CRUMAR®

Musical Instruments

mod. Performer

CRUMAR PERFORMER
OPERATING

DESCRIPTION

The Performer is a multivoice instrument incorporating an enormous amount of variability within a fairly simple format. It can produce a wide range of string and brass sounds quickly and accurately, but only through familiarization with the controls you will achieve maximum results.

THE PERFORMER PACKAGE

Your Performer comes complete with power cord, a min. jack patch cord for synthesizer interfacing, a carrying bag and a standard patch cord used to hook the Performer to an amplifier.

AMPLIFICATION

Your Performer keyboard can be connected to any conventional power amplifier and speaker system that will accept a monophonic phone plug from the instruments main output.

SETTING UP

Located on the rear right of the instrument is the on/off switch, fuse, and power cord connection. Plug the special power cord into the unit and run to the nearest available 110AC (or 220) outlet. On the rear left of the Performer is the main output panel. Using a standard phono plug, (supplied with the unit) run a line from the output marked « MAIN » to your amp. This will send both strings and brass through one channel.

For a stereophonic effect, plug another patch cord into the output marked, « BRASS ». You now have total separation of the string and brass voices for individual equalization, stereo placement through PA's, and special effects. (The other two outputs are for interfacing with a synthesizer and will be explained later).

Now you can switch the Performer on. A pilot light located on the on/off switch (as well as the LED's on the front panel) will signal that you are ready to begin.

SWITCHES

The four (4) switches or buttons found on your Performer are the on/off controls. By pushing the button in, the corresponding LED found on top of each switch, will light up indicating the function is turned on. This allows for easy viewing in poorly lite playing situations.

VOLUME SLIDES

On the front panel there are three (3) slide controls marked « VOLUME ». Moving left to right, they are the volume controls for the Brass section; the Violin section, and the overall master volume. Collectively, these controls provide a simple mixing console for more accurate control of volume levels. Remember, the right master volume control must be kept on otherwise no sound will be heard. Use the two other slides for achieving the proper balance between the strings and brass sounds.

BRASS SECTION

The Brass section is activated by depressing the on/off position switch and moving the volume slide to « ON ». A large variety of sounds are attained through manipulation of the four sliders found to the left of the volume control. The Attack and Decay sliders serve as envelope controllers. They provide the various nuances or subtleties needed when expressing a note. The Range and Resonance sliders control the overall sound quality. They function as the filter controllers. Although, each slider has an independent function, they all work together to produce sounds that range from French Horns to Synthesizer filter sweeps.

STRING SECTION

To activate the string section, depress either the 16' or 8' foot switch. The 8' foot octave is considered a violin register, while the 16' foot is more cello like. Both the 8' foot and 16' foot can be used together to achieve a rich, full string section. The three (3) equalization controls, (low, mid, high) function as a three band graphic, coloring the entire range of string possibilities. They also serve as an excellent means of altering the string sounds directly from the keyboard. Most importantly, it gives the performer a vast array of sound combinations ranging from very mellow types of string sounds to those very bright. Each equalization control is brought in by moving the sliders upwards. The higher the position, the greater the effect or interaction. By manipulating the low, mid and high sliders you can achieve the string sound of your choice.

CRESCENDO CONTROL

In the « 0 » position the strings will be heard immediately. By moving the slider upwards the attack time will be increased accordingly. This slide is always

MODULATION SECTION

The modulation section is always on and when the selector is in upper position activates the V.C.F. modulation, while in down position activates the Frequency modulation (F.M.). The LED serves as a visual monitor of the modulation rate. The V.C.F. modulation is routed into the filter and operates only in conjunction with the brass section.
Necessarily, the brass section must be turned on when operating these controls.
The F.M. may be used with both brass and strings sections. The modulation effects are controlled by the depth and rate sliders. The delay slide determines how long after the key is depressed the preset effect will come in. The Resonance and Range controls in the filter bank have greatest effect on what types of modulation sounds will be achieved.

PITCH CONTROL

This raises or lowers the pitch of the entire keyboard by as much as 2 - 1/2 octaves. This is the master oscillator and it can never go out of tune with itself. Adjust for proper pitch on the rear panel.

IMPORTANT:

The range or octave you choose will greatly effect the total sound characteristics. Try varying the instruments pitch from low to high when determining your optimum setting.

INTERFACING WITH A SYNTHESIZER

The Crumar Performer will interface with any synthesizer that will accept a gate of + 5V (no key or stand by) to ground (key depressed).

live, so take note of its position at all times since it will affect not only the sound of the strings, but their placement in the music.

WARNING:

If there is any question as to whether your synthesizer voltage is compatible, contact CRUMAR before attempting the interface. Improper connection will void the warranty and damage the unit. Once you are sure the voltages match, the interface procedure is easy:

1) Using the patch cord supplied with the unit, connect the Performer mini jack (located on back panel) to the «Gate In» on your synthesizer.
2) Connect a standard phono plug from the signal jack of the Performer into your synthesizer « External Input » (audio only).

After completing this simple two wire hook up, the Performer signal output can be controlled and modified by the synthesizer ADSR, voltage controlled filter and amplitude and filter (LFO) modulation.
(The DS - 2 Digital Synthesizer with two ADSR's, two completely independent LFO banks and a four pole filter is an ideal mate for the Performer).

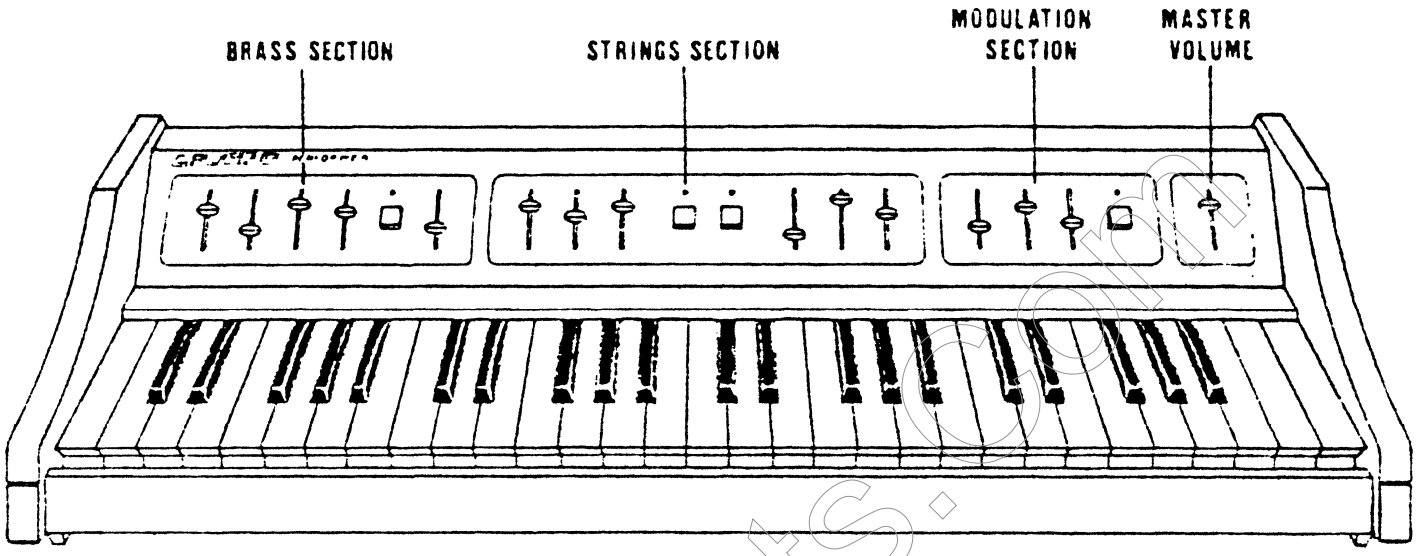
SUSTAIN SLIDE

This slide, found to the right of the Crescendo control, lengthens the time the note will sound after your hand is removed. It will increase or decrease depending on the position of the slide. In the « 0 » position, there will be no sustain and in the 8 position maximum sustain. (Note: the sustain feature is disabled or defeated when the brass buton is depressed).

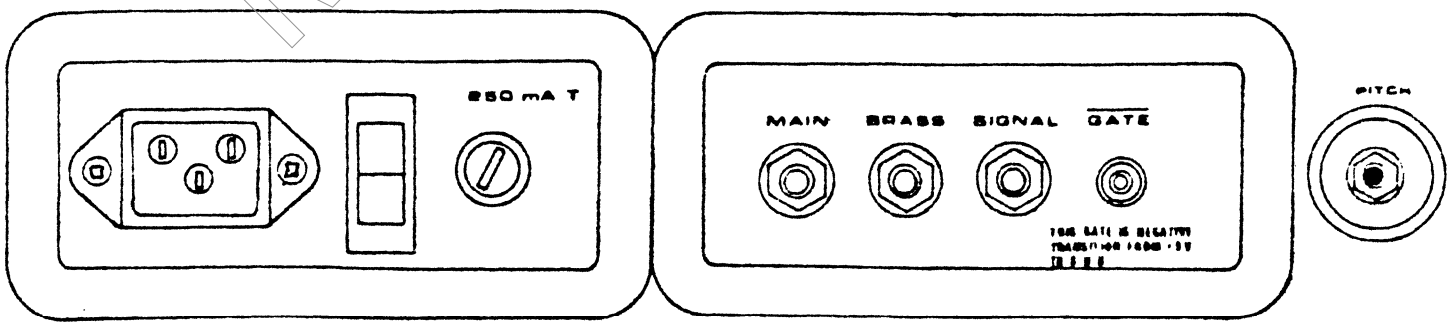
MAINTENANCE

Keep your Organizer T 1 and its accessories clean and dry. Any internal electronic service should be performed by a certified warranty repair station.

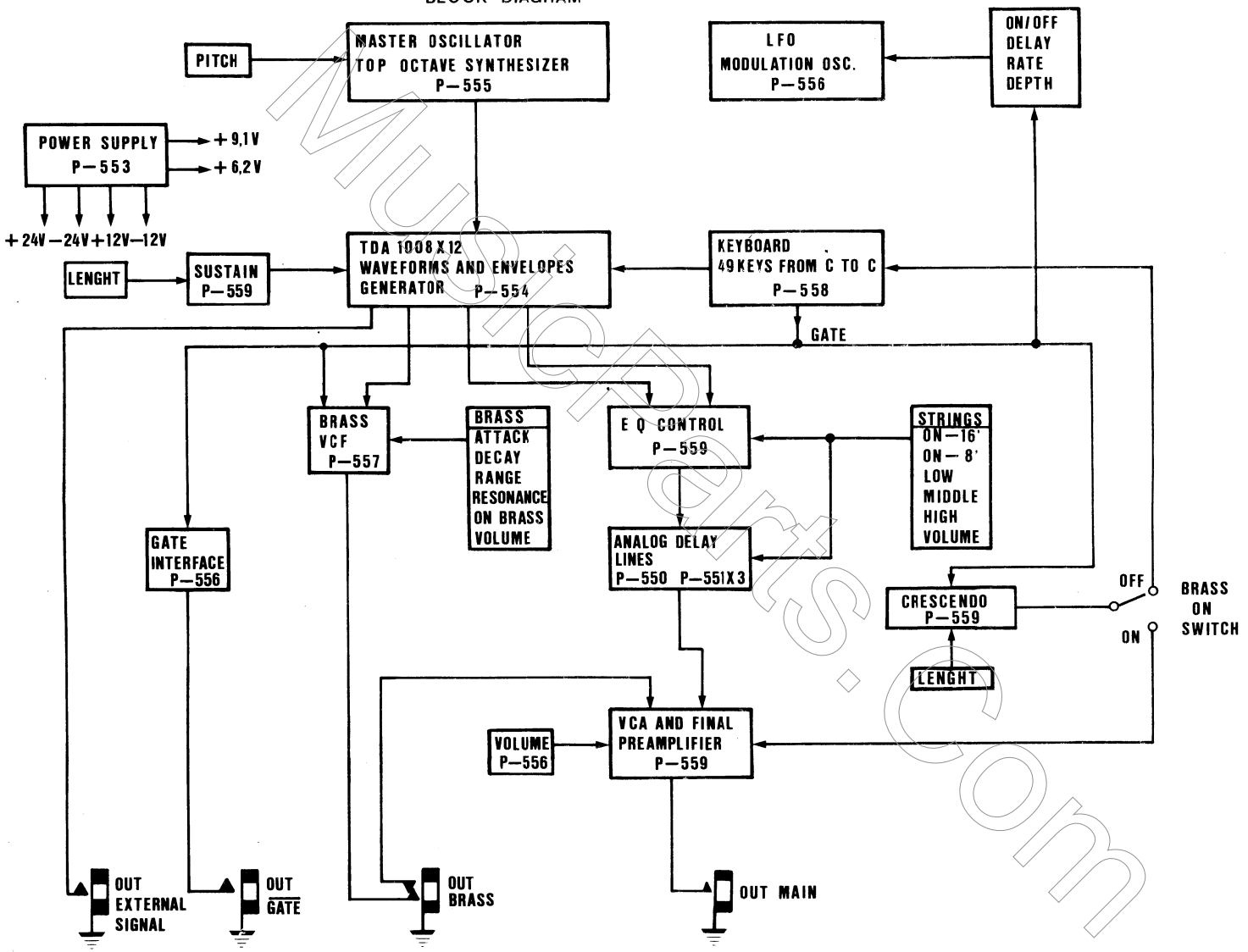
LOCATION DIAGRAM



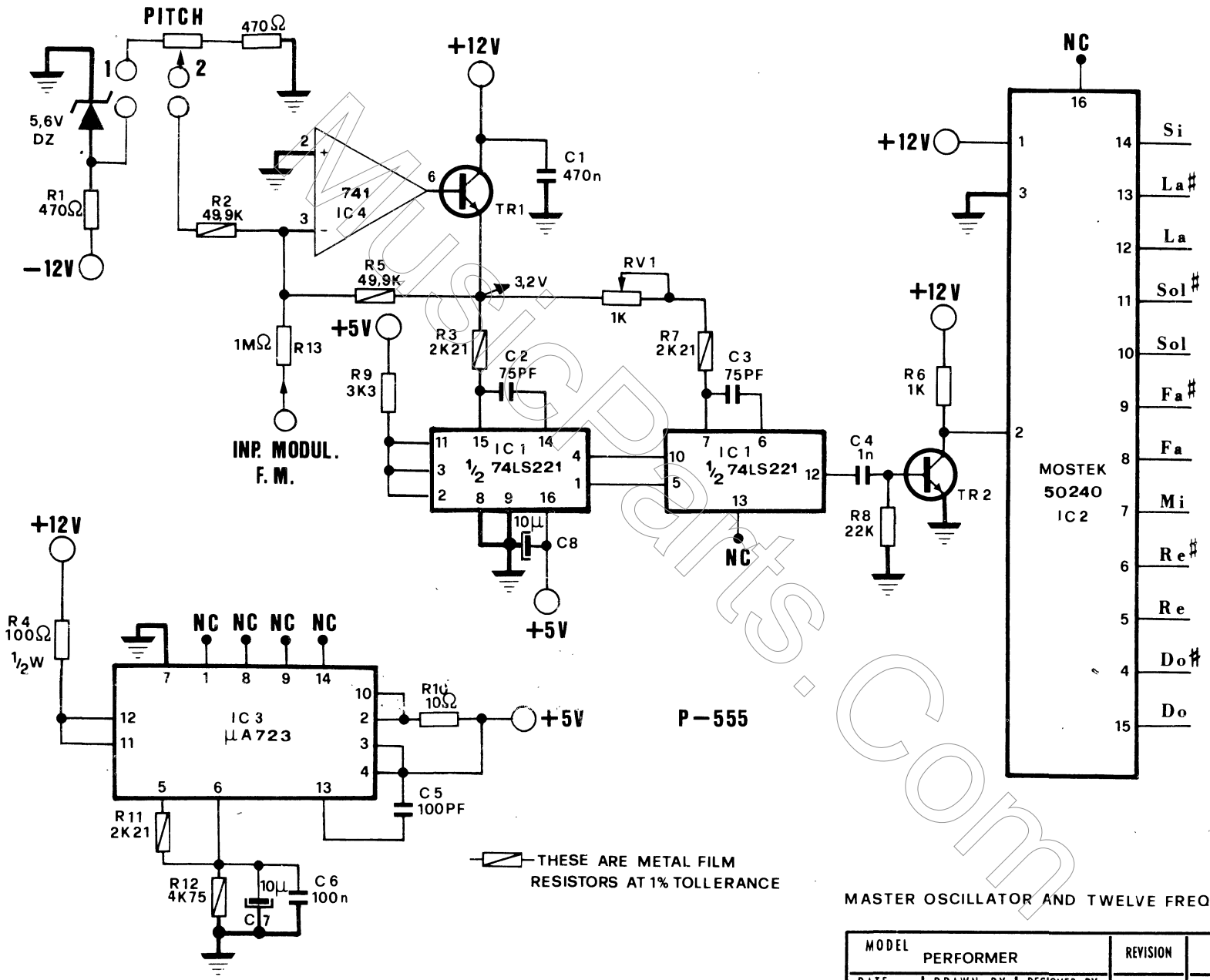
PEDALS - INPUT —— INSTRUMENT OUTPUTS



BLOCK DIAGRAM

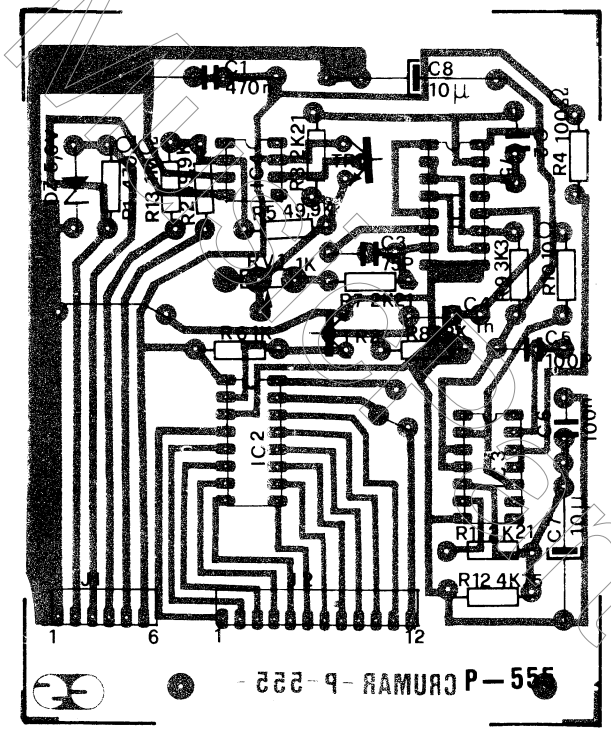


MODEL PERFORMER			REVISION			
DATE	DRAWN BY Borlini &	DESIGNED BY R Brai	DATE			



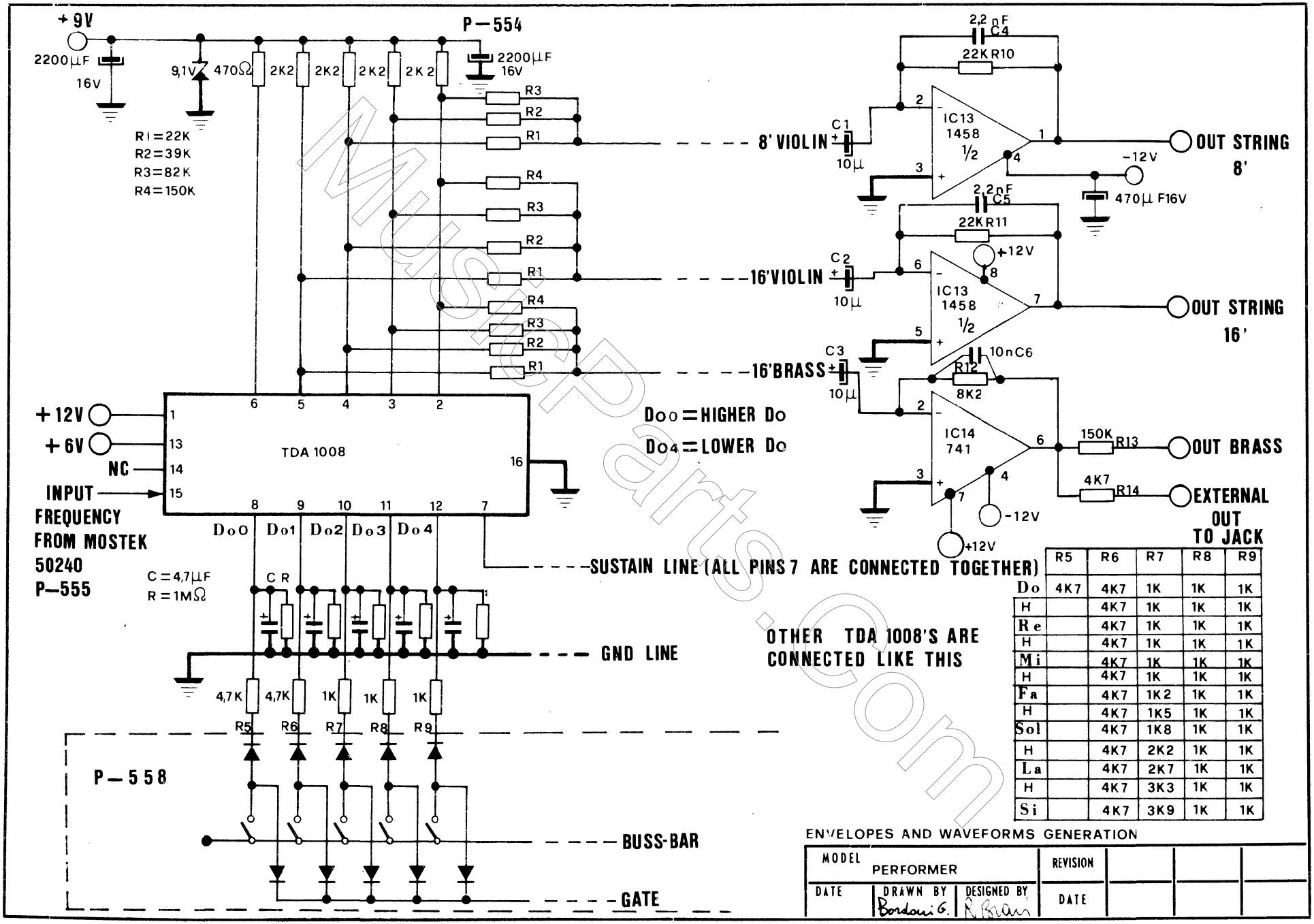
MASTER OSCILLATOR AND TWELVE FREQUENCYES GENERATION

MODEL	PERFORMER		REVISION			
DATE	DRAWN BY	DESIGNED BY	DATE			
	Bordoni G.	R. Bruni				



J 1		J 2	
1	GND	1	Do#
2	−12V	2	Re
3	PITCH 1	3	Re#
4	NC	4	Mi
5	PITCH 2	5	Fa
6	+12V	6	Fa#
		7	Sol
		8	Sol#
		9	La
		10	La#
		11	Si
		12	Do

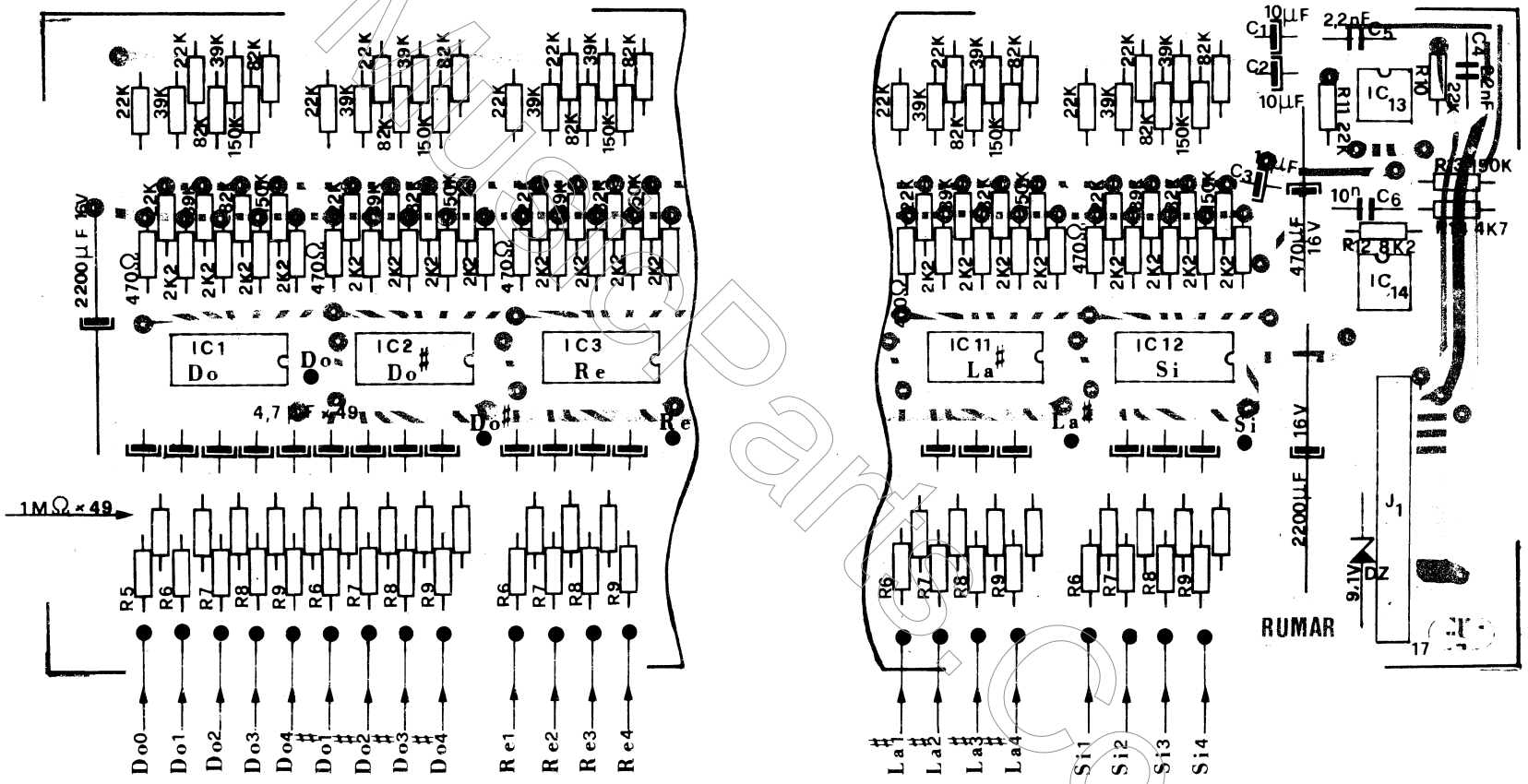
MODEL PERFORMER			REVISION			
DATE	DRAWN BY	DESIGNED BY	DATE			



	R5	R6	R7	R8	R9
Do	4K7	4K7	1K	1K	1K
H		4K7	1K	1K	1K
Re		4K7	1K	1K	1K
H		4K7	1K	1K	1K
Mi		4K7	1K	1K	1K
H		4K7	1K	1K	1K
Fa		4K7	1K2	1K	1K
H		4K7	1K5	1K	1K
Sol		4K7	1K8	1K	1K
H		4K7	2K2	1K	1K
La		4K7	2K7	1K	1K
H		4K7	3K3	1K	1K
Si		4K7	3K9	1K	1K

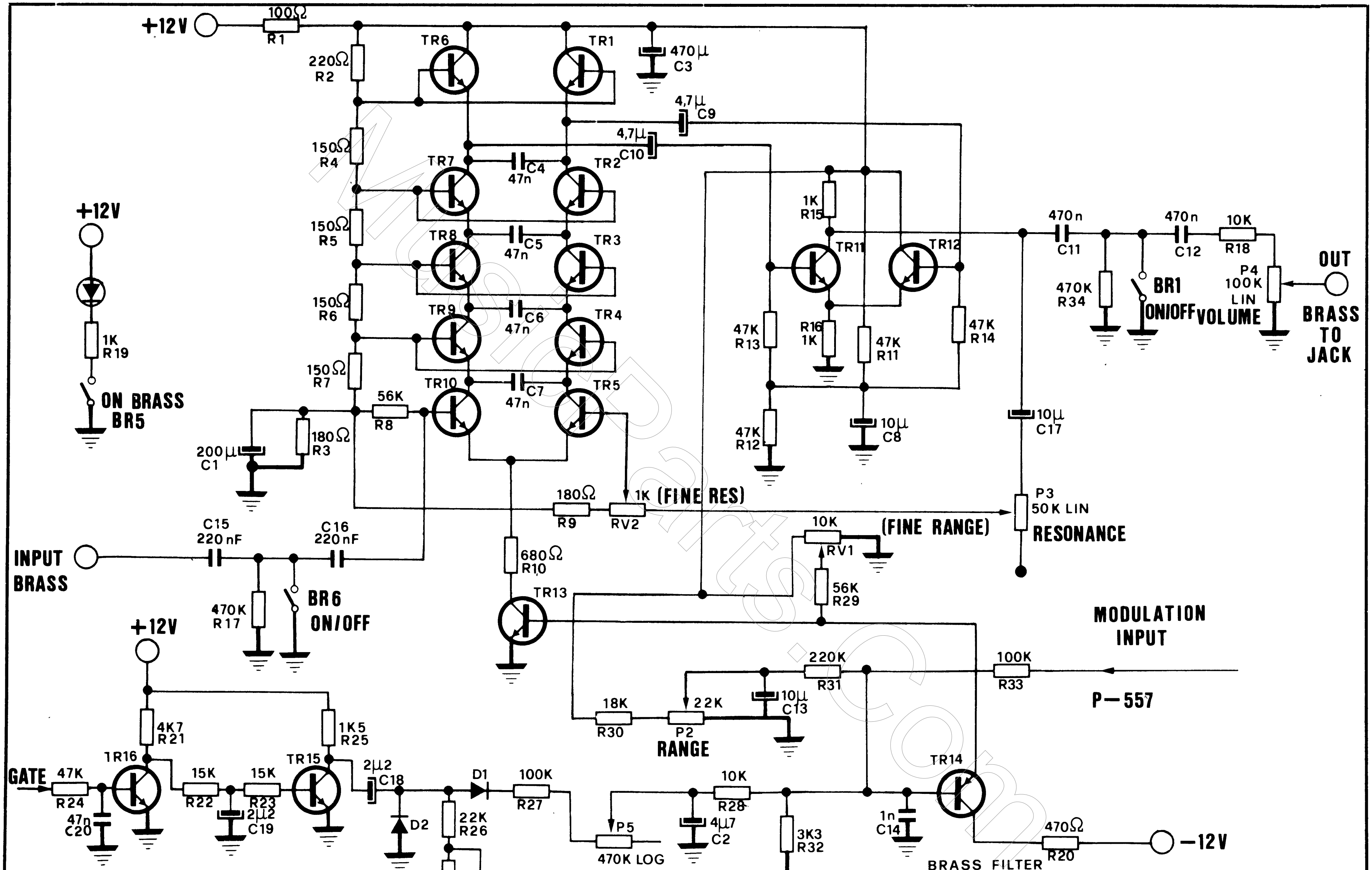
ENVELOPES AND WAVEFORMS GENERATION

MODEL	PERFORMER		REVISION			
DATE	DRAWN BY Bordoni G.	DESIGNED BY R. Rossi	DATE			

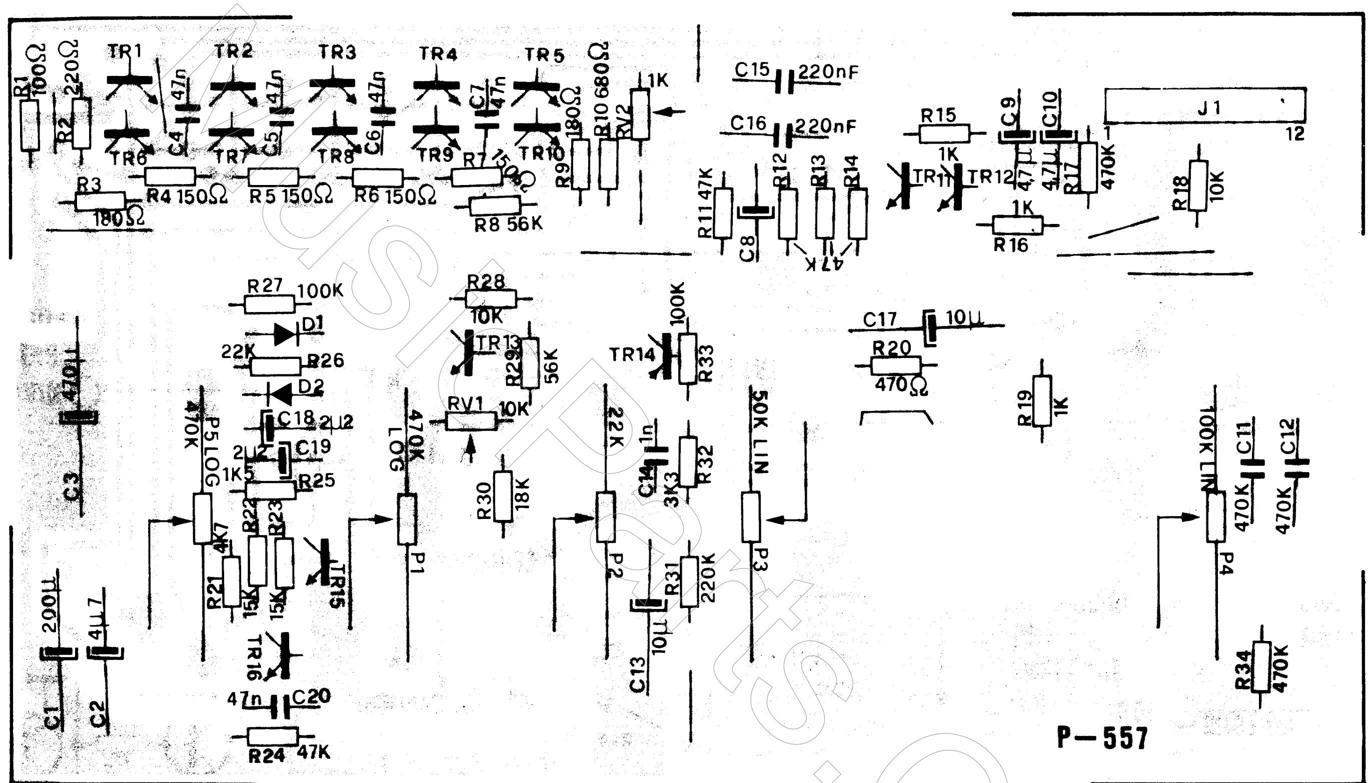


J1				
1	OUT STRING 8'	6	+12 V	FROM 11
2	GND	7	−12 V	TO 17
3	OUT STRING 16'	8	+ 9 V	GND
4	OUT BRASS	9	SUSTAIN LINE	
5	EXT. OUT	10	+ 6,2V	

MODEL PERFORMER			REVISION			
DATE	DRAWN BY Bordanig.	DESIGNED BY P.Bravi	DATE			

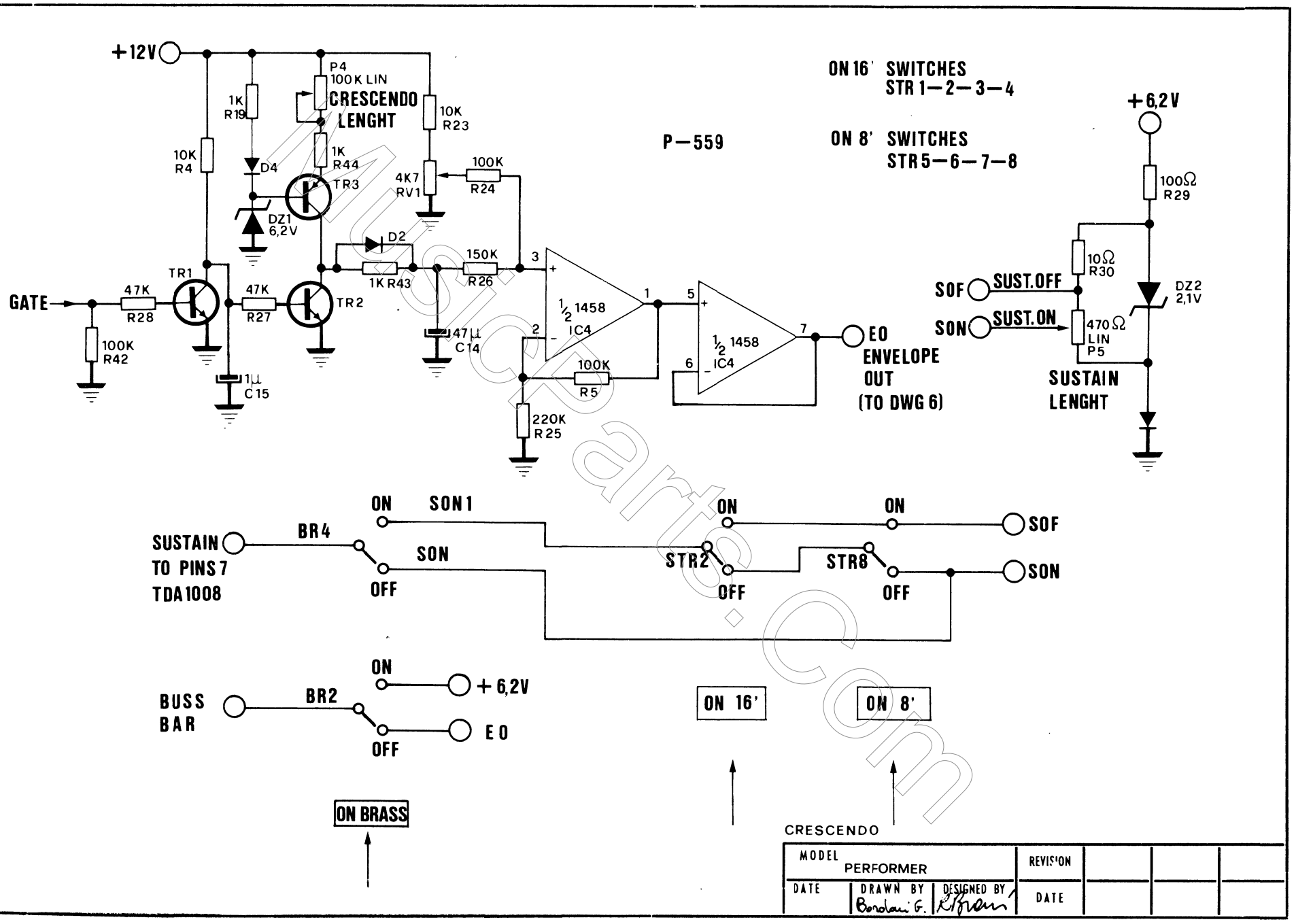

+12V
100Ω
R1
220Ω
R2
150Ω
R4
150Ω
R5
150Ω
R6
150Ω
R7
TR6
TR1
TR7
TR2
TR8
TR3
TR9
TR4
TR10
TR5
470µ
C3
4,7µ
C9
4,7µ
C10
C4
47n
C5
47n
C6
47n
C7
47n
56K
R8
180Ω
R3
200µ
C1
180Ω
R9
1K (FINE RES)
RV2
1K
R15
TR11
TR12
R16
1K
47K
R13
47K
R11
47K
R14
47K
R12
10µ
C8
470n
C11
470n
C12
10K
R18
470K
R34
BR1
ON/OFF
P4
100K
LIN
VOLUME
OUT
BRASS
TO
JACK
10µ
C17
P3
50K LIN
RESONANCE
10K
RV1
(FINE RANGE)
56K
R29
680Ω
R10
TR13
+12V
1K
R19
ON BRASS
BR5
INPUT
BRASS
C15
220 nF
C16
220 nF
470K
R17
BR6
ON/OFF
MODULATION
INPUT
P-557
220K
R31
100K
R33
18K
R30
22K
P2
RANGE
10µ
C13
+12V
4K7
R21
1K5
R25
GATE
47K
R24
47n
C20
TR16
15K
R22
15K
R23
2µ2
C19
TR15
2µ2
C18
D1
D2
22K
R26
470K
LOG
P1
DECAY
100K
R27
P5
470K LOG
ATTACK
10K
R28
4µ7
C2
3K3
R32
1n
C14
TR14
470Ω
R20
-12V
BRASS FILTER

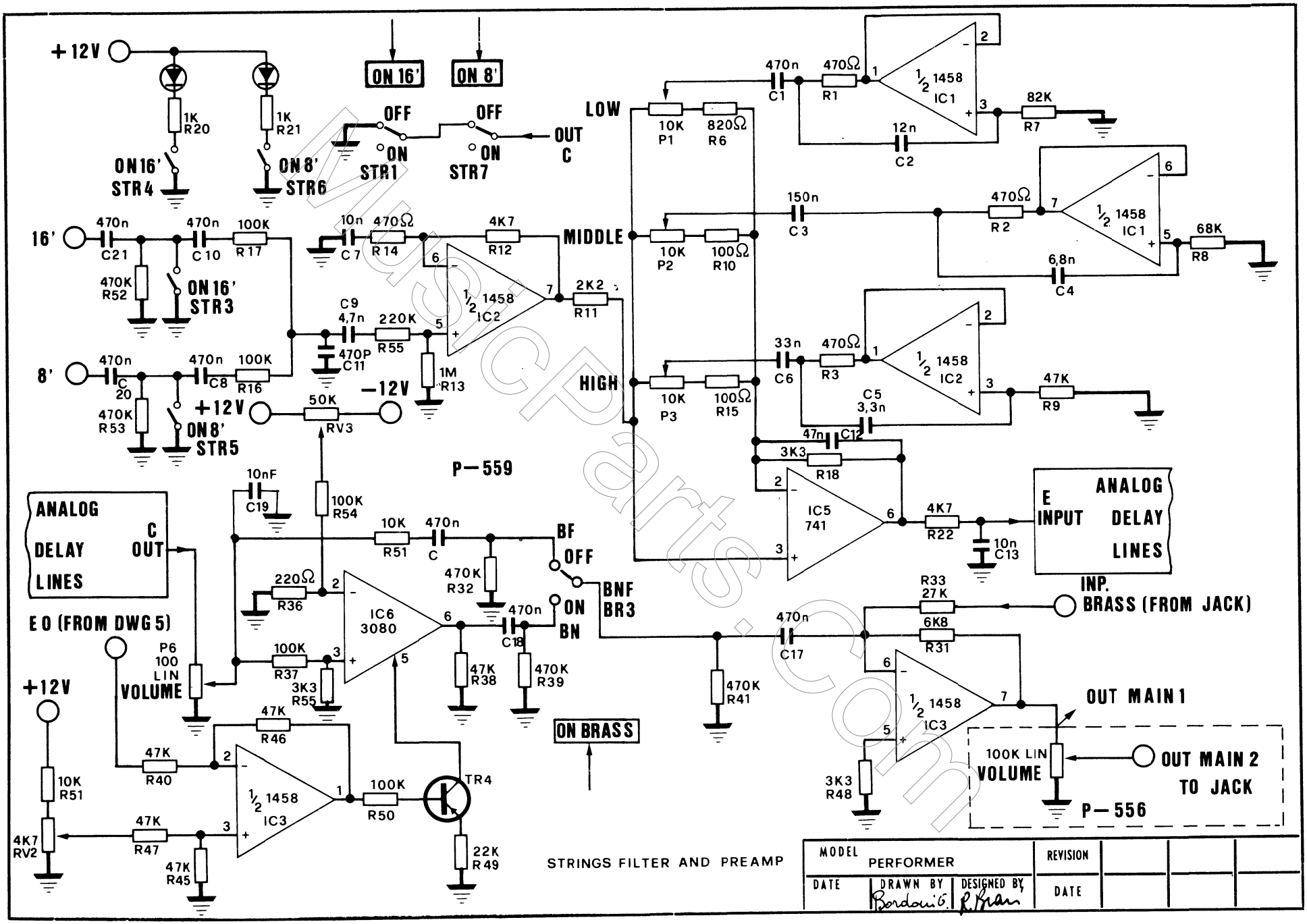
MODEL	PERFORMER	REVISION			
DATE	DRAWN BY Bortolani G.	DESIGNED BY R. Brai	DATE		



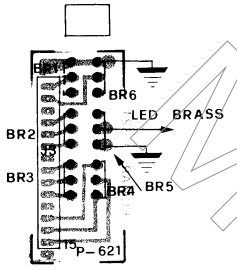
J1	
1	BR6 ON/OFF
2	−12 V
3	INP BRASS
4	GND
5	GND
6	GND
7	GND
8	OUT BR TO JACK
9	+12 V
10	BR5 ON/OFF
11	GATE
12	INP MOD.

MODEL PERFORMER			REVISION			
DATE	DRAWN BY Bordoni G.	DESIGNED BY R. Brasi	DATE			


+12V
P4
100K LIN
CRESCENDO
LENGHT
1K
R19
10K
R23
10K
R4
1K
R44
D4
TR3
4K7
RV1
100K
R24
DZ1
6,2V
D2
150K
R26
1K R43
TR1
47K
R28
47K
R27
TR2
GATE
100K
R42
1µ
C15
47µ
C14
3
1
2
½ 1458
IC4
5
6
7
½ 1458
IC4
100K
R5
220K
R25
EO
ENVELOPE
OUT
(TO DWG 6)
P—559
ON 16' SWITCHES
STR 1—2—3—4
ON 8' SWITCHES
STR 5—6—7—8
+6,2V
100Ω
R29
10Ω
R30
SOF
SUST.OFF
SON
SUST.ON
470Ω
LIN
P5
DZ2
2,1V
SUSTAIN
LENGHT
SUSTAIN
TO PINS 7
TDA1008
BR4
ON
SON 1
SON
OFF
STR2
STR8
BUSS
BAR
BR2
+6,2V
EO
ON BRASS
ON 16'
ON 8'
CRESCENDO
MODEL
PERFORMER
REVISION
DATE
DRAWN BY
Bordoni G.
DESIGNED BY
DATE


+12V
ON 16'
ON 8'
OFF
OFF
OUT C
1K R20
1K R21
ON16' STR4
ON 8' STR6
ON STR1
ON STR7
LOW
MIDDLE
HIGH
470n C1
470Ω R1
1/2 1458 IC1
82K R7
12n C2
10K P1
820Ω R6
150n C3
470Ω R2
1/2 1458 IC1
68K R8
6,8n C4
10K P2
100Ω R10
33n C6
470Ω R3
1/2 1458 IC2
47K R9
C5 3,3n
10K P3
100Ω R15
47n C12
3K3 R18
IC5 741
4K7 R22
10n C13
E INPUT
ANALOG DELAY LINES
16'
8'
470n C21
470n C10
100K R17
470K R52
ON 16' STR3
470n C20
470n C8
100K R16
470K R53
ON 8' STR5
10n C7
470Ω R14
4K7 R12
1/2 1458 IC2
2K2 R11
C9 4,7n
220K R55
470P C11
1M R13
+12V
50K RV3
-12V
P-559
10nF C19
100K R54
10K R51
470n C
BF
OFF
ON
BNF BR3
BN
470K R32
220Ω R36
IC6 3080
470n C18
100K R37
3K3 R55
47K R38
470K R39
ANALOG DELAY LINES C OUT
E 0 (FROM DWG 5)
P6 100 LIN VOLUME
+12V
47K R46
47K R40
1/2 1458 IC3
100K R50
TR4
10K R51
4K7 RV2
47K R47
47K R45
22K R49
ON BRASS
470K R41
470n C17
R33 27K
INP. BRASS (FROM JACK)
6K8 R31
1/2 1458 IC3
OUT MAIN 1
3K3 R48
100K LIN VOLUME
OUT MAIN 2 TO JACK
P-556
STRINGS FILTER AND PREAMP
MODEL PERFORMER
REVISION
DATE
DRAWN BY Bordonio
DESIGNED BY R.Rian
DATE

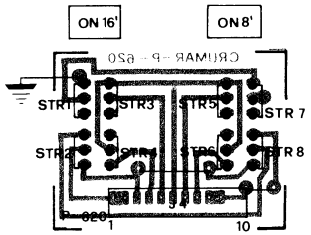
BRASS SWITCH



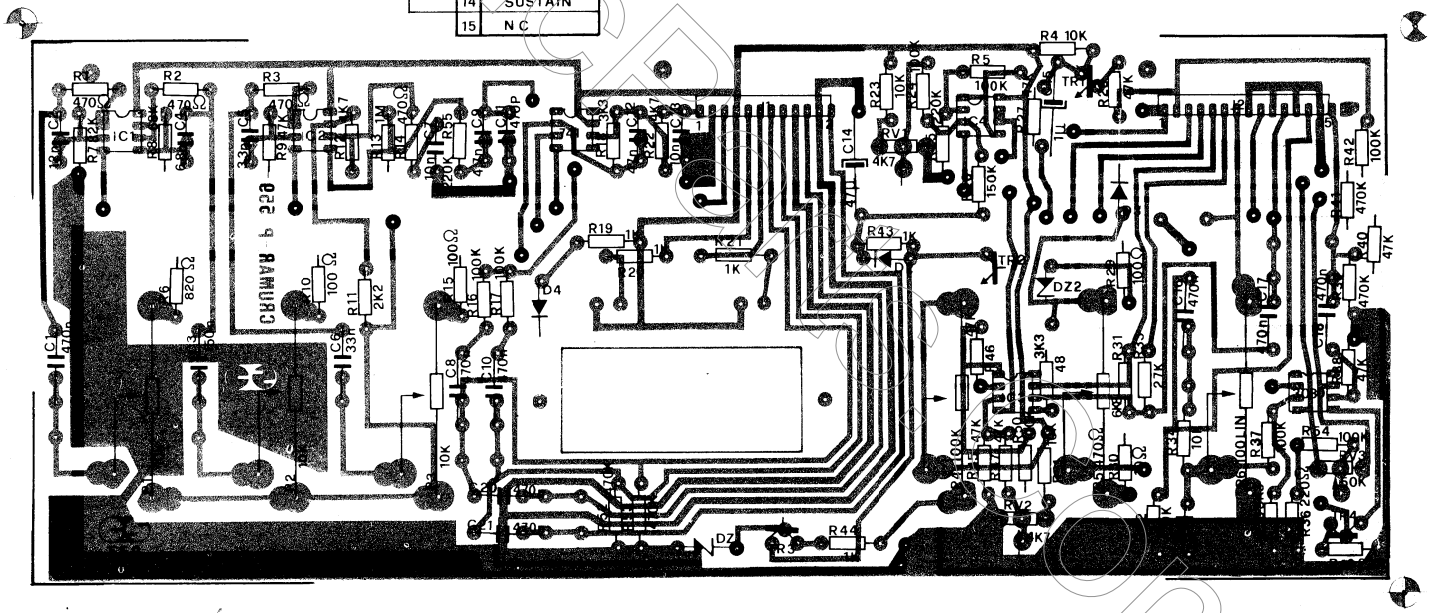
J3		
	1	BR1
	2	BR6
	3	NC
BR2	4	EO
	5	BUSS BAR
	6	+6,2V
	7	NC
BR3	8	BF
	9	BNF
	10	BN
	11	NC
BR4	12	SON
	13	SON1
	14	SUSTAIN
	15	NC

J4		
1	NC	
2	SON1	STR2
3	SOF	
4	LED 16'	STR4
5	ON 16'	STR3
6	GND	
7	ON 8'	STR5
8	LED 8'	STR6
9	SON	STR8
10	SON	

STRING SWITCH

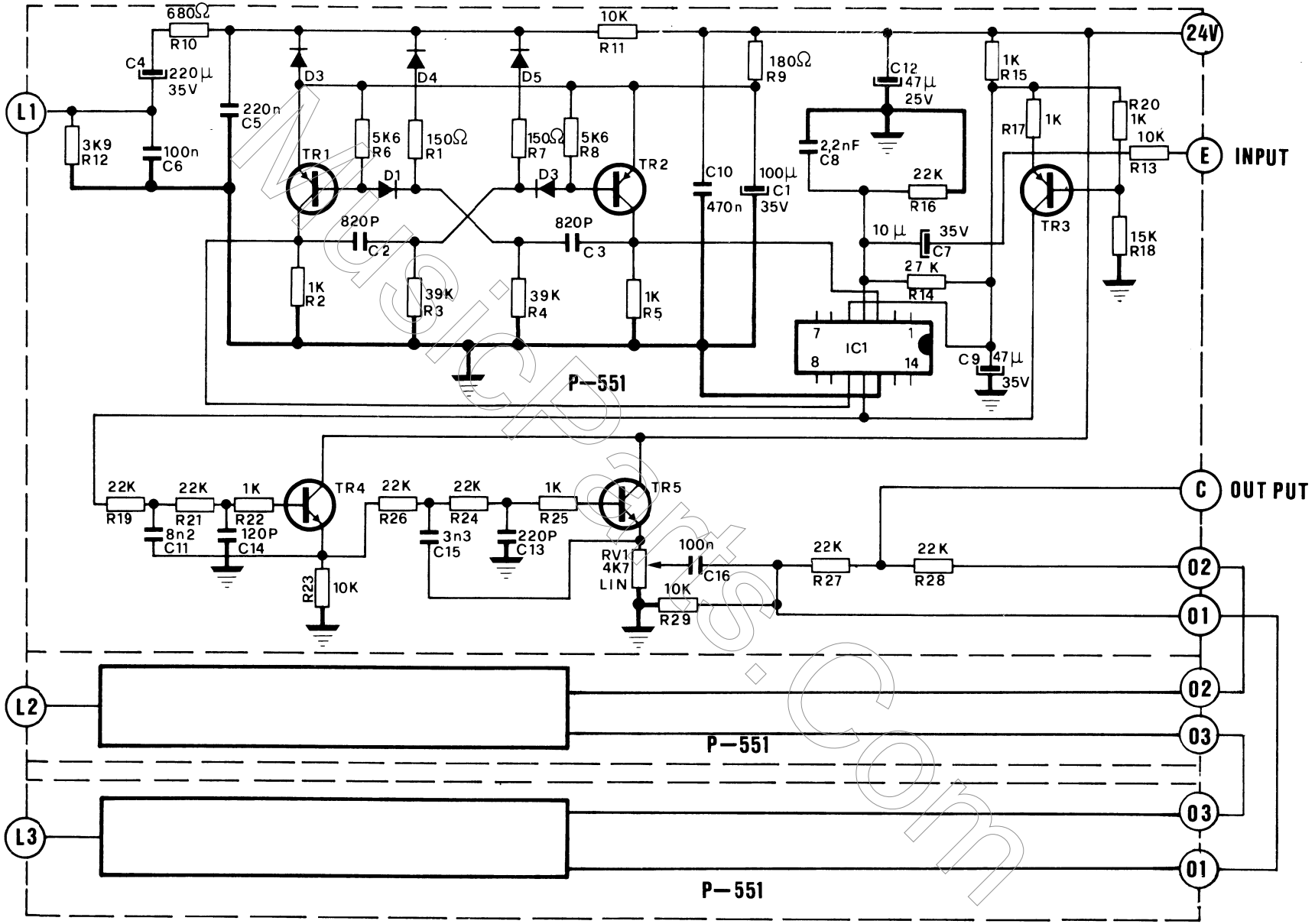


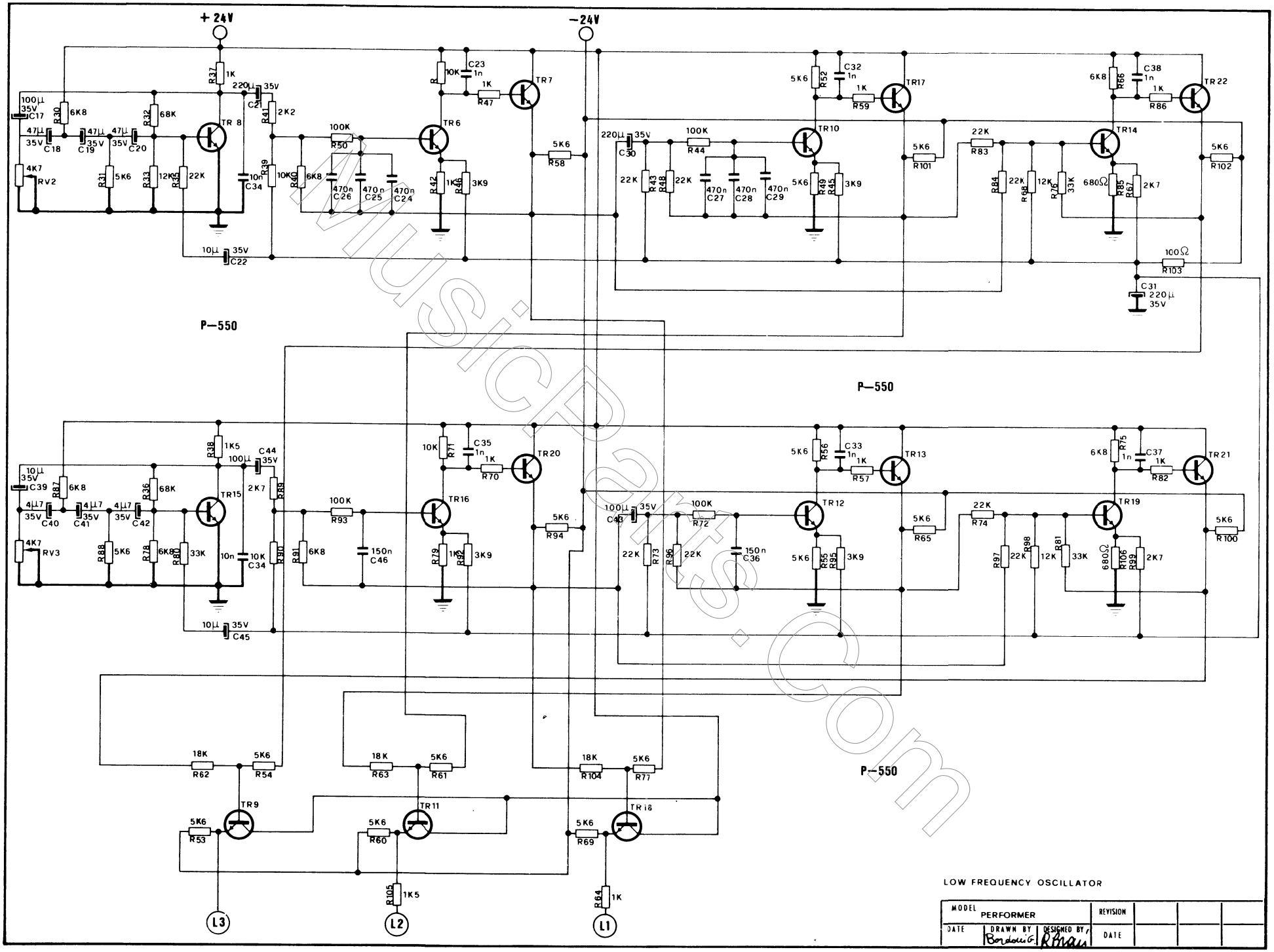
J1		J 2	
1	E INPUT	1	EO
2	GND	2	GATE
3	– 12 V	3	SON
4	+12 V	4	SOF
5	LED 16'	5	OUT MAIN 1
6	LED 8'	6	INP BR FROMJACK
7	ON 8'	7	C OUT
8	ON 16'	8	GND
9	GND	9	+6,2V
10	INP STRING 8'	10	GND
11	GND	11	BNF
12	INP STRING 16'	12	GND
		13	BF
		14	GND
		15	BN

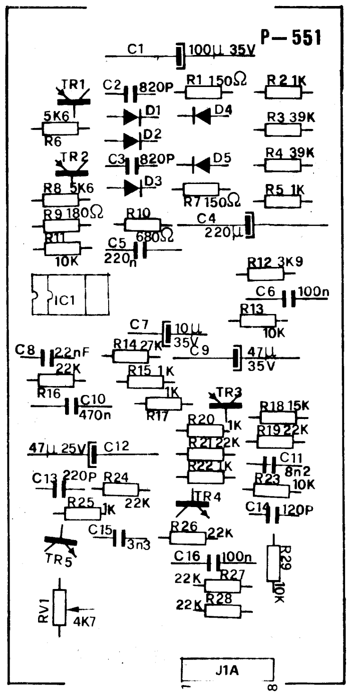


CRESCENDO STRING FILTERAND PREAMP.

MODEL PERFORMER			REVISION			
DATE	DRAWN BY Bordoni G.R. Brau	DESIGNED BY	DATE			

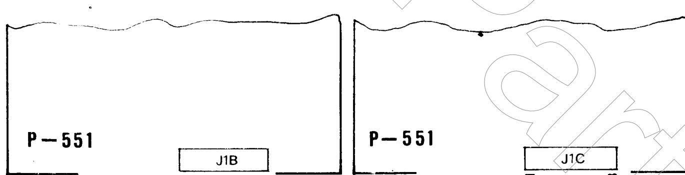

680Ω R10
10K R11
180Ω R9
24V
C4 220µ 35V
220n C5
D3
D4
D5
C12 47µ 25V
1K R15
L1
3K9 R12
100n C6
5K6 R6
150Ω R1
150Ω R7
5K6 R8
R17 1K
R20 1K
10K R13
E INPUT
TR1
D1
TR2
C10 470n
100µ C1 35V
2,2nF C8
22K R16
TR3
820P C2
820P C3
10µ 35V C7
15K R18
27 K R14
1K R2
39K R3
39K R4
1K R5
IC1
C9 47µ 35V
P—551
22K R19
22K R21
1K R22
TR4
22K R26
22K R24
1K R25
TR5
C OUT PUT
8n2 C11
120P C14
3n3 C15
220P C13
RV1 4K7 LIN
100n C16
22K R27
22K R28
R23 10K
10K R29
02
01
L2
02
03
P—551
L3
03
01
P—551
ADL—TCA350
MODEL PERFORMER
REVISION
DATE
DRAWN BY Bordoni G.
DESIGNED BY R Bravi
DATE

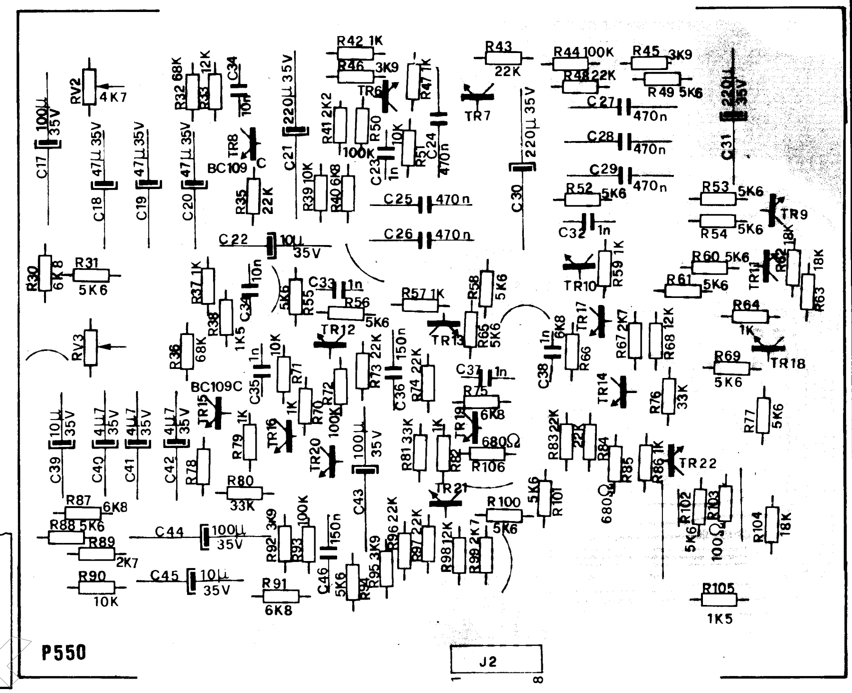

+24V
-24V
P—550
P—550
P—550
LOW FREQUENCY OSCILLATOR
MODEL PERFORMER
REVISION
DATE
DRAWN BY Bordonaro
DESIGNED BY R.Brain
DATE

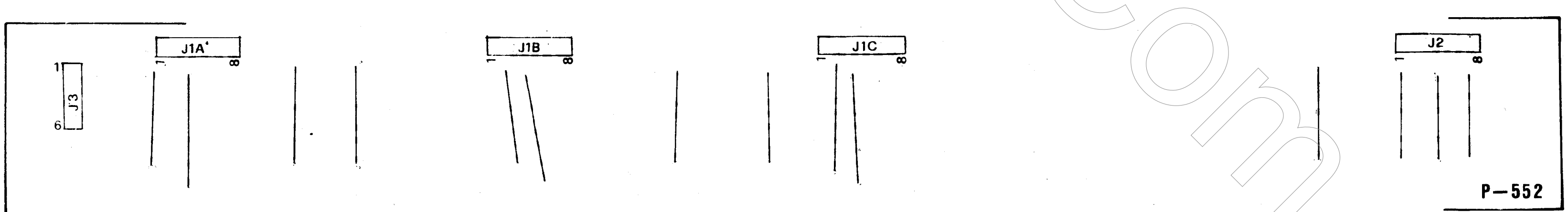


J1A		J1B		J1C		J2	
1	GND	1	GND	1	GND	1	GND
2	GND	2	GND	2	GND	2	GND
3	+24 V	3	+24 V	3	+24 V	3	GND
4	C	4	C	4	C	4	+24 V
5	01	5	02	5	03	5	−24 V
6	02	6	03	6	01	6	L1
7	E	7	E	7	E	7	L2
8	L1	8	L2	8	L3	8	L3

J3	
1	GND
2	+24 V
3	C=OUT
4	GND
5	E= INP
6	−24 V

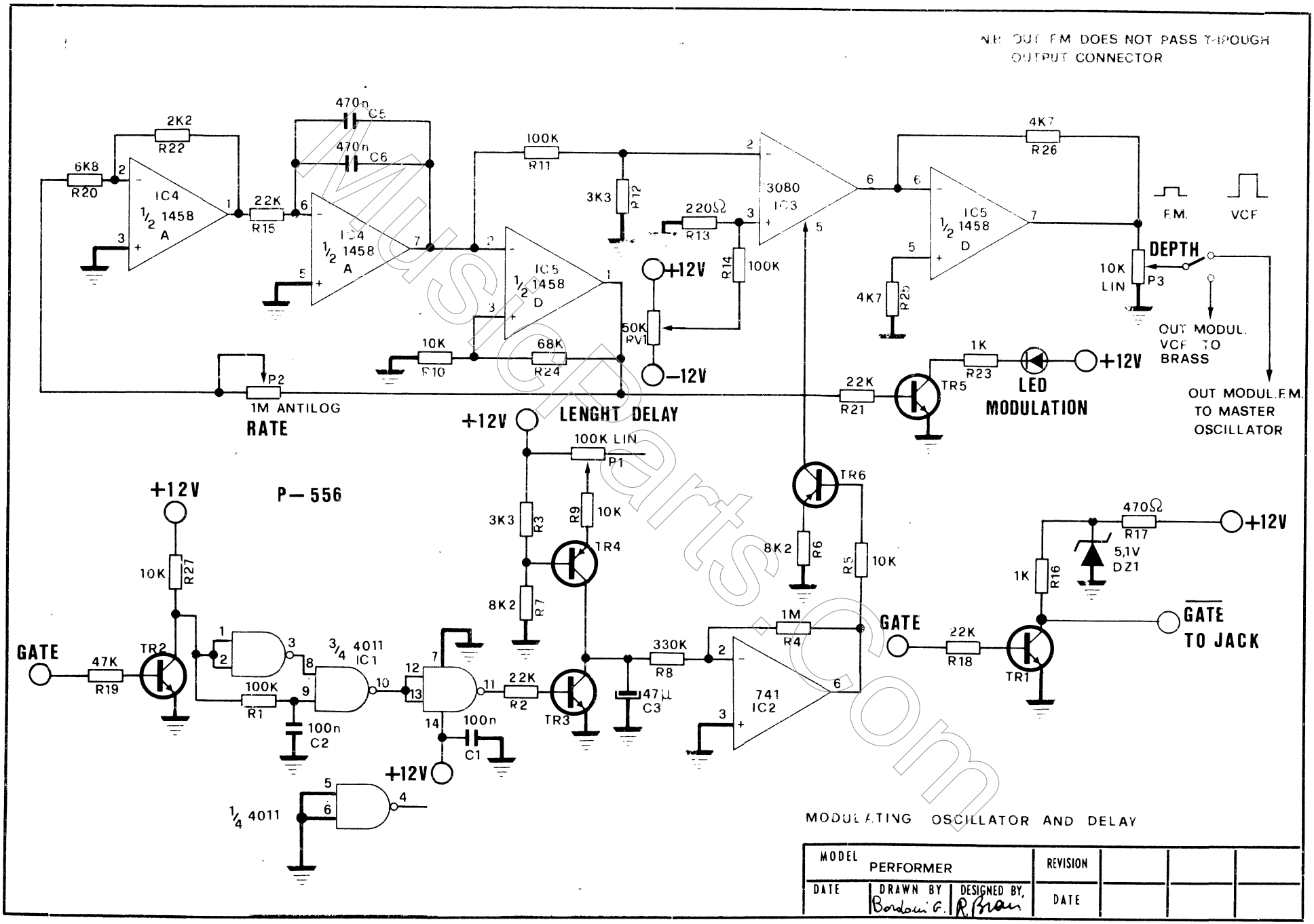




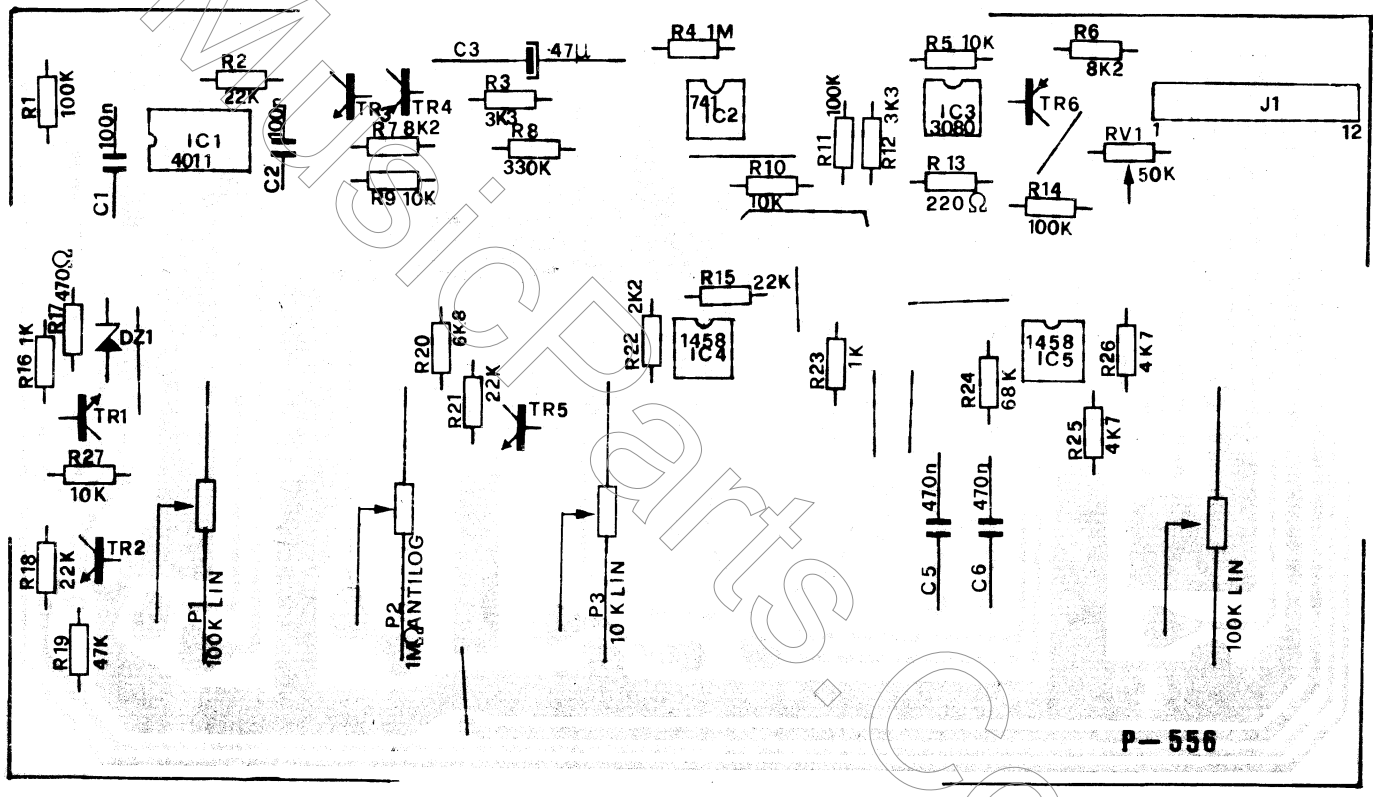


ADL—TCA LOW FREQUENCY OSCILLATOR
350

MODEL PERFORMER			REVISION
DATE	DRAWN BY	DESIGNED BY	DATE

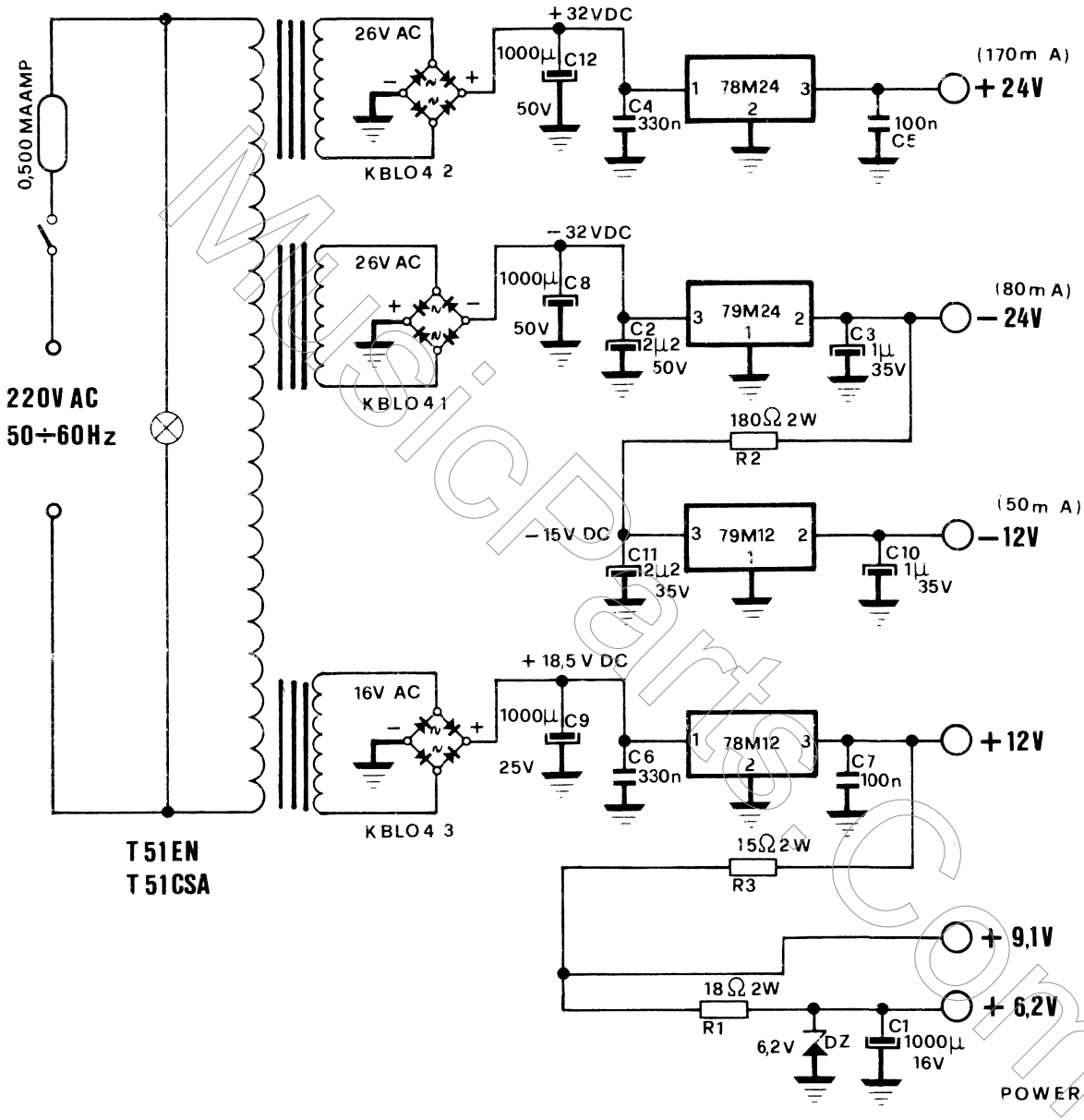

N.B. OUT F.M. DOES NOT PASS THROUGH OUTPUT CONNECTOR
P-556
RATE
1M ANTILOG
P2
LENGHT DELAY
100K LIN
P1
DEPTH
10K LIN
P3
F.M.
VCF
OUT MODUL. VCF TO BRASS
OUT MODUL. F.M. TO MASTER OSCILLATOR
LED MODULATION
GATE
GATE TO JACK
+12V
-12V
IC4 1/2 1458 A
IC5 1/2 1458 D
3080 IC3
741 IC2
3/4 4011 IC1
1/4 4011
TR1
TR2
TR3
TR4
TR5
TR6
5,1V DZ1
2K2 R22
6K8 R20
22K R15
470n C5
470n C6
100K R11
3K3 R12
220Ω R13
100K R14
50K RV1
10K R10
68K R24
4K7 R26
4K7 R25
1K R23
22K R21
10K R27
47K R19
100K R1
100n C2
100n C1
22K R2
3K3 R3
10K R9
8K2 R7
330K R8
47µ C3
1M R4
8K2 R6
10K R5
1K R16
470Ω R17
22K R18
MODULATING OSCILLATOR AND DELAY
MODEL PERFORMER
REVISION
DATE
DRAWN BY Bordoni G.
DESIGNED BY R. Bran
DATE

J1	
1	−12 V
2	+12 V
3	MOD. OUT
4	GND
5	OUT MAIN 1
6	GND
7	OUT MAIN 2
8	GND
9	GND
10	GND
11	GATE
12	$\overline{\text{GATE}}$



FOR OUT MAIN 1 AND OUT MAIN 2 SEE P−559

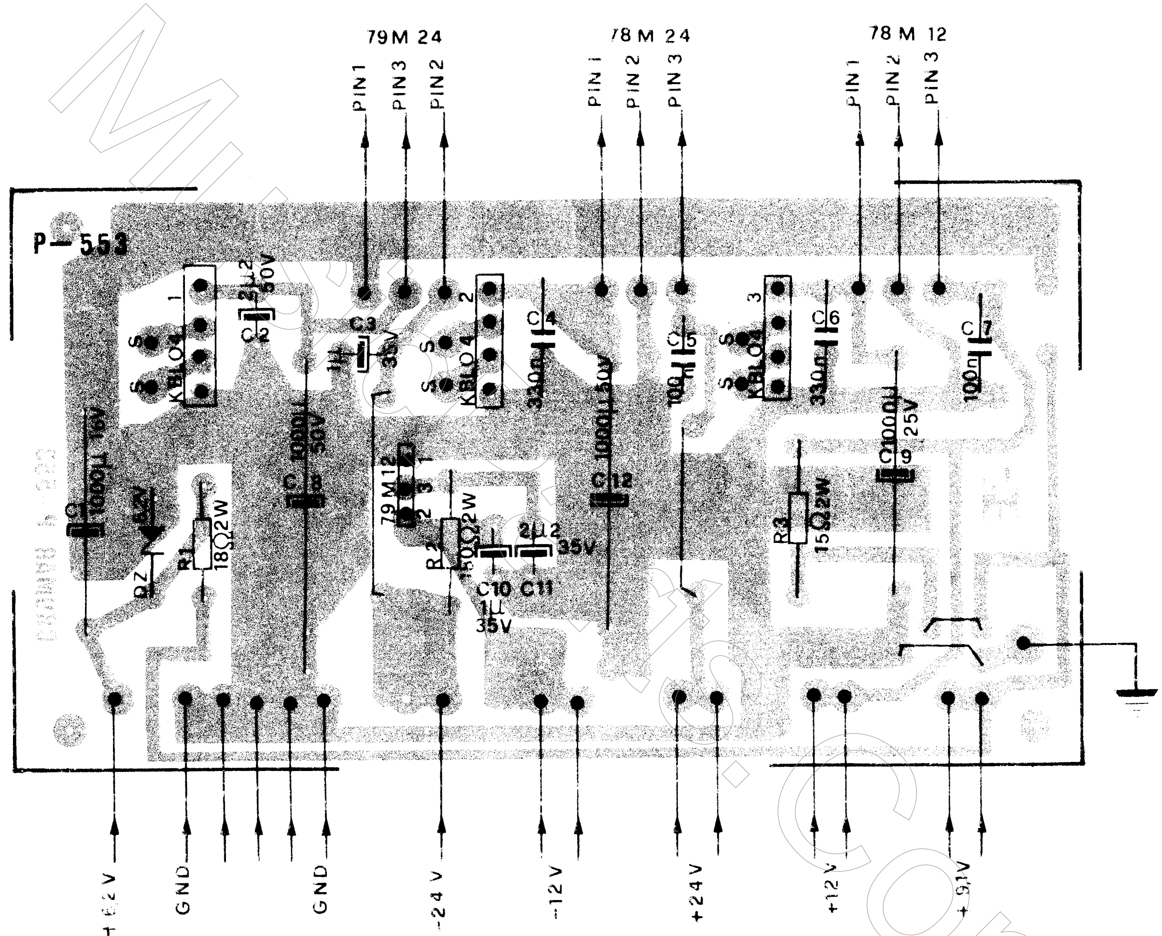
MODEL PERFORMER			REVISION			
DATE	DRAWN BY Bordoni G.	DESIGNED BY	DATE			



P—553

POWER SUPPLY

MODEL PERFORMER			REVISION			
DATE	DRAWN BY Bordieri G.	DESIGNED BY R. Bruni	DATE			



MODEL PERFORMER			REVISION			
DATE	DRAWN BY	DESIGNED BY	DATE			
	Bordoni	R. Brian				

PART LIST

P 555 - (MASTER OSCILLATOR)

IC 1	74LS221
IC 2	50240
IC 3	723
IC 4	741
TR 1	BC286
TR 2	BC173

P 554 - (WAVEFORMS GENERATION)

da IC 1 a IC 12	TDA1008
IC 13	1458
IC 14	741

P. 557 - (BRASS FILTER)

da TR 1 a TR 13	BC209C
TR 14	BC204
TR 15 e TR 16	BC209

P 559 - (STRING FILTER)

da IC 1 a IC 4	1458
IC 5	741
IC 6	3080
TR 1 e TR 2	BC209
TR 3 e TR 4	BC204

P 550 - (LFO FOR ANALOG DELAY LINES)

TR 8 e TR 15	BC209C
TR 6 e TR 7	BC209
da TR 9 a TR 14	BC209
da TR 16 a TR 22	BC209

P 551 - (ANALOG DELAY LINES)

da TR 1 a TR 3	BC204
TR 4 e TR 5	BC209C

P 556 - (MODULATION)

IC 1	4011
IC 2	741
IC 3	3080
IC 4 e IC 5	1458
da TR 1 a TR 3	BC209
TR 4 e TR 6	BC204
TR 5	BC209

CROSS REFERENCE GUIDE

TRANSISTOR

1)B C 2 8 6 è	
B C 2 8 6	FAIRCHILD -SGS
B D 3 7 1	NATIONAL SEMICONDUCTOR
2) B C 2 0 9 B/C è	
B C 1 7 3 B/C	I T T
B C 2 3 9 B/C	NATIONAL SEMICONDUCTOR
B C 2 3 9 B S/C S	MISTRAL
B C 5 4 9 B/C	PHILIPS
3) B C 2 0 4 B/C è	
B C 3 0 8 B/C	MISTRAL - TELEFUNKEN
B C 2 0 4 V I	MISTRAL - TELEFUNKEN (solo tipo B)
B C 2 0 5 B/C	NATIONAL SEMICONDUCTOR

INTEGRATED CIRCUIT

1) 7 4 L S 2 2 1 è	
S N 7 4 L S 2 2 1	TEXAS INSTRUMENT
7 4 L S 2 2 1	FAIRCHILD
2) 5 0 2 4 0 è	
M K 5 0 2 4 0	MOSTEK
3) 7 2 3 è	
u A 7 2 3	FAIRCHILD
L M 7 2 3	NATIONAL SEMICONDUCTOR
4) 7 4 1 è	
u A 7 4 1	FAIRCHILD
L M 7 4 1	NATIONAL SEMICONDUCTOR
S N 7 2 7 4 1	TEXAS INSTRUMENT
M C 7 4 1	MOTOROLA
5) T D A 1 0 0 8	PHILIPS
6) 1 4 5 8 è	
u A 1 4 5 8	FAIRCHILD
L M 1 4 5 8	NATIONAL SEMICONDUCTOR
M C 1 4 5 8	MOTOROLA
7) 3 0 8 0 è	
L M 3 0 8 0	NATIONAL SEMICONDUCTOR
C A 3 0 8 0	R C A
8) 4 0 1 1 è	
4 0 1 1	FAIRCHILD
C D 4 0 1 1	NATIONAL SEMICONDUCTOR - MOTOROLA - R C A

- All components mentioned in this enclosed « PART LIST » are on stock at CRUMAR'S.

PERFORMERS

Testing Standards

POWER SUPPLY (P553)

The output voltages of the transformer secondaries are:

a) 26 VAC
b) 26 VAC
c) 16 VAC

The input voltages of the various regulators are:

a)	79 M24	-32 VDC
b)	78 M24	+32 VDC
c)	79 M12	-15 VDC
d)	78 M12	+18, 5VDC

The output voltages and current consumptions:

a)	-24V (+o,5v)	80 mA
b)	+24v (+o,5v)	170 mA
c)	-12V (+o,5v)	50mA
d)	+12V (+o,5v)	120mA
e)	+6,2V (+o,5v)	150mA

f) There is also a point where you can read the +9,IV, but the regulator for this voltage is found on P.C. Board 554 and therefore, in testing P553, it is necessary to externally connect a Zener, at 9,IV with parallel condensor at 2200 UF 16V in order to assure the exact functioning currents at Zener of 6,2V.

Master Oscillator (P555)

This P.C. Borad contains the master oscillator at 2.00024 MHz and from there the 12 frequencies which drive the TDA 1008 which are found on P.C. Board .

a) Set the control for PITCH at center and set.... the calibration at 2.00024 MHz making the trimmer at 1KR RVI and having the probe forthe frequency meter at pin 12 of 74L5221. The emittor of TR1 should be around 3.4V

b) At pin 2 of 50240 the 2.00024 MHz should have an amplitude that varies from one volt to at least 10 volts.

c) The UA 723 applies and regulates the +5V to 74LS221.

Reproduction and (P554-P558) Frequency Division

This P.C. Board contains the TDA 1008. The inputs are the 49 controls that come from the keyboard, the 12 frequencies that come from P555 and one wire for regulating the sustain. The outputs are the audio signals (BRASS: STRING 16' and 8'; EXTERNAL OUT).

Regarding the 49 controls that come from the keyboard, they receive signals from the main rod (buss Bar) depending on the keys depressed.

a) If atleast one string is inserted (without BRASS) the common rod at rest is at +2V, at work (this is with a least one key pressed) the voltage of the common rod goes to +6,2V (the amplitude is stabilized by the setting of the CRESCENDO control.

b) If the BRASS is inserted (with or without the STRING) the common rod is always at 6.2V.
On the circuit stamped of the P.C.Board (P558) is where the function OR, 49 inputs at whose exit is available the GATE at rest is at OV (GND), when at least one key is pressed it goes to +5, 4V.

The TDA 1008 is an integrated circuit that functions as electronic counter for, potentially 5 keys of the same name.

This means that a TDA 1008 can do only all the DO, or only all the RE, etc, For this reason, there are 12 notes if you use 12TDA 1008. In the PERFORMER of 5 potential inputs, only 5 are used for the DO, while for all the other notes only 4 are used leaving the fifth one free.

Each TDA 1008 functions correctly when the pins of each one has the following characteristics:

Pins TDA 1008	Description:
1	+12V
13	+6V
15	input clock (output frequency of 50240 from P555).
16	GND
7	SUSTAIN - This pedal with the BRASS inserted (with or without STRING) is always at a fixed voltage of +2, 3V to which corresponds a sustain length equal to zero. This pedal, with at least one STRING inserted (without BRASS) is at a voltage, variable with the setting of the sustain, that goes from +2, 3V approx. (sustain = zero to +o,8V approx. (sustain = maximum length.)
8-9-10-11-12	INPUTS TDA 1008 - Pressing a key the pertinent pins go from +IV to +5V. The ascent is immediate when the BRASS (with or without STRING) is inserted. The rate of ascent (from +1 to +5V) is regulated with the setting of the CRESCENDO when at least one STRING (without BRASS) is inserted.

6-5-4-3-2

OUTPUTS TDA 1008 at rest (without Keys pressed) all these pins are found at =9V. Pressing a key, relative to TDA 1008 under inspection, one should observe in each one of these pins, symetrical to +9V, a wave with amplitude of one volt except for pin 6 on which the amplitude of the wave is o,5V ppK.

The final elements of this P.C. Board are the operational amplifiers at the outputs of which you should see the following signals:

1458 pin 1 STRING 8'	with	1 key pressed	2V ppK
	"	2 keys pressed	3,8V ppK
1458 pin 7 STRING 16	"	1 key pressed	2V ppK
	"	2 keys pressed	3,8V ppK
741 pin 6 BRASS	"	1 key pressed	0,8V ppK
	"	2 keys pressed	1,4V ppK

All these signals should be symetrical with GND.

This P.C. Board also contains the Zener of 9,1V for feeding the outputs of the TDA 1008 and it is this Zener to which we refer when talking of the P.553
At the edge of this P.C. Board it is necessary to talk of the effect sustain for which it is good to specify (see P559 keys on BRASS ON 16' ON 8") that this acts only on the STRING or only on the BRASS and therefore does not work for selections that use BRASS and STRING simultaneously.

Point SOF corresponds to SUSTAIN at minimum.

Point SON corresponds to SUSTAIN regulated by the setting of the SUSTAIN LENGTH CONTROL.

BRASS P(557)
This P.C. Board contains the VCF and everything that is used to obtain the sound of BRASS.

a) Rest voltage no key pressed
ATTACK = O; DECAY = 0; RANGE = 0; RESONANCE = 0.

Collector	TR1-TR6	+10,20V
"	TR2-TR7	+7,50V
"	TR3-TR8	+6,00V
"	TR4-TR9	+4,40V
"	TR5-TR10	+2,80V
Base	TR5-TR10	+1,80V
Emittor	TR5-TR10	+1,30V
Collector	TR11	+8,4V
Base	TR11	+4,5V
Emittor	TR11	+3,9V
Collector	TR12	+10,2V
Base	TR12	+4,5V
Emittor	TR12	+3,9V

signals Only 1 key pressed

ATTACK = 0; DECAY = Max; RANGE = Max; RESONANCE = 0
Regular the trimmer RV 1 so that +2V is at center, regulate trimmer RV 2 to the center of its Rotation.

BASE	TR 10	40 mVppK
COLLECTOR	TR7	10 mVppK
COLLECTOR	TR2	15 mVppK

Equal signals at these last two are found on all the collectors of the same (wire) row and all the signals are symetrical with respect to the rest voltages of the various transistors.

Collector TR11 800mVpp

b) Calibration of Brass Filter

ATTACH = 0; DECAY = Max; RANGE = Max; RESONANCE = 0
Rest tension for TR 13 and TR 14 - No key pressed.

Collector	TR 13	+1,1V
Base	TR 13	+0,6V
Base	TR 14	+0,08V
Collector	TR 14	-11,8V

If we now activate even one key the signal GATE (as we have seen previously goes from OV (rest) to +5,4v (work).

Collector	TR 16	from +10V goes to OV
Collector	TR 15	from OV goes to +12V with slow rise in amplitude from the condensor C19.

Node D1-D2-C18-R-26

In this mode you can see a positive rise with amplitude held to between +8V and +10V. The return rate to zero is regulated with the DECAY CONTROL with PL at maximum the amplitude is +IOV, with P1 at minimum the amplitude pot is +8V. In this mode the P5 ATTACK has no effect on the filtering.

CENTRAL P5

The same filtering preceding the minor amplitude (+0,8V) and with the attack rate regulated by P2 with P2 at maximum the amplitude reduces to +0,2V peak.

On the base of TR 13 you see again the filtering of 0,6V at rest with amplitude of 40 - 60 Mv.

c) Regulating the Trimmers

RV 1 (Regulates the opening of the VCF and therefore the excursion of the pot P2RANGE). ATTACH = 0; DECAY = Max; RANGE = Max; RESONANCE = 0.

This trimmer has already been positioned (see point A) so that at its center there is a voltage of +2V. A more accurate regulation is made internally in the +2V so that, repeatedly playing a note in the middle of the keyboard, at the output of the filter (collector TR11) you see, with an oscilloscope, the initial saw tooth not filtered for a short period. An erratic regulation of RV1 can cause the VCF to not filter because it is too open or the VCF is too closed.

RV 2 (Regulates the anti oscillation of the VCF and therefore the excursion of the pot P3 RESONANCE).
ATTACK = 0; DECAY = Max; RANGE = Max; RESONANCE = Max.
With a note pressed at the middle of the keyboard you should see a sine wave (anti oscillation of the VCF) signal, that should have a maximum amplitude at the beginning of the ramp 10+the saw tooth and amplitude 0 at the end of the same ramp.

An erratic regulation of RV 2 can cause annoying whistles or, on the other hand, inefficiency of the pot P3 RESONANCE.

STRING (R559)

This P.C.Board contains the pre-amplification circuits for the signal for the delay lines, a 3 band EQ control (high, medium, bass) a modulating circuitof amplitude for the CRESCENDO effect of the STRING. When the BRASS is inserted and the stage of final pre-amplification for the output MAIN.

a) CRESCENDO (Control of the circuit of CRESCENDO)
The CRESCENDO acts only on the STRING and observing BR 3 and BR 2 of the key on BRASS you can see how this effect is obtainable from the voltage of the common rod (BRASS OFF) or from a 3080 connected as modulator of amplitude (BRASS ON).
The CRESCENDO is triggered from the GATE,

Insert the BRASS effect with volume at zero.

Collector TR1	+11V (rest)	OV (work)
Base TR3	+6,2V	
Collector TR3	OV (rest)	+6,5V (work)
	the ascent rate from 0 to +6,5 is regulated with the control P4 CRESCENDO LENGTH	
Condensor C14	Like collector TR 3	
Pin 7 1758 l.c.4	At rest regulate RV 1 in order to have +2V; at work the rise from +2V to arrive at +6,2V always with the rate of ascent regulated by the control P4.	

The change in the CRESCENDO so obtained goes to 1458 l.c. 3:11 pin 1 from this OV at rest through the trimmer RV 2. At work, starting from OV going to -4V, opens the modulator with the 3080.
Playing instead only one STRING (without BRASS) the excursion of CRESCENDO goes to the common rod and the modulator is excluded from via BR 3 of the key ON BRASS.

b) Audio Signals

Insert the BRASS effect with volume at zero.

Enter STRING 16' with 1 key pressed		2vppK.
Enter STRING 8' with k key pressed		2vppK.
Insert the STRING effects 16' and 8'		
Pin 7 1458 i.c. 2 with 1 key pressed		2vppK.
Arrange the controls P1-P2-P3 to the centers.		
Pin 6 741	with 1 key pressed	2vppK.

INPUT ANALOG DELAY LINES	with one key pressed	IVppK
OUT ANALOG DELAY LINES	with one key pressed	280 mvppK.
PIN 6 3080	with one key pressed	800 mvppK. symetrical with respect to GND. The symmetry to GNP is regulated with the trimmer RV3.
PIN 7 1458 I.C. 3	with one key pressed	100 mvppK.
OVIT MAIN 1	with one key pressed	+ BRASS with filter open 180 mvppK
JACK BRASS	with one key pressed	200 mvppK.

MODULATION P (556)

This P. C. Board contains an oscillator of low frequency for the modulation and a modulator of amplitude to obtain the DELAY. The modulator of amplitude 3080 is always functioning and is controlled by the GATE.

GATE	OV (rest)	+5,4(work)
Collector TR2	+11V (rest)	OV (work)
Pin 104011	+12v (rest)	at work it has a negative impulse (from +12V to OV) of duration 6 to 7 msec.
Pin 11 4011	OV (rest)	at work it has a positive impulse (from OV b + 12v) of duration 6 to 7 Msec.
Condensor	C3 + 9V (rest)	GATE hardly arrives when the condensor C3 goes immediately to OV to initial, after 6-7 msec, to rise to +9V with a rate of ascent regulated by control P1 LENGTH DELAY.
Pin 6 741	10V (rest)	GATE barely arrives and this pin goes immediately to OV to initial, after 6-7 msec, to rise to -10V with descent tempo regulated always by the control P1 LENGTH DELAY.
Pin 7 1458 IC4		You see the frequence of the modulation (triangle) with amplitude IVppK symetrical to GND.
Pin 7 1458 IC5		You see the same frequency of Pin 7 of I.C. 4 modulated by pin 6 of 741 and with maximum amplitude at 6VppK symetrical to GND. This symmetry is obtained from trimmer RV 1.