WERSI

assembly manual

Technical Data
Wersimatic CX 1

AM 383 First Edition

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A. Foreword

This manual contains the technical information for the CX 1 rhythm and accompaniment unit; it includes schematic diagrams, printed circuit board layouts and technical descriptions.

Knowing the information presented here is not essential for the successful assembly or operation of your CX 1. It is presented for the technically interested kitbuilder and can also provide valuable service data in case you should ever need to--hopefully not—troubleshoot your CX 1.

B. Circuit Description

The central electronics for the CX 1 is mounted on printed circuit (PC) boards (Eurocard format, 100 x 160 mm) which plug into a backplane (mother) board in a card rack. The CX 1 is controlled by a separate control panel and is programmed from the optional instrument and programming panel. Interface and power supply are also used, depending on the application of the CX 1, and the famous Wersivoice is included.

This chapter contains circuit descriptions of the CX 1 electronics. Fig. 1 and 2 are block diagrams ®f the CX 1. The schematic diagrams are in Chapter C, appearing in the order of their description. Printed circuit (PC) board layouts are in alphanumerical order in Chapter D.

I Printed Circuit (PC) Boards Used in the CX 1

PC Board	Dimensions (mm)	Location	Function	Figs.
CPU 10	100 x 160	Card rack	Central processing unit	3,20
MA &1	100 x 200	Card rack	Extender board	21
PS 10	100 x 160	Card rack	Comet power supply	16,22
TP 10	70 x 180	Per AM 382	Twin transposer W 1 thru W 5	17, 23
TS 10	55 x 160	Comet power chassis	Electronic line switch	18,24
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Note 1: Used only for organ models W 1 thru W 5 and non-Wersi organs.
Note 2: Galaxy control panel; combines WM 58 and WM 59.
Note 3: Free-standing CX 1 (FA) programming panel; combines WM 59,two switches and a pitch control.

II. The Circuits

CPU

The central processing unit (CPU) is the control center of the CX 1 rhythm unit. Refer to Fig. 3. The microprocessor Z 80 (IC 17) is the "Brain" behind all the unit's functions, directing and timing the activities of the rhythm and accompaniment components.

The. Z 80 is supported by the following memories:

IC 10(84K ROM) - The program memory.
IC 9(84K ROM) - Fixed rhythms and accompaniment.
IC 8(16K RAM) - Read/write memory for free programmable rhythms.
IC 7 (16K RAM) - Read/write memory for free programmable accompaniments, sequences, automatic tempo and registration data. It also serves as a working register and stack.

The CPU addresses the memories via address bus A 0 thru A 12. It selects among the four memories by addressing 1-of-4 decoder IC 2 on lines A 12 thru A 15. Outputs 2 Y 0 thru 2 Y 3 enable the individual memories. The data bus D 0 thru D 7 will, therefore, carry only the date from the memory enabled at any given time. Decoder IC 2 is enabled by a. MREQ signal from the CPU, indicating that a memory read or write operation can be performed. The ROM's of course, can only be read. For the RAM's a WR signal requests a "write" operation (CPU sends data to memory) while a RD signal requests a "read" (memory sends data to CPU).

The clock generator is a 4.19 mHz. crystal oscillator, frequency divided by binary counter IC 5 to produce the CPU clock (∅)and further divided by IC 6 for the interrupt (INT) clock.
Q 1, IC 4a and f, and IC 3a and associated components form a power-down reset circuit, resetting the CPU at power-on, momentary power failure or a manual reset from the control panel. Since the RAM's (IC 7 and 8) are "volatile" (data disappears when power is removed), their supply voltage is retained during power interruptions by a 2.4-Volt battery across the supply line. This prevents accidental loss of the free-programmed data.

IC 11,a 1-of-8 decoder, enables the following off-board functions as instructed by the CPU, via the address bus and control inputs:
Y 0- Programmable peripheral interface IC 1.
Y 1 - Programmable peripheral interface IC 7 on WM 54.
Y2- Clock for shift registers on WM 58.
Y3- Clock for shift regimen on WM 59.
Y4- Tempo data via AID converter IC 2 on WM 53.
Y5- Not used.
Y6- TOS data read-in via IC 3 on WM 53.
The CPU can write instructions to or receive data from peripheral function and controls via IC 1, a programmable peripheral interface. Ports PA 0 thru PA 7 and PB 0 thru PB 7 carry trigger pulses for the rhythm instruments. Ports PC 0 thru PC 7 carry data for such functions as control panel selection and display, tempo, cassette readout, start-stop and accompaniment memory (see Fig. 3, which lists port functions).

WM51

PC board WM 51 (Fig. 4) contains the instrumental voices Snare, Tambourine, Maracas, Brushes, Bass Drum and Synthedrum. The trigger pulses are generated by the microprocessor on CPU 10.

The snare voice is generated by triggered phase-shift ringing oscillator Q 5 and fed to the audio buses via trimpot P 4 and resistors R 58 aid R 57. The volume of the snare voice is controlled by the width of the oscillator trigger pulse. If, for example, a 500-usec. pulse is applied to the base of Q 4, C 18 charges fully, and the snare impulses are at their highest level. If a 100-usec. pulse is applied to Q 4, C 18 can not charge fully, and the pulse level is lower.

The bass drum voice, like the snare, is generated by triggered ringing oscillator Q 8. The pulse level is likewise controlled by the trigger pulse width.

White noise from digital noise generator IC 1 is applied to frequency divider 1C 2, which in turn applies noise in specific frequency ranges to the various instrument voicing circuits. The noise modulates square-wave oscillator IC 3c and d, whose output is gated to the snare output via D 7 and D 8, producing a noise component with spectral characteristics typical of the snare. Similarly, the noise modulates multivibrator IC 3a and b, and the resulting noise component is gated to the tambourine output line via diodes D 5 and D 6 when a trigger pulse is applied to Q 3. Brush and maracas trigger pulses applied to Q 1 and O 2, respectively, result in noise characteristic of these instruments being gated to the output lines via diode gates D 1/D 2 and D 3/D 4.

The unique sounds of the synthedrum are generated in an amplifier/active filter circuit made up of IC 4, IC 5, IC 6, Q 9, Q 10 and associated component

WM 52

This card (Fig. 5) contains the voicing circuits for the Cymbals; Hi Hat and Cowbells. The cymbal round is produced by eight square-wave oscillators (IC 6, 4, p.o. 3). These oscillators are divided into four pairs, each pair producing a high tone and a low tone. The two tones are combined in an exclusive-OR gate (1/4 of IC 7) and the outputs of these gates are summed at the junction of resistors R 35 thru R 38. The cymbal sound is gated to the cymbal volume control. P 4 via gating diodes D 5 and D 6, which are triggered on by the cymbal trigger pulse through. Q 10/11 and R 53., Zener diode ZD 2, along with R 54 and C 29, delay the trigger turn-off, giving a natural decay effect to the cymbals.
The hi-hat voice works on the same principal as the Cymbals, except that the tone generation can be controlled to simulate either a long or short hi hat sound. On a hi hat long trigger, Q 9 turns on. This turns on transistors Q 1 thru Q 4, which start the high frequency oscillators of the four square wave oscillator pairs (IC 1, 2, p.o. 3). If only hi hat short is triggered, Q 9, and. thus Q 1 thru Q 4, are off, and only the low frequency oscillators are active. RC network R 52/C 27 delays the switchover from hi hat long to hi hat short slightly, giving a more natural effect. ZD 1, R 48 and C 26 lend a natural decay effect to the control voltage. R 51 and D 7 serve to shorten the percussive decay when only hi hat short is active.

The cowbell trigger via Q 5 combines the outputs of two square wave oscillators at the junction of summing resistors R 12 and R 13. Gating diodes D 1 and D 2 switch the resulting tone to the audio bus via cowbell volume control P 2.

WM 53

This board (Fig. 6) contains, in addition to the voicing circuits for the instruments Claves, Conga Hi, Conga Lo, Tom Hi and Tom Lo, the VCA (voltage-controlled amplifier) for volume control, the ADC (analog-to-digital converter) for tempo control and the cassette interface circuitry for writing-in and reading-out the composer program from ho a tape recorder.

The voices tom tom, conga and claves are generated by triggered phase-shift ringing oscillators, just like the snare and bass drum on WM 51. The outputs of the voicing oscillators are summed and direct coupled to the VCA (IC 5). The gain of the VCA is controlled by a voltage determined by the setting of the volume control on the control panel. The rhythm instrument audio and the accompaniment audio are combined at C 41 and C 42 and coupled to the audio output buses.

An analog voltage determined by the setting of the tempo controls on the control panel is converted to digital data by analog-to-digital converter IC 2. The data is then applied to the CPU.

Digital data for the so-called composer program can be stored on a cassette tape in the form of audio frequencies representing the digital "1" (on) and "0" (off) states in serial format. In the CX 1, a 2.4 kHz tone represents logic low (0 V) and 4.8 kHz represents logic high (5 V). When a cassette containing this information is "read into" the CX 1, the signal is filtered by active filter IC 4a and d, amplified by IC 4b and applied. to phase-locked loop (P LL)IC 6. Here the tones are converted into their corresponding voltage levels (0 V or 5 V). The serial pulses are buffered by IC 4c and applied to serial-to-parallel converter IC 1. The resulting data is then applied to the CPU.

Composer- program data to be recorded is obtained via CPU port PC 3 and applied to the tape jack via R 46.

WM 54

The WM 54 board (Fig. 7) contains the chord generator (IC 10). programmable peripheral interface IC 7 and the circuits for the chord tone voicing and envelope shaping.

The generator IC 10 receives an 8-bit data signal from IC 14 on WM 55. This data contains information regarding the keys pressed on the lower manual, as well as chord, arpeggio or walking bass encoding. The chords appear at pins 5, 6, 7, 32 and 34. The amplitude of a chord is determined by the envelope voltages present at A, B, C, D and E. The voltages are developed, depending on registration, by IC 8, C 23 thru C 27, and Q 7 thru Q 11. This envelope shaping process takes place as a result of trigger pulses developed by IC 7 and IC 8 from the CPU data bus.

The filters IC 1 and IC 3 develop the voices guitar, wa h-guitar and piano from the raw chord signal from IC 10. The voices strings and organ are developed by passive filtering and further

processing in the Wersivoice circuits. The arpeggio and bass tones developed by IC 10 are sent to board WM 56, via pins 25 a, 26 a and 27 a, and 29 a, respectively, for further processing.

Programmable peripheral interface IC 7 is enabled via pin 6 by PO 8 select signal from CPU 10. IC 7 interfaces between the data bus and the keyboard data converter circuits on WM 55 (or 57), enabling the CPU to write arpeggiation and walking bass sequencing instructions to the converter. In addition, the CPU writes registration instructions and triggering information to the bass and arpeggio-forming circuits on WM 56.

WM55

The WM 55 (Fig. 8) contains the accompaniment tone generator, with transposer, the serial-to-parallel converter chip IC 14, which applies digital data to the chord generator in accordance with the keys pressed on the lower manual. NOTE: The WM 55 is used only in the Comet organs. Board WM 57 handles these functions for the W 1 thru W 5 organs and the free-standing CX 1.

Serial keying information from the first 29 keys of the lower manual is applied in the form of pulses (D_{um}) to IC 6.. Outputs on pin 2 thru 14 and 23 thru 38 correspond to the key(s) depressed on the lower manual. These outputs are multiplexed in 12 + 12 + 5 groups by IC 11 /IC 7, IC 4/IC 3 and IC 2 as triggered in sequence from IC 14 via three gates of IC 9.

In addition, the codes "WB" and "Arp" are applied to the inputs of IC 14 via IC 10. These codes, which control the walking bass and arpeggiation, are determined by the CPU (independent of the current rhythm) and routed to IC 10 via the programmable peripheral interface IC 7 on board WM 54. The output of IC 14 is an 8-bit data signal which is applied to WM 54 to select chords, arpeggio and walking bass.

The tone generator is a 2 mHz oscillator (Q 1, IC 13c, d, e and associated components) and digital transposer (IC 15 and 16). The circuitry and principles of operation are identical to that of the Comet tone generator.

WM56

Board WM 56 (Fig. 9)containsthe envelope shaping and voicing circuits for the bass and arpeggio tones and also the preamps for the accompaniment.

The three arpeggio tone signals UArp 1, 2 and 3 (from WM 54) are fed to op-amps !C 9a, c and d. Switches IC 8b and a apply registration-dependent filtering as determined by CPU instructions applied to 1-of-10 decoder

IC 3. Diode switches D 24/23, D 28/27 and D 29/22 switch the apreggio tones through to IC 10 as enabled by switching transistors Q 5, Q 4 and Q 3, respectively. The latter are activated in accordance with Arp. trigger inputs and decoded registration data from IC 3.

IC 3 decodes the arpeggio registration information and controls the envelope shaping (via IC 6, 7, 12 and Q 3, 4 and 5) and the filter parameters of 1C 10. Filter IC 10 adds voicing to the raw arpeggio tones, which then go to the two channel preamp IC 13.

The bass tone at pin 16 (from WM 54, 29a) is envelope shaped by IC 1d. This registration-dependent envelope voltage is formed from the bass trigger and bass registration instructions by IC 4a and b, IC 1, C 2 and Q1. The raw bass-tones are voiced by filter IC 5 and go to preamp IC 13. The gain of the preamps is determined by a control voltage (Vol. Acc.) at pins 26 and 27.This voltage is set by controls "Volume" and "Balance" on the control panel.

WM 57

WM 57 (Figs. 10, 10a) functions similarly to the WM 55 board in the Comet, except that it processes direct key contact inputs from the lower manual of organ models W 1 thru W 5 or the keyboard of the free-standing CX 1. The board contains the accompaniment tone generator, with transposer, and the means for converting the lower manual chording inputs to digital data for the chord generator.

The first 29 keys of the lower manual are connected to backplane board WM 60 via Plugs 3, 4 and 5; each keying line is tied to an input of IC 3, 7, 9, 12 or 13, which are strobed hex inverters.The keying information present at the inputs to the inverters is transferred to the 12 data is "read" sequentially by IC 14 in groups of 12 + 12 + 5. (Order of transfer: IC 3/7, IC 9/12, IC 13). IC 14 then converts this information to an 8-bit data signal for application to the chord generator on WM 54.

Arpeggio and walking bass codes (ARP, WB) from WM 54 are applied to 3-state octal buffer IC 4. When enabled (via pins 1 and 19) by IC 14, the data

is transferred to IC 14's data inputs. IC 14 then feeds ARP and WB progression data to the chord generator. "Minor", "Seventh" and "Accompaniment Memory" switching information is applied to IC 14 via IC 10.

The accompaniment tone generator (Fig. 10a) is formed by IC 2c, d and a and Q 1. The latter acts as a variable resistance in the ocillator circuit to provide automatic frequency stabilization.

The oscillator frequency (about 2 mHz)is applied to IC 11, which is a 12th-root-of-2 ($\sqrt[12]{2}$) divider. This breaks the master frequency. down into the 12 notes of the top octave, which are then applied to IC 15, which serves here as a 1of-12 selector.

According to the binary code entered at its address inputs (pins 12, 11, 14, 13), IC 15 selects one of the tones applied to its input pins and transfers the tone to its output line (pin 1). The address code is determined by the setting of the transposer switch.

When the transposer switch is set on "C" (normal), a reference frequency is present at pin 1 of IC 15. The circuitry composed of IC 1 and IC 2 forms a frequency-to-voltage converter; the resultant frequency-dependent voltage is applied to comparator IC 6, whose comparison voltage (pin 3) is determined by the settings of the tuning trimpot P1. If the generator frequency tries to change, the voltage applied to IC 6, pin 2, changes accordingly and changes the bias on Q 1, which compensates for the frequency change and corrects the frequency.

The transposer alters the master frequency by selecting another tone for the output at IC 15, pin 1. The comparator sees this as a frequency "error" and swings the oscillator off frequency (the desired result) to compensate.

WM58

WM 58 (Fig. 11) is the CX 1 control panel. IC 1, 2, 3, 5 and 6 are 8-bit parallel-out serial shift registers. The registers are clocked from the CPU peripheral output P 10 (Y 2). The register outputs continuously and rapidly poll the status of the control panel function switches.

A momentary switch closure shows up on the data bus (D 0 for S 1 - 9, S 30 - 36; D 1 for S 10-17, S 18-25; and D 2 for S 26 - 29), instructing the CPU to initiate the function for that time slot. The CPU, in turn, sends a serial data code to the appropriate register set, designating the LED(s) to- illuminate on the panel switches.

The NSM 4000 is the LED display module; it receives display data from peripheral interface port PC 1 and is clocked via PC 4. Data on PC 2 enables the coarse and fine tempo controls to-read out their analog status to the analog-to-digital converter on WM 53.

WM 59

WM 59 (Fig. 12) is the instrument and programming panel. The principles of operation are the same as WM 58.

WM 61

WM 61 (Fig. 13) is an interface board used to adapt the CX 1 for use in the W 1 thru W 5 organ models. The board mainly converts the negative-going signal voltages of these organs to the positive-going voltages used by the CX 1 and vice-versa. The board also produces a regulated 5-Volt source from the organ's unregulated supply voltage.

WM 63

WM 63 (Fig. 14) is the instrument and programming portion of the control panel for the freestanding CX 1. Its upper portion is identical to WM 59; its lower portion contains the "Minor" and "Seventh" switches and the "Pitch" control.

WM 64

WM 64 (Fig. 15) is the power supply for the freestanding CX 1: It develops regulated +15, -15 and +5 Volts to power the CX 1. IC 4a develops a momentary trigger pulse from the keydown (KD) voltage from the keyboard.

PS10

PS 10 (Fig. 16) is the power supply for the Comet. It produces regulated +15, +12, +5 and -15 Volts to power the Comet's central and rhythm electronics.

TP10

TP 10 (Fig. 17) is a twin transposer used with the W 1 thru W 5 organ models. It enables the player to simultaneously transpose both the organ tone generator and the accompaniment generator into any of 12 keys.

The transposer switch applies G N D to one of 12 selected lines; this is gated by diodes to appear as a binary code on the four output pins of Plug 3. This code is applied, via level-shifting circuits, to the digital transposer of the CX 1.

The 4067 IC serves here as a 1 of-12 decoder, converting the binary code at its input pins to a GND on one of its 12 output lines. This places one of the output resistors and its associated trimpot in the organ's tone generator circuit, altering the master tone frequency. The trimpot in each line serves to accurately tune in the pitch selected by that line.

TS 10

TS 10 (Fig. 18) is a remotely controlled line switch used in the Comet S models. It permits the line voltage to be turned on without the need for routing the line voltage (which is high, therefore dangerous) to the main power switch.

WV2

WV 2 (Fig. 19) is the Wersivoice board. Tones routed through the Wersivoice are impressed with varying intensity, pitch and phase effects, giving them unique ensemble and choir effects at the output. The heart of the Wersivoice is three bucket-brigade memories (analog shift registers - IC 3, 5, 7) connected in parallel between the input and output. These devices are clocked by three voltage-controlled oscillators (VCO's).

The frequencies of the VCO's are determined by two master generators, one of which generates a 0-6 Hz triangular waveform, the other generating a 6 Hz sine wave. These generator outputs, in turn, undergo one or two 120^{o} phase shifts, depending on the selected mode. The audio signals passing through the bucket brigades experience individual time delays determined by the phase and frequency of the clocking. When recombined at the output, the signals have phase, frequency and amplitude differences similar to those which would occur naturally in an ensemble of instruments.

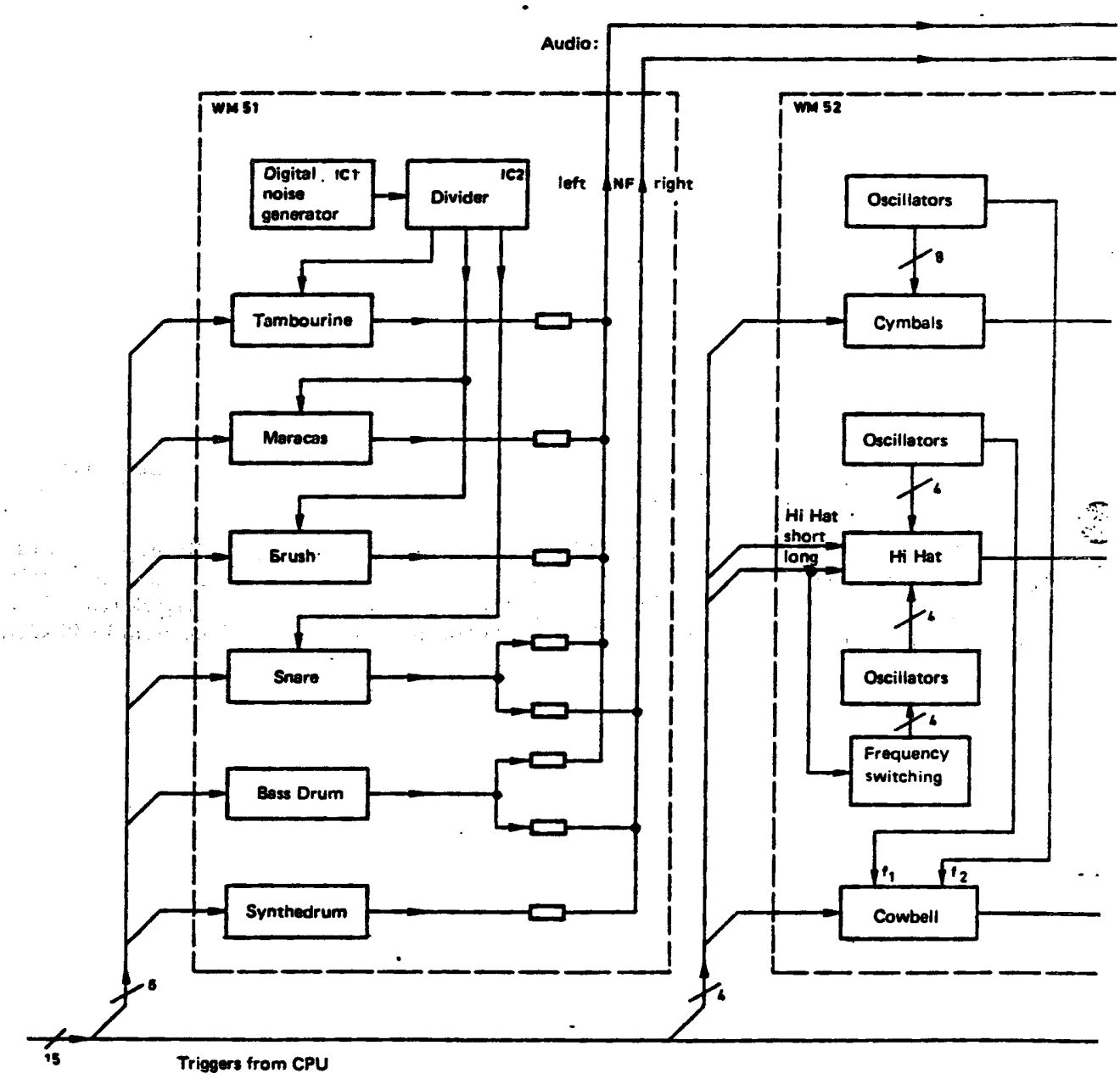
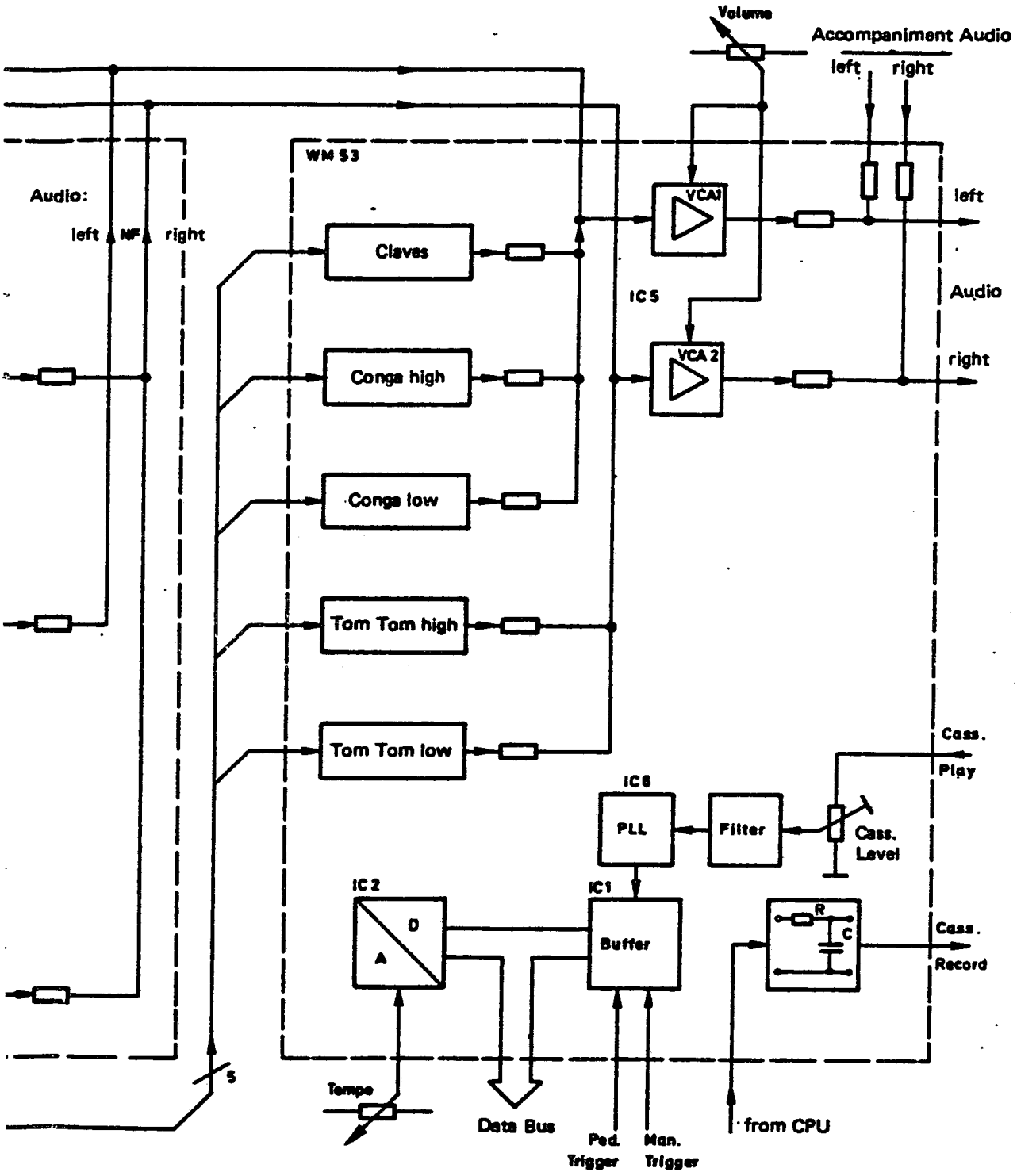


Figure 1 Block diagram, CX 1 rhythm


Volume
Accompaniment Audio
left
right
WM 53
Audio:
left
NF
right
VCA1
left
Claves
IC 5
Audio
VCA 2
right
Conga high
Conga low
Tom Tom high
Tom Tom low
Cass.
Play
IC 6
PLL
Filter
Cass.
Level
IC 2
IC 1
D
A
Buffer
R
C
Cass.
Record
S
Tempo
Data Bus
Ped.
Trigger
Man.
Trigger
from CPU

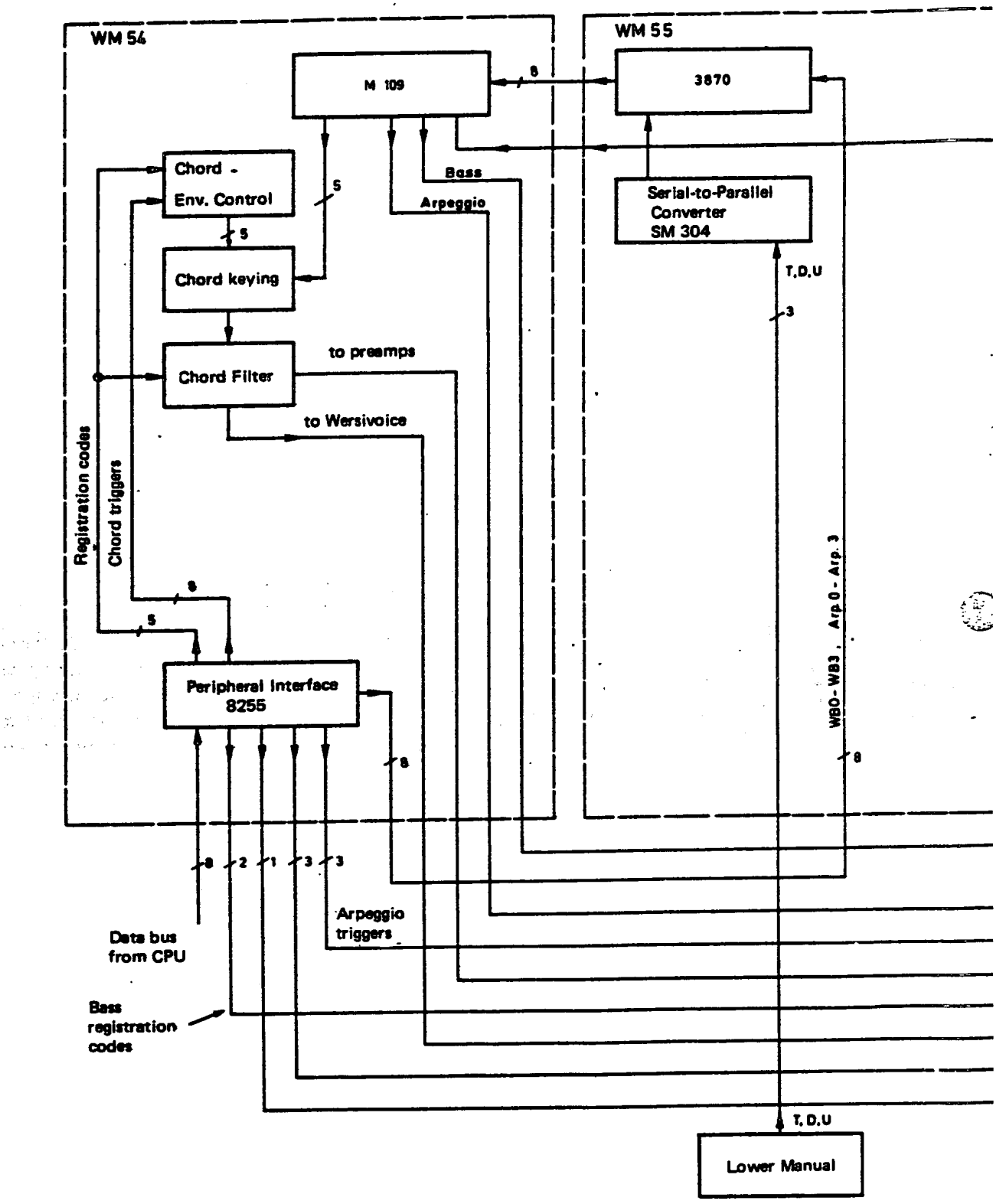
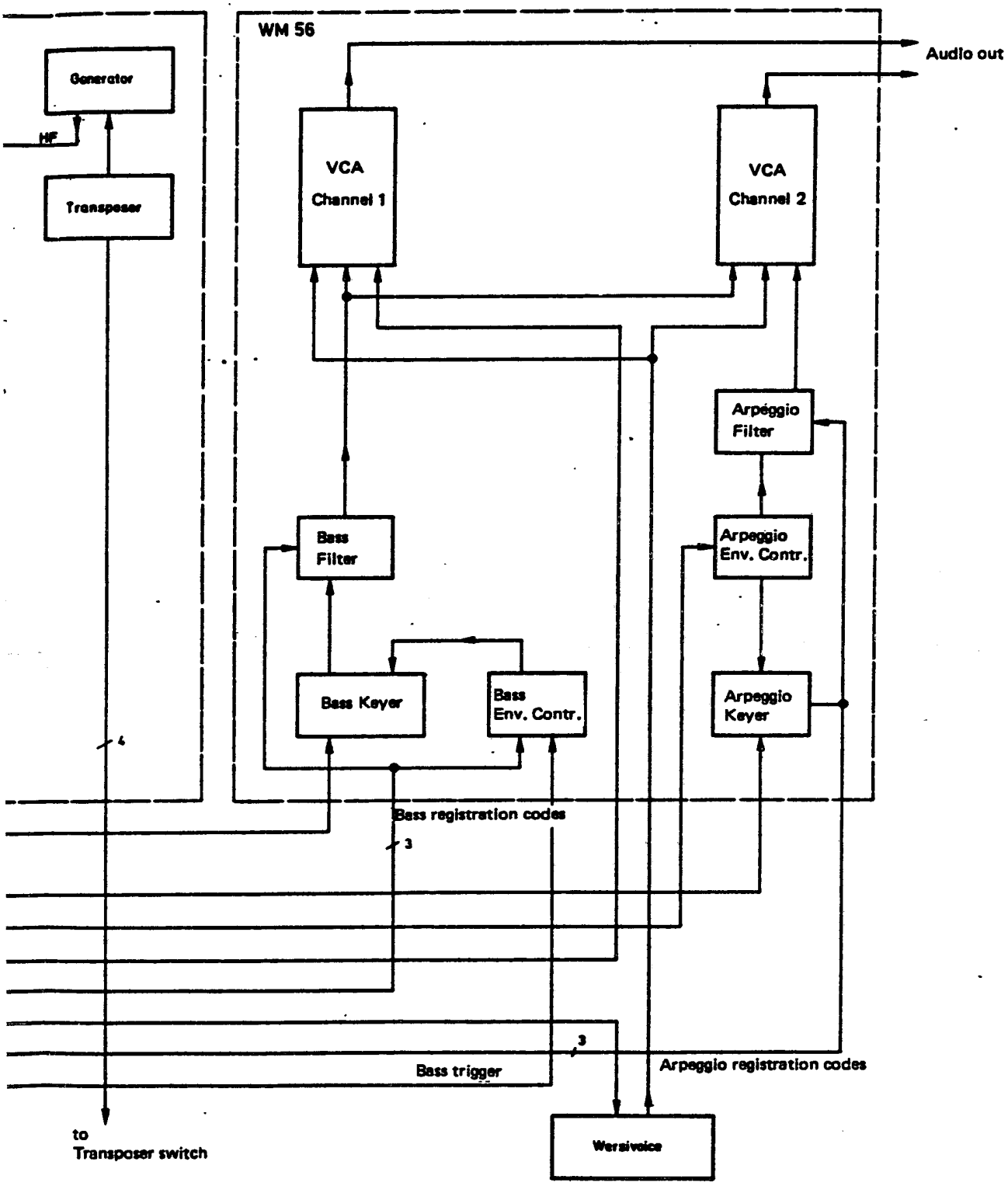


Figure 2 Block diagram, CX 1 accompaniment


WM 56
Audio out
Generator
HF
Transposer
VCA
Channel 1
VCA
Channel 2
Arpéggio
Filter
Bass
Filter
Arpeggio
Env. Contr.
Bass Keyer
Bass
Env. Contr.
Arpeggio
Keyer
4
Bass registration codes
3
3
Bass trigger
Arpeggio registration codes
to
Transposer switch
Wersivoice

C Schematic Diagrams

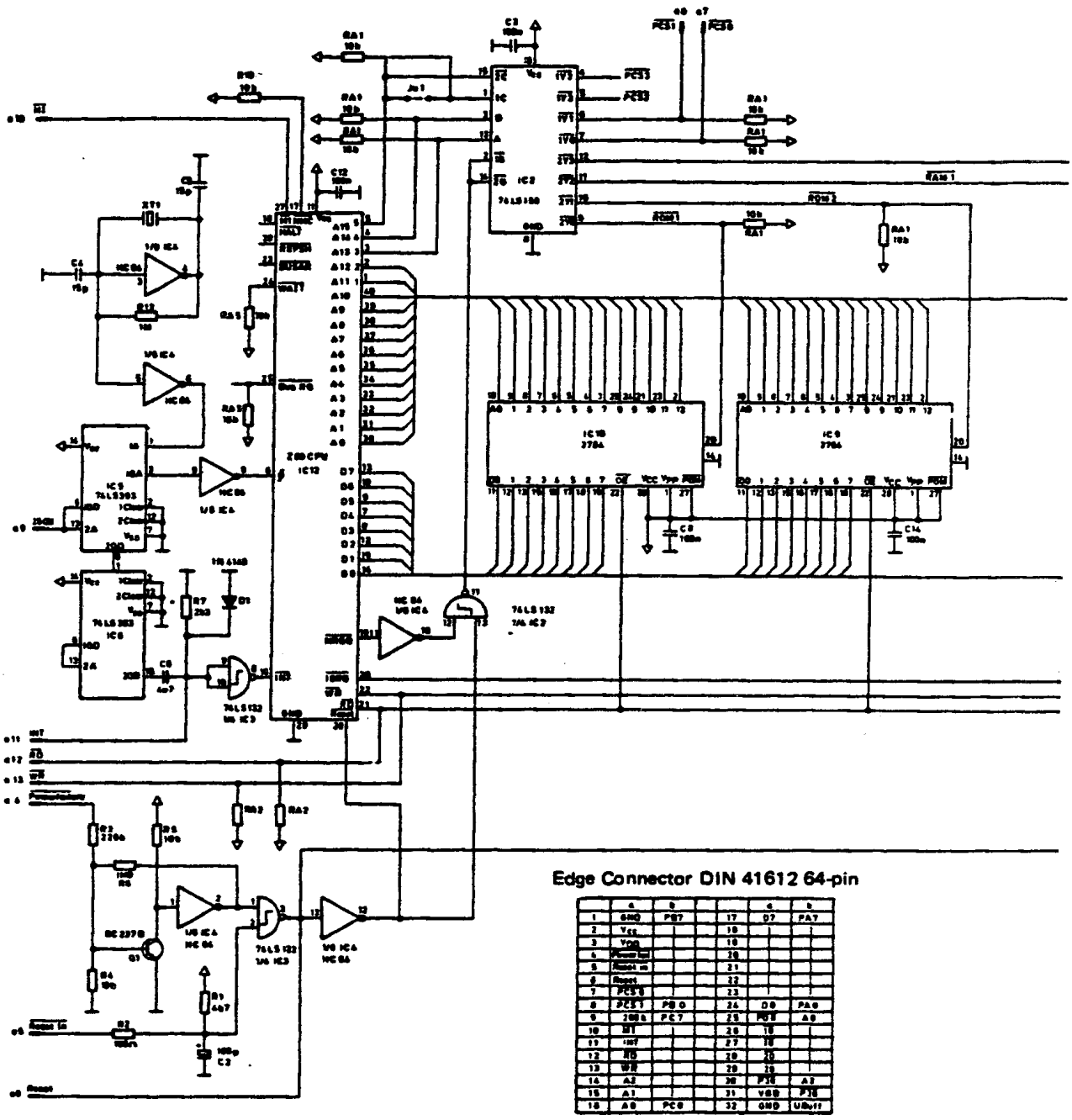
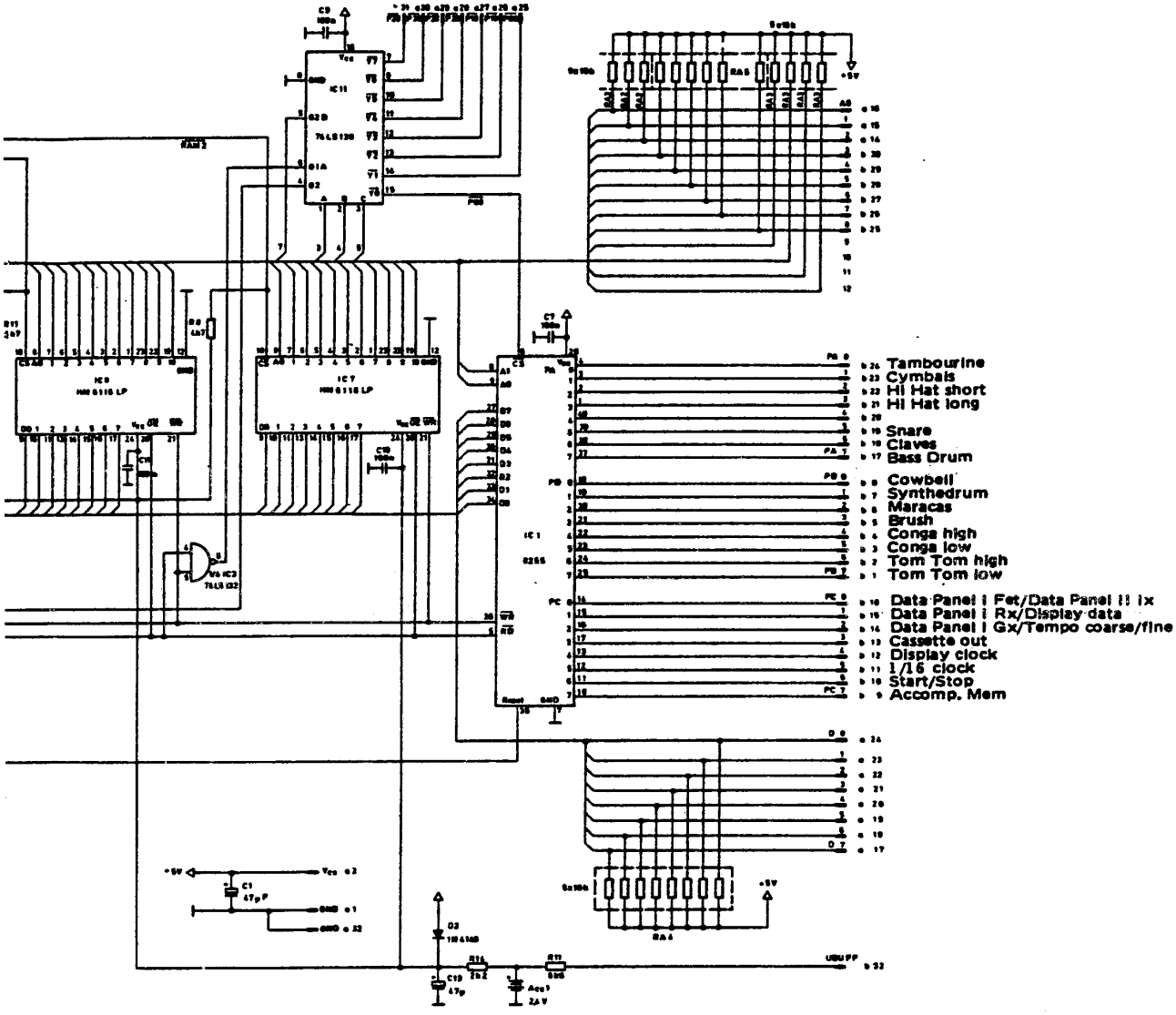


Figure 3 CPU 10 schematic diagram


Tambourine
Cymbals
HI Hat short
HI Hat long
Snare
Claves
Bass Drum
Cowbell
Synthedrum
Maracas
Brush
Conga high
Conga low
Tom Tom high
Tom Tom low
Data Panel I Fet/Data Panel II Ix
Data Panel I Rx/Display data
Data Panel I Gx/Tempo coarse/fine
Cassette out
Display clock
1/16 clock
Start/Stop
Accomp. Mem

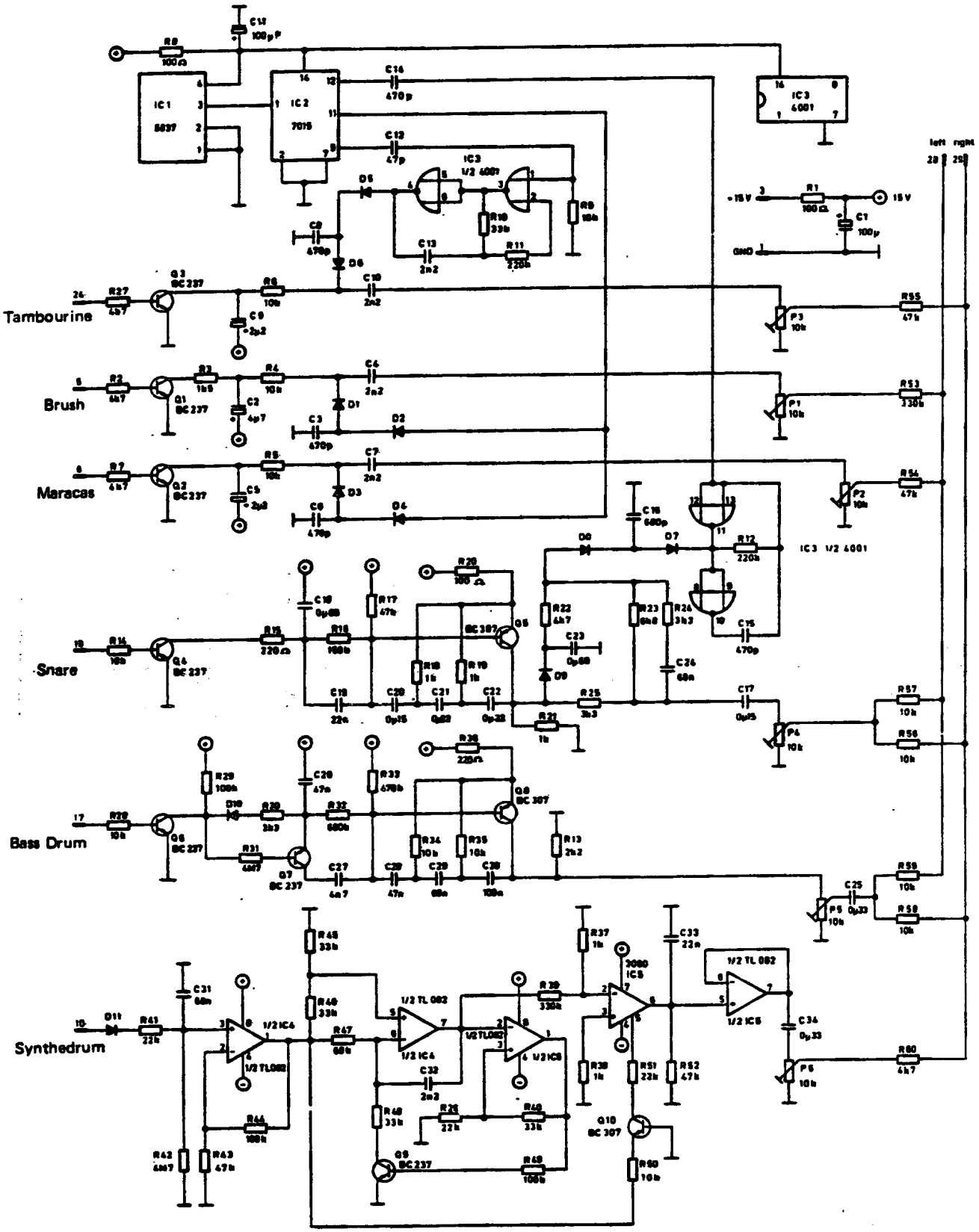


Figure 4 WM51 schematic diagram

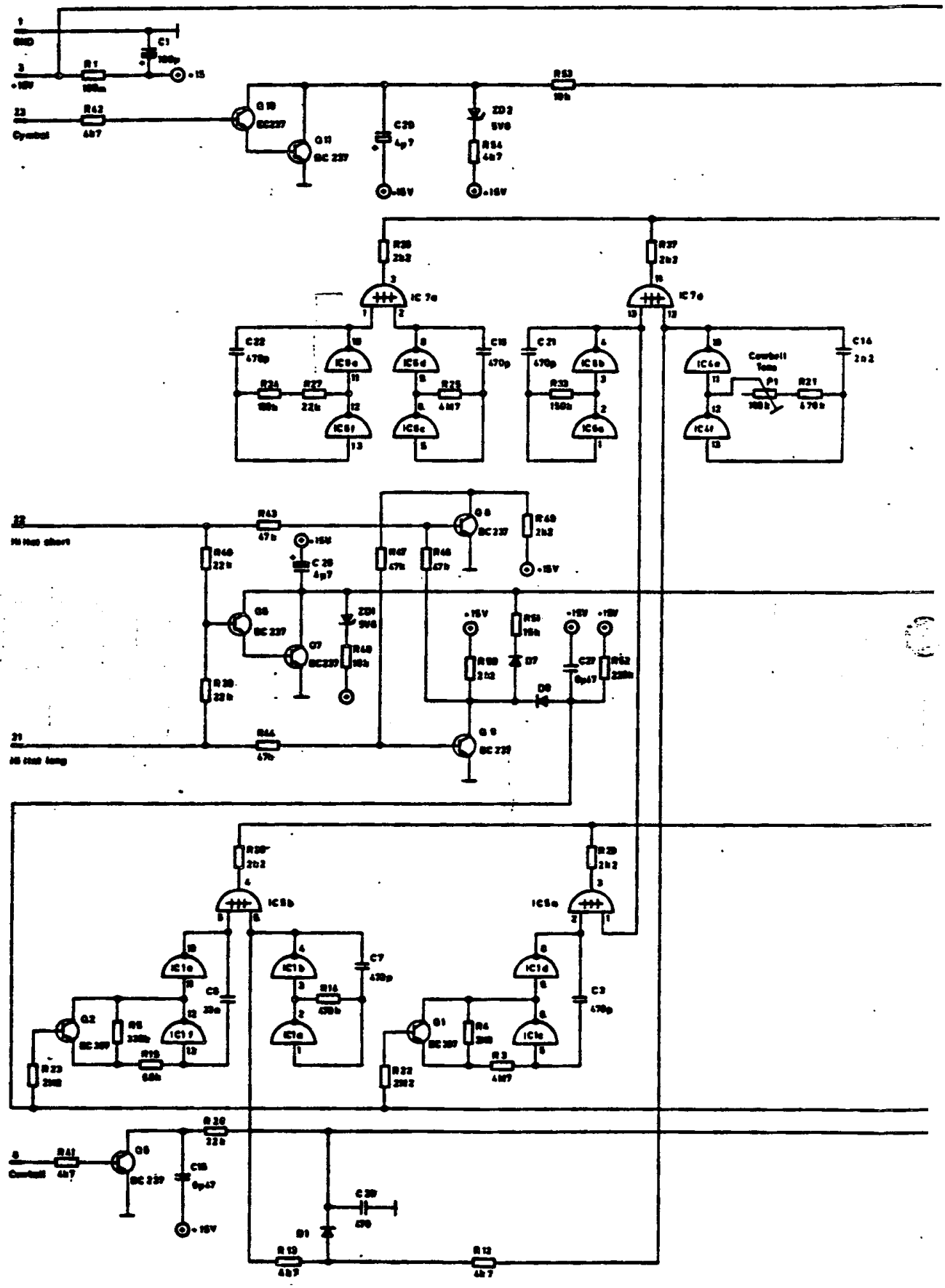
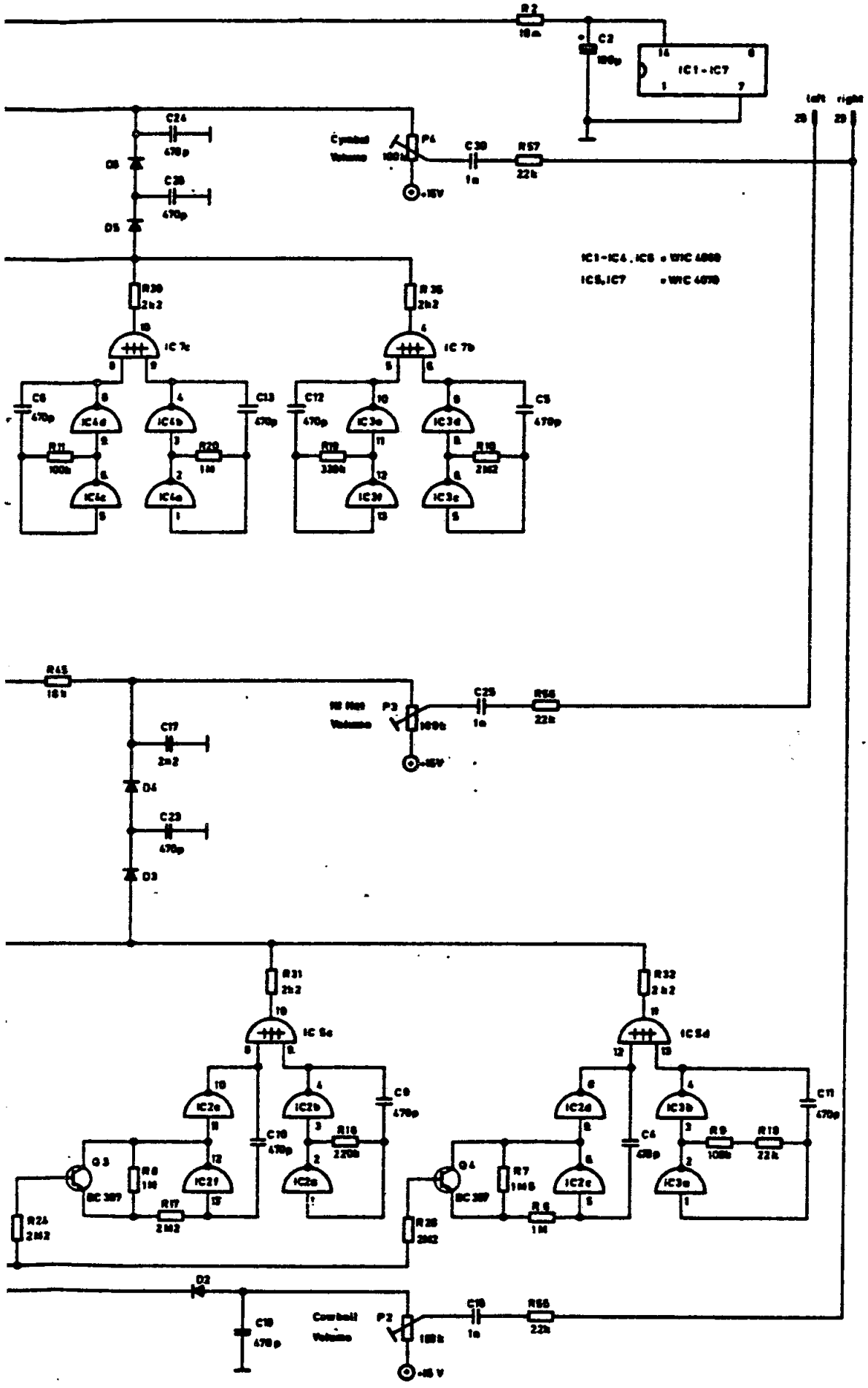


Figure 5 WM52 schematic diagram


IC1 - IC7
left
right
IC1-IC4, IC6 = WIC 4000
IC5, IC7 = WIC 4070
Cymbal Volume
Cowbell Volume
IC 7c
IC 7b
IC 9c
IC 9d
BC 307
BC 307

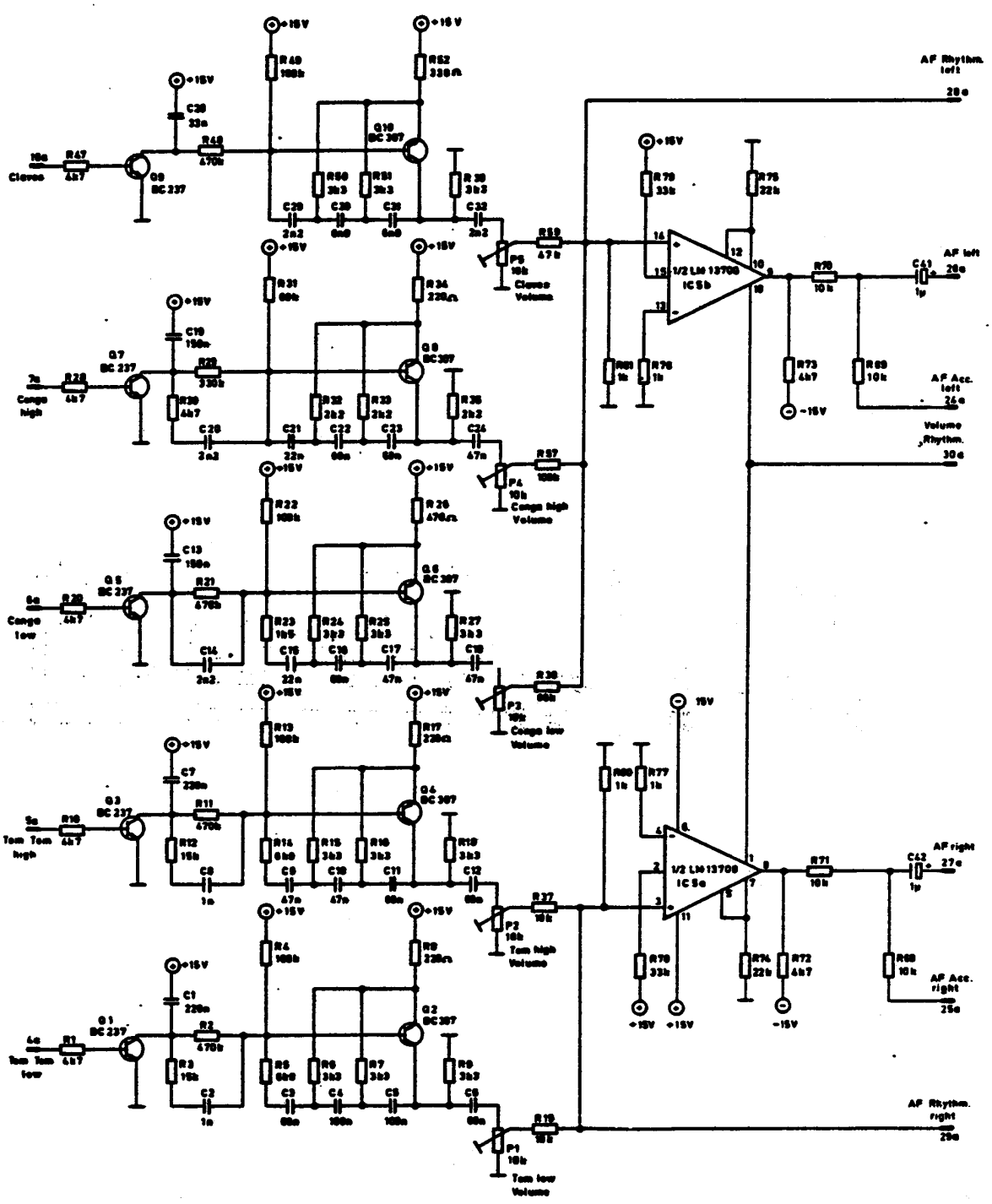
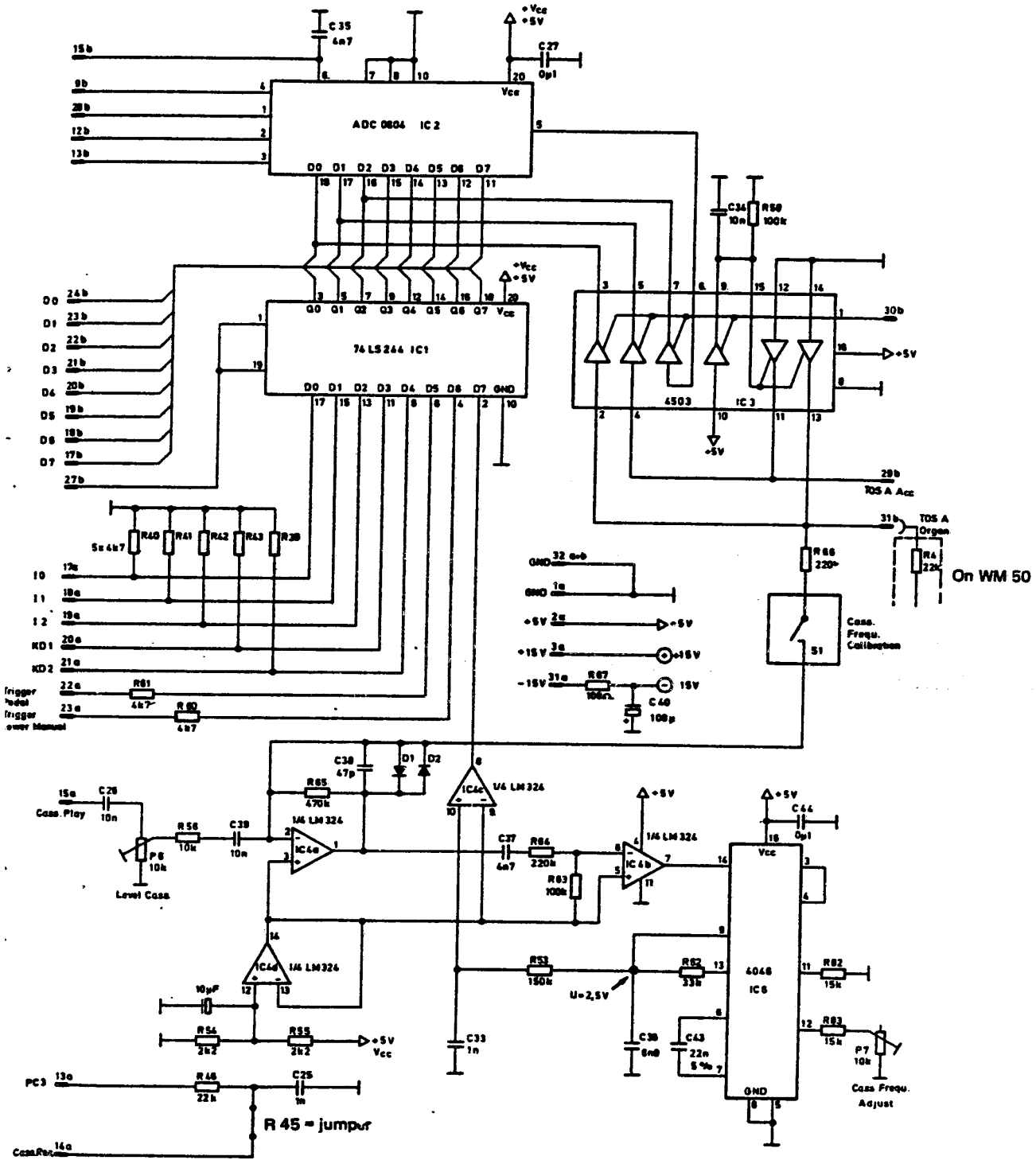


Figure 6 WM 53 schematic diagram


ADC 0804 IC 2
74 LS 244 IC1
4503 IC 3
4046 IC 6
1/4 LM 324
R 45 = jumper
On WM 50
Cass. Play
Level Cass.
Cass. Frequ. Calibration
Cass Frequ. Adjust
TOS A Acc
TOS A Organ
U=2,5V

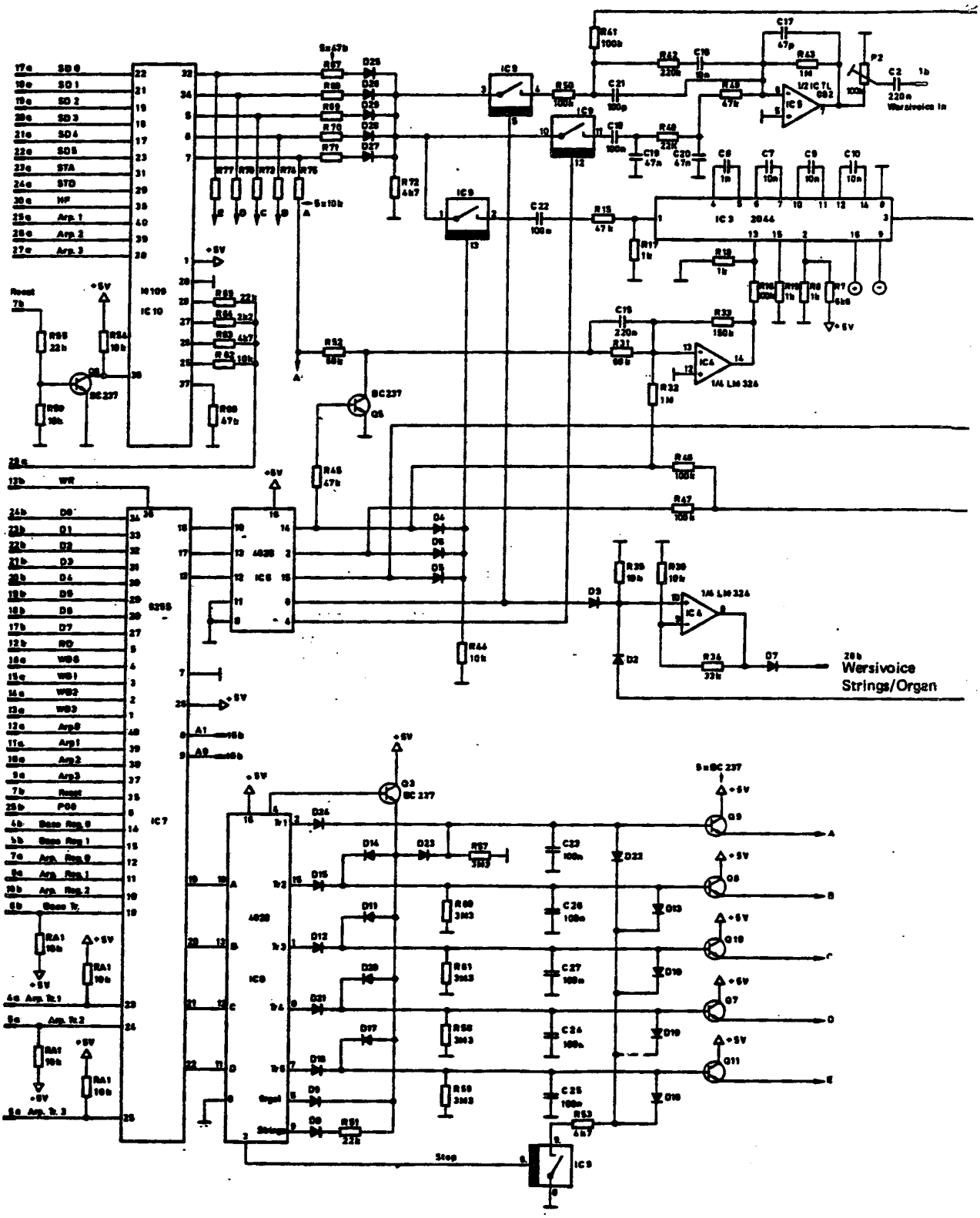
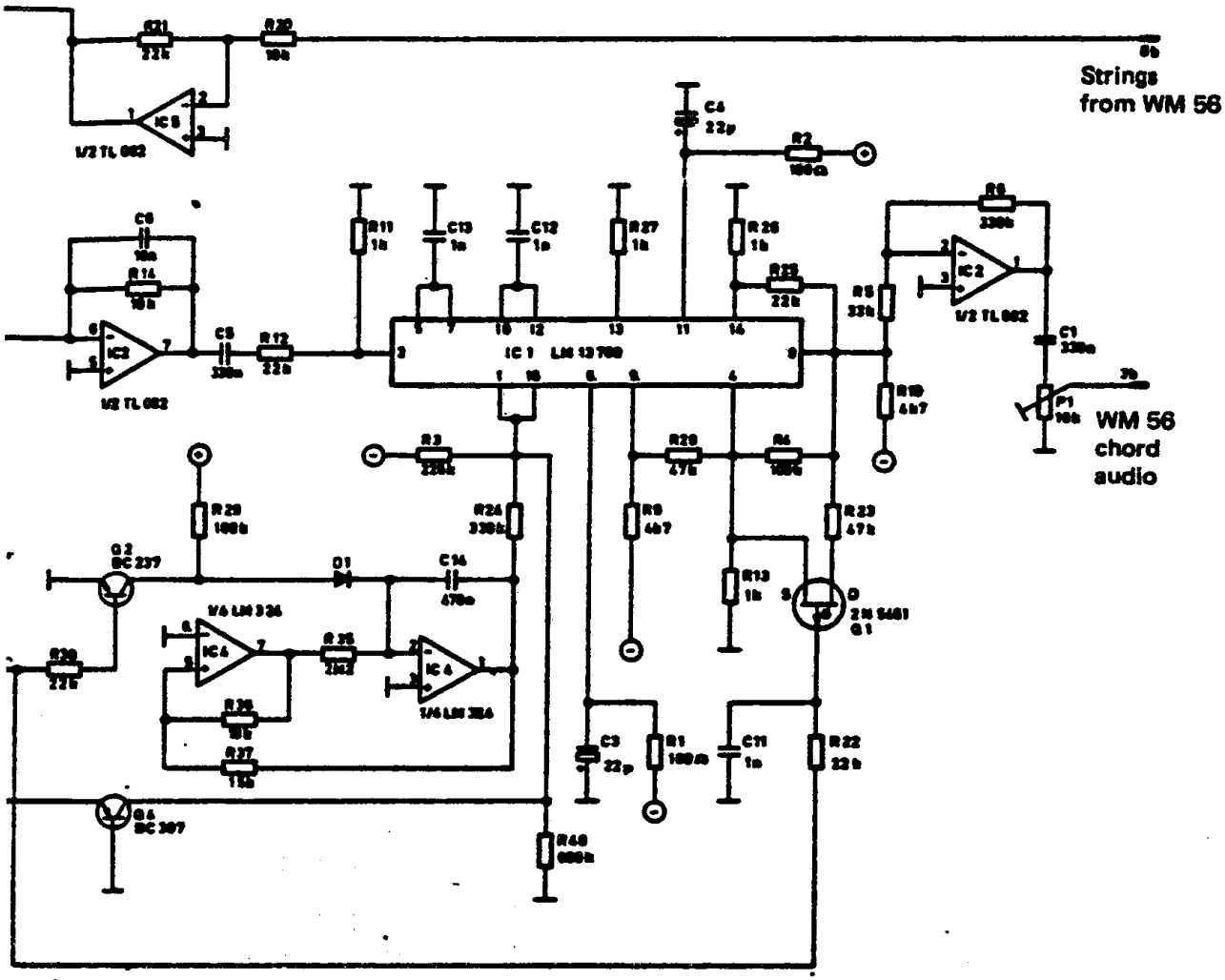


Figure 7 WM54 schematic diagram



Strings/Organ WM 56

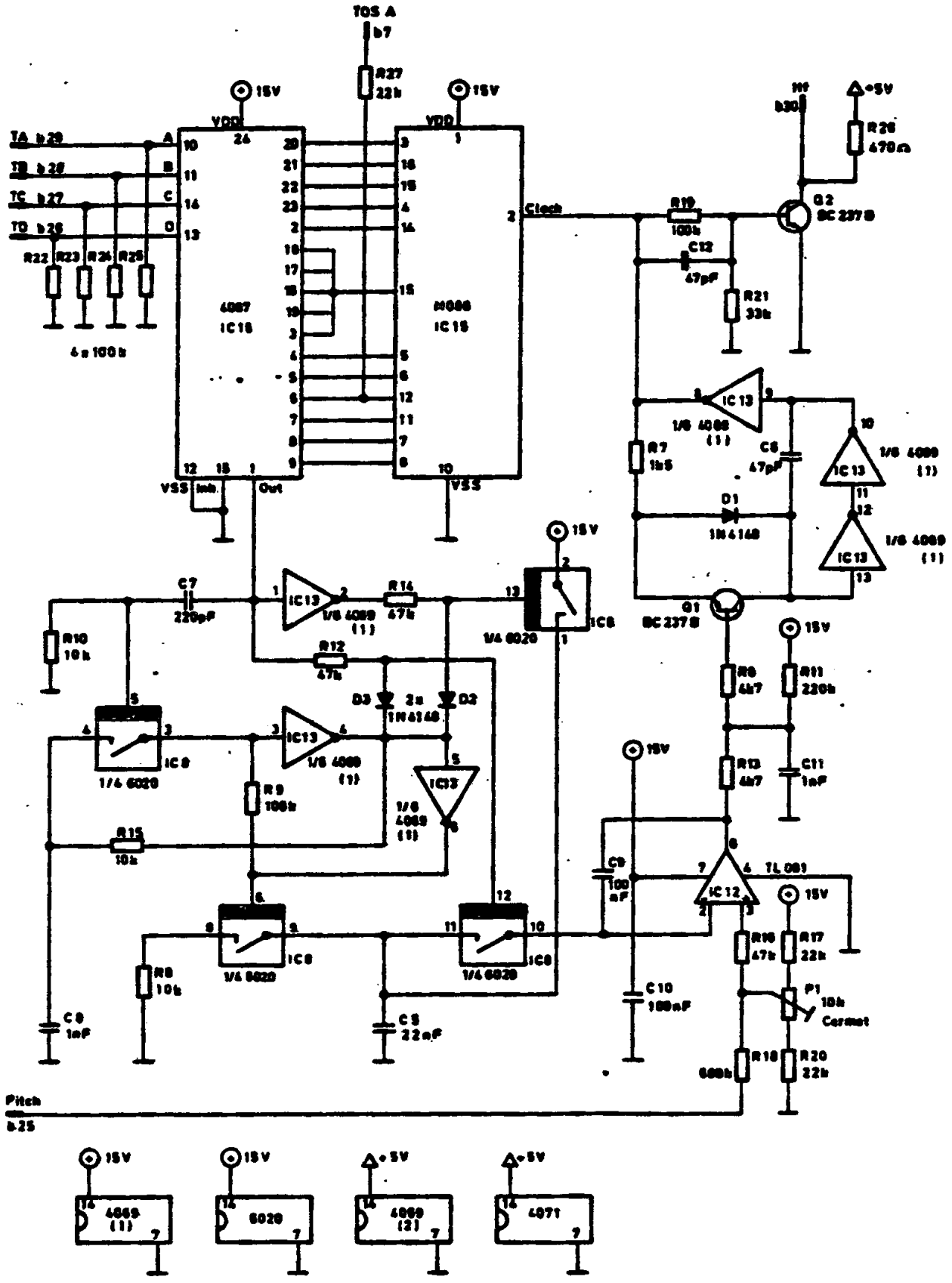
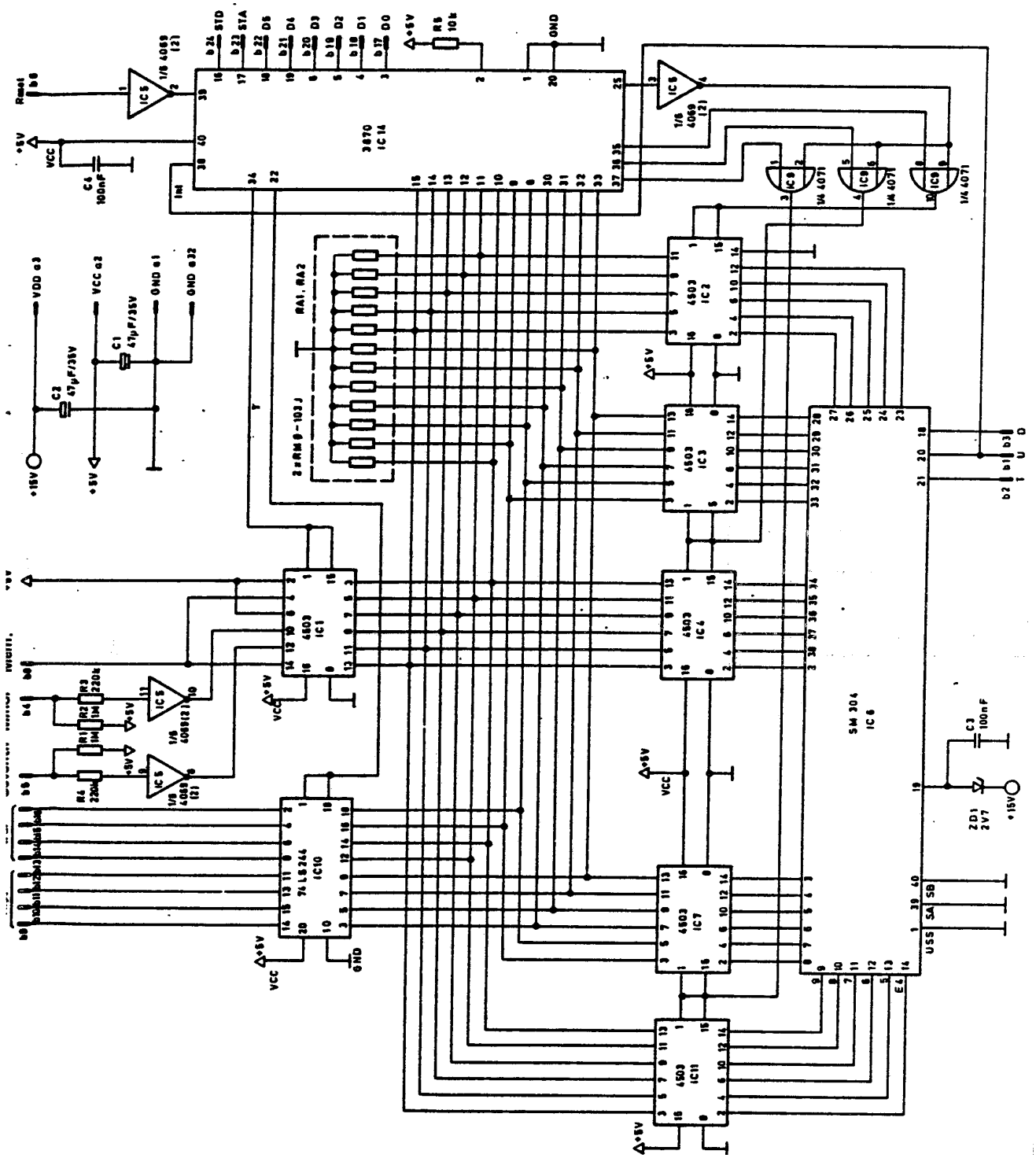


Figure 8 WM 55 schematic diagram



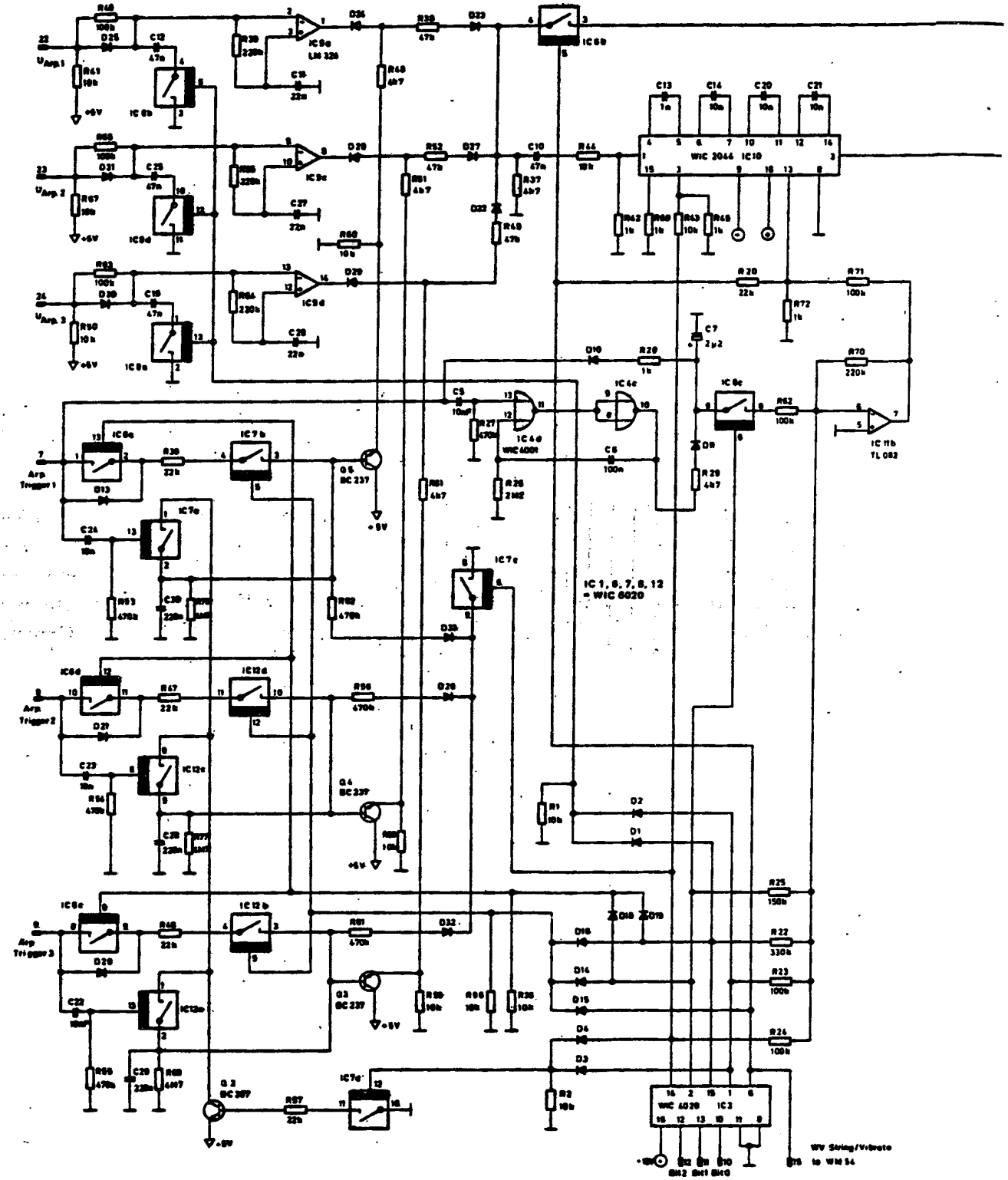
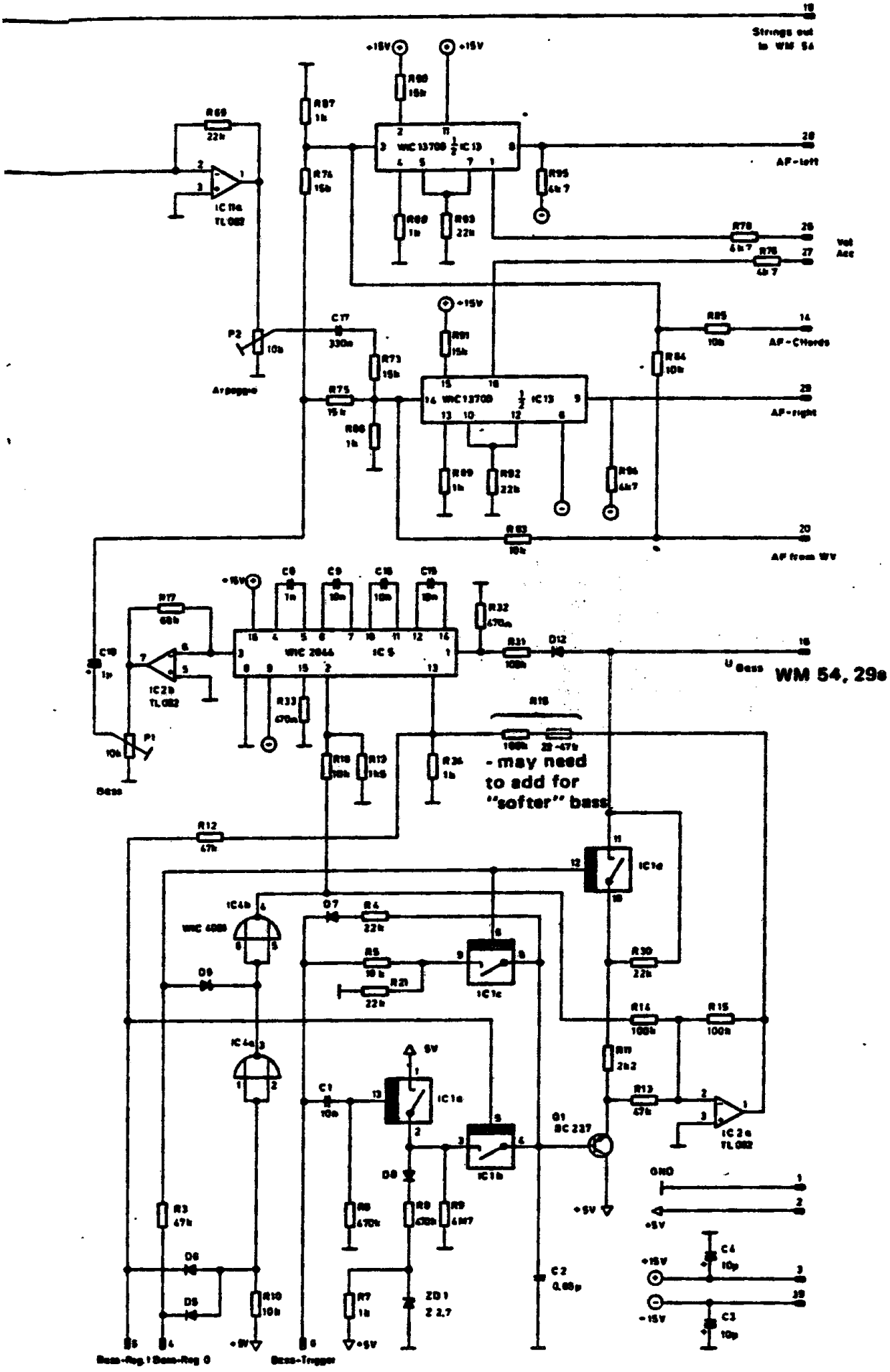


Figure 9 WM 56 schematic diagram


Strings out to WM 54
AF-left
Vol Acc
AF-CHords
AF-right
AF from WV
Arpeggio
Bass
WM 54, 29a
- may need to add for "softer" bass
AF-left
Vol Acc
AF-CHords
AF-right
AF from WV
Arpeggio
Bass
Bass-Reg 1
Bass-Reg 0
Bass-Trigger
GND
+5V
+15V
-15V
9V

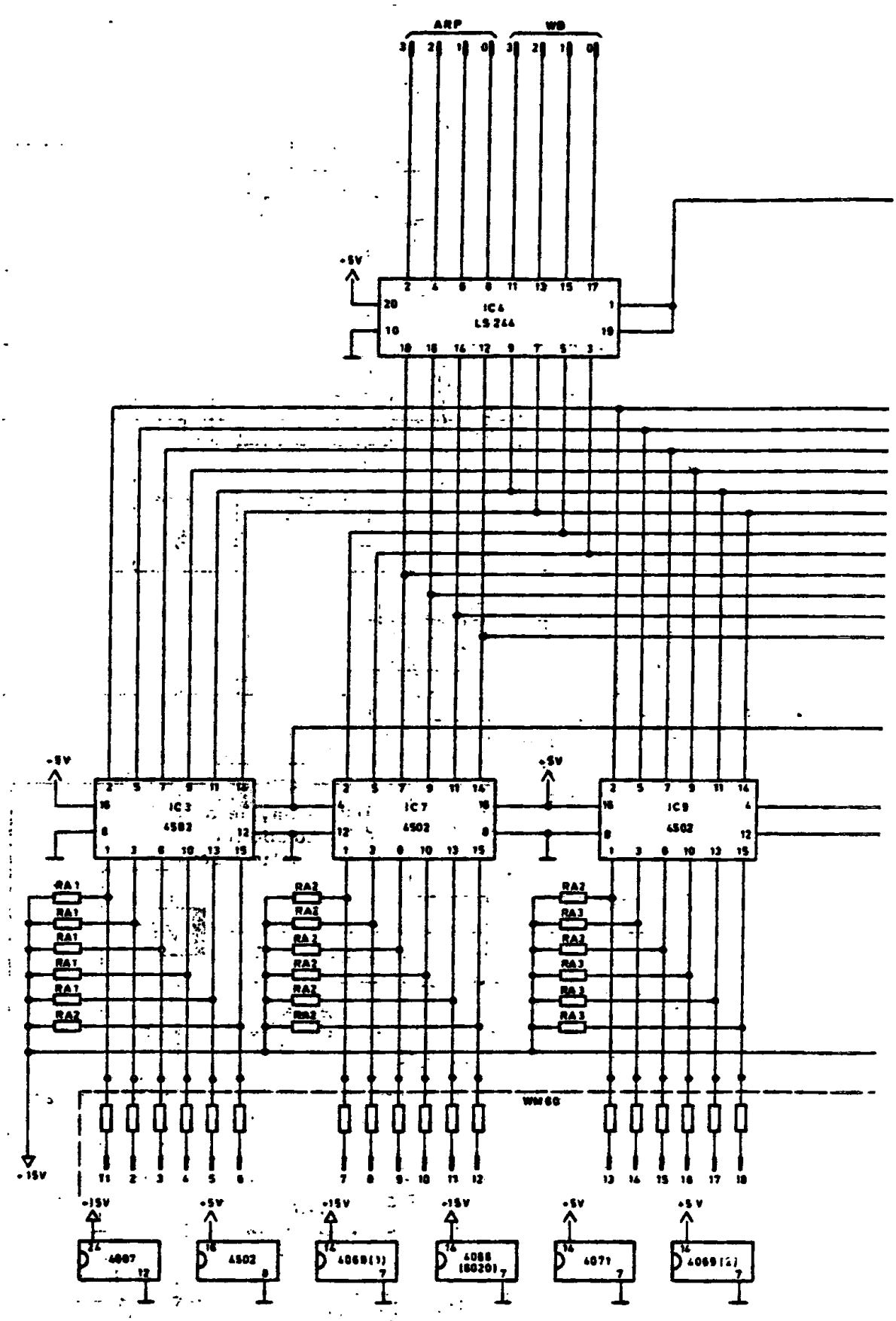
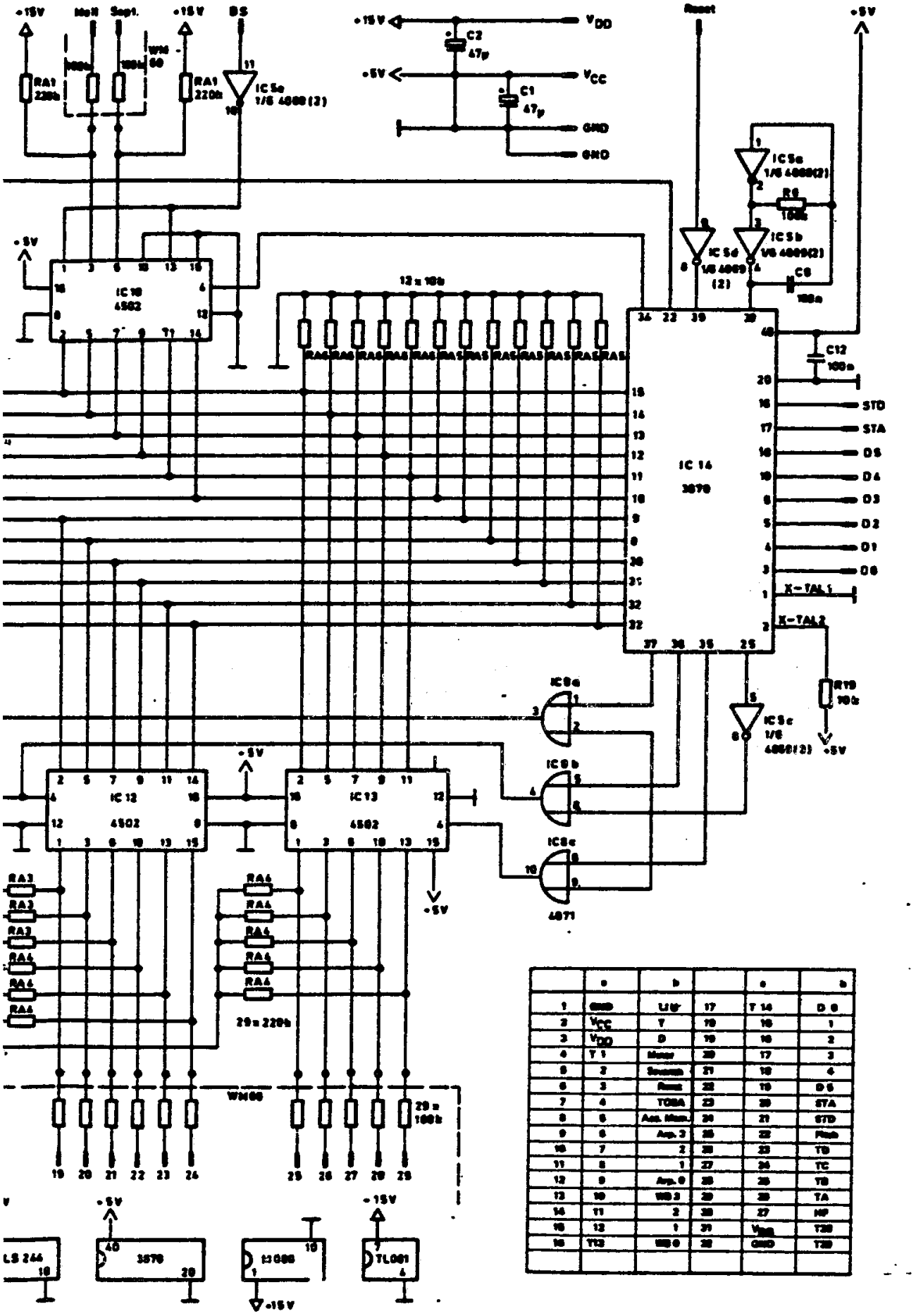


Figure 10 WM 57 schematic diagram



	a	b		c	b
1	GND		17	T 14	D 0
2	V_{CC}		16	16	1
3	V_{DD}		15	15	2
4	T 1		20	17	3
5	2		21	18	4
6	3		22	19	D 5
7	4	TOBA	23	20	STA
8	5		24	21	STD
9	6		25	22		
10	7		26	23	T9
11	8		27	24	TC
12	9		28	25	T8
13	10		29	26	TA
14	11		30	27	HP
15	12		31		T20
16	T13		32	GND	T20

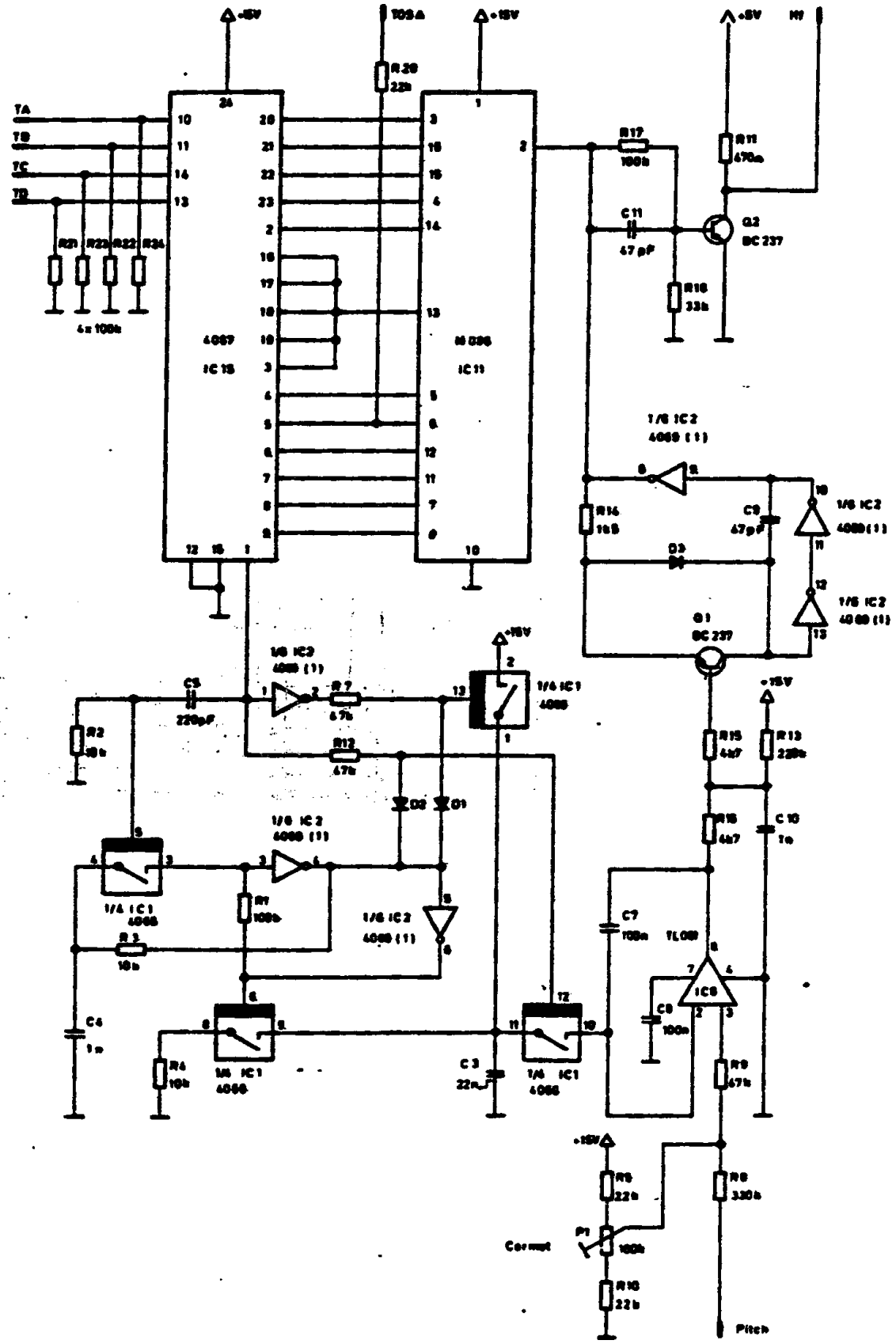


Figure 11 WM 57, accompaniment generator schematic diagram

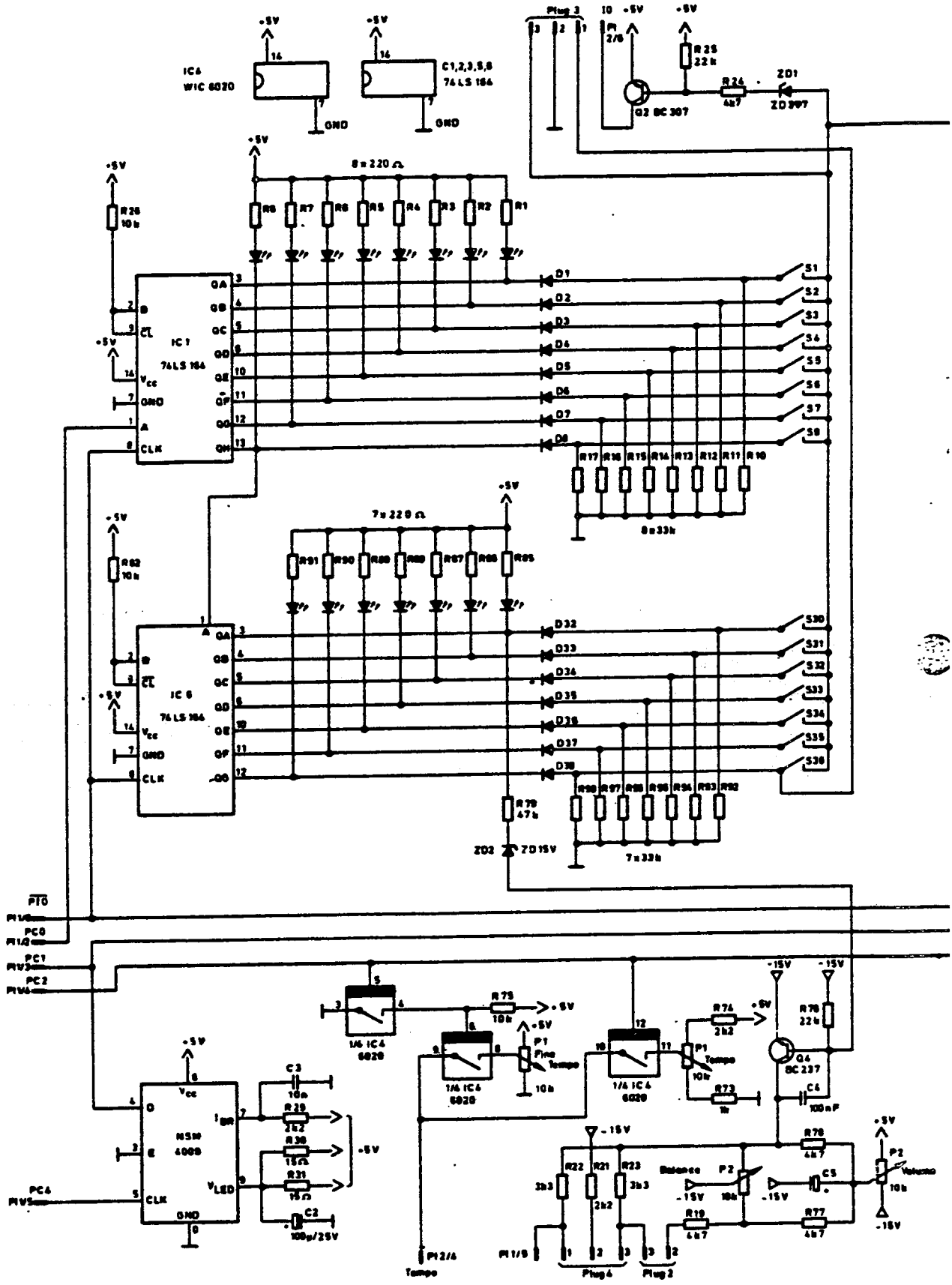
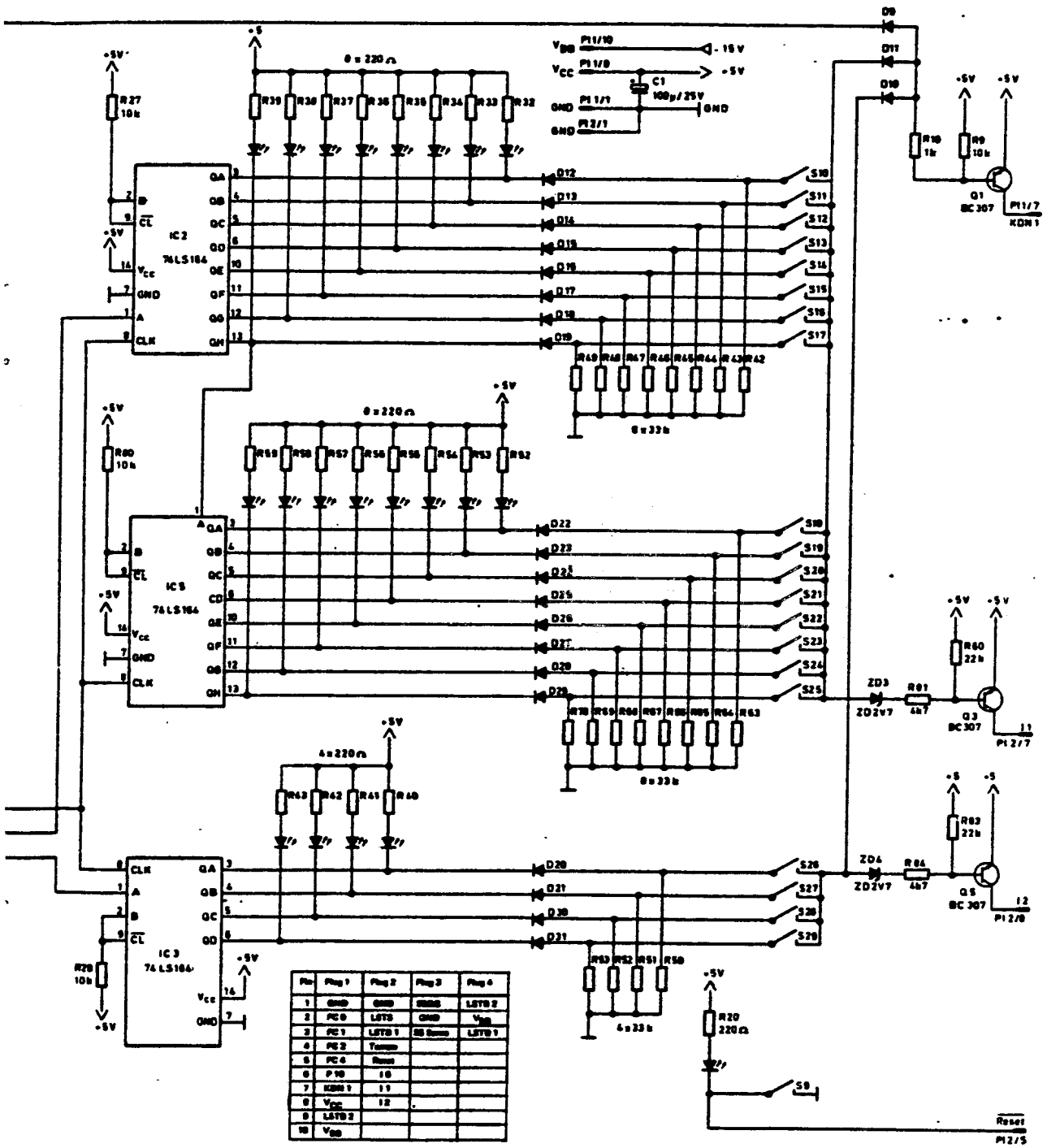


Figure 12 WM 58 schematic diagram



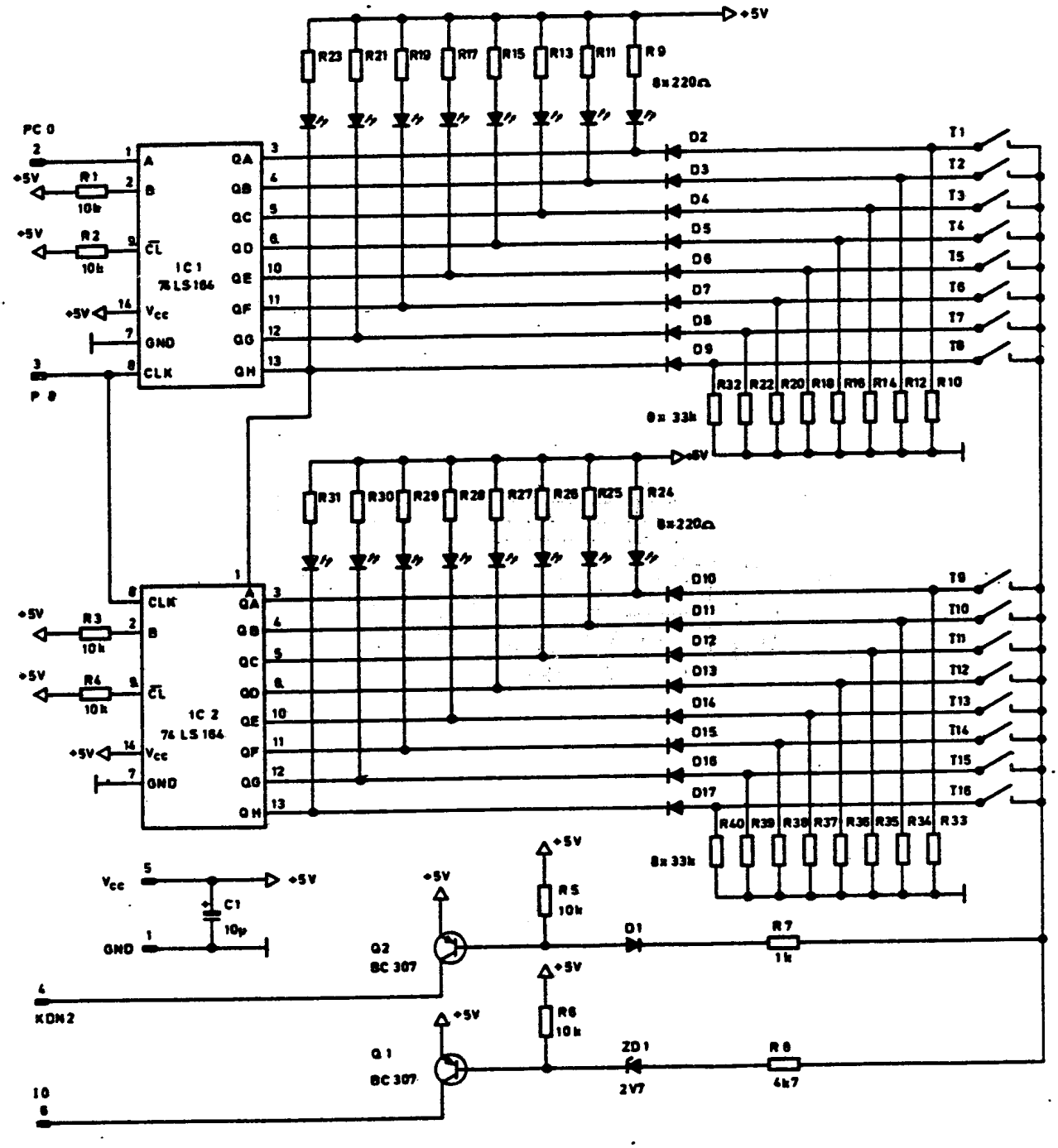


Figure 13 WM 59 schematic diagram

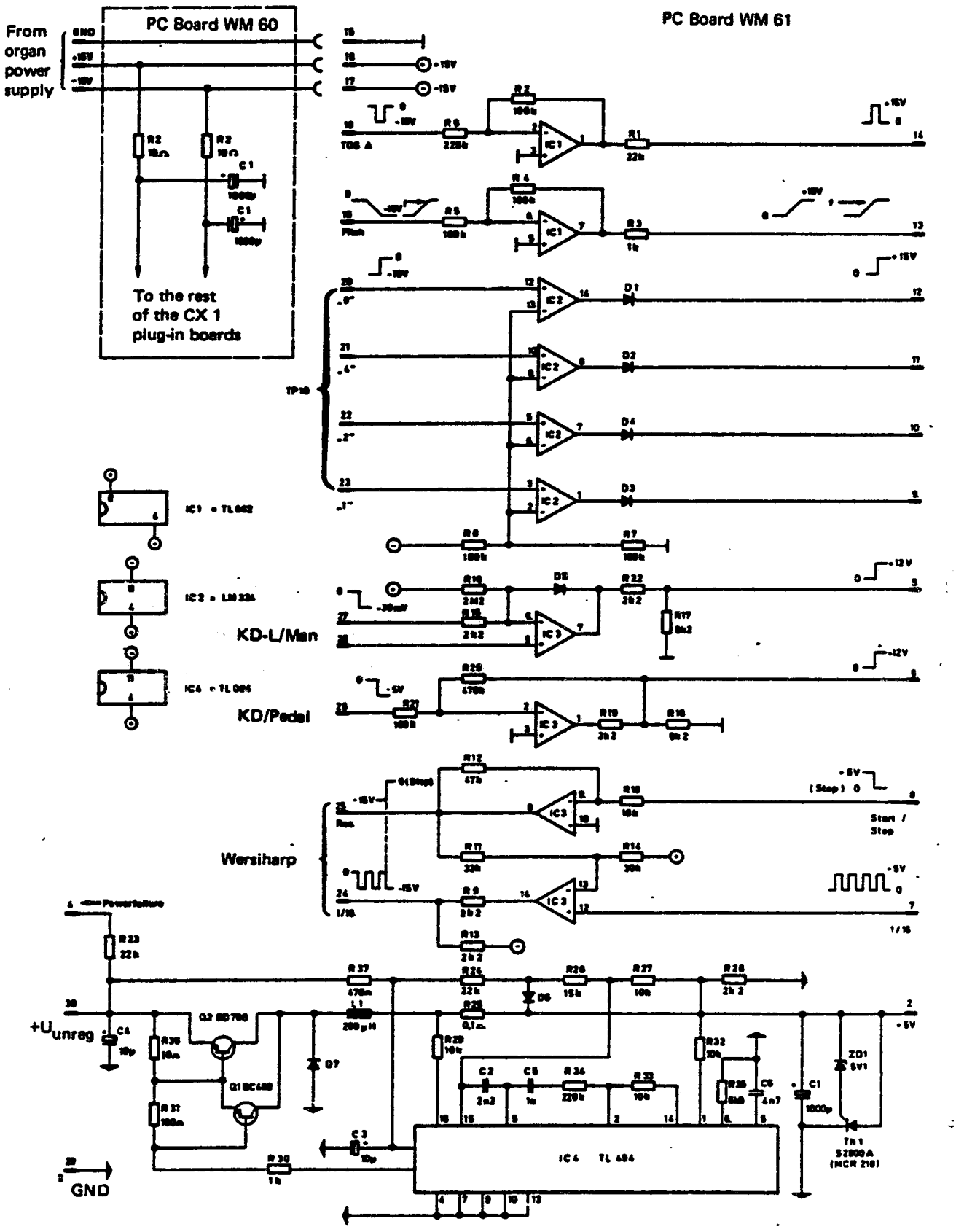


Figure 14 WM 61 schematic diagram

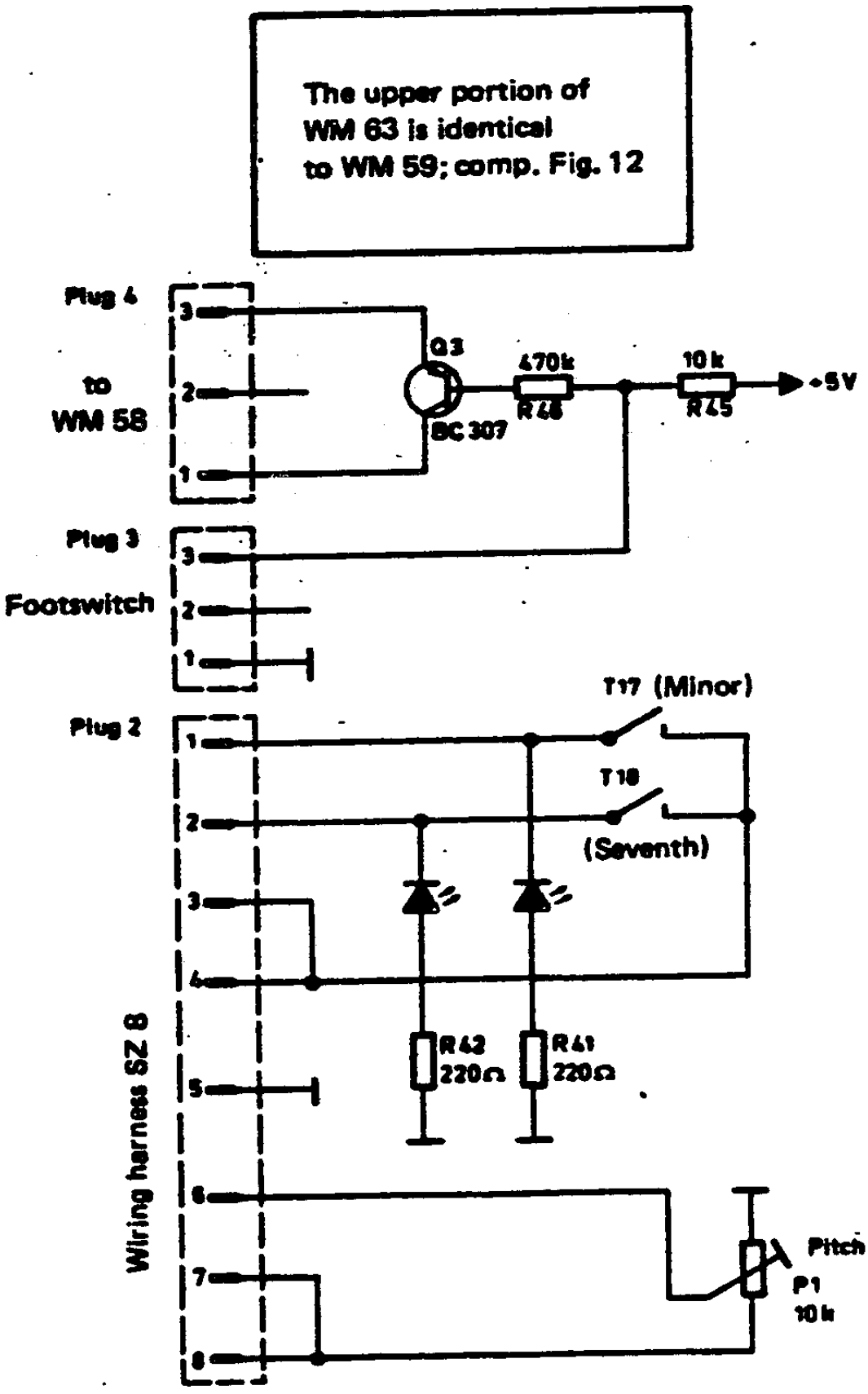


Figure 15 WM 63 schematic diagram, CX 1 - FA portion

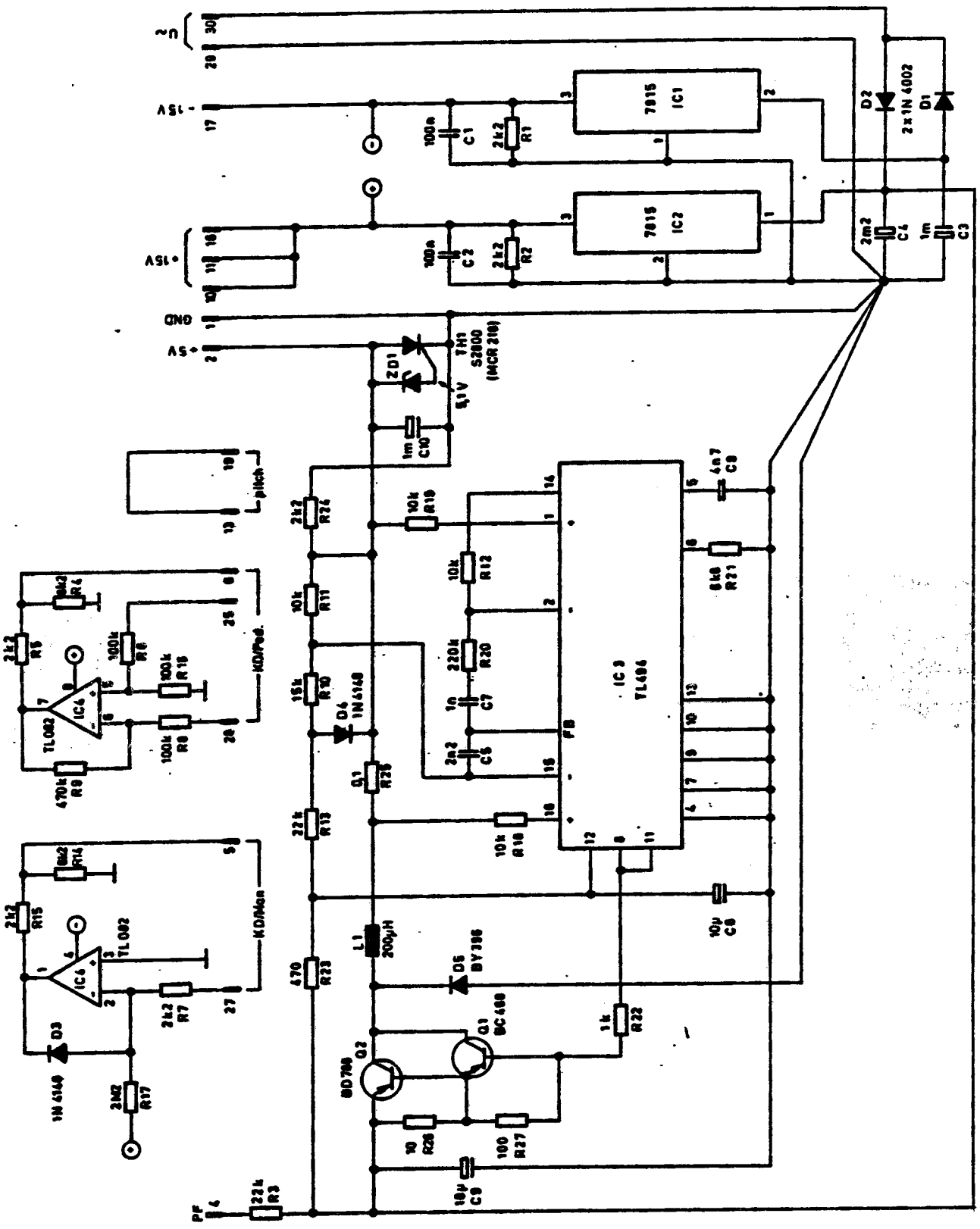


Figure 16 WM 64 schematic diagram

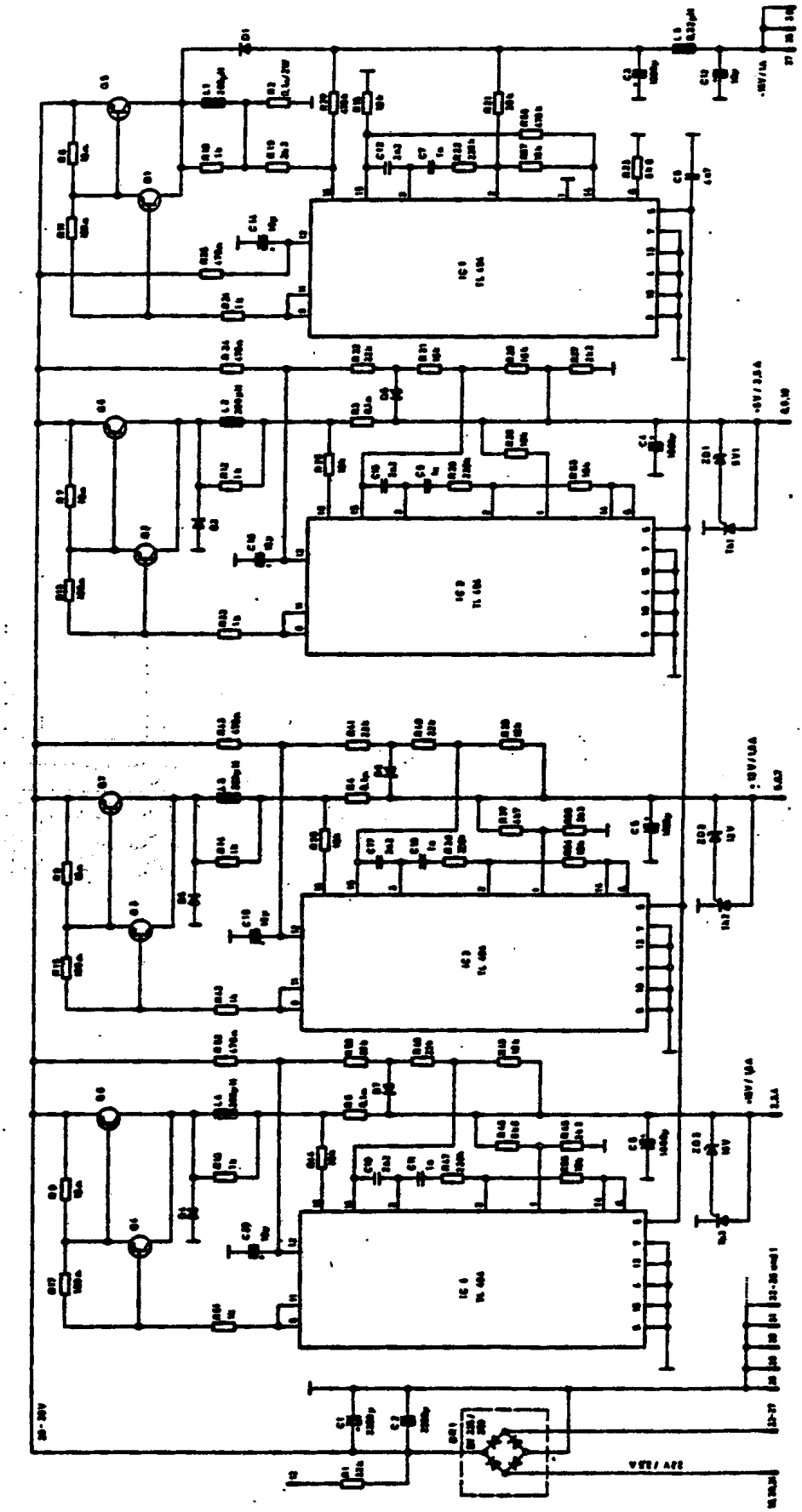


Figure 17 PS 10 schematic diagram

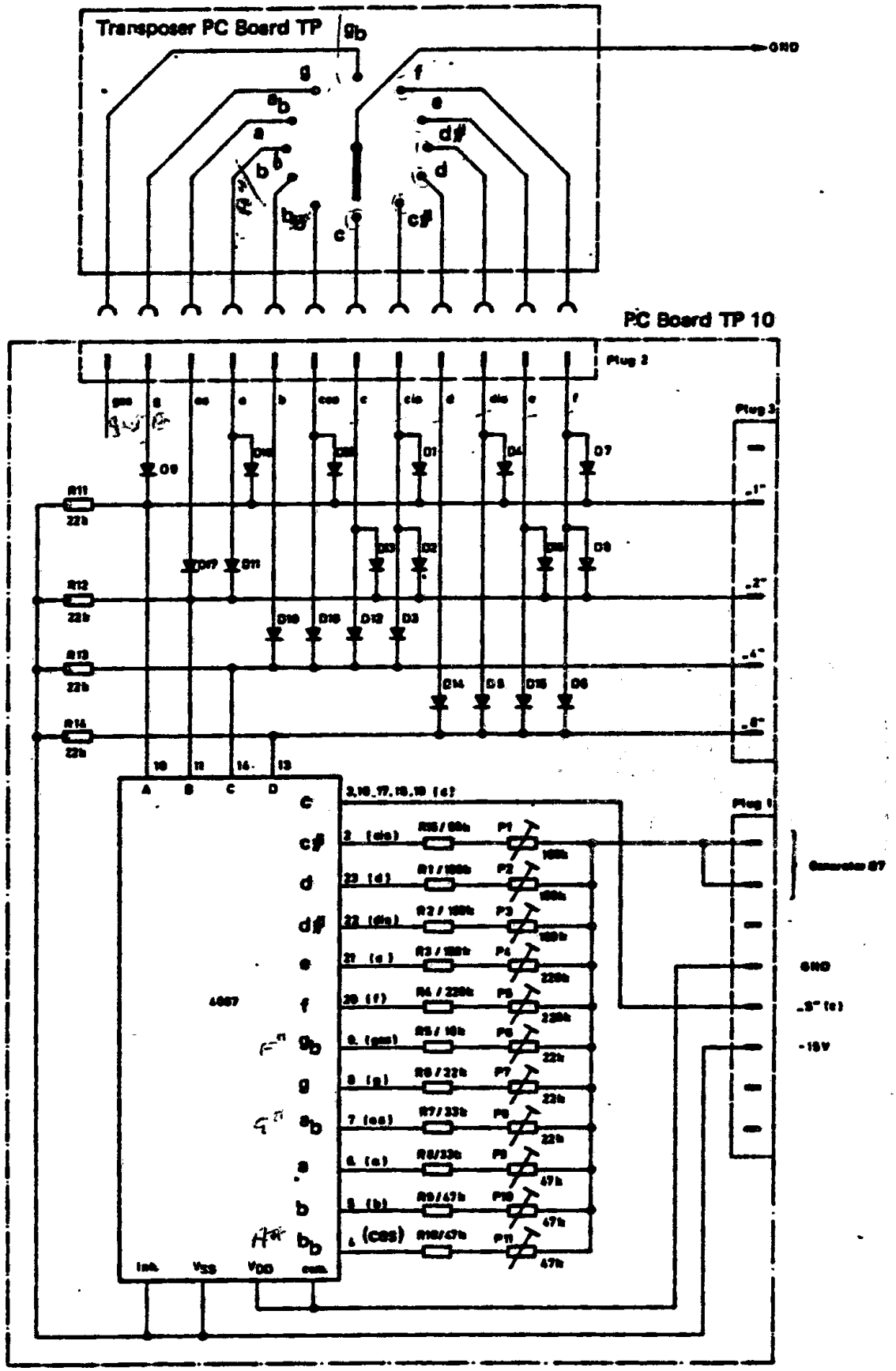


Figure 18 TP 10 schematic diagram

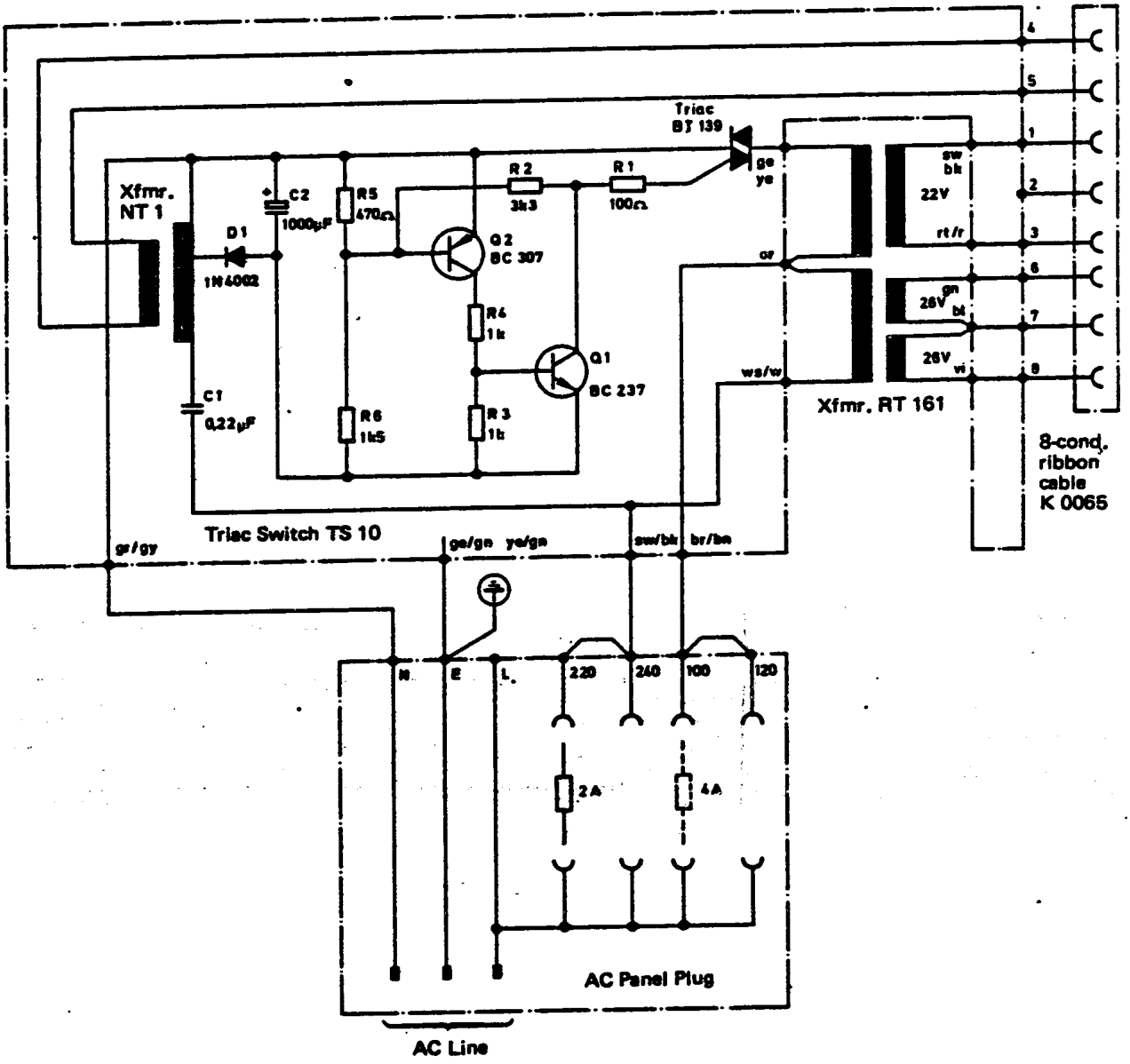


Figure 19 TS 10 schematic diagram

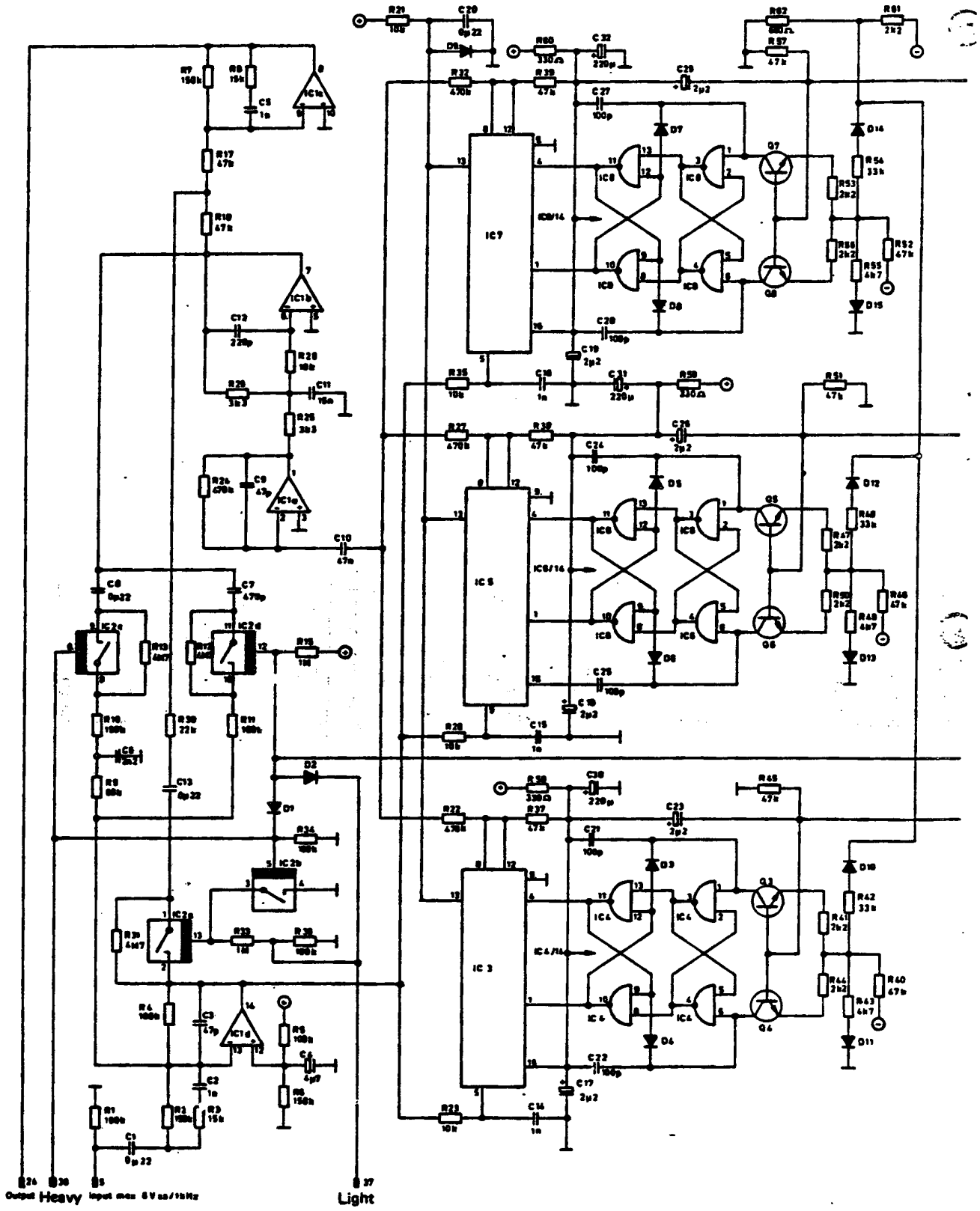


Figure 20 WV 2 schematic diagram

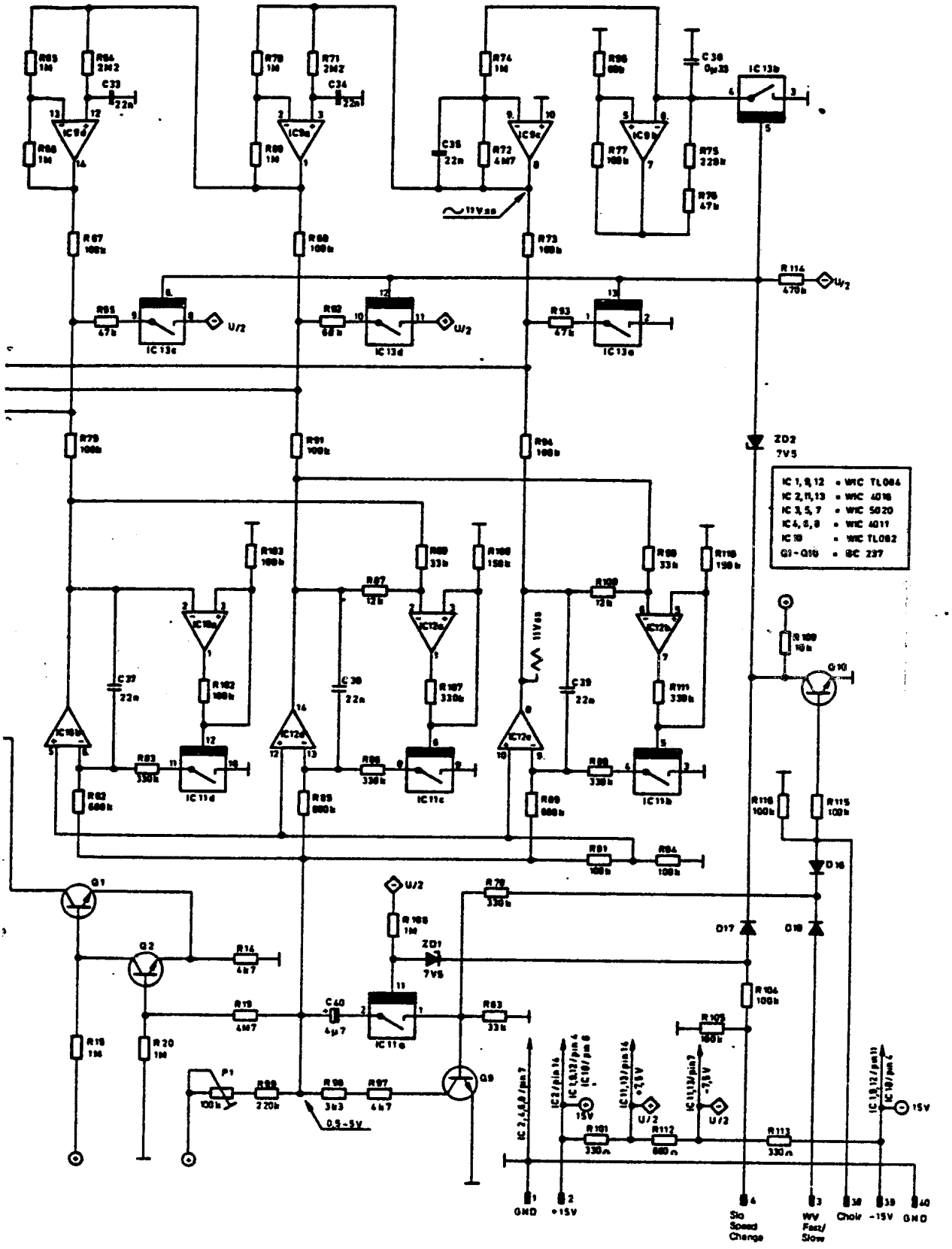

IC 1, 9, 12 = WIC TL084
IC 2, 11, 13 = WIC 4016
IC 3, 5, 7 = WIC 5020
IC 4, 6, 8 = WIC 4011
IC 10 = WIC TL082
Q1 - Q10 = BC 237
ZD2 7V5
ZD1 7V5
U/2
+15V
-15V
GND
Sla Speed Change
WV Fast/ Slow
Choir

Table 1 Pin Layout of Backplane Board WM 50

Pin Layout of Backplane Board WM 50

Pin	WM 51 a	WM 52 a	WM 53 a	WM 53 b	CPU a	CPU b	WM 54 a	WM 54 b	WM 55 a	WM 55 b	WM 56 a	WV 2	Pin
1	GND	GND	GND		GND	Tr. Tom low	GND	WV in	GND	U	GND	GND	1
2	Vcc	Vcc	Vcc	Vcc	Vcc	Tr. Tom high	Vcc		Vcc	T	Vcc	VDD	2
3	VDD	VDD	VDD		VDD	Tr. Conga low	VDD	Aud. Chd.	VDD	D	VDD		3
4			Tr. Tom low		Powerfailure	Tr. Conga high	Arp.Tr.1	B.Reg.0		Minor	B. Reg. 0		4
5	Tr. Brush		Tr. Tom high		Res. in	Tr. Brush	Arp.Tr. 2	B. Reg.1		7th	B. Reg. 1	WV in	5
6	Tr. Maracas		Tr. Conga low		Reset	Tr. Maracas	Arp.Tr. 3	B.Tr.		Reset	B. Tr.		6
7			Tr. Conga high		PCS 0	Tr. Synthedrum	Arp.Reg.0	Reset		TOS A Acc.	Arp.Tr. 1		7
8		Tr. Cowbell			PCS 1	Tr. Cowbell	Arp.Reg.1	Aud. Str.		PC 7	Arp.Tr. 2		8
9				260 K	260K	PC 7	Arp. 3	UStr/Vibr.		Arp. 3	Arp.Tr. 3		9
10	Tr.Sy..thedrum				M 1	PC 6	Arp. 2	Arp.Reg.2		Arp. 2	Arp.Reg. 0		10
11					Int	PC 5	Arp. 1			Arp. 1	Arp.Reg. 1		11
12				RD	RD	PC 4	Arp. 0	RD		Arp. 0	Arp.Reg. 2		12
13			PC 3	WR	WR	PC 3	WB 3	WR		WB 3			13
14			Cass. Rec.		A 2	PC 2	WB 2			WB 2	Aud. Chd.		14
15			Cass. Play	Tempo	A 1	PC 1	WB 1	A 1		WB 1	Aud. Bass		15
16			Tr. Claves		A 0	PC 0	WB 0	A 0		WB 0	Aud. Str.		16
17	Tr.Bassdrum		I 0	D 7	D 7	Tr.Bassdrum	SD 0	D 7		SD 0			17
18			I 1	D 6	D 6	Tr. Claves	SD 1	D 6		SD 1	NF String		18
19	Tr. Snare		I 2	D 5	D 5	Tr. Snare	SD 2	D 5		SD 2			19
20			KD 1	D 4	D 4	PA 4	SD 3	D 4		SD 3	WV out	WV out	20
21		Tr.HiHat long	KD 2	D 3	D 3	Tr.HiHat long	SD 4	D 3		SD 4			21
22		Tr.HiHat short	Tr. Pedal	D 2	D 2	Tr.HiHat short	SD 5	D 2		SD 5	UArp. 1		22
23		Tr.Cymbal	Tr.Lower Man.	D 1	D 1	Tr. Cymbal	ST A	D 1		STA	UArp. 2		23
24	Tr. Tamb.		Aud. Acc. L.	D 0	D 0	Tr. Tamb.	STD	D 0		STD	UArp. 3		24
25			Aud. Acc R.		P 08	A 8	UArp. 1	P 08		Pitch			25
26			Audio L.		P 10	A 7	UArp. 2			Transp. D	Vol. Acc. 1		26
27			Audio R.	P 38	P 18	A 6	UArp. 3			Transp. C	Vol. Acc. 2		27
28	Aud. Rh. L.	Aud. Rh. L.	Aud. Rh. L.	P 20	P 20	A 5		Vibr./String		Transp. B	Aud. Acc. L.		28
29	Aud. Rh. R.	Aud. Rh. H.	Aud. Rh. R.	TOS A Acc.		A 4	Aud. Bass			Transp. A	Aud. Acc. R.		29
30			Vol. Rh.	P 30	P 30	A 3	HF			HF			30
31	VBB	VBB	VBB	TOS A Org.	VBB	P 38	VBB		VBB		VBB		31
32	GND	GND	GND		GND	U. Buf.	GND		GND		GND		32
													33
												Vibr/Str.	34
												VBB	35
												GND	36
													37
													38
													39
													40

V_{CC} = + 5 V

V_{DD} = + 15 V

V_{BB} = − 15 V

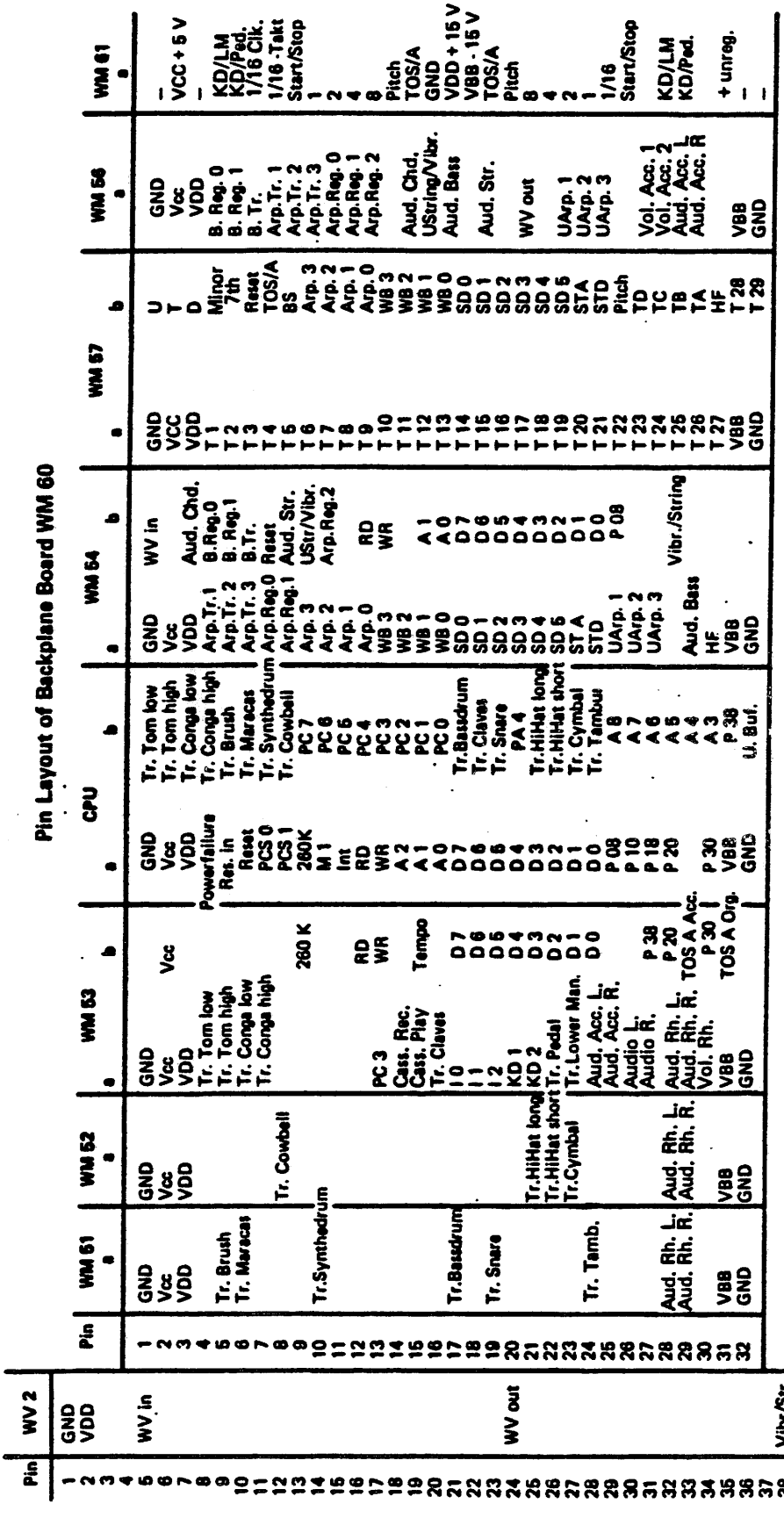


Table 2 Pin Layout of Backplane Board WM 60

D PC Board Layouts

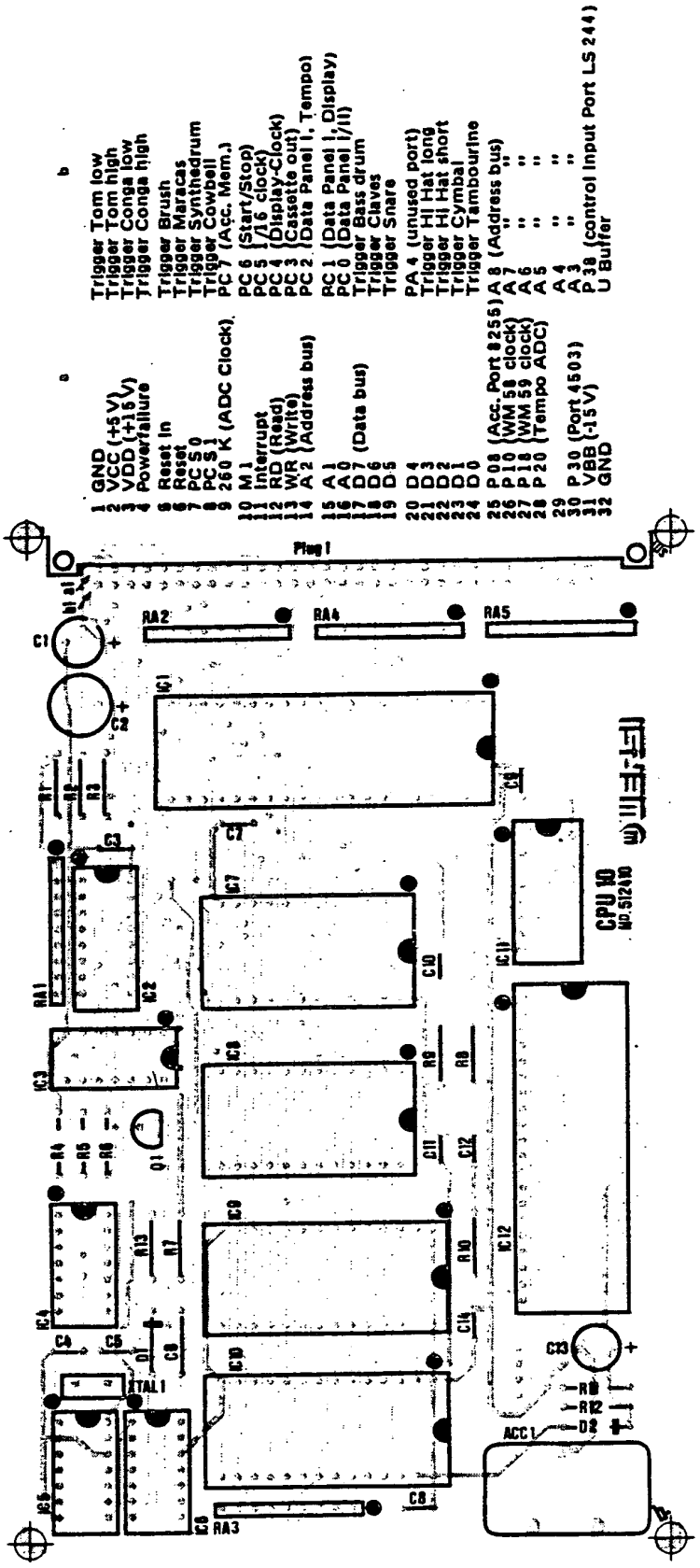


Figure 21 PC board CPU 10, side B and component layout

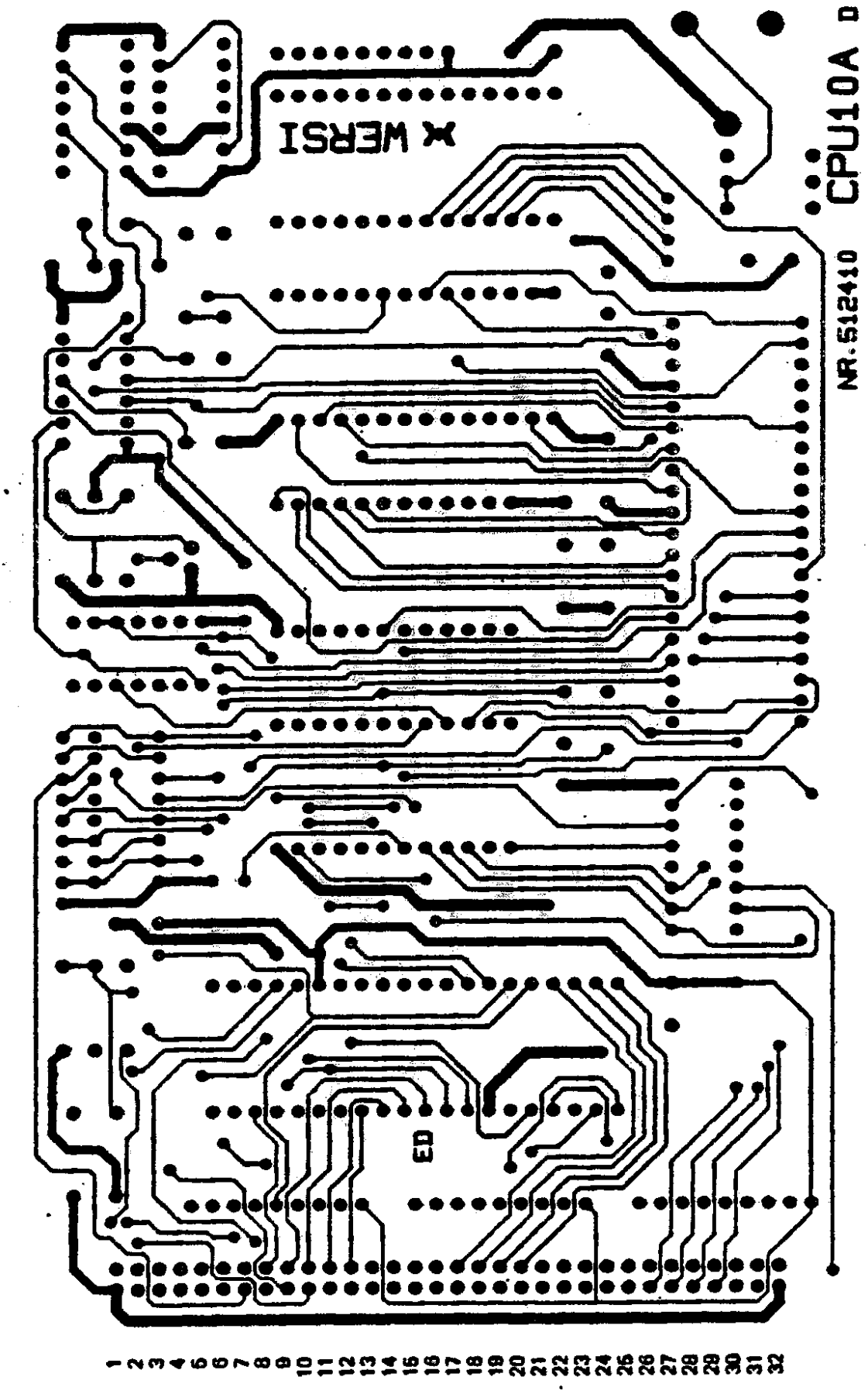


Figure 22 PC board CPU 10, side A

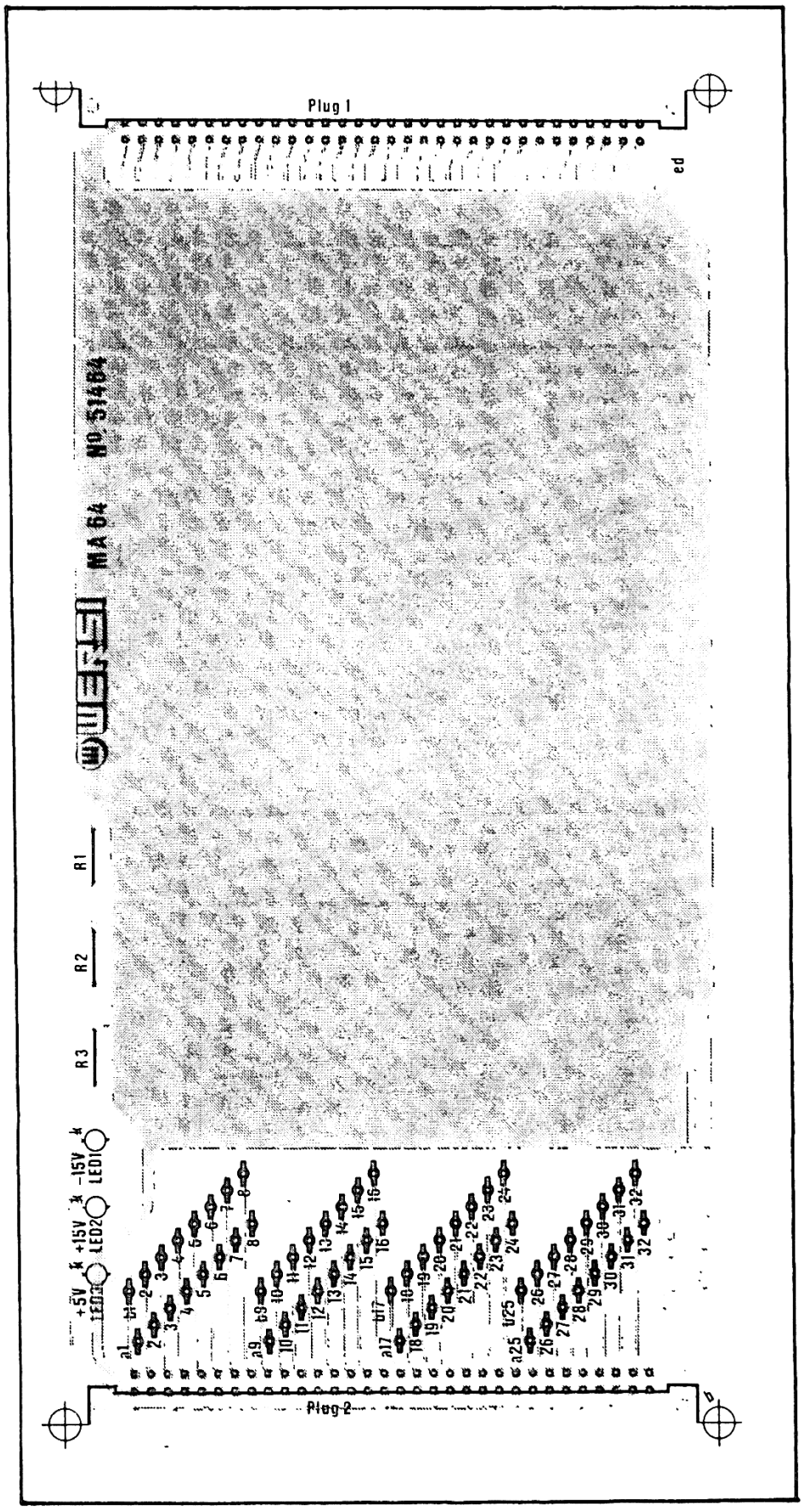


Figure 23 Extender board MA64, side A and component layout

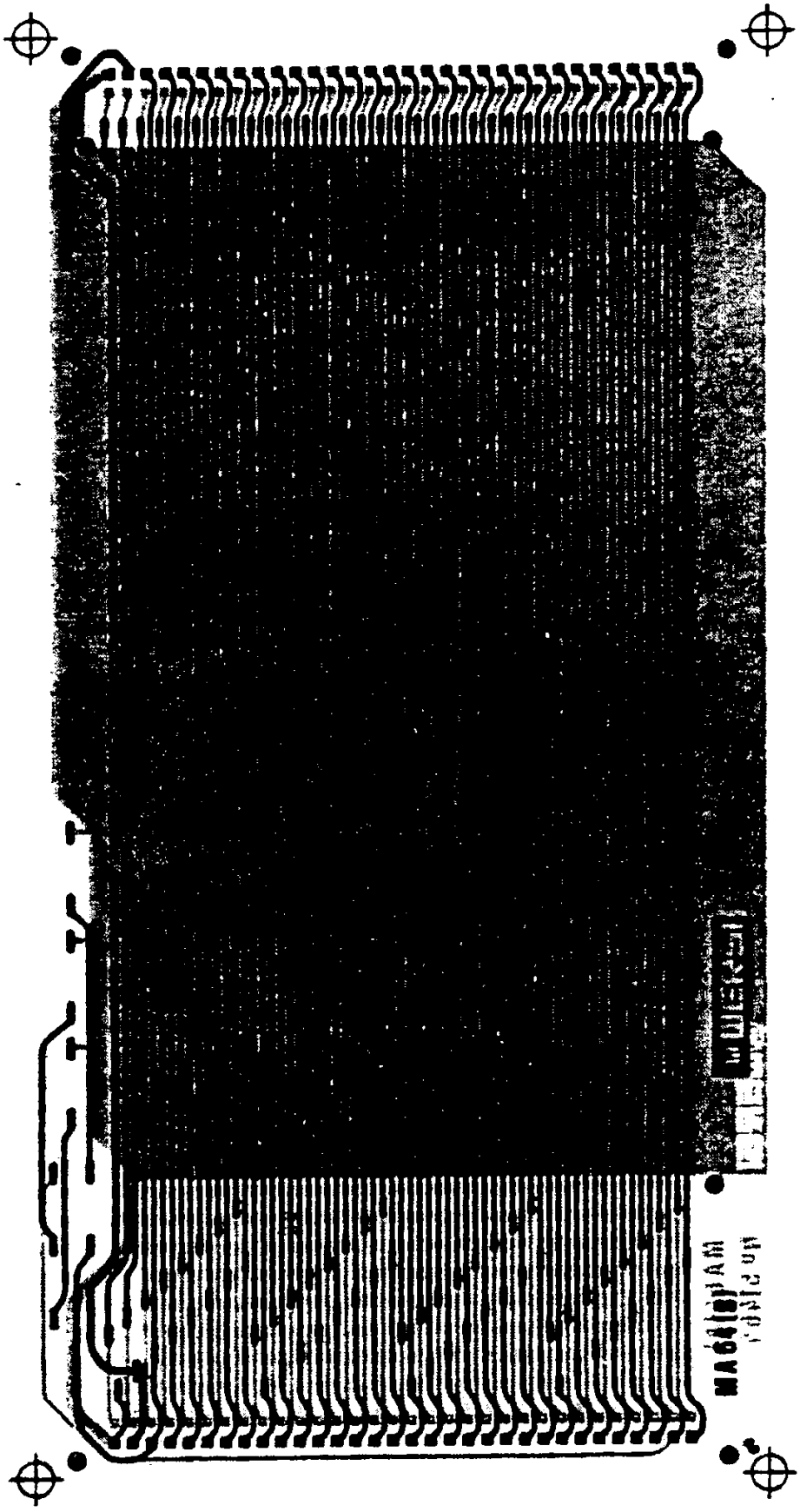


Figure 24 Extender board MA64, side B (side A shown screened)

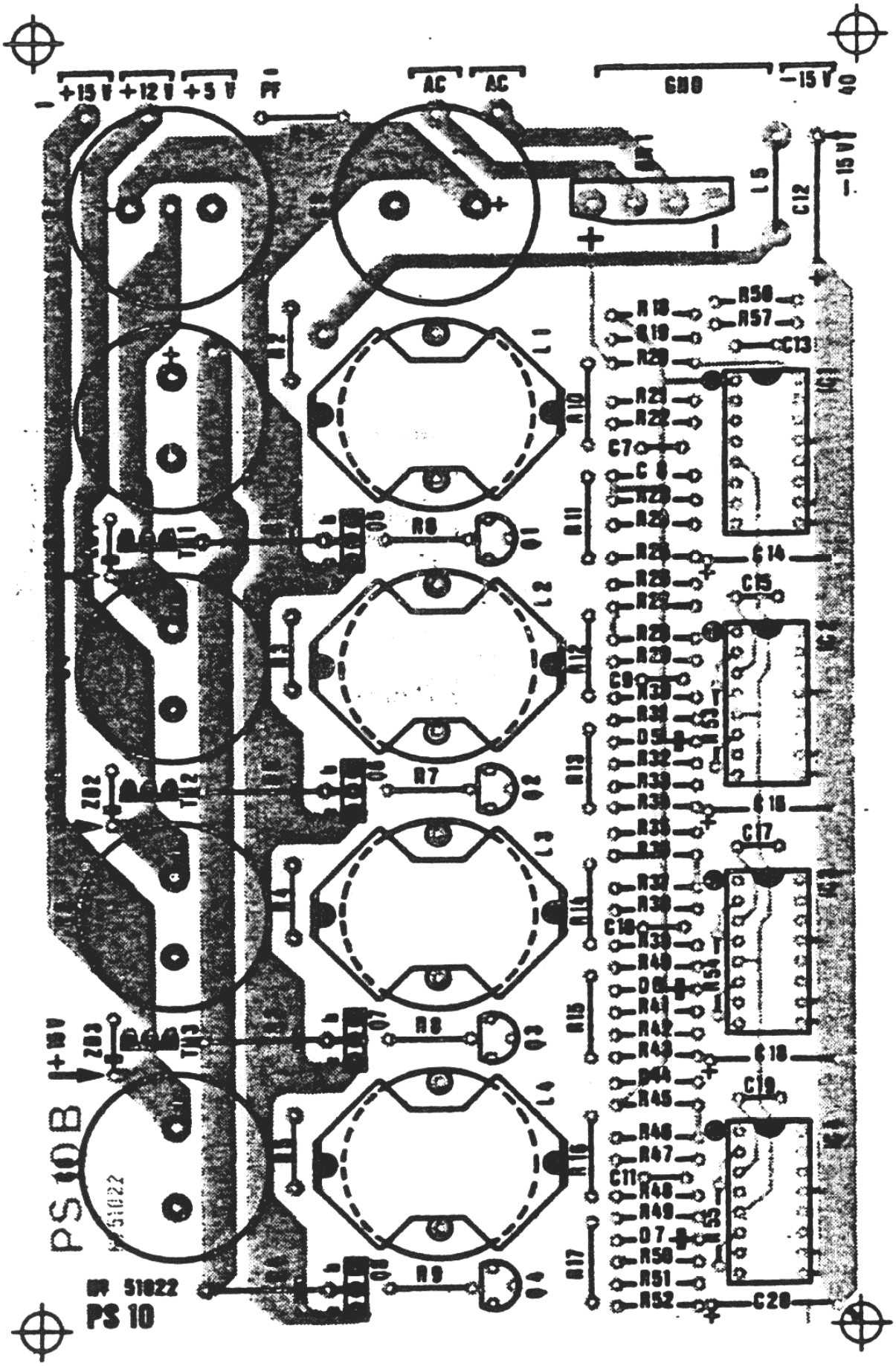


Figure 25 PC board PS 10, side B and component layout

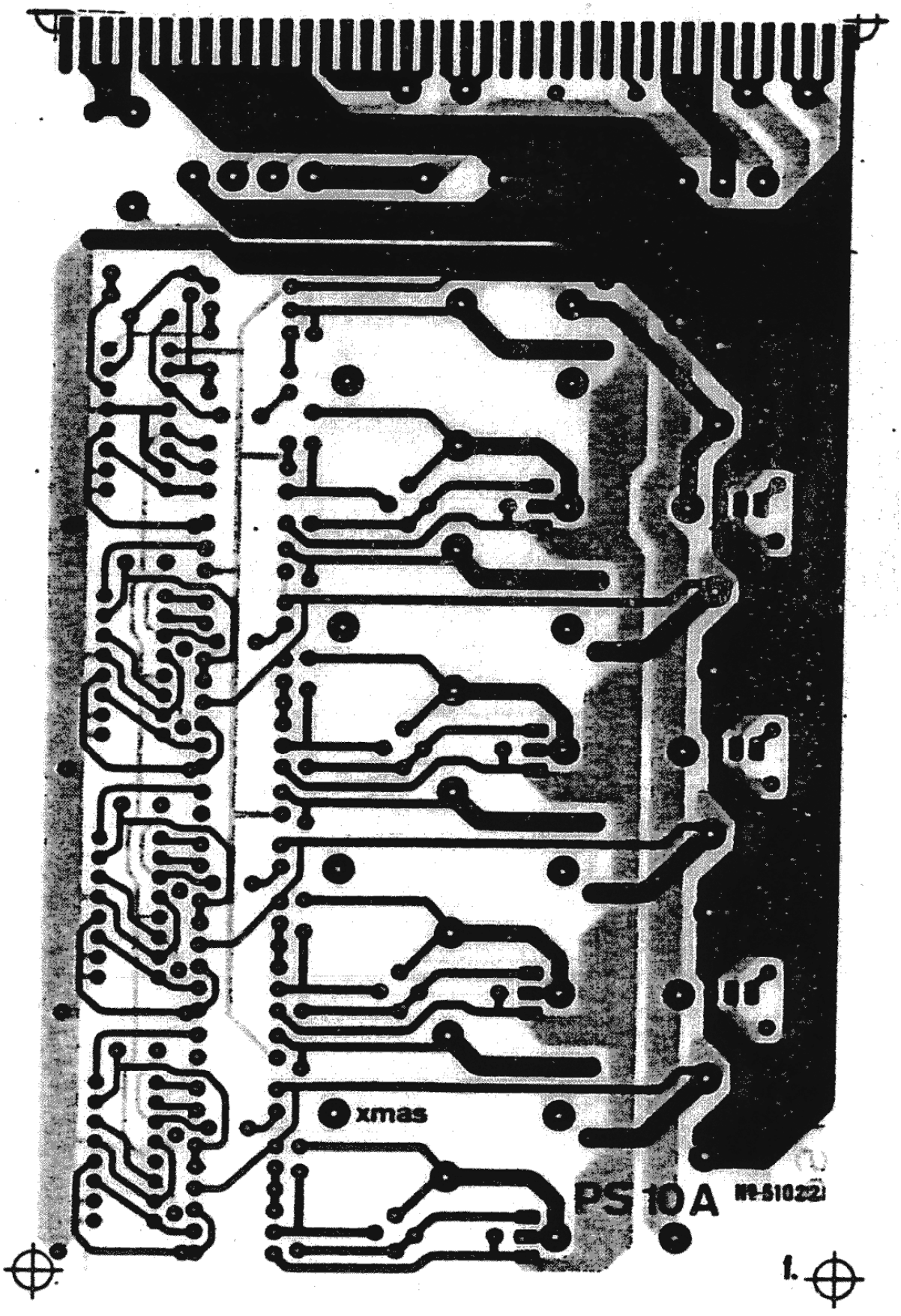


Figure 26 PC board PS10, side A (side B shown screened)

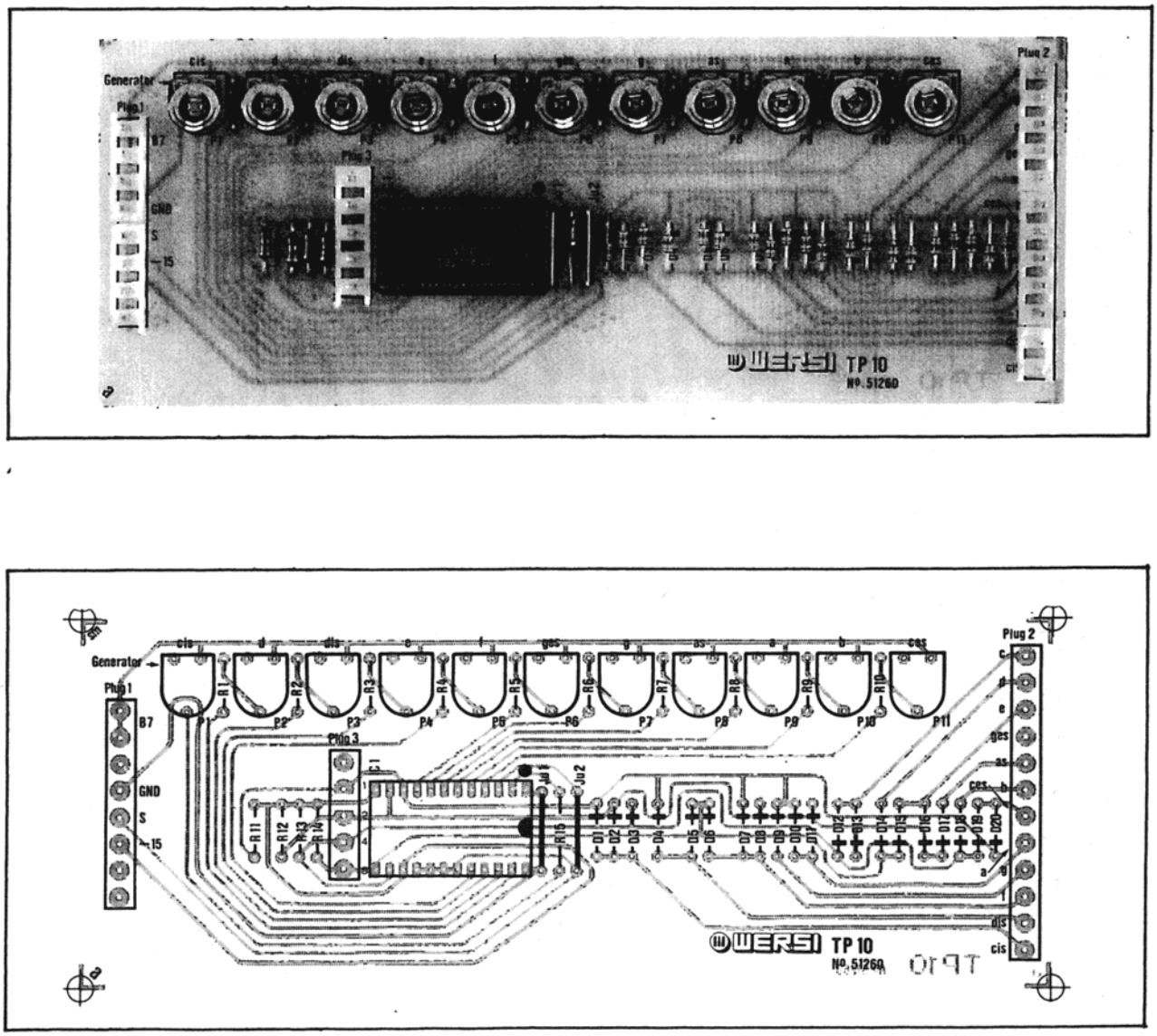


Figure 27 PC board TP 10 foil pattern and component layout

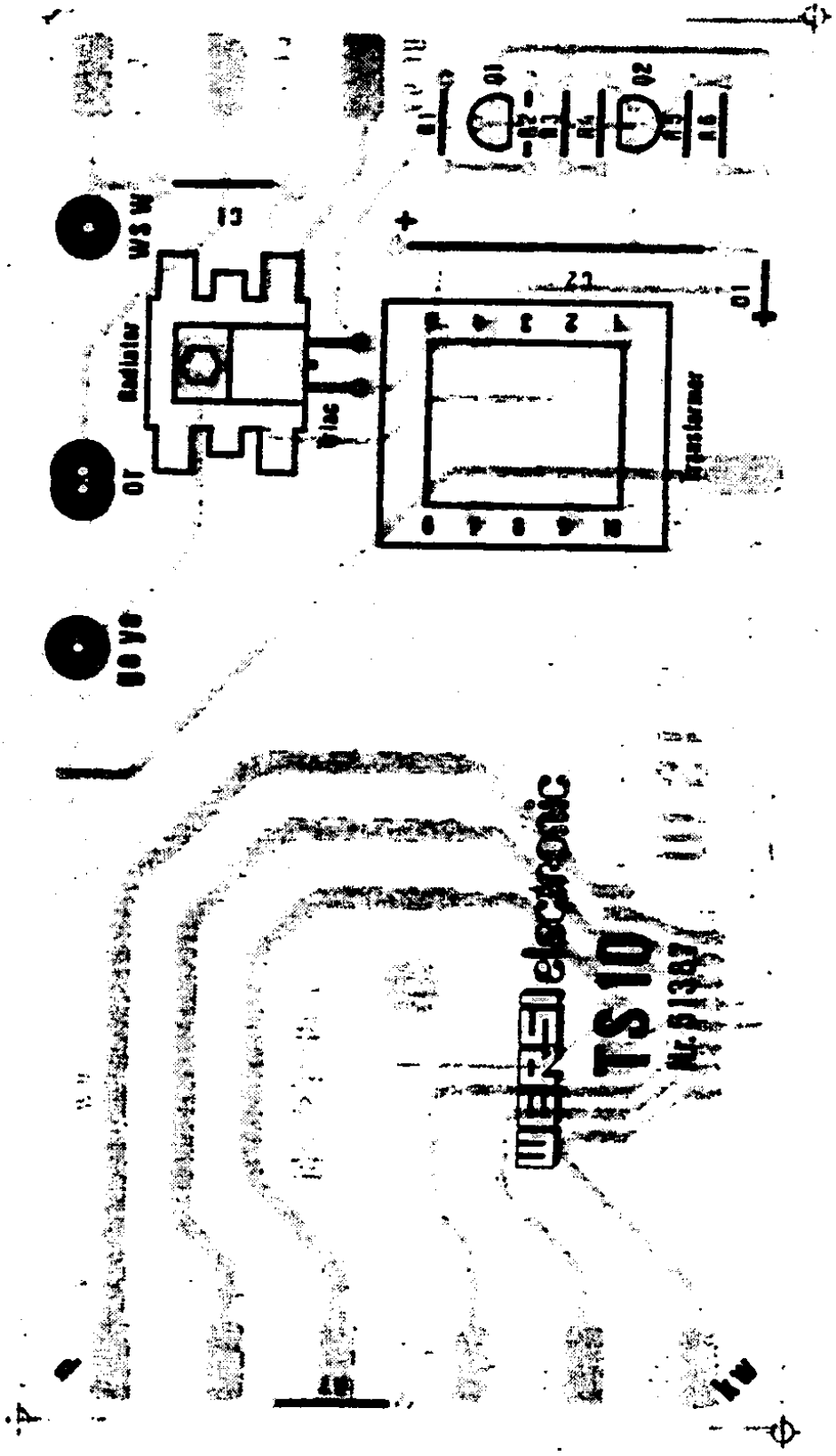


Figure 28 PC board TS 10 foil pattern and component layout

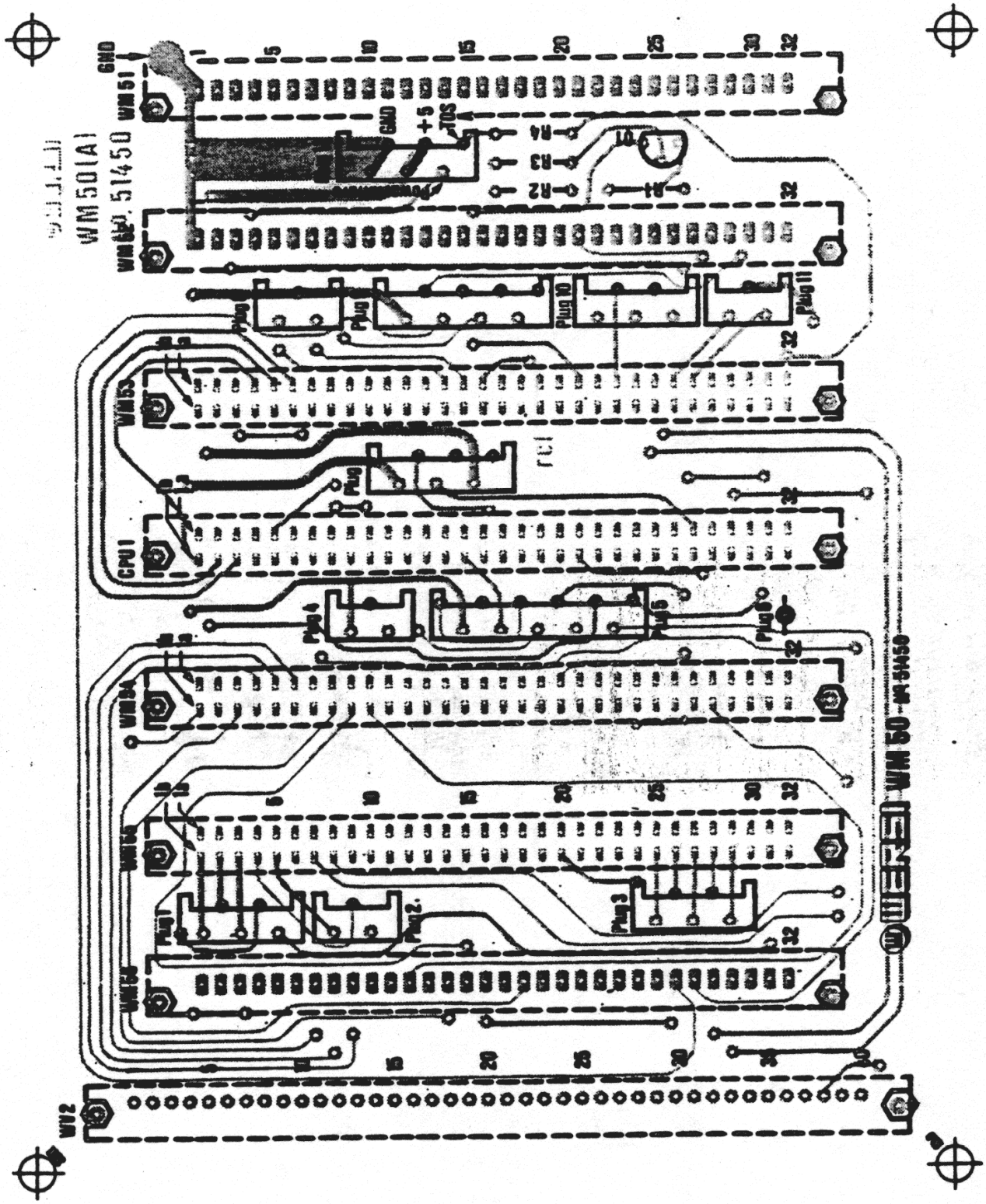


Figure 29 PC board WM 50, side A and component layout

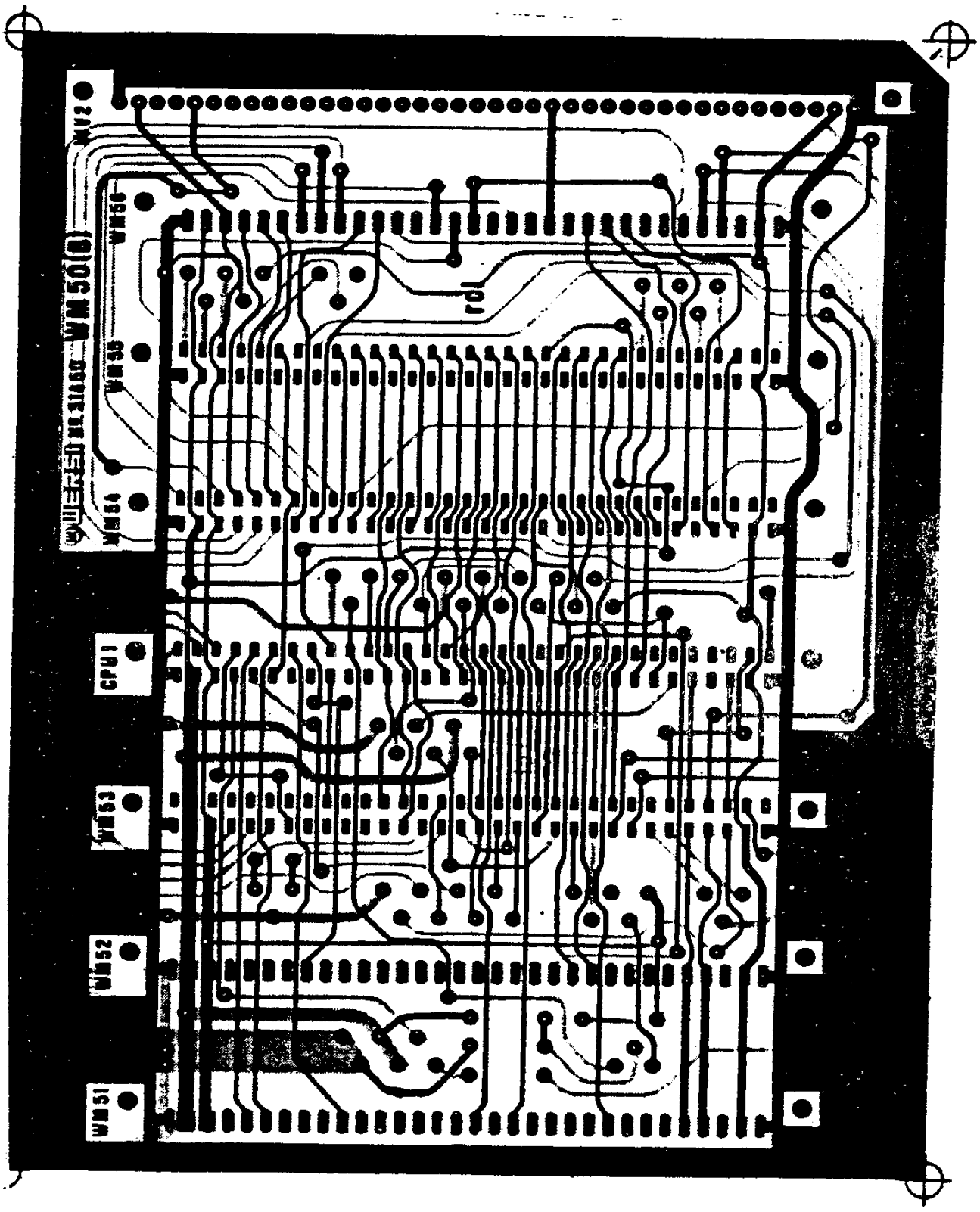


Figure 30 PC board WM 50, side B (side A shown screened)

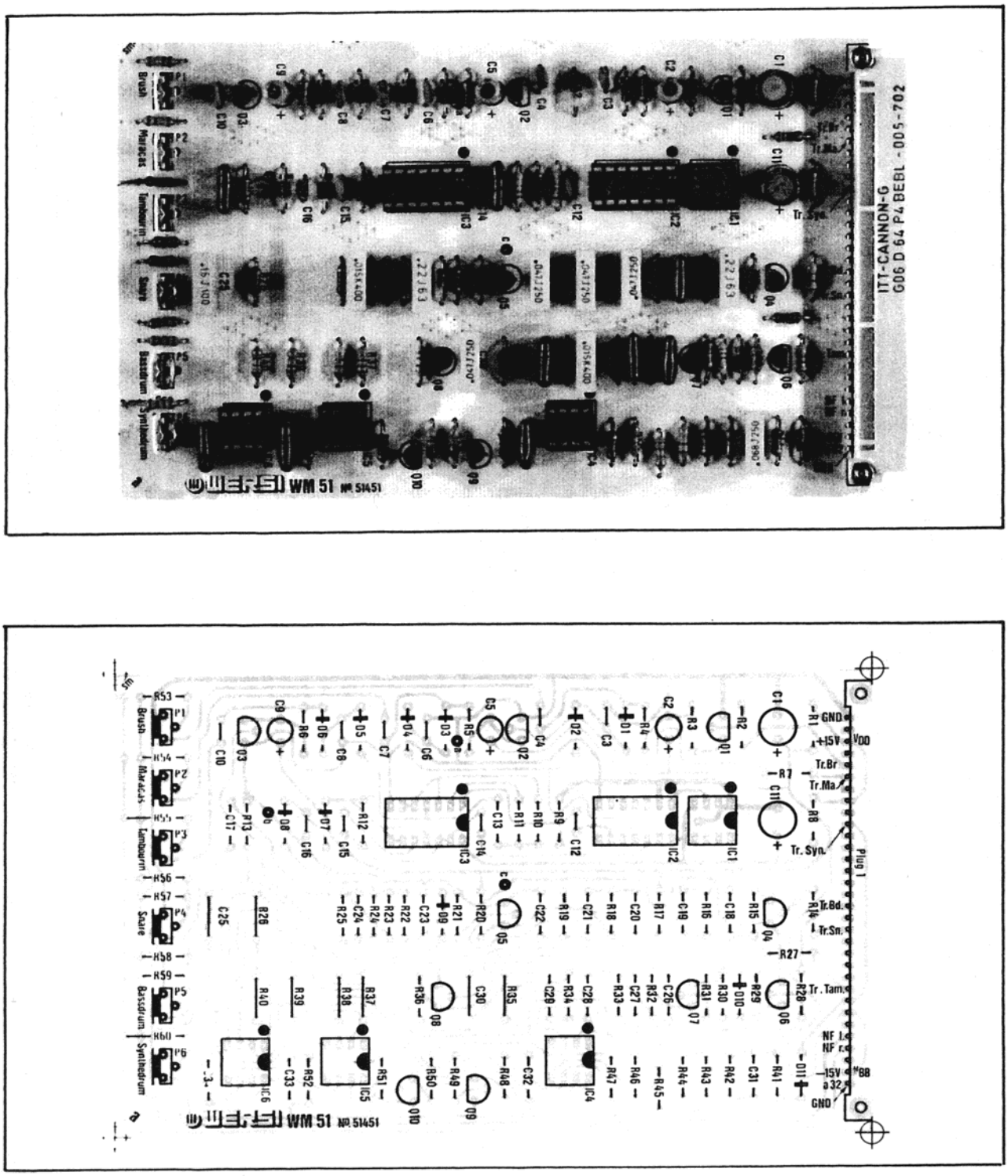


Figure 31 PC board WM 51 foil pattern and component layout

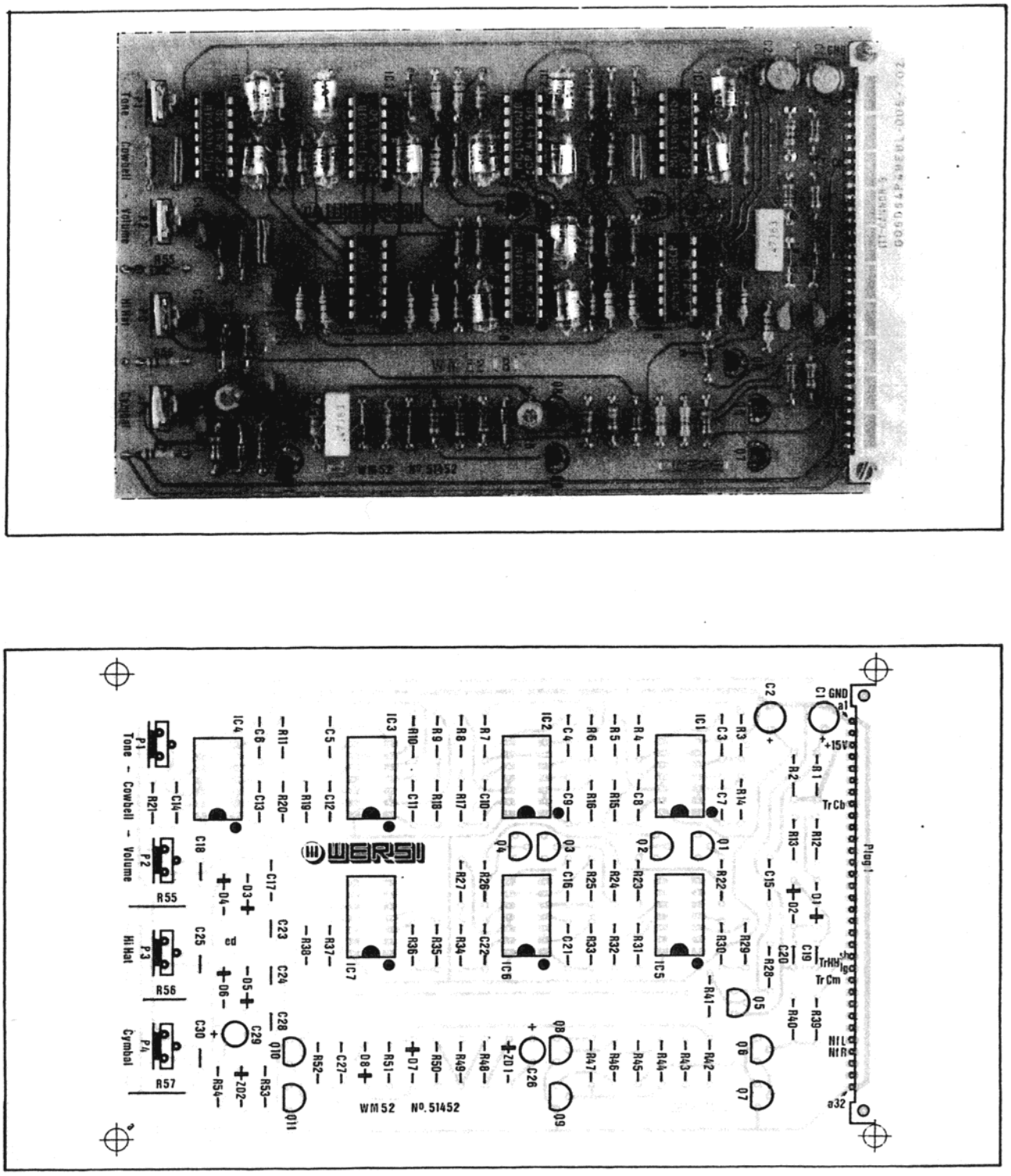


Figure 32 PC board WM 52, side B and component layout

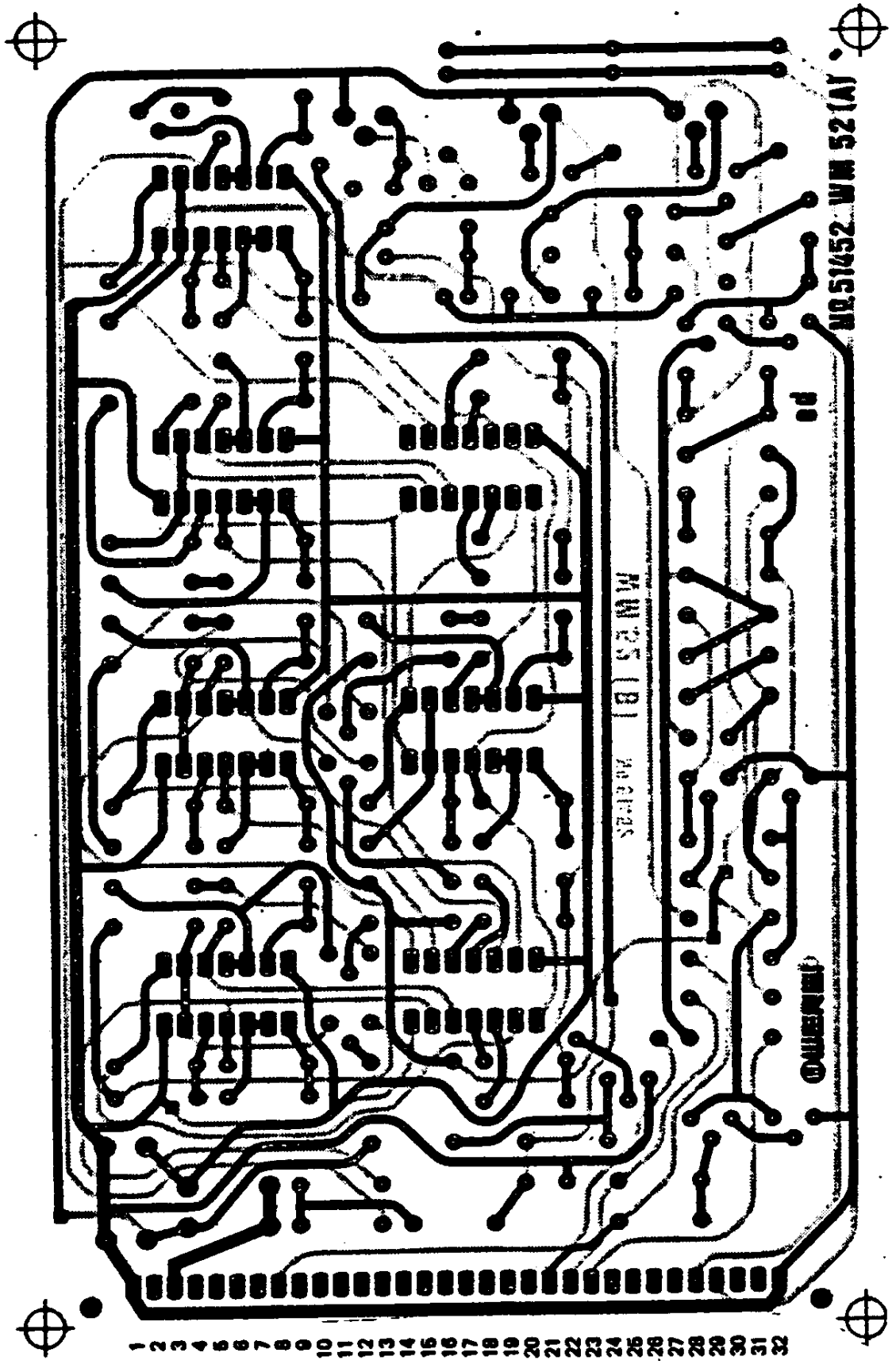


Figure 33 PC board WM 52, side A (side B shown screened)

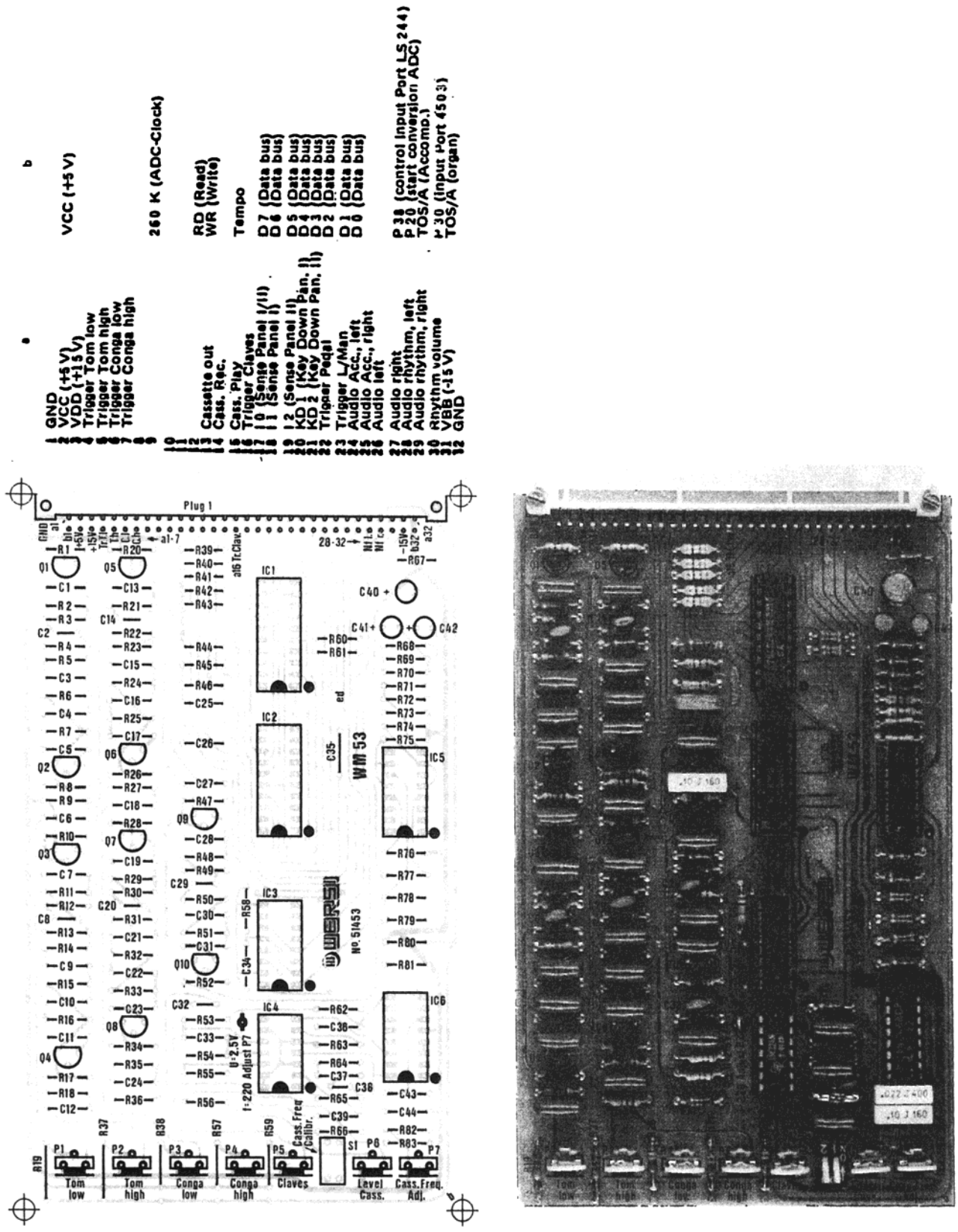


Figure 34 PC board WM 53, side B and component layout

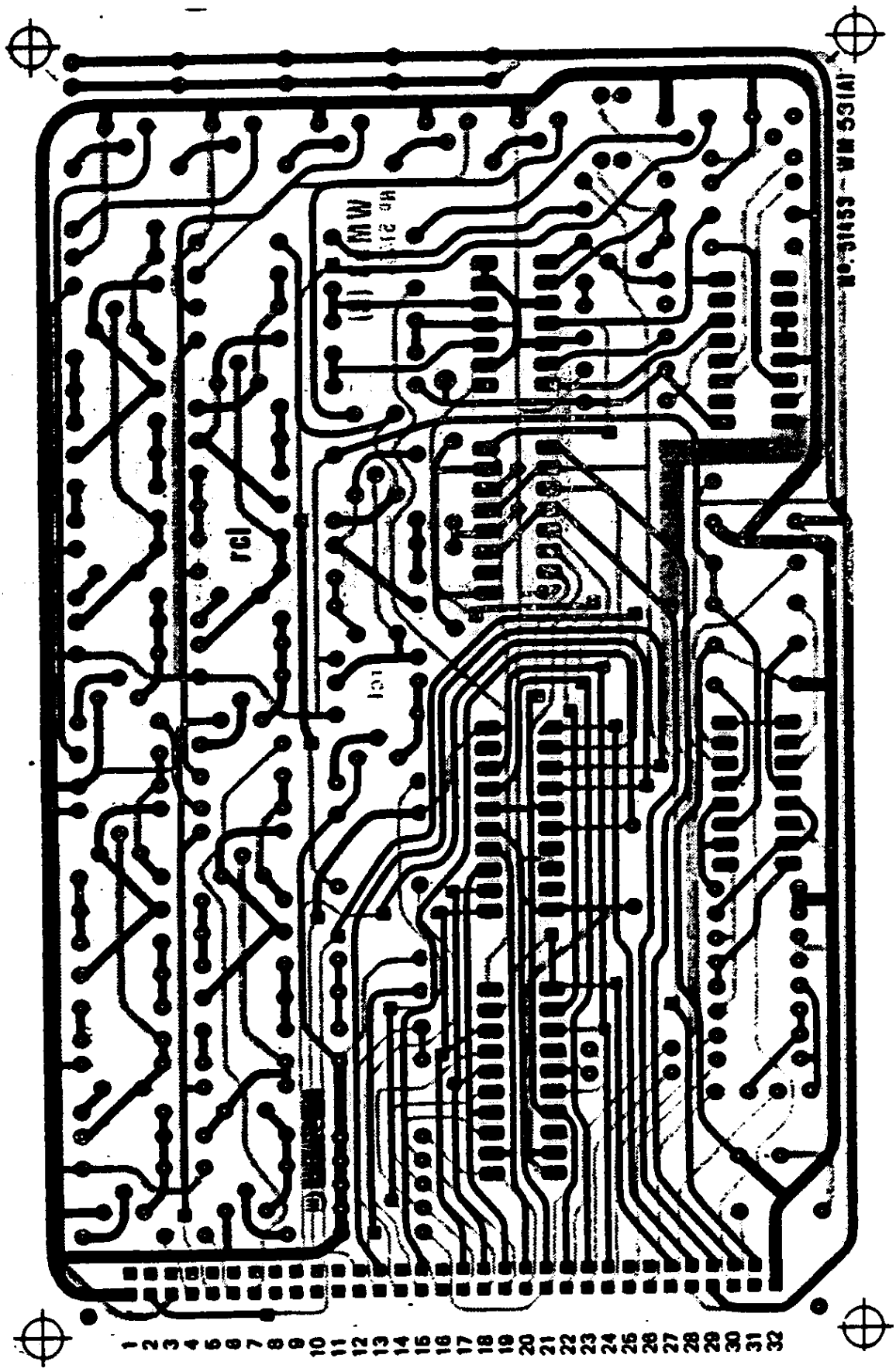


Figure 35 PC board WM 53, side A (side B shown screened)

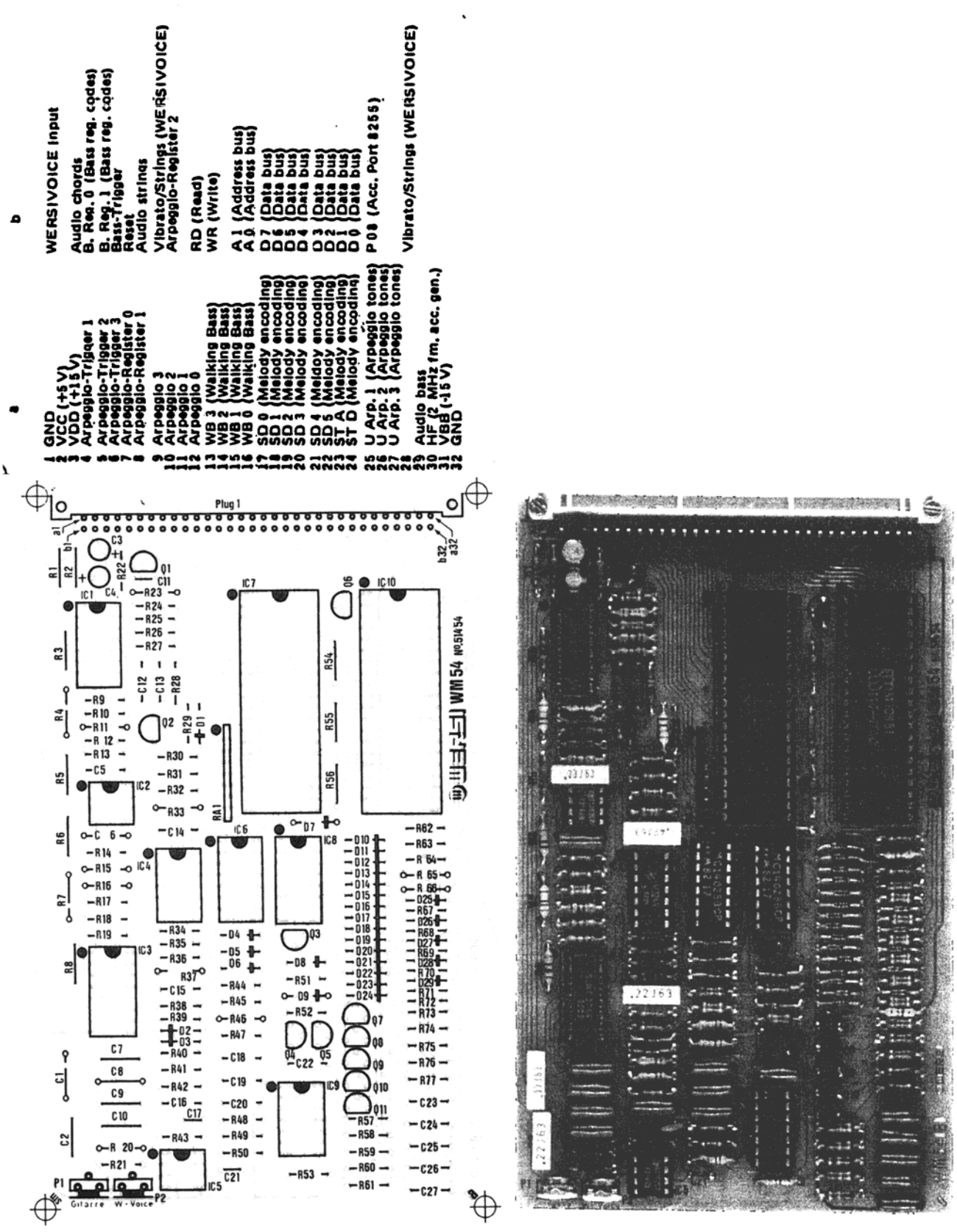


Figure 36 PC board WM 54, side B and component layout

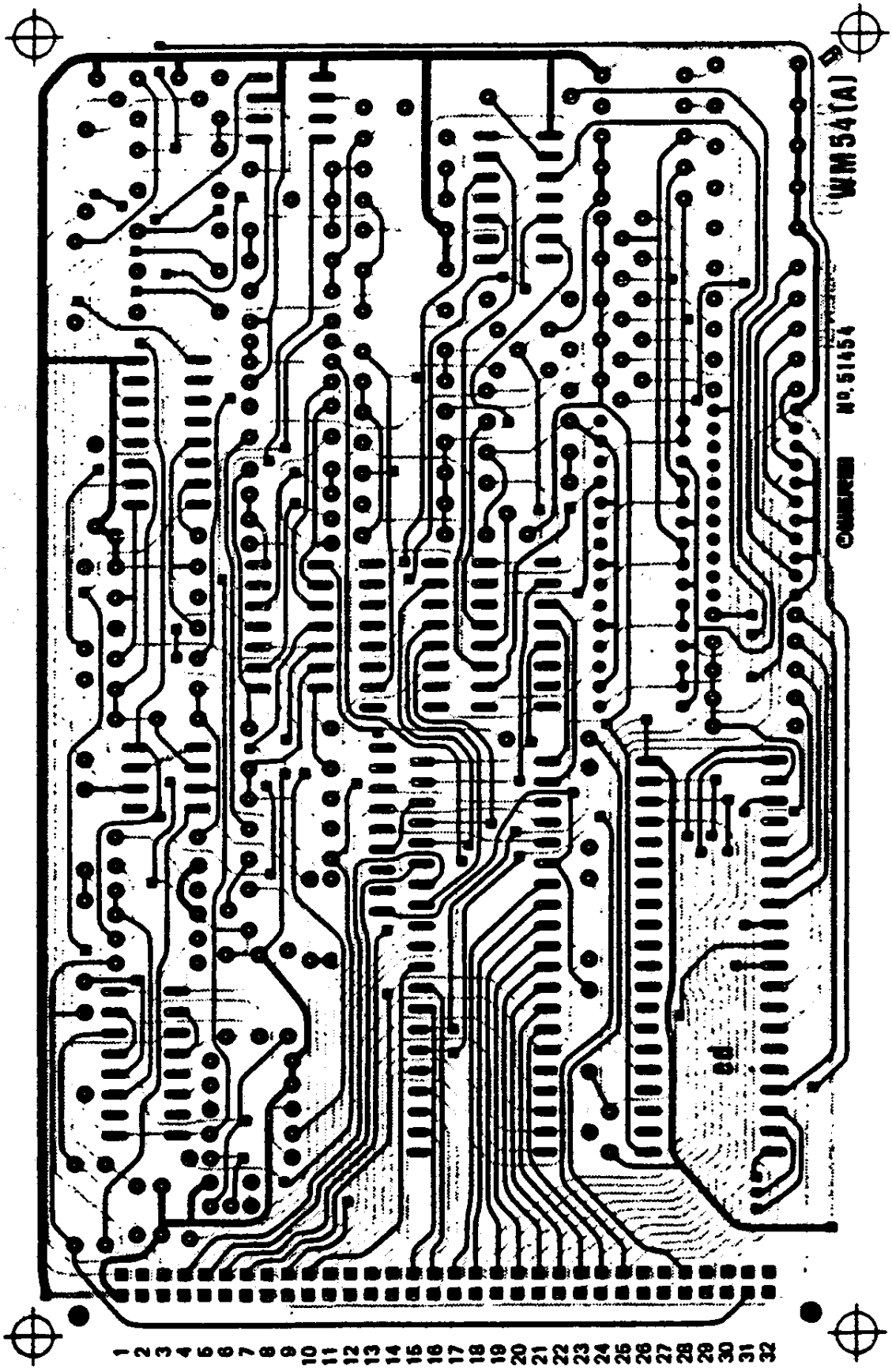


Figure 37 PC board WM 54, side A (side B shown screened)

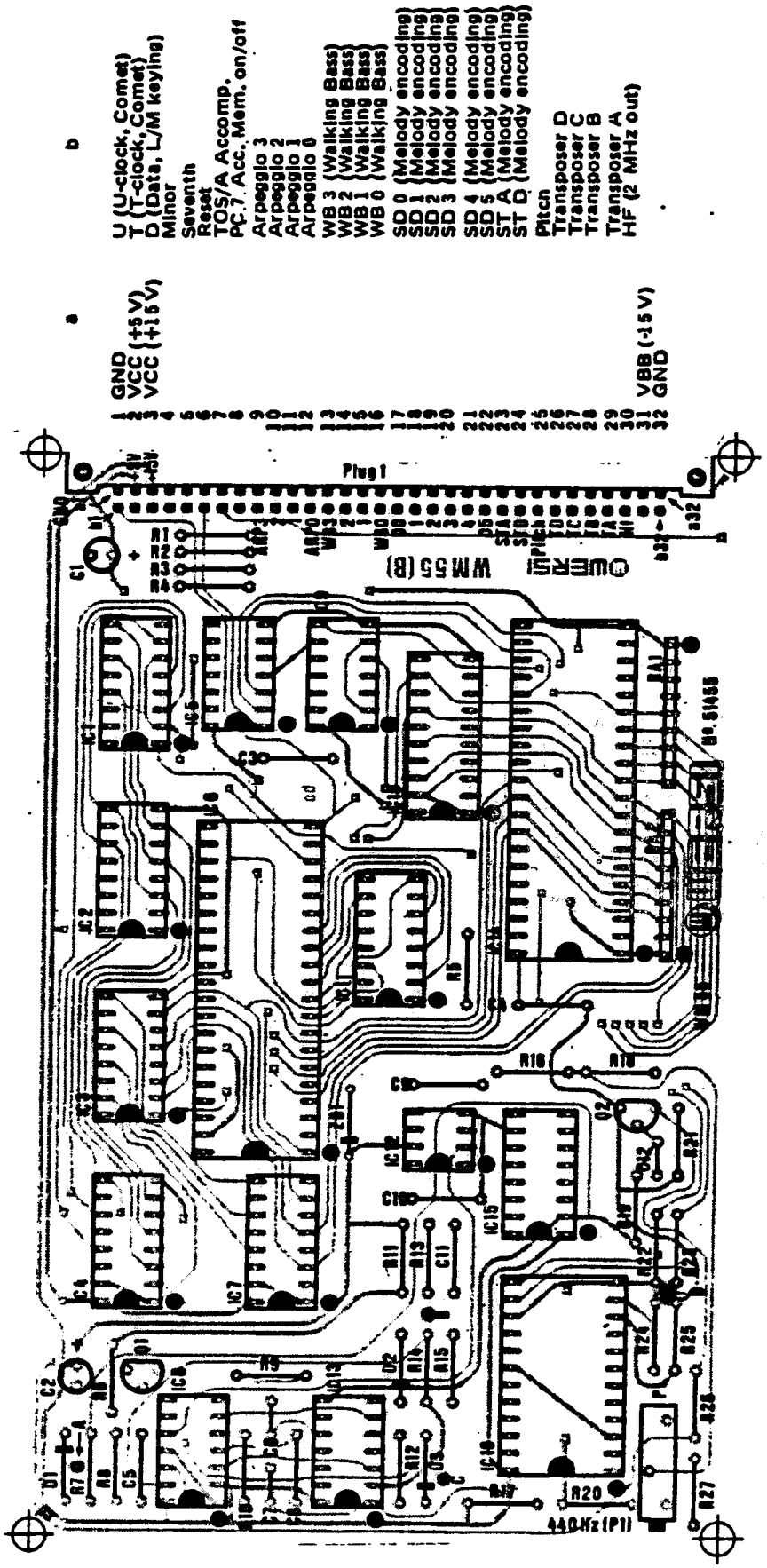


Figure 38 PC board WM 55, side B and component layout

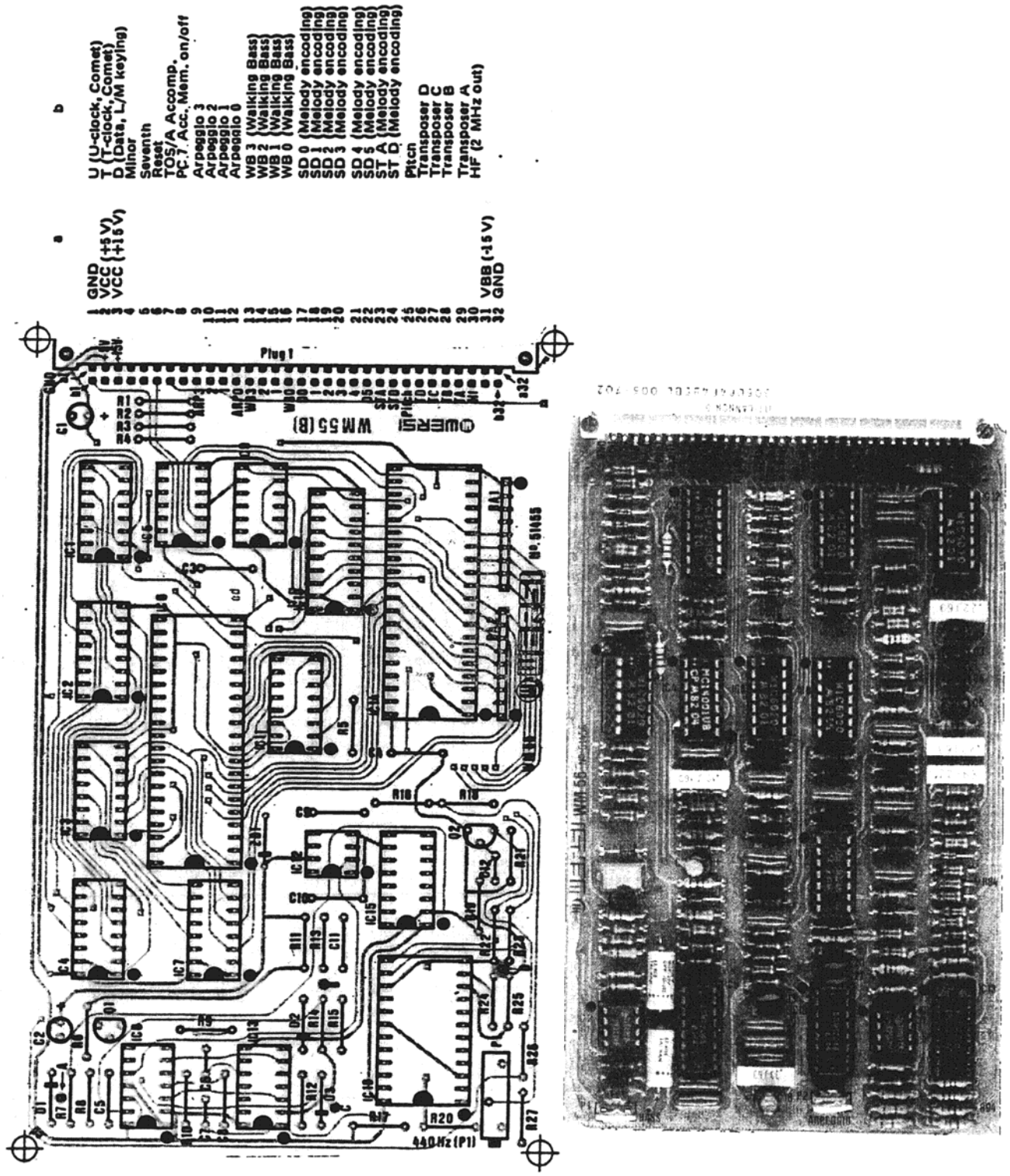


Figure 39 PC board WM 56, side B and component layout.

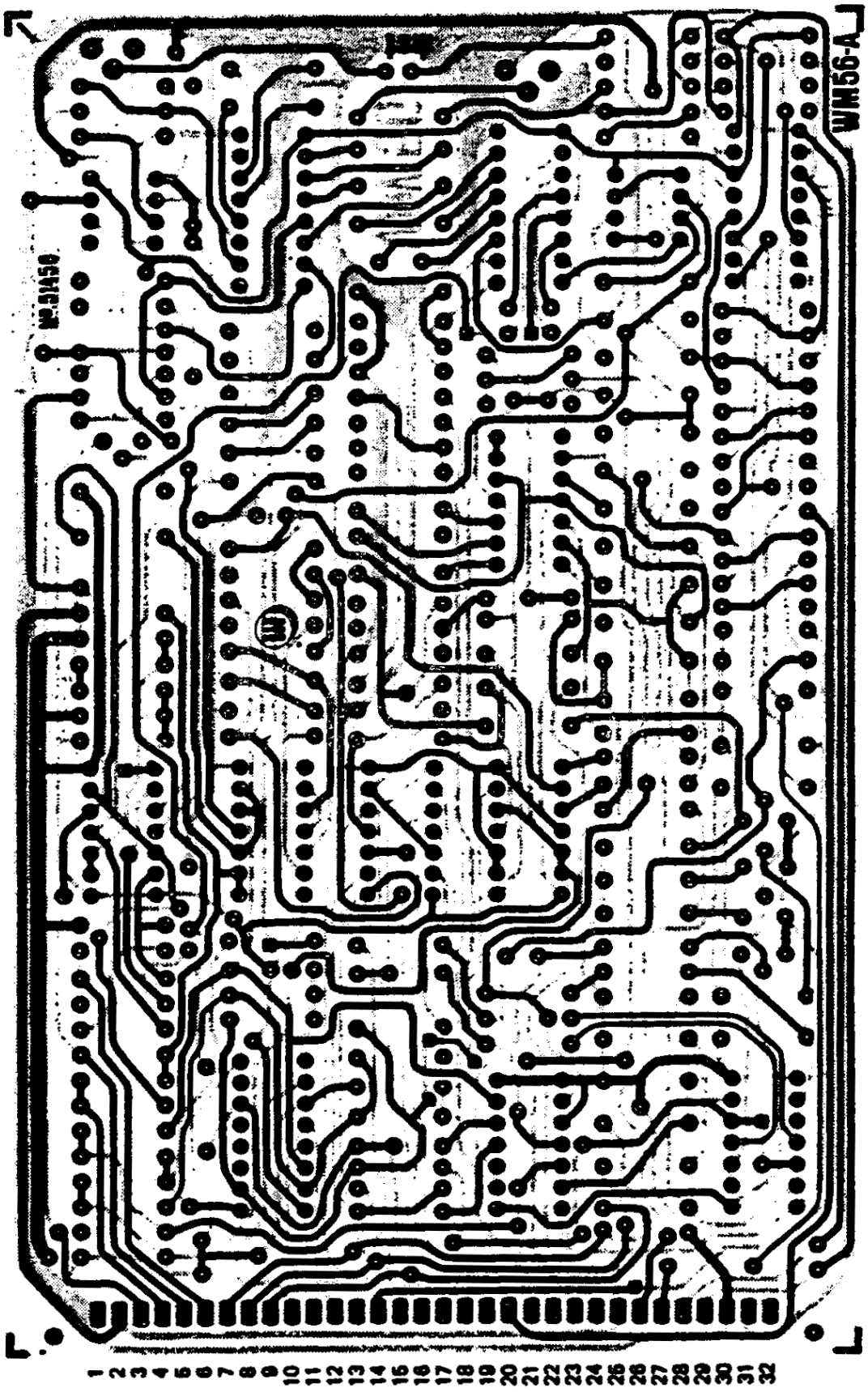


Figure 40 PC board WM 56, side A (side B shown screened)

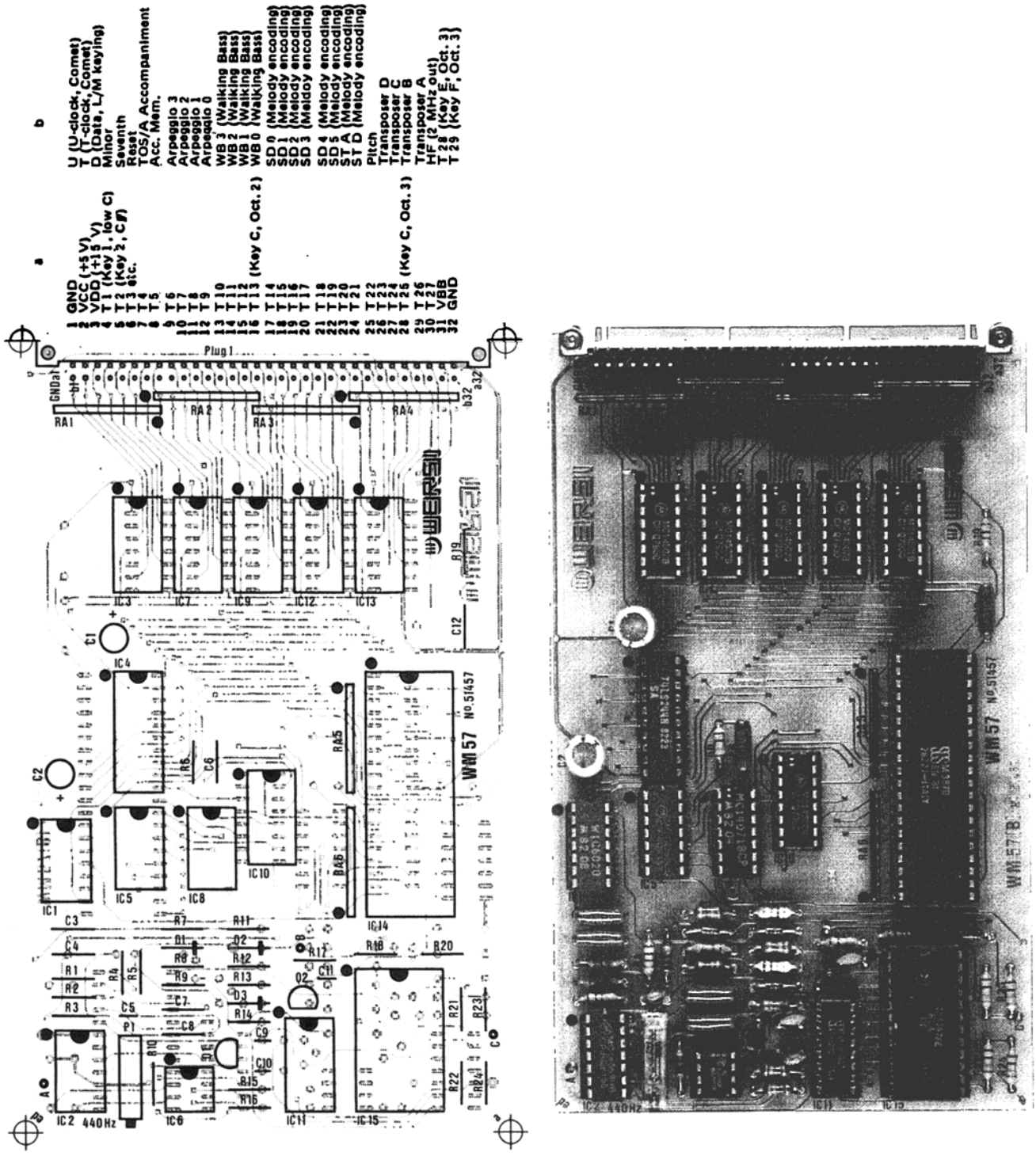


Figure 41 PC board WM 57, side B and component layout

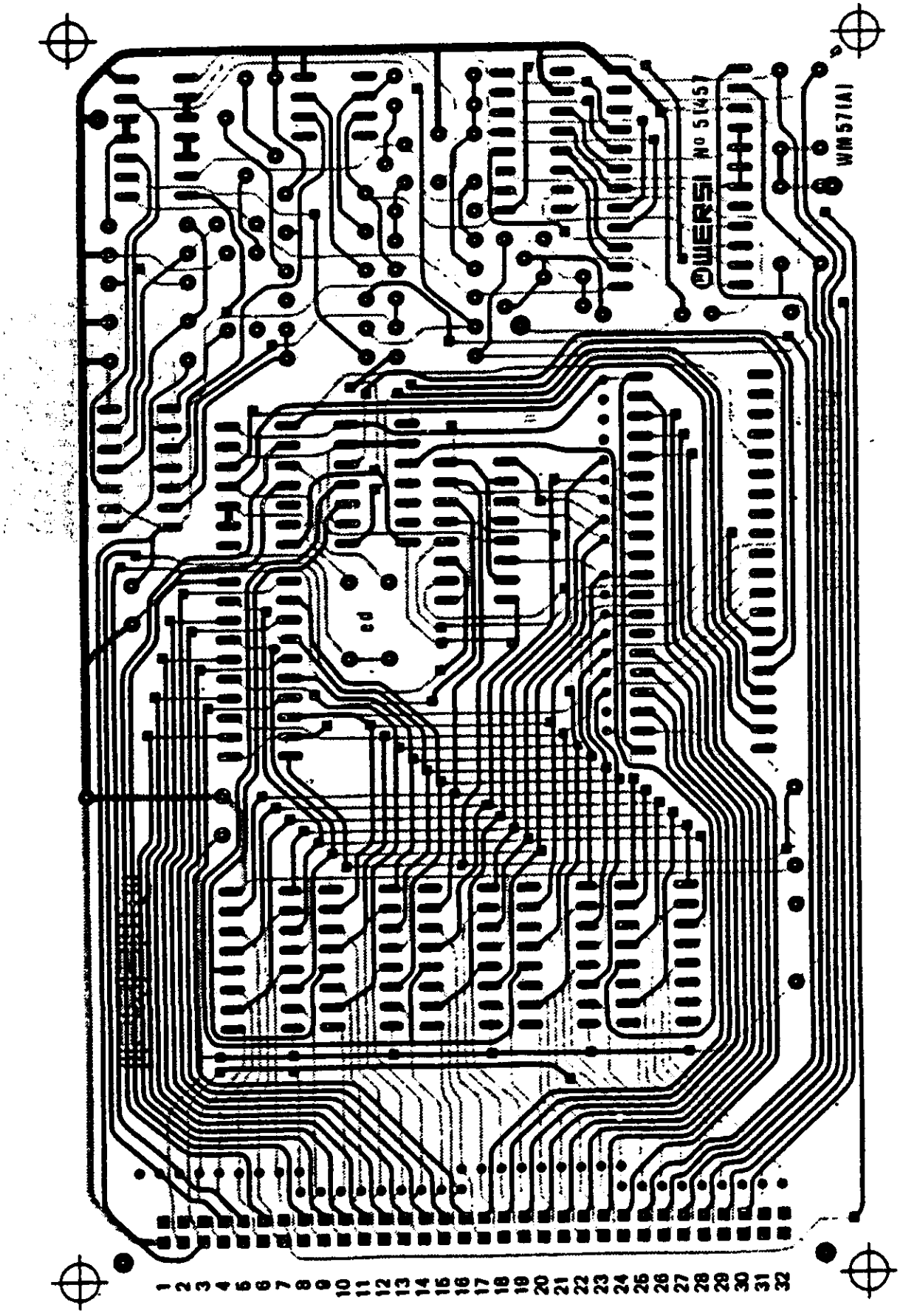


Figure 42 PC board WM 57, side A (side B shown screened)

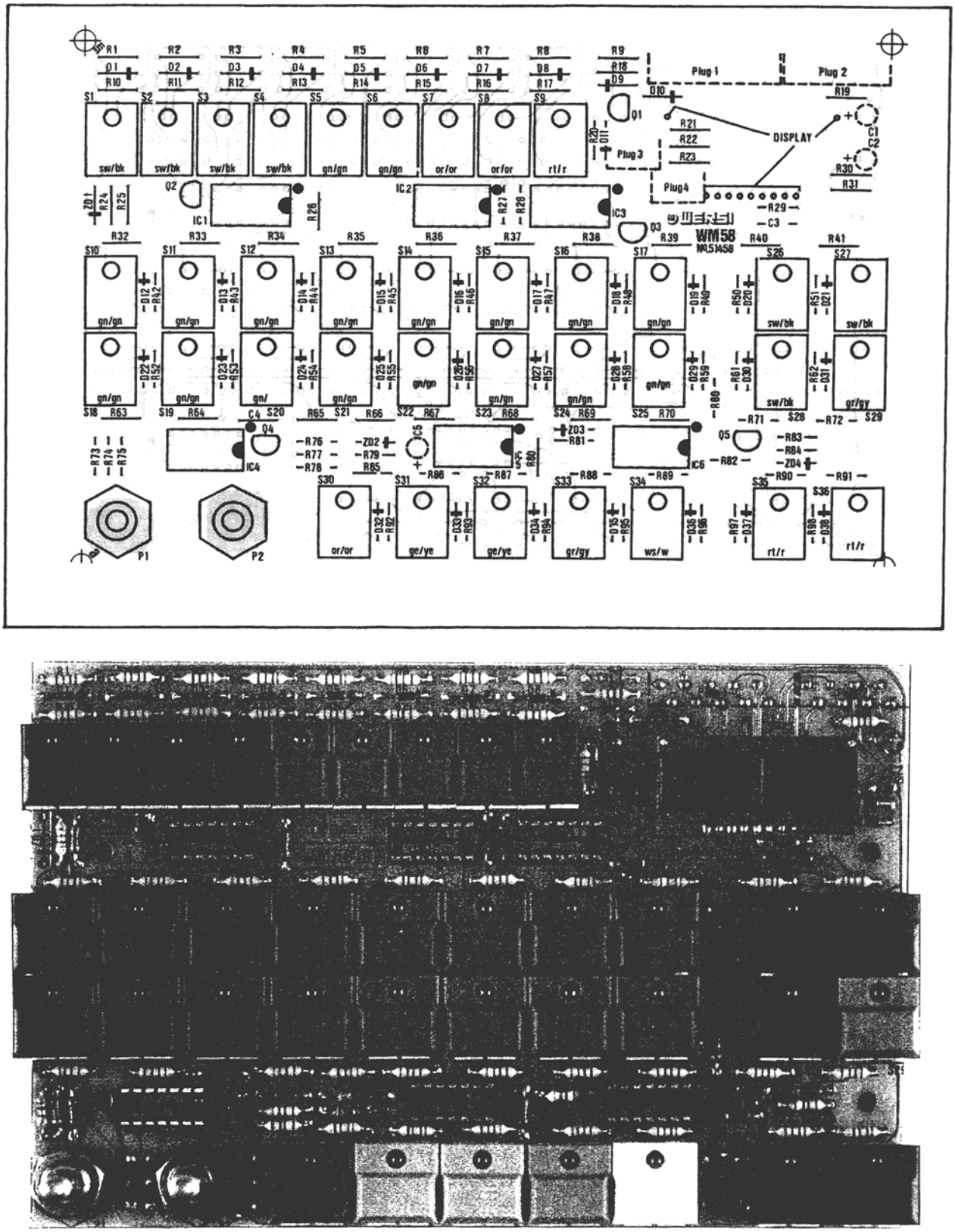


Figure 43 PC board WM 58, side B and component layout.

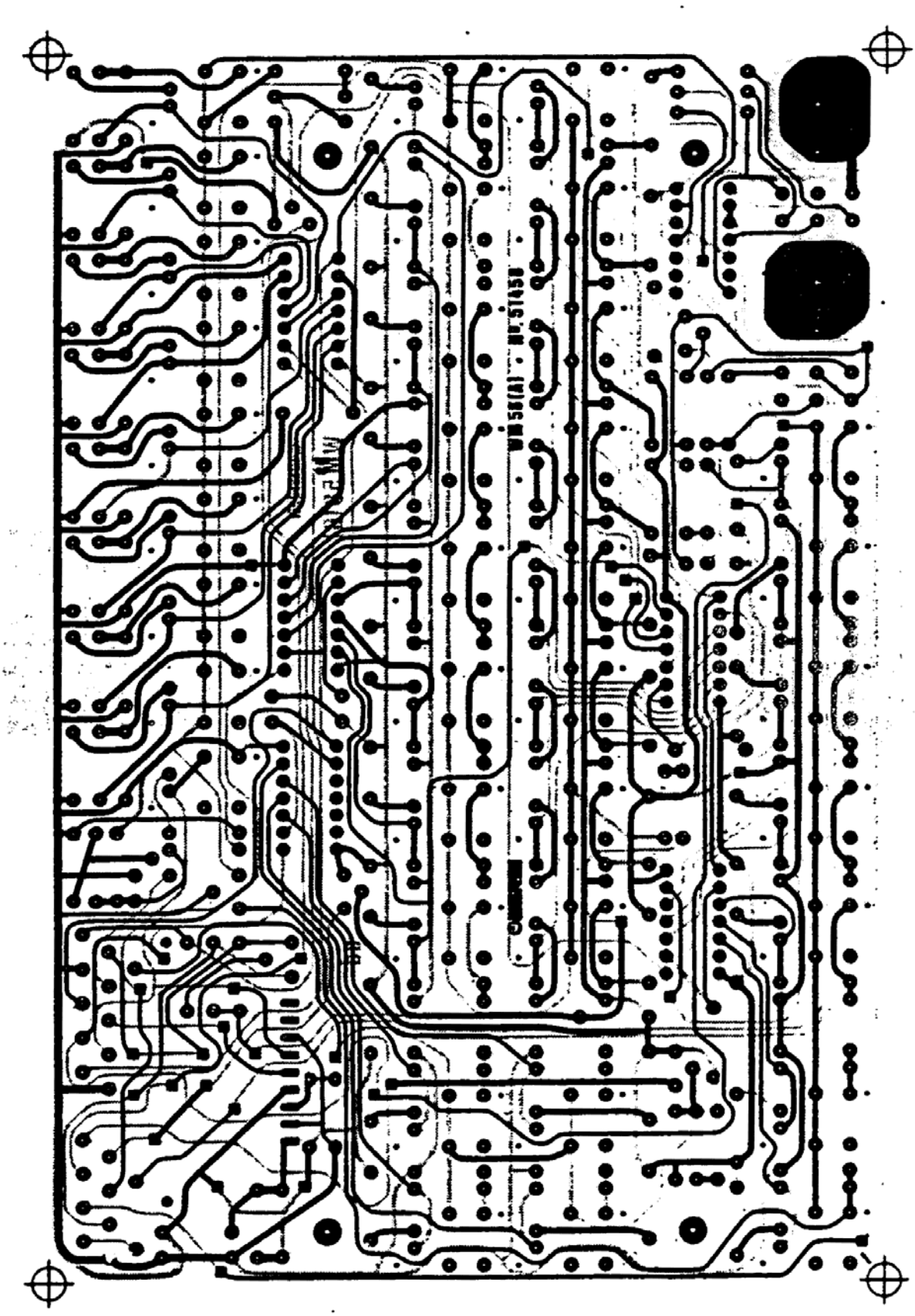
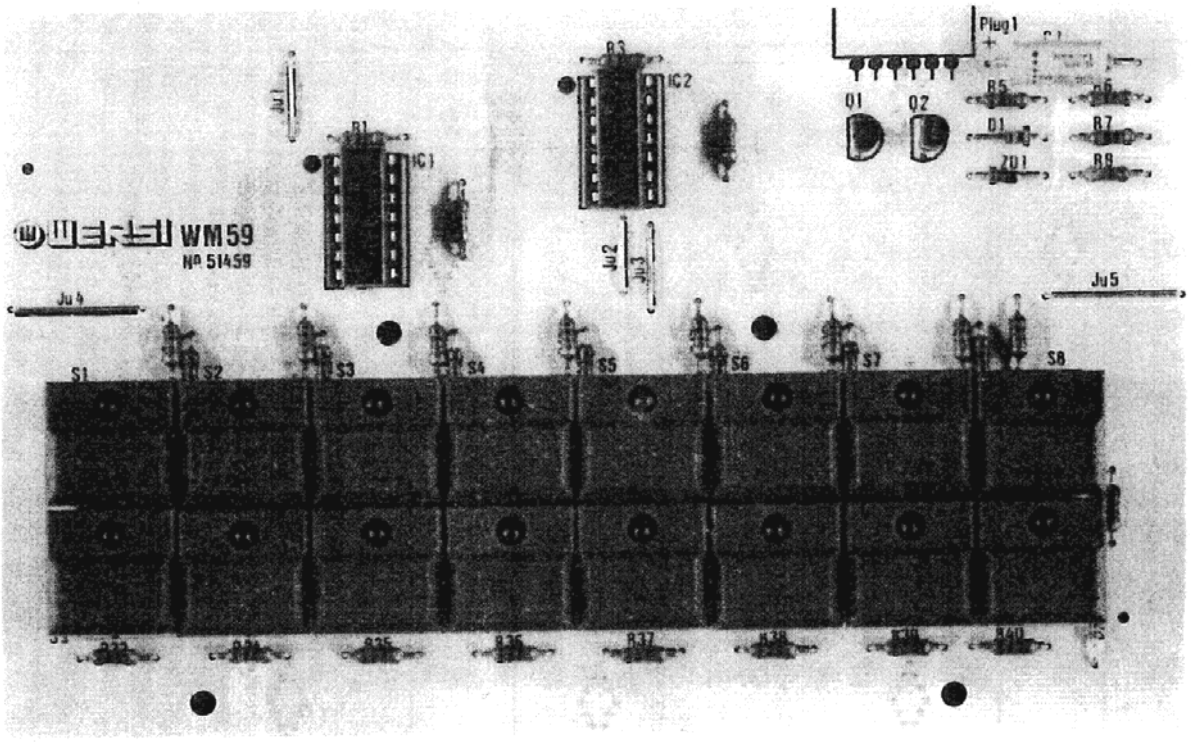


Figure 44 PC board WM 58, side A (side B shown screened)



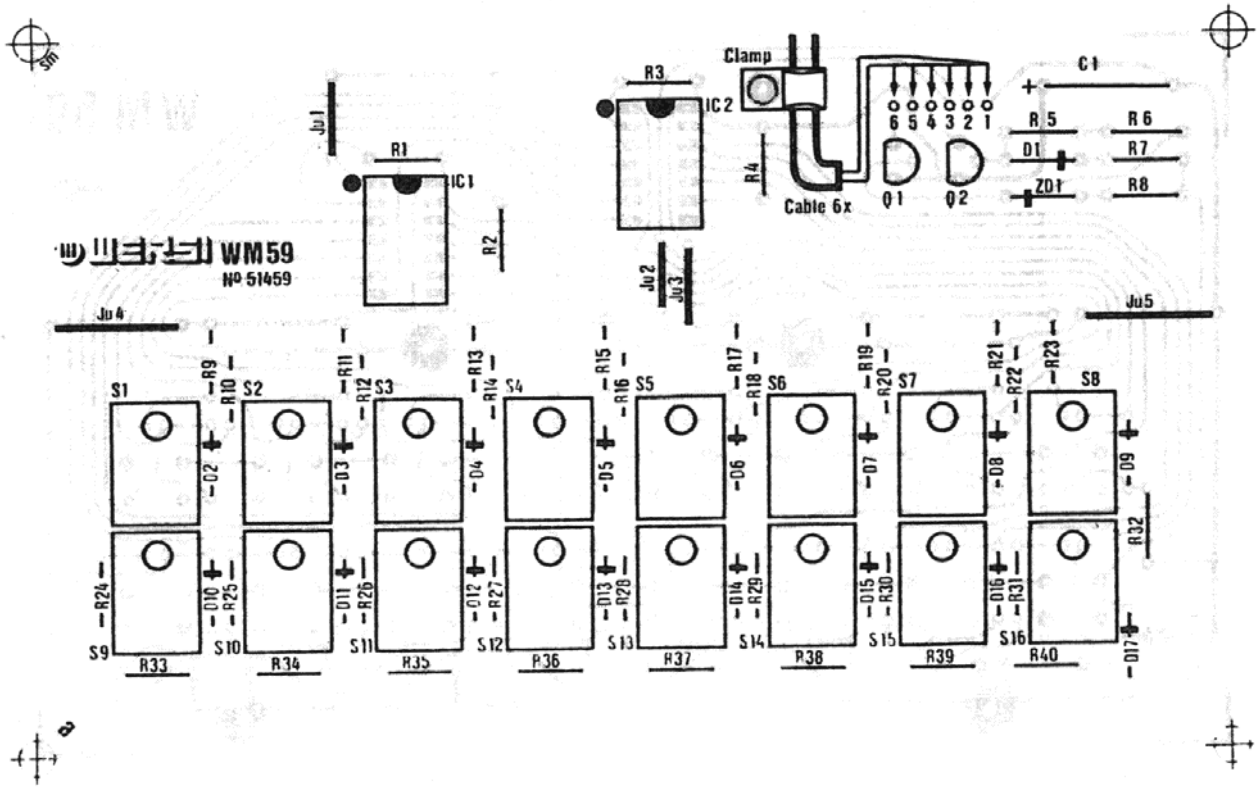
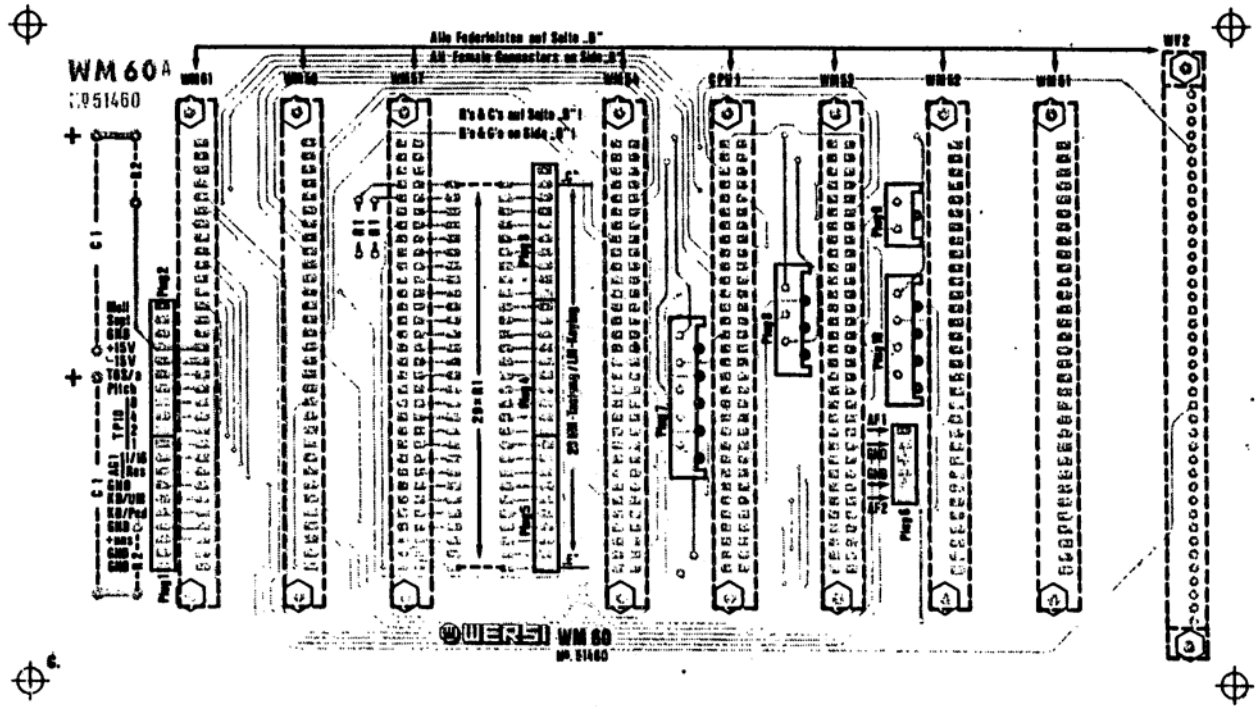
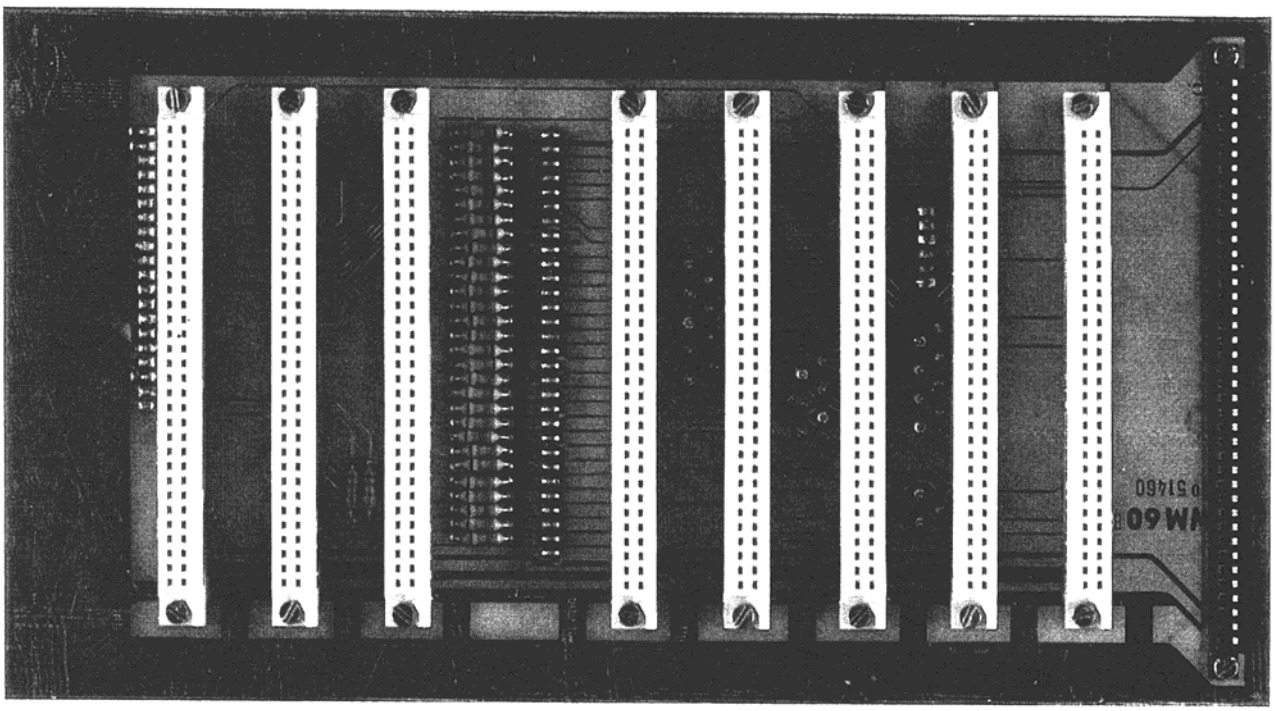


Figure 45 PC board WM 59 foil pattern and component layout


WM 60 A
WM 60



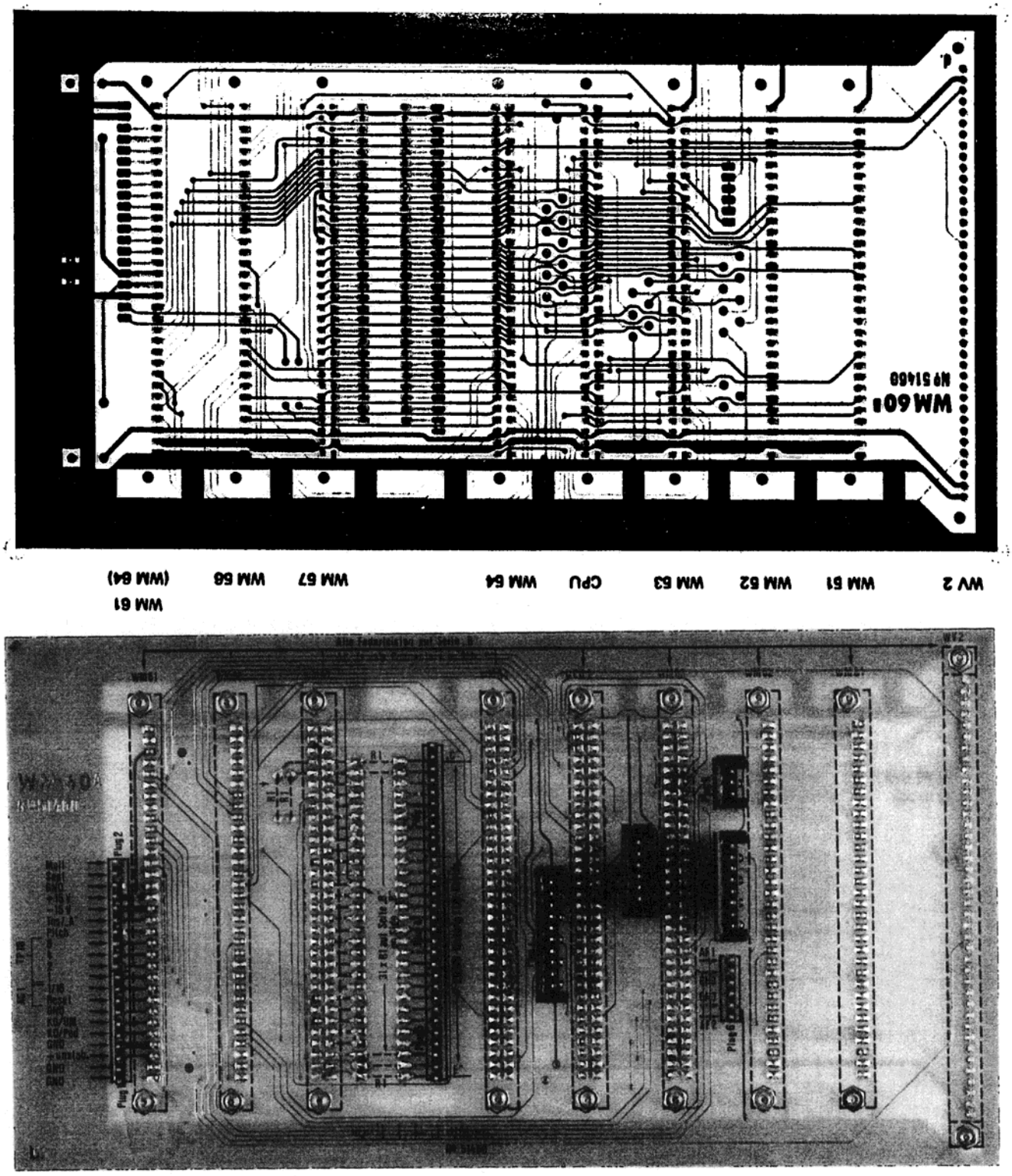


Figure 46 PC board WM 60, side A and component layout

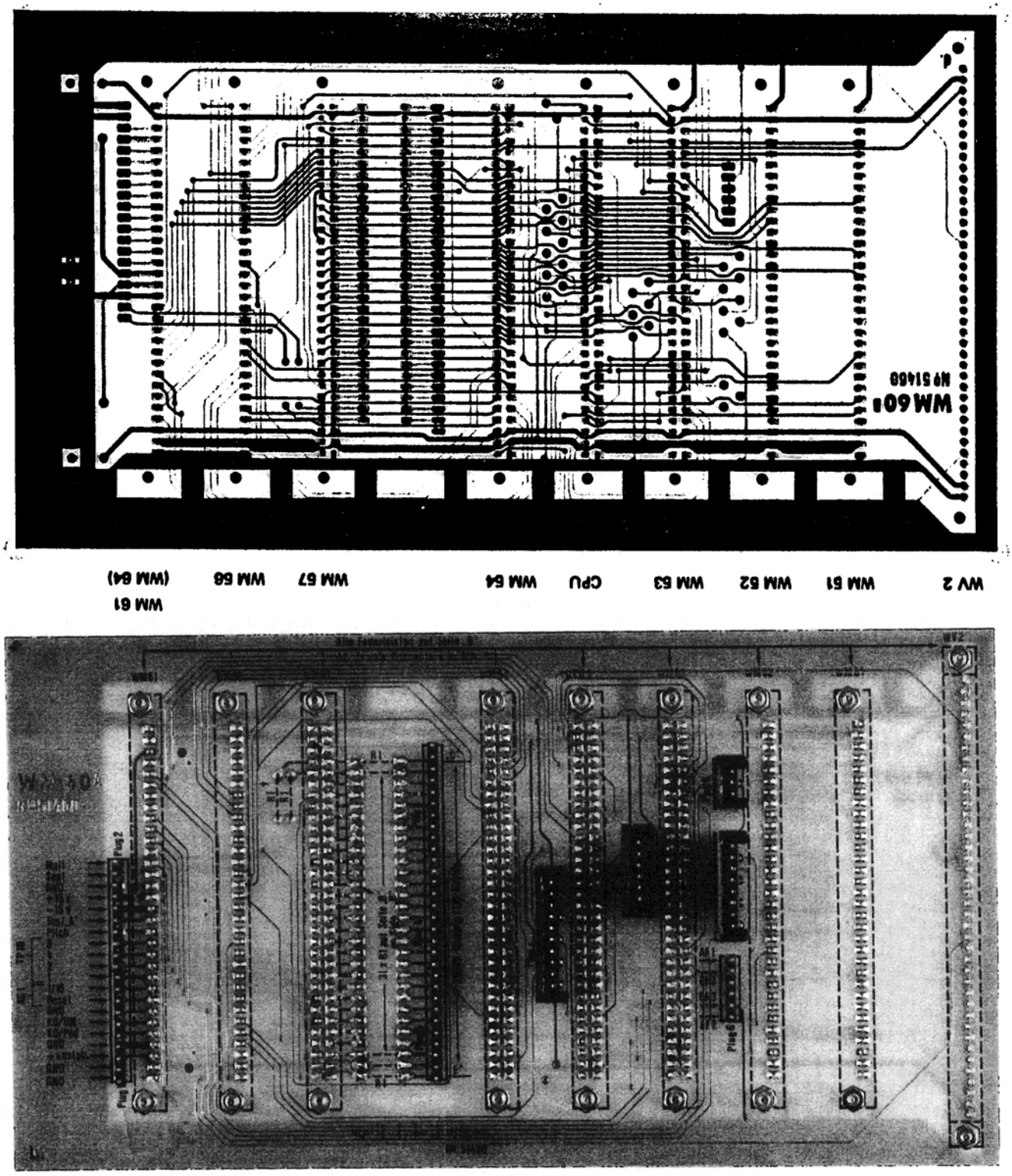


Figure 47 PC board WM 60, side B (side A shown screened)

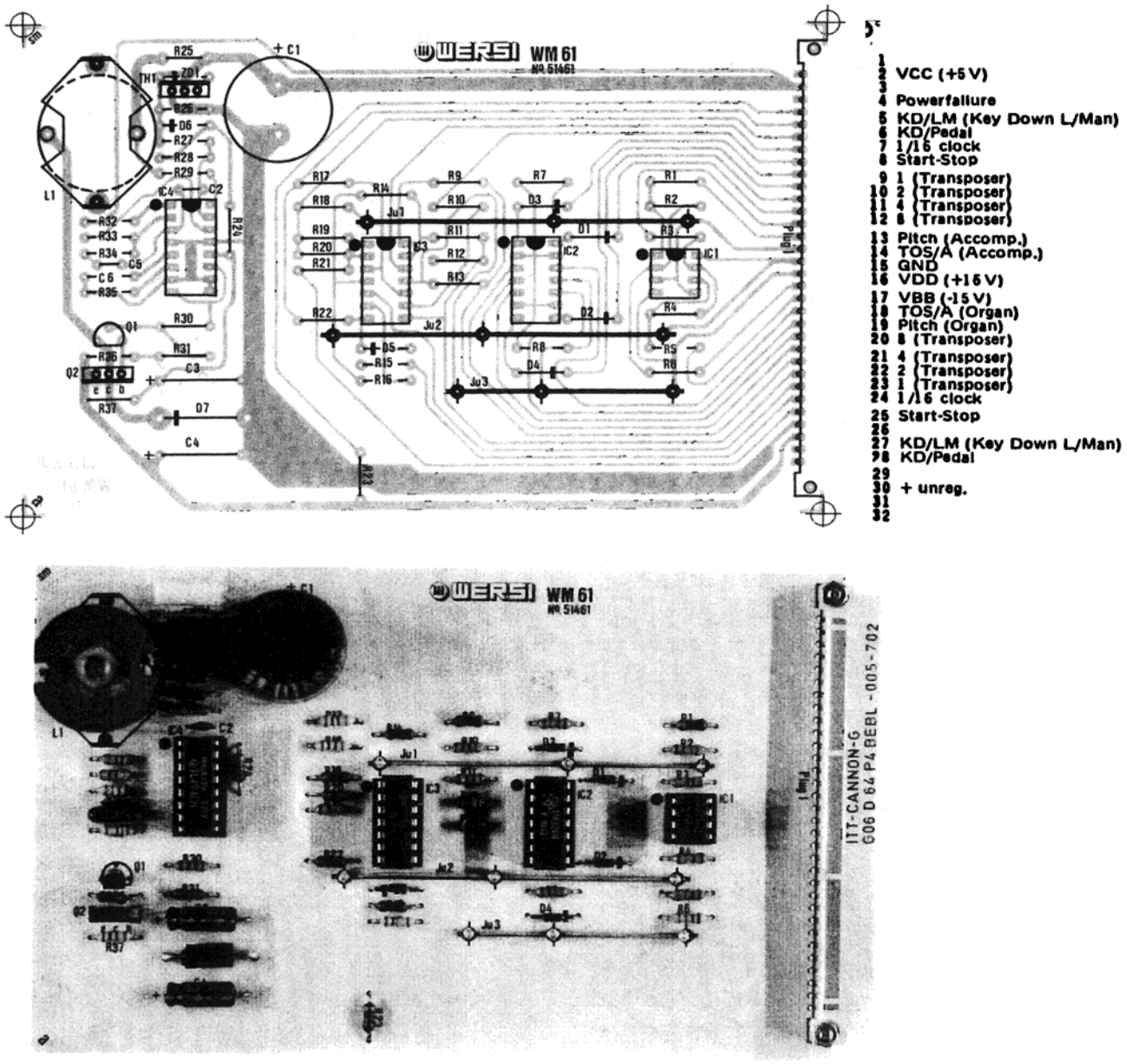


Figure 48 PC board WM 61 foil pattern and component layout

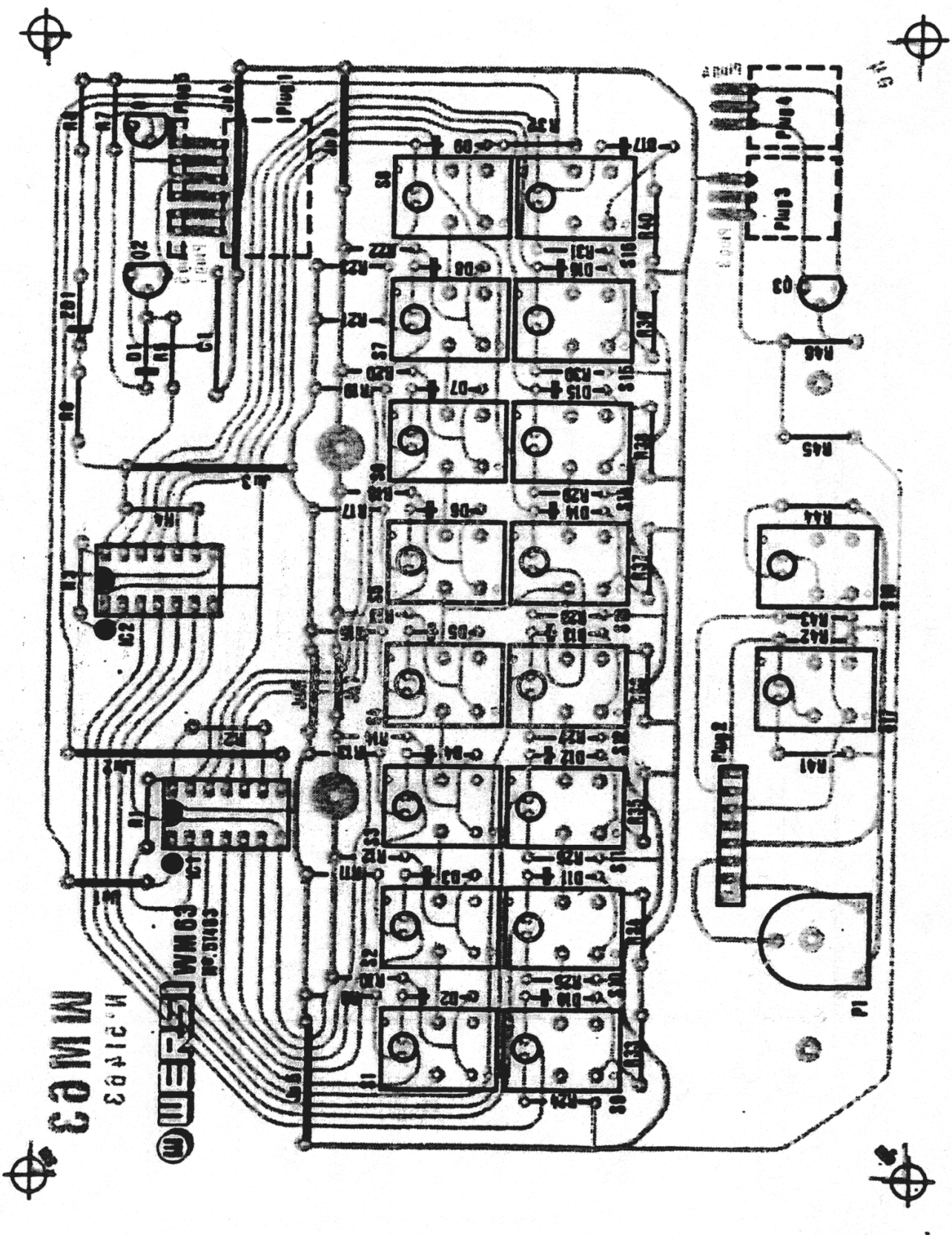


Figure 49 PC board WM 63 foil pattern and component layout

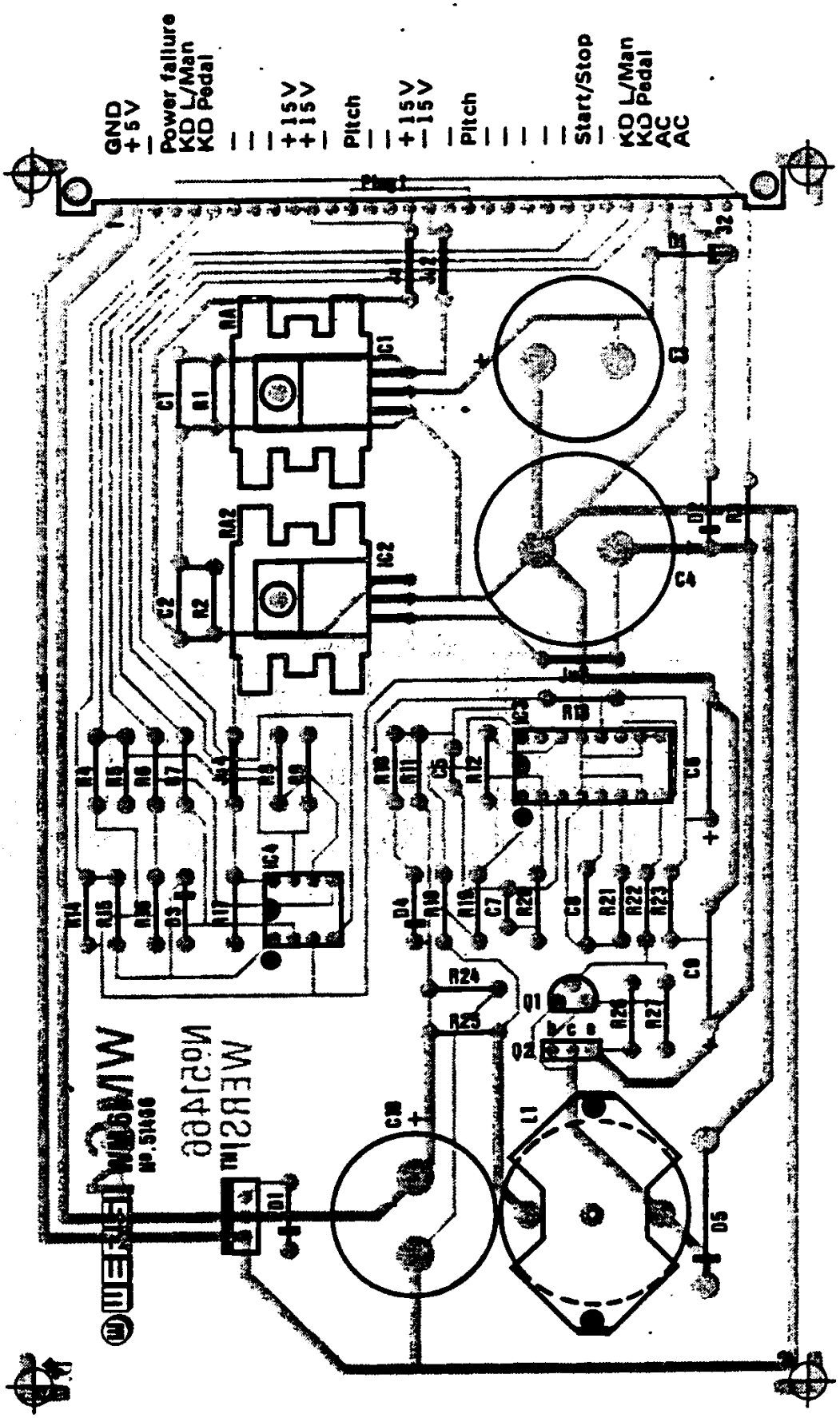


Figure 50 PC board WM 64 foil pattern and component layout

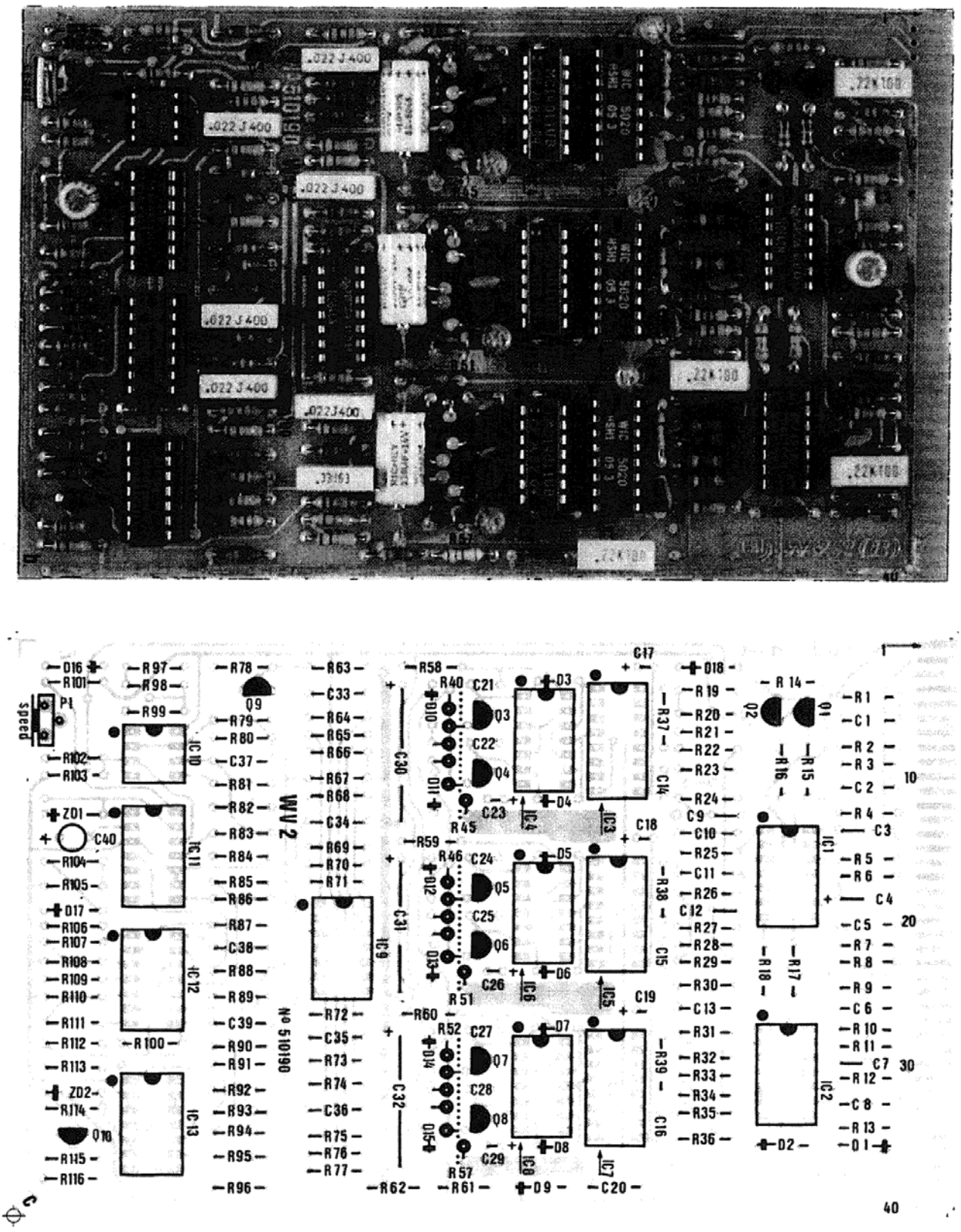


Figure 51 PC board WV 2, side A and component layout

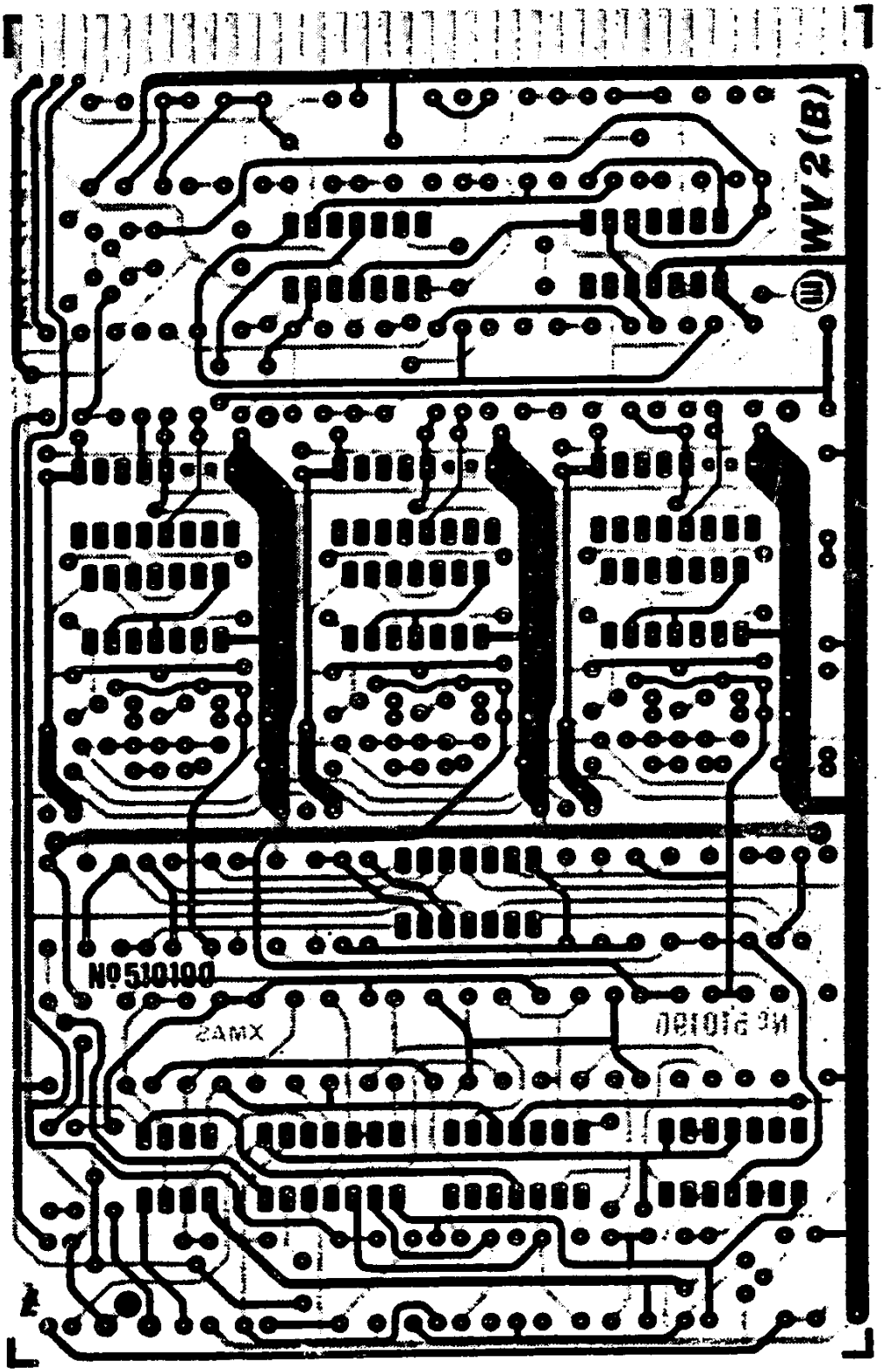


Figure 52 PC board WV 2, side B (side A shown screened)