STANDARD SIGNAL

GENERATOR 931 K

The only difference between the 931 H and 931 K is the power supply circuit, thus the handbook for the 931 H is valid for the 931 K with minor modifications.

STANDARD SIGNAL GENERATOR

9 3 1 K

CONTENTS

I - GENERAL.

1.1. The Standard Signal Generator 931 H is designed for repairs, production testing and design work on radio receivers and similar apparatus operating in the range 50 kc/s to 50 Mc/s.

1.2. Frequency is accurately set by the direct reading dial and a 1000 point per scale vernier gives the possibility of returning precisely to a previously noted frequency.

1.3. The RF circuit is designed for low drift and low harmonic content and output is practically constant throughout any given range. A strong detent mechanism gives exact positioning of the coil turret.

1.4. Output, adjustable from a few tenths of a microvolt to one volt on RF, ten times as much on AF, is monitored permanently by a moving coil meter.

1.5. Output may be unmodulated RF, modulated RF (internal or external), AF, or multivibrator. All outputs may be used with the attenuator. RF level, modulation depth, and AF level are all monitored.

1.6. The attenuator consists of a non inductive potentiometer feeding a ladder network. Output impedance is near 75 Ω except for 100 mV output level (0 to 40 Ω).

1.7. A standby switch is provided that cuts all RF and AF outputs whilst leaving the heaters on and dissipating the same total heat as on normal output.

GENERATEUR UNIVERSEL MOD. 931 K	METRIX UNIVERSAL GENERATOR 931 K
SCHEMA FONCTIONNEL	BLOCK DIAGRAM
PLANCHE 3	DRAWING 3
- OSCILLATEUR	- OSCILLATOR
- SEPARATEUR	- SEPARATOR
- MODULATEUR HF.	- HF. MODULATOR
- AMPLI. BF.	- LF. AMPLIFIER
- BF. POUR AMPLI	- LF. FOR AMPLIFICATION
- BF. POUR MODUL.	- LF. FOR MODULATION
- OSCILLATEUR BF.	- LF. OSCILLATOR
- MULTIVIBRAT.	- MULTIVIBRATOR
- ATTENUAT. PROGRESSIF	- FINE ATTENUATOR
- ATTENUAT. DECIMAL	- DECADE ATTENUATOR
- SORTIE	- OUTPUT
- MODUL. EXT.	- EXTERNAL MODULATION

2 - CONTROLS AND TERMINALS.

2.1. Frequency is read directly on the MAIN DIAL (15) for all ranges. An additional linear scale is provided which, in conjunction with the VERNIER DIAL (16), provides 1000 points per scale.

2.2. The RANGE switch (9) is directly coupled to the coil turret and brings the coils into position in the oscillator circuit.

2.3. The ATTENUATOR (12) is engraved from 0.1 to 10 and gives a fine control of the output.

2.4. The ATTENUATOR MULTIPLIER (14) varies the output by powers of 10.

2.5. The OUTPUT SWITCH (10) determines the type of output, marked on the inner arc OUTPUT, and the type of indication given by the meter, marked on the outer arc METER INDICATION.

2.6. The MODULATION OR AF OUTPUT switch (7) determines the modulation or AF output frequency. When this switch is in the EXTernal MODulation position AF applied to the EXTernal MODulation terminals (8) will either modulate the RF signal or will reappear at the OUTPUT connector (13) depending on the position of the OUTPUT SWITCH (10). When this AF from an external source appears as an output signal it is monitored by the meter.

2.7. The % MODULATION OR AF LEVEL knob (11) controls the AF output or modulation level.

2.8. The METER (1) carries three scales. % MODulation, RF level, AF level. The scales are selected by the OUTPUT SWITCH (10).

2.9. RF level is set by the RF LEVEL knob (2).

2.10. The STANDBY-OPERATE switch (6) is used in the OPERATE position for normal working and in the STANDBY position to prevent the 931 H from working whilst keeping it ready for instant use. Drift is minimized by dissipating the normal consumption in a dummy load to maintain approximately constant temperature in the interior of the case.

2.11. At the rear of the instrument are to be found the power input socket, the fuse and the power supply selector switch .

3 - CIRCUIT.

3.1. Operation as RF generator (OUTPUT SWITCH at RF).

3.1.1. Tube V1 is connected as a tuned plate grid feedback oscillator. The feedback and RF take-off circuits have been designed for maximum stability and minimum harmonic content.

V1 plate supply is continuously variable from 0 to maximum volts by potentiometer P1, the RF LEVEL control.

3.1.2. The oscillator output is fed to tube V2, an aperiodic buffer amplifier, whose function is to separate the modulator from the RF oscillator to minimize parasitic FM.

3.1.3. Tube V2 output is fed to tube V3 grid at the same time as the modulating voltage if required.

3.1.4. Tube V3 output is applied to the attenuator input, P5, which is followed by a ladder network.

3.1.5. AF is generated by tube V4b for frequencies 150, 400, 800, 1500, 3000 c/s. For 50 c/s the 6.3 V heater voltage is fed to a series tuned circuit L11, C25 to reduce harmonic content. For external modulation the voltage is applied to EXT MOD terminals.

3.1.6. These different frequencies are applied to S3b which selects the one to be used and applies it to V4a grid.

3.1.7. V4a is used as a cathode follower to drive the modulator V3.

3.1.8. When the OUTPUT SWITCH is in the METER INDICATION-RF LEVEL position the measurement circuit, D1, measures the voltage at the input to the attenuator system.

When the OUTPUT SWITCH is in the METER INDICATION-% MOD position the measurement circuit, D2, measures the AF voltage at the input to the modulator.

3.2. Operation as AF generator or amplifier (OUTPUT SWITCH at AF)

3.2.1. AF is generated and amplified as described in paragraphs 3.1.5. to 3.1.7. and is applied to the grid of V3.

3.2.2. Output is taken via transformer T1 from the plate circuit of V3 to feed the attenuator system and the output monitor.

3.3. Operation as multivibrator (OUTPUT SWITCH at MULTIVIBRATOR.)

3.3.1. V3 is connected as a blocking oscillator which produces an output rich in harmonics.

The fundamental frequency is about 1 Kc/s but harmonics up to 10 Mc/s are available.

3.3.2. The output is taken from V3 plate to the attenuator system via C22 which discriminates against the lower frequency components so that the signal at the output of the attenuator system consists essentially of a series of harmonics in the RF range spaced 1 Kc/s apart.

4 - OPERATING INSTRUCTIONS

4.1. Preliminary

4.1.1. Check that the power supply is 50 c/s. If not the filter L11, C25 will be mistuned and it may not be possible to attain 80 % modulation at power line frequency.

4.1.2. At the rear of the instrument set the power line selector switch to the correct position.

4.1.3. Check the fuse at the rear.

4.1.4. Bring the meter nedle to zero by turning slowly the screw in the centre of the meter moulding.

4.1.5. Connect the power input cable.

4.1.6. Set the STANDBY-OPERATE switch to STANDBY and switch ON.

The pilot lamp should light.

4.2. CW output

4.2.1. Set the range switch to the appropriate range and rotate the MAIN DIAL to read the frequency under the corresponding index.

4.2.2. Set the MODULATION switch to CW.

4.2.3. Set the significant figures of the output on the ATTENUATOR DIAL and the multiplier on the ATTENUATOR MULTIPLIER.

4.2.4. Set the OUTPUT SWITCH to RF - RF LEVEL.

4.2.5. Turn the SET RF knob to bring the meter needle to 1 V on the RF scale.

The RF output at the end of the output cable will then be as indicated by the attenuator system settings, if the load impedance is 75 Ω.

4.3. Internally modulated RF

4.3.1. Carry out the procedure of section 4.1. with the MODULATION switch set to the modulation frequency required.

4.3.2. Set the OUTPUT SWITCH to RF - % MOD and turn the % MOD knob to bring the meter needle to the required setting on the % MOD scale.

4.3.3. Return the OUTPUT SWITCH to RF-RF LEVEL and check that the meter needle is still at 1 V.

4.4. Externally modulated RF.

4.4.1. Connect a source of AF to the EXT MOD terminals.

4.4.2. Set the MODULATION SWITCH to EXT. MOD.

4.4.3. Carry on as in section 4.3.

4.5. AF output.

4.5.1. Set the OUTPUT SWITCH to AF-AF LEVEL.

4.5.2. Set the required output by the ATTENUATOR DIAL and the ATTENUATOR MULTIPLIER. The indications are multiplied by 10 on AF output.

4.5.3. Set the AF OUTPUT switch to the frequency desired or to EXT. MOD. if an external source is connected to the EXT. MOD. terminals.

4.5.4. Bring the meter needle to 10 V on the AF scale by turning knob AF LEVEL.

4.5.5. The output at the end of an open cable at the OUTPUT connector will be ten times the attenuator system settings.

4.6. Multivibrator.

4.6.1. Set the OUTPUT SWITCH to MULTIVIBRATOR.

The meter indication is 0.

4.6.2. The attenuator system gives correct proportional adjustments but the indications are meaningless.

4.7. Standby - operate.

4.7.1. If it is required to cut the 931 H output whilst leaving it ready for immediate use set the STANDBY-OPERATE switch to STANDBY. When the switch is set to OPERATE after an idle period there is low drift since the tube heaters are not cut at STANDBY and there is a normal current drain to maintain internal temperature.

4.8. Accessories.

4.8.1. The OPEN CABLE is used when the AF or RF voltage is to be injected into a high impedance circuit.

4.8.2. The 75 ohms terminated cable is used when the AF or RF voltage is to be injected into a low impedance circuit. Attenuator multiplier settings are not valid in position 100 mV .

4.8.3. The ARTIFICIAL ANTENNA is used at the input to a receiver to simulate normal antenna loading.

5 - MAINTENANCE.

5.1. To remove the instrument from its case.

5.1.1. Remove 26 hexagon head screws from the edges of the front panel.

5.1.2. Withdraw the instrument from the case far enough to pass the hand between the instrument and the case.

5.1.3. Remove the plug on the cable from the panel to the power jack. If the instrument is to be switched on fit a temporary extension cable.

5.2. To remove the RF shield.

5.2.1. Remove V1 shield and V1.

5.2.2. Remove the two straps fixing the cable harness at the top of the RF shield.

5.2.3. Remove 12 screws in the base of the shield.

5.2.4. Remove the shield taking care not to pull the two connections passing through the slot.

5.2.5. If the instrument is to be switched on replace V1 and its shield.

5.3. To remove the power pack chassis.

5.3.1. Remove tubes V7 and V8 and plug J01.

5.3.2. Unsolder the two brown wires at the top of the power input filters.

5.3.3. Remove 8 hexagon head screws holding the power pack chassis into the read of the case.

5.3.4. Remove the chassis, replace V7 and V8 and plug J01.

5.3.5. Reconnect the brown wires to the power input filter by using two temporary extension wires.

5.4. To reassemble.

5.4.1. Check that the instrument is no longer connected to the power line and remove all temporary connections.

5.4.2. Remove plug J01.

5.4.3. Remove tubes V7 and V8.

5.4.4. Remount the power pack chassis in the rear of the case.

5.4.5. Replace tubes V7 and V8 and solder the two brown wires to the top of the power input filters.

5.4.6. Remove V1 and its shield. Replace the RF shield and the two cable harness straps. Replace V1 and shield.

5.4.7. Set the instrument near enough to the case to plug J01 into place.

5.4.8. Replace the instrument in its case

ADDENDUM

Add to 4.8. Accessories

If the HA 564 (75 Ω terminated) cable is used to connect to a high impedance circuit the input voltage to that circuit is given by the fine attenuator setting multiplied by the decade attenuator setting. This is valid for the 10 μV - 100 μV - 1 mV and 10 mV ranges only. On the last position, 100 mV, the internal resistance of the generator varies with different settings of the output attenuator, thus the indicated output level will not necessarily be accurate.

If the load circuit has an impedance of 75 Ω the HA 85 (non-terminated) cable should be used, connected to output socket (13).

If the impedance of the load circuit is low, but not 75 Ω, the output level indicated on the meter may be corrected by multiplying by the factor,

$$\frac{2 \cdot x}{75 + x}$$ where **x** is the load impedance.

Clearly if x tends to infinity this factor tends to 2. This means that the voltage at the end of the open circuit (non-terminated) cable is twice the voltage indicated by the generator.

This is true for frequencies up to 1 MHz, i.e. when the wavelength is much longer than the cable. For much higher frequencies (shorter wavelengths) standing wave effects due to any mismatch of the cable output must be taken into account. The HA 85 non terminated 75 Ω cable should therefore be used for accurate measurements up to 1 MHz.

The non-terminated cable HA 85 is also used generally with the direct output (14). Since the cable is not matched to this output it may be used up to approximately 1 MHz. The direct output (14) gives approximately 1 V on HF. and 10 V on LF.

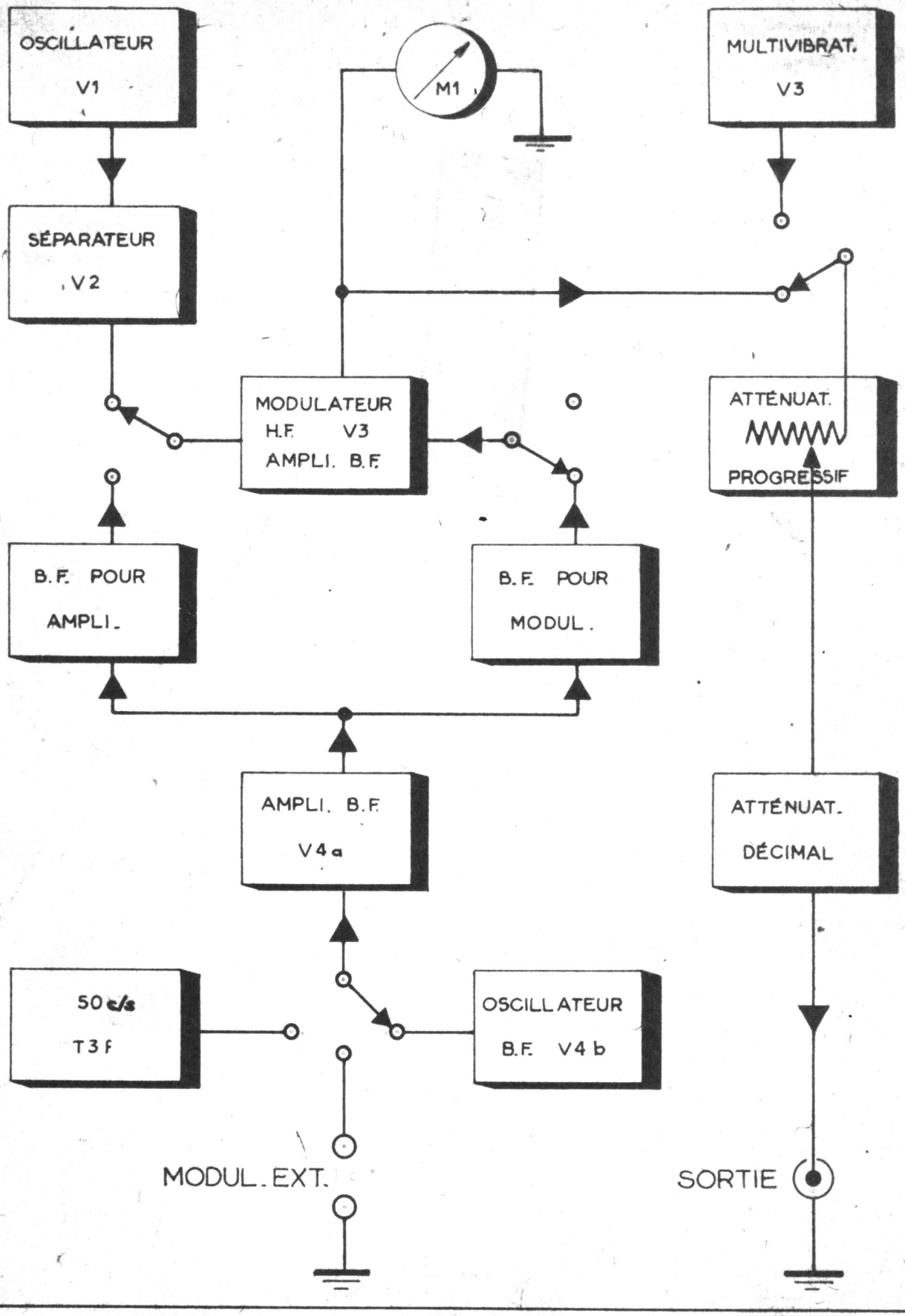
The artificial antenna HA 397 is used with the 75 Ω terminated cable HA 564. It is connected between the cable and the radio antenna input. The artificial antenna input impedance is high in comparison with 75 Ω.

The sensitivity of a radio receiver is expressed in terms of the input level applied to an artificial antenna connected to the receiver input, and not directly in terms of the level at the receiver input.

GENERATEUR UNIVERSEL 931 K METRIX	METRIX UNIVERSAL GENERATOR 931 KK
SCHEMA DE PRINCIPE	SCHMATIC DIAGRAM
PLANCHE 1	DRAWING 1

GENERATEUR 931 K	GENERATOR 931 K
ALIMENTATION	POWER SUPPLY
PLANCHE 2	DRAWING 2
- ROTACTEUR	- RANGE SWITCH
- BLOC OSCILLATEUR	- OSCILLATOR UNIT
- NIVEAU HF	- HF LEVEL
- PLATINE MONTEE	- CIRCUITS ON FRONT PLATE
- CHASSIS AMPLI.	- AMPLIFIER CHASSIS
- ATTENUAT. PROGRESSIF	- FINE ATTENUATOR
- NIVEAU BF.	- LF. LEVEL
- ATTENUATEUR A DECADES	- DECADE ATTENUATOR
- MODUL. EXT.	- EXTERNAL MODULATION
- SORTIE DIRECTE	- DIRECT OUTPUT
- SORTIE ATT.	- ATTENUATOR OUTPUT
- ALIMENTATION voir planche 2	- POWER SUPPLY see drawing 2
- CONTACT	- SWITCH
- POS	- POSITION
- COMMUTATION	- FUNCTION
- % MOD	- % MODULATION
- B.F.	- LOW FREQUENCY
- MULTIVIBRATEUR	- MULTIVIBRATOR (Flip-Flop)
- HP PURE	- CW (unmodulated HF)
- MOD. EXT.	- EXTERNAL MODULATION
- ATTENTE	- STANDBY
- MESURE	- WORKING
- MARCHE	- ON
- ARRET	- OFF

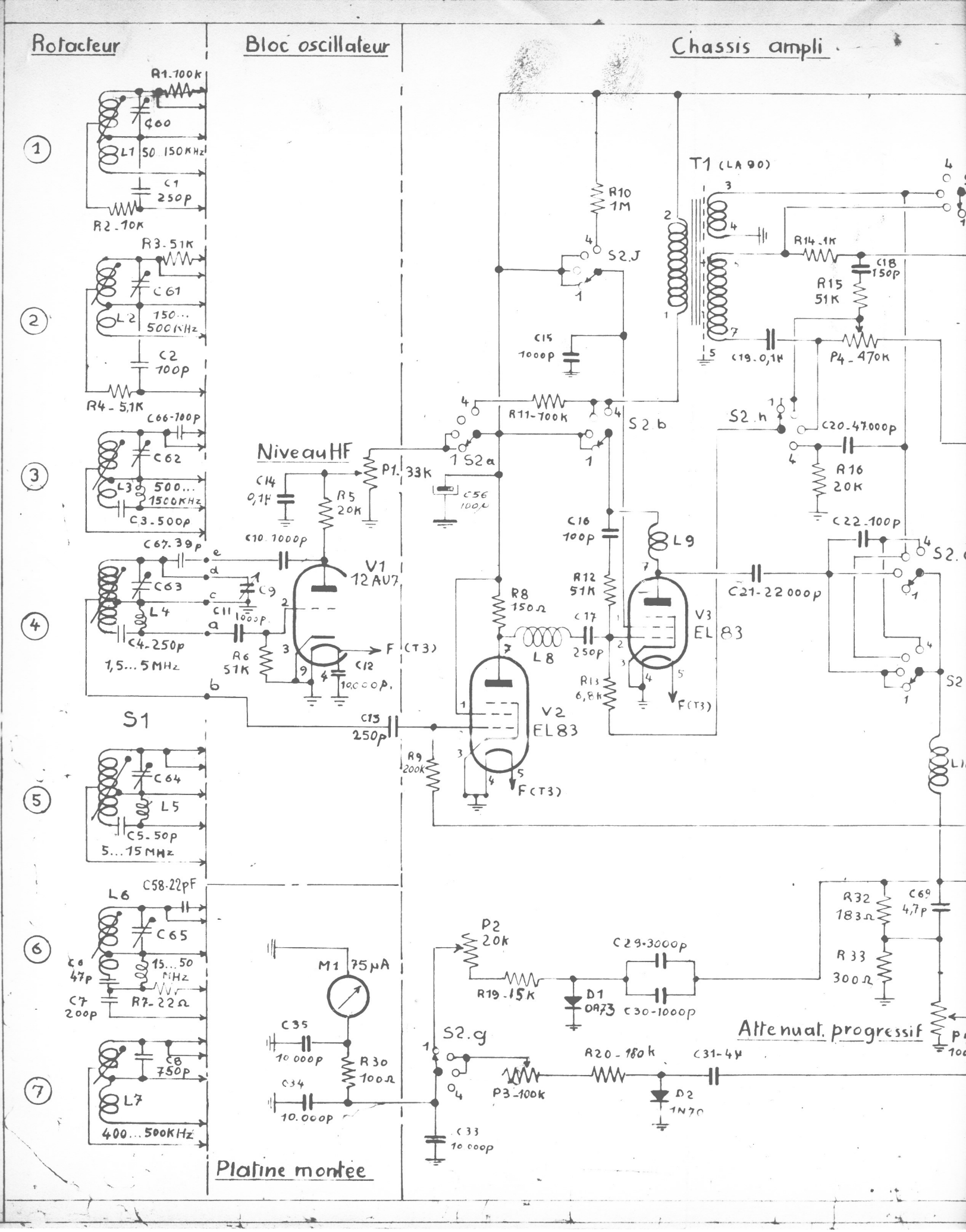
PLANCHE. 3

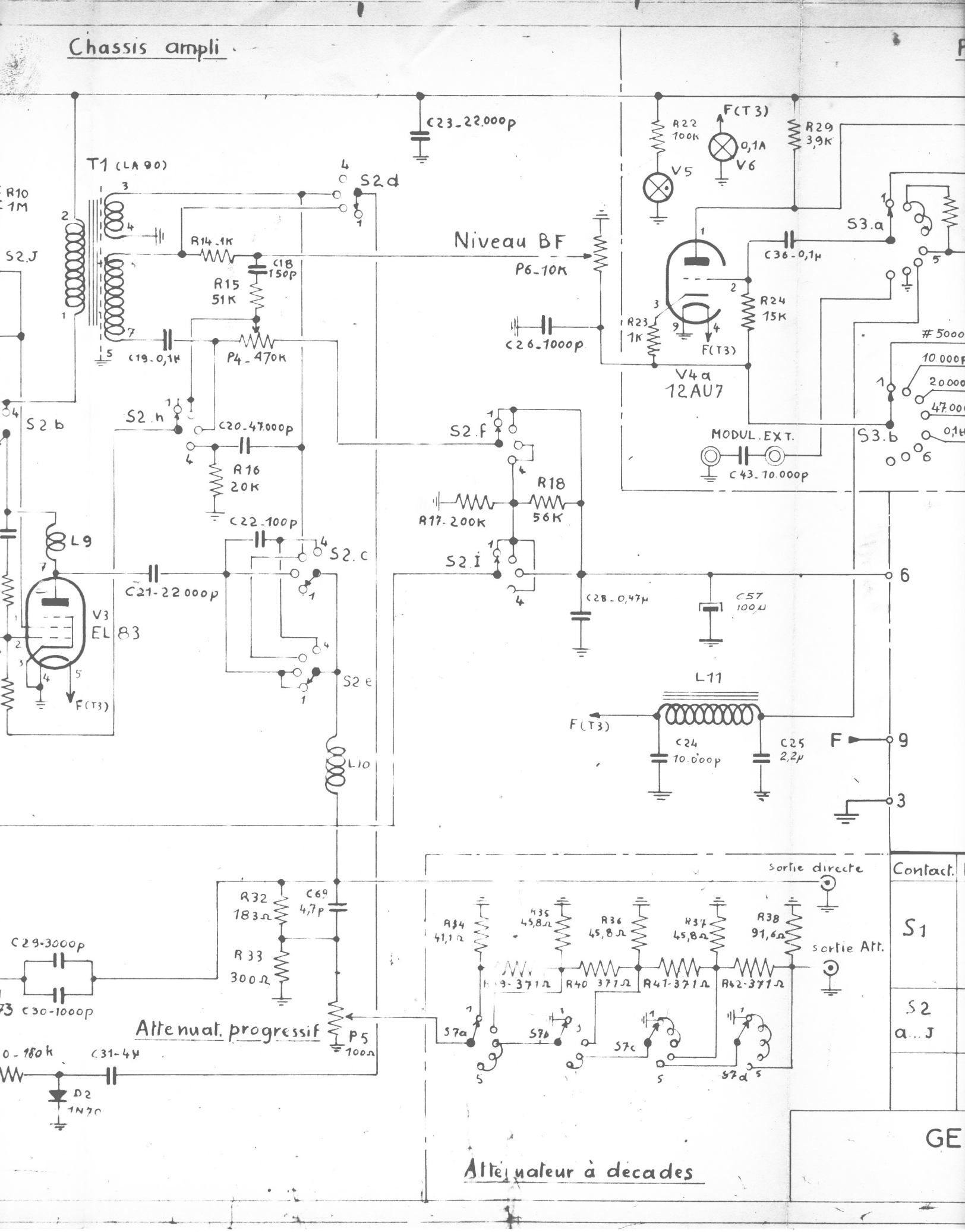


GÉNÉRATEUR UNIVERSEL MOD. 931 K — MÉTRIX

SCHÉMA FONCTIONNEL

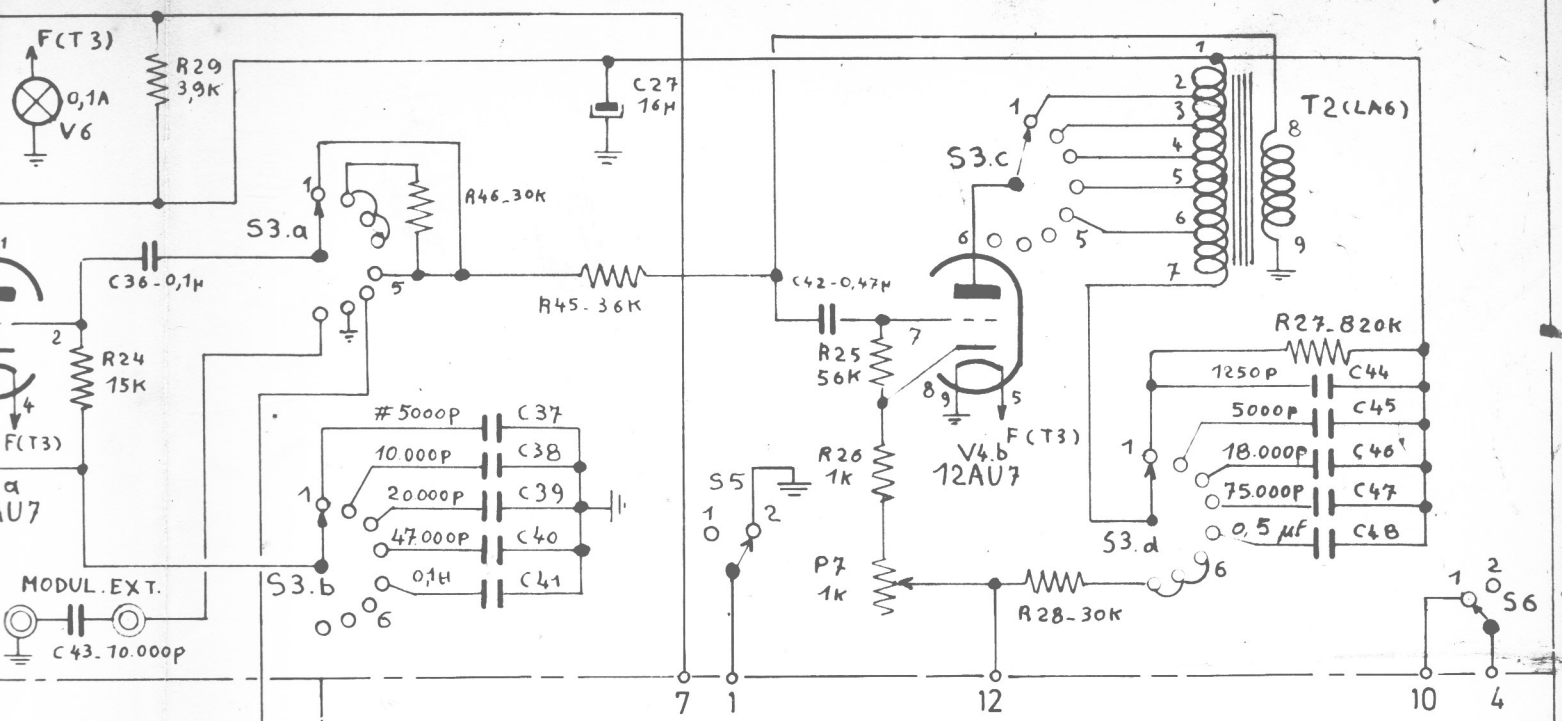
2046

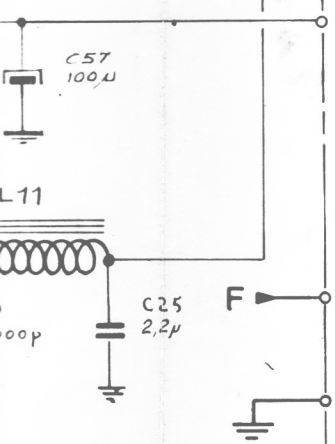

Rotacteur
Bloc oscillateur
Chassis ampli
R1-100K
C00
L1 50 150KHz
C1 250p
R2-10K
R3-51K
C61
L2 150... 500KHz
C2 100p
R4-5,1K
C66-100p
C62
L3 500... 1500KHz
C3-500p
C67-39p
C63
L4
C4-250p
1,5... 5MHz
C9
C11 1000p
R6 51K
C12 10000p
S1
C64
L5
C5-50p
5... 15MHz
L6
C58-22pF
C65
C6 47p
15... 50 MHz
C7 200p
R7-22Ω
C8 750p
L7
400... 500KHz
Niveau HF
P1-33K
C14 0,1µ
R5 20K
C10 1000p
V1 12AU7
F (T3)
C56 100p
R10 1M
S2.J
C15 1000p
T1 (LA90)
R14-1K
C18 150p
R15 51K
C19-0,1µ
P4-470K
R11-100K
S2.b
S2.a
S2.h
C20-47.000p
R16 20K
C22-100p
C16 100p
L9
R12 51K
C21-22000p
R8 150Ω
C17 250p
L8
V3 EL83
R13 6,8K
V2 EL83
C13 250p
R9 200K
F (T3)
R32 183Ω
C69 4,7p
R33 300Ω
P2 20K
C29-3000p
R19-15K
D1 OA73
C30-1000p
Attenuat. progressif
M1 75µA
C35 10 000p
R30 100Ω
C34 10.000p
S2.g
P3-100K
R20-180K
C31-4µ
D2 1N70
C33 10 000p
Platine montée


Chassis ampli
C23_22.000p
T1 (LA 90)
S2.d
R14_1K
C18 150p
R15 51K
C19_0,1µ
P4_470K
Niveau BF
P6_10K
C26_1000p
F(T3)
R22 100K
V5
0,1A
V6
R29 3,9K
S3.a
C36_0,1µ
R24 15K
R23 1K
V4a 12AU7
MODUL. EXT.
C43_10.000p
S3.b
S2.h
C20_47.000p
R16 20K
C22_100p
S2.c
S2.f
R18
R17_200K
56K
S2.i
C28_0,47µ
C57 100µ
L9
V3 EL 83
C21_22000p
S2.e
L10
L11
C24 10.000p
C25 2,2µ
F
6
9
3
Sortie directe
Sortie Att.
R32 183Ω
C69 4,7p
R33 300Ω
R34 41,1Ω
R35 45,8Ω
R36 45,8Ω
R37 45,8Ω
R38 91,6Ω
R39-371Ω
R40 371Ω
R41-371Ω
R42-371Ω
S7a
S7b
S7c
S7d
C29-3000p
C30-1000p
Atténuat. progressif
P5 100Ω
C31-4µ
D2 1N70
Contact.
S1
S2 a...J
Atténuateur à décades
GE

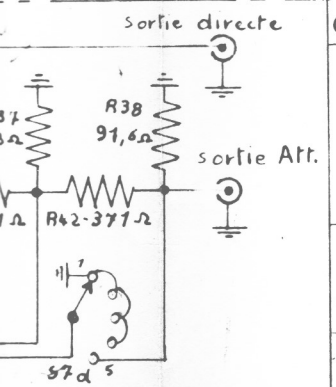
Platine montée

Planche 1





ALIMENTATION VOIR PLANCHE 2



Contact.	Pos	Commutation
S1	1	50 - 150KHz
	2	150 - 500KHz
	3	500 - 1550KHz
	4	1.5 - 5 MHz
	5	5 - 15MHz
	6	15 - 50MHz
	7	400 - 500KHz
S2 a...J	1	HF
	2	% Mod.
	3	BF
	4	Multivibrateur

Contact.	Pos	Commutation
S3 a...d	1	3000Hz
	2	1500 Hz
	3	800 Hz
	4	400 Hz
	5	150 Hz
	6	50 Hz
	7	HF Pure
	8	Mod. Ext.

Contact	Pos	Commutation
S5	1	Attente
	2	Mesure
S6	1	Marche
	2	Arret
S7 a...d	1	1,0µV.
	2	100µV.
	3	1 mV.
	4	10mV.
	5	100mV.

GENERATEUR UNIVERSEL 931 K METRIX
SCHEMA DE PRINCIPE

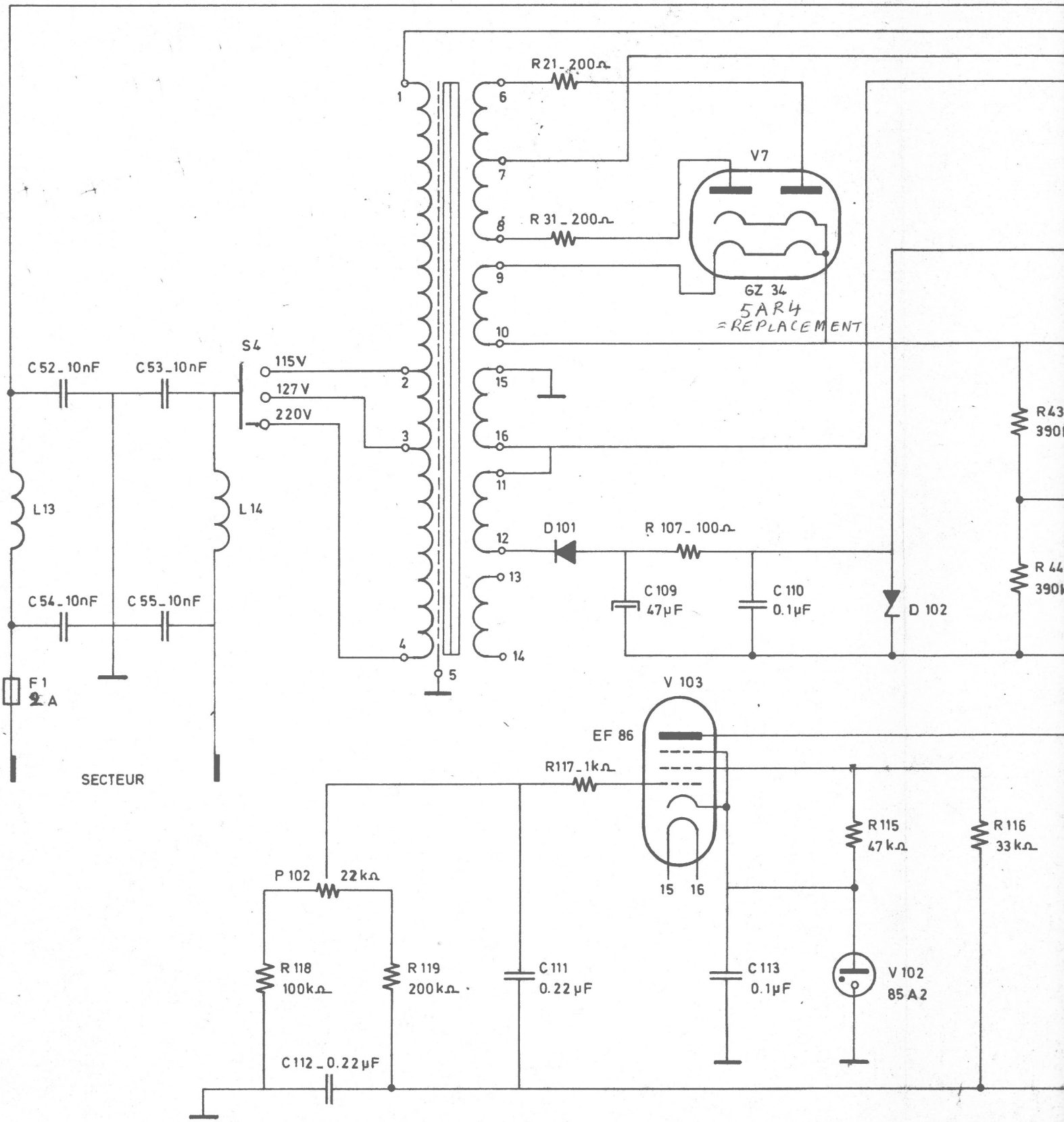
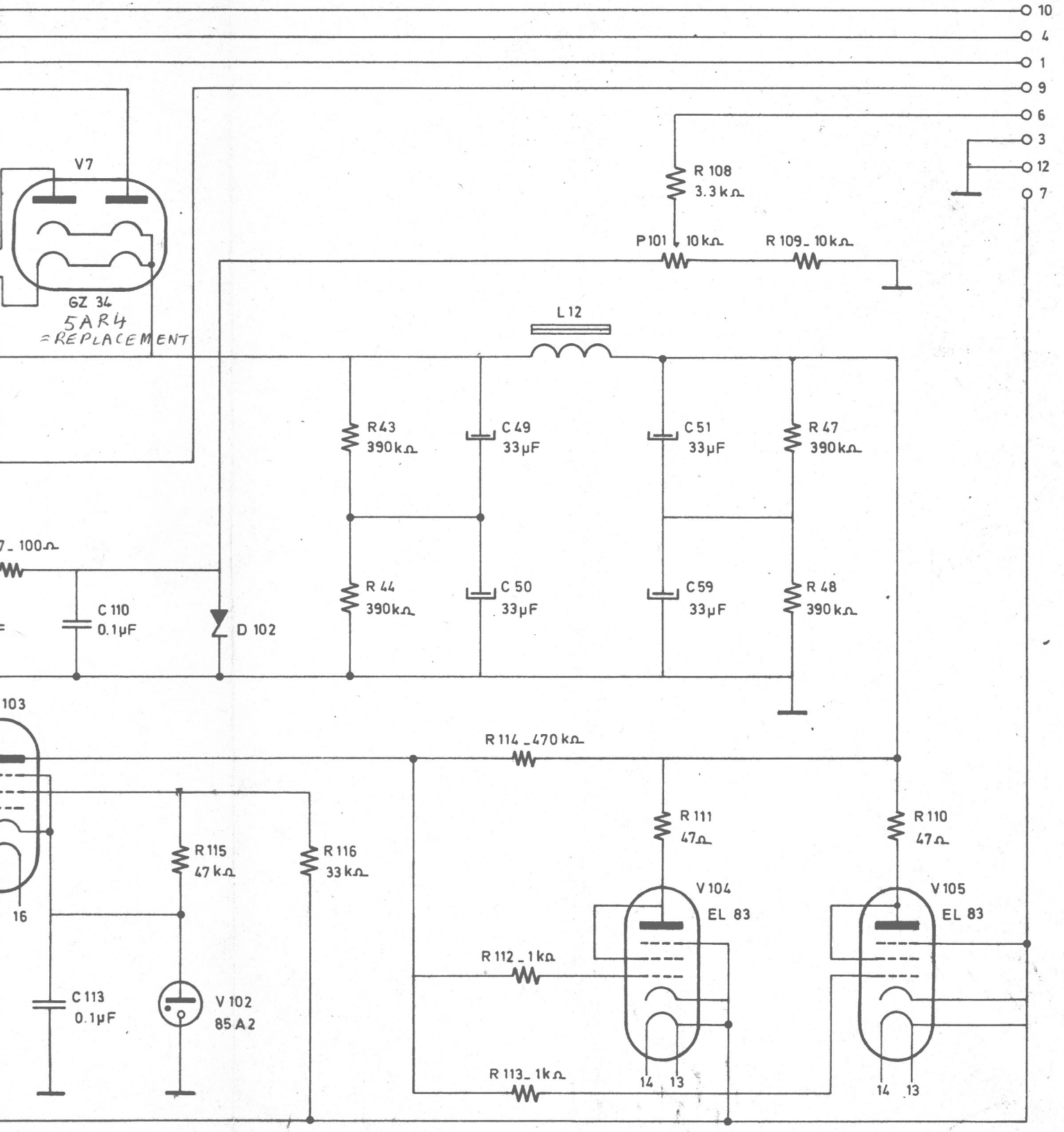
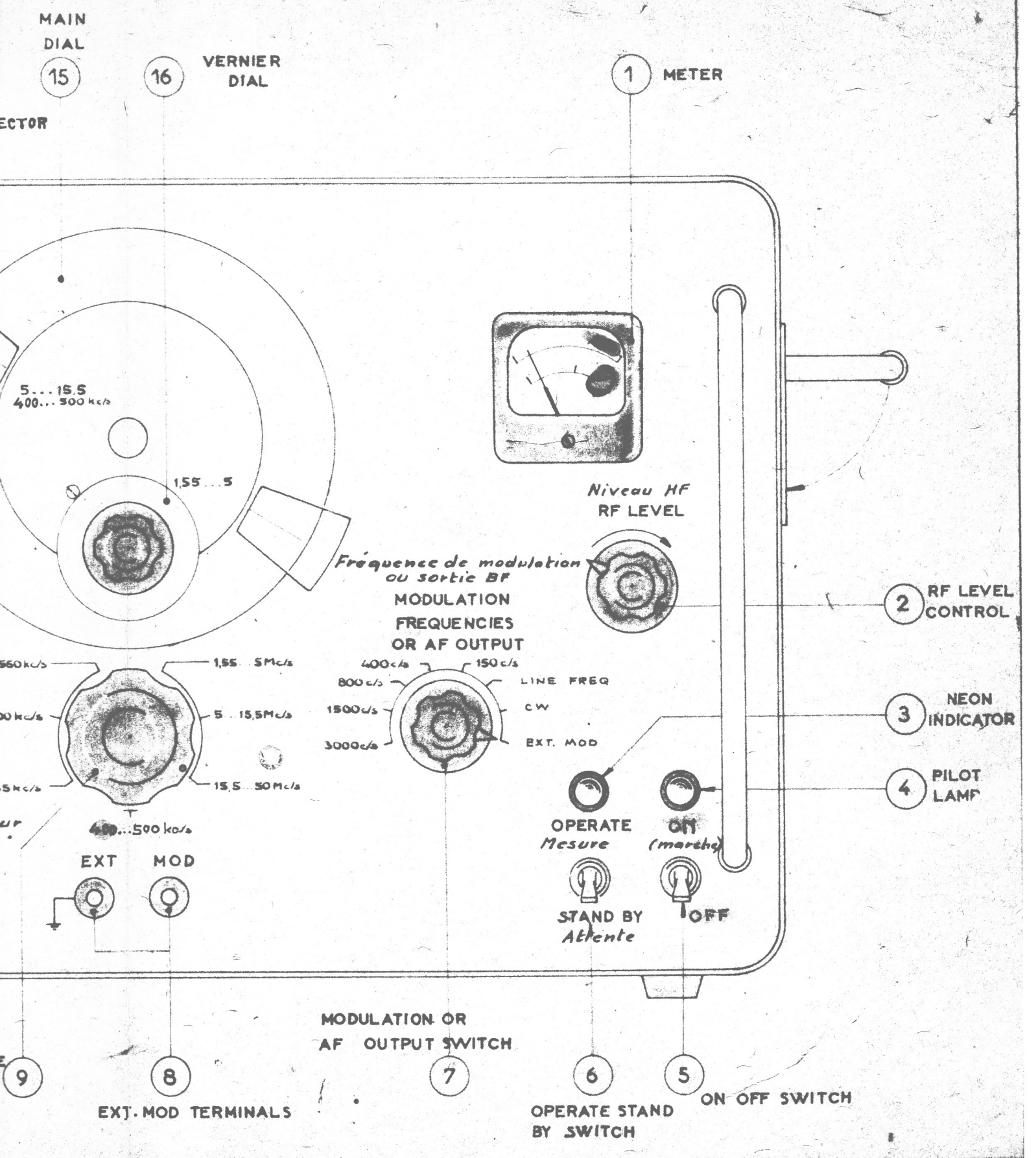

R21_200Ω
V7
R 31 _ 200Ω
GZ 34
5AR4
=REPLACEMENT
S4
115V
127V
220V
C52_10nF
C53_10nF
C54_10nF
C55_10nF
L13
L14
F1
2A
SECTEUR
D101
R 107 _ 100Ω
C 109
47μF
C 110
0.1μF
D 102
V 103
EF 86
R117_1kΩ
P 102 22kΩ
R 118
100kΩ
R 119
200kΩ
C 111
0.22μF
C 113
0.1μF
V 102
85 A2
R 115
47 kΩ
R 116
33 kΩ
C112_0.22μF

PLANCHE 2


10
4
1
9
6
3
12
7
V7
GZ 34
5AR4
=REPLACEMENT
R 108
3.3 kΩ
P101 10 kΩ
R 109_ 10 kΩ
L 12
R43
390 kΩ
C 49
33 µF
C 51
33 µF
R 47
390 kΩ
R 44
390 kΩ
C 50
33 µF
C 59
33 µF
R 48
390 kΩ
C 110
0.1 µF
D 102
R 114 _470 kΩ
R 111
47Ω
R 110
47Ω
V 104
EL 83
V 105
EL 83
R 112 _1 kΩ
R 113_ 1 kΩ
14
13
14
13
R 115
47 kΩ
R 116
33 kΩ
C 113
0.1 µF
V 102
85 A2
16

MAIN DIAL
ATTENUATOR MULTIPLIER
14
17
15
16
VERNIER DIAL
HIGH OUTPUT CONNECTOR
Attenuateur multiplié par (x 10 pour BF)
ATTENUATOR MULTIPLIED BY (x10 FOR AF)
1 mV
100 µV
10 mV
100 mV
Sortie OUTPUT
HIGH OUTPUT
Sortie directe
1 V RF HF
10 V AF BF
METRIX
5 ... 15,5
400 ... 500 kc/s
1,55 ... 5
13
OUTPUT CONNECTOR
Atténuateur
ATTENUATOR
instrument indique
METER INDICATES
MODUL
AF LEVEL
Niveau BF
OUTPUT
RF
AF
LEVEL RF
MULTIVIBRATOR
Niveau HF
12
ATTENUATOR
% MODULATION
or AF LEVEL
Niveau BF
500 ... 1560 kc/s
1,55 ... 5 Mc/s
155 ... 500 kc/s
5 ... 15,5 Mc/s
50 ... 155 kc/s
15,5 ... 50 Mc/s
400 ... 500 kc/s
Sortie
NF
HF
BF
Multivibrateur
STANDARD SIGNAL GENERATOR TYPE 931
ANNECY METRIX FRANCE
Générateur universel 931
EXT
MOD
11
OUTPUT SWITCH
10
RANGE SWITCH
9
8
EXT. MOD TERMINALS

STANDARD SI



STANDARD SIGNAL GENERATOR TYPE 931 A METRIX

FRONT VIEW