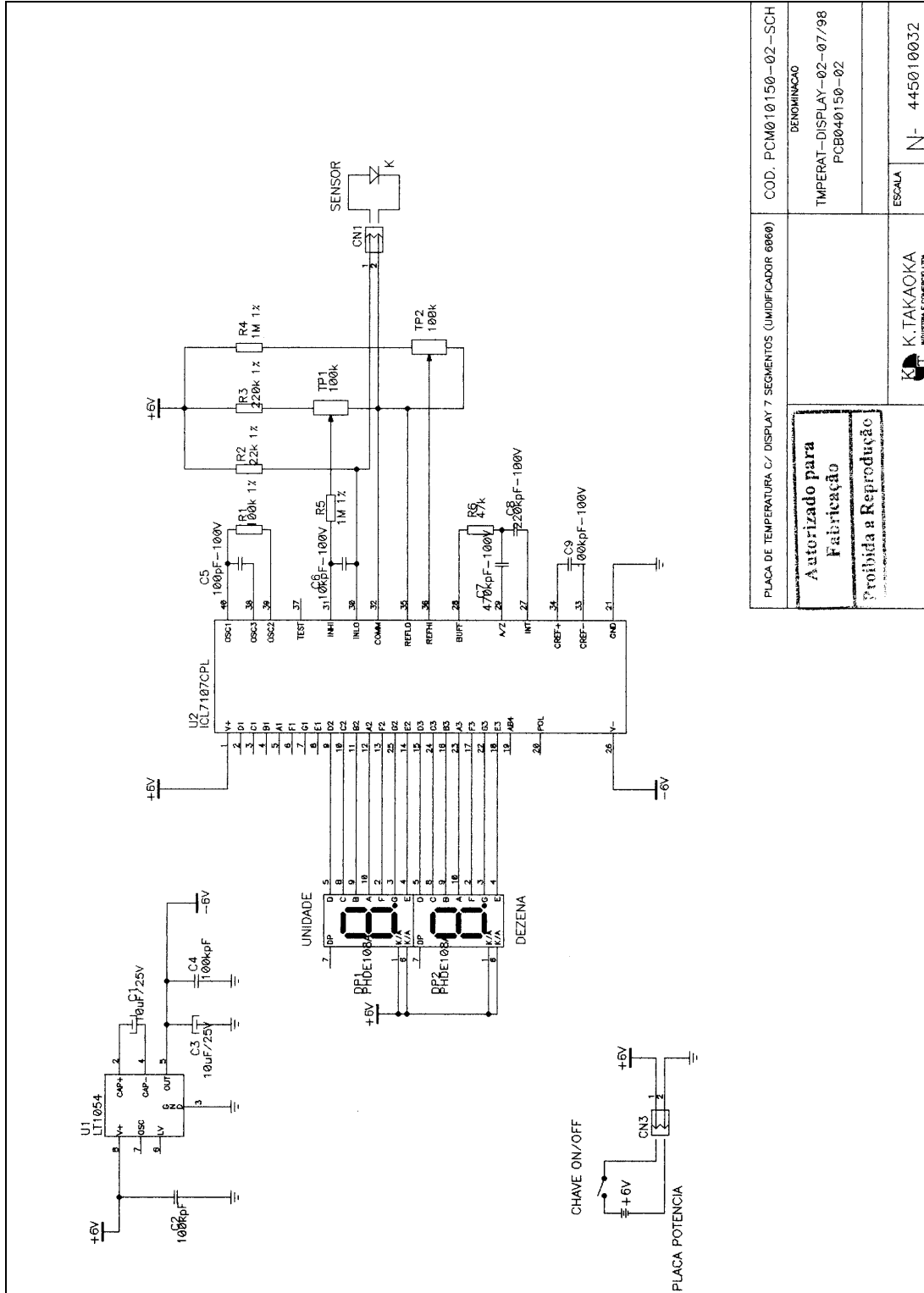
When temperature reaches the temperature adjusted by means of the potentiometer in the front part of the humidifier, the board will turn off the supply for the heating resistance. Once temperature falls some degrees below the temperature adjusted, the supply for the resistance will be resumed until it reaches once more the temperature adjusted and the cycle starts over.

Supply and Signals



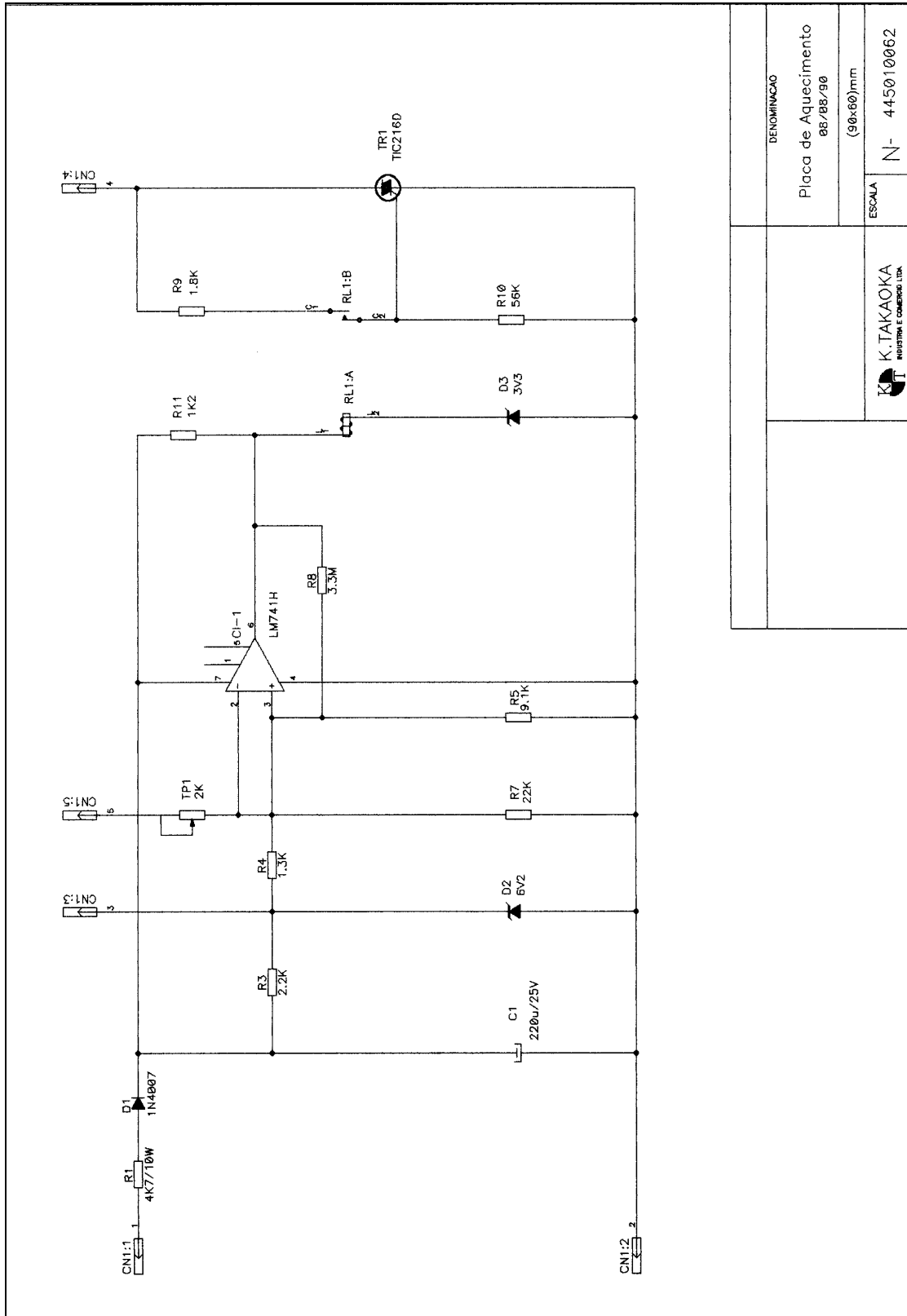
5.4 Electrical Schemes

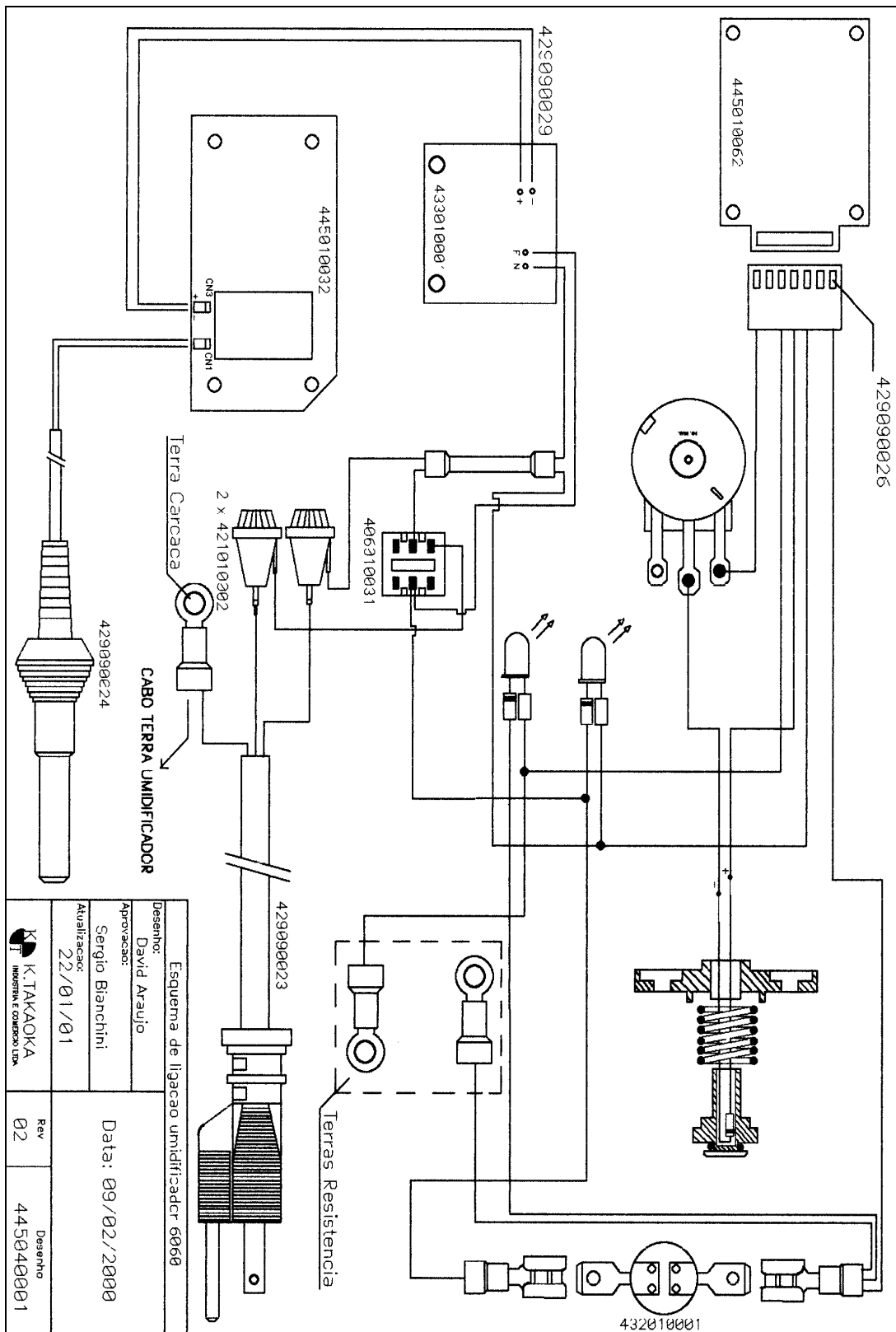
5.4.1 Electrical scheme of the thermometer board



PLACA DE TEMPERATURA C/ DISPLAY 7 SEGMENTOS (UNIFICADOR 6060)	COD. PCM010150-02-SCH
<p style="text-align: center;">Autorizado para Fabricação</p> <p style="text-align: center;">Proibida a Reprodução</p>	DENOMINAÇÃO
	TEMPERAT-DISPLAY-02-07/98 PCB040150-02
<p style="text-align: center;">K.TAKAOKA INDUSTRIAL COMERCIO LTDA</p>	ESCALA
	N- 445010032

5.4.2 Electrical scheme of the temperature control board





6 ELECTRONIC ADJUSTMENT PROCEDURE

Material Required:

- 1 – Glass thermometer with scale up to 100°C.
- 1 – Small screwdriver.
- 1 – Recipient with ice.
- 1 – Thermometer for measuring room temperature.

Calibration of the Temperature Control Module:

- 1 – Switch on the humidifier with the temperature control potentiometer in the maximum position.
- 2 – Place a reference thermometer to monitor the water temperature of the its reservoir.
- 3 – Wait for the water temperature to reach 50°C and then adjust TM1 (item 5.3) to turn off heating (the HEATER ON LED is dimmed in the panel).
- 4 – If heating is deactivated before the water reaches 50°C, adjust TM1 to reactivate it (the HEATER ON LED is on).
- 5 – Check that the humidifier keeps an ON-OFF routine during heating to keep water temperature at 50°C +/- 3°C.

Calibration of the Thermometer Module:

- 1 – Place the temperature sensor within a recipient with ice in fusion.
- 2 – Once the reading is stable, adjust TP1 (item 5.2) so that “00” is indicated in the display.
- 3 – Remove the temperature sensor from the ice and leave it exposed to the room temperature.
- 4 – Once the reading is stable, check that the temperature matches the one from the standard thermometer (room temperature). Tolerance must be of +/-1°C. If necessary, adjust TP2 (item 5.2) to the display temperature and repeat items 1 to 4 until the process is stable.

7 POWER SUPPLY

Supply the heated humidifier with a 100 or 220v AC distribution network by means of the power cable provided with the equipment.

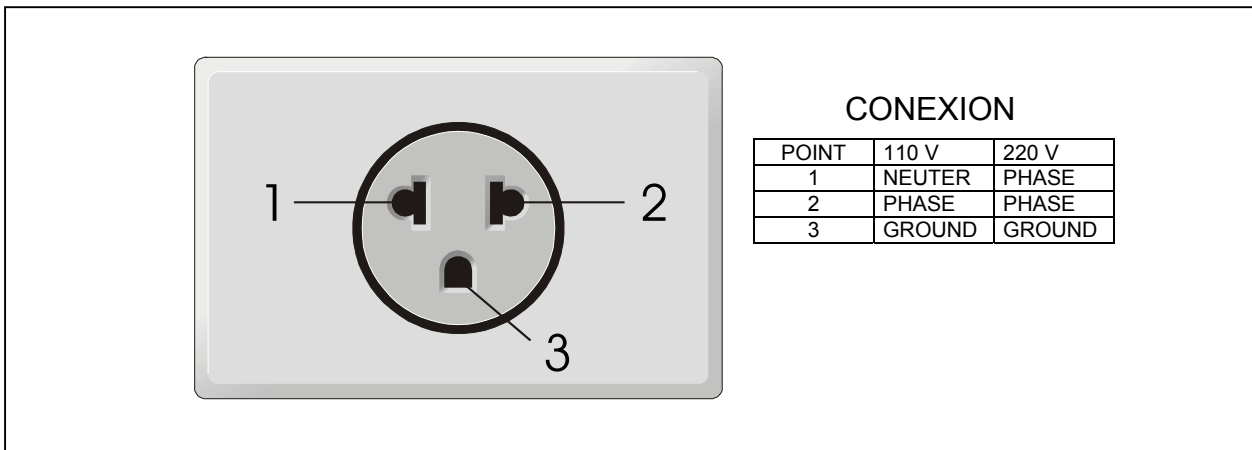


Figure. Three-pin electric Nema 5-15P tap.

8 REVISION PROGRAM

All revisions must be requested by the user.

Half-annual Revision

Item	OK	NOK	Notes
1. General look of the humidifier			
2. Humidifier's on/off key			
3. Humidifier's fuse-holder			
4. Humidifier's POWER ON Led			
5. Humidifier's HEATER ON Led			
6. Braking system of the humidifier's chamber			
7. Humidifier's temperature sensor			
8. Humidifier's digital display			
9. Humidifier's overall operation			

Annual revision

Item	OK	NOK	Notes
1. Humidifier's electronic readjustment			

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