

General Information, REC

Overview

Introduction This section gives some general information about the REC recorder.

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General Information

Introduction

REC is a digital printer for real time and/or histogram recordings on thermo sensitive paper.

REC is designed for TCM3 and OXI recordings (not TCM30). The printer automatically distinguish between tc and saturation monitoring, and it automatically records the primary parameters $p\text{CO}_2$ and $p\text{O}_2$ (TCM3)/ SaO_2 and pulse rate (OXI) as curves, and secondary parameters such as time, temperature, calibration information and paper speed as alpha-numerical characters.

Data transfer from the monitor to REC is performed in serial mode via a multiple core cable.

REC is powered by 12 VAC which is supplied from the monitor by the same cable that is used for data transmission.

If REC is recording data from TCM3s below RUN 22, it is necessary to power the recorder from its "own" mains adapter via the rear panel AC-input plug.

The recorder's front panel includes two keys:

- Paper speed selection key (2, 5 or 10 mm pr. minute)
- Paper feed key

REC exists in two versions. One for real time recordings and one for real time and/or histogram recordings.

Via a configuration program, included in the software, the recorder can be setup to seven different languages (English, German, French, Spanish, Italian, Russian, Swedish and Danish).

The configuration program, which is called by pressing the paper feed key for 10 seconds, also includes steps for selection between linear and non-linear axis, calibration curve recordings (TCM3 only), and selection between real time and/or histogram recordings (histogram recordings requires histogram software).

For a detailed information, please refer to user manuals for the monitors.

On its right, REC has two lock-screws for snap-on attachment to OXI and TCM3 (for TCM3 from production RUN 22 only).

Software

REC is computer controlled and the software primarily takes care of the following functions:

- Thermal printer control
- Front panel LED and key control
- Reading of alpha-numerical characters from the monitor

The program memory includes a test program for checkout and adjustment of the recorder. For further details refer to "Test Procedures".

Continued on next page

General Information, *Continued*

Hardware

The thermal printer is an Olivetti 2040 20 character printer for printing curves and alpha numerical characters on 80 mm thermo-sensitive paper.

The electronics is mounted on four PCBs.

The Printer Control PCB includes the power supply, the motor control circuit, the control circuit for the 20 position printing head, test points for checkout and adjustments, and the alarm output circuit.

The Display PCB includes four LEDs and two keys.

The Connector PCB includes the necessary connectors and flat-cables for interfacing the thermal printer with the printer control PCB.

The Computer PCB includes the microcomputer NSC 800 with its peripherals.

Specifications

Dimensions

Height 8 cm

Width 12 cm

Depth 23 cm

Weight 1.9 kg

Paper speeds (selected via the front panel)

2 mm/min., 5 mm/min., or 10 mm/min.

Power requirements

12 - 15 VAC through recorder cable or 100/120/220/240 VAC through appropriate mains adapter.

Consumption: Typically 2 VA.

Alarm output

Open collector switch. Max. load 24V/250 mA



Test Procedures, REC

Overview

Introduction This section details the procedures for testing and adjusting REC. For each of the paragraphs the required tools for testing are listed.

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Introduction

This section describes the necessary procedure for checking and adjusting the REC

Repairs to REC is made only by replacing spare parts listed in the Spare Parts section. Defective PCBs, which are returned to RADIOMETER for exchange. This is to ensure patient and functional safety.

RADIOMETER recommend a yearly preventive maintenance checkout.

Checkout and Adjustment

To carry out the checkout and adjustment procedure, the following tools are necessary:

- 4 1/2 digit True RMS Digital Voltmeter, (the Fluke 8060A is recommended). The accuracy in the DC voltage ranges must be equal to or better than 0.05% + 2 digits.
- Adjustment tool for the trimming potentiometers.
- 5 mm wrench for adjusting the tacho disk.

The Checkout and Adjustment procedure is based on the test software included in the REC program memory.

The test program is called by switching on the REC while the two front panel keys are depressed simultaneously.

The test software includes 6 program steps which are identified by the front panel LEDs.

The LED combination for each program step is shown in the left margin.

The paper feed key is used to step through the test program.

Note

It is recommended to load the mains adapter by the monitor to prevent an overvoltage to influence the checkout and adjustment procedure.

Test Procedures

Self-test

In this step a self-test of the RAM, EPROM, EEPROM, and peripherals is carried out.

Step	Action	Front Panel LEDs
1.	Connect the power to the recorder while the two front panel keys are depressed simultaneously. All 4 LEDs are activated.	● ▶ ▶ ▶ ▶
2.	Wait approximately 20 seconds for the self-test to finish. The test program proceeds automatically to the next step.	

Printing Pulse

This procedure is used for adjusting the printing pulse.

Step	Action	Front Panel LEDs
1.	Connect DVM+ to TP3 and DVM- to TP1. Ensure that the DVM is a TRUE RMS type.	● ▶ ▶
2.	Check that the average value of the pulse signal (DVM in the DC voltage range) is 3.30 ± 0.01 V. If outside, adjust R138 on the Printer Control PCB to 3.300 ± 0.005 V.	
3.	Press the paper feed key to proceed to the next program step.	

Motor Amplifier Feed Back

This procedure is used for adjusting the feed back to the motor amplifier.

Step	Action	Front Panel LEDs
1.	Check that the motor is running and that paper is mounted.	● ▶
2.	Connect DVM+ to TP4 and DVM- to TP1 and check that the voltage is approximately 1.30 to 1.40 V. The DVM reading is difficult as the voltage changes during the check. If outside, adjust R126 on the Printer Control PCB to approximately 1.30 V.	
3.	Press the paper feed key to proceed to the next program step.	

Continued on next page

Test Procedures, *Continued*

Automatic Motor Speed

The test program now automatically adjusts the motor speed to 5 micro lines pr. second corresponding to 400 ms between each line interrupt. When the adjustment has been finished, the necessary D/A converter data input is stored in the EEPROM, the motor stops and the stored data is printed on paper as a decimal number.

Step	Action	Front Panel LEDs
1.	Press the paper feed key to proceed to the next program step.	● ▶

Printing Voltage and Tacho Disk

This procedure is used for adjusting the printing voltage and the mechanical position of the tacho disk.

Step	Action	Front Panel LEDs
1.	Connect DVM+ to TP8 and DVM- to TP1 on the Printer Control PCB. Check that the voltage is 17.6 ± 0.4 V. If necessary, adjust R111 on the Printer Control PCB to 17.6 ± 0.4 V.	● ▶
2.	Check that the 3 lines printed on the middle of the paper are straight and regular. If necessary, loosen the tacho disk by a 5 mm wrench and adjust the disk. Fasten the tacho disk after the adjustment.	
3.	Press the paper feed key to proceed to the next program step.	

Test Printout

This procedure generates a printout including the character set and the software version.

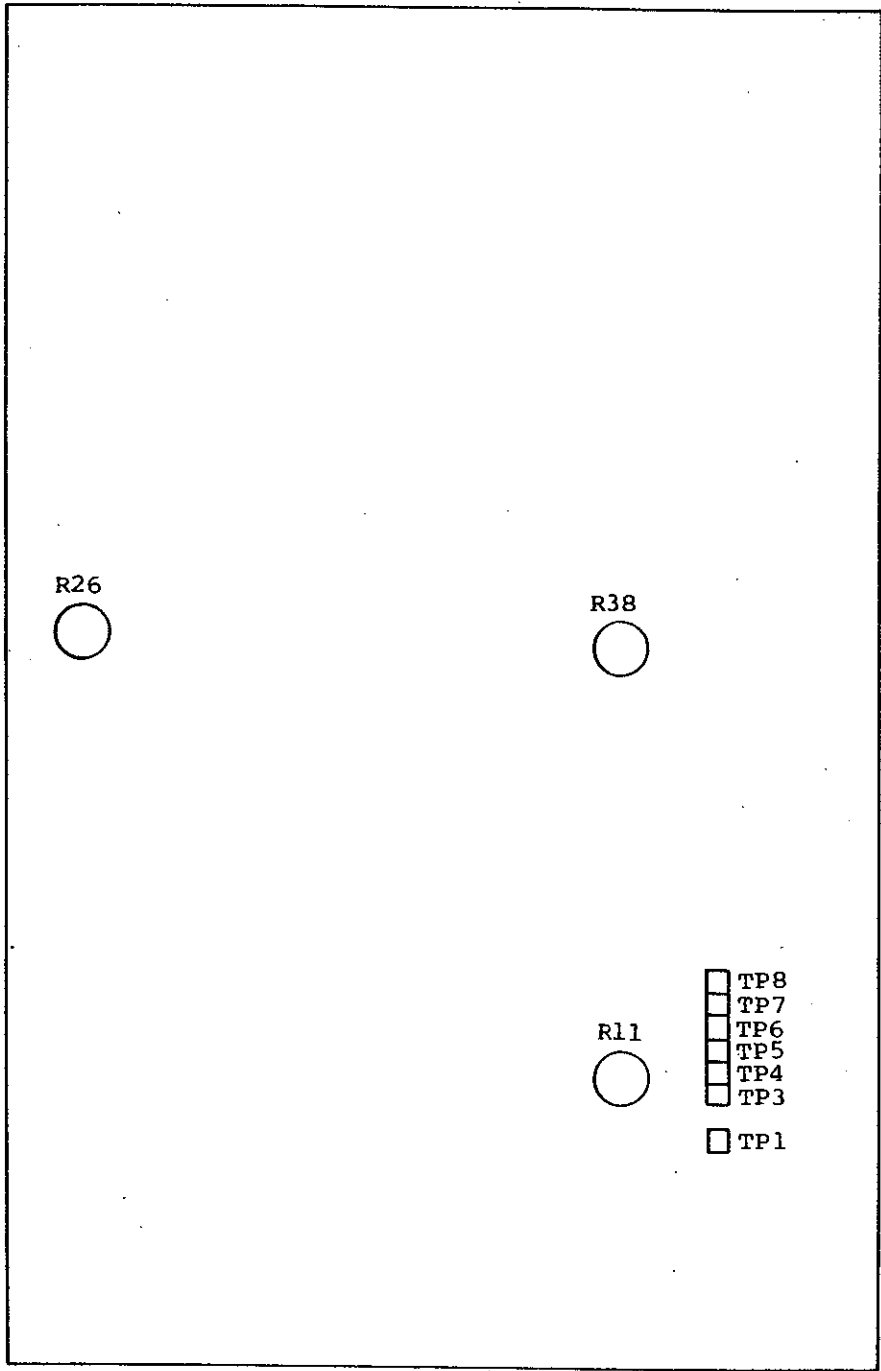
Step	Action	Front Panel LEDs
1.	Check that the alpha numeric character set and the software version number is printed on paper.	● ▶ ▶
2.	The checkout and adjustment procedure except the self-test can be repeated by pressing the paper feed key.	

Error Codes

Error Indications

The table below lists the error codes which is a combination of flashing LEDs. The table also lists the corresponding causes and corrective actions.

Error Code	Cause	Corrective Action
●	Paper run out	Mount a new paper roll
● ▶	Parallel port error	If the error code remains activated after the recorder has been switched off and on, replace the Microcomputer PCB
● ▶▶	Serial Port error	
● ▶▶▶	RAM error	
● ▶▶▶▶	EPROM error	
● ▶▶▶▶▶	EEPROM error	
● ▶▶▶▶▶▶	Motor error	Check the DC voltage in TP4.
● ▶▶▶▶▶▶▶		Check that the DC voltage in TP7 is < 21 V
Consecutively left to right flashing LEDs	Software error	If the error code remains activated after the recorder has been switched off and on, replace the Computer PCB



TEST POINTS AND ADJUSTMENT COMPONENTS

COMPONENT SIDE VIEW

PRINTER CONTROL PC-BOARD ASSEMBLY 901-806

Dismantling and Replacement, REC

Overview

Introduction This section details the procedures for dismantling the REC and replacing parts.

Contents This section contains the following topics.

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Procedures for Dismantling and Replacements

Introduction

To dismantle and replace the various parts of the REC, the following tools are necessary:

Pozidrive screwdriver, # 0

Pozidrive screwdriver, # 1

The numbers in brackets refer to the exploded view in section 4.

Cabinet (48)

Step	Action
------	--------

- | | |
|----|--|
| 1. | Disconnect the cables and switch off the recorder. |
| 2. | Remove the paper lid (49), the rear plate (38) and the two bottom screws (19). |
| 3. | Carefully draw the cabinet from the front panel (1). |
| 4. | When replacing the cabinet, ensure that the flat-cable on the recorders' left side is not clamped. |

Do not remove the fixation screws (54) or the protection spacers (52) and (53), when dismantling the recorder.

Locking System (56-60)

Step	Action
------	--------

- | | |
|----|---|
| 1. | When attaching the recorder to the monitors TCM3 or OXI, the lock lever (56) should be released, thus preventing the recorder from sliding forward. |
| 2. | When using a TCM3 without the "keyholes" (below RUN 19), the recorder cannot be locked to the monitor and the lock-lever is redundant and can be fastened by the hex-head screw (57). |
| 3. | The lock-house (59), can be released by the four screws (60). Use the #0 pozidrive screwdriver. |
-

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Procedures for Dismantling and Replacements, *Continued*

Front Panel

Step	Action
1.	Remove the four screws attaching the fixation brackets (14) to the two aluminium chassis (21 and 31).
2.	Disconnect the PCB connector from the Printer Control PCB (18) and remove the two fixation brackets (14) by the four screws (16).
3.	Lift off the Display PCB (3) and the front part assembly (4 to 13)
4.	When replacing the entire front section (1 to 16) ensure that the 7-pole cable is not clamped.

Computer PCB

Step	Action
1.	Unscrew the four screws securing the PCB to the stand-offs (32).
2.	Unplug the flat-cable from the Printer Control PCB (18).

Printer Control PCB

Step	Action
1.	Unscrew the four screws securing the PCB to the right and left aluminium chassis (21 and 31).
2.	Unplug the cable connector (40) and the flat-cable (50) from the PCB.

Thermal Printer Unit

Step	Action
1.	Unscrew the 4 screws securing the connector PCB (50) to the two brackets (22).
2.	Carefully unplug the 2 flat-connectors from the Connector PCB (50) and unscrew the 4 screws securing the mounting plate (26) to the left and right aluminium chassis (21 and 31).
3.	Remove the printer unit/mounting plate by lifting and turning outwards the lower edge from the paper guide (17).
4.	Separate the printer unit and the mounting plate by unscrewing the 4 screws (28).

Spare Parts, REC

Overview

Introduction This section lists the spare parts available for servicing the REC. The spare parts list specifies to which extend the monitors may be serviced as only the spare parts listed may be replaced.

Contents This section contains the following topics.

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Available Spare Parts

Introduction

All spare parts available for the REC are listed in this section which also includes an exploded view to ease the identification of the parts.

When ordering spare parts include the code number and the description of the part.

Trade-in Parts

The modules marked with an * must be returned to RADIOMETER for replacement. This is to ensure the highest possible degree of patient and functional safety.

They will be replaced in accordance with our Trade-in arrangement for modules, with the exception of modules that have been damaged during attempted repairs.

Histogram Updating

A kit for updating the standard recorder to histogram version, is available under the code no. 904-729. For further details refer to the following pages.

Available Parts

The numbers in the left column refer to the exploded view at the end of this Section.

Ref. No.	Part No.	Quantity	Description
1	927-032	1	Front panel for REC, white
	927-033	1	- yellow
	927-034	1	- pink
	927-035	1	- green
	927-036	1	- blue
2	927-025	1	Set of keys for TCR3/REC
3	901-700	1	* Display PCB assembly for TCR3/REC
4	886-217	1	Right cover plate for TCR3/REC
5	921-425	1	Writing plate for TCR3/REC
6	886-216	1	Left cover plate for TCR3/REC
7	921-426	1	Top cover plate for TCR3/REC
8	921-423	1	Paper tear-off edge for TCR3/REC
9	008-105	7	Screw, M2 x 5 mm
10	042-207	7	Washer, ϕ 2.2/5 x 0.3 mm
11	009-105	4	Screw, M2 x 5 mm, countersunk
12	041-148	6	Nylon washer, ϕ 8.7/13 x 1.6 mm

Continued on next page

Available Spare Parts, Continued

Available Parts (continued)	Ref. No.	Part No.	Quantity	Description
	13	885-730	2	Fixation rail for TCR3/REC
	14	887-433	1	Right fixation bracket
	15	042-359	4	Washer, ϕ 3.5/9 x 1 mm
	16	008-312	4	Screw, M3 x 12 mm
	17	927-037	1	Paper guide
	18	901-806	1	* Printer Control PCB assembly
	19	008-306	6	Screw, M3 x 6 mm
	20	009-306	15	Screw, M3 x 6 mm, countersunk
	21	885-762	1	Left aluminum chassis
	22	887-430	2	Bracket for TCR3/REC
	23	885-722	1	Paper roll housing for TCR3/REC
	24	886-219	1	Left paper pin holder for TCR3/REC
	25	886-220	1	Right paper pin holder for TCR3/REC
	26	886-218	1	Mounting plate for TCR3/REC
	27	910-164	1	Thermal printer unit for TCR3/REC
	28	008-208	4	Screw, M2,5 x 8 mm
	29	921-424	1	Paper pin for TCR3/REC
	30	984-053		Thermo-sensitive paper for TCR3/REC, box with 6 rolls
	31	885-723	1	Right aluminum chassis
	32	037-316	4	Stand off for TCR3/REC
	33	901-747	1	* Computer PCB assembly, histogram
		901-741	1	* - standard
	34	885-725	1	Bracket for DIN connector, TCR3/REC
	35	805-423	1	DIN connector, 5-pole
	36	885-763	1	Rear aluminum chassis
	37	887-438	1	Left fixation bracket

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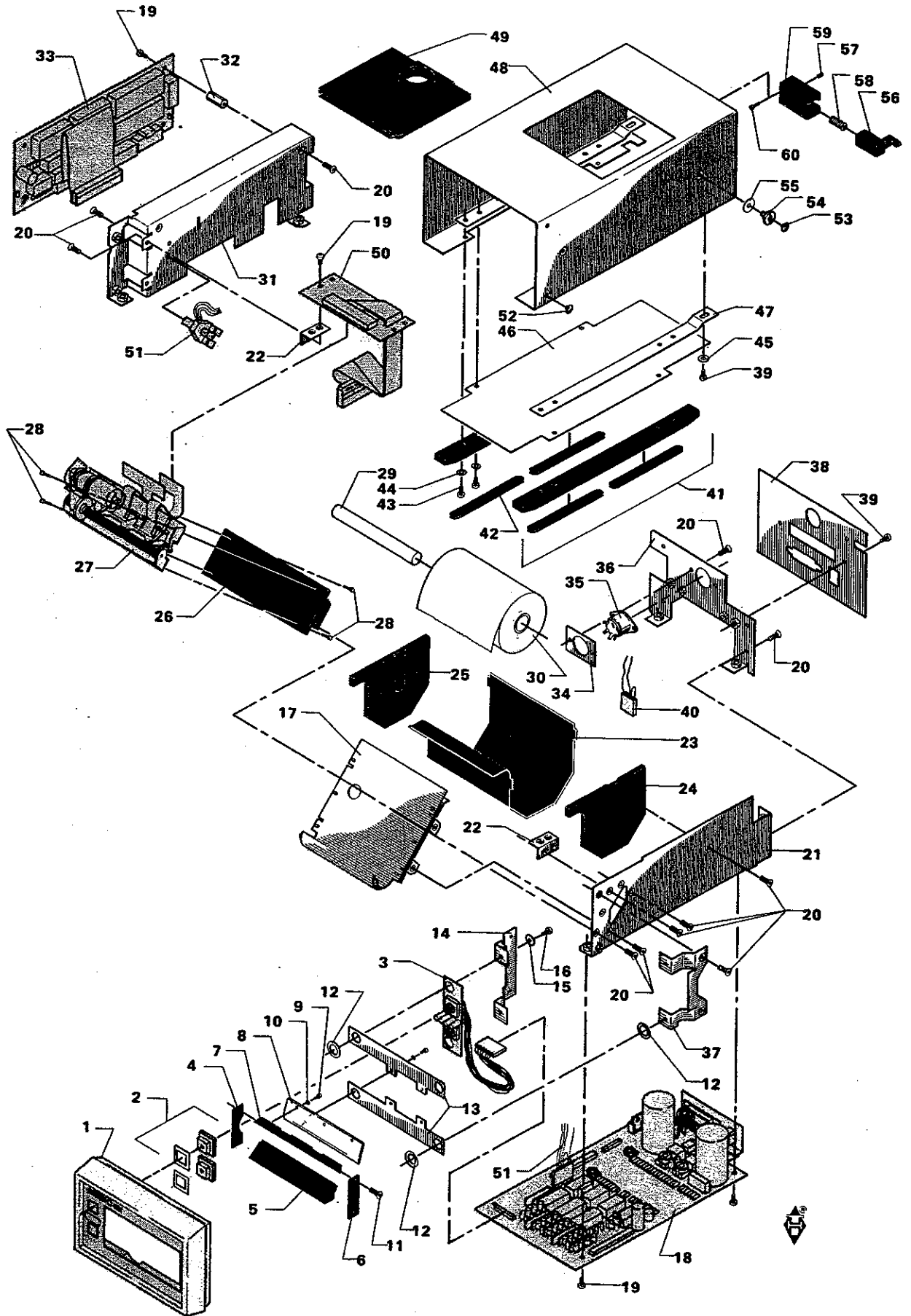
Available Spare Parts, *Continued*

Available Parts (<i>continued</i>)	Ref. No.	Part No.	Quantity	Description
	38	978-530	1	Rear panel, standard (run 1-5)
		978-531	1	Rear panel, histogram (run 1-5)
		978-566	1	Rear panel, standard (run 6 onwards)
		978-567	1	Rear panel for REC, histogram (run 6 onwards)
	39	008-902	4	Screw, M3 x 8 mm, black
	40	927-038	1	2-pole cable with connector
	41	927-003	2	Bottom rail kit for TCC3/TCR3/REC/BAT
	42	837-133	4	Rubber foot
	43	008-308	8	Screw, M3 x 8 mm
	44	046-901	8	Spring washer M3
	45	042-306	2	Washer, ϕ 3.2/7 x 0.5 mm
	46	885-705	1	Bottom plate for TCR3/REC, white
		885-797	1	- yellow
		885-798	1	- pink
		885-799	1	- green
		885-800	1	- blue
	47	885-731	2	Thread plate for TCR3/REC
	48	885-761	1	Cover for REC, white
		885-793	1	- yellow
		885-794	1	- pink
		885-795	1	- green
		885-796	1	- blue
	49	921-427	1	Cover for paper roll, TCR3/REC
	50	901-744	1	* Connector PCB assembly
	51	901-800	1	Optical paper detector
	52	842-169	4	Protection spacer for REC/BAT
	53	842-168	2	Protection spacer for fixation screw

Continued on next page

Available Spare Parts, *Continued*

Available Parts (<i>continued</i>)	Ref. No.	Part No.	Quantity	Description
	54	025-031	2	Fixation screw for REC, M4 x 5
	55	043-112	2	Washer, 4.1 x 11 x 1 mm
	56	923-165	1	Lock for REC
	57	012-203	1	Pointed screw
	58	876-834	1	Spring
	59	923-164	1	Lock-house
	60	008-110	4	Screw, M2 x 10
		904-729		Histogram updating kit consisting of EPROMs with histogram software, and rear plate.



REC SERVICE PARTS

Circuits Description, REC

Overview

Introduction This section gives detailed information as to build-up and function of the electronics. It provides the background information required for servicing the REC.

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Computer PCB

General Description

The PCB includes the front panel control circuitry and the serial interface to the OXI and TCM3 monitors.

These and the thermal printer control functions are software controlled by the 8 bit CMOS microprocessor system NSC800 with its peripherals.

The memory consists of 8 kbyte RAM and 128 kbyte program memory. Some data, such as paper speed information, are stored in an EEPROM.

The circuitry is shown on the drawing 2410-A1.

Microcomputer

The microcomputer consists of the CPU (QD1), the program memory (QD3 and QD6), the data memory (QD8), the EEPROM (QD7) and the address latch (QD2).

The addressing takes place via the non multiplexed address bus A8-A15, the combined address/data bus AD0-AD7 and the address latch QD2.

Data transfer between the CPU, the memories and the other peripherals also takes place via AD0-AD7.

Some of the control functions, for example the memory mapping are performed by QD4, a programmable logic device which is UV light erasable.

The CPU oscillator is controlled by a 3.2 MHz crystal, setting the clock frequency to 1.6 MHz.

Continued on next page

Computer PCB, *Continued*

Input/Output

The microcomputer communicates externally with the help of the parallel port QD11 and the serial port QD10.

The input-output ports are organised as follows:

Part		Function
QD11	PA0	Write pulse input
	PA2	NMI enable
QD11	PB0	Motor ON/OFF output
	PB1	Alarm output
	PB2	Power check input from the Printer Control PCB
	PB3	Paper check input from the Printer Control PCB
	PB4-PB7	LED control signals for the front panel
QD11	PC0	EEPROM data input/output
	PC1	EEPROM enable output
	PC2	Clock output for the EEPROM
	PC4	System clock output

Part		Function
QD10	DCD	Timing input from QD3.
	CTS, DSR	Front panel key input signals

The incoming data from OXI/TCM3 is checked for errors and converted to parallel for transfer to the CPU.

When incoming data is detected, an interrupt is sent to the CPU (RSTC).

Printer Control PCB

- General Description** The Printer Control PCB includes the control and drive circuitry for the thermal printer, rectifier and DC regulator circuits.
- Included is also a galvanic isolated circuit for the alarm output.
- The circuitry is shown on the drawing 2435-A1.
-
- Rectifier Circuit** The mains adapter AC voltage is rectified and filtered by C17, C18, L3, CR1 and C9 to a DC voltage of nominal 15 V.
- Via the rear panel D-connector pin 2 and 6, REC can be supplied from OXI or TCM3.
-
- DC Regulators** The PCB includes 3 regulated dc sources.
- QA1 is a standard linear +5 V regulator, supplying RECs IC circuits.
- QA3, Q3 and associated components constitutes a step down switching regulator, supplying +5 V to the DC motor.
- The writing head is supplied with +18 V from the step-up switching regulator QA2 and associated components.
- The output voltage is adjustable by R11.
- The circuit includes a high-input voltage detector. If the input voltage exceeds 21 V, the LBD voltage (pin 8) of QA2 will go high and activate the input excess voltage error code.
-
- DC Motor Control** The motor speed is controlled by the D/A converter QD1, the buffer QA4b, the driver QA4a and the complementary power amplifier Q4/Q5.
- The motor current is measured by QA4c, the output signal of which is added to the motor drive signal to obtain a negative Z amplifier.
- This is necessary for the motor to overcome varying loads at low speeds.
- QA4d is a paper run-out detector. Without paper, the optical detector will activate QA4. PAPER CHECK goes low and the microprocessor stops the motor by activating Q6.
-
- Printing Control** The control circuit for the thermal printing head is constituted by the 20 Darlington driving transistors Q7 to Q26, one for each printing element, 3 data latches QD3, QD4 and QD5 and a mono-stable multi-vibrator QD2 for adjusting (R38) the printing pulse length.
-

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Printer Control PCB, *Continued*

Line and Dot Interrupt

The dot and line strobe signals from the printers' tacho disk are regenerated and combined by the two RS flip flops QD7 to form the line interrupt and dot interrupt signals.

Alarm

The opto-coupler QA5 and transistor Q27 form a galvanic isolated alarm output circuit. Max. power requirement to the external switching system is 24 V, 250 mA.

Test Points

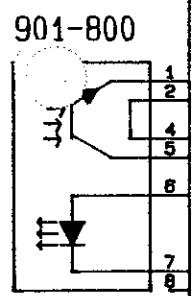
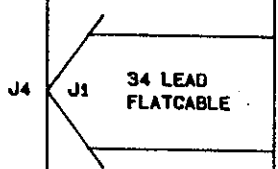
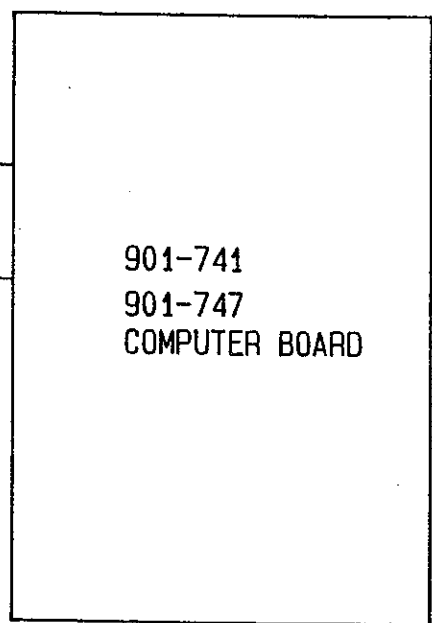
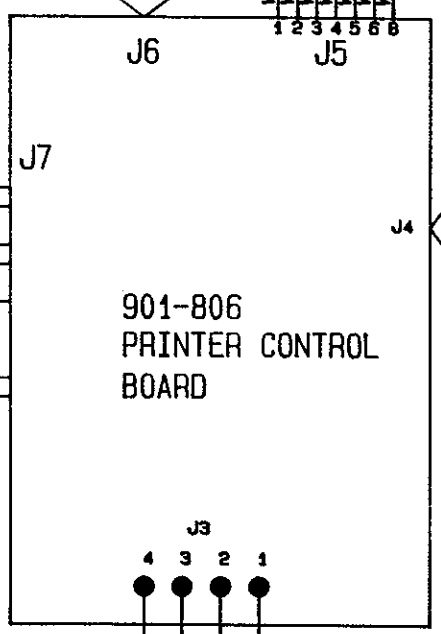
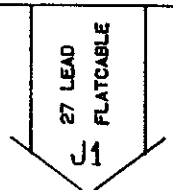
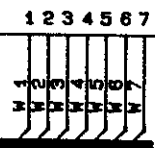
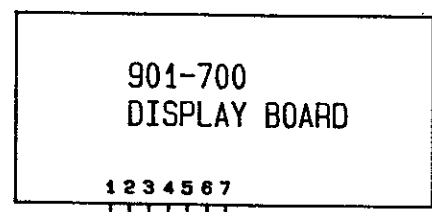
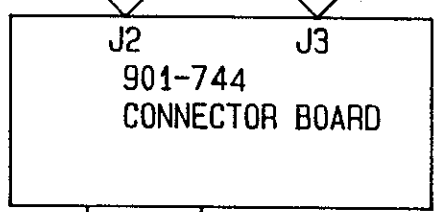
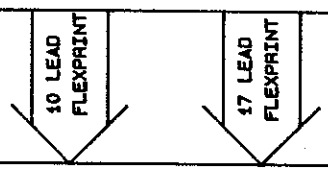
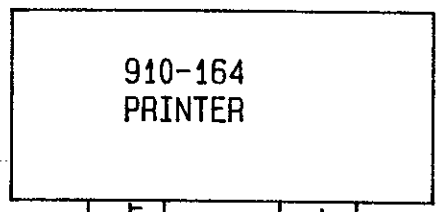
The PCB includes the following test points.

Test Point	Function
TP1	Ground
TP3	Printing pulse
TP4	Motor feed back signal
TP5	+5 V supply for motor
TP6	+5 V general
TP7	Rectifier voltage
TP8	Printing head voltage

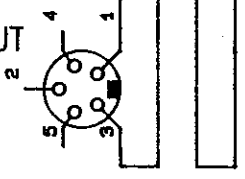
Thermal Printer PU2040

The Olivetti PU2040 thermal printer consists of a DC motor, a printing head with 20 thermal resistor components, a mechanical cam system for horizontal movement of the printing head and a tacho disk delivering dot and line strobe signals for the printer electronic control system.

Each of the 20 thermal printing components covers 14 horizontal dots. This gives a total resolution of 280 dots pr. line.



ALARM OUTPUT



This drawing must not be used on to any person not authorized by us to receive it. It must not be copied or otherwise used by such persons without our authority.

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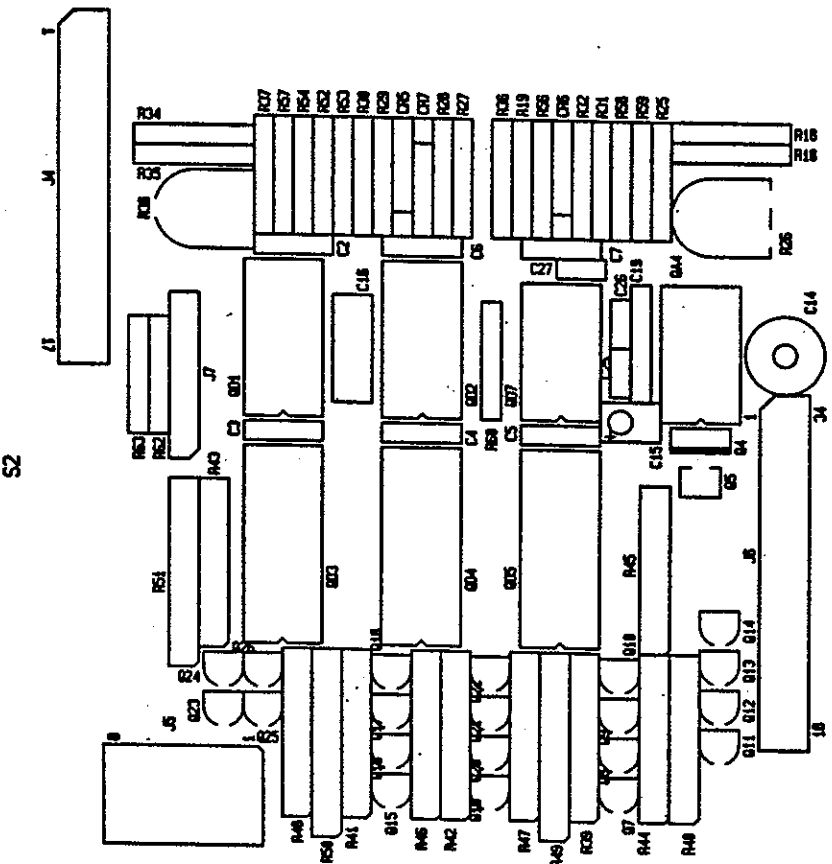
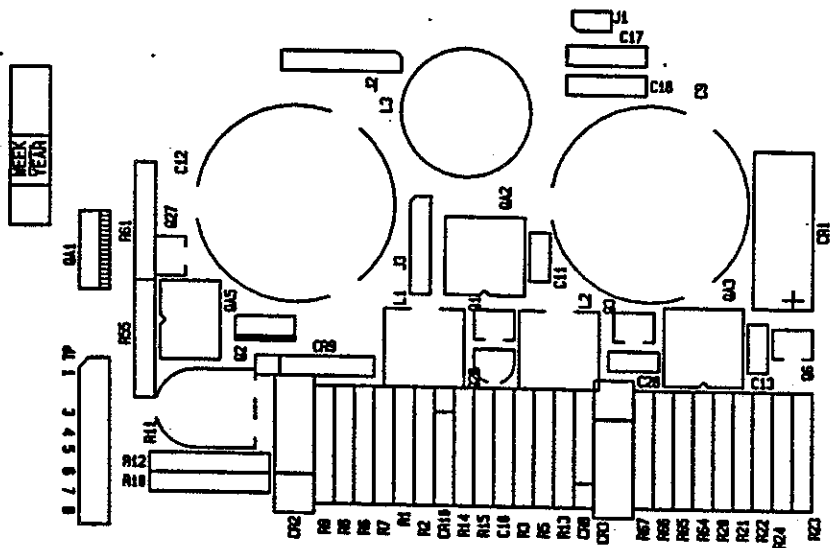
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000-110

type REC3
from no. to no.

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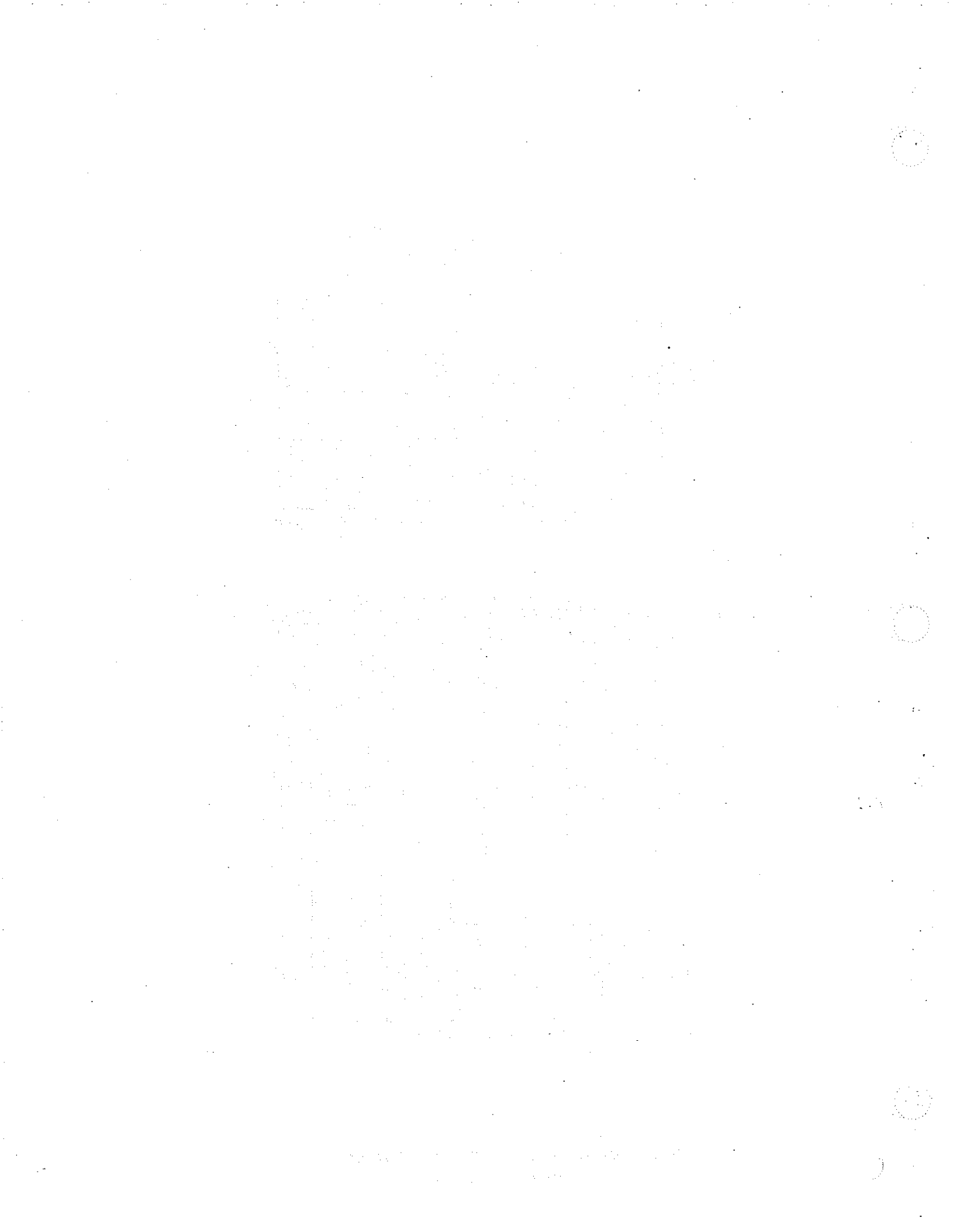
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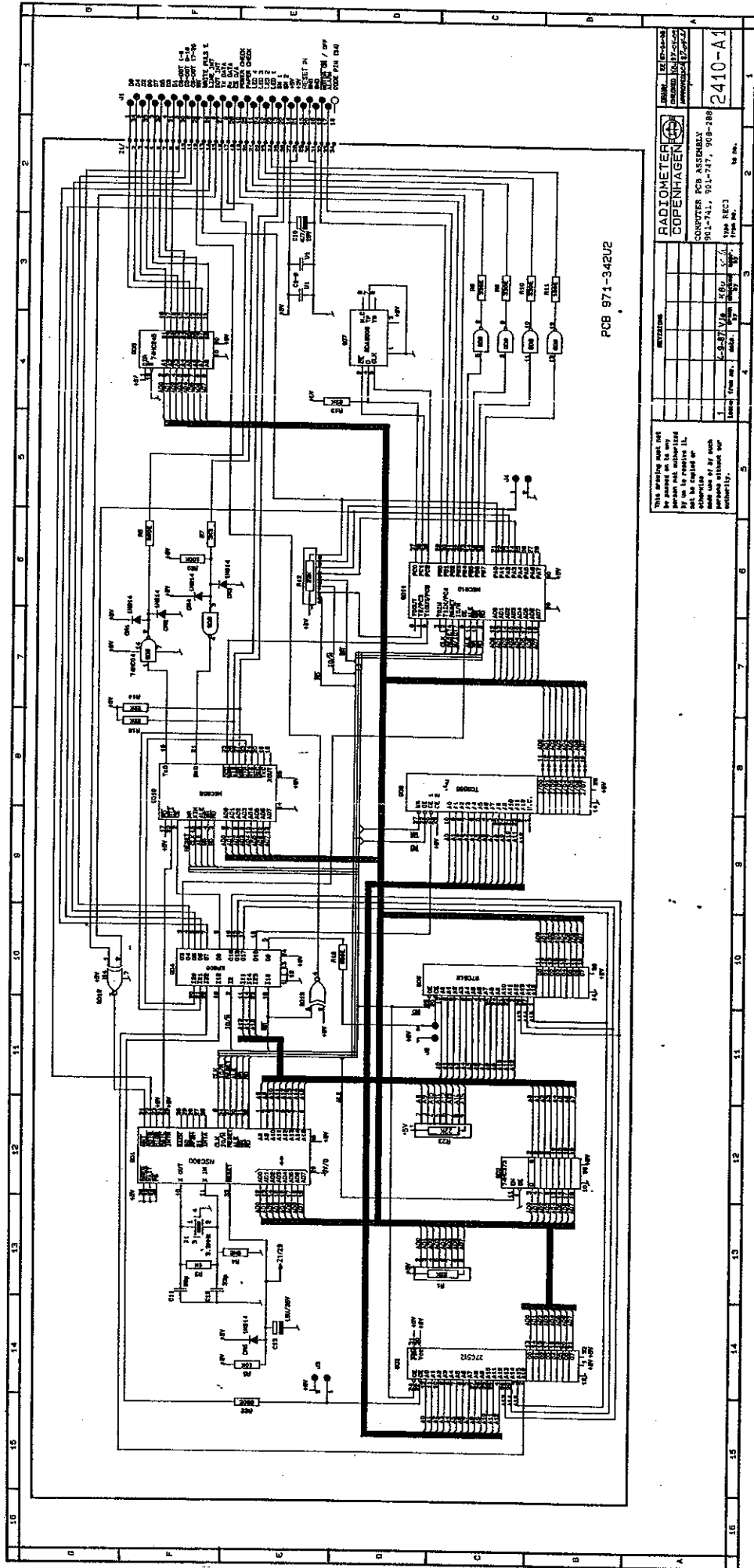




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REC Printer Control PC-Board 901-806
Component layout





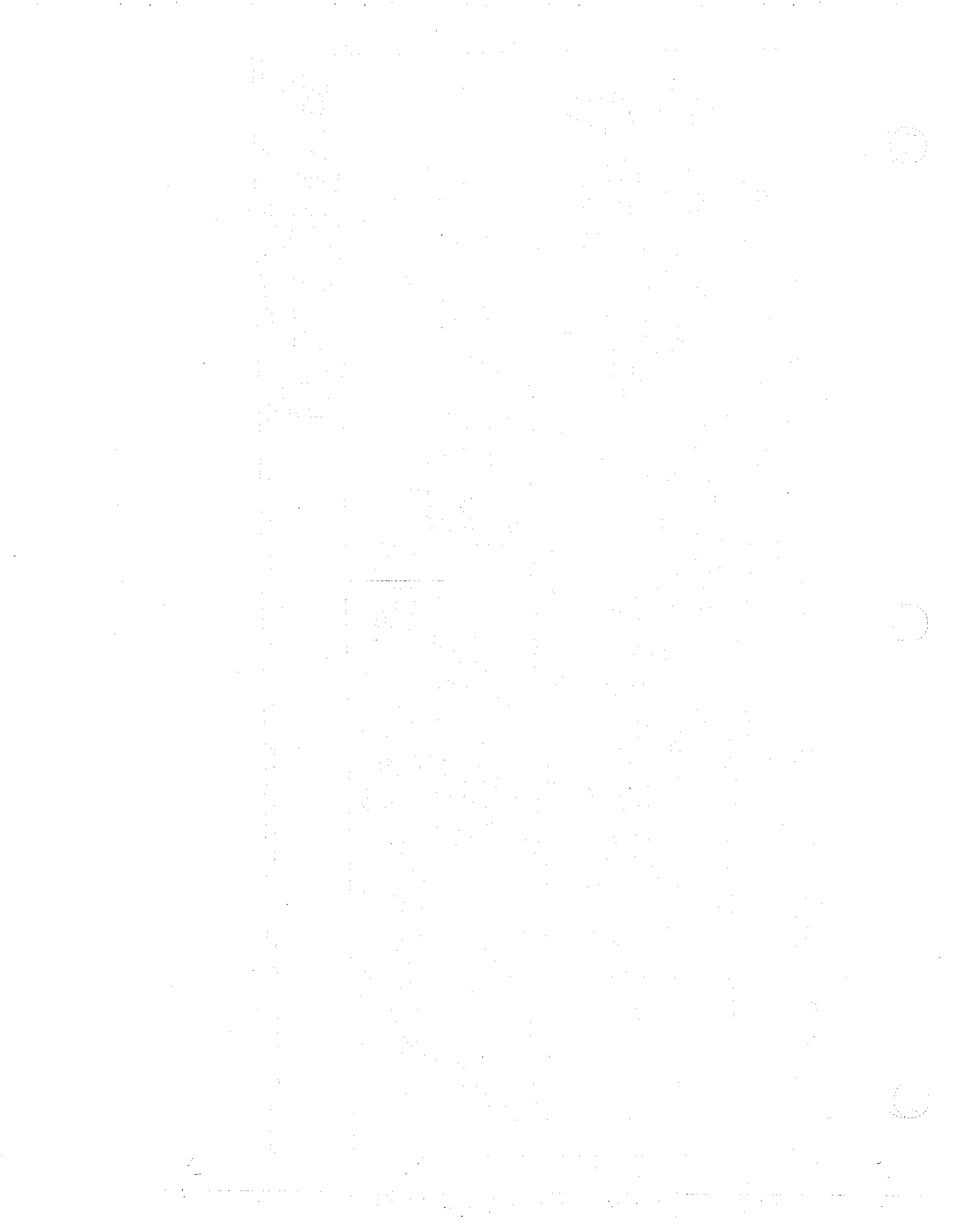
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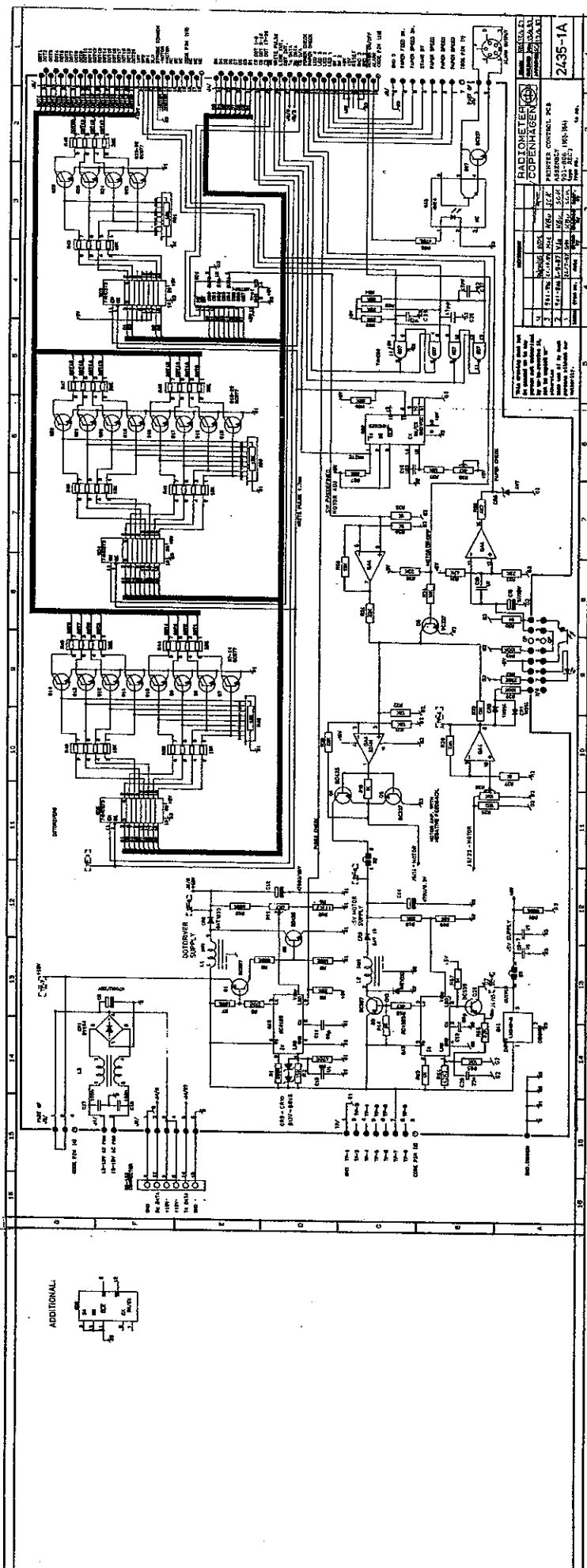
CONVERTER PCB ASSEMBLY
901-741, 901-747, 908-288

2410-A1

REVISIONS	
NO.	DESCRIPTION
1	ASSEMBLY
2	ASSEMBLY
3	ASSEMBLY
4	ASSEMBLY
5	ASSEMBLY
6	ASSEMBLY
7	ASSEMBLY
8	ASSEMBLY
9	ASSEMBLY
10	ASSEMBLY
11	ASSEMBLY
12	ASSEMBLY
13	ASSEMBLY
14	ASSEMBLY
15	ASSEMBLY

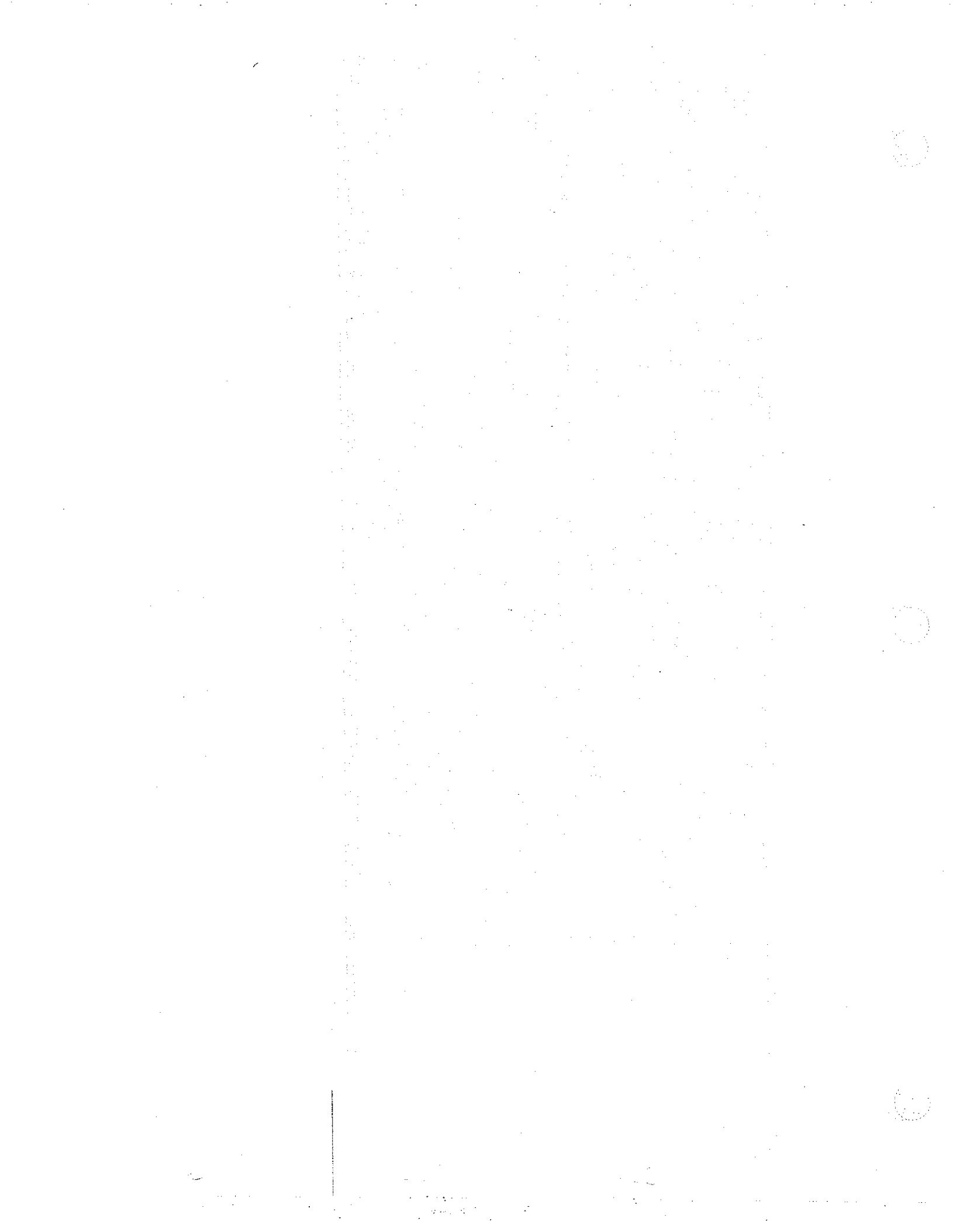
This drawing shall not be used for assembly or repair of any person not authorized by us to provide IL. It is the property of Radiometer Copenhagen and shall not be used in any way without our written consent.

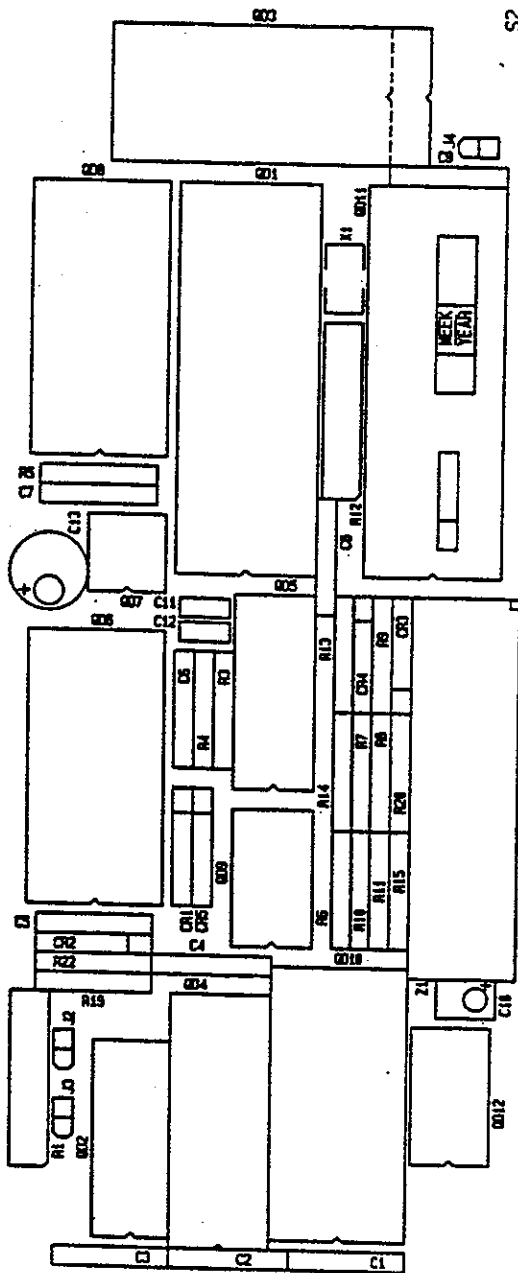




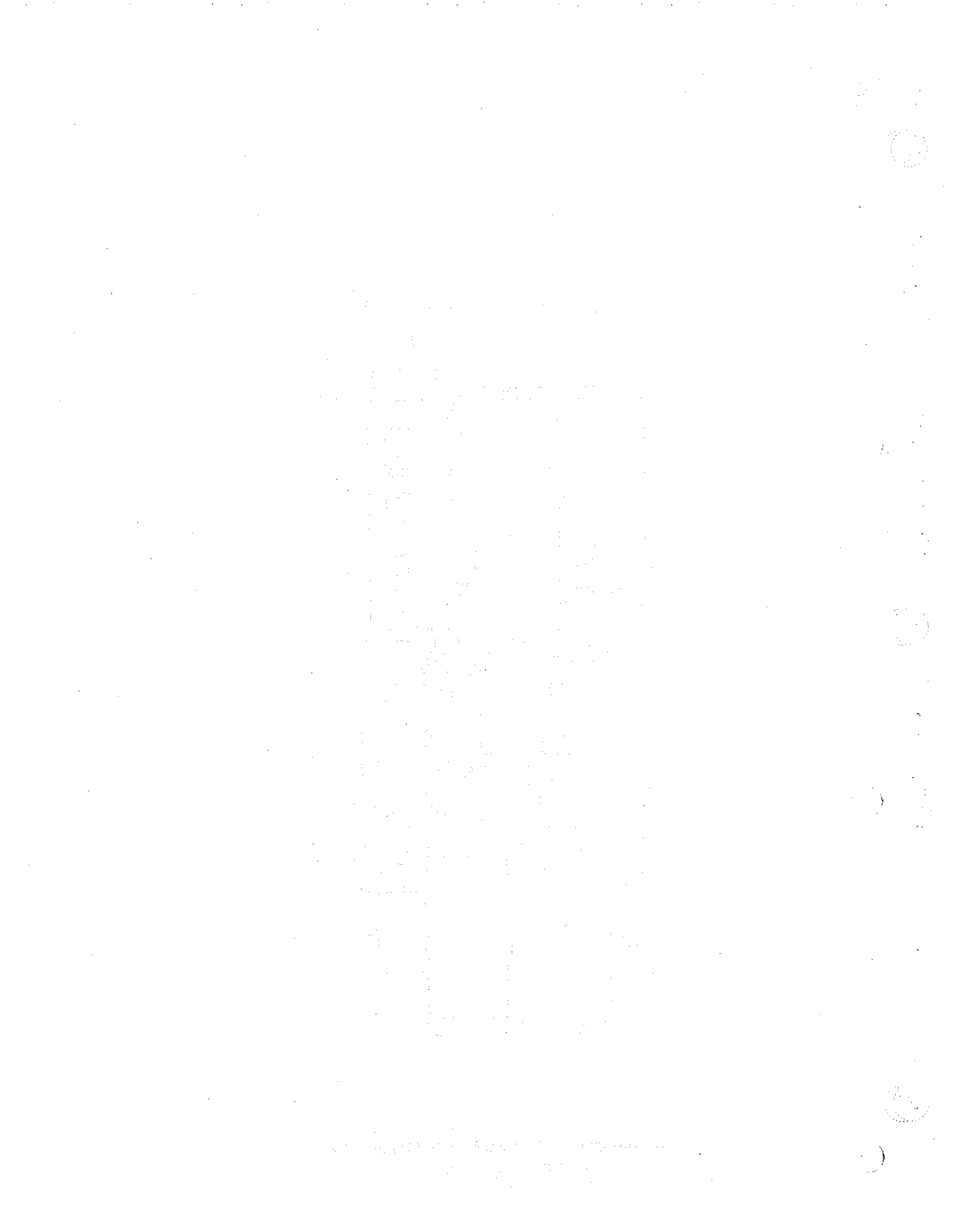
ADDITIONAL:







REC Microcomputer PC-Board 901-741/901-747
Component layout



6. Accessories

Battery Unit, Electrode Simulator, and Mains Adapter

Introduction This part gives detailed information about the function and servicing of the battery cassettes, electrode simulator and mains adapters.

Contents This chapter contains the following topics.

Topic	See Page
TCB3.....	3
BAT.....	13
TC Electrode Simulator	25
Mains Adapter.....	33

TCB3

Overview

Introduction This part gives detailed information about the function and servicing of the battery cassette TCB3.

Contents This section contains the following topics.

Topic	See Page
General Information.....	5
Dismantling and Replacements.....	7
Spare Parts	9
Circuits Description	11

General Information

Introduction

The Battery Cassette is provided as a power supply for the TCM3 during transport.

It contains 6 alkaline type LR 20 (US size D) batteries, enough for approximately 12 hours of operation.

It is attached to the Monitor by a 1/4 Turn Hinge and electrically connected via the 15 pole connector on the rear panel.

The cassette includes a battery indicator which is activated when the cassette is attached to the Monitor.

Dismantling and Replacements

Introduction

For the dismantling and replacement of the parts in the TCB3, the following tools are necessary:

- Pozidrive screwdriver # 1
- Wrenches for 4 and 14 mm nuts.
- Pliers
- Cyanolite adhesive, 991-035.

The numbers in brackets refer to the exploded view.

Battery Change (18)

Step	Action
------	--------

- | | |
|----|---|
| 1. | Unscrew the battery cover (1) and replace the batteries (18). Ensure that the polarity is in accordance with the labels printed next to the battery tubes (17). |
|----|---|

Note that all 6 batteries must be changed at a time.

Battery Indicator and Internal Cable (23)

The Battery Indicator, the cable with components and the 15 pole connector constitute one service part (23).

Step	Action
------	--------

- | | |
|----|--|
| 1. | Remove the cover (19) by unscrewing the 2 screws. |
| 2. | Disconnect the cable terminals from the battery springs (20) and the cover (19).

If a tool for removing the crimped connector pins from the connector house is available, it is not necessary to remove the connector and the cassette cover.

If this is not the case, it will be necessary to cut the cable at the connector and dismantle the entire battery cassette. |
| 3. | Unscrew the nut (10), loosen the 2 screws (15) which secure the battery tubes, and remove the cover (13). |
| 4. | The battery indicator is fastened in place with a cyanolite adhesive product, the so-called Loctite. Using pliers, carefully twist it loose and draw the entire cable out through the battery indicator hole. |
| 5. | After the replacement cable is fitted, the battery indicator must be fastened in place with the cyanolite adhesive. |

CAUTION: The adhesive must not come into contact with the skin. Use plastic gloves or similar.

Continued on next page

Dismantling and Replacements, *Continued*

**Battery
Indicator and
Internal Cable
(23) *(continued)***

Step	Action
6.	Connect the negative battery terminal (the one with 4 leads) to the spring which is closest to the connector.
7	Ensure that the battery springs (20) fit correctly into the tubes (17) and that the cable is not clamped when the cover (19) is refitted.

Spare Parts

Introduction

All spare parts available for the TCB3 are listed in this section which also includes an exploded view to ease the identification of the parts.

When ordering spare parts include the code number and the description of the part.

Available Spare Parts

The numbers in the left column refer to the exploded view at the end of this Section.

Ref. No.	Part No.	Quantity	Description
1	927-012	1	Battery Cover for TCB3, complete
2	885-711	1	Cover for TCB3
3	885-715	1	Bracket for Battery Cover, TCB3
4	009-308	2	Screw, M3 x 8, countersunk
5	009-306	10	Screw, M3 x 6, countersunk
6	035-216	1	Fingerscrew for TCB3
7	856-220	1	Spring for TCB3
8	923-126	1	Spring Holder for TCB3
9	046-412	2	Spring Washer for TCB3
10	032-901	2	Nut, M10 x 1
11	065-839	1	Bushing for TCB3
12	872-509	1	Spindle for TCB3
13	885-717	1	Lid for TCB3
14	927-011	1	Hinge for TCB3, complete
15	008-312	2	Screw, M3 x 12
16	035-503	2	Nut with lockring for TCB3
17	927-010	1	Set of Battery Tubes for TCB3, complete
19	927-013	1	Battery Lid for TCB3, complete
20	876-862	2	Battery spring for TCB3
21	046-902	2	Washer
22	008-408	2	Screw, M4 x 8
23	636-016	1	Cable for TCB3, complete. Battery indicator and female D connector included.

Continued on next page

Spare Parts, Continued

Available Spare Parts	Ref. No.	Part No.	Quantity	Description
<i>(continued)</i>	24	020-906	2	Screw, M2.5
	25	042-105	2	Washer, M2.5
	26	064-505	1	Cable guard
	27	046-904	2	Spring washer
	28	031-250	2	Nut, M2.5
