ANTEC
LEYDEN

DECADE

Service manual

CE

DECLARATION OF CONFORMITY

We Antec Leyden B.V., Zoeterwoude, The Netherlands, declare that the product

Electrochemical Detector DECADE (part number 120.0035)

to which this declaration relates, is in conformity with the following directives:

Safety (73/23/EEC)

Safety requirements for laboratory equipment (Class I, Installation cat. II, Pollution degree 2)	IEC 1010-1

Immunity (89/336/EEC)

Electromagnetic immunity	IEC 801-2/3/4 & ENV 50140
Radio frequency current injection	ENV 50141 & IEC 1000-4-6
Voltage dips and interruptions	IEC 1000-4-11

Emissions (89/336/EEC)

Electromagnetic radiation	EN 55022, Class B (CISPR 22)

Attention

Use shielded cable(s) to connect all I/O's with other devices. Thoroughly connect the shielding to common. Antec Leyden will not accept any liability for damage, direct or indirect, caused by connecting this instrument to devices which do not meet relevant safety standards.

January 27, 2004

H.R. Louw,
Manager purchase & production

Important notice

This service manual is designed for use by qualified personnel who are experienced in servicing this type of equipment. Because of the possible hazards to an inexperienced person in servicing this product as well as the risk of damage to the product we strongly recommend that all servicing is performed by our field service representatives.
In addition to improve instrument performance changes have been made to the instrument by the manufacturer since this service manual was originally printed. Accordingly we make no representations or warranties either express of implied that the information contained in this service manual is complete or accurate. It is understood that the purchaser must assume all risk in the use of this manual for the purpose of performing service upon the instrument is covers. Components of this instrument which are considered user serviceable are discussed in the manual standard supplied with each instrument.
This instrument contains electrostatic sensitive parts. Always use proper protection against electrostatic discharges, especially when boards are removed and / or components such as integrated circuits, (MOS)FET opamps are handled.

Spare parts and service availability

Antec Leyden provides operational spare parts of the instrument and current accessories for a period of five years after shipment of the final production run of the instrument. Spare parts will be available after this five years period on an ‘as available’ basis.
Antec Leyden provides a variety of services to support her customers after warranty expiration. Repair service can be provided on a time and material basis. Technical support and training can be provided by qualified service personnel on both contractual or as-needed basis.

General safety reminders

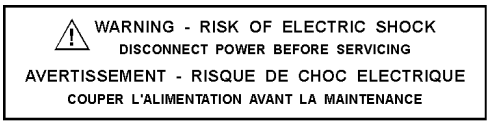
The following pages summarise cautionary information basic to the safe operation of this instrument. **It is strongly recommended that the user reads the safety practises as they are posted for his safety!** Always take extra care of your test equipment. Be sure to use the right equipment for the right job. Measuring high voltages requires a well insulated high voltage probe.
Damaged probes and cables are dangerous and should be replaced. Also be cautious around test equipment like an oscilloscope. The oscilloscope housing may become live if the cable is connected to a live circuit! **Avoid dangerous situations at all time!**
Basic tips regarding to good electrical safety practises are easy to remember. Combined with good common sense they should keep you on the job for a long time to come.

Safety practices

The following safety practices are intended to insure safe operation of the equipment.

Electrical hazards

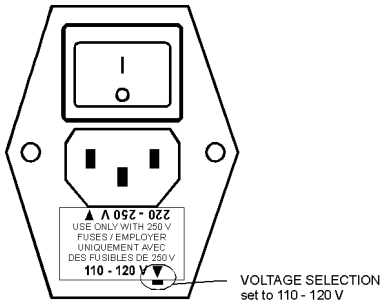
1. Disassembly exposes potentially dangerous voltages. Therefore disconnect the instrument from all power sources before disassembly.



2. Replace blown fuses with size and rating stipulated on the rear panel and in this manual where listed.

WARNING - RISK OF FIRE REPLACE FUSE AS MARKED		
	FUSE RATING	
INPUT VOLTS	UL / CSA	IEC 127
100-120 V 200-240 V	3.2A 250V TL 1.6A 250V TL	T 3.2A 250V T 1.6A 250V

3. Replace faulty or frayed power cords.
4. Check whether the voltage selector is in the correct position. If the triangle with the voltage range is pointing towards the small white block, the system is set to that line voltage. If not correct this insert has to be reversed. Also the fuses are included in the line connector. The correct values are given on the rear panel for the different line sources.



General precautions

1. Perform periodic leak checks on LC tubing and connections.
2. Do not allow flammable and/or toxic solvents to accumulate. Follow a regulated, approved waste disposal program. Never dispose of such products through the municipal sewage system.

Table of contents

Specifications

General specifications

Power	110-120/220-240 VAC, 50/60 Hz
Operating modes	DC, Pulse and Scan
Potential range	between +2.00 and - 2.00 V in 10 mV increments
Recorder output	between +0.1 and - 0.1 or between +1.0 and -1.0 V
Ranges INT	1 nA, 10 nA and 1 µA/V
Integrator output	between +10.0 and -10.0 V
Offset	between +50% and - 50% of recorder output, 10% steps
Drift monitor	0.1 - 10 nA/min (Pulse), 0.1 pA/min - 10 nA/min (DC)
Event marker	10% of recorder output
Autozero	range determined by integrator setting, in µA range: 16 µA, in nA range: 160 nA, in pA range: 16 nA; triggered by keyboard, rear panel contact closure, or RS232C control
RS232C	full parametric instrument control (option)
Injector sensor	starts system clock if Load to Inject
Oven	length 40 cm, from 5°C above ambient to 60°C, accuracy 0.5°C, stability 0.1°C; accommodates injector, column, pulse dampener and flowcell
Environmental	Humidity: Max. 80% relative humidity, non condensing (5°C - 30°C), linear decreasing to 50% rel. humidity at 40°C

DC mode

Range	10 pA - 5 µA in 1, 2, 5 steps
Filter (time constants)	0.1 - 5 s in 1, 2, 5 steps
Noise	< 2 pA with a dummy cell (load of 300 MOhm and 0.5 µF) with 0.1 s filter; with 2 s filter the noise is < 1 pA

PULSE mode

Range	10 nA - 5 µA in 1, 2, 5 steps
Pulse times	t1: 100 - 2000 ms; t2: 100 - 2000 ms; t3: 0 (off) - 2000 ms in 10 ms steps
Sample times	20, 40, 60, 80 and 100 ms

SCAN mode

Range	10 nA - 5 µA in 1, 2, 5 steps
Scan rate	1 - 50 mV/s in 1, 2, 5 steps
Cycle	half, full or continuous
	Start/Stop, Hold and Autozero, Starting potential (E1), End potential (E2)

AUTO mode

DC mode (5 files) and pulse mode (4 files), master/slave mode, cycle time, number of cycles, drift monitor

Time-based control of 20 time points as to sensitivity, filter settings, output contacts (2 open collector, 2 relays), autozero, offset, inject/load position of electrically actuated VALCO injector (option) and E-cell (DC only). Switching time electrically actuated VALCO injector: 80 ms

Rear panel I/O connections

Mains, Recorder (12 bits) and Integrator (analog) . 2 open collector outputs (AUX 1 and 2) I max. 250mA, U max. 28V and 2 relay outputs I max. 500mA, U max. 28V, cell on, cell off, + 24 V output I max. 500mA, Common, Hold/Busy, Start, Reset, Autozero, Overload, Inject marker, Electrically actuated injector control, position of manual injector, RS232C connector (option)

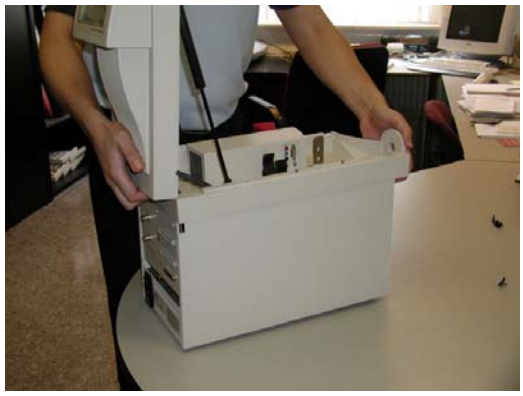
Physical specifications

Dimensions	48 (L) x 22 (W) x 36.5 (H) cm = (18.75” x 8.6” x 14.3”)
Weight	15.5 kg (34.2 lbs) with Rheodyne 7725i injector and without pulse dampener

1. Opening a DECADE for service

Disassembling is only necessary if values are out of spec. or internal repairs are required. The SERVICE MODE guides you through all settings, values and specs. and advises you when to disassemble for adjustment.

Before disassembling read this carefully!

1. Disconnect the DECADE from mains power. 2. Put the DECADE in front of you on a table with the back panel to the right i.e. the injector to the left. Make sure there is enough room on the table between you and the DECADE i.e. this room should be the width of a DECADE. 3. On the back panel (at your right-hand side) of the DECADE unscrew the four outer screws i.e. the screws at the edge of the cabinet (4x M3x8). 4. Open the oven compartment, and unscrew the ten screws in the plastic bottom cover i.e. the one's in the holes, remove these screws and put them aside (10x M3x12)	
5. With the opened oven compartment lift out the complete upper part. To do so put your left hand under the left out coming part (where the injector is mounted), and your right hand under the backside of the cover. 6. The power cable will be restrained by the corner of the board rack and needs attention while lifting the upper part. **7. Take care not to lift it too high or too fast because of possible damage to the backside of the motherboard and the cable connections!!**	

8. Now put the upper part in front of the cabinet; this is sometimes difficult because the power cable coming from the left of the cabinet going to the right of the upper part can be obstructed at a corner.	
9. From left to right there are six board positions: electrode board, spare, CPU board, oven control + scrubber control board (option), I/O board, spare. 10. Most boards include cable connections. If necessary, gently remove these before board removal. The connections are all unique, so mixing them up is impossible.	

With the upper part in front of you and the cables still connected the DECADE is fully serviceable and can be tested under power. There is no direct danger for electrical shock because the power unit where the dangerously high potentials are accessible is fully covered by a metal shielding cover.

Never remove boards while mains power is on this may cause serious damage to electronic parts.

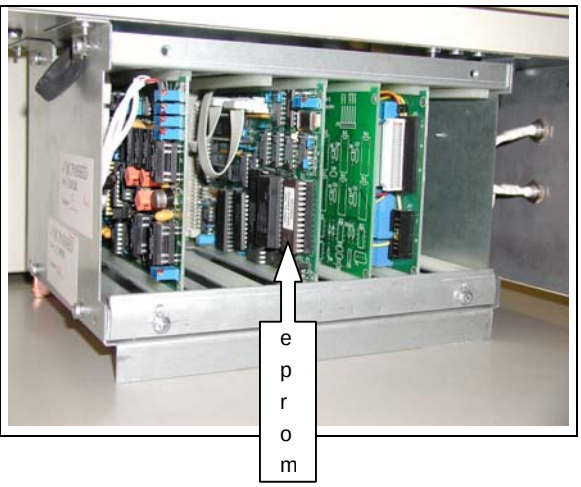
Some boards include cable connections. Gently remove these before board removal. A small screwdriver may be used to gently loosen the connectors.

Though the connectors are all unique note the fitting directions to prevent errors.

1.1 Exchanging EPROMS

To exchange EPROMS disassemble the DECADE. Pull out the EPROM as shown below and install the new one.

Removing the EPROM:
To remove the eprom, carefully pull it out preferably using an IC-puller or a small flat screwdriver. Lift the eprom out evenly so the pins of the eprom do not bend. The marking (dent) on the eprom points upwards.
Be careful not to damage the board when using the screwdriver.



2. Assembling a DECADE

Do not attempt to over-tighten, force or wrongly enter a (damaged) screw or the head may turn and the screw will be irremovable. This may also cause permanent damage to the screw thread. Always use the indicated type of screw or the head may turn and the screw will be irremovable.
Always use a correct fitting screwdriver for example PHILLIPS RECESS Gr. 1 (long type).

Before assembling read this carefully:

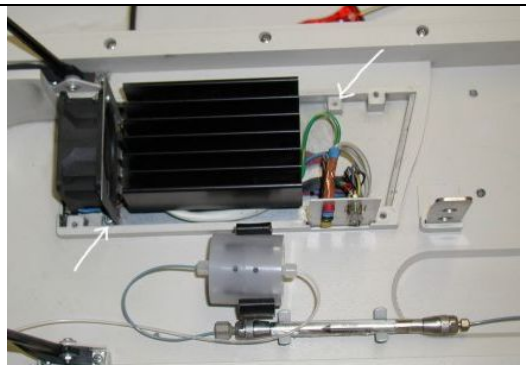
1. Re-assembling is done in fact in reversed order, but some details should be taken into account.
2. Be sure that the DECADE is disconnected from mains power.
3. When the upper part is lifted above the cabinet **take care of the power cable and the back of the motherboard.**
4. Slowly lower the upper part with the back panel (right) between the sides of the cabinet.
5. Keep the power cable between the shielding cover of the power supply and the side of the cabinet, at the side facing towards you. The cable set at the right must be pushed inside and up while lowering.
6. When everything is in place, it must be possible to lower the upper part **smoothly** into the cabinet. If it does not fit, lift the top up again and reposition cables (a long screwdriver might help).
7. When upper and lower part fit correctly the four screw mounting holes at the rear panel correspond such that the 4 screws (4xM3x8) together with the plastic rings can be fitted.

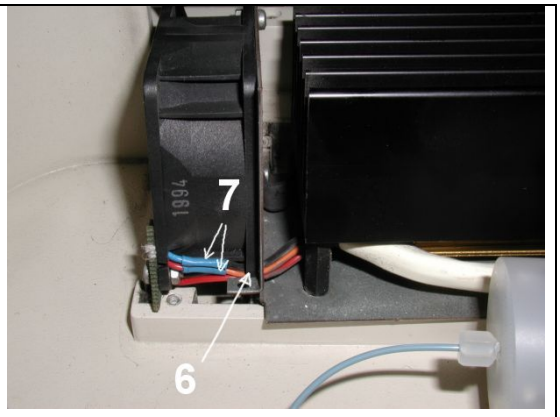
Inside the oven compartment fit the ten screws together with the plastic rings in the sides of the plastic bottom cover (10x M3x12).

3. Repair

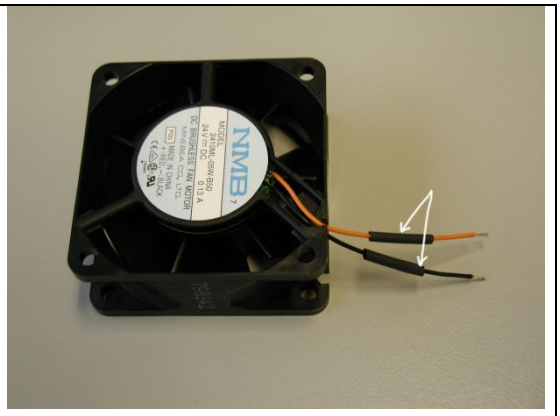
3.1 Replacement instructions fan for oven power unit

1. Disconnect the unit from mains power.
2. Remove the oven cover plastic part complete with the metal mazes, notice that they differ in shape, so keep them at the original side.

3. Loosen the oven power unit by removing the four screws in the bottom corners.	
4. Loosen the temperature transducer triangle board.	
5. Remove the 3 bolts and nuts from the fan mounting, one bolt also holds the shielding wire!	

6. Using a sharp cutter, cut the plastic corner of the old fan so that the wires can be released (see new fan for details) do not damage the wires. 7. Cut the orange and black wires from the old fan close to the fan, and strip the insulation of the wires.	

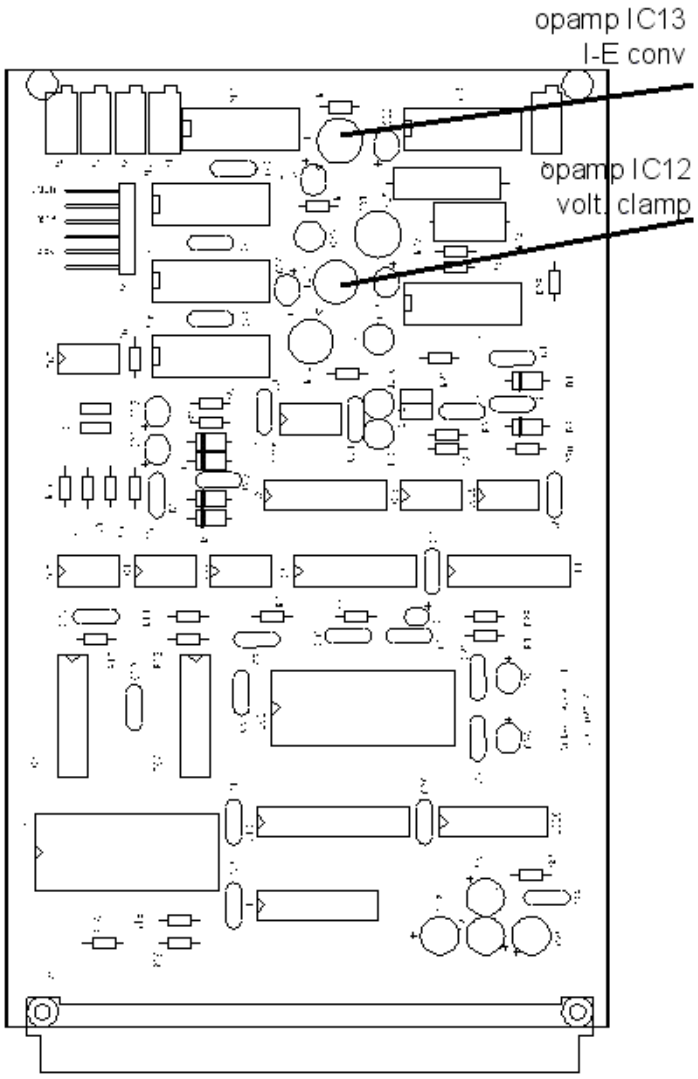
8. Place the new fan and place the 3 bolts and nuts, one bolt also holds the shielding wire !

9. Use the supplied heat shrinkable tube over the wires to prevent short circuit.	

10. Solder the wires from the oven power unit and the fan together.
11. Heat the heat shrinkable tube over the soldered parts.
12. Replace the temperature transducer triangle board using the bolt and nut.
13. Check that the fan runs free from any obstructions.
14. Reassemble the oven power unit by replacing the four screws in the bottom corners.
15. Replace the oven cover plastic part complete with the metal mazes.

3.2 Replacement of opamp

A damaged OpAmp IC12 should replace as indicated. There are only 2 opamps of this type, the voltage clamp and the I/E converter. The electrode board is the first board from the left, if you have the DECADE opened in front of you.

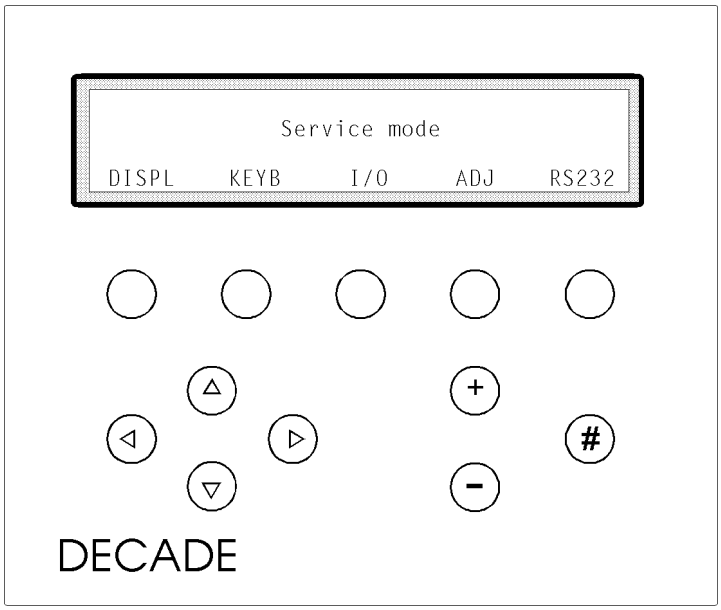


Before opening a DECADE please read the instructions in "Chapter 1. " carefully.

4. Entering the service mode

This description is functional from software release 1.05 and higher although some parts are only functional in software version 3.00 and higher.

The service mode can be accessed by switching on the DECADE while keeping the accept button (#) depressed. The Service mode main screen will be displayed.



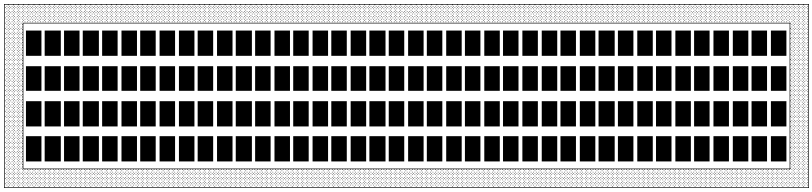
Leaving the service mode is done by switching the DECADE off and on again.

Always wait at least 10 seconds between switching off and on the DECADE

The following system checks / adjustments can be executed

- F1 (DISPL) display check
- F2 (KEYB) keyboard check
- F3 (I/O) I/O check
- F4 (ADJ) adjustment checks / adjustments
- F5 (RS232) RS232C ID settings

4.1 Display test (DISPL)



This screen enables you to check if all pixels on the LCD display are fully functional.
The LCD display is built up of 4 lines of 40 characters. Each character block has 5 x 7 pixels.
If all pixels are fully functional the display is black. If one or more pixels are missing the display control on the CPU board, the flat cable or the corresponding connections are faulty.

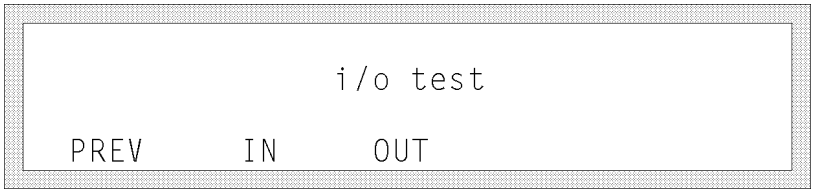
If necessary the display contrast can be adjusted as described below.

1. Disassemble the DECADE as described.
2. Switch on the DECADE in any screen.
3. Adjust the display contrast to your convenience with potentiometer X1 on the CPU-board (see layout).
4. Reassemble as described.

4.2 Keyboard test (KEYB)

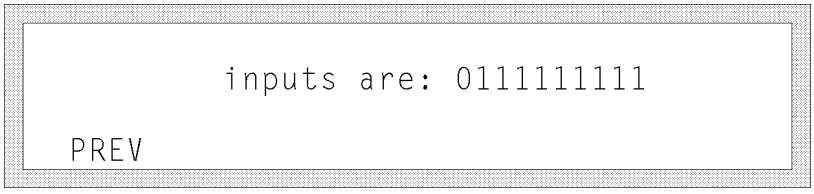
This screen enables you to test all keyboard keys.
After entering this screen the display will reveal F1. If the corresponding key is pressed the screen will show F2 etc. This test will step through all keys ending with the # key after which the Service mode main screen is displayed.
This test requires that the keys are activated in the order displayed.
If it is impossible to pass a certain key the keyboard control on the CPU board, the flat cable (see wiring diagram) or the corresponding connections are faulty.

4.3 I/O tests (I/O)



This screen enables you to select between an I/O in- or output test. Pressing F2 (IN) will bring you to the input test screen F3 (OUT) to the output test screen. Pressing F1 (PREV) brings you back to the Service mode main screen.

4.3.1 Input test (IN)



This screen enables you to test all relevant input functions. Pressing F2 will display ten characters inputs are 0111111111. After pressing F1 (PREV) the i/o test screen is displayed. The ten characters displayed correspond with input signals on the rear panel or other input functions.
An input signal given on the rear panel strip must be a low (common) pulse with a minimal pulse length of 110 ms.
To easily check inputs on the rear panel use a custom made short circuit wire between common (pin no. 12 on the upper- or lower rear panel strip) and the input to be tested.

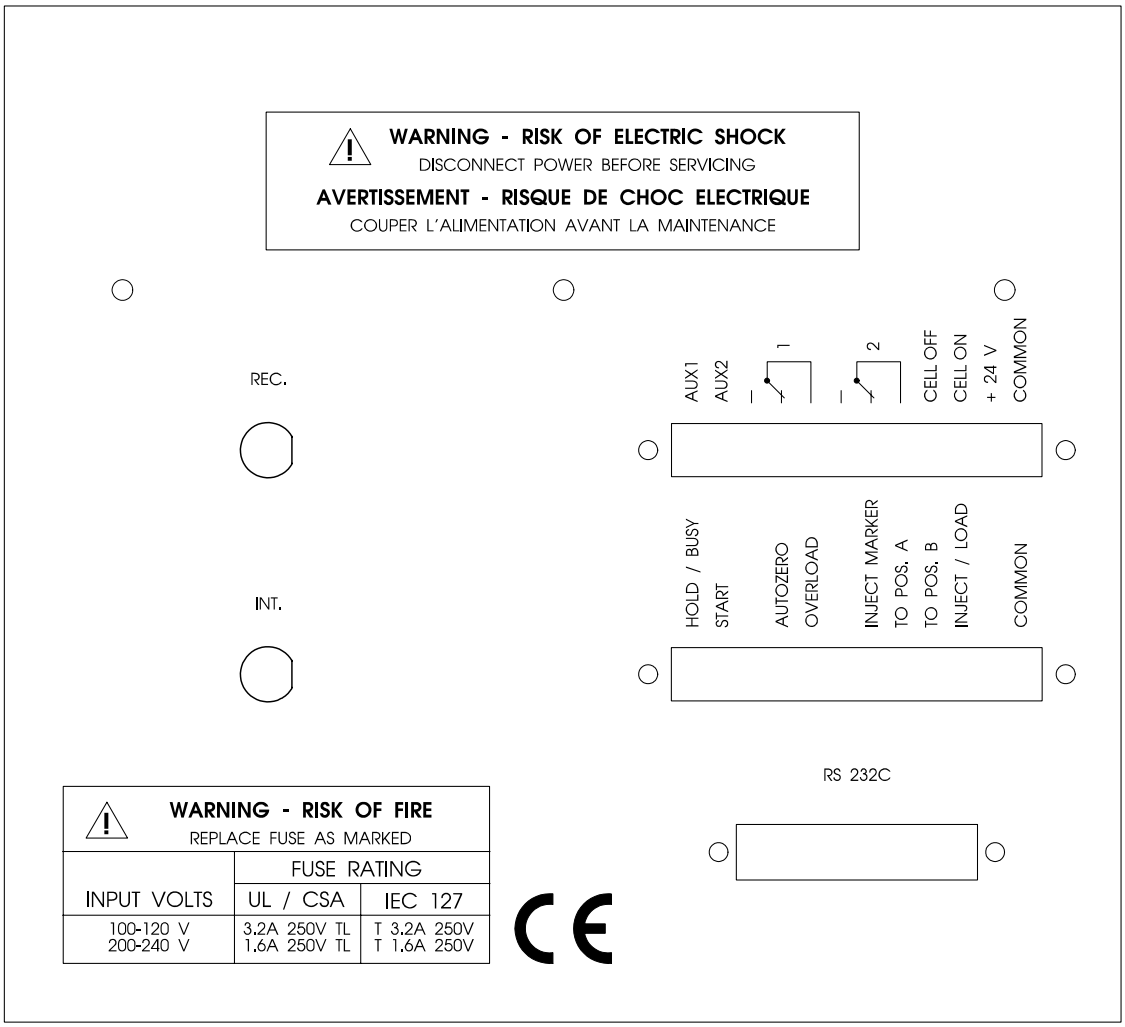


Fig. 1. Rear panel of the DECADE

From left to right the ten characters displayed correspond with the following functions and are tested as described below.

1. Open / close sensor for oven compartment (located on the inside of the oven compartment cover). Check this function by opening and closing the oven cover, or by manual interruption of the sensor. The status for open is 1 closed is 0.

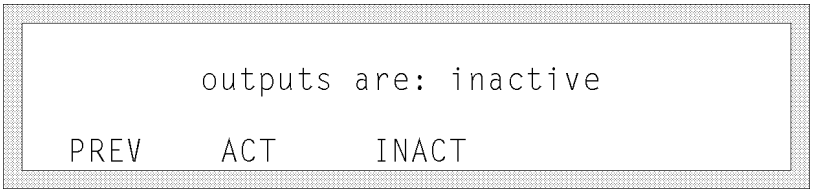
2+3. Control signals from internal electrically actuated injector. Check this function by giving a low (common) input on either pin no. 8 or 9 on the lower rear panel strip. The status of the actuator changes from LOAD (01) to INJECT (10) or vice versa. For more information about the electrically actuated injector refer to the corresponding manual.

4. Inject/load in-output. Corresponds with P1 inside oven compartment and pin no. 10 on lower rear panel strip. Check this function by giving a low (common) input, short-circuit P1 or by switching the manual injector. A low (common) input, a short-circuit on P1, or switching the manual injector to INJECT produces a 0 on screen.

5. Autozero input. Corresponds with pin no. 4 on lower rear panel strip. Check this function by giving a low (common) input. A low (common) input produces a 0 on screen.
6. Not connected
7. Start input. Corresponds with pin no. 2 on lower rear panel strip. Check this function by giving a low input. A low (common) input produces a 0 on screen.
8. Hold/busy in-output. Corresponds with pin no. 1 on lower rear panel strip. Check this function by giving a low (common) input. A low (common) input produces a zero on screen.
9. Cell off input. Corresponds with pin no. 9 on upper rear panel strip. Check this function by giving a low (common) input. A low (common) input produces a 0 on screen.
10. Cell on input. Corresponds with pin no. 10 on upper rear panel strip. Check this function by giving a low (common) input. A low (common) input produces a 0 on screen.

If any input fails the I/O input control on the I/O board, the wiring or the corresponding connections are faulty.

4.3.2 Output test (OUT)



This screen enables you to select the i/o output status. Pressing F2 (ACT) will force the outputs to a active status. F3 (INACT) forces them to the inactive status. F1 (PREV) brings you back to the i/o test screen. How to test one or more outputs is described in method A-C.

A. TTL outputs are tested with a voltmeter. Connect the minus of the voltmeter to common (pin no.12 on the lower- or upper rear panel strip) and the plus of the voltmeter the TTL output that needs to be tested. **In an active status the voltmeter will display 5V ± 0.5V, inactive 0V ± 0.5V.**

B. Open collector outputs are tested with a voltmeter. Connect the voltmeter with the plus to the 24V output (pin no.11 on the upper rear panel strip) and the minus of the voltmeter to the open collector output that needs to be tested. **In an active status the voltmeter will display 24V ± 0.5V, inactive 0V ± 0.5V.**

C. Switching relays are tested with an Ohmmeter (contacts open or closed measurement). Connect the Ohmmeter to the relay pins that need to be tested. The situation drawn on the rear panel is the inactive status.

To check all outputs proceed as described below.

1. Press F3 (INACT):	Outputs are: inactive
2. Connect a voltmeter as described in method A.	
3. Pin no.7 rear panel lower strip (INJECT MARKER):	5V ± 0.5V
4. Pin no.5 rear panel lower strip (OVERLOAD):	5V ± 0.5V
5. Pin no.1 rear panel lower strip (HOLD/BUSY):	5V ± 0.5V
6. Connect a voltmeter as described in method B.	
7. Pin no.1 rear panel upper strip (AUX 1):	0V ± 1V
8. Pin no.2 rear panel upper strip (AUX 2):	0V ± 1V
9. Connect an Ohmmeter as described in method C.	
10. Between pin no.4 and 5 rear panel upper strip:	0 ± 2 Ohm
11. Between pin no.3 and 5 rear panel upper strip:	>10M Ohm
12. Between pin no.7 and 8 rear panel upper strip:	0 ± 2 Ohm
13. Between pin no.6 and 8 rear panel upper strip:	>10M Ohm
14. Press F2 (ACT):	Outputs are: active
15. Connect a voltmeter as described in method A.	

16. Pin no.7 rear panel lower strip (INJECT MARKER): 0V ± 1V
17. Pin no.5 rear panel lower strip (OVERLOAD): 0V ± 1V
18. Pin no.1 rear panel lower strip (HOLD/BUSY): 0V ± 1V
19. Connect a voltmeter as described in method B.
20. Pin no.1 rear panel upper strip (AUX 1): 24V ± 1V
21. Pin no.2 rear panel upper strip (AUX 2): 24V ± 1V
22. Connect an Ohmmeter as described in method C.
23. Between pin no.3 and 5 rear panel upper strip: 0 ± 2 Ohm
24. Between pin no.4 and 5 rear panel upper strip: >10MOhm
25. Between pin no.6 and 8 rear panel upper strip: 0 ± 2 Ohm
26. Between pin no.7 and 8 rear panel upper strip: >10MOhm

If one or more of these checks fail the I/O control on the I/O-board or its corresponding connections (see wiring diagram) are faulty.

4.4 Adjustments (ADJ)

This screen enables you to select between certain functions in which tests and if necessary adjustments are made.
Pressing F1 (PREV) brings you back to the Service mode main screen.

- F2 (VLTCL) the voltage clamp circuitry test/adjustment
- F3 (ZER.IE) the current to voltage converter circuitry test/adjustment
- F4 (AZERO) the autozero circuitry test/adjustment
- F5 (OUTP) the output voltages test/adjustment

These levels are all factory set and under normal circumstances do not need adjustment.

If necessary adjustment is made with one or more potentiometers situated on the electrode-board (see layout). If any of these test/adjustments fail the source of the problem is most likely on the electrode-board (or its corresponding connections).

Prior to pressing F2 (VLTCL) connect a voltmeter as illustrated in Fig. 2.

This voltmeter must have an internal resistance of 10MΩ or higher.

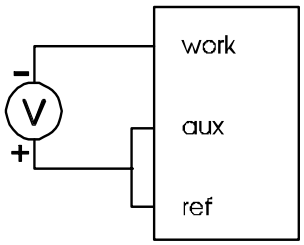
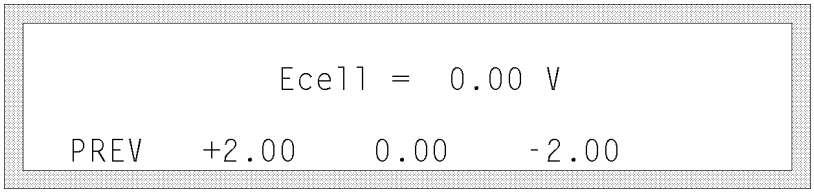


Fig. 2. Connection of the voltmeter for the VLTCL test.

4.4.1 The reference voltage (VLTCL)



This screen enables you to select between the two outer and intermediate voltage levels of the voltage clamp circuitry. F2 (+2.00) forces the voltage clamp circuitry to +2.00V, F3 (0.00) to 0.00V and F4 (-2.00) to -2.00V. Pressing F1 (PREV) brings you back to the adjustments main screen.

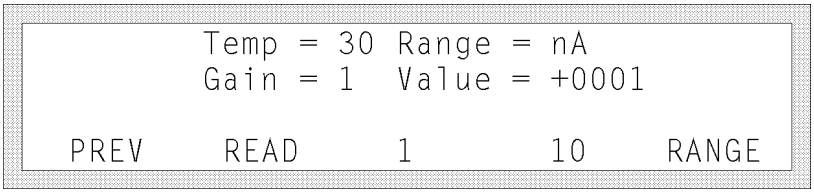
Check the specs. as described below:

1. Press F2 (+2.00) U meter: +2.00V ± 1mV
2. Press F3 (0.00) U meter: 0.00V ± 0.1mV
3. Press F4 (-2.00) U meter: -2.00V ± 1mV

If these values are within spec. the voltmeter can be disconnected **after leaving this screen i.e. pressing F1 (PREV).**
When no voltage, or a voltage >2.5V is detected the voltage clamp circuitry on the electrode-board or its corresponding connections are faulty.
For adjustment see description below.

1. Disassemble as described.
2. Press F2 (+2.00)
3. With P3 (see layout) adjust the voltmeter readout to 2.00V ± 1.00mV
4. Press F3 (0.00)
5. With P2 (see layout) adjust the voltmeter readout to 0.00V ± 0.10mV
6. Go back to step 2 until the values are in specs.
7. Press F1 (PREV) and disconnect the voltmeter.
8. Reassemble as described.

4.4.2 The current/voltage converter (ZER.IE)



This screen enables you to select different amplifications and displays the zero status setting of the I/E converter for these selections. Whilst entering this screen the oven temperature is automatically set to 30 °C to ensure proper check/adjustment temperature.
The Temp = xx displays the actual oven temperature and will be stable after warm a warm-up period. If your room temperature is above 30 °C the specs. may not be reached!
F3 (1) and F4 (10) changes the internal amplification. F5 (RANGE) toggles between pA, nA and µA range. F1 (PREV) returns you to the adjustments main screen.
The zero level can only be READ into the system RAM when the range is nA and the amplification level is 1 in all other settings the READ function disappears.
Because of the extremely high amplifications of the circuitry this value should only be READ or adjusted only under some specific circumstances.
To check this values the DECADE must be on in the above screen for at least 30 min.
The READ and / or adjustment is performed in the nA range at amplification level 1 at a temperature of 30 °C (Temp = 30). The value readout is hexadecimal.

To check for proper adjustment proceed as described below.

1. Press F5 (RANGE) until Range = nA
2. Press F3 (1): Value = ±0000 ± 0005
3. Press F4 (10): Value = ±0000 ± 0010
4. Press F5 (RANGE) until Range = pA
5. Press F3 (1): Value = ±0000 ± 0010
6. Press F4 (10): Value = ±0000 ± 0030
7. Press F5 (RANGE) until Range = µA
8. Press F3 (1): Value = ±0000 ± 0005
9. Press F4 (10): Value = ±0000 ± 0010

If values are out of specs. proceed as follows:

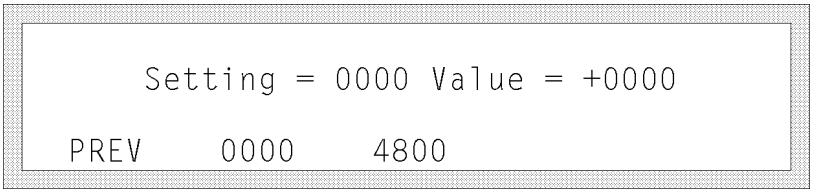
1. Press F5 (RANGE) until Range = nA
2. Press F3 (1): Gain = 1
3. Press F2 (READ): Value = ±0000 ± 0001

Now re-check all ZER.IE values if not in spec. adjustment is required proceed as described below.

1. Disassemble as described.
2. Switch on the DECADE in the Service mode as soon as possible after disassembling and got to the ZER.IE screen.
3. **Adjustments are automatically done at 30°C. The system temperature is very important.**
4. Press F5 (RANGE) until Range = nA
5. Press F3 (1): Gain = 1
6. Press F2 (READ): Value = ±0000 ± 0001
7. Press F4 (10)
8. Adjust the value with P4 (see layout) to ±0000 ± 0001
9. Repeat step 6 to 8 until values are in specs.
10. Reassemble as described.

If the ZER.IE values are still out of specs. the I/E converter circuit on the electrode-board is faulty.

4.4.3 Autozero level (AZERO)



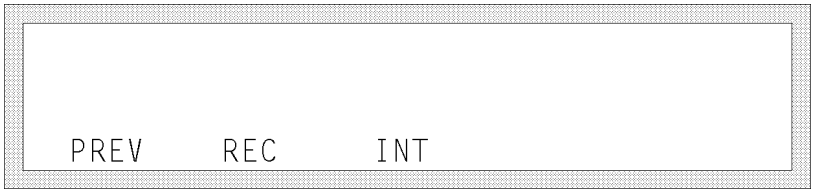
This screen enables you to select between a zero and intermediate AZERO value. The AZERO value is the compensation signal presented to the amplifier circuit to enable the output to become 0.00V. This signal is used to autozero and / or produce offset in the output signals. Pressing F2 (0000) produces a zero level, F3 (4800) an intermediate level. F1 (PREV) brings you back to the adjustments main screen. The Value readout is hexadecimal.
To check this values the DECADE must be on in the above screen for at least 30 min.

1. Press F2 (0000) Value = ±0000 ± 0005
2. If this Value is out of spec. refer to ZER.IE check/adjustment.
3. Press F3 (4800) Value = +4800 ± 0010
4. If this value is out of spec. adjustment is required proceed as described below.

1. Disassemble as described.
2. Switch on the DECADE in the Service mode as soon as possible after disassembling and got to the AZERO screen.
3. **The system temperature is very important.**
4. Adjust to +4800 ± 0010 with P1 (see layout).
5. Reassemble as described.

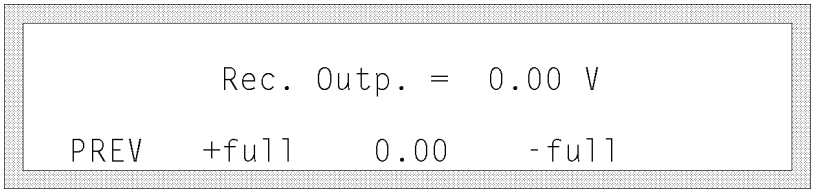
If the AZERO values are still out of specs. the I/E converter or the zero circuit on the electrode-board is faulty.

4.4.4 Outputs test and adjustments (OUTP)



This screen enables you to select between a check / adjustment on the recorder- and / or the integrator output. F2 (REC) brings you to the recorder output check screen, F3 (INT) to the integrator output screen. F1 (PREV) brings you back to the adjustments main screen.

4.4.4.1 Recorder output check and adjustment (REC)



This screen enables you to select between the two outer and intermediate voltage levels of the recorder output circuitry.
F2 (+full) forces this output to max. (+1.00V), F3 (0.00) to zero voltage (0.00V) and F4 (-full) to max. neg. (-1.00V). F1 (PREV) brings you back to the output main screen.
To check connect a voltmeter to the recorder output at the back panel of the DECADE.
Checks are performed as described below.

1. Press F3 (0.00) U meter: 0.00V ± 0.05V
2. Press F4 (-full) U meter: -1.00V ± 0.05V
3. Press F2 (+full) U meter: +1.00V ± 0.05V

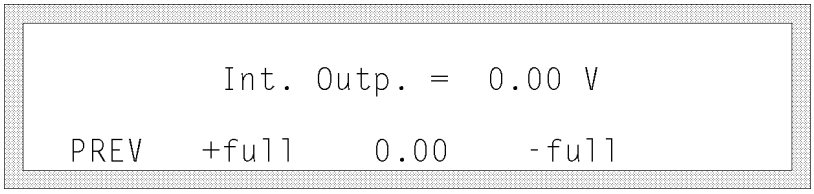
If these values are within spec. the voltmeter can be disconnected.
When no voltage at all or a voltage >1.5V is detected the recorder output circuitry on the electrode-board or its corresponding connections (see wiring diagram) are faulty.
The recorder output circuit only requires adjustment for the +full (+1.00V) setting.
For adjustment see description below.

1. Disassemble as described.
2. Switch on the DECADE in the Service mode and got to the Recorder output check and adjustment screen.
3. Press F2 (+full) Rec. Outp. = +1.00V
4. Adjust the voltmeter readout with P5 (see layout) to +1.00V ± 0.05V

If the values are still out of specs. the recorder output circuit on the electrode board is faulty.

The recorder output can be set from 1.00V max. to 0.1 V max. by changing the jumper position from JP8 (1.00V) to JP9 (0.1V). This jumper is located on the right hand side of the MOTHERboard (see layout).

4.4.4.2 Integrator output test

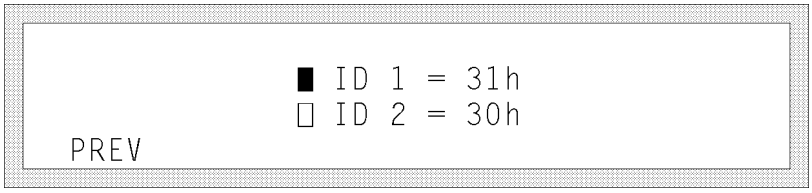


This screen enables you to select between the two outer and intermediate voltage levels of the integrator output circuitry.
F2 (+full) forces this output to max. (+10.00V), F3 (0.00) to zero voltage (0.00V) and F4 (-full) to max. neg. (-10.00V). F1 (PREV) brings you back to the output main screen.
To check connect a voltmeter to the integrator output at the back panel of the DECADE.
Checks are performed as described below.

- Press F3 (0.00)	U meter:	0.00V ± 0.05V
- Press F4 (-full)	U meter:	-10.00V ± 0.50V
- Press F2 (+full)	U meter:	+10.00V ± 0.50V

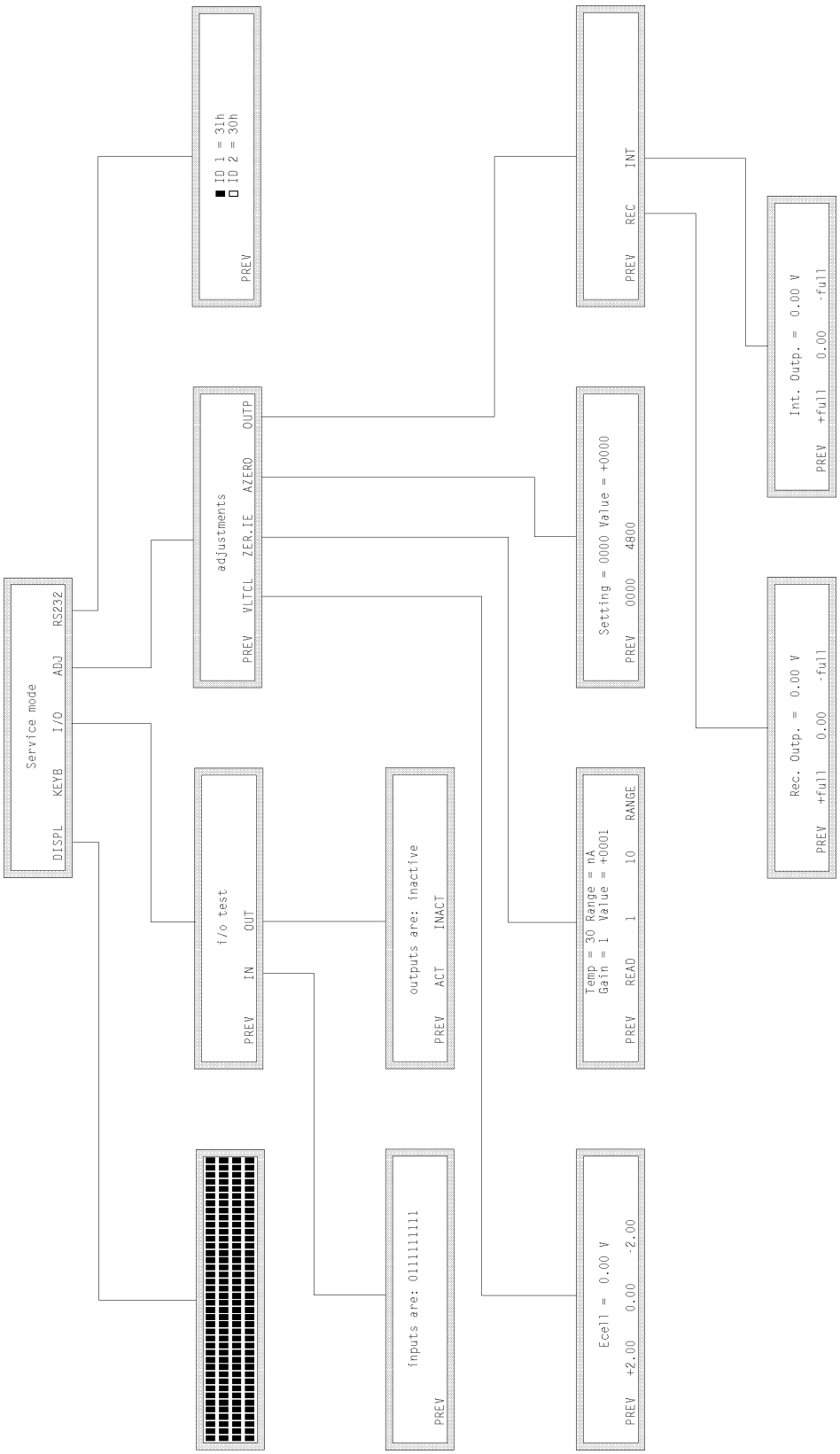
If these values are within spec. the voltmeter can be disconnected.
If these values are out of specs. check the AZERO adjustment, since this values are electronically related to the AZERO adjustment.
When no voltage or a voltage > 10.5V is detected the integrator output circuitry on the electrode-board ore its corresponding connections (see wiring diagram) are faulty.

4.5 RS232



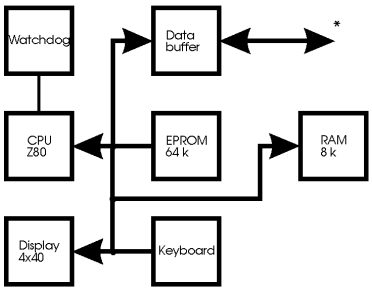
In this screen the device identifier i.e. ID 1, ID 2, can be user defined.
Default values are: ID 1=31, ID 2=30 (both hexadicimal). For any necessary testing on the RS232C communication port refer to the normal mode or the RS232C communications protocol. The electronic schematics for the RS232C port driver are included in the I/O-board circuit.

5. Overview of all service mode screens

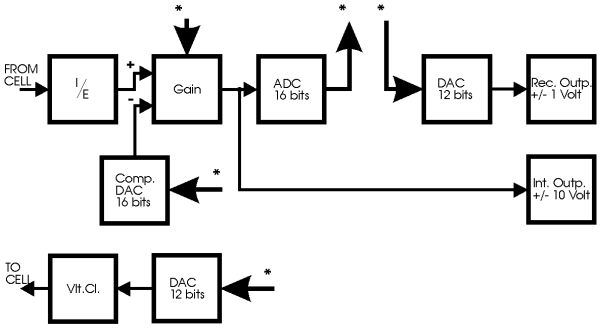


6. Block diagrams

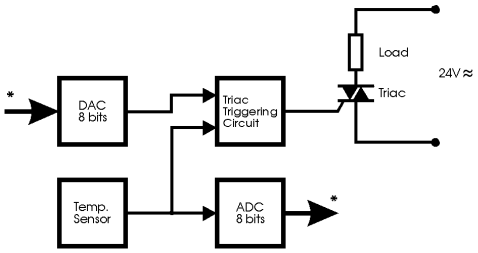
CPU-board



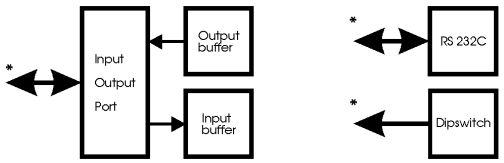
Electrode-board



Ovencontrol-board



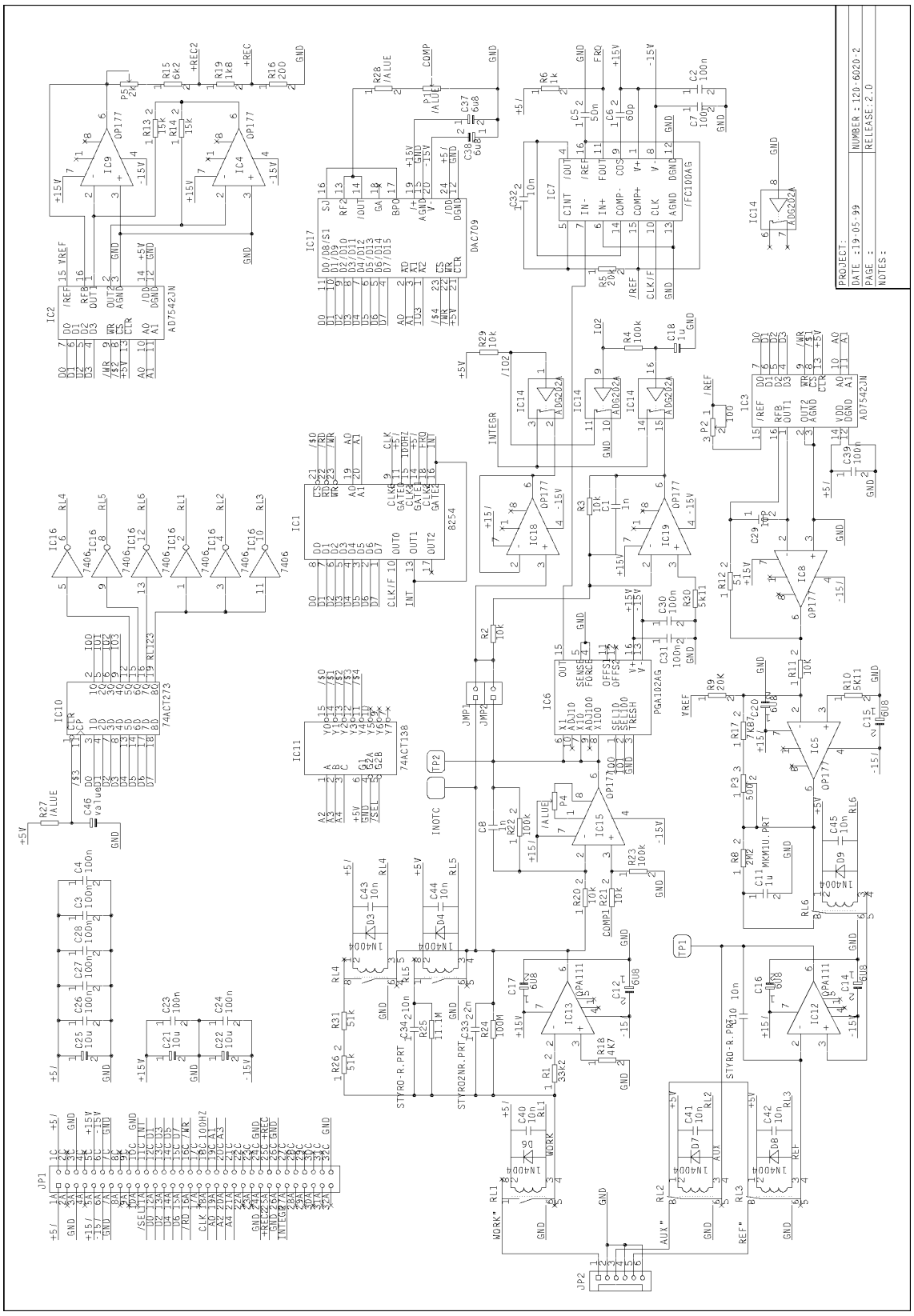
I/O-board



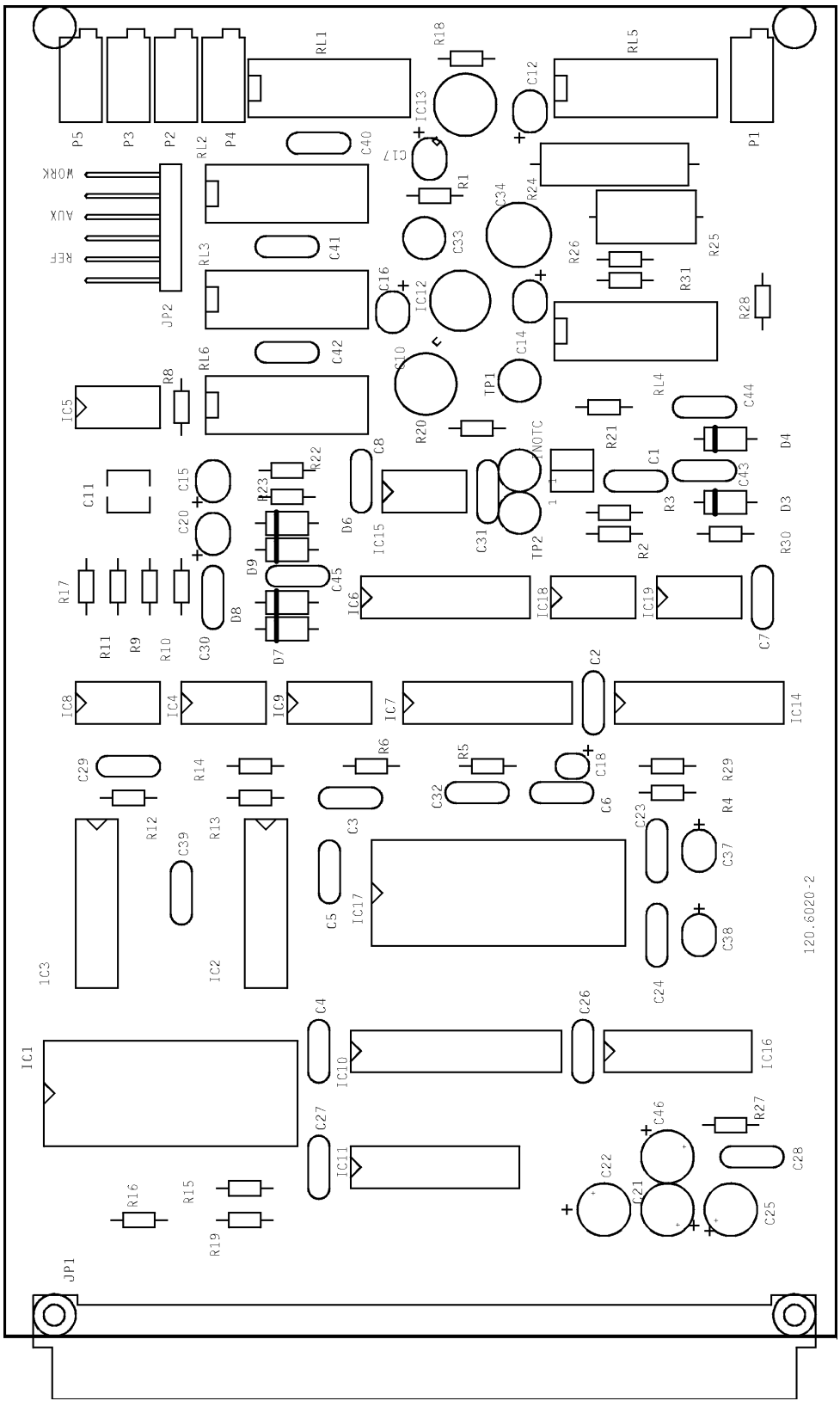
Service Manual

Part II
Board layout and circuitry

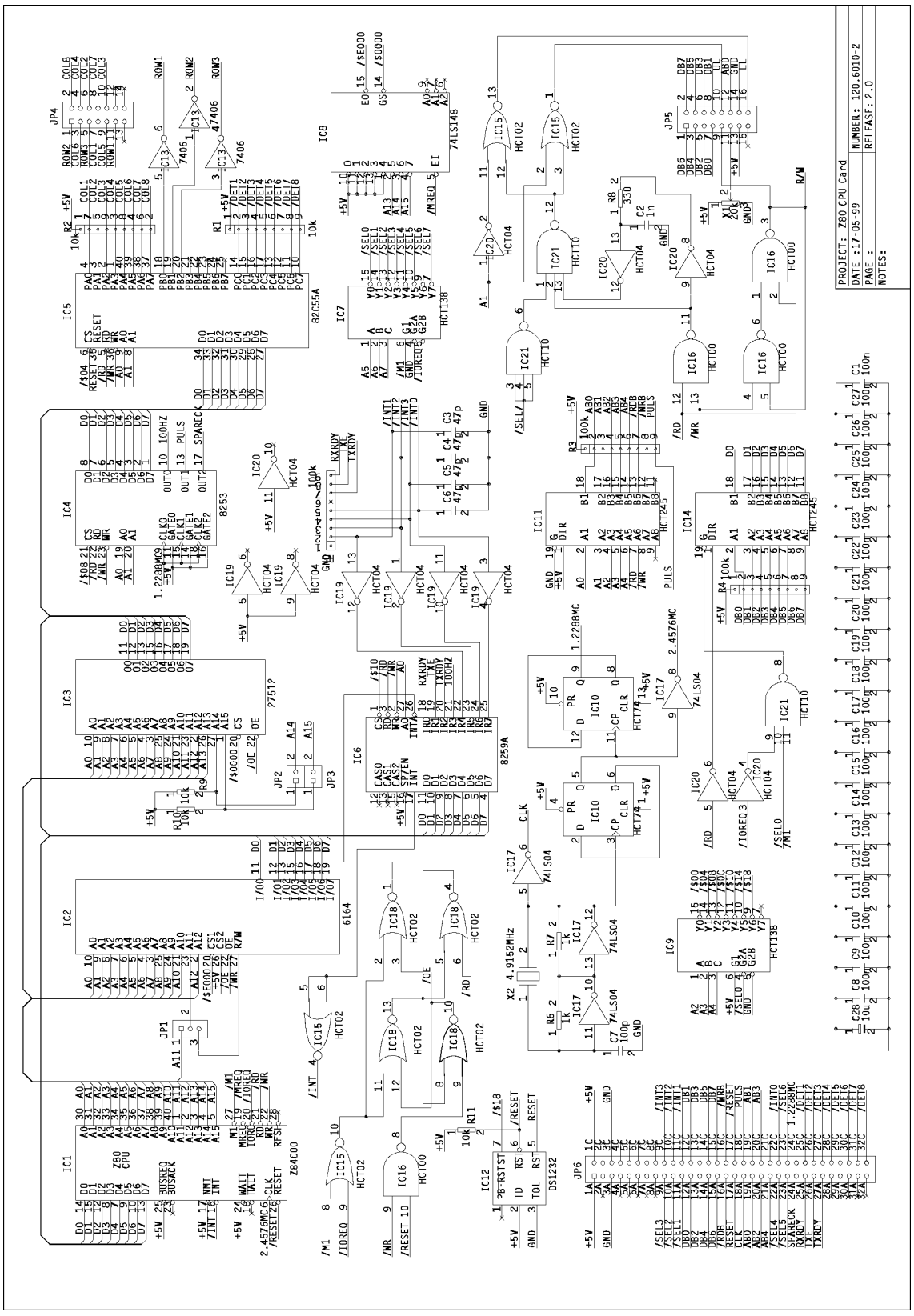
7. Electrode board circuit



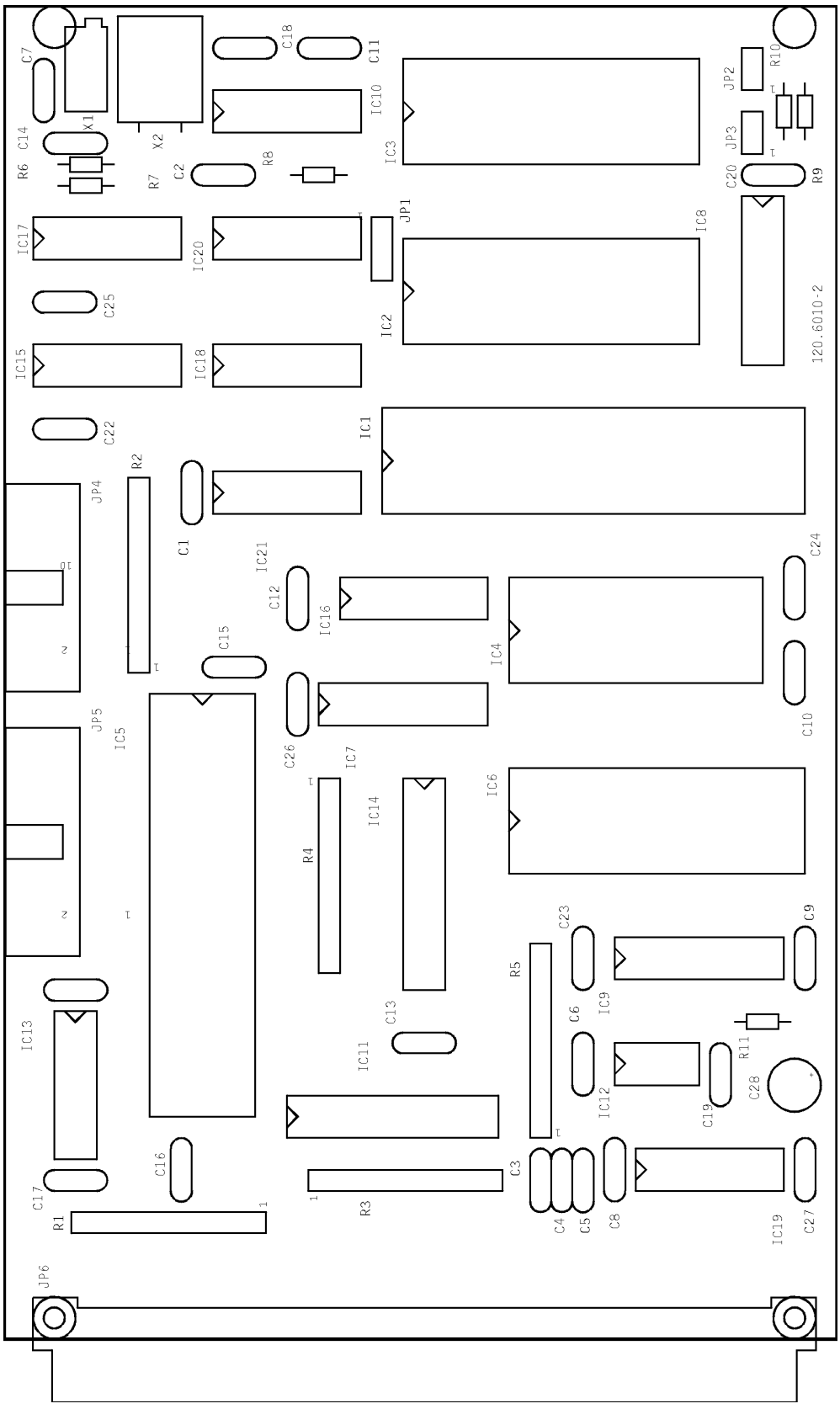
8. Electrode board layout



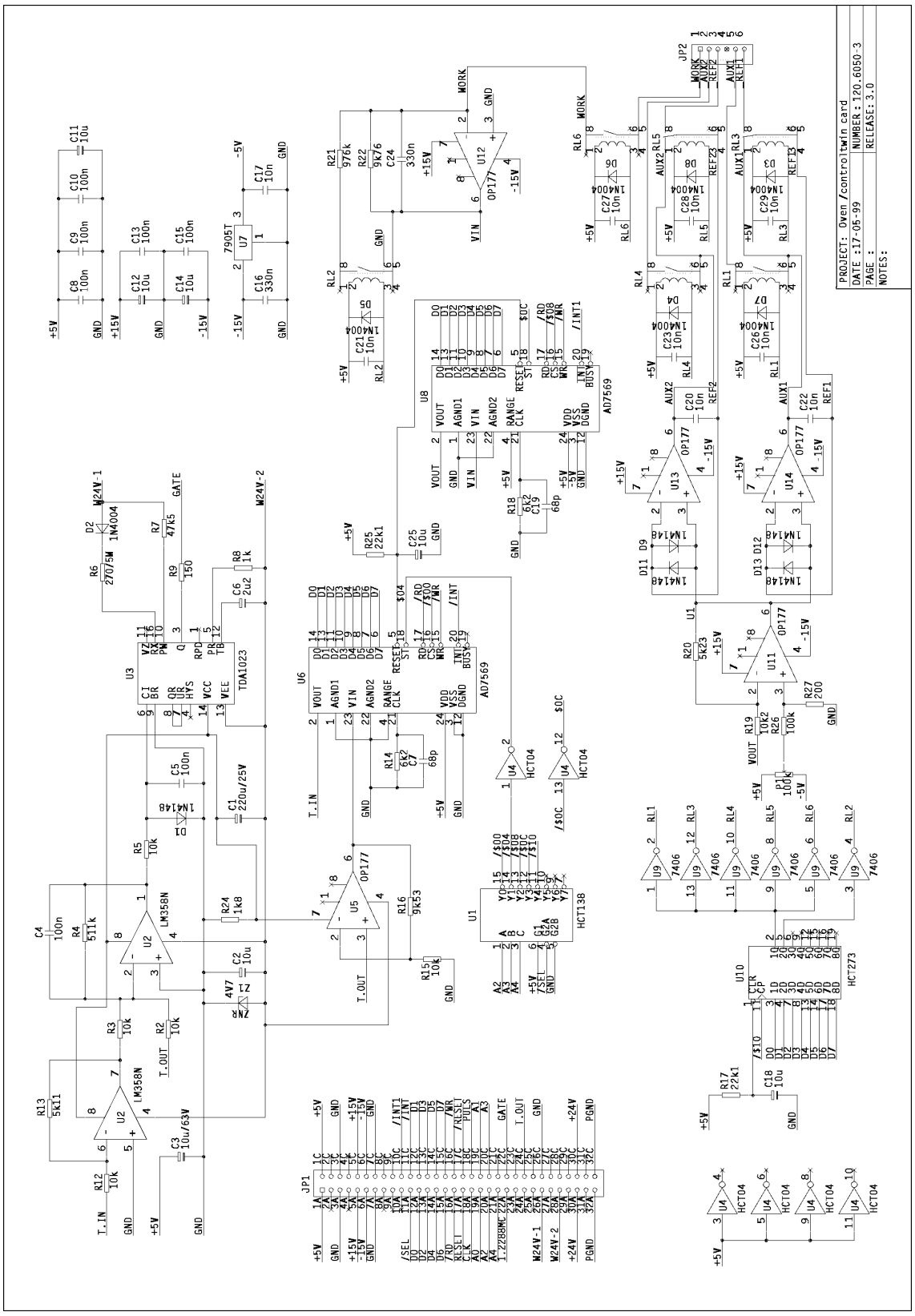
9. CPU-board circuit



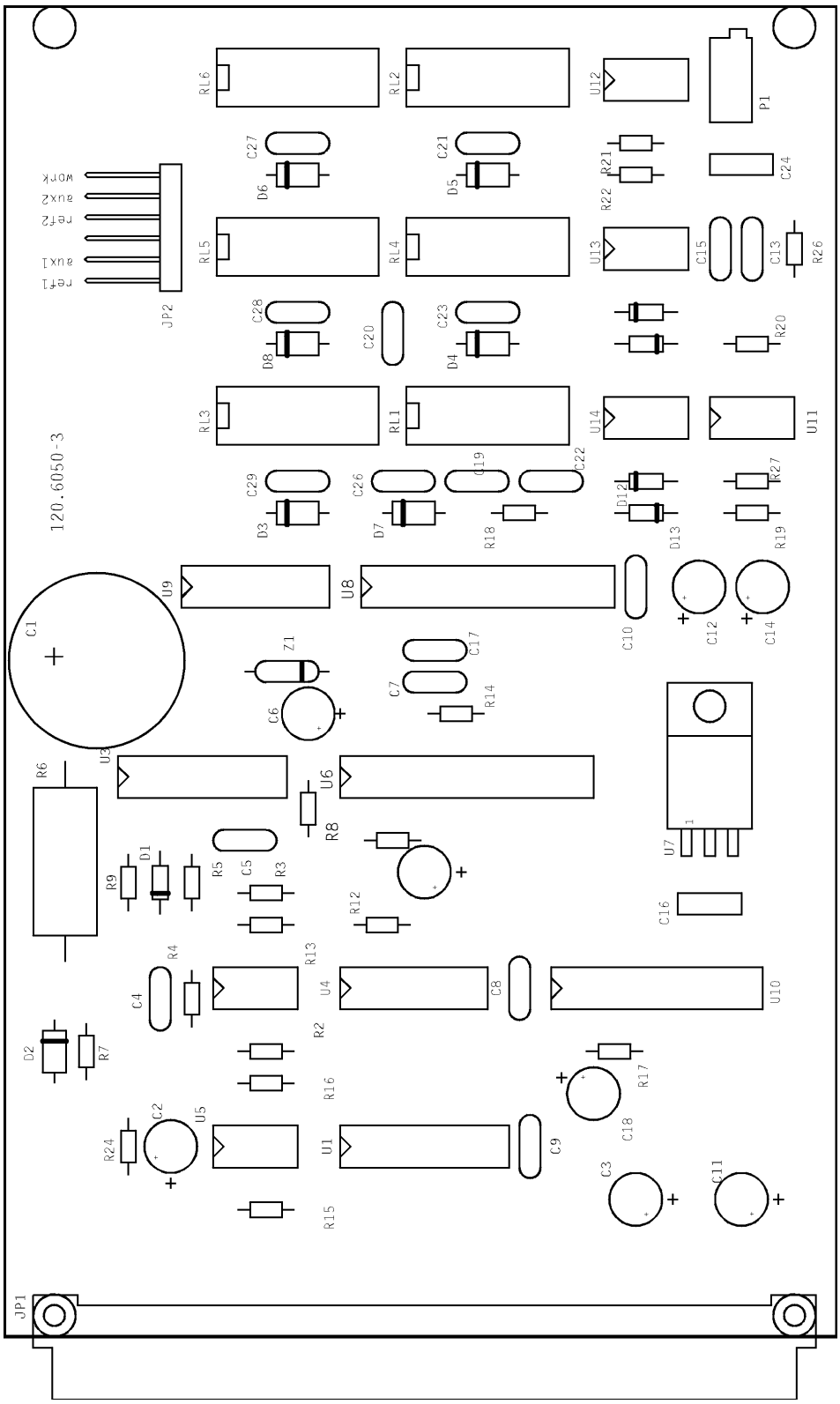
10. CPU-board layout



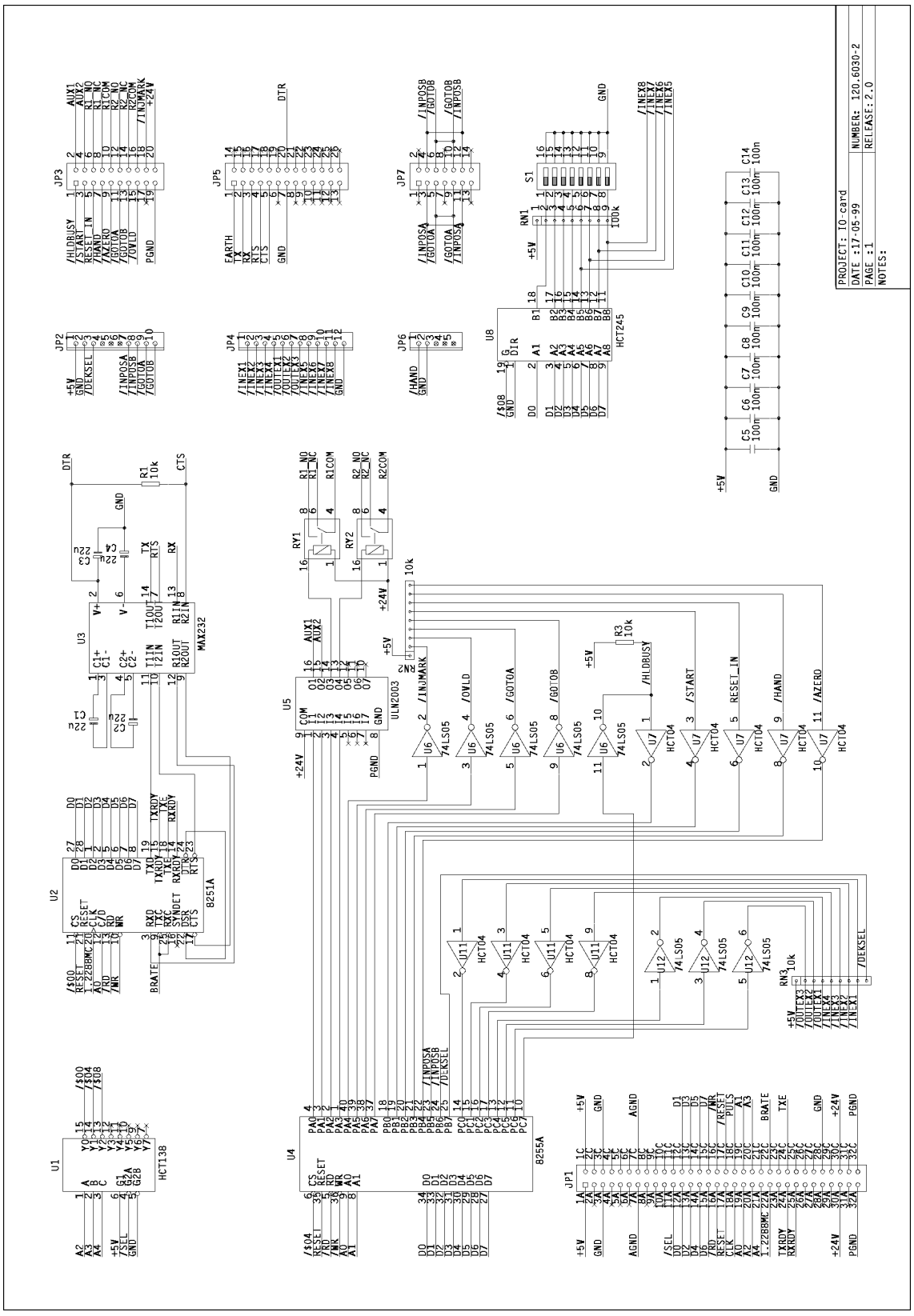
11. Oven control board circuit



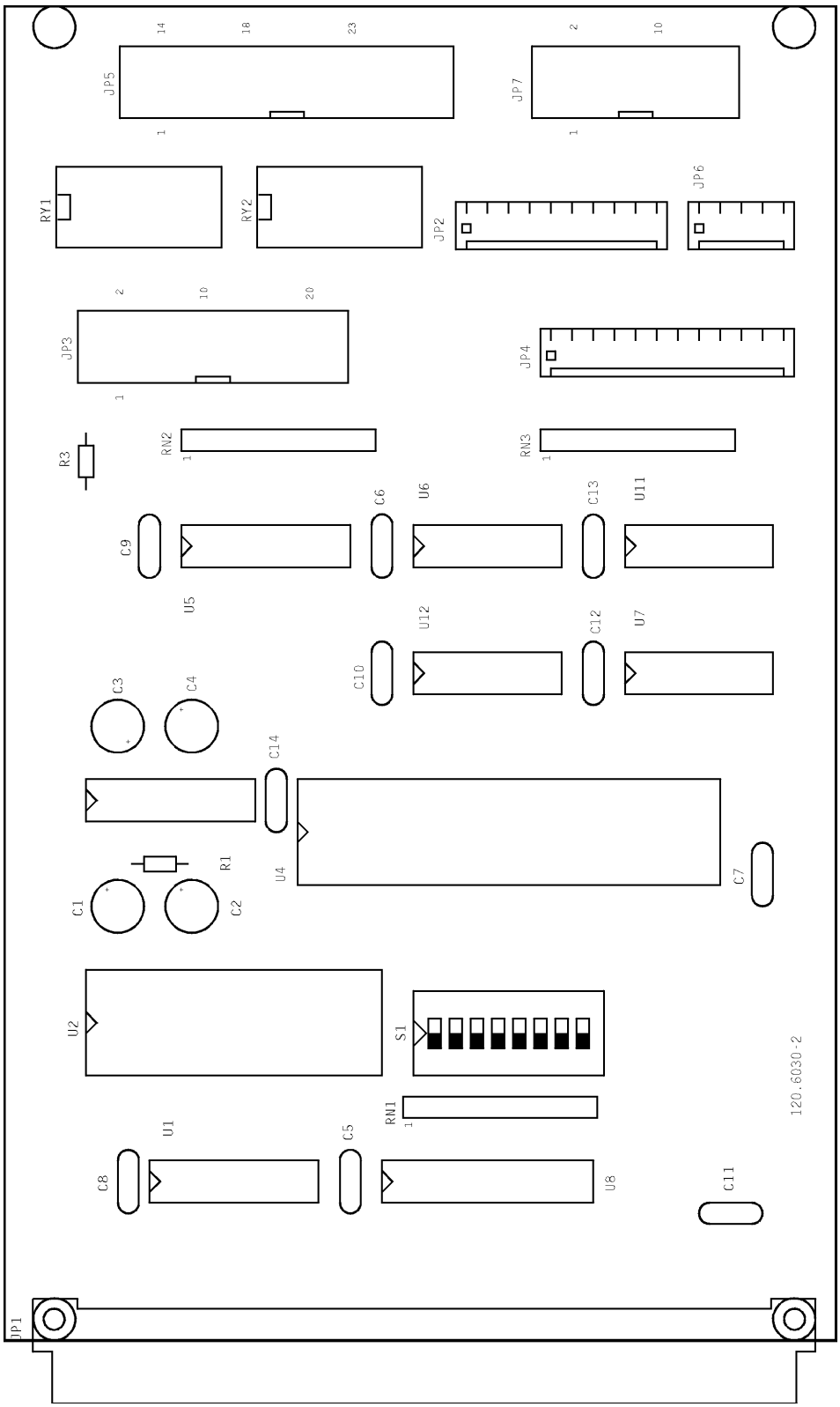
12. Oven control board layout



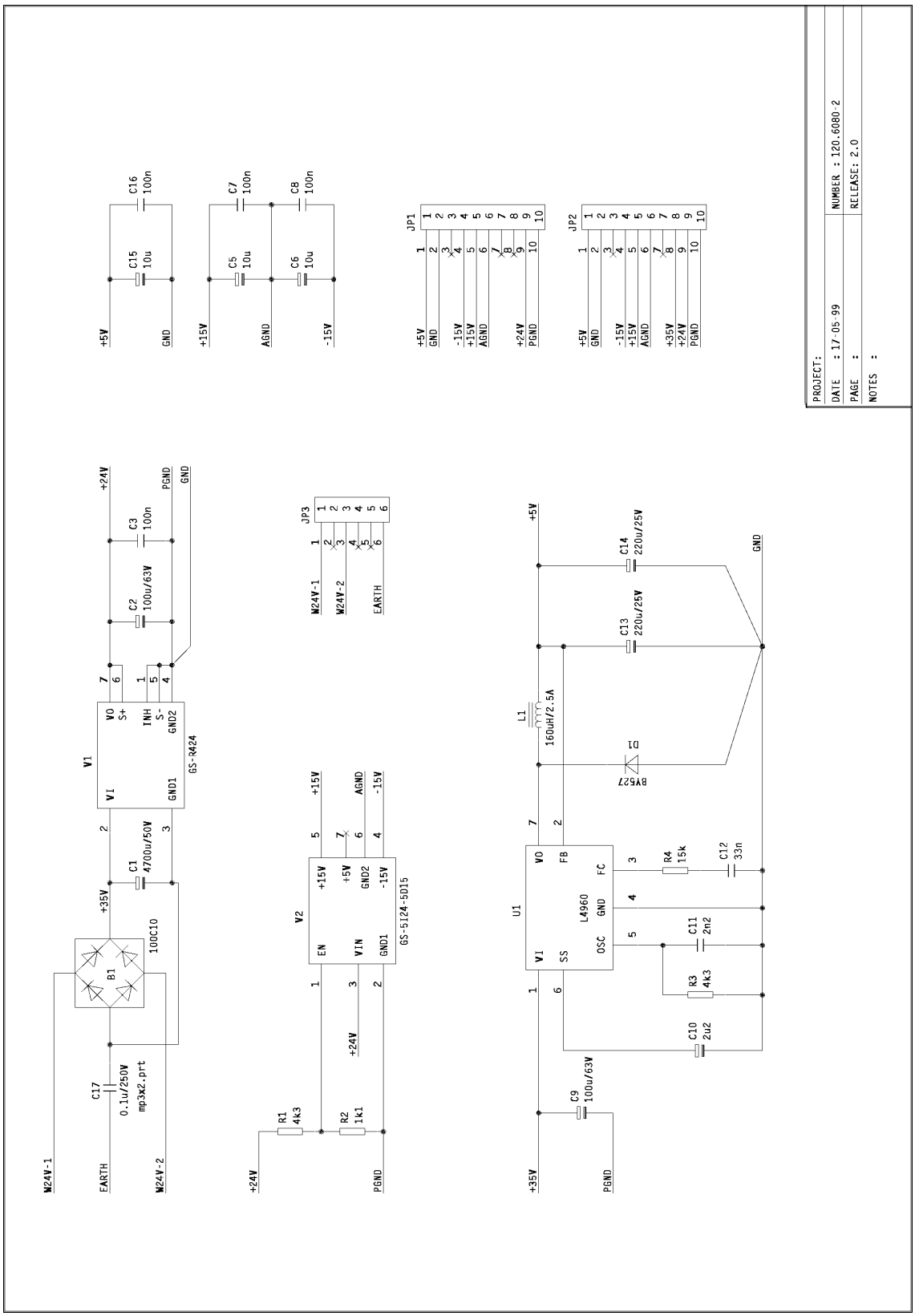
13. I/O-board circuit



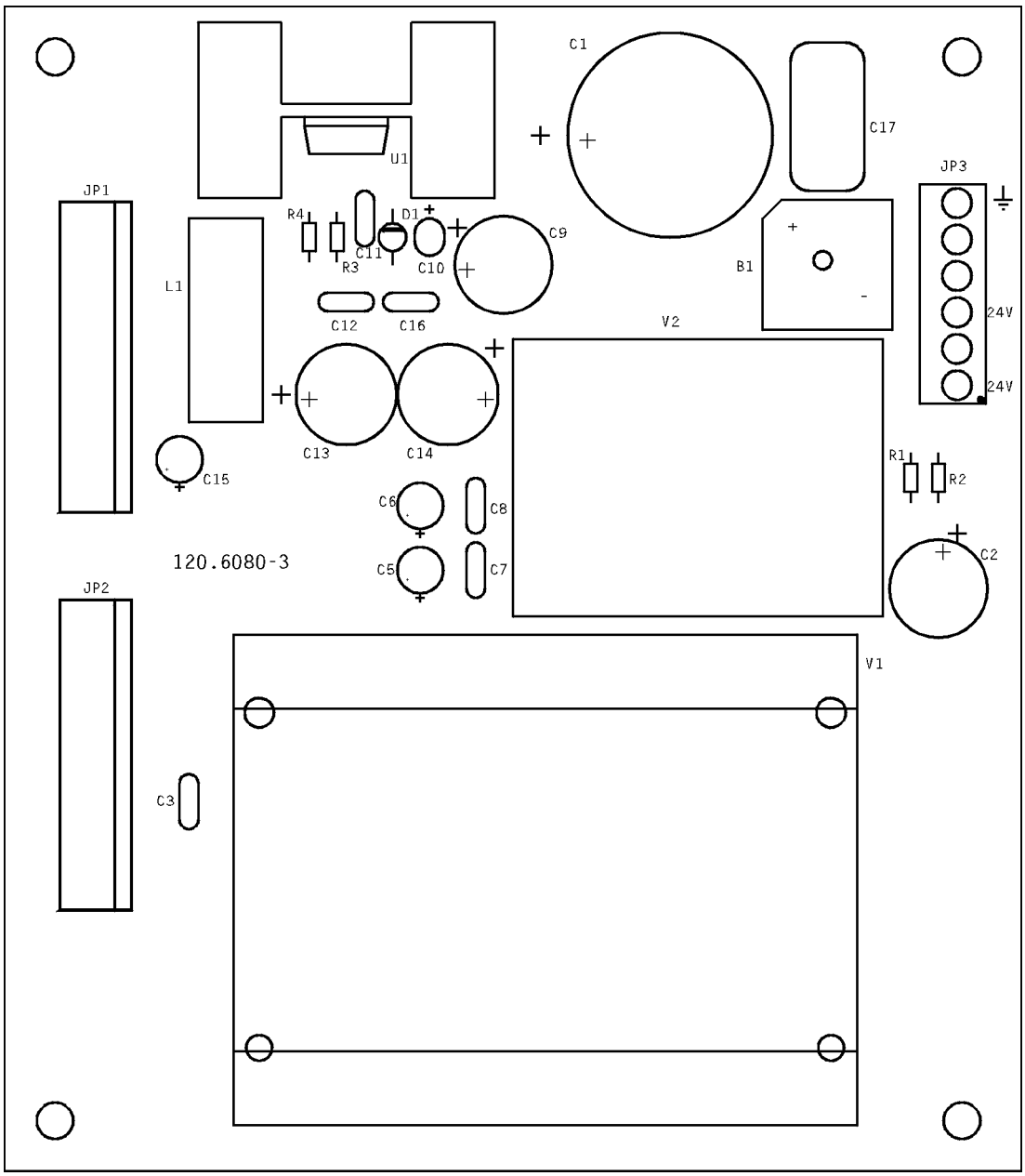
14. I/O-board layout



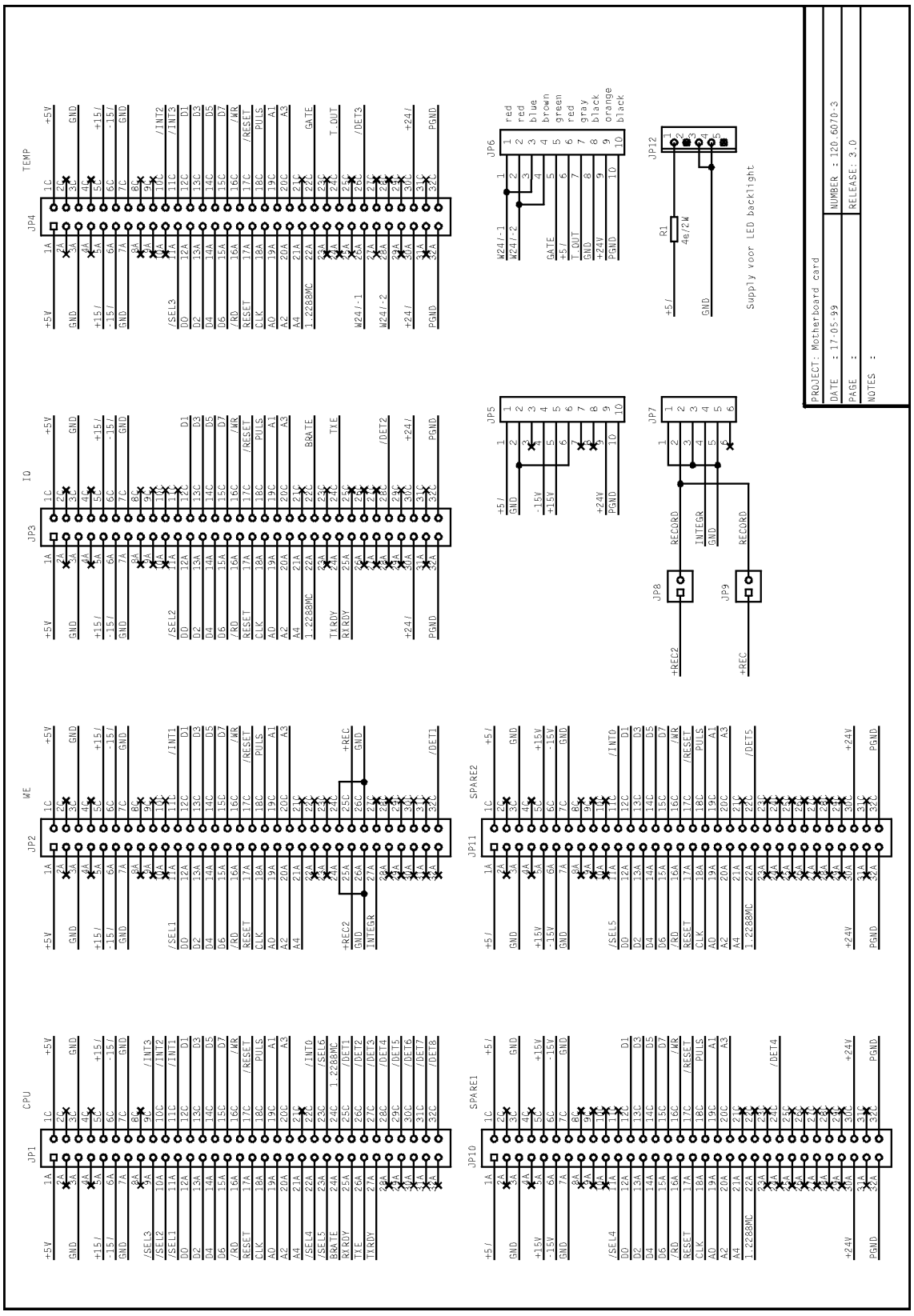
15. Power supply board circuit



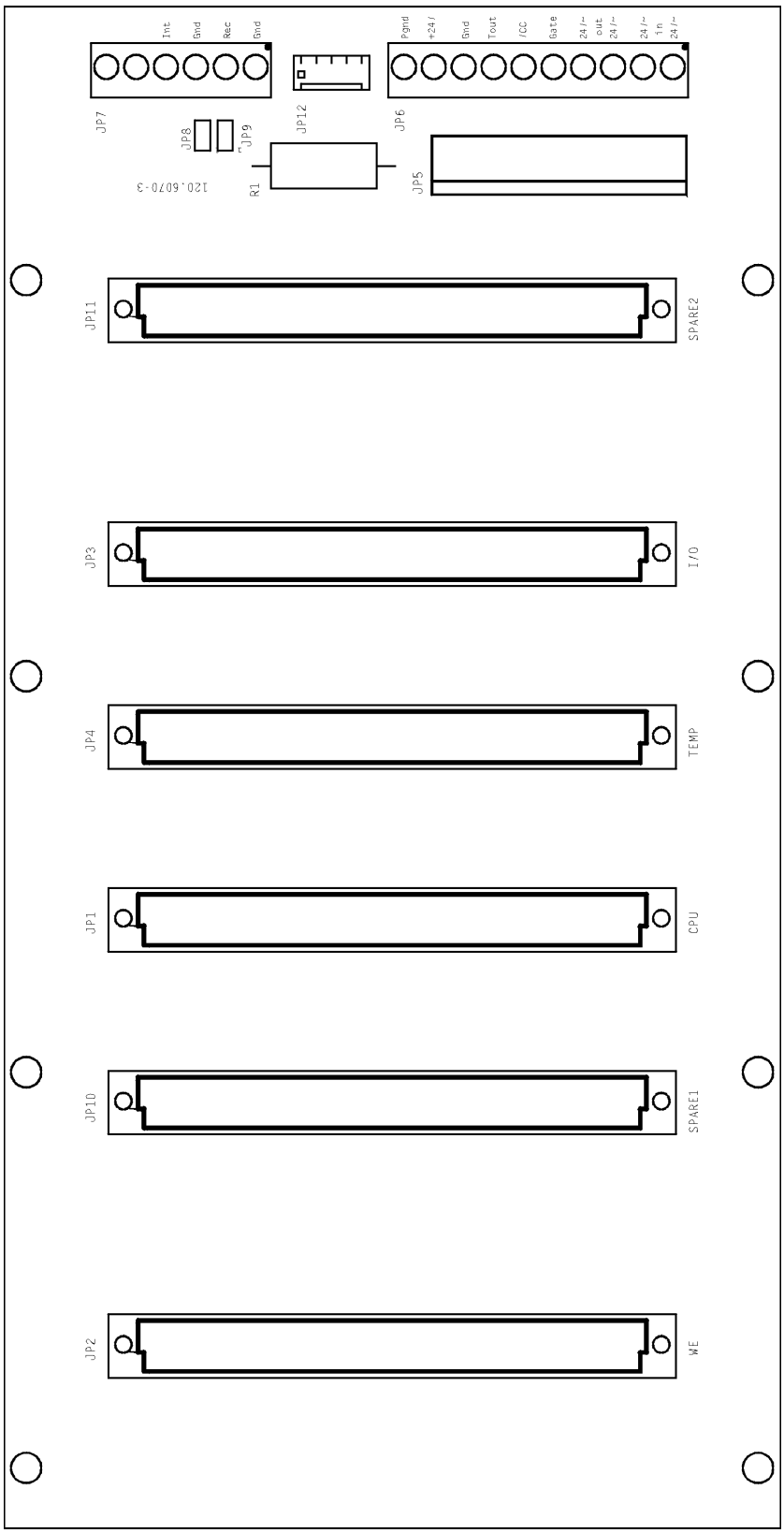
16. Power supply board layout



17. Motherboard circuit



18. Motherboard layout



19. Wiring diagram