Modt 30N/84

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RGM502 and RGM504, Technical Manual

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Abstract:

This manual contains technical information on the RGM502/504 regulator module for the DSU6xx terminal.

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1. GENERAL DESCRIPTION 1.

The RGM502/504 regulator module is a multiple output DC power supply.

The input power requirement of the module is two times 15 Volt, 50 Hz.

The module produces a number of regulated DC voltages, sufficient to supply the logic boards within the DSU6xx as well as the keyboard KBU6xx with DC power.

All heatsink mounted components are thermally connected to the aluminium bottom-plate of the terminal.

The two units RGM502 and RGM504 are electrically identical, but the mechanical outline and the PCB layout are significantly different. Nevertheless the two units are mutually replacable. Throughout this manual, the two modules are described as one. References to the schematics are made with the ROM502 identification item first, followed by the corresponding RGM504 identification item enclosed in parentheses.

2. SPECIFICATIONS 2.

2.1 Input Requirements 2.1

	min	typ	max	
Power	-	35	60	Watt
Voltage	12	17	22	Volt RMS
	18	24	30	Volt Peak
Current	-	7	10	A peak
Frequency	48	50	62	Hz

2.2 Output Voltages 2.2

Voltage (Volt)			Current (mA)		Ripple (mV pp)
min	typ	max	min	max	max
-27.5	-25	-22.5	0	15	100
-12.2	-12	-11.8	0	250	100
-5.2	-5	-4.8	0	20	100
+4.75	+5	+5.25*	60	6000	50
11.8	+12	12.2	0	300	100

* adjustable

2.3 Miscellaneous 2.3

	min	typ	max	
Switch frequency	50	60	70	KHz
Operating Temperature	7	-	50	°C

3. FUNCTIONAL DESCRIPTION 3.

A block diagram of the RGM502/504 is shown in fig. 1, and the schematic diagrams are available in sections 4.1 and 4.2.

The 15 V AC is rectified by DB2 (DB1) to produce the plus and minus approx. 20 Volt unregulated DC power from which the ±12 and ±5 Volt is generated.

Three simple linear series regulators produce the ±12 Volt and -5 Volt.

In order to minimize the heat generation of the RGM, the +5 Volt regulator is a high efficient switch mode converter. It utilizes MOSFET switch transistor and schottky diode, and the efficiency is above 80%.

A voltage doubler is made up by C10, C11 (C9) and DB1 (DD1-DD4). A potential of approx. -40 Volt is built up over C1, and from here the -25 Volt is generated by a linear series regulator.

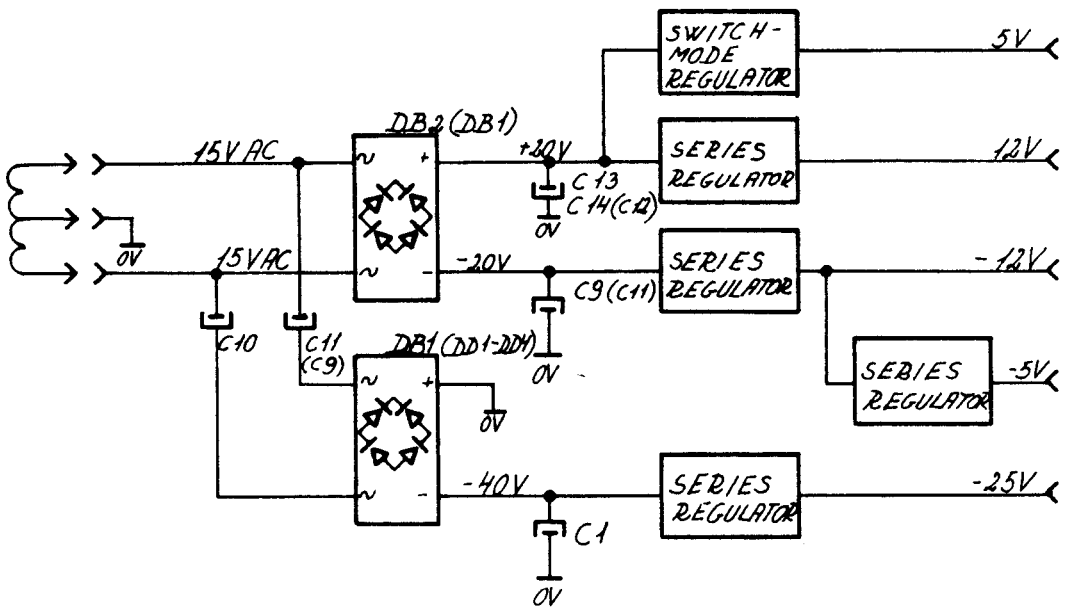


Figure 1: Block diagram.

3.1 The Switch Mode Converter 3.1

The basis principle of operation of the +5 V regulator is illustrated in fig. 2.

A pulse width modulator controls the switch "transistor" SwT. The on/off ratio determines the DC current in the inductor L1, and thereby the voltage across the output capacitor.

SwT is not a simple transistor, but the function of the circuitry surrounding and including Q1, Q3, Q4 and Q5 is equivalent to an extremely high quality PNP switch transistor.

In the simplified schematic of the regulator in fig. 2 a battery is used as an equivalent to the capacitor C16, which is charged through D2 (D6) and R12 when the transistor Q1 is off.

The zenerdiode D3 (D8) ensures that the gate-source voltage does not rise above 10 Volt which would damage the MOSFET transistor.

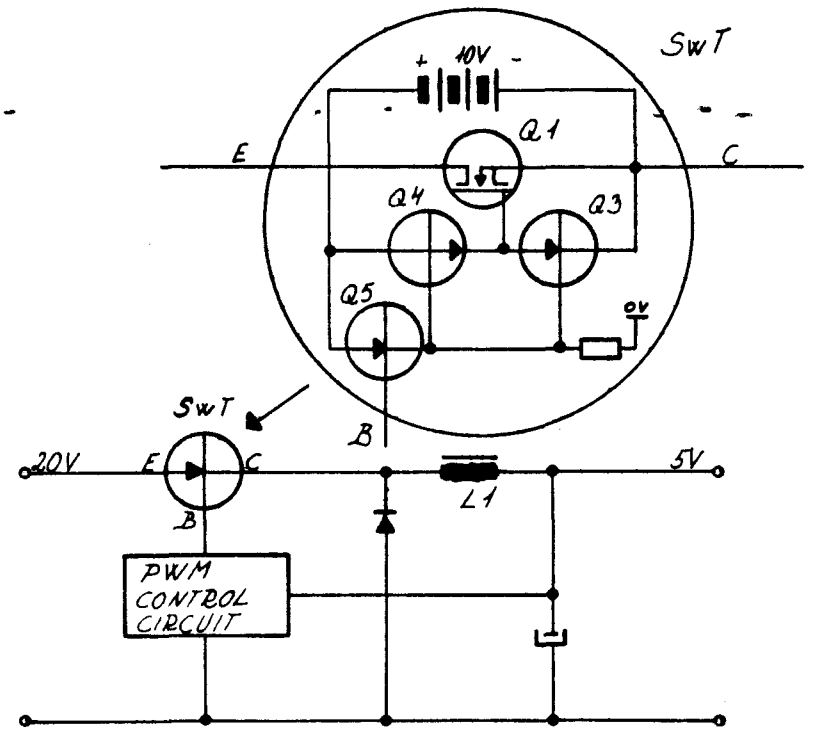


Figure 2: Simplified schematic of the switch mode converter.

3.1.1 Control Circuit

3.1.1

The PWM control circuit is built around a TL494 SMP-controller.

The TL494 contains a free-running oscillator, the frequency of which is determined by R18 and C19 (R16 and C17). The signal on pin 5 is an approx. 60 KHz 3 Volt peak sawtooth voltage.

Two error amplifiers are contained in the TL494, but in the RGM502/504 only one is used. In fig. 3 the function of the error amplifier and pulse width modulator is illustrated. The reference voltage Vreff is generated also by the TL494 (approx. 5.0 Volt).

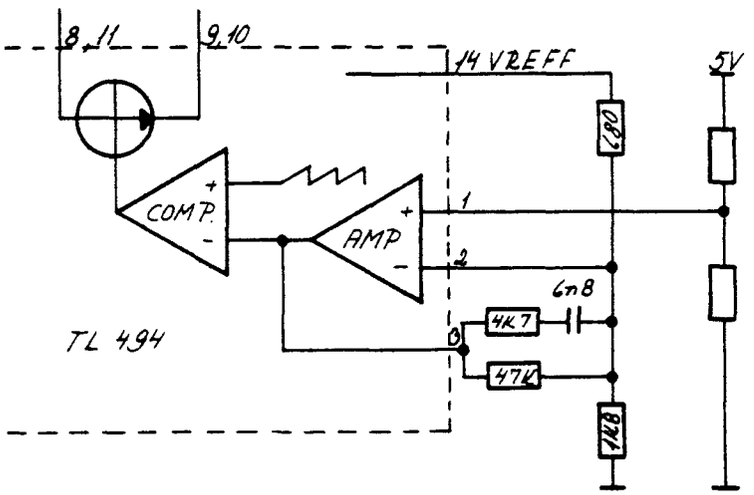


Figure 3: Error amplifier and PWM.

3.1.2 Current Limiter

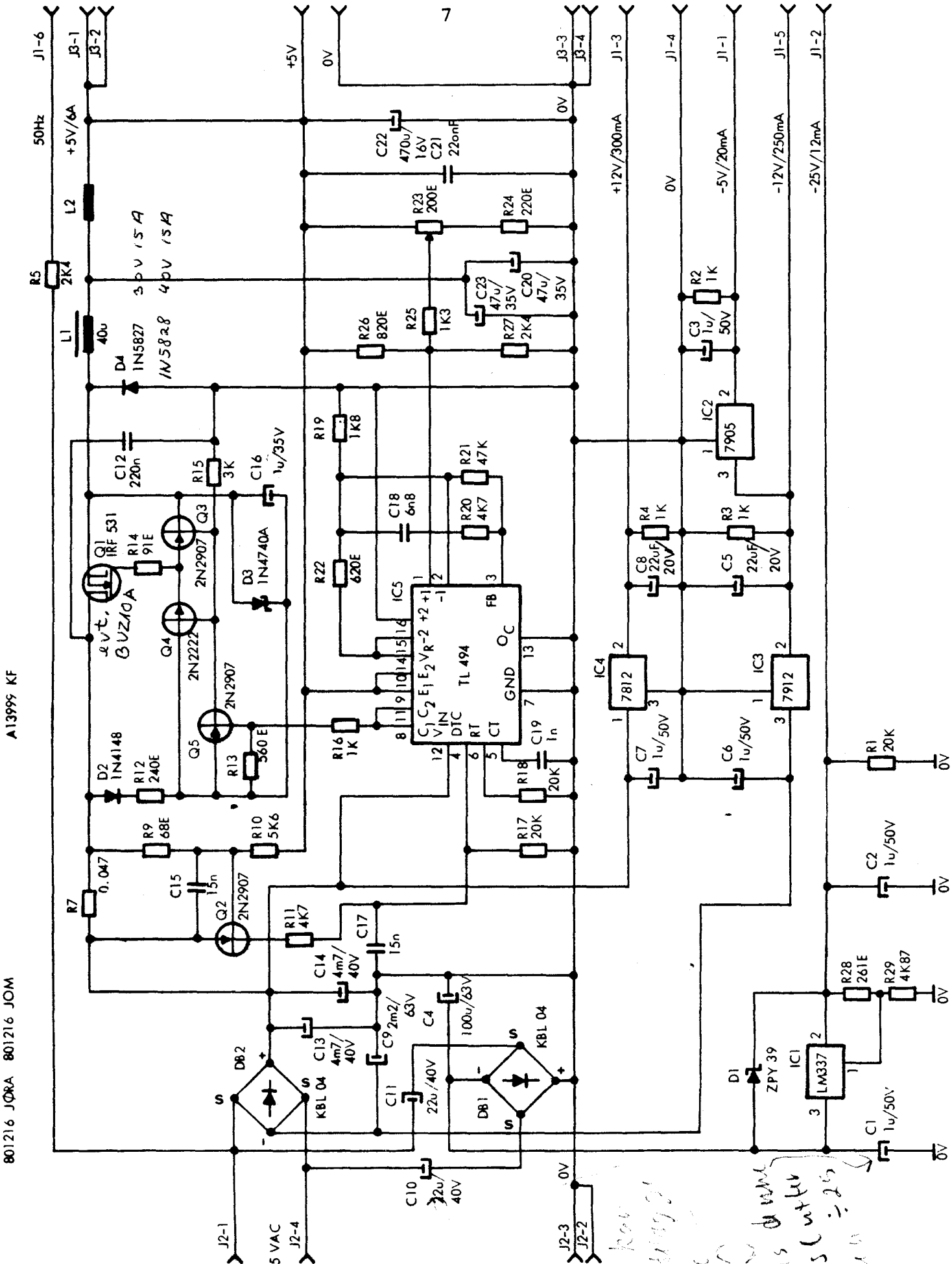
3.1.2

The output power of the regulator is limited by means of an over-current sensing circuitry.

The current that flows through the MOSFET also flows through the 0.047 Ohm resistor.

When the voltage across the resistor is sufficient to turn on the transistor Q2 (which is biased through R9 and R10 (R11 and R11)) the capacitor C17 (C18) is charged, and will remain charged for several periods.

The voltage across C17 (C18) is sensed by the TL494 pin 4 (dead time control) and the effect is that the output transistor is disabled.



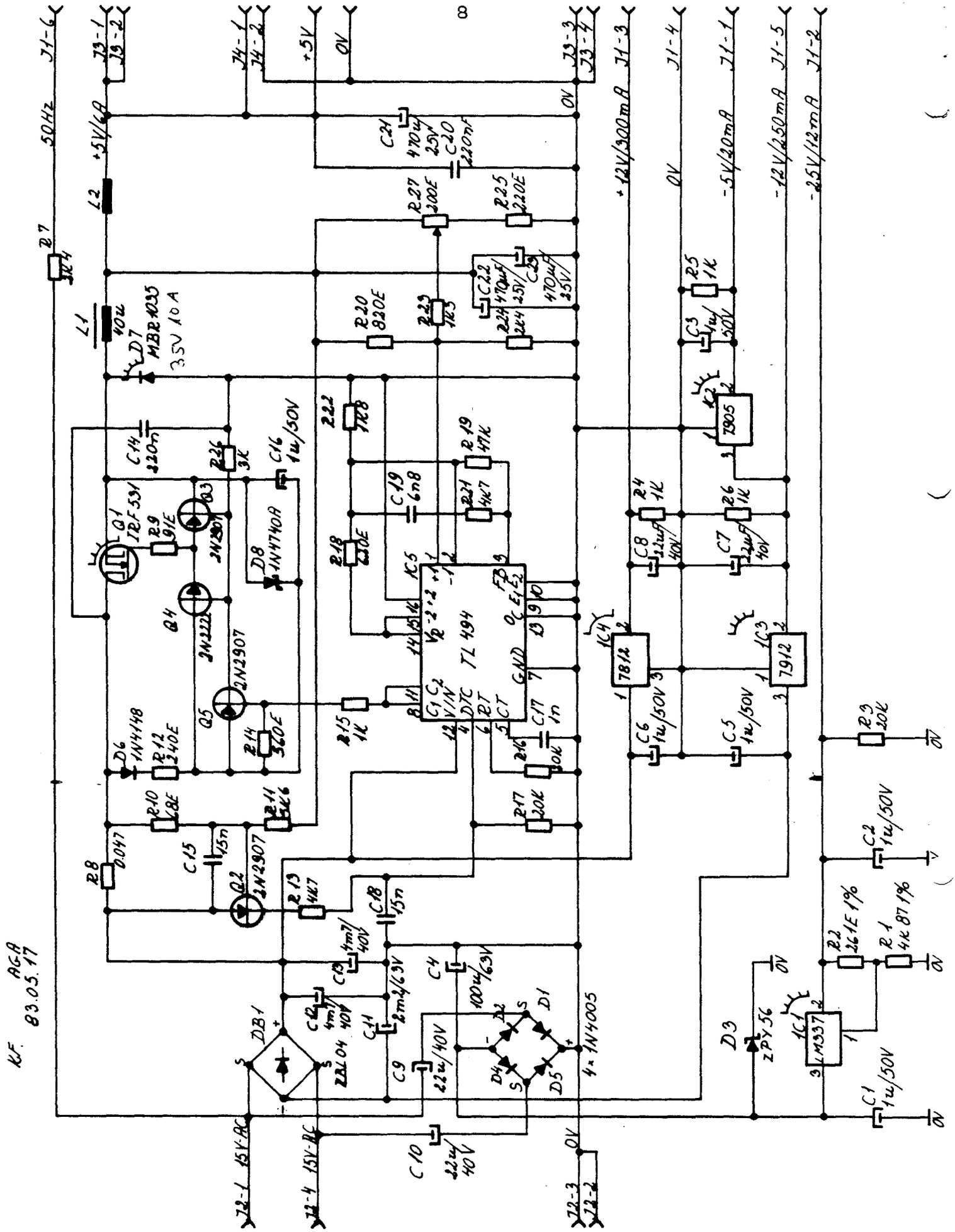
801216 JOMA 801216 JOM

A13995 KF

RGM 502

R 13559

4.1 RGM502 Schematic Diagram



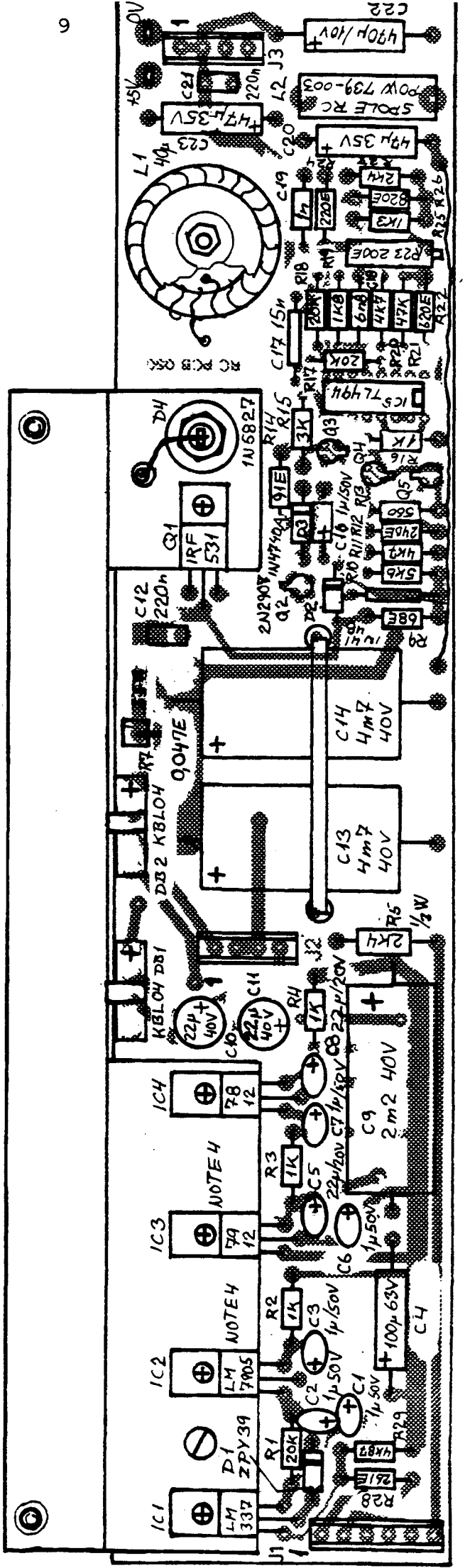
RGM504

R 13666

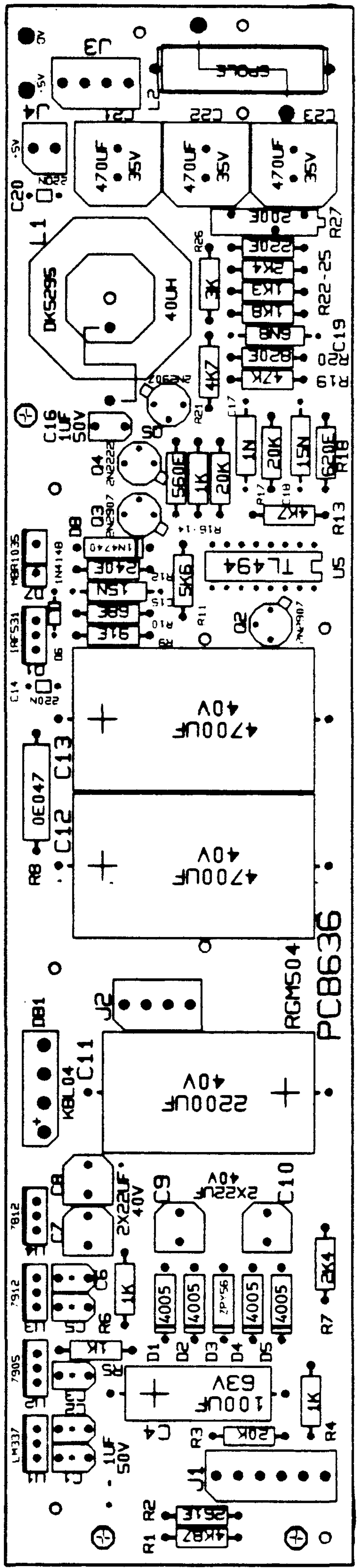
4.2 RGM504 Schematic Diagram

5. ASSEMBLY DRAWINGS

5.1 RGM502



5.2 RGM504


PCB636
RGM504
TL494
U5
J1
J2
J3
J4
L1
L2
DK5295
40UH
C11
2200UF
40V
C12
4700UF
40V
C13
4700UF
40V
C4
100UF
63V
C9
C10
2X22UF
40V
470UF
35V
KBL04
DB1
LM337
7905
7912
7812
MBR1035
IRF531
TL494
R22-25
R27
R13
R18
R19
R20
C19
Q2
Q3
Q4
Q5
D1
D2
D3
D4
D5
D8
4005
1N4148
1N4740
2N2907
2N2222

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