

# CONCORDE

Service Manual





## DECLARATION OF CONFORMITY

The manufacturer declares that the product

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Electrochemical Detector **CONCORDE**

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

**Low Voltage directive (73/23/EEC)**

Conform the following product standard:

- # IEC 1010-1 (1990) +      Safety requirements for electrical equipment for measurement,  
A1 (1992) + A2 (1995)      control and laboratory use, part I: General requirements  
                                         Installation cat. II  
                                         Pollution degree 2

Issued by KEMA in report no: 95.6907.50-KRQ/EAP

Marked: 1996

**EMC directive (89/336/EEC)**

Conform the following European generic standards:

- # EN 50081-1 (1992)      Electromagnetic compatibility - Generic emission standard  
                                         Part 1: Residential, commercial and light industry
- # EN 50082-1 (1994)      Electromagnetic compatibility - Generic immunity standard  
                                         Part 1: Residential, commercial and light industry
- # EN 50082-2 (1994)      Electromagnetic compatibility - Generic immunity standard  
                                         Part 2: Industrial environment

Conform the following basic standards:

|                                        |                                           |
|----------------------------------------|-------------------------------------------|
| Terminal voltage disturbance           | EN 55022 (1986, 1994), Class B            |
| Electromagnetic radiation              | EN 55022 (1986, 1994), Class B (CISPR 22) |
| Electrostatic discharge                | IEC 801-2 (1991)                          |
| Radio frequency electromagnetic fields | IEC 801-3 (1984) & ENV 50140 (1993)       |
| Bursts, fast transients, surges        | IEC 801-4 (1991)                          |
| Radio frequency current injection      | ENV 50141 (1993) & IEC 1000-4-6 (1994)    |
| Voltage dips and interruptions         | IEC 1000-4-11 (1993)                      |

Issued by NMI under project no: 10033654

Marked: 1995

### **Attention**

Use shielded cable(s) to connect all I/O's with other devices. Thoroughly connect the shielding to common.

Manufacturer will not accept any liability for damage, direct or indirect, caused by connecting this instrument to devices which do not meet relevant safety standards.

August 1, 2003

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The information contained in this document is subject to change without notice. Manufacturer and its affiliated companies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

## Important notice

This service manual is to be used 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 our field service representatives perform all servicing.

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 or 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 it covers. Components of this instrument, which are considered user serviceable, are discussed in the manual 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

Manufacturer 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. Manufacturer provides a variety of services to support her customers after warranty expiration. Repair service can be provided on a time and material basis. Qualified service personnel on both contractual and as-needed basis can provide technical support and training.

## 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

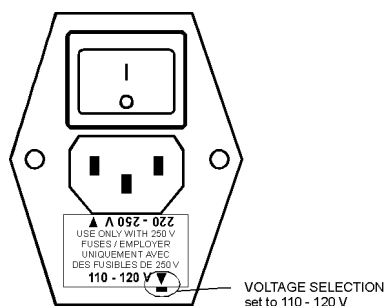
The following safety practices are intended to insure safe operation of the equipment.

### Electrical hazards

1. Disassembling exposes potentially dangerous voltages. Therefore disconnect the instrument from all power sources before disassembling.
2. Replace blown fuses with size and rating stipulated on the rear panel and in this manual where listed.

|  <b>WARNING - RISK OF FIRE</b><br>REPLACE FUSE AS MARKED<br><b>AVERTISSEMENT - RISQUE DE FEU</b><br>REPLACEZ LE FUSIBLE COMME INDIQUÉ | INPUT<br>VOLTS | FUSE RATING  |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|-------------|
|                                                                                                                                                                                                                        |                | UL / CSA     | IEC 127     |
|                                                                                                                                                                                                                        | 100-120 V      | 3.2A 250V TL | T 3.2A 250V |
|                                                                                                                                                                                                                        | 200-240 V      | 1.6A 250V TL | 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.

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# 1. 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                                                                                                                                   |
| Current ranges integrator | 1 nA, 10 nA and 1 $\mu$ A/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 $\mu$ A range: 16 $\mu$ A, 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 $\rightarrow$ Inject                                                                                                                                    |
| Oven                      | height 37 cm, from 5°C above ambient to 45°C, accuracy 0.5°C, stability 0.1°C; accommodates column and flowcell                                                                     |

## DC mode

|                         |                                                                                                                          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Current ranges recorder | 10 pA - 5 $\mu$ A 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 M $\Omega$ and 0.5 $\mu$ F) with 0.1 s filter; with 2 s filter the noise is < 1 pA |

## PULSE mode

|              |                                                                            |
|--------------|----------------------------------------------------------------------------|
| Range        | 10 nA - 5 $\mu$ A 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 $\mu$ A in 1, 2, 5 steps                                                                     |
| Scan rate | 1 - 50 mV/s in 1, 2, 5 steps                                                                           |
| Cycle     | half, full or continuous<br>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 electric valve (VALCO option) and E-cell (DC only).

## Rear panel I/O connections

Mains, Recorder (12 bits) and Integrator (analog)  
2 open collector (AUX 1 and 2; I max. 250 mA, U max. 28V) and 2 relay outputs (I max. 500 mA, U max. 28 V), cell on, cell off, 24 V output (I max. 500 mA), Common, Hold/Busy, Start, Autozero, Overload, Inject marker, Electric valve control, Manual valve (phone jack), RS232C connector

## Physical specifications

|            |                                                                |
|------------|----------------------------------------------------------------|
| Dimensions | 44 (D) x 22 (W) x 44 (H) cm = 17.3" (D) x 8.7" (W) x 17.3" (H) |
| Weight     | 16.6 kg (36.5 Lbs) without flow cell and column                |

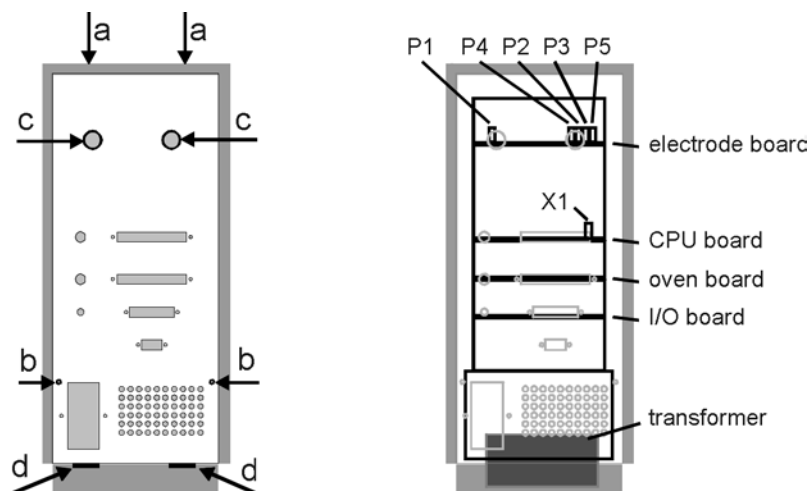


## 2. Disassembling

**Before disassembling read this carefully.** Most adjustments are done without disassembling via service openings 'c'. Disassembling is only necessary if internal repair is required. The SERVICE MODE guides you through all settings, values and specifications. It advises you when adjustments are required.

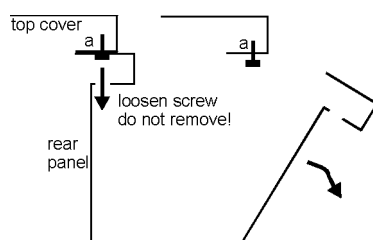
### 2.1 Disassembling of rear panel

**Always use a correct fitting screwdriver for example PHILLIPS RECESS Gr. 1.**



*Fig. 1. Rear panel CONCORDE with screws (a, b), service openings (c), fittings (d) and the potentiometers (X1, P1-P5) and board positions.*

1. Disconnect the CONCORDE from mains power.
2. Position the CONCORDE backwards on a table.



3. On the rear panel of the CONCORDE loosen (do not remove!) the 2 screws indicated as 'a' in Fig. 1. Remove both screws indicated as 'b'.
4. Open the rear panel by pulling the top towards you.
5. The rear panel can be moved aside, without disconnecting cables, enabling access to the printed circuit boards.

**Never remove boards while mains power is on this may cause serious damage to electronics.**

From top to bottom there are six board positions: Electrode board, spare, CPU board, oven board, I/O board, spare (Fig. 1).

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. If necessary, removal of boards is best done from top to bottom.

## **2.2 Disassembling power supply board**

The power supply board can be accessed from the bottom of the CONCORDE.

1. Disconnect the CONCORDE from mains power.
2. Turn the detector on its side and remove the bottom plate.
3. Disconnect the power supply board from the bottom plate.

## **3. Assembling**

### **3.1 Assembling of rear panel**

**Always use a correct fitting screwdriver for example PHILLIPS RECESS Gr. 1.**

Do not attempt to overtighten, 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.

1. Disconnect the CONCORDE from mains power.
2. Restore all boards, wiring and connectors and check for proper installation.
3. Place both fittings (Fig. 1d) in the bottom panel and gently put the rear panel in place. **Be careful not to damage cables and make sure all connectors are in place.**
4. Tighten screws (b) indicated in Fig. 1.
5. Tighten screws (a).

### **3.2 Assembling power supply board**

The power supply board can be accessed from the bottom of the CONCORDE.

1. Disconnect the CONCORDE from mains power.
2. Turn the detector on its side.
3. Mount the power supply board to the bottom plate.
4. Connect each brown wire to the screw connector block at the 24V positions (see page 35).

5. Connect the yellow wire to the screw connector block at the 'ground' symbol position (see page 35).
6. Put the connector in JP1 (see page 35).
7. Install the bottom plate in the CONCORDE bottom.

## 4. Entering the service mode

**This description is functional from software release 3.02 and higher.**

The service mode can be accessed by switching on the CONCORDE while pressing (keep button pressed!) the enter button (■). The Service mode main screen will be displayed.

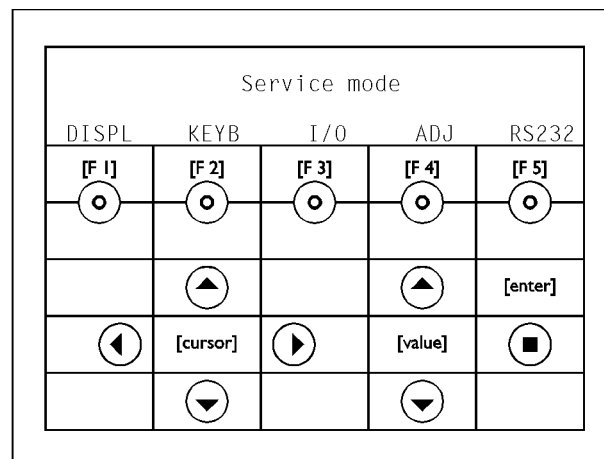


Fig. 2. Keyboard of the CONCORDE.

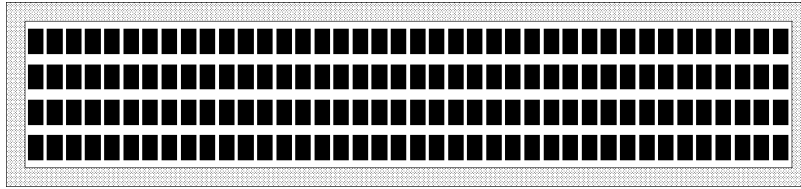
To leave the service mode: switch off, wait 10 s, and switch on the CONCORDE.

**Always wait at least 10 seconds between switching off and on the CONCORDE.**

**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 rear panel as described.
2. Switch on the CONCORDE.
3. Adjust the display contrast to your convenience with potentiometer X1 on the CPU-board (see Fig. 1).
4. Assemble the rear panel as described.

#### 4.2 Keyboard test (KEYB)

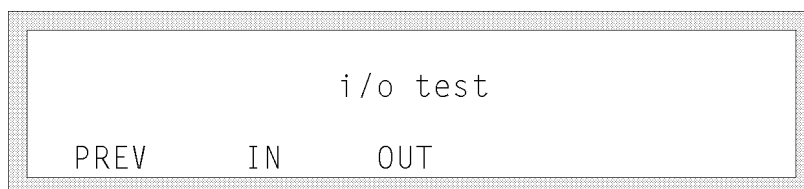
This screen enables you to test all keyboard keys.

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 enter key after which the Service mode main screen is displayed.

**This test requires that the keys are activated in the order displayed.**

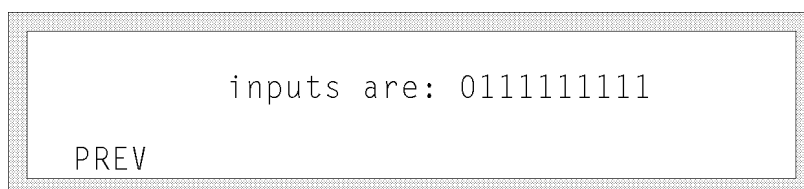
If it is impossible to pass a certain key the keyboard control on the CPU board, the flat cable (see wiring diagram) or the corresponding connections are faulty.

### 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.

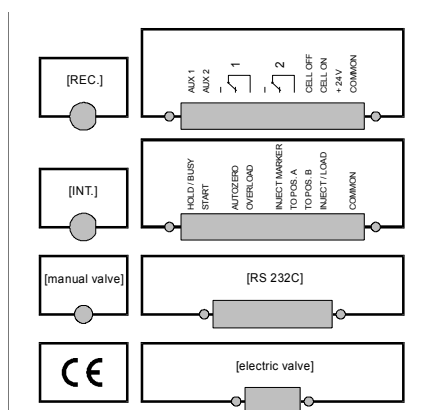
#### 4.3.1 Input test (IN)



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.



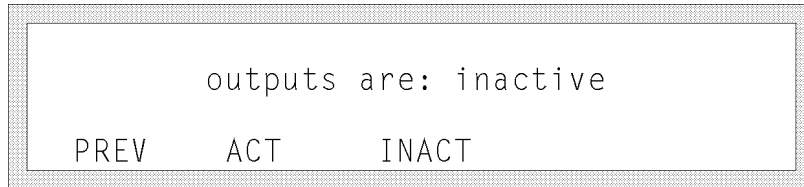
*Fig. 3. Rear panel of the CONCORDE*

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. The sensor is located on the inside of the doorpost, and is activated by a small metal strip at the doorhandle. Check this function by opening and closing the oven door. The status for open is 1, closed is 0.
- 2+3. **Only functional if electric valve option is installed.** Control signals from electric valve. 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 valve changes from LOAD (01) to INJECT (10) or vice versa. For more information about the electric valve refer to the corresponding manual.
4. Inject/load in-output. Corresponds with 'manual valve' and pin no. 10 on lower rear panel strip. Check this function by giving a low (common) input, short-circuit 'manual valve' input or by switching the manual valve. A low (common) input, a short-circuit on manual valve input, or switching the manual valve 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 an 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  $5V \pm 0.5V$ , inactive  $0V \pm 0.5V$ .**
- 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  $24V \pm 0.5V$ , inactive  $0V \pm 0.5V$ .**
- 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.

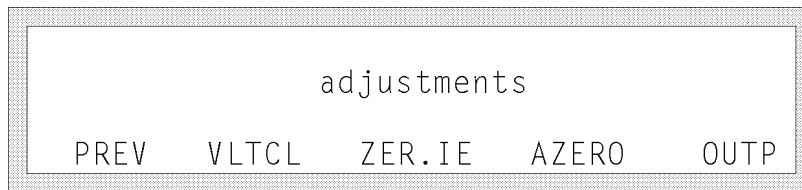
- |                                                     |                       |
|-----------------------------------------------------|-----------------------|
| 1. Press F3 (INACT):                                | Outputs are: inactive |
| 2. Connect a voltmeter as described in method A.    |                       |
| 3. Pin no.7 rear panel lower strip (INJECT MARKER): | $5V \pm 0.5V$         |
| 4. Pin no.5 rear panel lower strip (OVERLOAD):      | $5V \pm 0.5V$         |
| 5. Pin no.1 rear panel lower strip (HOLD/BUSY):     | $5V \pm 0.5V$         |
| 6. Connect a voltmeter as described in method B.    |                       |
| 7. Pin no.1 rear panel upper strip (AUX 1):         | $0V \pm 1V$           |
| 8. Pin no.2 rear panel upper strip (AUX 2):         | $0V \pm 1V$           |
| 9. Connect an Ohmmeter as described in method C.    |                       |
| 10. Between pin no.4 and 5 rear panel upper strip:  | $0\Omega \pm 2\Omega$ |



|                                                      |                            |
|------------------------------------------------------|----------------------------|
| 11. Between pin no.3 and 5 rear panel upper strip:   | $>10\text{M}\Omega$        |
| 12. Between pin no.7 and 8 rear panel upper strip:   | $0\Omega \pm 2\Omega$      |
| 13. Between pin no.6 and 8 rear panel upper strip:   | $>10\text{M}\Omega$        |
| 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): | $0\text{V} \pm 1\text{V}$  |
| 17. Pin no.5 rear panel lower strip (OVERLOAD):      | $0\text{V} \pm 1\text{V}$  |
| 18. Pin no.1 rear panel lower strip (HOLD/BUSY):     | $0\text{V} \pm 1\text{V}$  |
| 19. Connect a voltmeter as described in method B.    |                            |
| 20. Pin no.1 rear panel upper strip (AUX 1):         | $24\text{V} \pm 1\text{V}$ |
| 21. Pin no.2 rear panel upper strip (AUX 2):         | $24\text{V} \pm 1\text{V}$ |
| 22. Connect an Ohmmeter as described in method C.    |                            |
| 23. Between pin no.3 and 5 rear panel upper strip:   | $0\Omega \pm 2\Omega$      |
| 24. Between pin no.4 and 5 rear panel upper strip:   | $>10\text{M}\Omega$        |
| 25. Between pin no.6 and 8 rear panel upper strip:   | $0\Omega \pm 2\Omega$      |
| 26. Between pin no.7 and 8 rear panel upper strip:   | $>10\text{M}\Omega$        |

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.

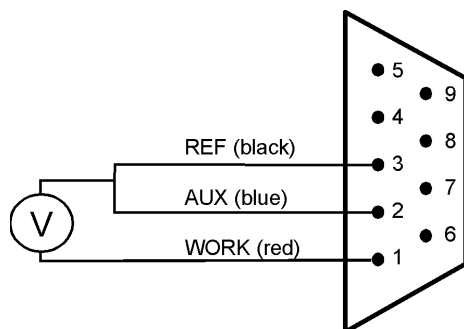
- F2 (VLTCL)      the voltage clamp circuitry test/adjustment
- F3 (ZER.IE)     the current to voltage converter circuitry test/adjustment
- F4 (AZERO)      the autozero circuitry test/adjustment
- F5 (OUTP)       the output voltages test/adjustment

**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 Fig. 1). If any of these test/adjustments fail the source of the problem is most likely on the electrode-board (or its corresponding connections).

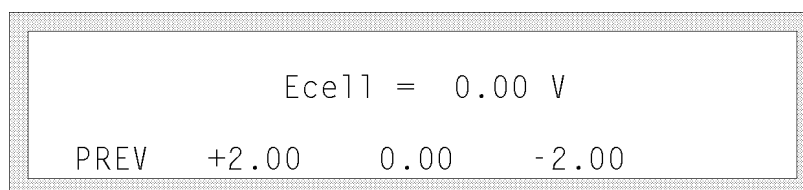
**Prior to pressing F2 (VLTCL) connect a voltmeter as illustrated in Fig. 4.**

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



*Fig. 4. Connection of the voltmeter to the female connector in the CONCORDE 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 specifications as described below:

1. Press F2 (+2.00) U meter:  $+2.00\text{V} \pm 1\text{mV}$
2. Press F3 (0.00) U meter:  $0.00\text{V} \pm 0.1\text{mV}$
3. Press F4 (-2.00) U meter:  $-2.00\text{V} \pm 1\text{mV}$

If these values are within specifications the voltmeter can be disconnected **after leaving this screen i.e. pressing F1 (PREV)**.

When no voltage, or a voltage  $>2.5\text{V}$  is detected the voltage clamp circuitry on the electrode-board or its corresponding connections are faulty.

For adjustment see description below.

1. Press F2 (+2.00)
2. With P3 (see Fig. 1) adjust the voltmeter readout to  $2.00\text{V} \pm 1.00\text{mV}$
3. Press F3 (0.00)
4. With P2 (see Fig. 1) adjust the voltmeter readout to  $0.00\text{V} \pm 0.10\text{mV}$
5. Go back to step 1 until the values are in specifications
6. Press F1 (PREV) and disconnect the voltmeter.

#### 4.4.2 The current/voltage converter (ZER.IE)

|                        |      |   |    |       |
|------------------------|------|---|----|-------|
| Temp = 30 Range = nA   |      |   |    |       |
| Gain = 1 Value = +0001 |      |   |    |       |
| PREV                   | READ | 1 | 10 | RANGE |

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 specifications may not be reached!

F3 (1) and F4 (10) changes the internal amplification. F5 (RANGE) toggles between pA, nA and  $\mu$ A 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 these values the CONCORDE 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 =  $\pm 0000 \pm 0005$
3. Press F4 (10): Value =  $\pm 0000 \pm 0010$
4. Press F5 (RANGE) until Range = pA
5. Press F3 (1): Value =  $\pm 0000 \pm 0010$
6. Press F4 (10): Value =  $\pm 0000 \pm 0030$
7. Press F5 (RANGE) until Range =  $\mu$ A
8. Press F3 (1): Value =  $\pm 0000 \pm 0005$
9. Press F4 (10): Value =  $\pm 0000 \pm 0010$

If values are out of specifications proceed as follows:

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

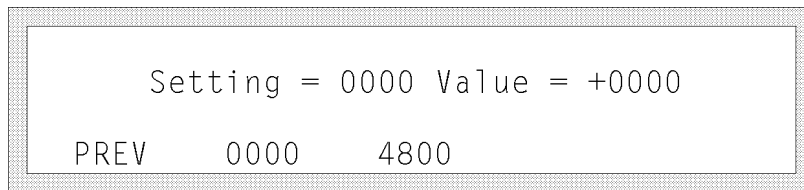
Now re-check all ZER.IE values. If not in specifications adjustment is required.

**1. Adjustments are automatically done at 30°C. The system temperature is very important.**

2. Press F5 (RANGE) until   Range = nA
3. Press F3 (1):               Gain = 1
4. Press F2 (READ):         Value =  $\pm 0000 \pm 0001$
5. Press F4 (10):             Value = xxxx
6. Adjust the value with P4 (see Fig. 1) to  $\pm 0000 \pm 0001$
7. Repeat step 3 to 6 until values are in specifications

If the ZER.IE values are still out of specifications 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 these values the CONCORDE must be on in the above screen for at least 30 min.**

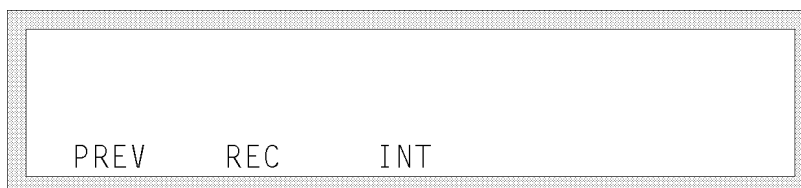
1. Press F2 (0000) Value =  $\pm 0000 \pm 0005$
2. If this Value is out of specifications refer to ZER.IE check/adjustment.
3. Press F3 (4800) Value =  $+4800 \pm 0010$

If this value is out of specifications adjustment is required:

Adjust to  $+4800 \pm 0010$  with P1 (see Fig. 1).

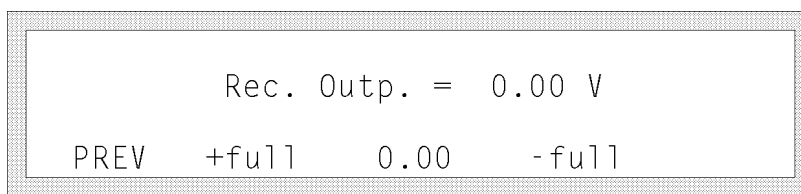
If the AZERO values are still out of specifications the I/E converter or the zero circuit on the electrode-board is faulty.

#### 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 rear panel of the CONCORDE.

Checks are performed as described below.

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

If these values are within specifications 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.

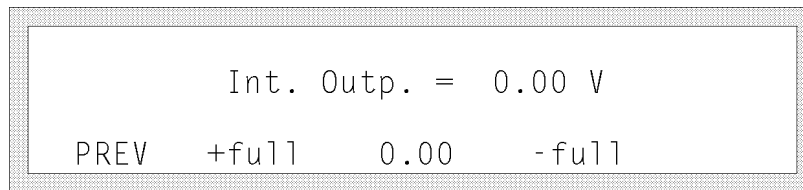
1. Press F2 (+full)    Rec. Outp. = +1.00V
2. Adjust the voltmeter readout with P5 (see Fig. 1) to  $+1.00V \pm 0.05V$

If the values are still out of specifications 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 bottom side of the motherboard. To get access to this jumper first remove all other boards from top to bottom.



#### 4.4.4.2 Integrator output test (INT)



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 rear panel of the CONCORDE.

Checks are performed as described below.

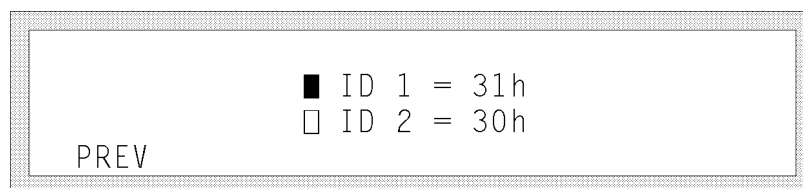
- |                    |          |                     |
|--------------------|----------|---------------------|
| - Press F3 (0.00)  | U meter: | 0.00V $\pm$ 0.05V   |
| - Press F4 (-full) | U meter: | -10.00V $\pm$ 0.50V |
| - Press F2 (+full) | U meter: | +10.00V $\pm$ 0.50V |

If these values are within specifications the voltmeter can be disconnected.

If these values are out of specifications 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 or its corresponding connections (see wiring diagram) are faulty.

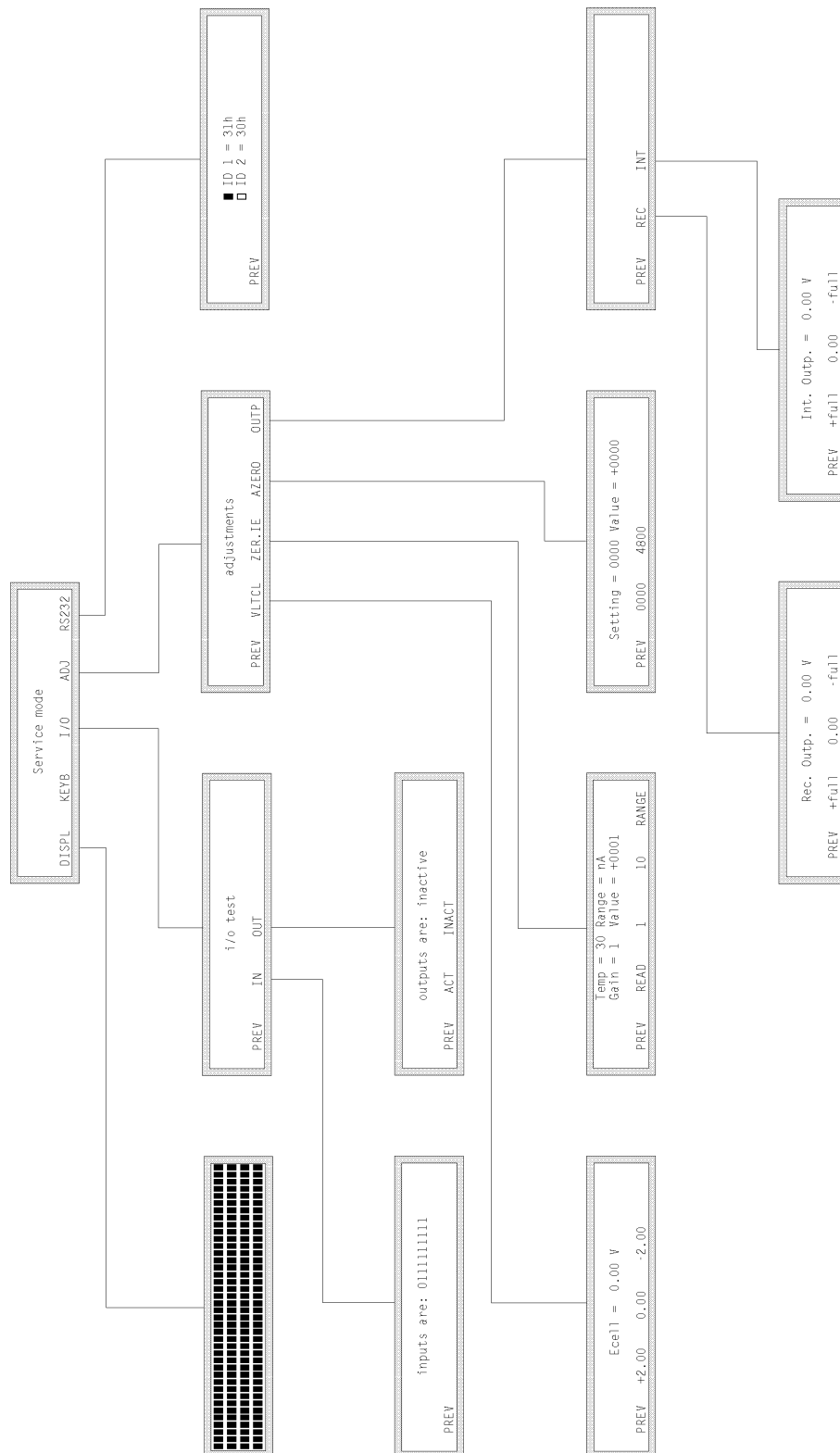
#### 4.5 RS232



In this screen the device identifier i.e. ID 1, ID 2, can be user defined.

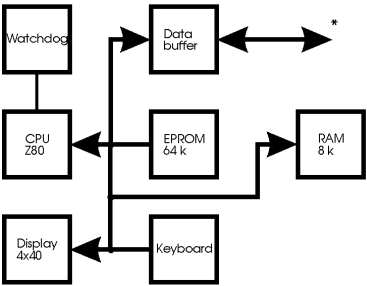
Default values are: ID 1=31, ID 2=30 (both hexadecimal). For any necessary testing on the RS232C communication port refer to the normal mode or the RS232C communications protocol. The electronic schematics for the RS232C port driver are included in the I/O-board circuit.

## 5. Overview of all service mode screens

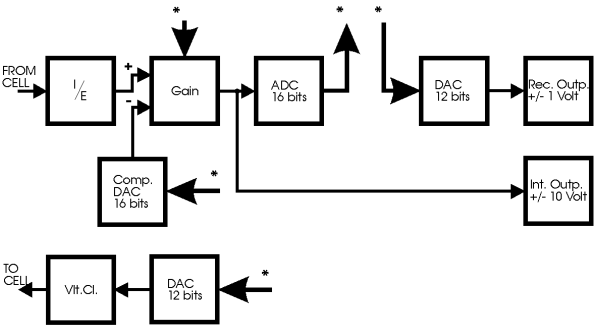


6. Block diagrams

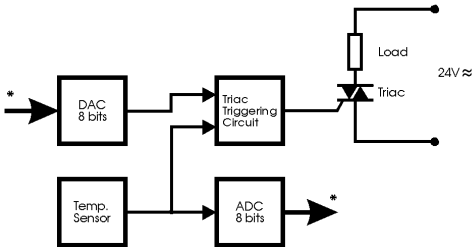
CPU-board



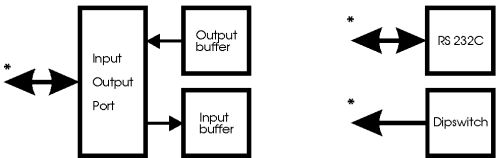
Electrode-board



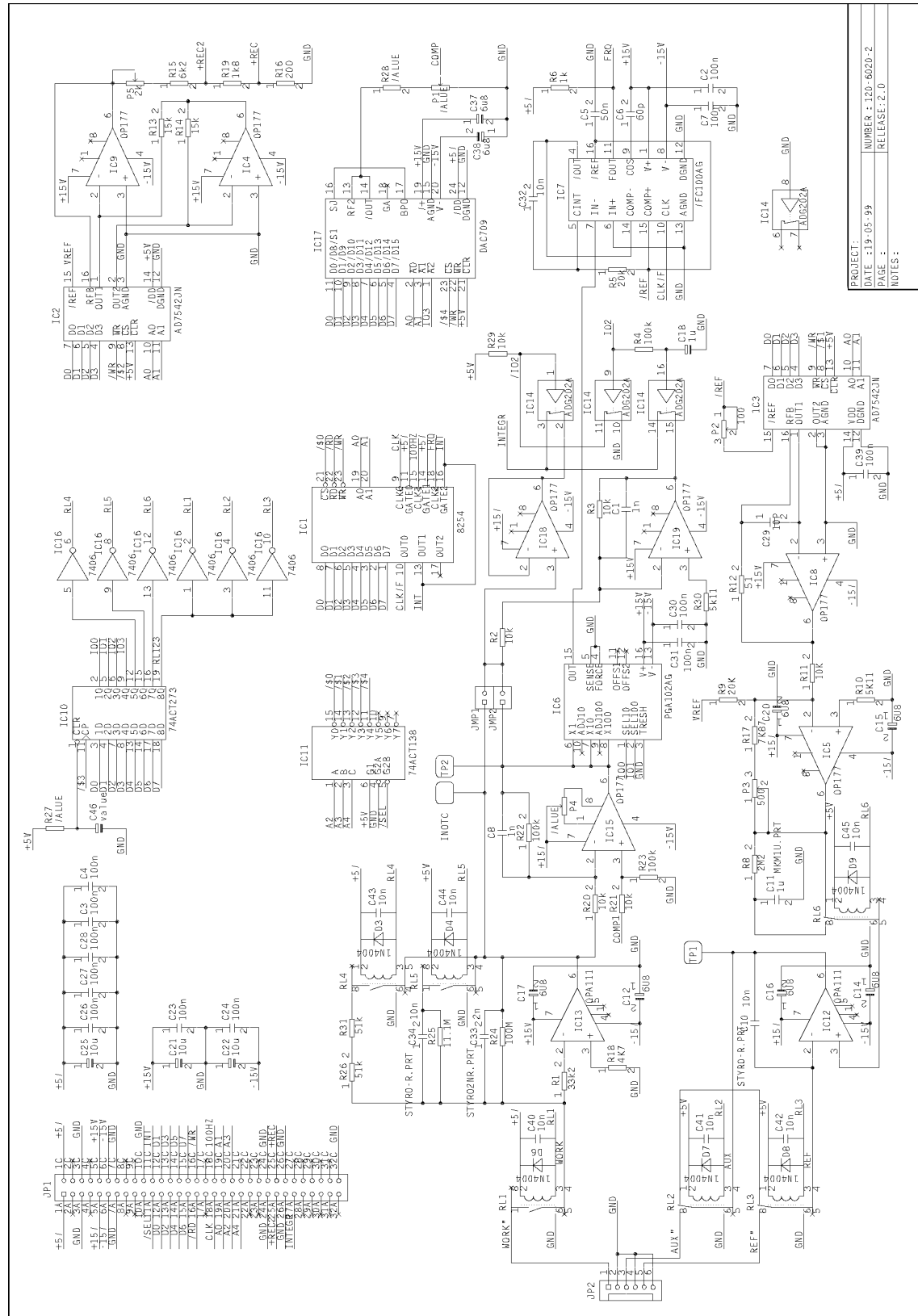
Ovencontrol-board



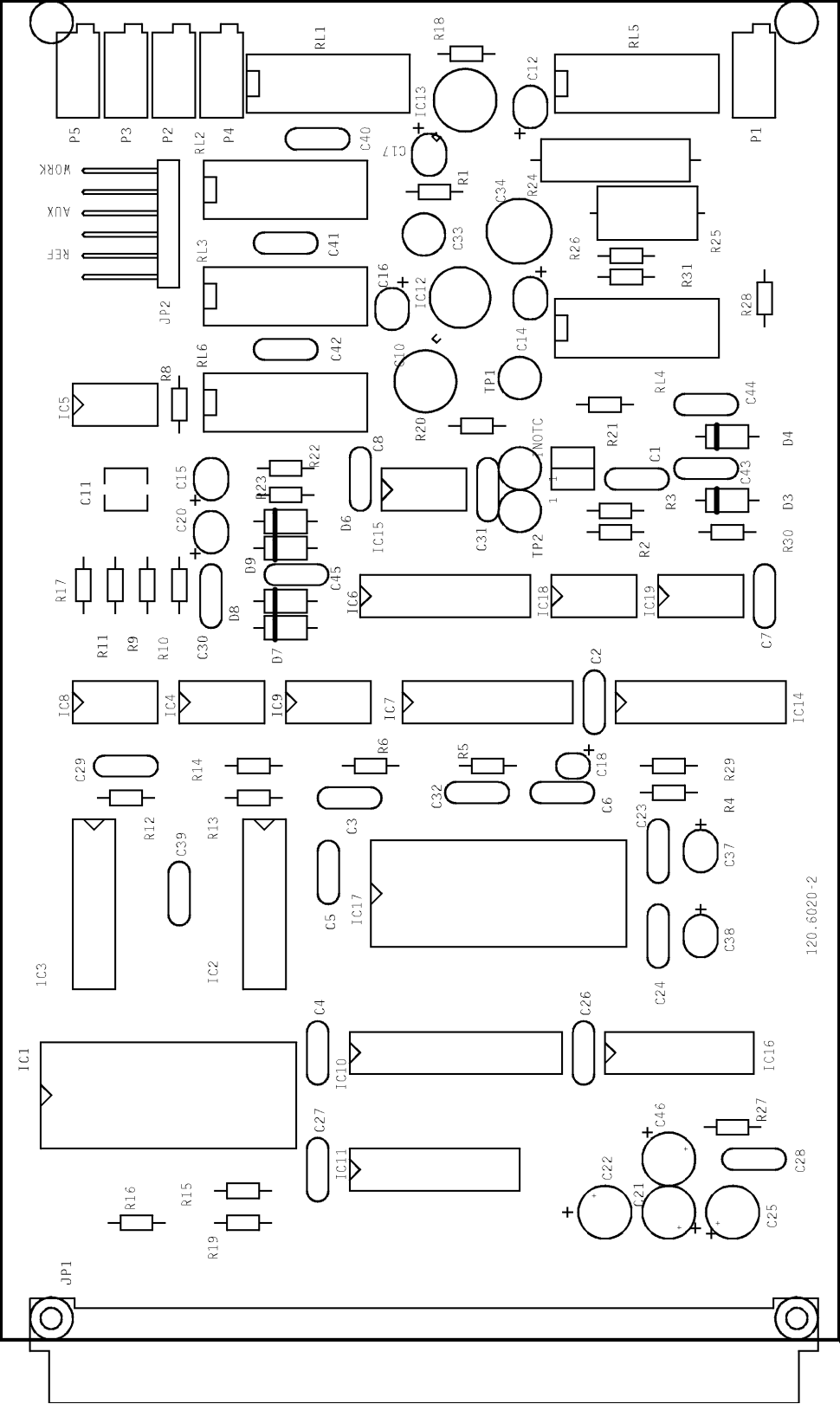
I/O-board



## 7. Electrode board circuit

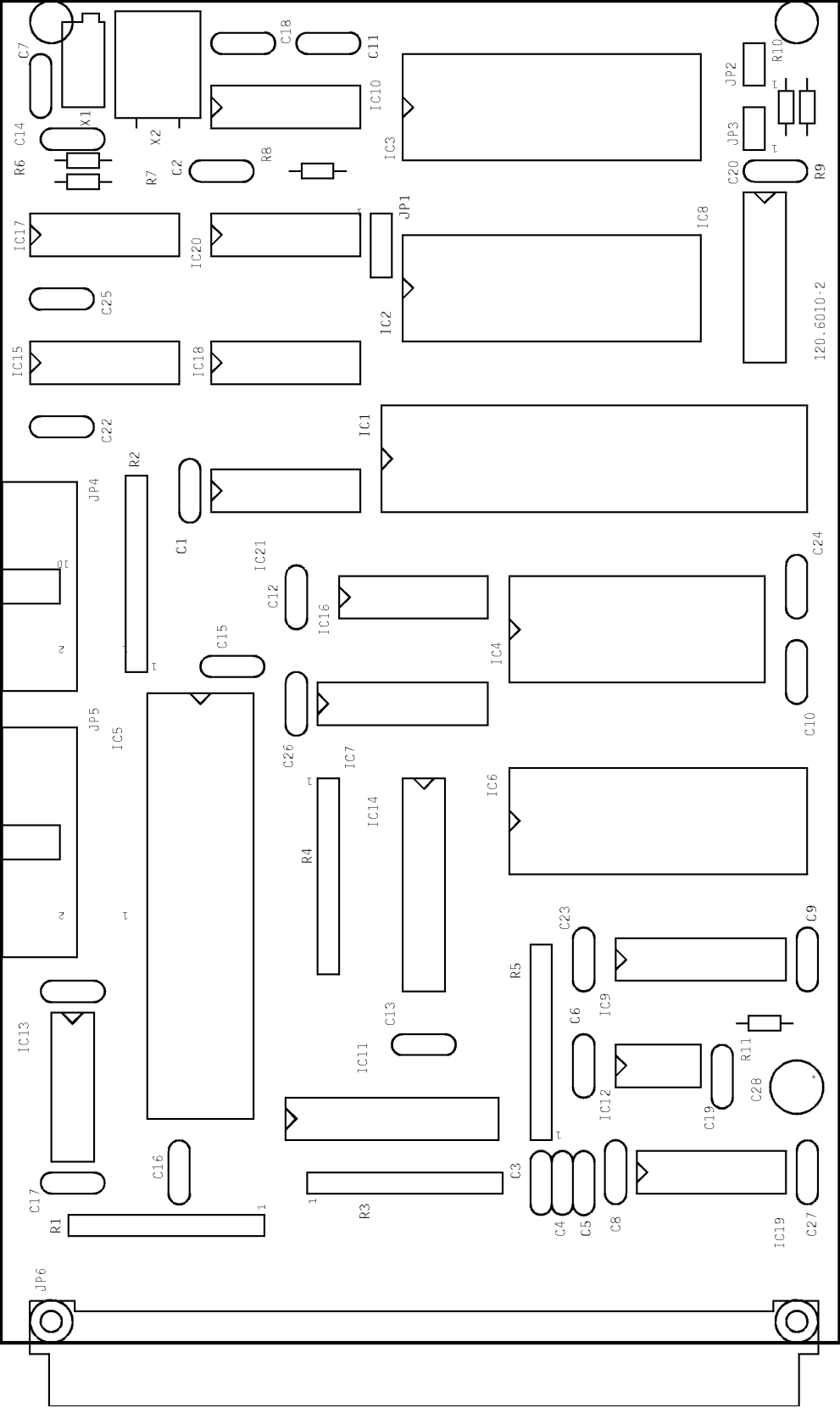


8. Electrode board layout

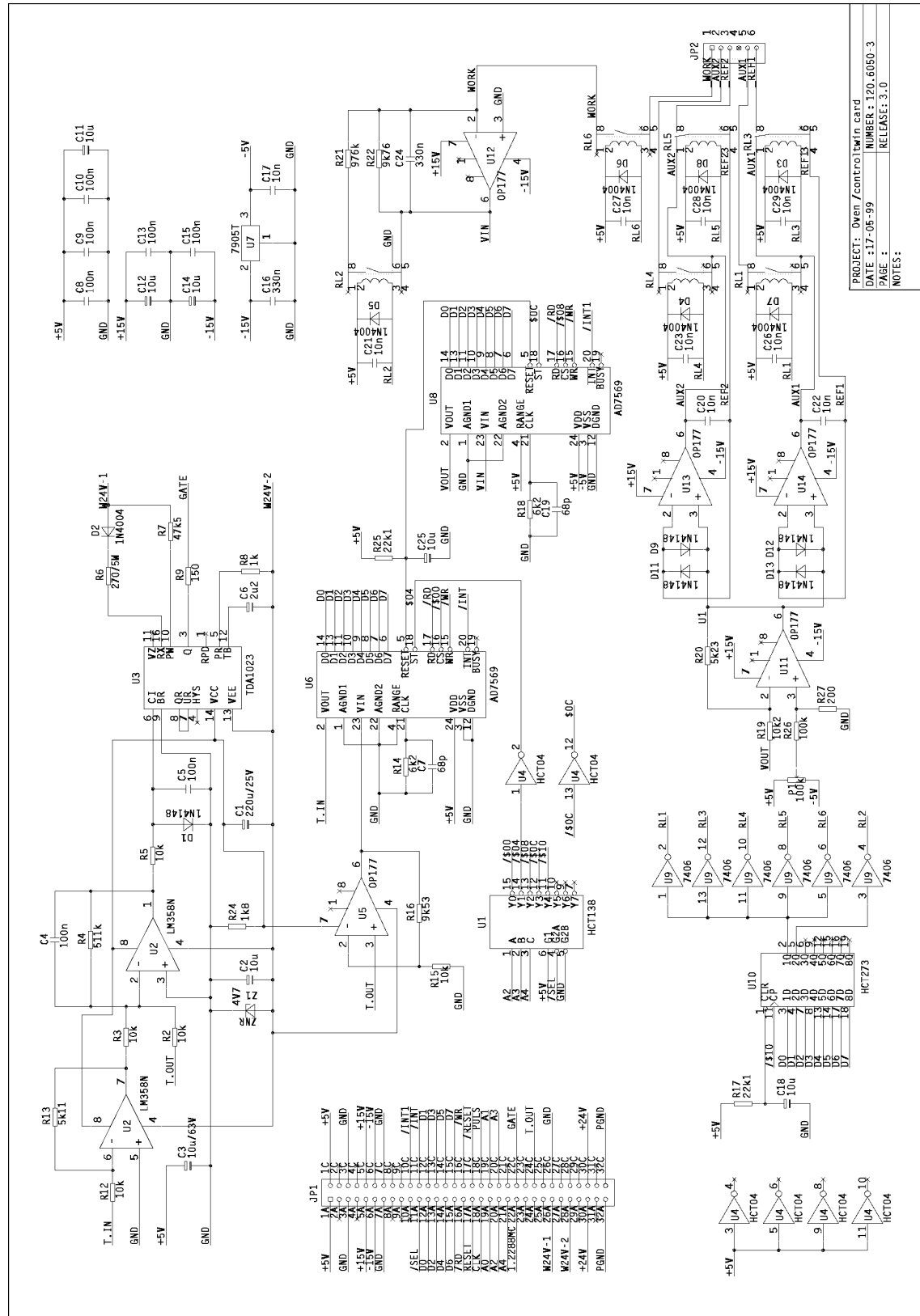




10. CPU-board layout

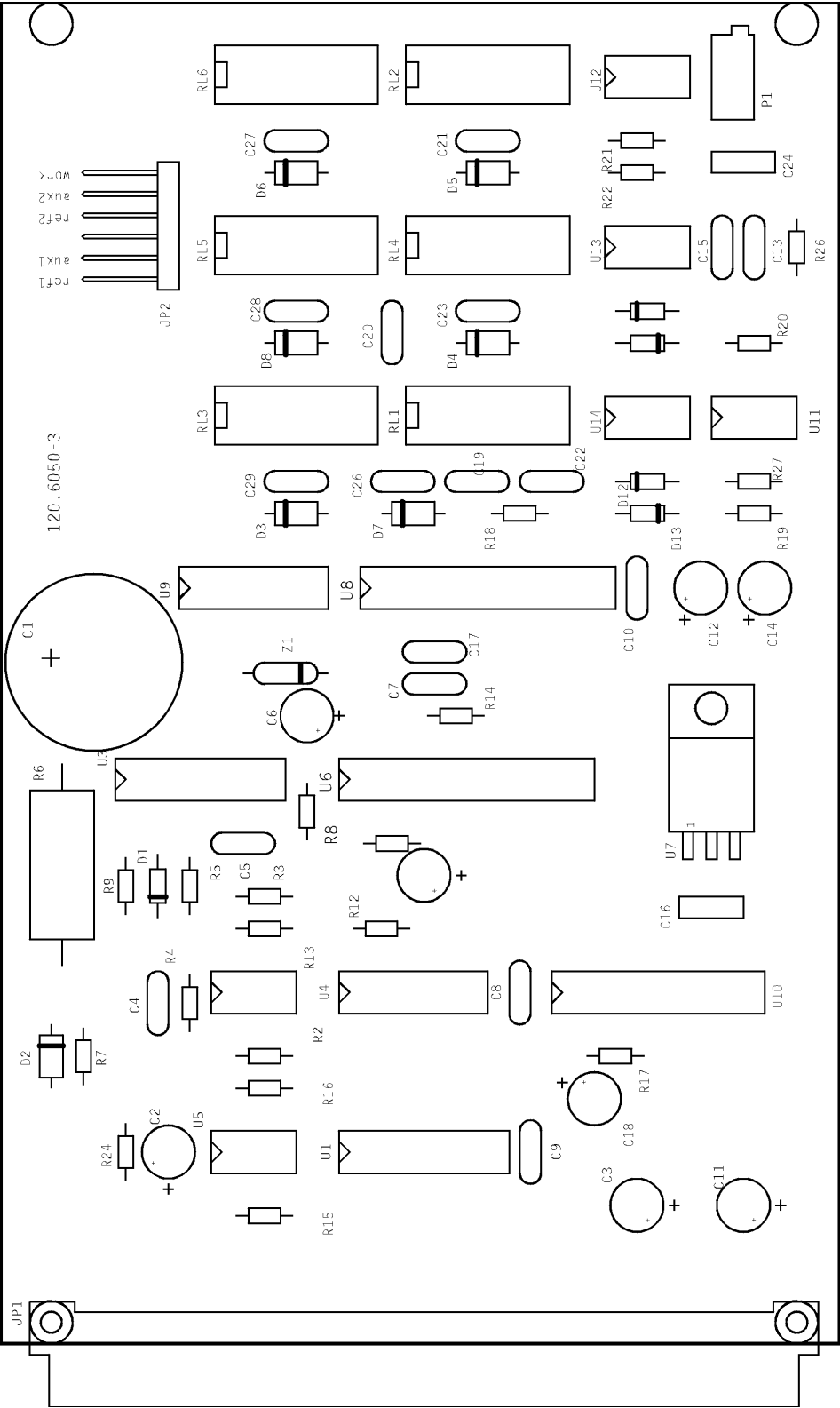


# 11. Oven control board circuit



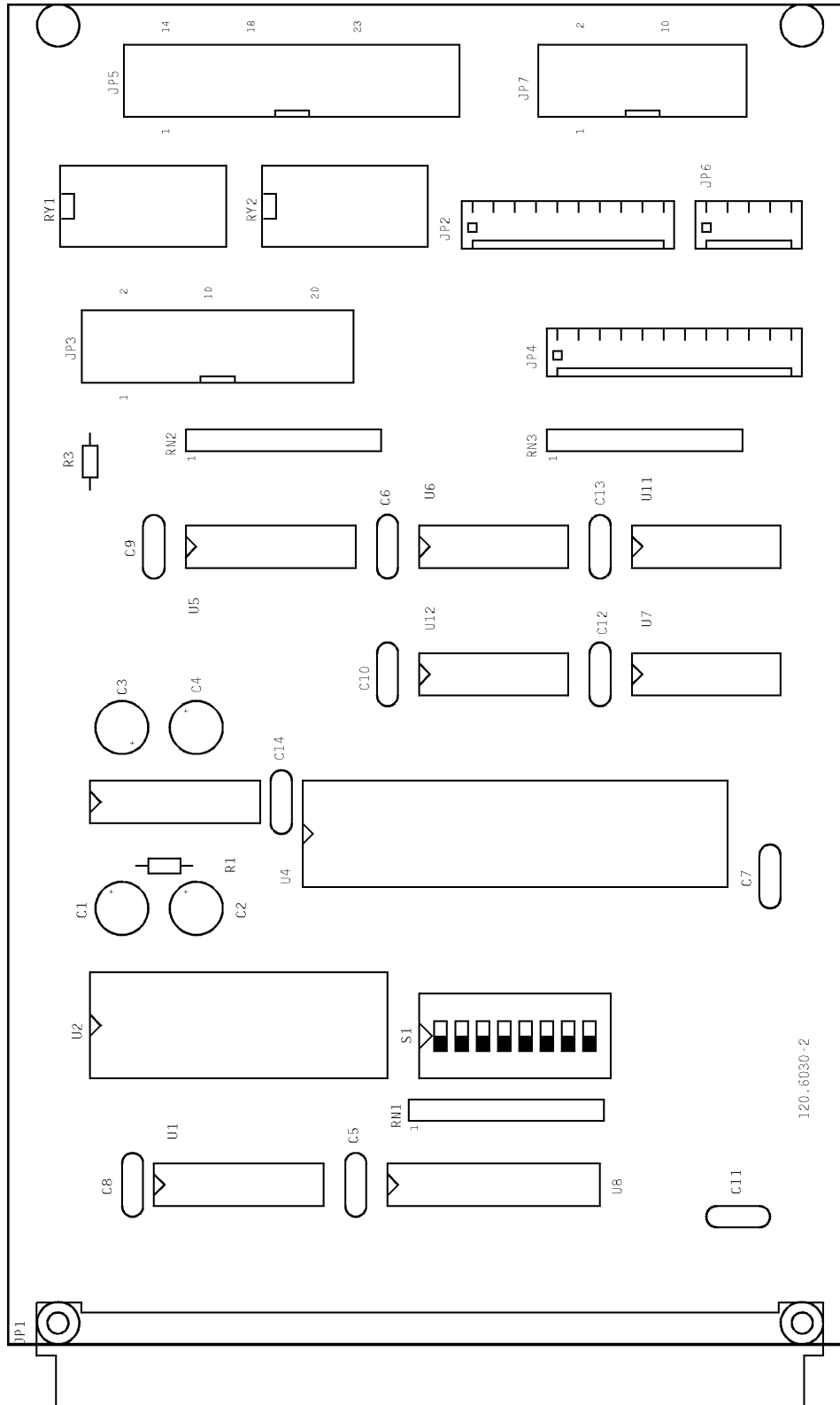


12. Oven control board layout

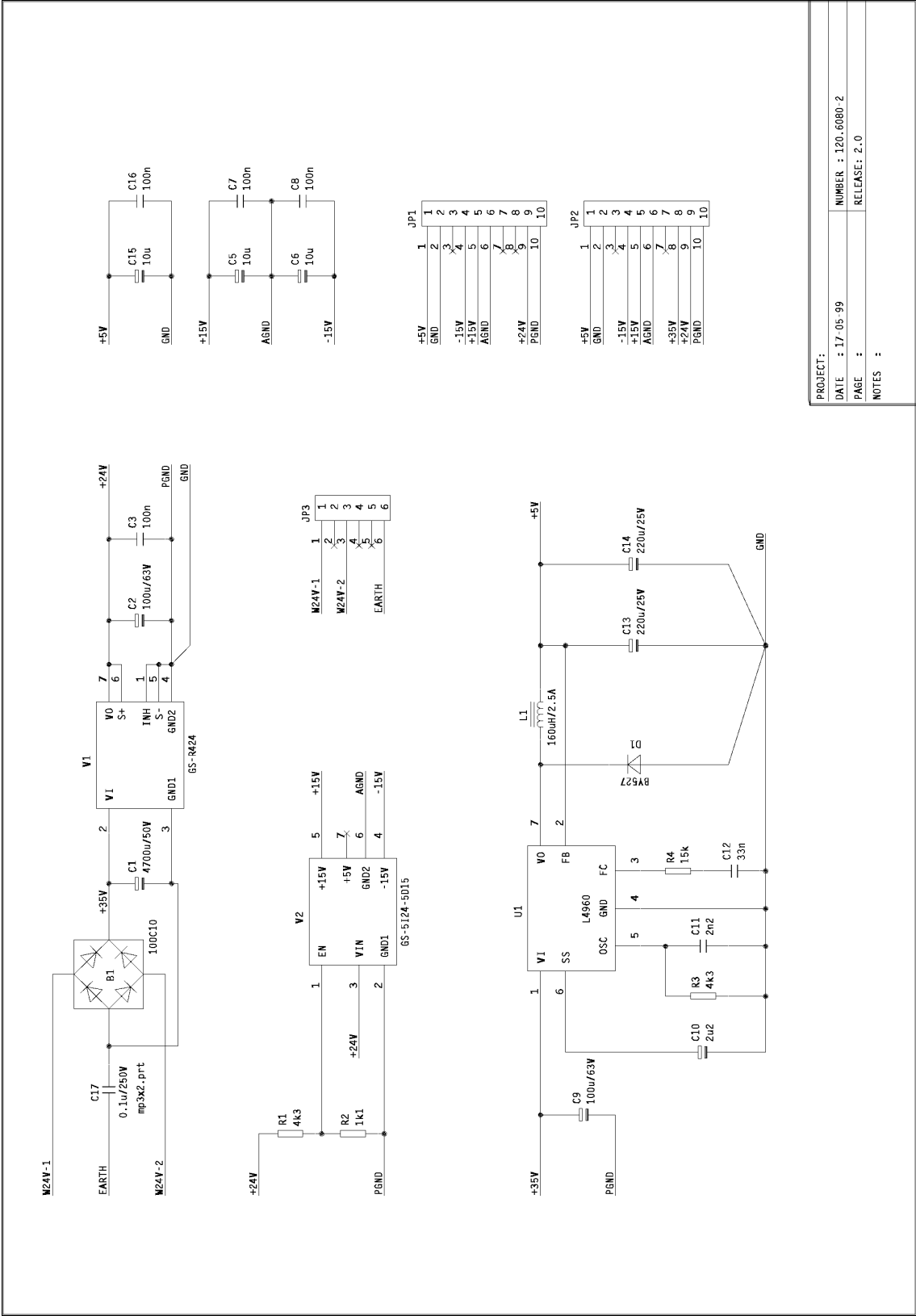




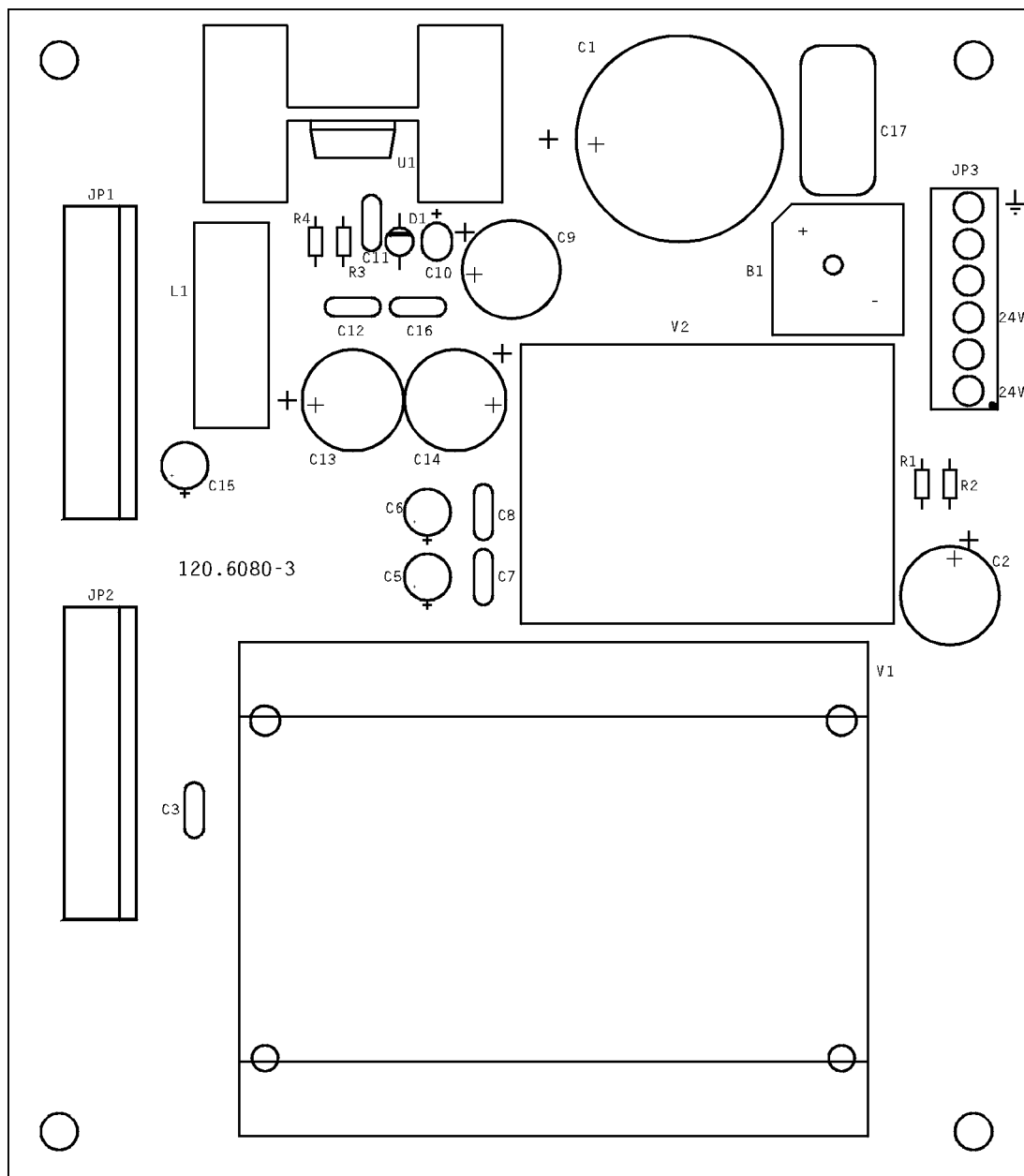
## 14. I/O-board layout



15. Power supply board circuit

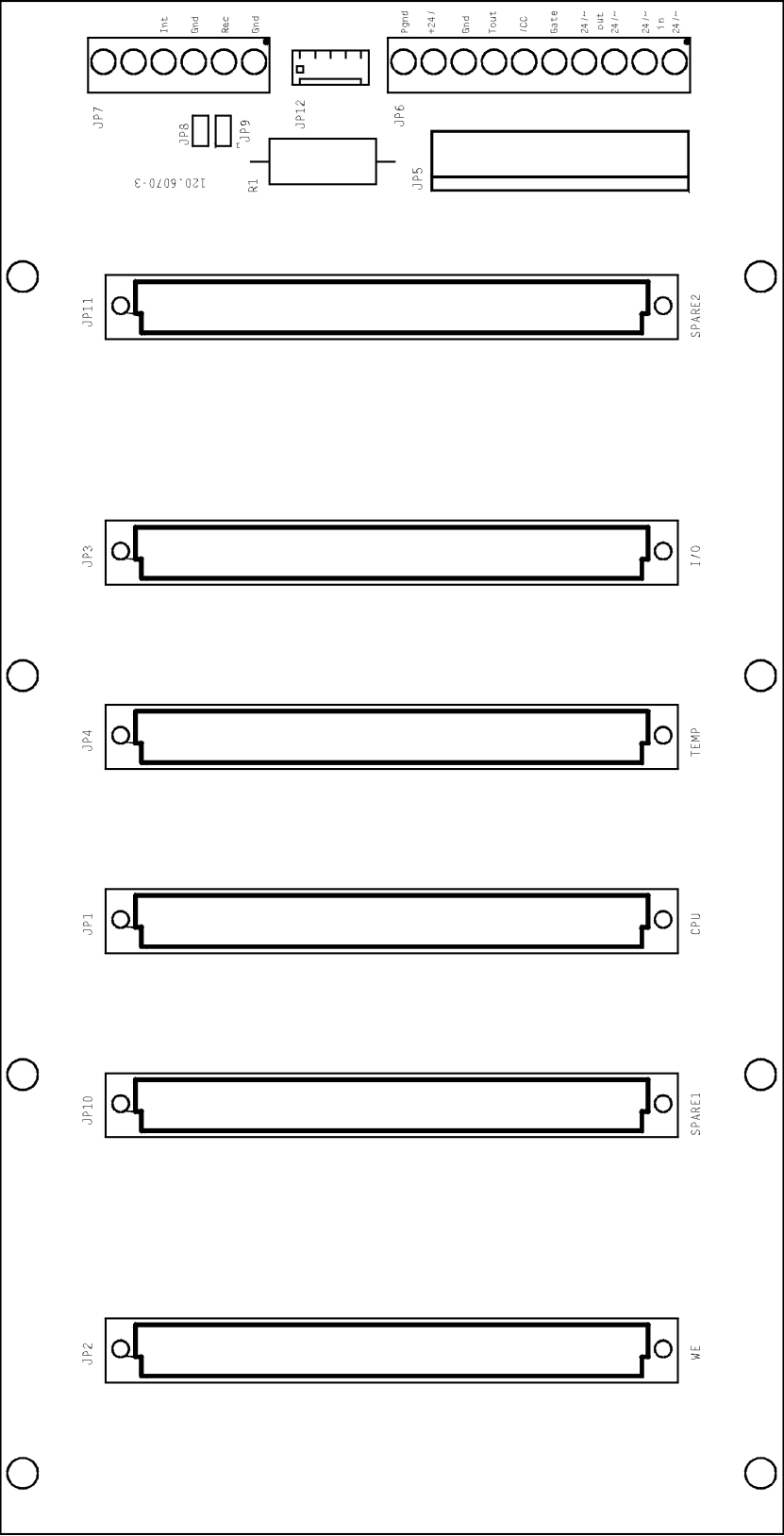


## 16. Power supply board layout





18. Motherboard layout



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