

MILESTONE

MLS-1200 PYRO MICROWAVE ASHING MODULE

service manual

Thank you for having selected our system and welcome in the ever growing world club of Milestone users.

We are sure that you will be completely satisfied with this new tool entering your laboratory.

We invite you to read carefully this service manual and to keep it in reach for convenient and fast consulting.

For any possible clarification or any request of intervention please contact either our Representative in your country:

or Milestone at the following address:

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1 INTRODUCTION

Each Milestone unit is accurately tested before leaving the manufacturing plant. All units are provided with a Quality Test Certificate. A proper use and a proper and accurate service are however required to assure long and safe operation of the system.

**READ THESE INSTRUCTIONS CAREFULLY
BEFORE OPERATING THE UNIT**

2 GENERAL WARNINGS

In order to operate under safe conditions and avoid any danger or risk of accidents, the following rules must be strictly followed :

- 1) Always disconnect the unit from the mains power before any repair.
- 2) Before switching the unit on again after every repair, it is necessary to make sure that:
 - all the internal connections are correctly soldered;
 - all the cables are insulated and don't come into contact with either the door or the sharp edges of the unit;
 - both the electrical and mechanical connections are virtually faultless;
 - no modifications have been made to the built-in safety devices;
 - the spare parts are those required by the manufacturer.

WARNING : do not operate the unit if the slightest doubt exists that it is not properly working !

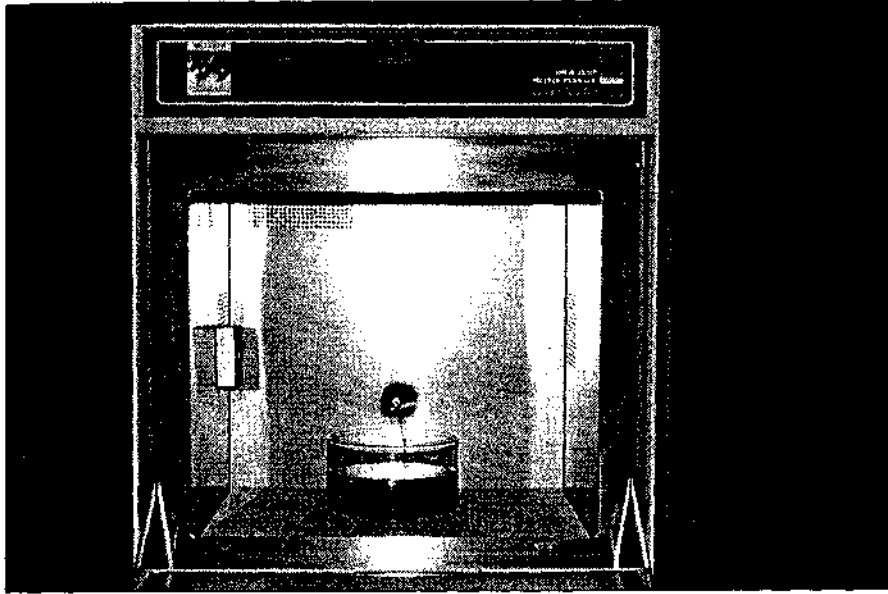
**DO NOT INTRODUCE ANY METAL PARTS OR METAL CONTAINERS
INTO THE MICROWAVE WORKING CHAMBER**

- 3) The microwaves generated inside the MLS-1200 PYRO unit have a frequency of 2450 MHz and reach the highest absorption in aqueous matrices causing a rapid increase in temperature. This may represent a danger for the operator. Therefore avoid any exposure to the microwave field generated by the magnetron.

3 POWER MEASUREMENT

Proceed along the following guidelines :

- 1) take out of the middle of the unit the complete muffle, leaving the ceramic base placed at the bottom of the working-chamber (see Picture 1)



Picture 1

- 2) create the following program :

STEP	POWER	TIME
1	1000 W	1 minute

- 3) fill in a cylinder-shaped pyrex container (diameter approx. 20-22 cm) with **1 liter of water** (± 25 ml);
- 4) introduce the pyrex container into the working-chamber
- 5) bend the thermocouple as far as it reaches the water.
- 6) read on the display placed on the front of the unit, the initial temperature of the water (T_i)
- 7) start the previously stored program at point 2
- 8) at the end of the program, check final temperature (T_f) (as soon as it becomes stable) reading the display again.
- 9) calculate the working power using the following formula:

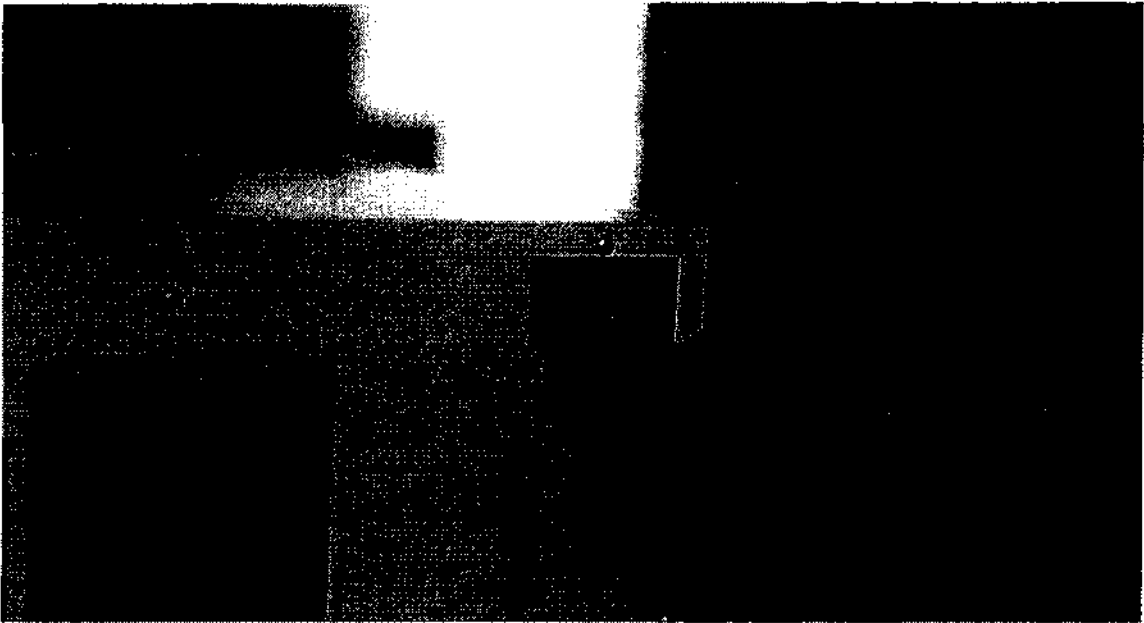
$$\text{WORKING POWER (W)} = 70 \times (T_f - T_i)$$

This procedure is according to IEC Norms no.705.

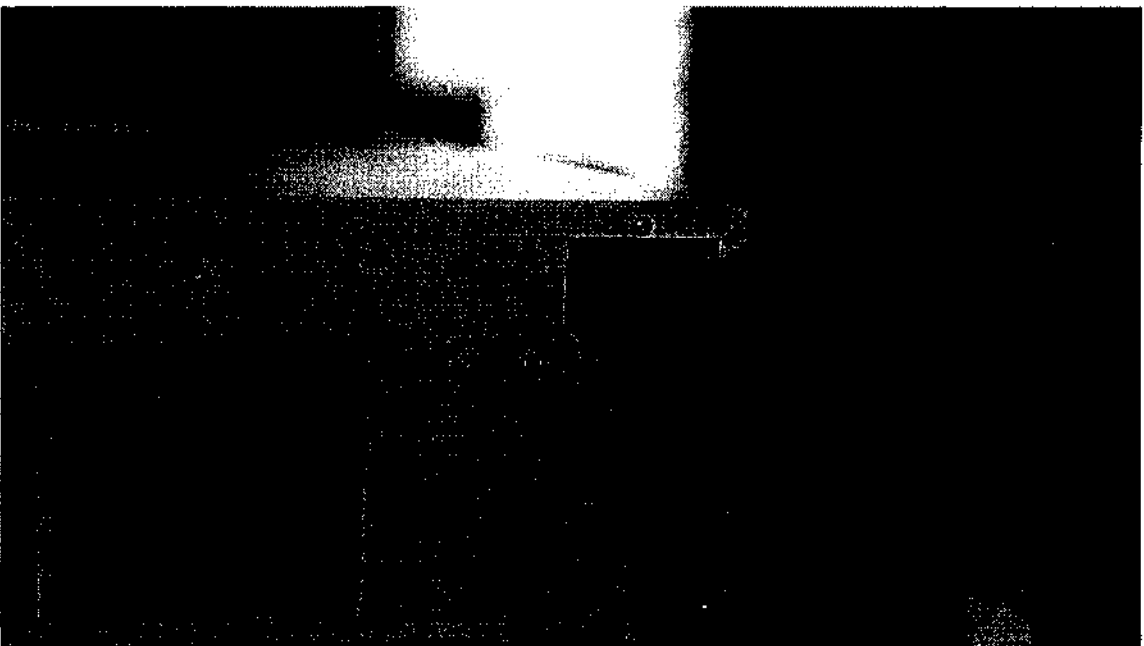
NOTE: T_i and T_f temperature measurements must be extremely accurate, as a $\pm 1^\circ\text{C}$ deviation is equivalent, when calculating the power, to a difference of ± 70 W; it is therefore recommended to repeat the test several times.

4 REMOVAL OF THE CABINET COVER

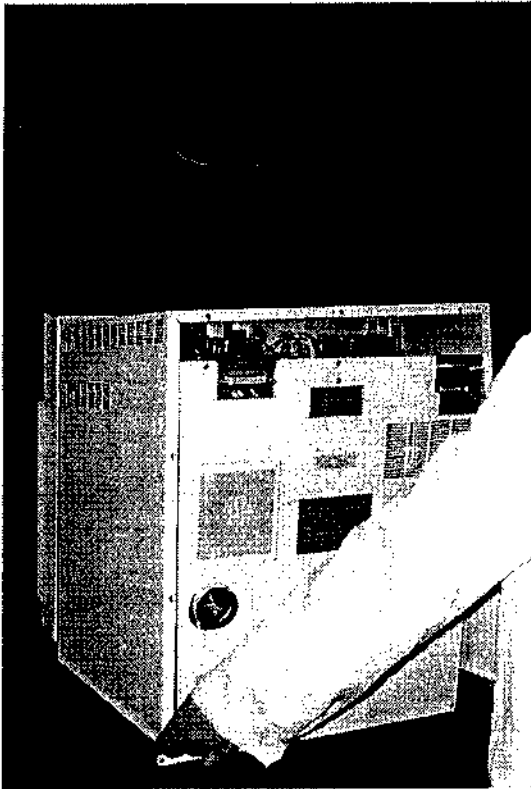
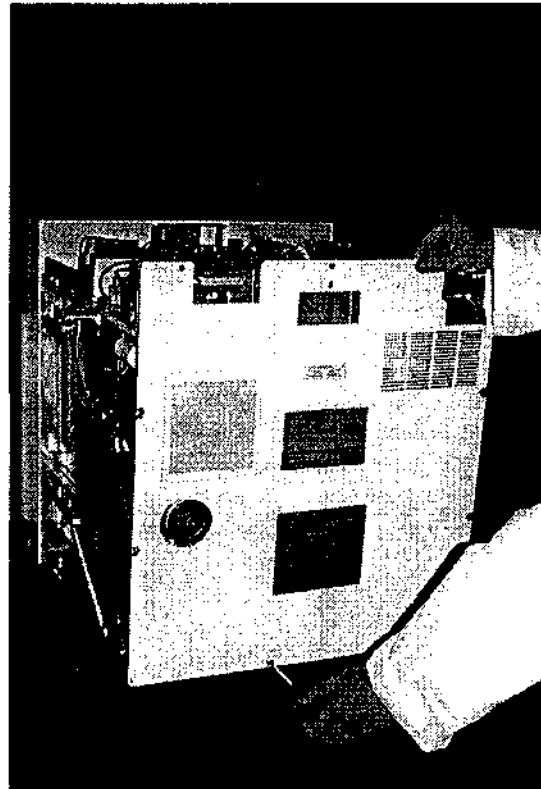
- 1) Disconnect the unit from mains power to prevent any undesired switching on.(picture 1 and 2);
- 2) Loosen the two cross screws on the right and left sides of the unit; (picture 3);
- 3) Loosen the cross screws placed on the back of the unit (picture 4);
- 4) Remove the cover by lifting it from the back (picture 5)
- 5) Unscrew the middle screw on the base of the back panel. It is now possible to reach the high voltage connections (picture 6)



Picture 1

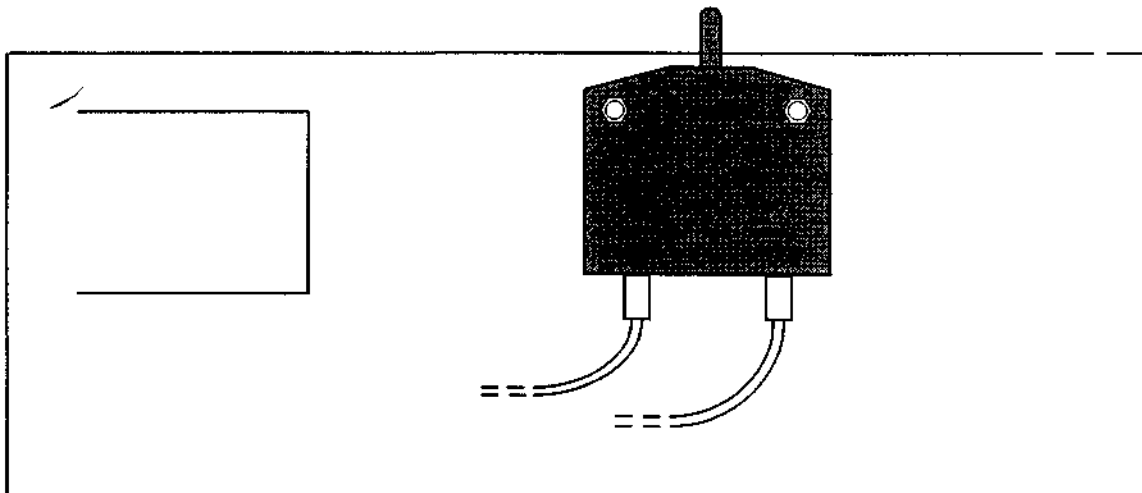


Picture 2

*Picture 5**Picture 6*

WARNING: HIGH VOLTAGE IN THE CAPACITORS

BEWARE : never bypass the serial switch to the 220 V line located on the left back side of the unit. But you have to bypass it if you want to make a faulting. (see Figure below)



5 ELECTRICAL CONTROLS

BEWARE DANGER HIGH VOLTAGE!

When repairing high power transformer, capacitors, relays and resistance as well as Magnetron, it is possible to get in contact with high voltage. Therefore it is necessary to use only instruments with high voltage insulation higher than 5000 Volt. Personnel must take the utmost care not to get in contact with high voltage.

5.1 SAFETY CONNECTION (POWER CORD EARTH)

Check connection of safety contact to the plug of the unit. The resistance must not exceed 100 mOhm.

5.2 DOOR SWITCHES (P/N 33062 and P/N 33064)

The unit is provided with 4 safety switches. The two switches placed on the upper right and left sides of the MLS-1200 PYRO unit are operated by closing the door. They open when pushing the door handle downwards. This means that when the door is closed, these switches are also closed. When the door is open, these switches are open too. The lower switches are safety switches and are also activated by the door arm.

To check the correct functioning of the switches, use an electrical resistance Ohm-meter.

Right and left door-slide switches :

CLOSED DOOR: $R = 0 \text{ ohm}$

OPEN DOOR : $R = \text{infinite}$

Right and left door-handle switches:

CLOSED DOOR: $R = 0 \text{ ohm}$

OPEN DOOR: $R = \text{infinite}$

When the door is closed, the switches are open and viceversa.

BEWARE : when pushing down the door handle, be careful that the upper left switch is activated before the right one.

Defective switches must be destroyed to prevent future use.

5.3 HEATING TRANSFORMER TEST P/N 33046

CAUTION: During the operation about 2300 VAC get to the high voltage terminals. While using the measurement instruments, keep your hands, tools, etc. off the high voltage terminals.

To check the heating transformer, proceed as follows :

- 1) Disconnect the unit and loosen the capacitor with an insulated screwdriver.
- 2) Disconnect the connecting cable between capacitor and high voltage transformer.
- 3) Connect the Voltmeter to the terminals of the magnetron wires.
- 4) Connect the unit to the mains power and start a program with microwave power (e.g. 1000 W for 1 minute). The heating voltage should be around 4.6 VAC.

ATTENTION: Disconnect the unit from the mains power before disconnecting the Voltmeter.

- If the Voltmeter indicates no voltage, connect the wires with the capacitor, set the Voltmeter to the correct measurement range and check if 220 V (230 V) are available.
- If the input voltage is normal but there is no voltage in the heating wires, it will be necessary to replace the transformer.
- The resistance at the terminals of the heating transformer must be:
 $\approx 13 \text{ Ohm}$ on the primary winding.
 $\approx 0,8 \text{ Ohm}$ on the secondary winding.

5.4 HIGH VOLTAGE TRANSFORMER TEST P/N 33044

As about 2300 VAC are available at the secondary winding of the transformer during operation, no high voltage measurement should be carried out. Normally, it is enough to check the current flow to make sure of the state of the transformer.

- 1) Disconnect the unit, loosen the capacitor with an insulated screwdriver and disconnect the transformer wires;
- 2) Measure the resistance value between the high voltage terminals with an electrical resistance meter; it should turn out to be about 40 Ohms.
- 3) If a much lower, a much higher or an infinite resistance is measured, the transformer is faulty and must be replaced.

5.5 CAPACITOR TEST P/N 33051

The consequence of an open capacitor is that no high voltage gets to the magnetron. A shorted capacitor normally interrupts the fuse for current overload. An electrical resistance meter can be used to check a discontinued or shorted capacitor.

- 1) Unplug the unit from the power grid and wait 1 minute before getting in contact with the high voltage parts; loosen the capacitor with an insulated screwdriver and disconnect the capacitor wires.
- 2) Set the resistance meter to the highest value and measure the resistance between the capacitor terminals. The resistance meter must indicate for a short time interval the flow between the terminals; when the capacitor is charged, it must indicate an infinite value.
- 3) If the resistance meter shows a continuous flow between the terminals of the capacitor, or no current flow at all is detected, it is necessary to replace the capacitor.
- 4) Measure the resistances between both capacitor terminals and the cover of the capacitor. The resistance meter must indicate an infinite value.

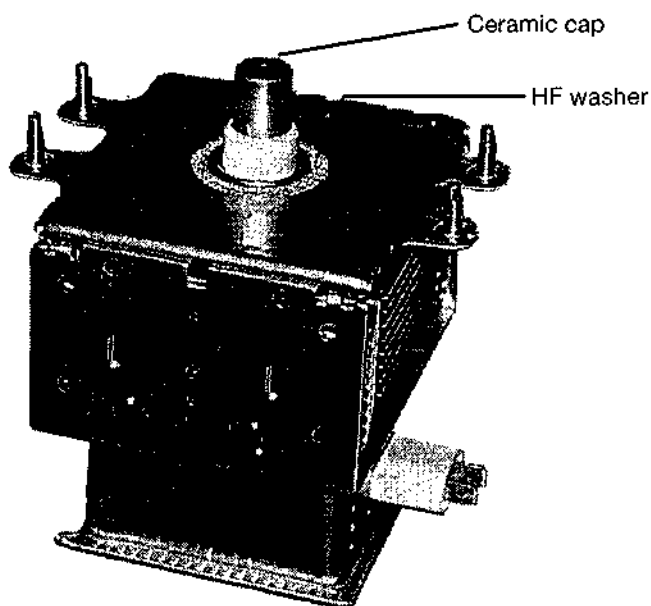
5.6 DIODE TEST P/N 33054

- Disconnect the unit and wait for 1 minute.
- loosen the capacitors with an insulated screwdriver and disconnect the capacitor wires and the diodes connections.
- Measure the resistance at the highest value terminals. Then invert the wires and observe the flow on the measuring instrument. A normal diode has an infinite resistance in one direction and a weak resistance in the opposite direction. If it shows a current flow or an infinite resistance in both directions, it is necessary to replace the diode.

NOTE: Resistance meters with a battery of less than 6 to 9 Volts are generally not suitable for checking the diodes. In the case of an infinite resistance in both directions, the unit should first be used on a diode which has been proved not to be faulty before replacing a diode when there's no need for it.

5.7 MAGNETRON CONTROL P/N 33040

The magnetron is shown in picture 1.



Picture 1

- 1) Disconnect the unit from the mains power and wait for one minute;
- 2) disconnect the high voltage wires from the wire terminals and measure the resistance between magnetron terminals;
- 3) connect the resistance meter between the magnetron wires and the magnetron case (earth); the read-out of the resistance meter must be an infinite value. A lower resistance means that the magnetron is defective and must be replaced.
- 4) Check the two terminals. The resistance should be maximum 300 milliOhm. A higher resistance means a fault in the wires or cut-off wires and sometimes also the magnetron has to be replaced.

Absolutely do not use the unit in case of missing or faulty washers. The washer wrapped all around the magnetron prevents any microwave leakage between magnetron and magnetron drive.

CAUTION: the ceramic cap must not get damaged or scratched by metallic parts, as even very small scratches on the ceramic surface sensibly shorten its life.

5.8 ANODE CURRENT

The anode current gives an indication on the status of the magnetron. When the magnetron becomes "old", the resistance at the wires is increased and the anode current is decreased.

For the measurement of the anode current, follow these instructions:

- Disconnect the unit and take the plug out, wait for 1 minute.
- Check the Ohm value of the resistance connected with the diode's grounding. The correct value is 10 Ohms.
- Connect a Voltmeter with a measuring range of minimum 5 V at the resistance terminals.
- Connect the unit and start a program with 100 % power. Do not forget to introduce a microwave absorbing charge (for example water) into the unit.
- Measure the voltage, which with magnetron type 2M121 must be about 4,3 VAC.

NOTE: Don't touch the Voltmeter during the measurement.

The anode current can be measured by the following equation:

$$I_A = VR/10 = 4,3 \text{ V}/10 \text{ Ohm} = 0,43 \text{ A}$$

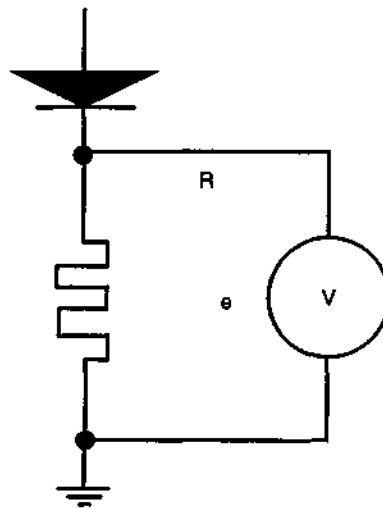


Figure 1

The anode current for the Magnetron type 2M121 must be 430 mA (+/- 10 mA) at 100% power. With an anode current lower than 410 mA, it is necessary to replace the magnetron. It may also be that some component is not properly working in the high voltage parts (capacitors, diodes, line) which might result in a lower current.

5.9 HIGH FREQUENCY LEAKAGE

IMPORTANT: a high-frequency leakage test must be carried out before and after every repair.

To perform this test, use the Leak Tester P/N 33700 supplied by Milestone.

The test is as follows:

- 1) Switch on the Leak Tester.
- 2) Operate the unit at full power (1000 W) for one minute.
- 3) Check the MLS-1200 PYRO unit for leakage gently moving the Leak Tester.
Start from the upper right side of the door and proceed clockwise all around the door until you get back to the starting point. Carry out a similar test on all the visible screening.

THE VALUE MUST ALWAYS BE LOWER THAN 5 mW/cm²
MEASURED AT 5 cm DISTANCE FROM THE UNIT SURFACE

NOTE : In order to perform a correct high frequency leakage check, the unit must be positioned in such a way that the meter can easily be used perpendicularly to the lower door edge.

IMPORTANT : in case of radiofrequency leakage, do not absolutely operate the unit until it has been perfectly repaired.

Possible causes of microwave leakage are the following :

- 1) The door doesn't close well against the working chamber.
- 2) A hinge is broken.
- 3) The radiofrequency door washer is damaged.
- 4) The door is bent or the unit presents some other visible damages which could cause a microwave leakage.
- 5) There are faulty parts in the connections.
- 6) There are faulty parts in the microwave generator.

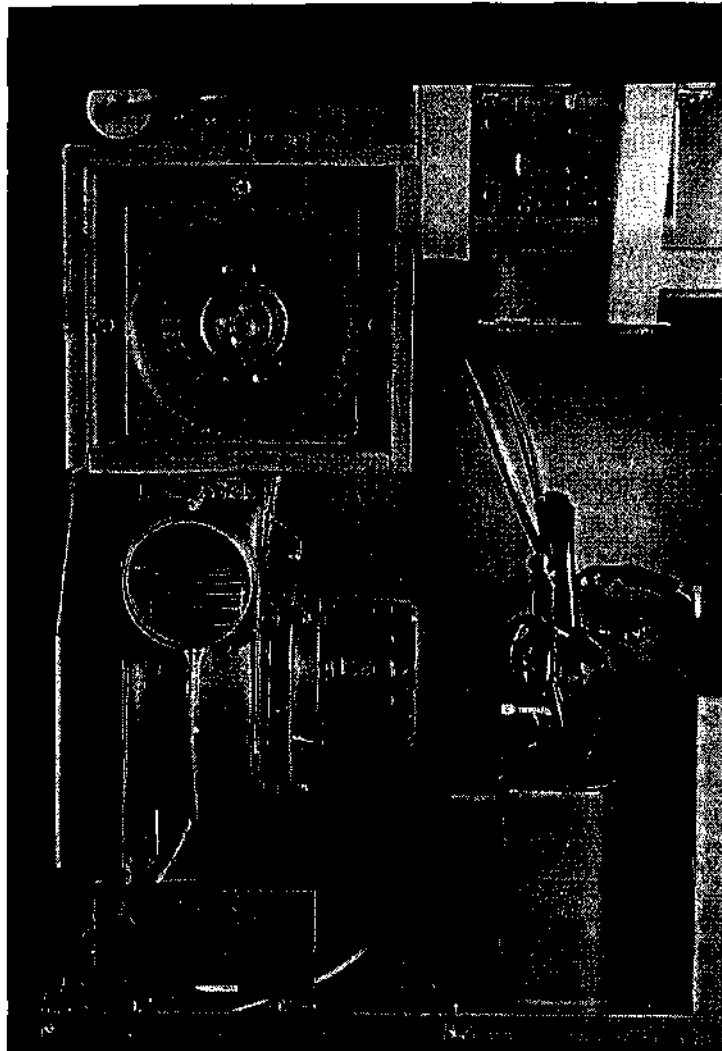
The following points must always be checked after every repair:

- 1) Has the RF magnetron washer been correctly installed?
- 2) Are the working chamber and the microwave drive in perfect conditions?
- 3) Can the door be properly closed, and do the safety devices operate correctly?

IMPORTANT : Do not connect the unit for any reason until the above mentioned circumstances have been carefully checked and, if necessary, seen to.

5.10 EXHAUSTING FAN

The MLS-1200 PYRO units have built-in exhausting and ventilation fan placed on the back of the unit (see picture 2)



Picture 2

The air stream generated by this system allows:

- cooling of the parts surrounding the muffle, i.e. hardware
- removing particles, fumes and odours from the working chamber
- conveying fresh air (oxygen) to the samples to facilitate burning.

- Exhaust motor p.n. 50045

TECHNICAL SPECIFICATIONS

Voltage = 220 V
 Frequency = 50 Hz
 Current = 0,16 A
 Power input = 35 W

Air Volume = 64 m³/h
 Speed = 2700 round/mm
 Noise level = 58 dBA
 Admissible Temp. = 150°C

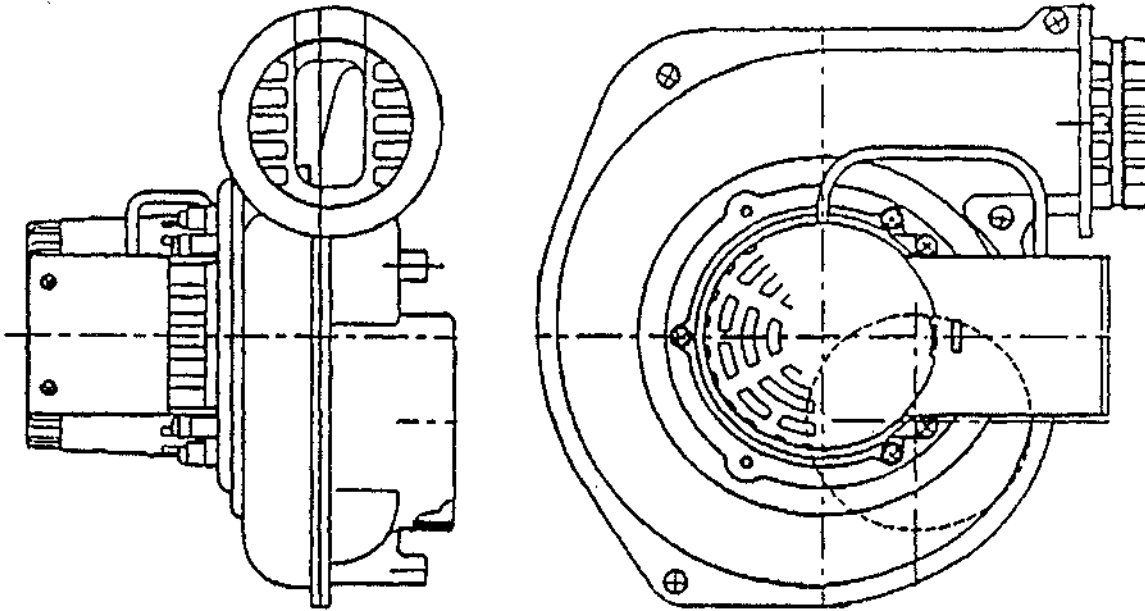


Figure 2

5.11 TEMPERATURE SENSOR - P/N 33086

The MLS-1200 PYRO unit has two built-in temperature sensors (Klixon). One is located on the magnetron walls and disconnects the microwave emission in case of overheating, at a temperature of 110° C (230 °F).

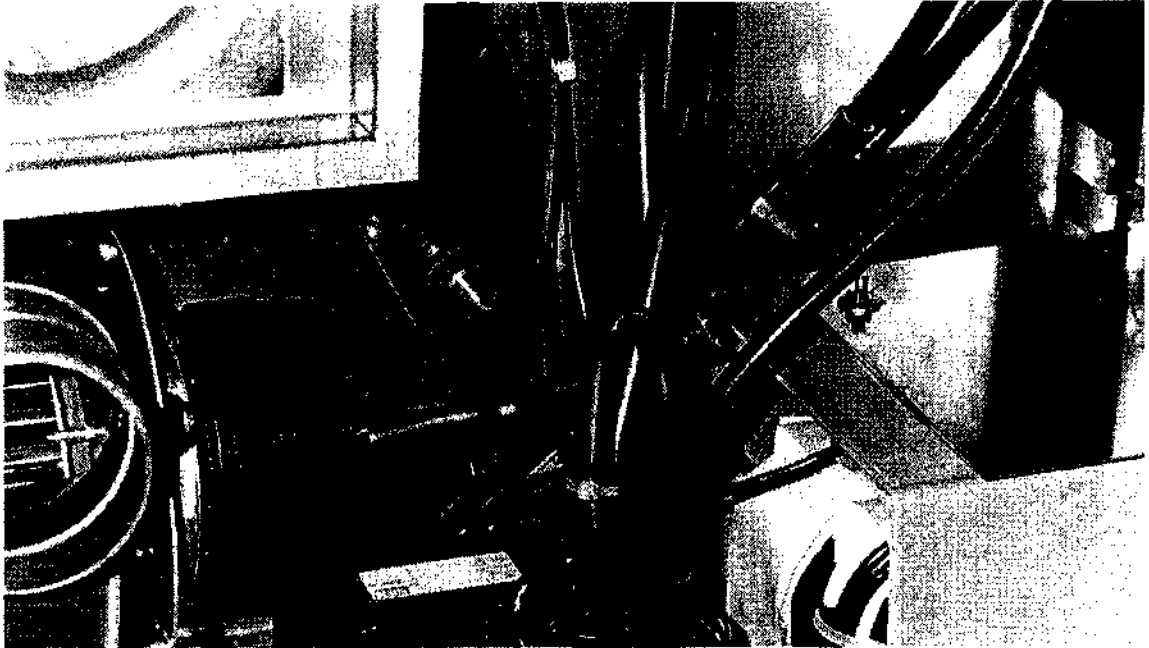
The second sensor is placed on the metal side of the microwave chamber; it is activated whenever there is microwave generation inside the unit with no absorbing charge (the heating elements are the charge). If however the temperature of the external side of the chamber exceeds 80°C (176°F) the temperature sensor will disconnect the microwave emission. The display will show "DOOR NOT CLOSED"

This will last for a few minutes until temperature goes back to values below 69°C (156°F), and the Klixon is reactivated.

5.12 TEMPERATURE MEASUREMENT SYSTEM

Temperature Measurement System in MLS-1200 PYRO includes the following parts:

1. Thermocouple type K NiCr-Ni with measuring range $-200^{\circ}\text{C} + 1300^{\circ}\text{C}$, which is installed in the back of the unit (see Picture 3).



Picture 3

The thermocouple is introduced inside the working chamber into the muffle where temperature measurement takes place (see figure 3)

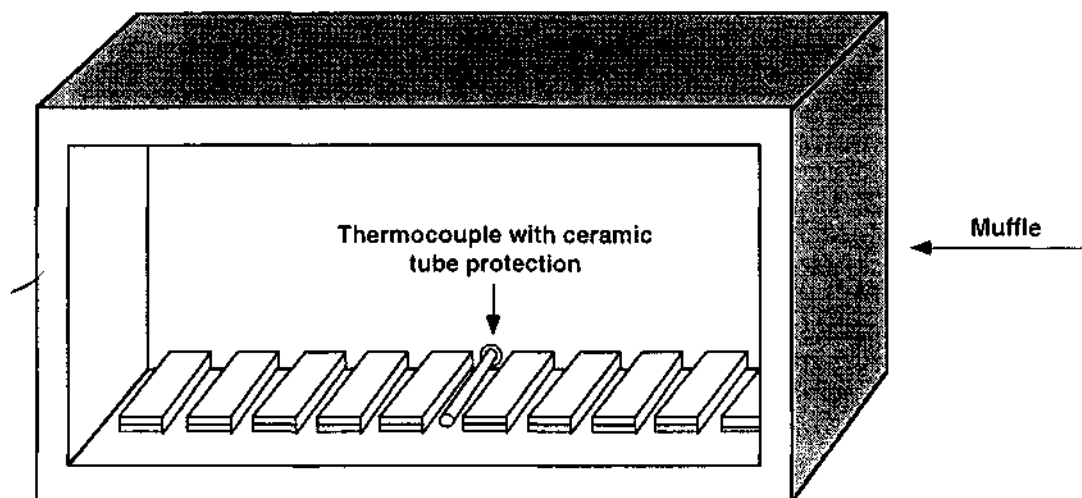
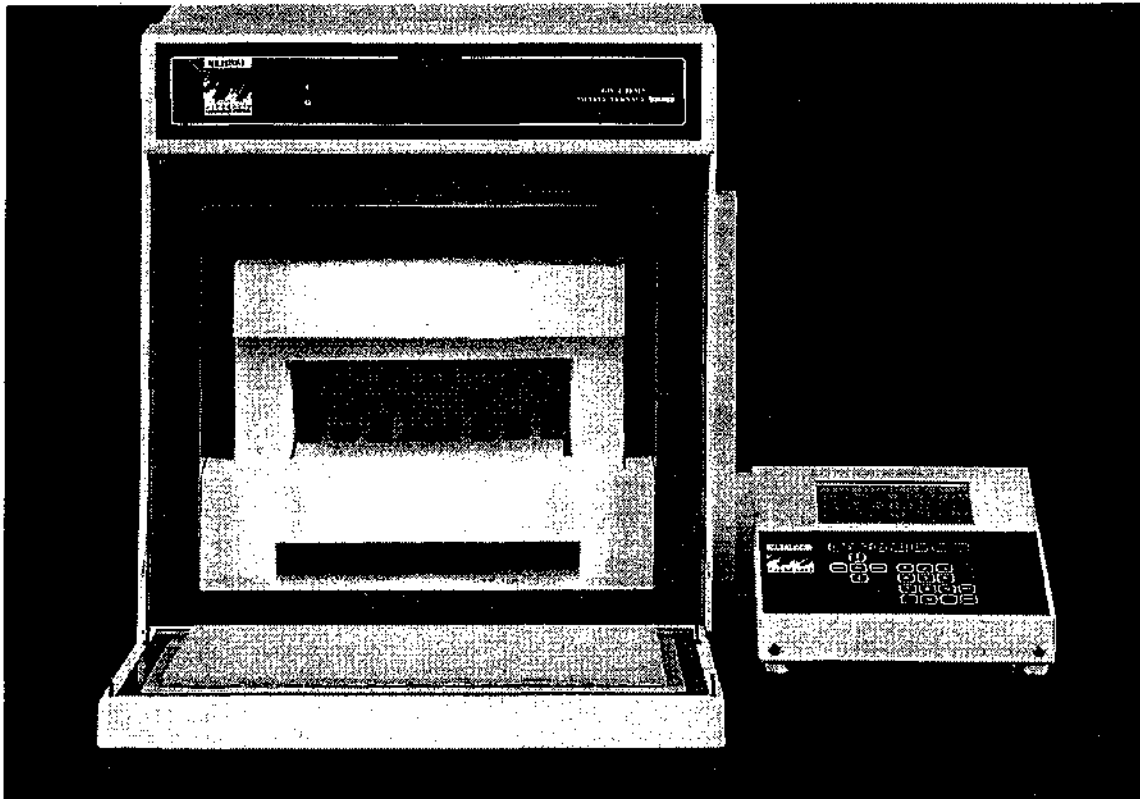


Figure 3

2. Electronic Card with ATC-300-S display with measuring range between 0°C and 1250°C. The ATC-300-S card is placed on the front panel for easy temperature reading (see Picture 4)



Picture 4

The ATC-300-S card receives signal in mV from the thermocouple and converts it into mV graduated value to:

- attain temperature reading on the display
- generate an analogic signal for microprocessor control of temperature
- generate an analogic signal for external connections (recorder, PC, etc.)

CALIBRATION OF THE THERMOCOUPLE

The following comparison table allows to check correct functioning of the NiCr-Ni thermocouple according to DIN-IEC 584-1 Norms.

Temp.	NiCr - Ni typ K	
°C	mV	Δt max
-200	-5,891	± 2,5°C
-100	-3,533	
0	0	
20	0,789	
50	2,022	
100	4,095	
200	8,137	
300	12,207	
400	16,395	
500	20,640	
600	24,902	
700	29,128	
800	33,277	
900	37,325	
1000	41,269	
1100	45,108	★
1200	48,828	
1300	52,398	

* Under -40°C and over 1000°C the tolerance of the thermocouple is subject to substantial variations.

CALIBRATION OF THE ATC 300-S ELECTRONIC BOARD AND DISPLAY

Technical Specifications:

ATC-300 S

Temperature Range:	0°C... 1250°C
Solution:	$\pm 1\text{K (}^{\circ}\text{C)}$
Accuracy:	0,083% (MBEW)
Output Voltage:	0V...10V
Supply Voltage:	12V and 5V

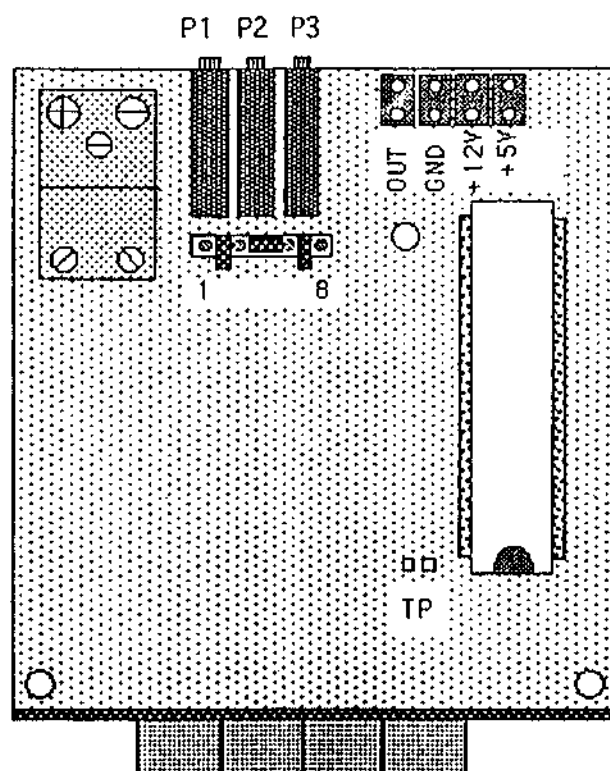

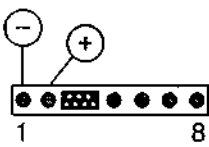
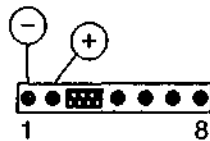


Figure 4: Top View ATC-300 with Potentiometers and Jumpers

CALIBRATION OF ATC-300 AFTER ASSEMBLY

Step	Jumper Settings	Calibration and Checks
1. Preparation		Connect ATC-300 without Sensor;
2. Zero Adjustment		With potentiometer P1 adjust voltage of Pin "OUT" to $0,000\text{V} \pm 1\text{mV}$ the display shows 000 ± 1
3. Gain Control		at jumper pins 1 (-) and (+) a voltage of $22,772\text{ mV}$ needs to be applied; at pin 8 should be a voltage (toward pin 1) of $- 555\text{ mV} \pm 5\text{mV}$ (+ Zero- offset); at pin OUT should be a voltage of $4400\text{mV} \pm 40\text{mV}$ note the actual value for step 5;

4. Display Adjustment



the voltage of 22,772 mV is still applied at pin 1 and pin 2; with P2 adjust the displayed number to 550 units;

5. CAL-U Adjustment



with potentiometer P3 adjust voltage at pin OUT to the value measured in step 3;

6. Normal Operation



set jumpers for normal operation;

SERVICE CHECKS

Step	Jumper Settings	Calibration and Checks
7. Preparation		Connect ATC-300 without Sensor;
8. Zero Adjustment		check voltage at Pin "OUT" for: 0,000 V \pm 1 mV both displays show 000 \pm 1 units (LCD and LED);
9. Processor Adjustment		check voltage at Pin "OUT" for: 4400mV \pm 40mV display must show 550 \pm 1
10. Normal Operation		set jumpers for normal operation; plug in sensor and check for correct display value;
11. Display Control		bridge "TP"-pads; all segments must be illuminated (-1888);

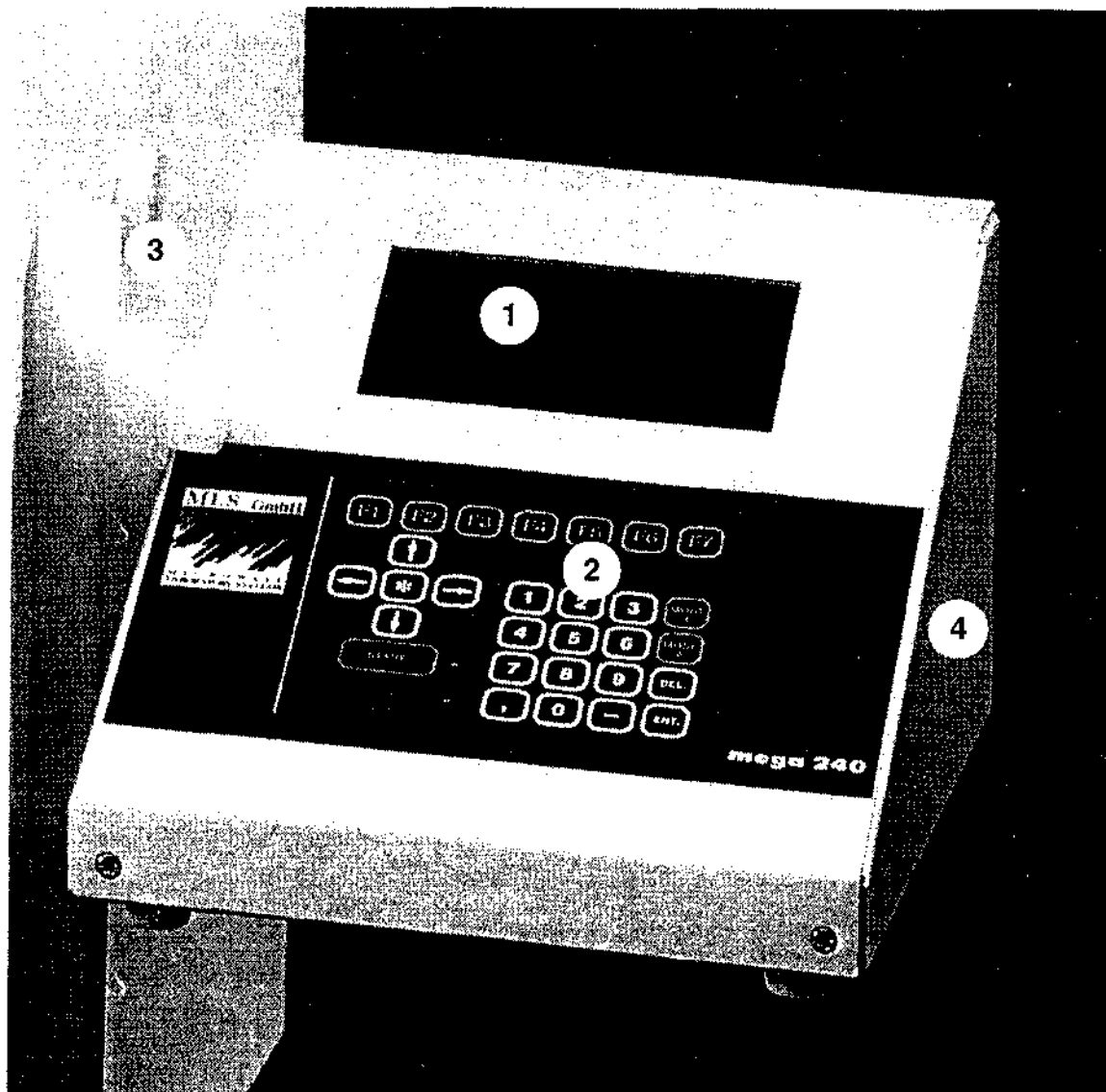
Remark:

On the event that under normal operation the display doesn't exactly show the sensor's temperature a correction can be achieved via potentiometer P1 (Zero Adjust). The correction must not exceed a range of $\pm 2K$ ($^{\circ}C$) Bigger differences could result from a malfunction of the ATC-300.

Different Display Values: As an average value the CPU generates the displayed temperature (LCD) out of 250 samples which takes some 1-2 seconds delay time compared to the values shown on the red LED display. This effect can occasionally lead to a difference of $3^{\circ}C$ - $4^{\circ}C$ between the two displays.

6 DESCRIPTION OF COMPONENTS

- 1) LCD Display
- 2) Keyboard
- 3) Attachment of control panel to MLS-1200 PYRO
- 4) Control panel body

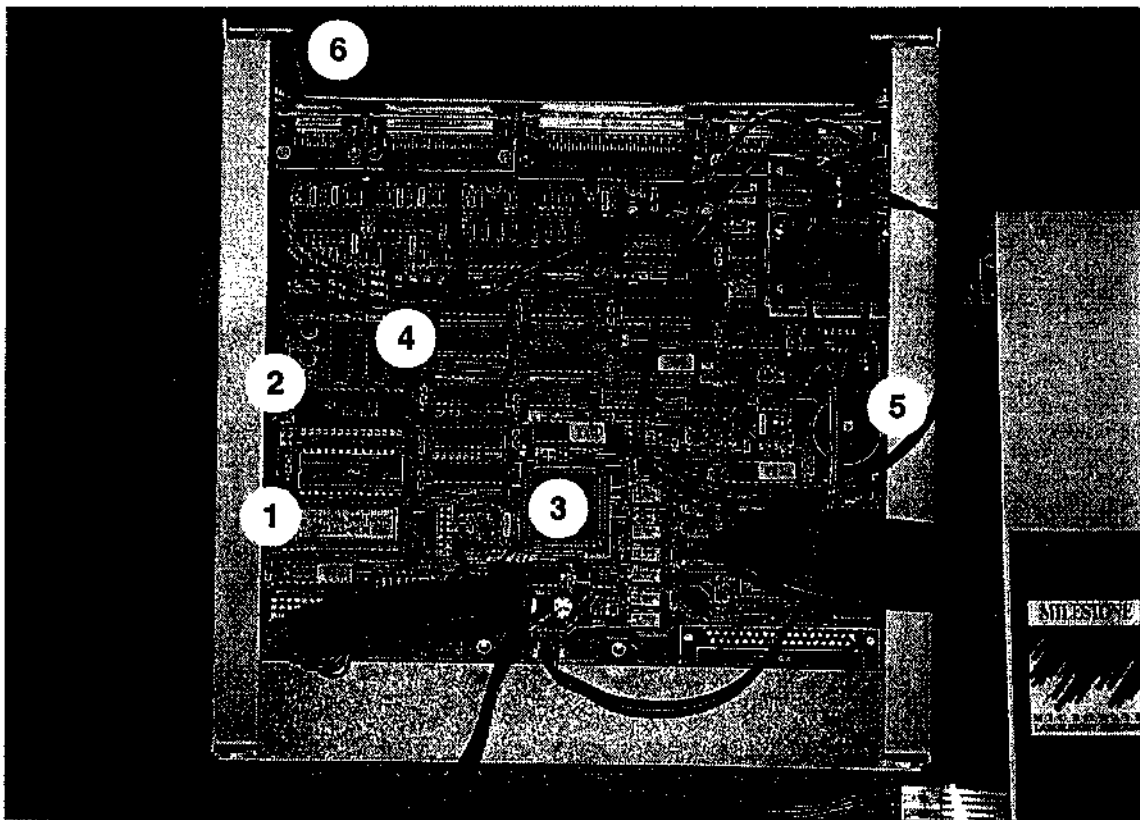


Picture 1: Control panel of MLS-1200 PYRO unit

Removal of the cabinet cover of the 240 Remote Control

- Disconnect the 50 pin connection between MLS 1200 PYRO and 240 Remote Control.
- Remove the polypropylene fixing screw located on the leftside of the Remote Control.
- Unscrew the 2 screws located on the front and the 4 screws located on the rear side of the 240 Remote Control.
- Remove the cover by raising the front and pushing towards to the back.

- 1) Eprom
- 2) Ram
- 3) Microprocessor
- 4) Back-up Battery
- 5) Buzzer
- 6) Contrast Regulation by potentiometer

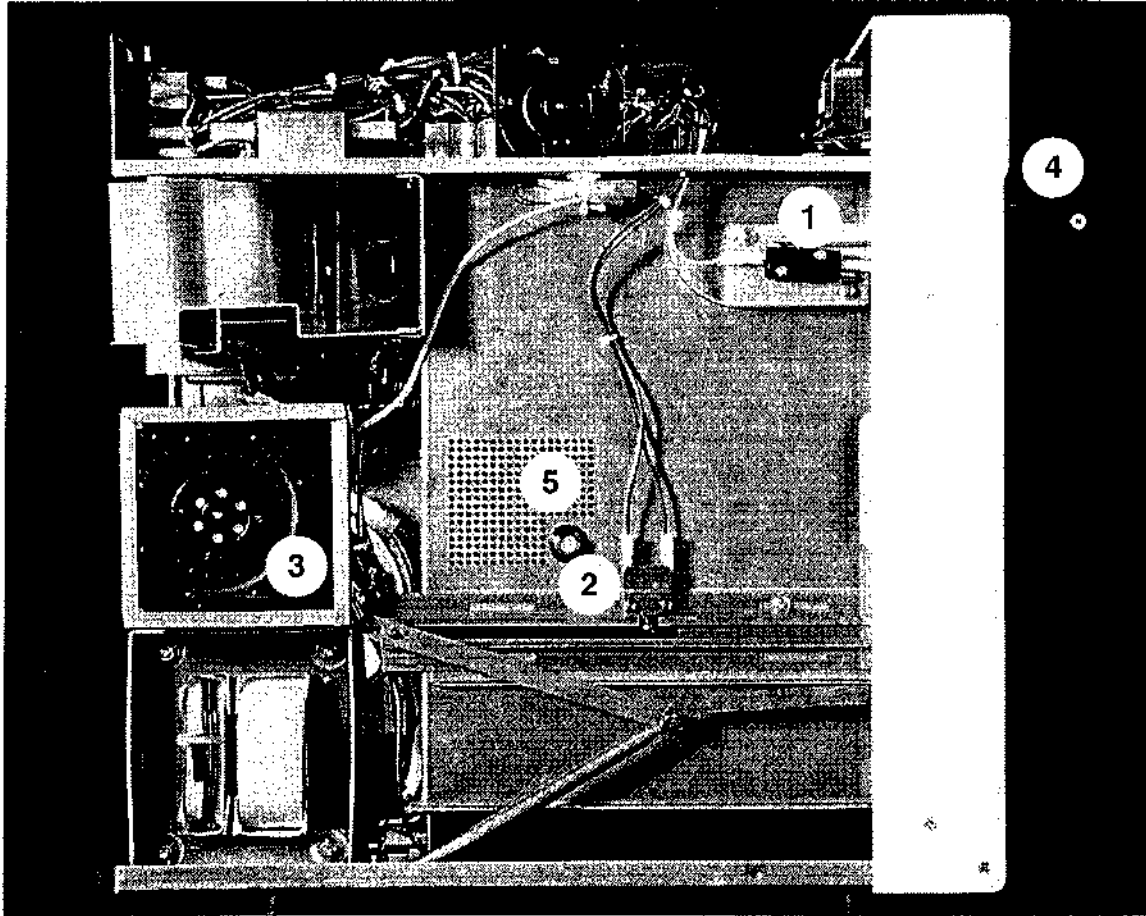


Picture 2

Note: ✓

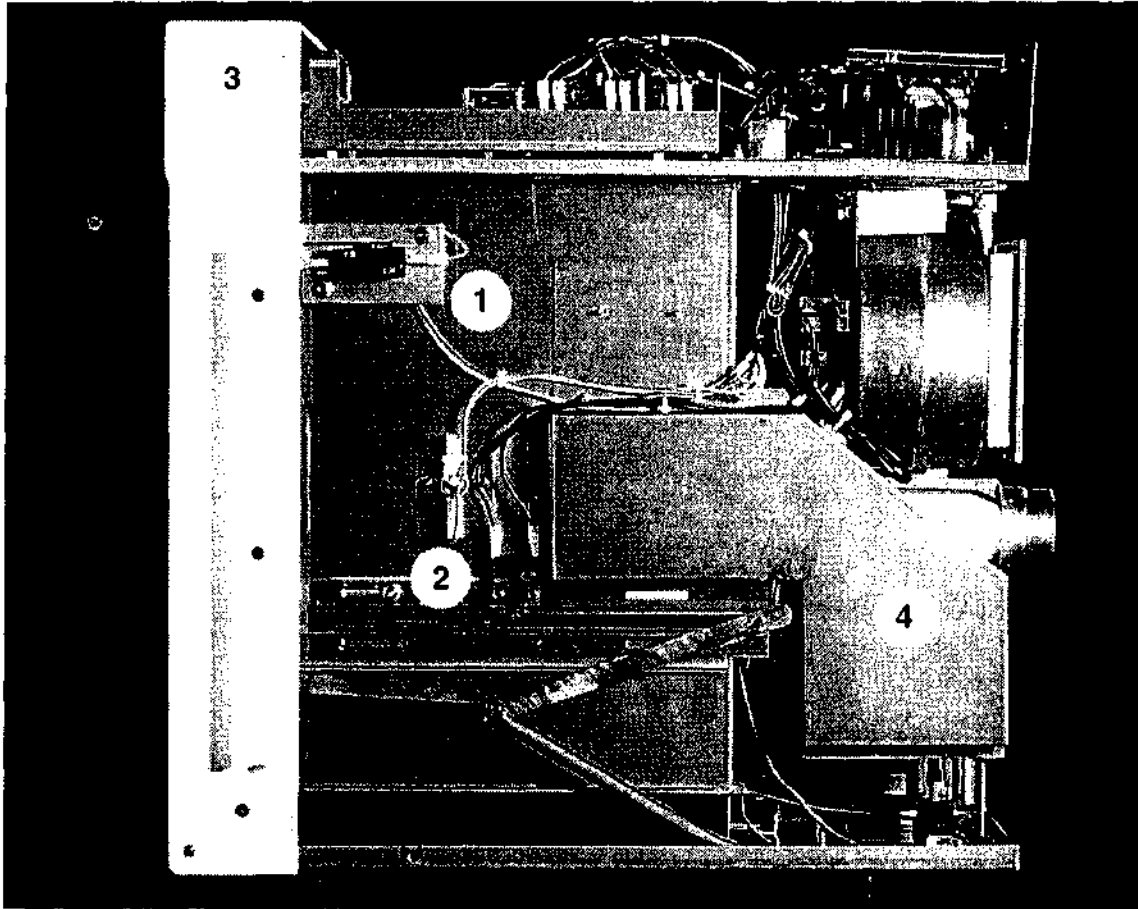
The C.P.U. Board is located inside the Remote Control 240

- 1) Left safety switch (is activated by lowering the door-handle)
- 2) Left safety switch (is activated by opening the door)
- 3) Fan cooling for high voltage circuit
- 4) Door handle for opening/closing
- 5) Hole for quartz tube introduction (only for Pyro Sulphate Ashing system with SAM35)



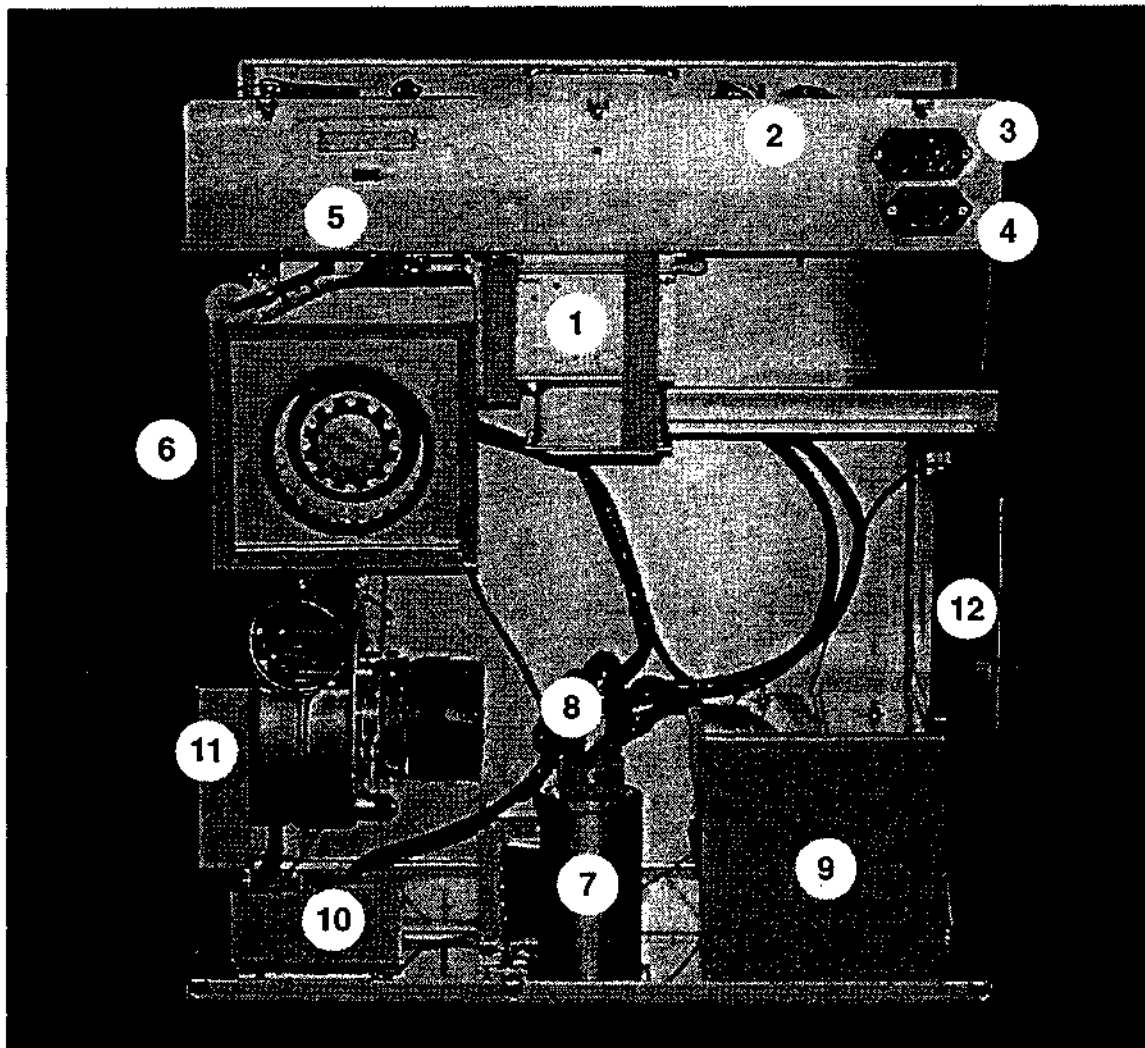
Picture 3: Left-side view of MLS-1200-PYRO

- 1) Right safety switch (is activated by lowering the door-handle)
- 2) Right safety switch (is activated by opening the door)
- 3) Front panel (with acid resistant coating)
- 4) Fan-exhaust system



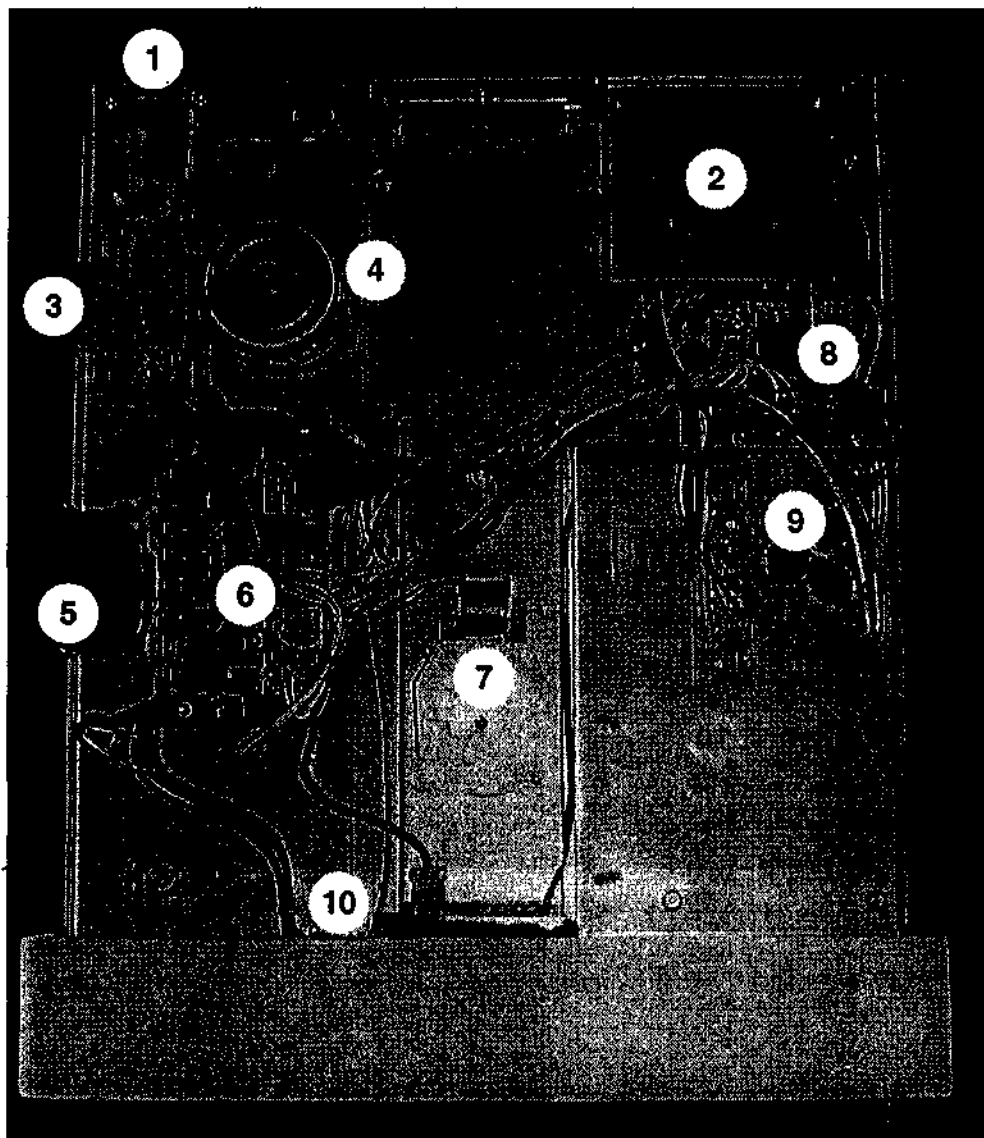
Picture 4: Right-side view of MLS-1200 PYRO

- 1) Magnetron
- 2) Safety switch
- 3) 220V line inlet and 16A/T fuse
- 4) Electrical connection to external modules (options)
- 5) 50 pin connection for 240 Remote Control
- 6) Magnetron fan
- 7) High voltage capacitor
- 8) Heating transformer
- 9) High voltage transformer
- 10) High voltage diode
- 11) Exhaust motor
- 12) Cooling Fan For HV traFo



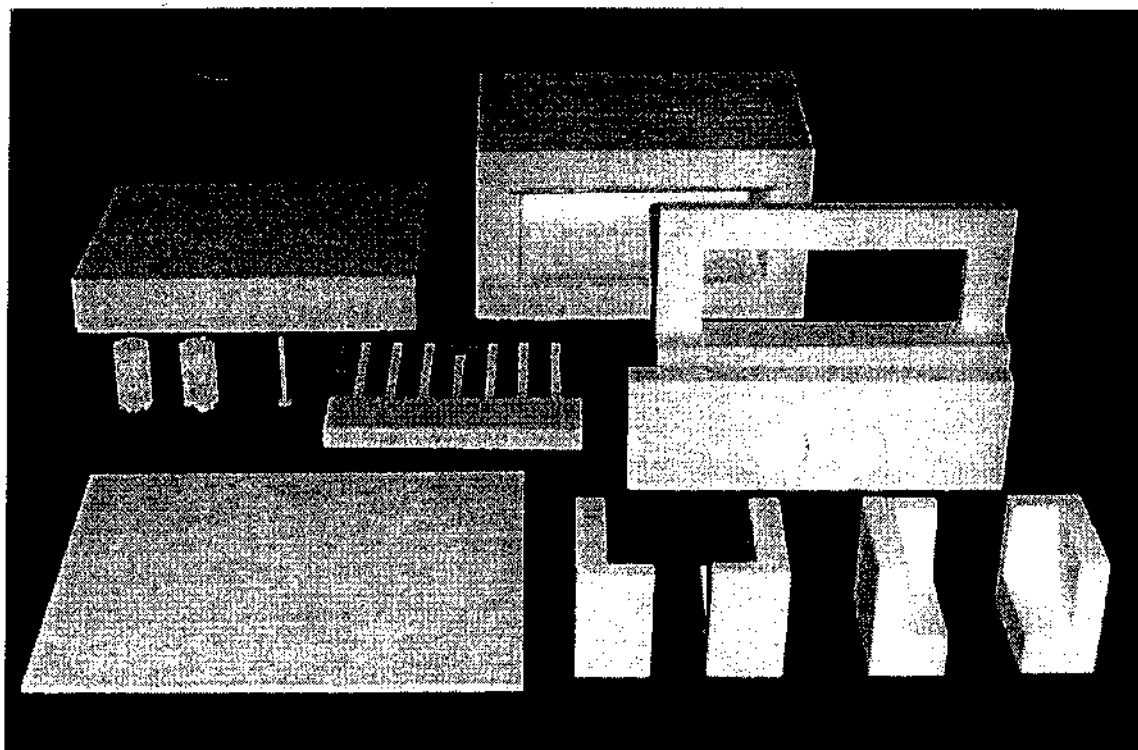
Picture 5: Back-view of MLS-1200 - PYRO

- 1) Power supply 220V and 16A/T fuse
- 2) Interface board for 240 Remote Control
- 3) Radiofrequency filter RLC
- 4) Toroidal transformer
- 5) Cooling fan
- 6) Relays board
- 7) Microwave diffuser motor
- 8) Power board for Magnetron
- 9) Power supply board
- 10) ATC-300 Electronic board and Display



Picture 6: Over-view of MLS-1200 PYRO

Picture 7 below, shows all the parts included in the complete muffler kit p/n 50075.



Picture 7

You can easily recognize all the items with their exact part number in the Figure 1 next page.

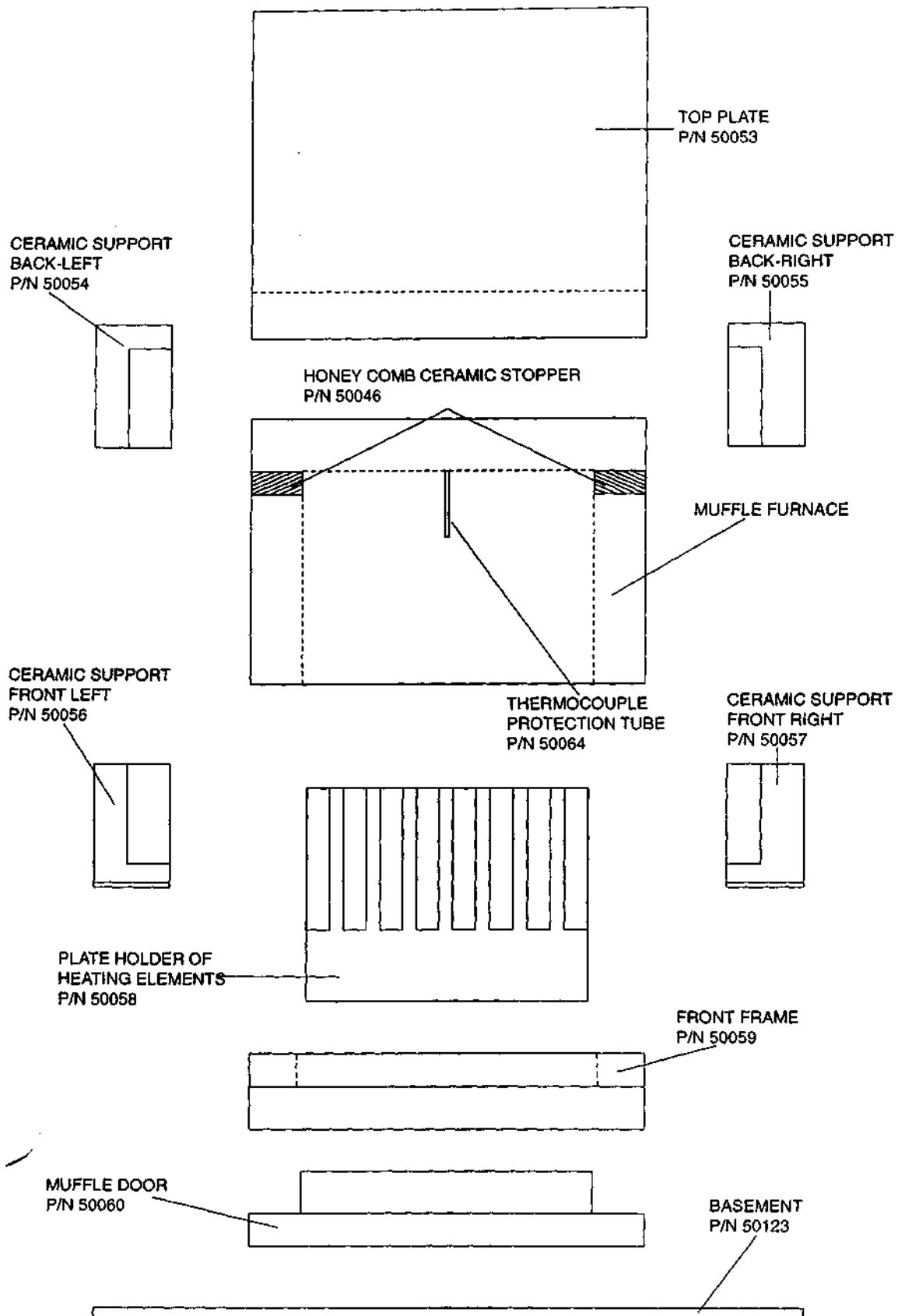
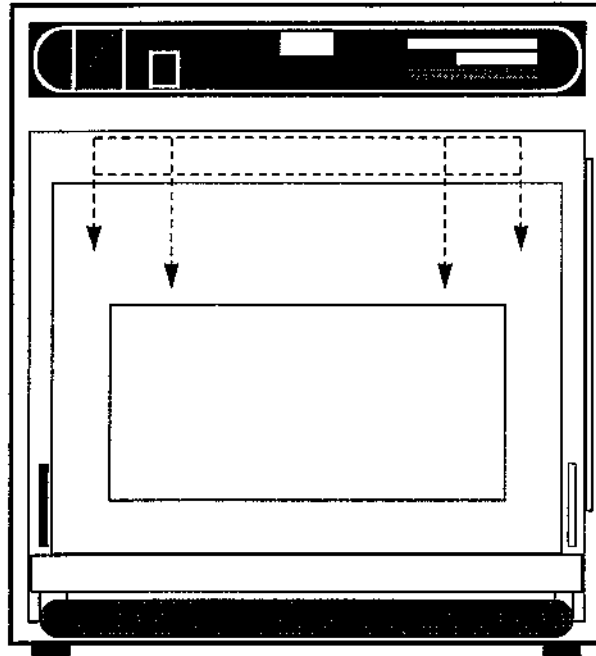


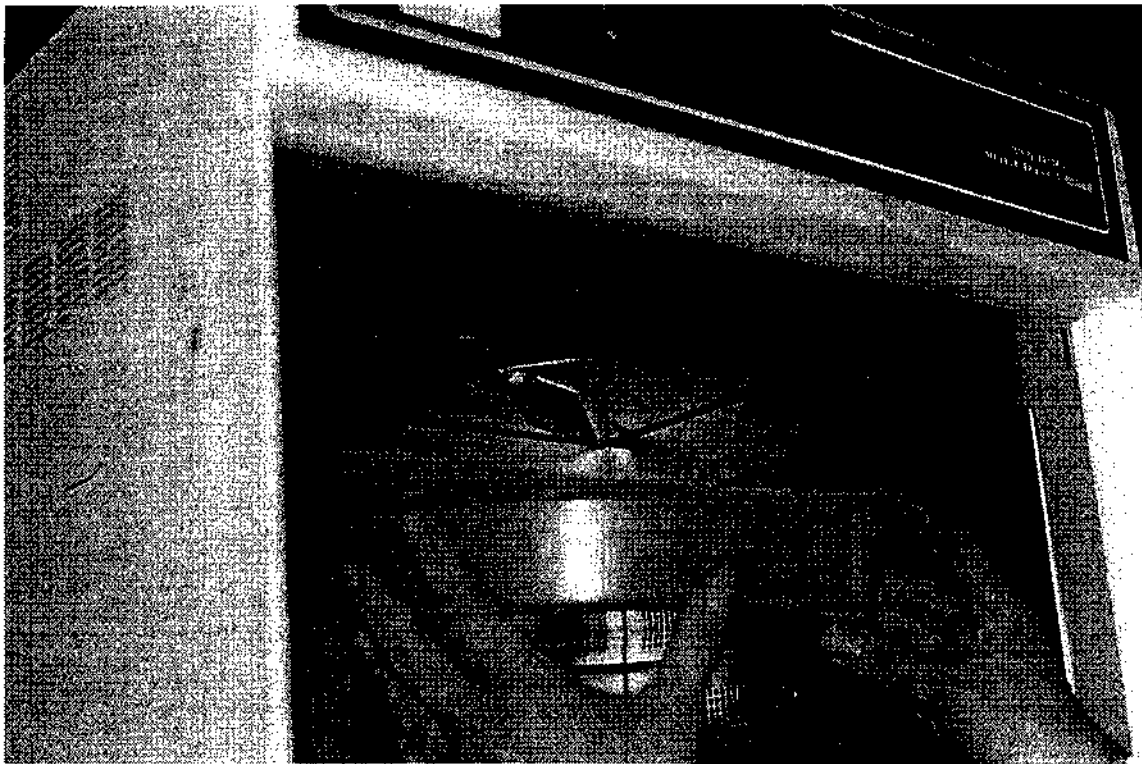
Figure 1 = Top view of the complete muffle kit. (p/n 50075)

WARNING

***BEFORE USING REMOVE THE PLASTIC DISC PLACED ON THE
CEILING OF THE WORKING CHAMBER TO PROTECT THE
MICROWAVE DIFFUSER DURING THE TRANSPORT***



Picture 8 below, shows how to proceed to this operation



Picture 8

6.1 HOW TO INSTALL MUFFLE KIT P/N 50075 INSIDE MLS-1200 PYRO UNIT

1. Position the bottom plate P/N 50123 inside the PYRO working chamber (Figure 1)
2. Position the 4 ceramic supports P/N 50054 - 50055 - 50056 and 50057 at the four corners of the working chamber (Figure 1).

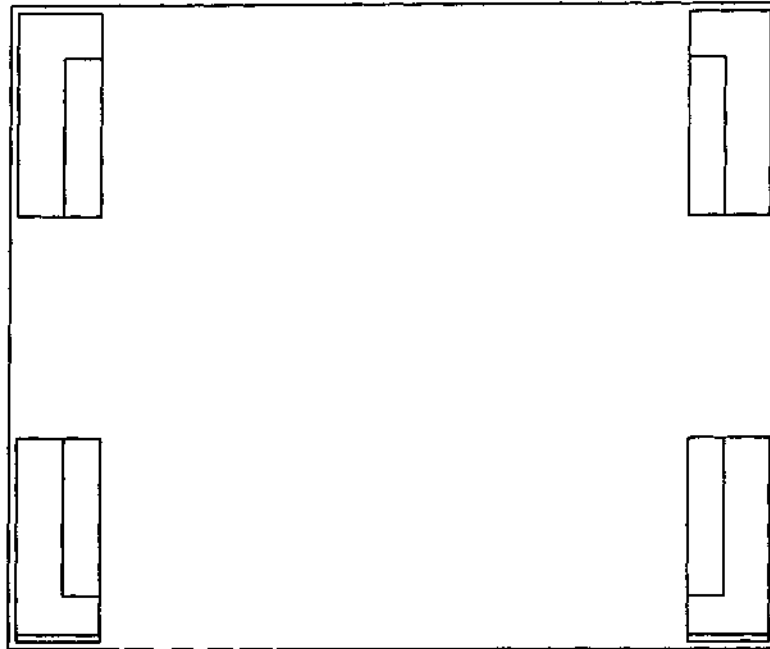


Figure 1

3. Place the muffle P/N 50005 on the 4 ceramic supports carefully introducing at the same time the thermocouple through the hole in the backwall of the muffle itself (Figure 2)
4. Cover the end of the thermocouple placed inside the muffle with the ceramic protection tube P/N 50064 (Figure 2).

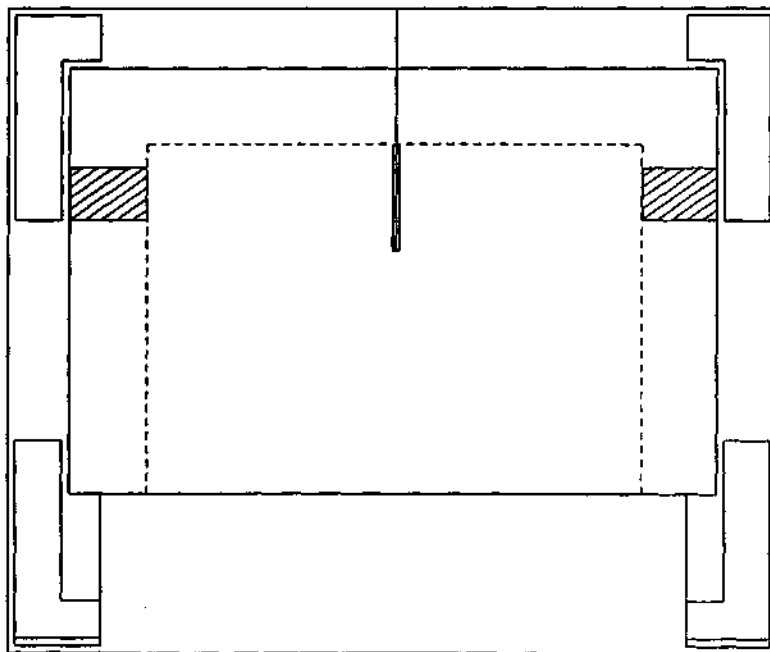


Figure 2

5. Introduce the plate P/N 50058 inside the muffle with heating elements turned to the rear side of the muffle in close contact with the thermocouple (Figure 3)
6. Place the front frame P/N 50059 on the front ceramic supports to perfectly position the muffle (Figure 3).

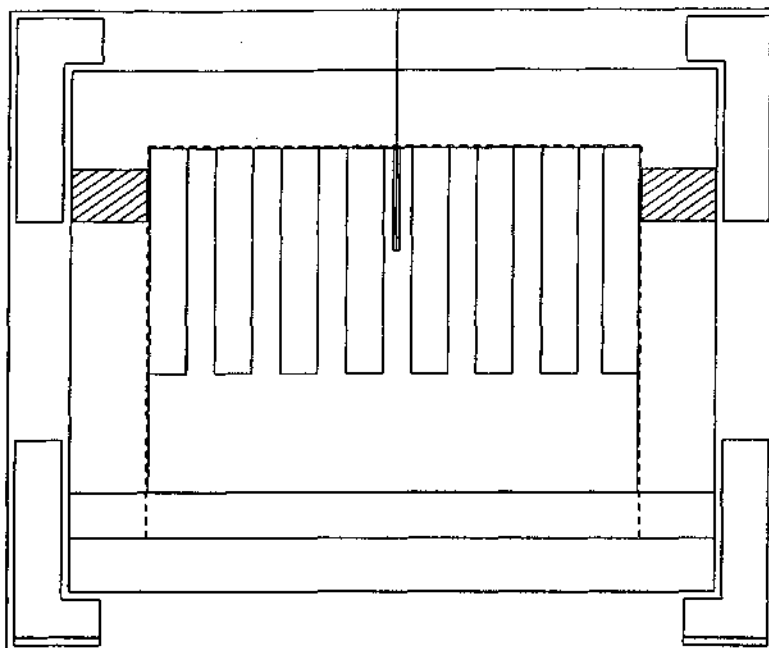


Figure 3

7. Place on top the ceiling P/N 50053 to cover the muffle and the front frame (Figure 4).

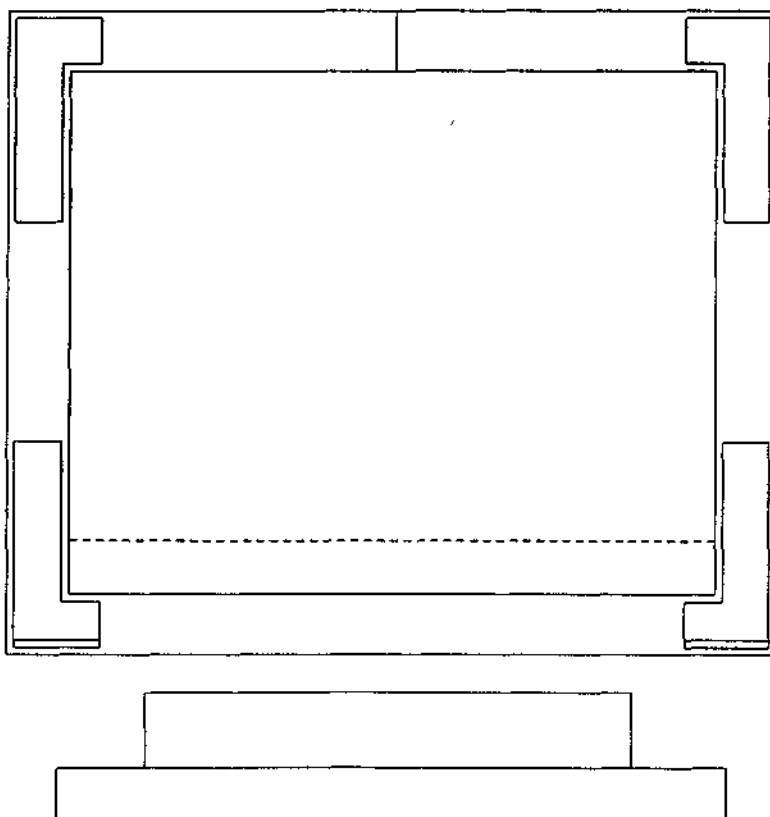


Figure 4

8. Close the muffle access inside the muffle using the door P/N 50060 (Figure 4)

7 HOW TO ADJUST THE TEMPERATURE VALUE

When the temperature value (T2) reading on the display of the MEGA 240 Control Terminal does not match with the actual temperature reading on the display in front of the MLS-1200 PYRO unit, new calibration of the system is required. This procedure has to be followed also in case of replacement of some active parts of temperature measurement or control, e.g.:

- K Thermocouple
- ATC-300-S
- Interface board
- CPU board

How to proceed:

1. Open the M240 terminal control by removing the 6 screws (2 in front and 4 behind).
2. Remove the M240 top panel (the one with the display) and lay it beside the base panel (which contains the CPU) without removing the connections between the two parts. (See Figure 1).

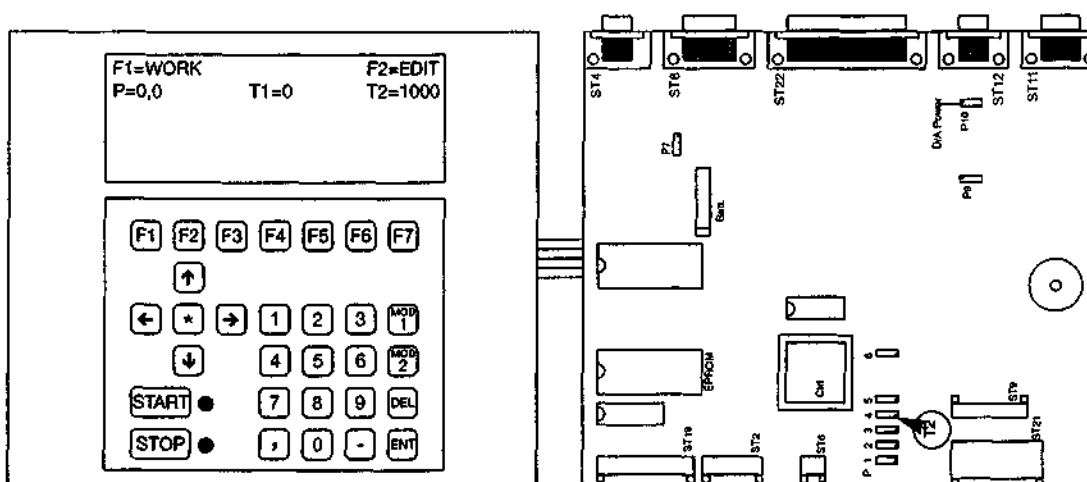


Figure 1: M240 open view

In this way, it is possible to calibrate the CPU (T2 potentiometer) and read the values on the display

3. Install the following microwave program:

Time = 1 h
 Power = 1000W
 T2 = 1000°C

4. Read the temperature value on the red display located on the front frame of the Pyro (see Figure 2)

Read the correct value of T2 on the red display

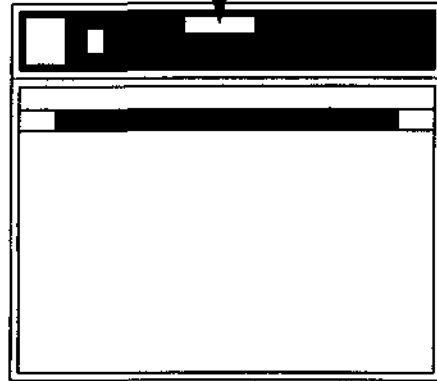


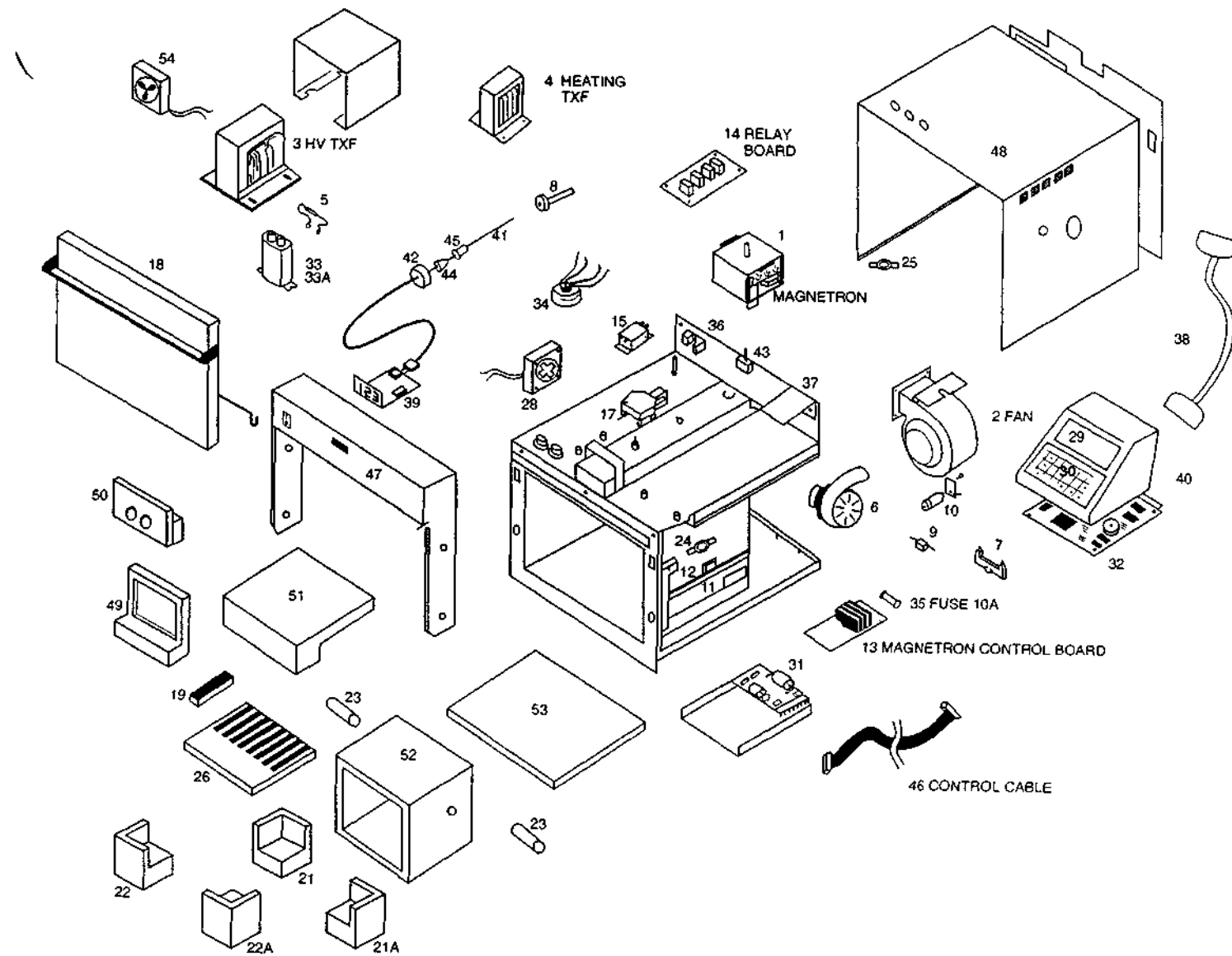
Figure 2

5. By means of a screwdriver, regulate the 10 Kohm potentiometer (T2) on the CPU board (see Figure 1). Adjust the potentiometer (T2) until the remote control display value T2 corresponds to the front frame LED Display of the MLS-1200 Pyro.
6. Start the microwave program installed in point N. 3
7. Repeat the operations in points N. 4 and 5 at approximately every 100°C until reaching 1000°C.

P.S. The difference allowed at 1000°C between the real value on the red display and that read on the M240 is 1-2°C.



Figure 2: MLS 1200 PYRO exploded view



Reference Number	Part Number	Description
1	33040	Magnetron
2	33042	Magnetron fan
3	33044	High voltage transformer
4	33046	Heating transformer
5	33048	High voltage resistance 4MOhm 2W
6	50045	Exhaust motor
7	33054	High voltage diode SCL 11 Z 2B5
8	50064	Ceramic tube for thermocouple
9	33058	Resistance 10Ohm
10	33060	Capacitor for Magnetron fan
11	33062	Safety microswitch on right/left door
12	33064	Door microswitch on right/left door
13	33066	Magnetron control board
14	33068	Relay board
15	33100	Line filter 20A/220V
16	33072	Diffuser axle 75mm in PTFE
17	33074	Diffuser motor MW-220W
18	33077	Complete door (working chamber)
19	33965	Heating elements
20	33080	Microwave diffuser
21	50054	Back-left ceramic support of muffle
21A	50055	Back-right ceramic support of muffle
22	50056	Front-left ceramic support of muffle
22A	50057	Front-right ceramic support of muffle
23	50046	Boat stop (ceramic stopper)
24	33086	Thermic switch of ceiling of the microwave chamber
25	33086	Thermic switch of magnetron
26	50058	Support for heating elements
27	33090	Rubber feet
28	33304	Fan 220V, 50/60Hz
29	33258	LCD Display for 240 Remote Control
30	33259	Flat keyboard for 240 Remote Control
31	33716	Power supply 12V/5V/24V
32	33930	Complete CPU Board for 240 Remote Control
33	33053	Capacitor 1,14uF (50Hz)
33A	33051	Capacitor 1uF (60Hz)
34	33319	Toroidal transformer
35	33300	10A fuse for magnetron control board
36	33301	16A fuse (line fuse)
37	33727	Interface board complete with 50 pin Cable for 240 Remote Control
38	33916	50 pin cable for 240 Remote Control
39	33726	ATC-300-S Electronic board + Display
40	33930	Remote Control for Mega 240 (CPU included)
41	33973	Thermocouple Type K
42	33597	Fixing element for thermocouple (I)
43	33096	Safety switch 220V
44	33598	Fixing element for thermocouple (II)
45	33599	Fixing element for thermocouple (III)
46	33316	Cable between interface board and relay board
47	33221	Frontal frame for MLS 1200 PYRO
48	30333	Complete chassis cover for MLS 1200 PYRO
49	50059	Front frame of muffle
50	50060	Muffle door
51	50053	Ceiling of muffle
52	50005	Muffle
53	50123	Bottom Plate of muffle
54	50045	Cooling Fan For HV traFo

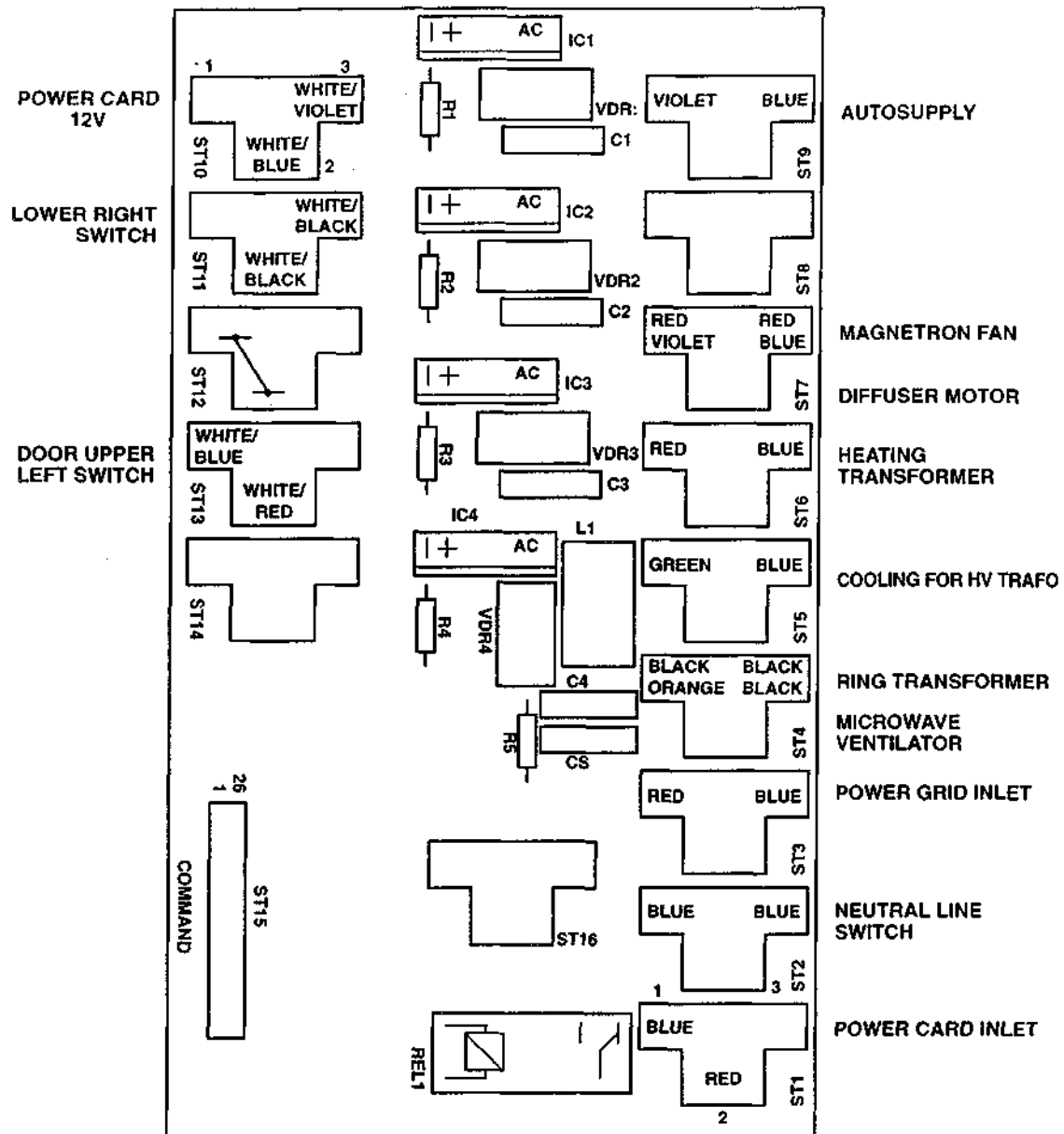


Figure 3: Relays card, side-view of components

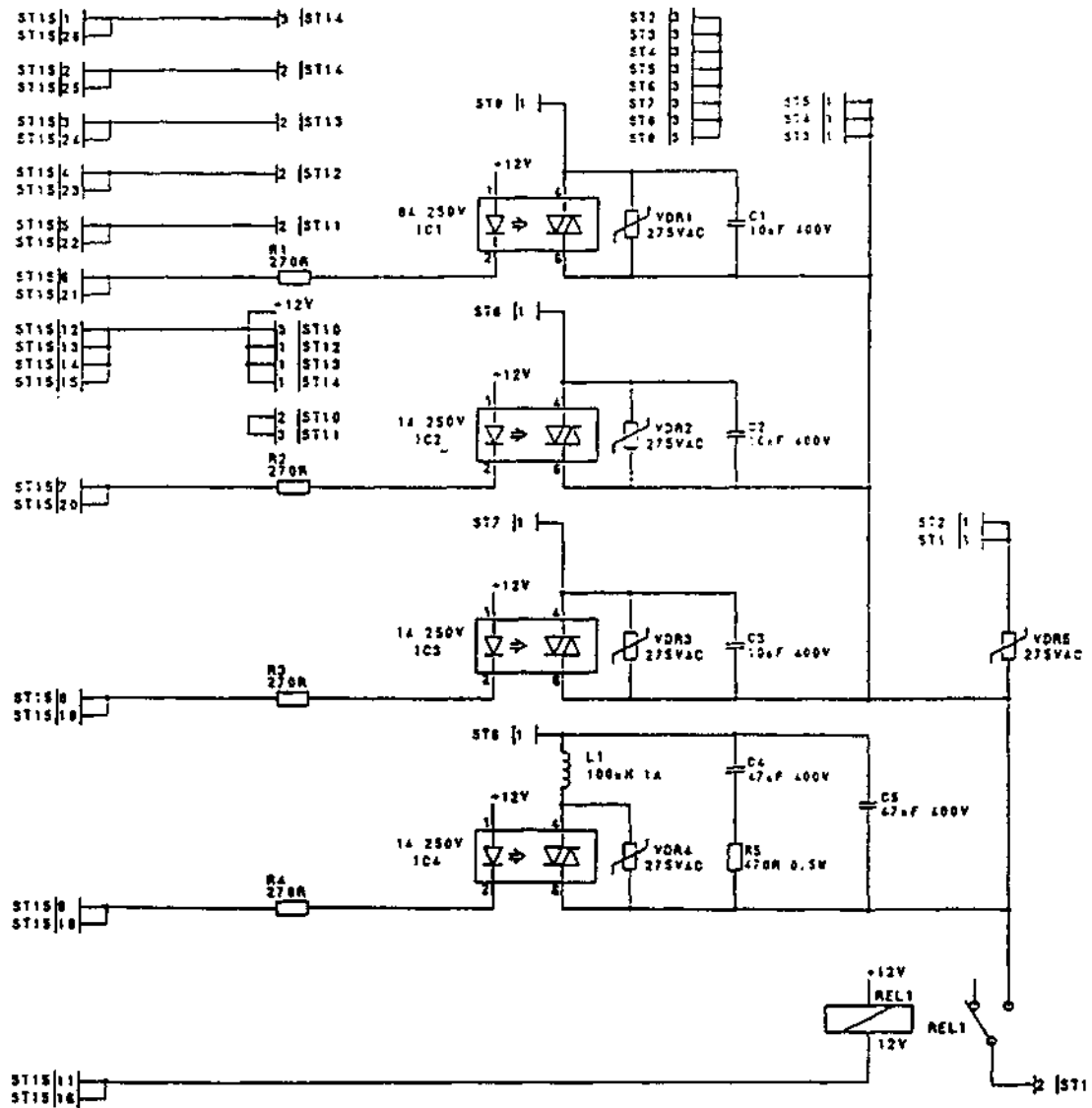


Figure 4: Electric diagram of relays card

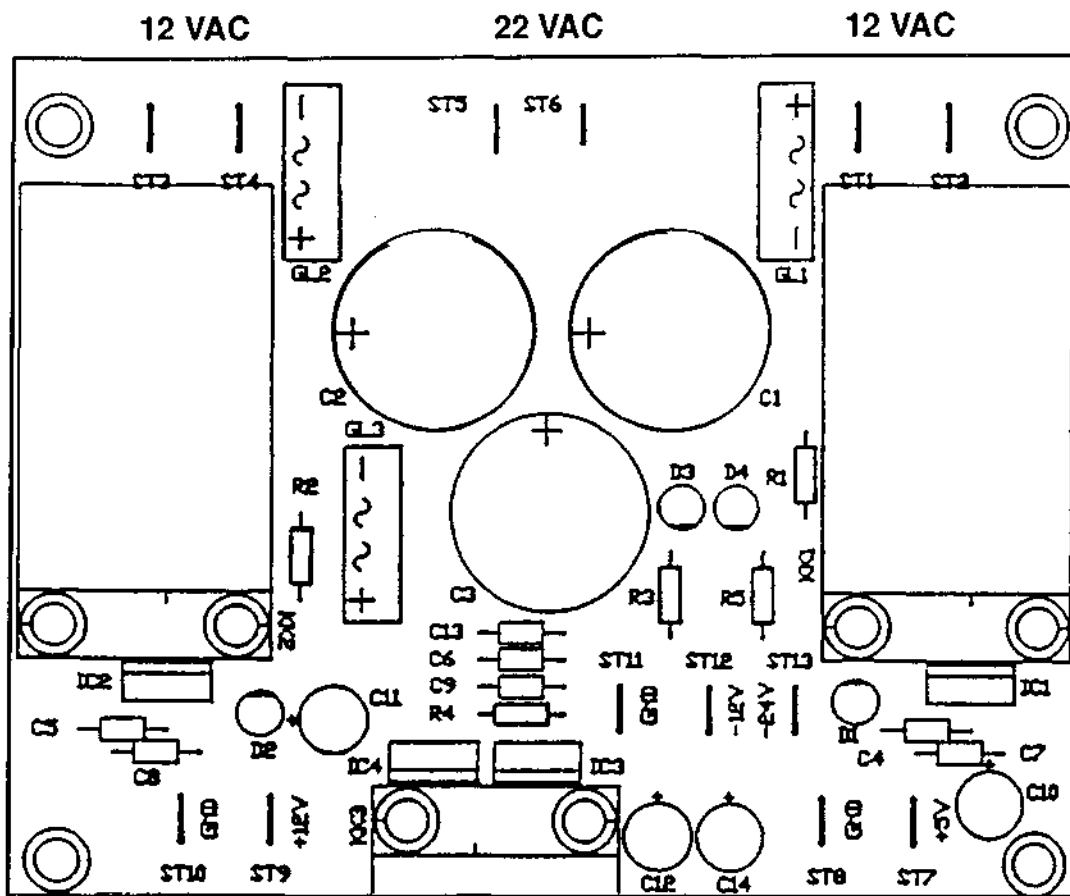


Figure 5: Power supply, side-view of components

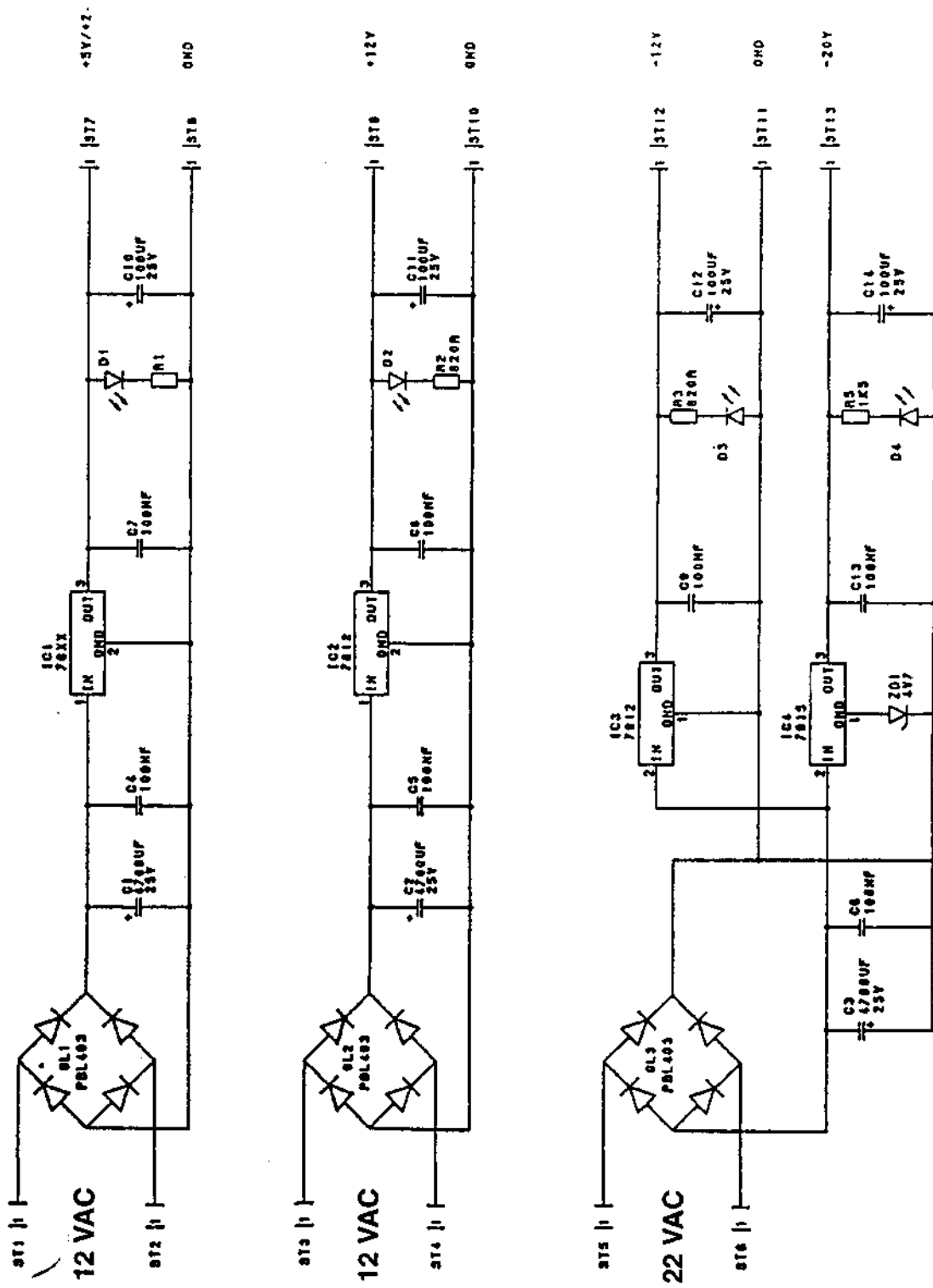


Figure 6: Electric diagram of power supply

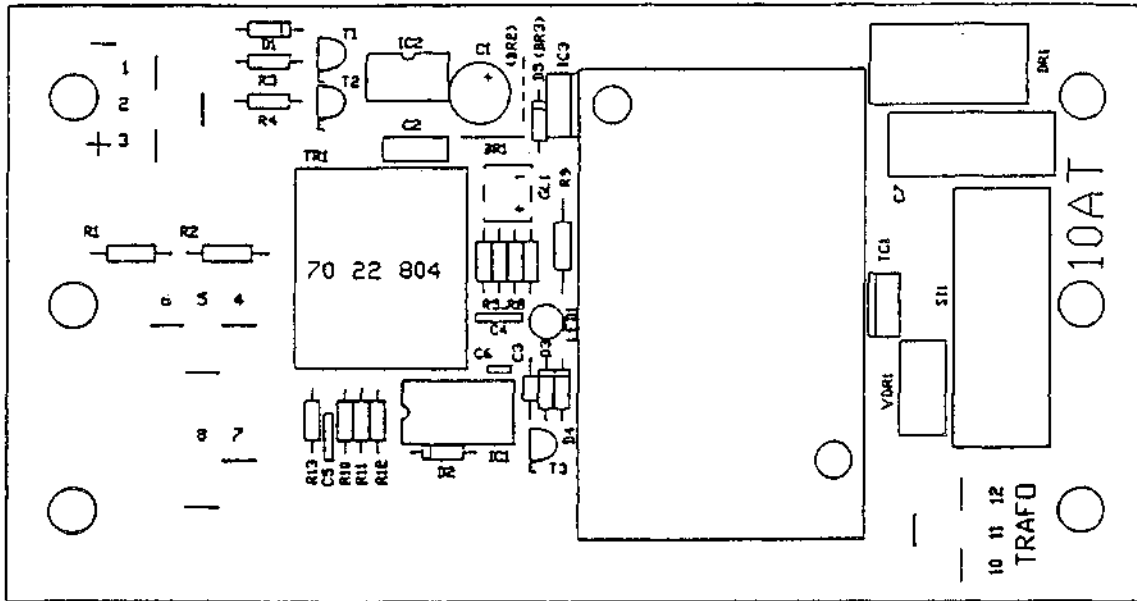
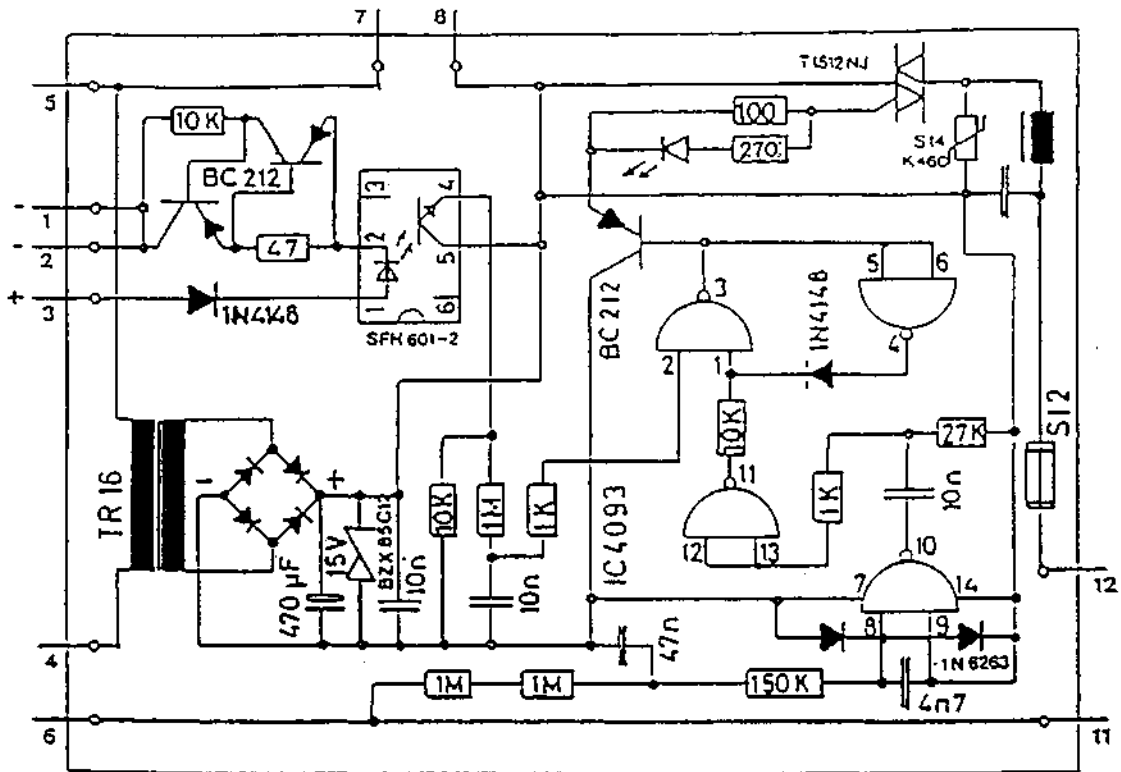


Figure7: Power board, side-view of components



12 V Command Inlet "+ -"

1 - ST10/Relays board

2 connected with 1

3 ÷ ST10/Relays board

220 V "INLET"

4 ST1

6

5 ST1

220 V "DOOR SWITCH"

7 door switch

8 door switch

9 not used

220 V Exit "Trafo"

10 not used

11 N High voltage transformer (not used)

12 L1 High voltage transformer

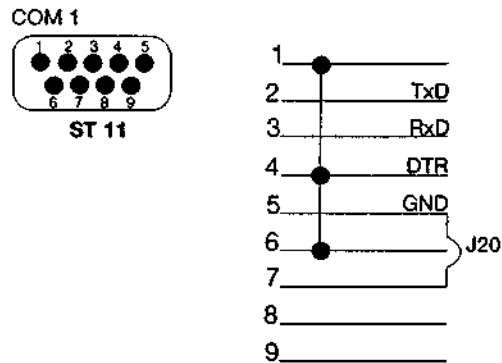
Figure 8: Electric diagram of Power board

Interface Connections on 240 Remote Control

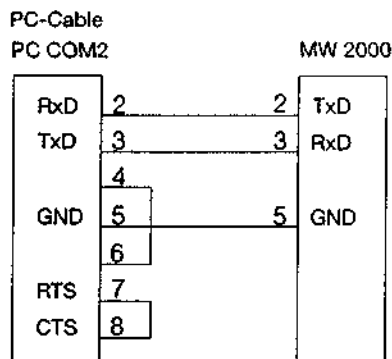


Backview

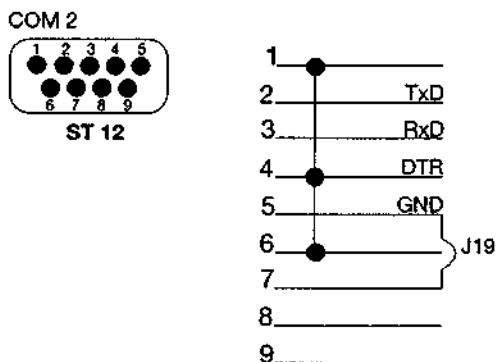
PC-Connection RS 232/COM1



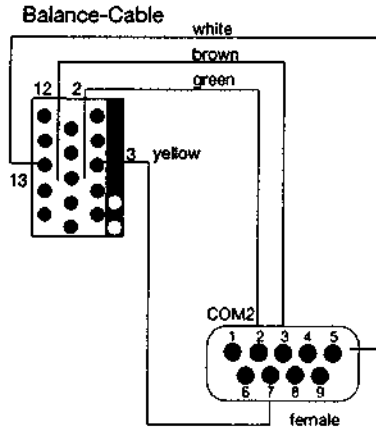
PC-Connection



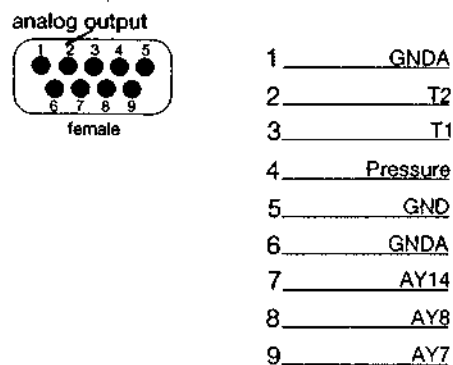
Balance-Connection RS 232/COM2



Balance-Connection



Analog - output - Connection



GNDA analog ground
GND digital ground

T2 = external temperature: 1°C = 8mV

T2 = external temperature control calibration

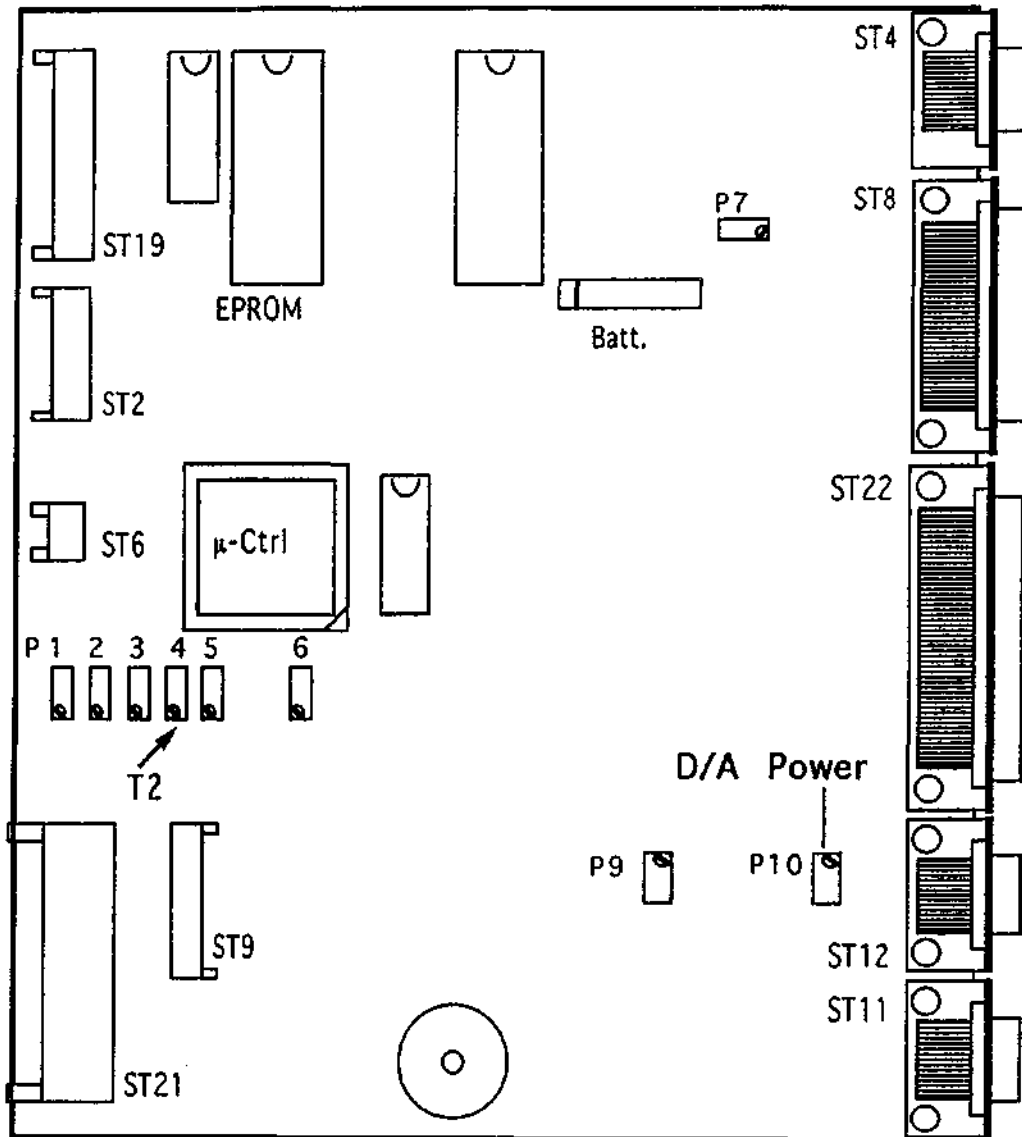


Figure 9: CPU card, top view of the main components

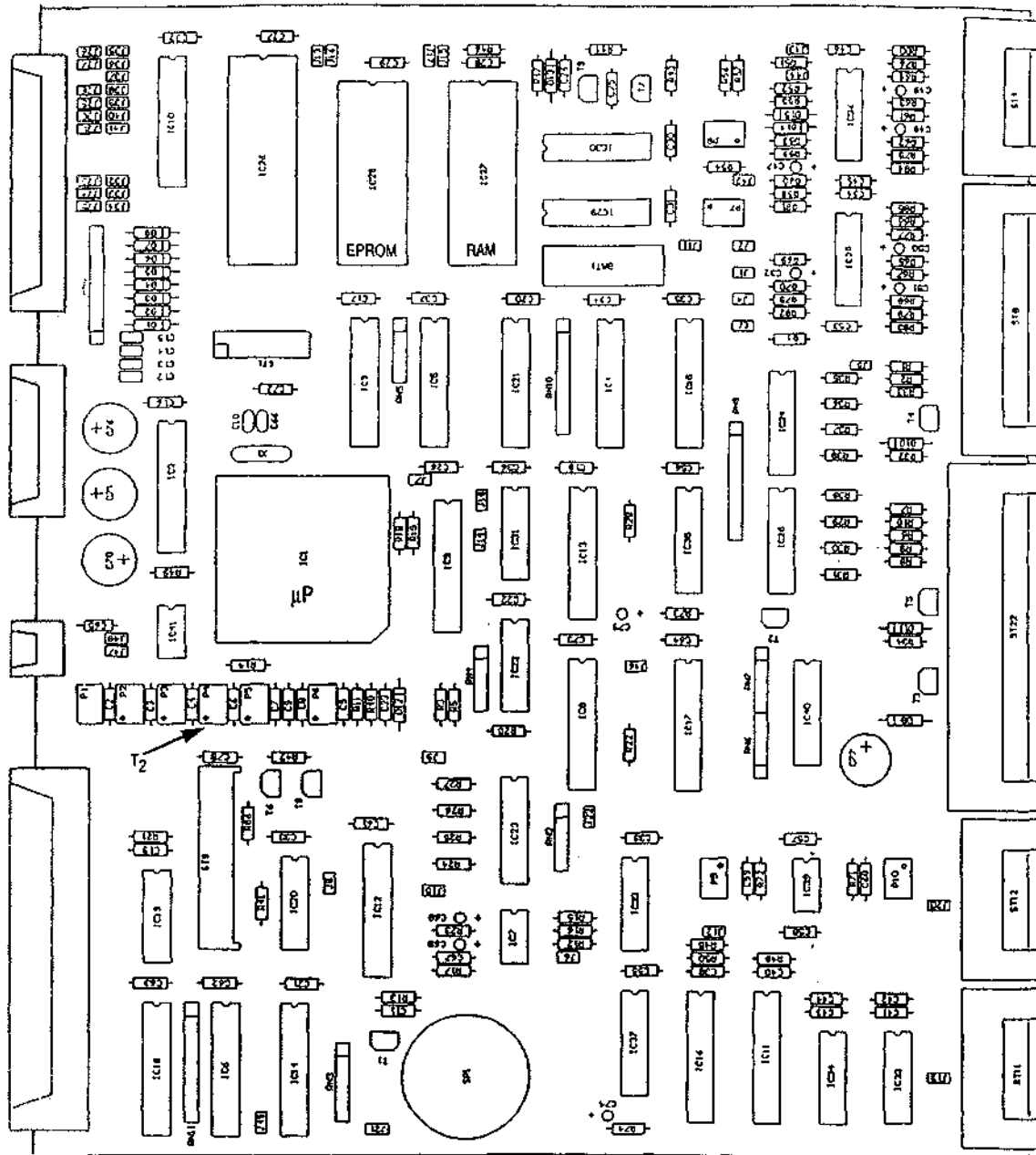


Figure 10: CPU card, top view of the components

9 ERROR MESSAGES

In case the operator has any difficulties with the control terminal, e.g. is in a sub-menu and does not know how to come out of it, the basic rule is to push the STOP key to go back to the Main Menu. Switching ON/OFF the unit will cause resetting and going back to Main menu. Work programs remain unaltered.

This chapter will list the most common error messages

1) "DOOR NOT CLOSED"

As an added safety the magnetrons are provided with overheating thermal safety switch. In the remote event of thermal overheating, the following will appear:

>DOOR NOT CLOSED<
=====

CONTINUE = CLOSE DOOR
ABORT=STOP

If this error message is not due to the door, interrupt the program and check if for example the cavity is empty. After cooling the unit can be again operated regularly.

2) "FATAL ERROR: RAM"

The unit is provided with a Lithium battery to save the storage in memory of working programs. If the following message appears:

FATAL ERROR: RAM
check ram or battery

It is supposed that the battery is exhausted and the operator has to call for immediate service. Otherwise there may be modifications in the stored programs when the power is off. The unit itself for the rest is ready for use. After the error message, press the STOP key and under EDIT O delete all programs (KILL ALL PROGRAMS) and set a new one.

In case the unit is newly installed, or the **EPROM** memory has been replaced, keep the STOP key pressed until you hear a whistle, which informs that the unit is initialized.

9.1 HOW TO CONTROL THE RAM BATTERY'S CHARGE

You can check RAM - battery - buffer when power-off the system and measure the voltage between the RAM-PINS (GND-VCC)

Proceed as follow:

- Detect (with diagram in Figure 1) the position of RAM and battery in the CPU board.

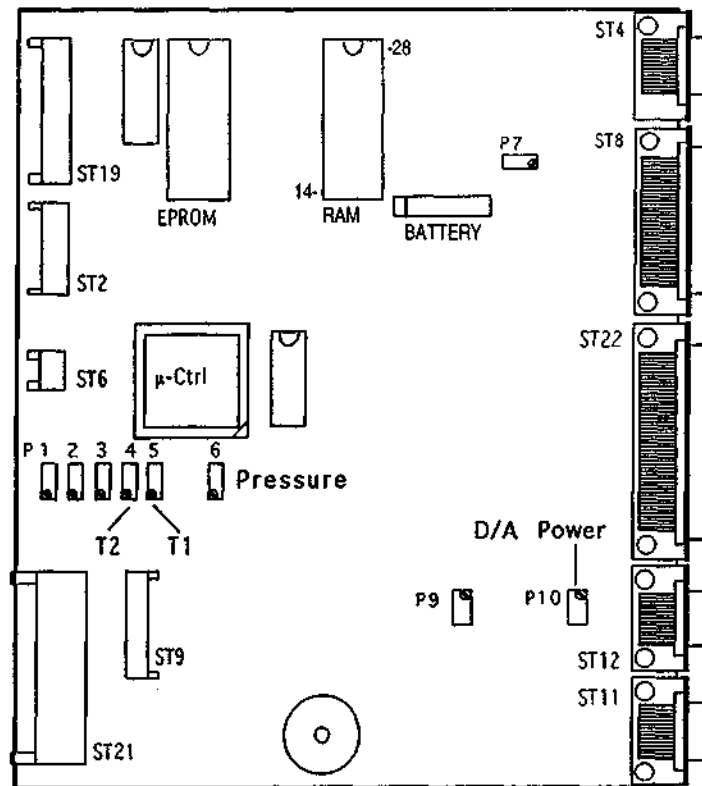


Figure 1 = CPU card, top view of the main components

- Take a multimeter and select VDC (V-)
- Measure the voltage as shown in Figure 2

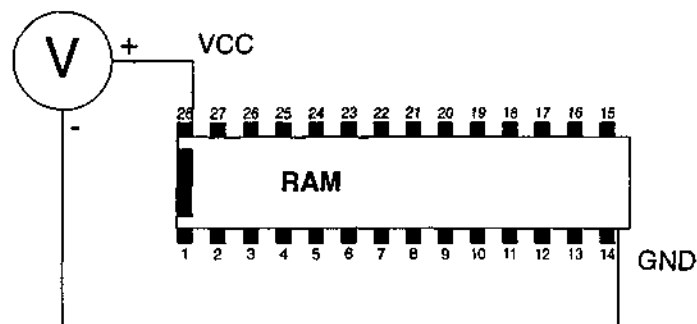
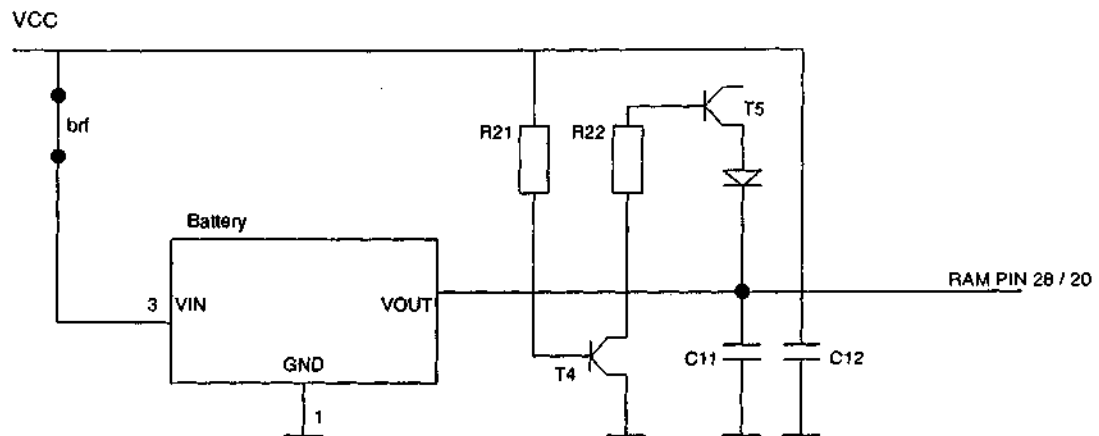


Figure 2

RAM Pin Table

Pin No	Name	
14	GND	Ground
28	VCC	5V buffer voltage off the RAM
20	CS	Chip Select 5V

When you can't measure 5V between Pin 14 and Pin 28 check in the CPU board the battery-buffer circuit below:



If the voltage measured is lower than 2.5V, replacement of the battery is needed

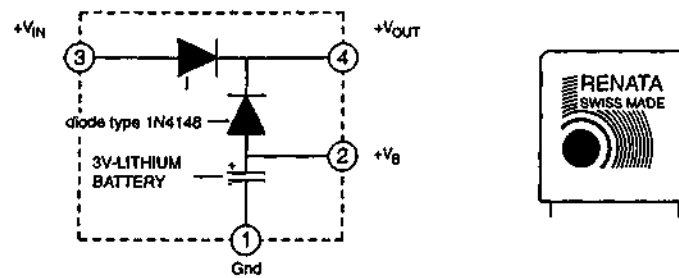


Figure 2: Schematic of lithium battery

10 TROUBLESHOOTING LIST

PROBLEM	DIAGNOSIS
<ul style="list-style-type: none"> - Difficulties in switching on the M240 Control Terminal: display dark or fully lightened or crossed by vertical and horizontal lines. 	<ul style="list-style-type: none"> A) Check perfect connection of 50 pins cable between PYRO and M240 Control Terminal. B) Repeat switching on of the unit by MAIN SWITCH placed on the front frame of the PYRO. C) Open the M240 Control Terminal and check all connections between CPU, power supply and display. D) If after these checks A, B and C the problem still remains, replace in sequence: <ul style="list-style-type: none"> - Interface board - 50 pins connection cable - CPU board - Display board
<ul style="list-style-type: none"> - Some keys on the M240 keyboard do not allow data input into the program. 	<ul style="list-style-type: none"> A) Open the M240 Control Terminal and check the connection between the keyboard and CPU B) Replace EPROM C) Re-initialize the EPROM by switching on the MAIN SWITCH and simultaneously push the STOP key on the M240 keyboard
<ul style="list-style-type: none"> - Independent block of working program with return to the main menu. - The working program presents parameters that are not set by the operator. - Difficulty in breaking the working program. - Autostart of a working program. 	<ul style="list-style-type: none"> A) Replace the EPROM. B) Initialize the new EPROM (push simultaneously MAIN SWITCH and STOP TASTE on M240 Control Terminal). C) Replace the CPU board.
<ul style="list-style-type: none"> - Microwave emission is not controlled when preset temperature value (T2) is reached. - The T2 value on the display of M240 Control Terminal does not correspond to the actual reading on the red display placed on the PYRO front frame. 	<ul style="list-style-type: none"> A) Check the 50 pins connecting cable: <ul style="list-style-type: none"> - some pins may be bent or broken - some cables of the 50 pin connector (male or female) may be unsoldered or detached or interrupted. - connection between PYRO unit (interface board) and M240 Control Terminal may be loose: carefully fasten the screws in the connecting plugs. B) Check any short circuit on the interface board. C) Adjust the potentiometer T2 on the CPU board (see chapter 7).

PROBLEM	DIAGNOSIS
The red display on the front frame of the unit shows absurd values e.g. 1 or 1323	<p>A) If the display shows figure 1:</p> <ul style="list-style-type: none"> - replace the ATC-300-S card (see paragraph 5.12). <p>B) If the display shows ± 1323:</p> <ul style="list-style-type: none"> - check connection between the thermocouple and the ATC-300-S card. - replace the thermocouple.
The unit doesn't switch on	<ul style="list-style-type: none"> - Fuse 16AT-250V power mains grid; - Front Switch; - RLC Filter - Safety switch on the cover
There is no microwave emission	<ul style="list-style-type: none"> - Magnetron; - Heating transformer; - Right and left door-slide switches; - Right door-handle switch; - Fuse 10AT-250V on power board; - The magnetron fan is malfunctioning which causes magnetron overheating and activation of the temperature sensor located on magnetron.
After 5 second magnetron heating time the program doesn't start and the display shows "DOOR NOT CLOSED"	<ul style="list-style-type: none"> - The door is not perfectly closed; - Left door-handle switch; - Exhaust fan is blocked (with consequent over-heating of the uW chamber therefore the temperature sensor intervenes). - The temperature sensor (klixon) is defected.

11 RECOMMENDED SPARE PARTS

P/N 33301	Fuse 16AT-250V
P/N 33300	Fuse 10AT-250V
P/N 33940	CPU Board Mega 240 (installed inside the Remote Control)

HIGH FREQUENCY LEAKAGE TEST (SEE PARAGRAPH 5.9)

P/N 33700	Leak tester microwave radiation measurement
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