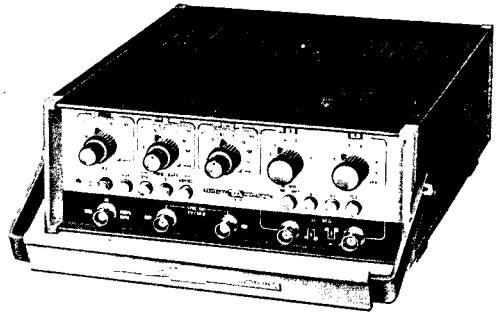


200.-

118

**INSTRUCTION MANUAL**

**TE 10  
PULSE GENERATORS**



**TEKELEC TA AIRTRONIC**

\* A free charge instruction manual is provided with each instrument

Serial number .....
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## SECTION I GENERAL INFORMATION

### 1 - 1. Introduction

The Model TE 10 Pulse Generator is an advanced, very versatile and low cost instrument designed for general purpose applications.

The instrument is characterized by :

- 0,01 Hz minimum repetition frequency
- 1 sec. maximum pulse delay
- 1 sec. maximum pulse width
- a duty cycle normal, reverse or fixed at 50 %

Accessories :

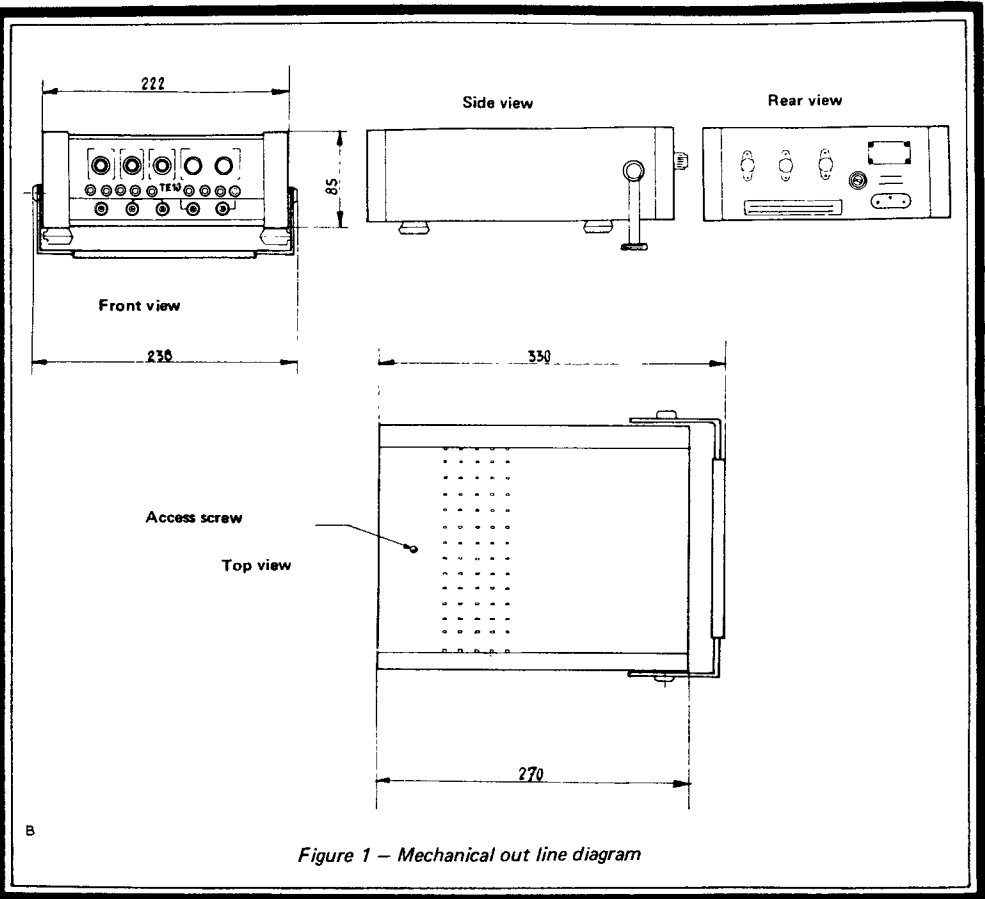
The instrument is supplied with an AC cord.

Optional accessory : Rack mounting kit.

### 1 - 2. Physical characteristics :

Dimensions : (see figure 1)

- Wide : ..... 222 mm
- Deep : ..... 270 mm
- High : ..... 85 mm
- Weight : ..... 3,5 kg



## SECTION 2 - SPECIFICATIONS

### 2 - 1. Pulse characteristics :

These characteristics are specified with the outputs banded by  $50 \Omega$

#### 2 - 1.1. Internal repetition rate :

Adjustable from 0.01 to 10 MHz

- by 9 step selector : 0.01 Hz - 0.1 Hz ; 0.1 Hz - 1 Hz ; 1 Hz - 10 Hz ; 10 Hz - 100 Hz ; 100 Hz - 1 KHz ; 1 KHz - 10 KHz ; 10 KHz - 100 KHz ; 100 KHz - 1000 KHz ; 1 MHz - 10 MHz.
- by vernier between ranges
- Frequency jitter :  $10^{-3} + 0.5$  ns
- Double pulse mode : up to 10 MHz (5 MHz clock repetition rate)
- Symmetrical pulse mode : up to 5 MHz (10 MHz clock repetition rate)

#### 2 - 1.2. Pulse delay : (see Figure 2) :

Adjustable from 50 ns to 1 s (the leading edge of the pulse output is delayed from the advanced sync output by  $\Theta + 110$  ns  $\pm$  20 ns,  $\Theta$  being the pulse delay)

- by 8 step selector : 50 ns - 100 ns ; 100 ns - 1  $\mu$ s ; 1  $\mu$ s - 10  $\mu$ s ; 10  $\mu$ s - 100  $\mu$ s ; 100  $\mu$ s - 1 ms ; 1 ms - 10 ms ; 10 ms - 100 ms ; 100 ms - 1 s ;
- by vernier between ranges
- Pulse delay jitter :  $10^{-3} + 0.2$  ns

#### 2 - 1.3. Pulse width :

Adjustable from 50 ns to 1 s :

- by 8 step selector : 50 ns - 100 ns ; 100 ns - 1  $\mu$ s ; 1  $\mu$ s - 10  $\mu$ s ; 10  $\mu$ s - 100  $\mu$ s ; 100  $\mu$ s - 1 ms ; 1 ms - 10 ms ; 10 ms - 100 ms ; 100 ms - 1 s ;
- by vernier between ranges
- Pulse width jitter :  $10^{-3} + 0.2$  ns.

2-1.4. Duty cycle :

Normal and reverse. Maximum pulse width duty cycle is near 100 %.  
- In normal mode, maximum duty cycle is  $\geq 50\%$ .

2-1.5. Transition time :

Rise and fall time  $\leq 5$  ns (10 % to 90 % of pulse amplitude).

2-1.6. Amplitude :

Simultaneous positive and negative outputs. Adjustable from 1 V to 10 V.

2-1.7. Waveform aberrations :

Overshoot, undershoot, ringing, etc... are  $\leq \pm 5\%$  full amplitude.

2-1.8. Output protection :

Synchro and pulse outputs are protected against accidental output shorts and overloads. It is recommended, however, to avoid keeping the instrument powered when pulse outputs are not 50 ohm loaded, amplitude controls being adjusted to 10 V.

2-1.9. Operating modes :

- Single pulse "  $\perp$  " : One output occurs for each sync pulse cycle, delayed from reference sync pulse by the delay time.
- Double pulse "  $\perp\perp$  " : Two output pulses occur for each sync cycle. One pulse at approximately advanced sync time and the second one delayed from the advanced sync time pulse by the setting at the delay control. Both pulses have the same output parameters, i.e. : width, amplitude, rise time. Double pulse operation is available up to 10 MHz (5 MHz clock repetition rate).
- Symmetrical pulse mode "  $\square$  " : Output pulse state changes at each clock cycle.

Duty cycle: 50 %

Maximum frequency : 5 MHz. Sync. outputs are available at internal clock rate (10 MHz rate max.)

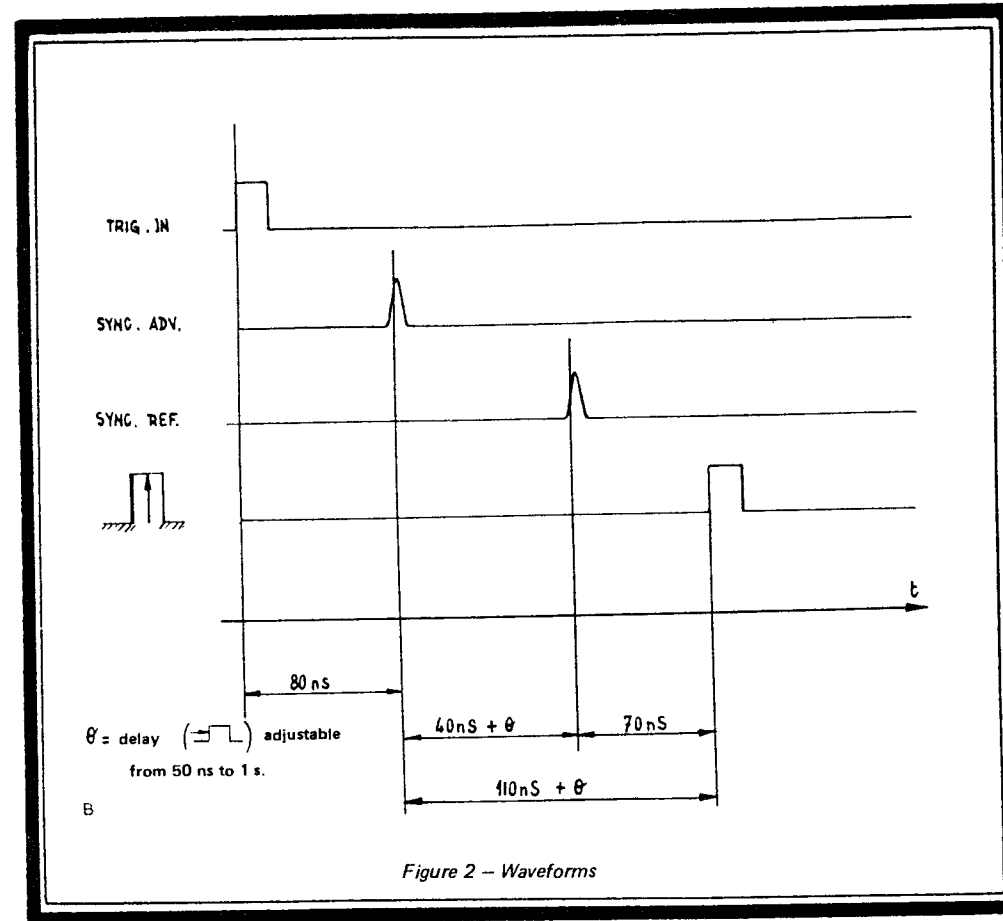


Figure 2 - Waveforms

## 2 - 2. Triggering characteristics :

### 2 - 2.1. Triggering modes : internal - external - manual

- Internal mode : adjustable from 0.01 Hz to 10 MHz
- External mode : the leading or trailing edges of an external triggering signal triggers the main pulse output.
  - \* Frequency : 0 to 10 MHz
  - \* Width : greater than 50 ns
  - \* Amplitude level : + 2 V minimum to + 5 V
  - \* The triggering input is direct-coupled
  - \* Input impedance : 3 kohm // 15 pF
  - \* Max. amplitude :  $\pm 20$  Volts
- Manual mode : Operation of a front panel pushbutton provides one cycle of single or double pulse output. In symmetrical pulse mode the output pulse state changes.

### 2 - 2.2. Gating : (see figure 2)

Synchronous or asynchronous pulse trains can be generated through the gating input :

- Frequency : 0 to 10 MHz
- Pulse width : greater than 50 ns
- " 0 " level : 0 to + 0.4 V
- " 1 " level : + 2 V to + 5 V
- Input impedance : 3 Kohm // 15 pF
- Max. amplitude :  $\pm 20$  V

### Synchronous gate :

#### Delay :

The first pulse is synchronised with the leading edge of gate signal. The gate signal is delayed from the advanced sync output by  $80 \text{ ns} \pm 15 \text{ ns}$ .

#### Operation :

- 1) When a gating signal is applied to the GATE input, the SYNC pushbutton being pushed, the operation is as follows :
  - " 1 " state enables pulse outputs
  - " 0 " state inhibits pulse outputs
- 2) When the " 0 " pushbutton is pushed, the operation is as follows :
  - " 1 " state inhibits the pulse outputs
  - " 0 " state enables the pulse outputs

When an operation without GATE is required, the gating signal applied to the GATE input must be removed.

#### Asynchronous gate :

The cycle begins with the first internal clock pulse occurring after the leading edge of the gate signal.

### 2 - 2.3. Synchronization outputs :

- Amplitude : greater than + 2 V into 50 ohm load.
- Width :  $16 \text{ ns} \pm 5 \text{ ns}$  (at 50 % of signal amplitude)
- Leading edge transition time :  $6 \text{ ns} \pm 2 \text{ ns}$

– Advanced sync output " ADV "

Occurs coincident with each clock signal, advanced  $110 \text{ ns} \pm 20 \text{ ns} + \Theta$  ( $\Theta$  being the delay time) from the main output pulse, in single pulse mode (see Figure 2).

– Reference sync output " REF "

Occurs advanced 70 ns from the leading edge of the main output pulse, in single pulse mode (see Figure 2)

2 - 3. – Power required :

- $100 \text{ V} \pm 10\% - 115 \text{ V} \pm 10\%$
- $200 \text{ V} \pm 10\% - 230 \text{ V} \pm 10\%$
- 50 Hz to 400 Hz - 30 VA

Nota : To change power supply voltage refer to # 4.2.

2 - 4. – Environment

- Operating temperature : .....  $0^\circ\text{C}$  to  $+50^\circ\text{C}$
- Storage temperature : .....  $-20^\circ\text{C}$  to  $+70^\circ\text{C}$
- Humidity : 80 % RH at  $20^\circ\text{C}$ , linearly decreasing from 80 % to 0 %, from  $+20^\circ\text{C}$  to  $+50^\circ\text{C}$ .

### SECTION 3 - INSPECTION AND CHECKOUT

3 - 1. Unpacking and inspection :

3 - 1.1. Before accepting the instrument from the shipper, inspect the crated instrument for external damage. Any sign of external damage must be noted by customer and shipper, and should be called to the attention of an insurance investigator.

3 - 1.2. As soon as the equipment is unpacked, inspect the instrument for damage in shipment. Check for scratches or dents and damaged switches or connectors. If damage is noted, do not use the instrument unless instructed by the insuring agency.

3 - 2. Reshipment :

When a damaged instrument is to be returned to the factory for repair or service, contact your nearest TEKELEC-AIRTRONIC Representative for written permission to ship, for shipping instructions and for a shipping form. Such action will ensure expedient repair and return of the instrument.

## SECTION 4 - OPERATION

### 4 - 1. Front panel description : (see Figure 3)

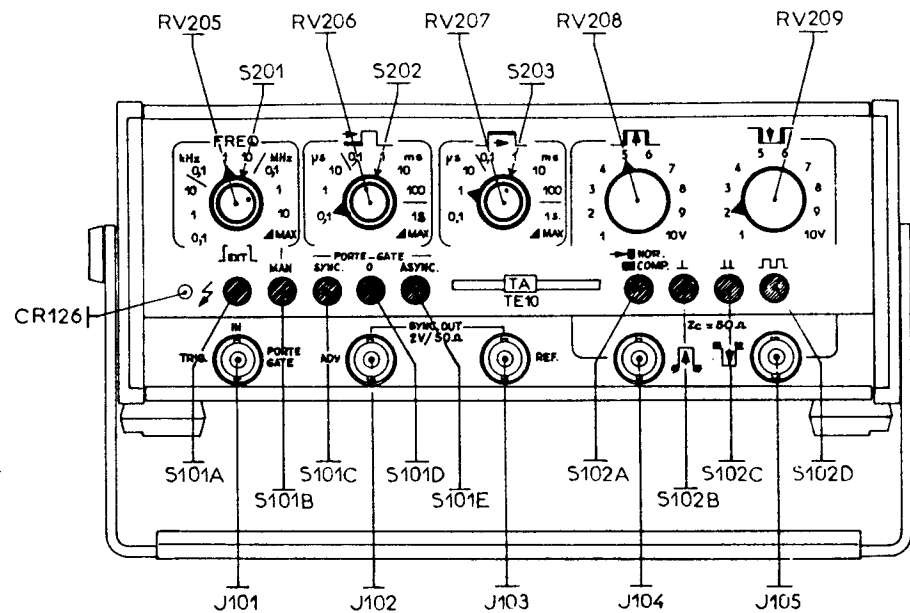


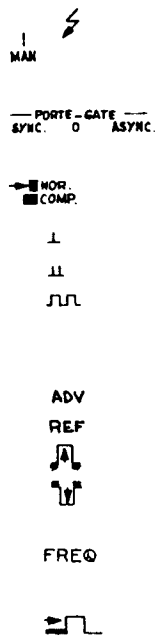
Figure 3 - Front panel description




REF. NO

DESCRIPTION

SYMBOLS USED ON FRONT PANEL

- S 101 A - ON/OFF switch
- S 101 B - Manual triggering pushbutton
- S 101 C - Synchronous gate pushbutton
- S 101 D - Operation without gating
- S 101 E - Asynchronous gate pushbutton
- S 102 A - Normal/Reverse duty cycle pushbutton
- S 102 B - Single pulse mode
- S 102 C - Double pulse mode pushbutton
- S 102 D - Symmetrical pulse mode pushbutton
- J 101 - External triggering or gate input
- J 102 - Advanced sync output
- J 103 - Reference sync output
- J 104 - Positive pulse output
- J 105 - Negative pulse output
- CR 126 - ON/OFF Pilot lamp
- S 201 - Frequency rotary switch
- RV 205 - Frequency vernier
- S 202 - Pulse delay rotary switch
- RV 206 - Pulse delay vernier



S 203	- Pulse width rotary switch	
RV 207	- Pulse width vernier	
RV 208	- Positive output amplitude control	
RV 209	- Negative output amplitude control	

#### 4 - 2. Placing in operation

The instrument leaves the factory set to operate from 208 V to 252 V AC power supplies. When operating from other supplies, remove the top of the instrument by rotating a quarter turn the screw located on rear panel. Set the switches located on the printed circuit board in the correct position corresponding to the required AC line voltage (see Figure 4).



Change fuse according to voltage : \* Fuse 100 V - 115 V : 0.5 A Slow action  
\* Fuse 200 V - 230 V : 0.25 A Slow action

#### 4 - 3. Operating considerations. The 2 outputs and are achieved by two current generators. They must be loaded by 50 Ω

Set the front panel controls as follows :

- \* Frequency rotary switch to 10 KHz (vernier at maximum)
- \* Pulse delay rotary switch to 0.1 μs (vernier at minimum)
- \* Pulse width rotary switch to 10 μs (vernier at maximum)
- \* Push the "0" gate pushbutton
- \* Push the NDR pushbutton
- CDMP
- \* Push " "
- \* Amplitude controls to 10 V
- \* Synchronise the scope with "ADV" sync
- \* Examine the waveform of positive pulse output (Figure 5)
- \* Examine the waveform of negative pulse (see Figure 5)

#### 4 - 4. Caution :

If the   amplitude controls are set to 10 V, do not maintain the instrument powered when the main pulse outputs are not connected to 50 ohm load. When one output only is used, set the vernier of the other output back to minimum.

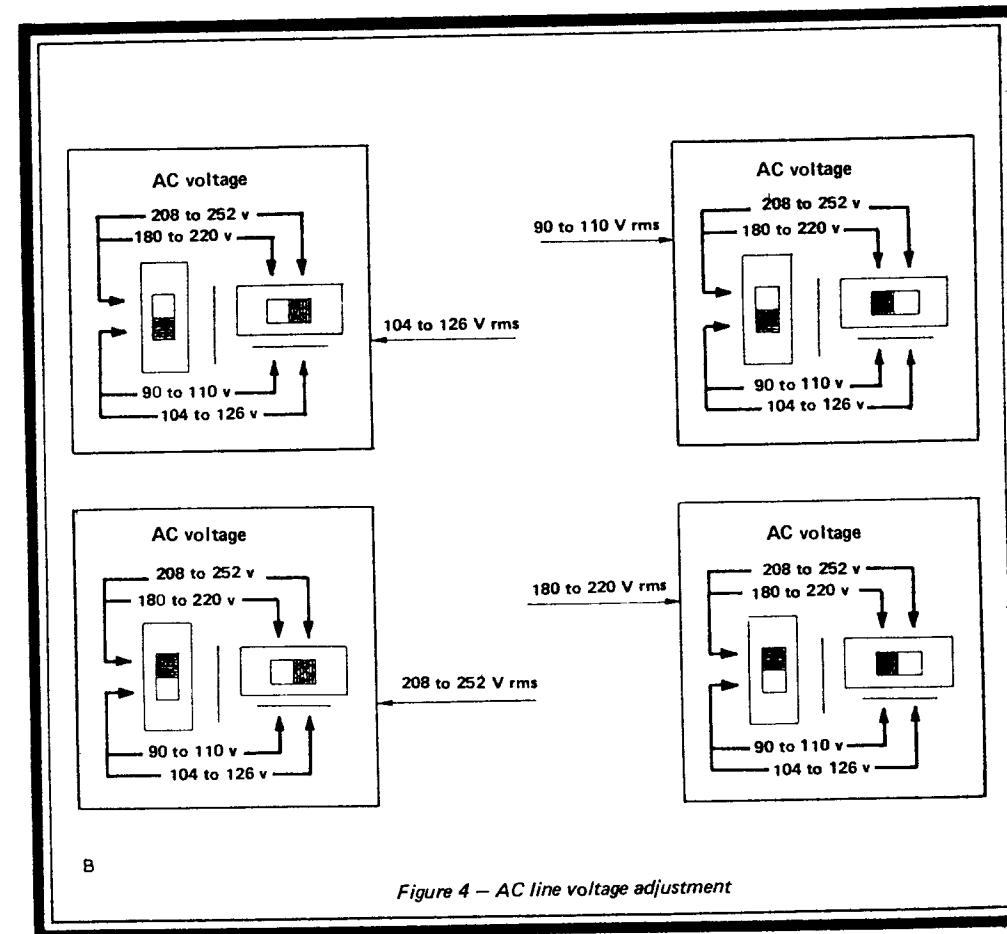
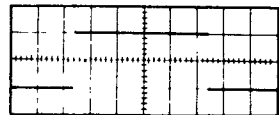


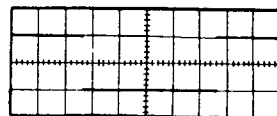
Figure 4 - AC line voltage adjustment





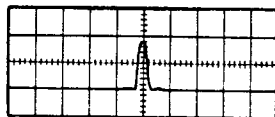
POSITIVE OUTPUT

Horiz. : 2  $\mu$ s/Cm  
Vert. : 5 v/Cm



NEGATIVE OUTPUT

Horiz. : 2  $\mu$ s/Cm  
Vert. : 5 v/Cm

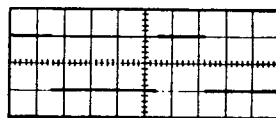


SYNC. OUTPUT

Horiz. : 50 ns/Cm  
Vert. : 2 v/Cm



SYNCHRONOUS GATE OPERATION



DOUBLE PULSE OPERATION

Figure 5 — Waveforms of output pulses

## SECTION 5 THEORY OF OPERATION

### 5 - 1. Block diagram description (see Figure 6)

The A 201 internal oscillator can be triggered in the 4 following modes :

- Continuous operation (input/output feedback through a time constant)
- External triggering
- Manual triggering
- Synchronous gate

The clock frequency is divided by A 202, A 203, and A 204 decade circuits to provide the ranges : 10 Hz, 1 Hz and 0.1 Hz. The clock output signal (PT A) is applied to A 205 delay one-shot and is amplified by Q 102 to become the advanced sync output.

Output from the A 205 delay one-shot is applied to :

- A 206 width one-shot (PT E)
- A 207 double pulse circuit (PT B)
- A 101 JK-flip-flop
- Q 103 amplifier to become the reference sync output

Signal applied to duty cycle reversing stage comes either from width one-shot in the single or double pulse mode (PT C), or from JK-flip-flop in symmetrical mode.

A 102 and A 103 circuits realize the duty cycle reversing and preamplification of signals which are fed to the output amplifiers (PT F and PT G).

Both output amplifiers are complementary. Output level of those amplifiers is a function of the setting of built-in current generators.

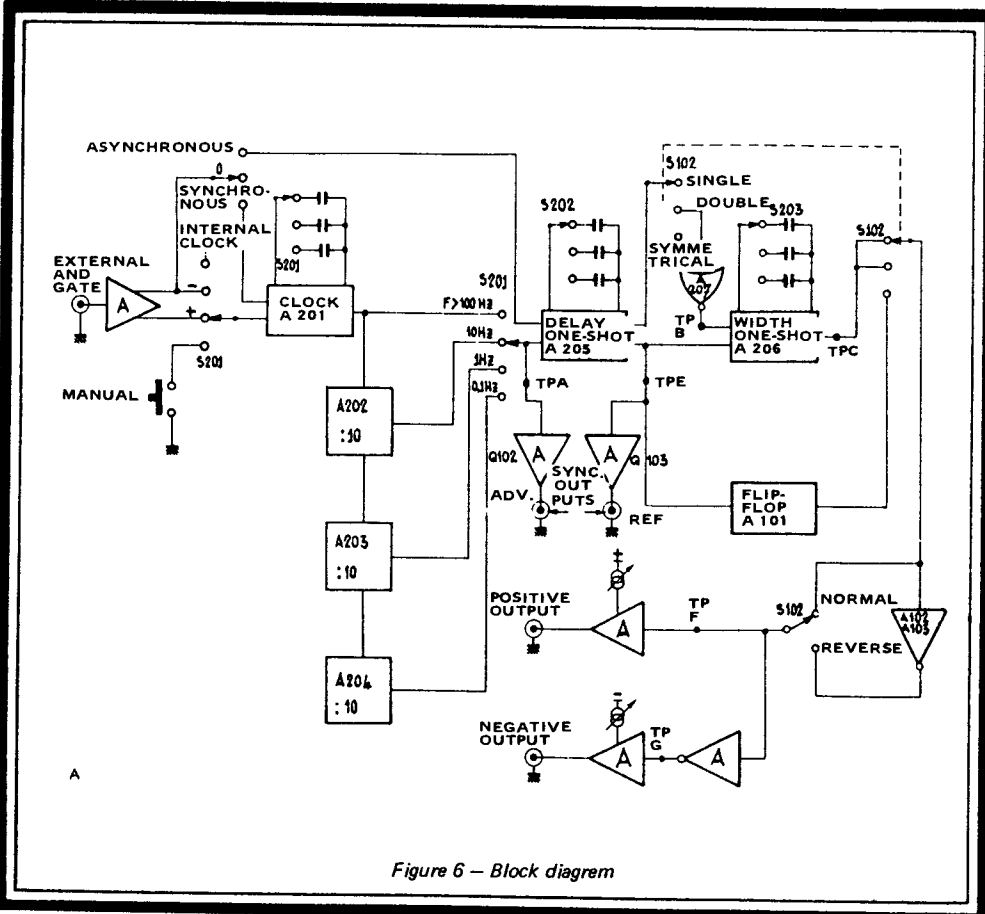


Figure 6 - Block diagram

5 - 2. Circuit description (see Figure 7 and schematic fold-out)

5 - 2.1. Internal oscillator :

The internal oscillator is constituted by A 201 clock integrated circuit and RC networks which determine oscillator frequency. At rest, gate input is biased by a reference voltage (+ 3.75 V at 25°C) so that it operates in class A. The reference voltage is slaved to the temperature in the same way as the internal reference voltage of the integrated circuit, thus stabilizing the oscillator frequency versus temperature.

Feedback capacitance is connected between " DR " output and oscillator input.

When a positive variation occurs on A 201 output, this variation is coupled through C capacitance (C 202 to 207) to the input and maintains the " 1 " state ; this capacitance is then charged through R resistance (RV 205) until the circuit is switched. The circuit output passes to " 0 " state and the new state is coupled through C capacitance to the input, thus maintaining the " 0 " state. C capacitance is then discharged through R resistance until the circuit is switched again to its former state.

In external triggering mode, the clock is blocked at " 0 " state by grounding its input through R 220 resistance. Triggering signal is then applied after adaptation through Q 101 and A 201 to the second input of circuit.

In manual triggering mode, the clock is blocked in the same way as above, but a positive pulse is applied through R 219 when " MAN " pushbutton is pushed.

In synchronous gate mode, the clock is driven through Q 101, A 104 and A 201. " NDR " output pulse of the clock is applied through Q 203 buffer to A 202, A 203, A 204 decodes. The pulse is applied to the inputs of A 205 one-shot and advanced sync output amplifier (Q 102).

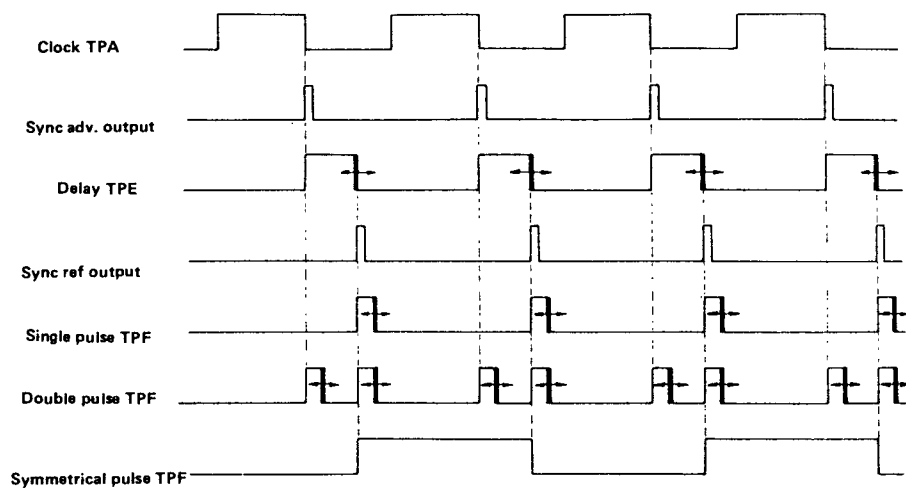


Figure 7 - Internal oscillator waveforms

Asynchronous gate signal is applied to the other input of A 205 one-shot. The trailing edge of delay one-shot output is applied to one input of A 206 width one-shot, to clock input of A 101 JK-Flip-Flop, and to A 102 reversing circuit. A 102 generates reference sync pulse through Q 103 amplifier.

The leading edge of delay one-shot output is applied to A 207 double pulse circuit which provides a second pulse on another input of width one-shot when the pushbutton is pushed.

The switching circuit composed of A 102 and A 103 enables either the width one-shot output, or the Flip-Flop output.

#### 5 - 2.2. Output amplifiers :

The output of A 102 - A 103 is fed to the power amplifiers which are complementary. Only positive amplifier operation is described below.

Signal issuing from A 103-3 is applied to Q 104 preamplifier. The reversed signal on the collector of Q 104 is applied through CR 110 and Q 105 to Q 106 and Q 107 output transistors of positive output power amplifier. Q 106 and Q 107 are connected across output load. The current flowing in the load is delivered by the regulated current generator composed of Q 204, Q 108 and Q 109. Consequently, output amplifiers require no protection against short-circuits.

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- 1. 2. Physical characteristics

### **SECTION 2 – SPECIFICATIONS**

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- 2. 3. Power required
- 2. 4. Environment

### **SECTION 3 – INSPECTION AND CHECKOUT**

- 3. 1. Unpacking and inspection
- 3. 2. Reshipment

### **SECTION 4 – OPERATION**

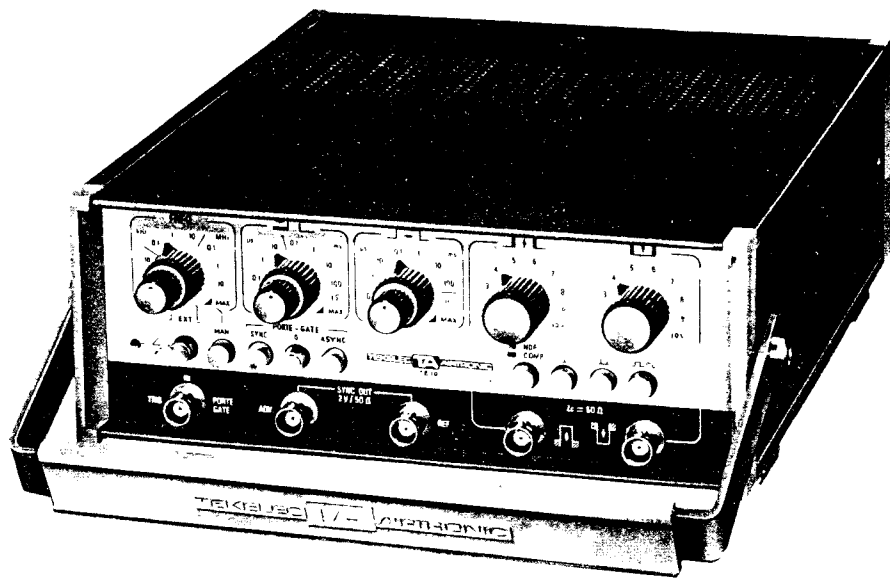
- 4. 1. Front panel description
- 4. 2. Placing in operation
- 4. 3. Operating considerations
- 4. 4. Caution

### **SECTION 5 – THEORY OF OPERATION**

- 5. 1. Block diagram description
- 5. 2. Circuit description

### **SECTION 6 – CALIBRATION/MAINTENANCE**

- 6. 1. Equipment required
  - 6. 2. Calibration procedure
  - 6. 3. Servicing
-



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## SECTION 6 - CALIBRATION / MAINTENANCE

### 6 - 1. Equipment required

- Oscilloscope, 100 MHz bandwidth, e.g. : TEKTRONIX 581.
- Resistive loads 50 ohms, 2 W.
- Digital voltmeter, e.g. : TEKELEC-AIRTRONIC TE 360

### 6 - 2. Calibration procedure (main output pulses loaded into 50 ohms)

See circuit location schematic fold-out.

Connect a dc voltmeter between straps and ground and check successively the Supply voltages as follows :

Voltages	MIN.	MAX.
+ 5 V	+ 4,8 V	+ 5,2 V
+ 11 V	+ 10,15 V	+ 12,06 V
+ 15 V	+ 14,25 V	+ 15,75 V
- 11 V	- 10,15 V	- 12,06 V
- 15 V	- 14,25 V	- 15,75 V

### 6 - 2.2. Internal oscillator calibration :

Set delay and width controls to 0.1  $\mu$ s range. Verniers at minimum.

Adjust RV 201 to obtain -1.25 V on Q 201 emitter (PT 0) with respect to + 5 V supply.

Set frequency control to 1 MHz range with vernier at max.

Adjust RV 201 to obtain the max frequency on the main pulse outputs.

Set frequency control to 10 MHz range with vernier at max.

Adjust RV 202 to obtain an output pulse frequency between 10 MHz and 10.5 MHz.

Check the overrange between the frequency ranges is greater than 2 %.

### 6 - 2.3. Pulse delay calibration :

No adjustments

Only check the overrange between the pulse delay ranges is greater than 2 %.

### 6 - 2.4. Pulse width calibration :

No adjustments

Just check the overrange between the pulse width ranges is greater than 2 %.

### 6 - 2.5. Output amplitude calibration :

- Set frequency control to 0.1 MHz with vernier at max.
- Push the symmetrical pulse mode pushbutton
- Set amplitude controls at 10 V

RV 203 et RV 204 adjustment potentiometers are located on the upper PC board. C 110 and C 117 capacitors are located on the lower PC board.

- Adjust RV 203 to obtain a + 10 V pulse on the positive output
- Adjust C 110 to obtain minimum overshoots and transition times  $\leq 5$  ns.
- Adjust RV 204 to obtain a - 10 V pulse on the negative output
- Adjust C 117 to obtain minimum overshoots and transition times  $\leq 5$  ns.

### 6 - 3. Servicing (See Figure 8)

In case of failure please refer to the diagram of Figure 8 thanks to which defective part (s) will be rapidly localized.

The diagram enables a systematic control of all TE 10 functions, by simply checking the presence of a signal on test points, provided correct test process is respected.

Any servicing should thus start by checking of power supplies.

### 6 - 3.1. Symbol signification



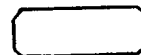
This symbol shows the function to be tested.



This symbol shows the test point and is used as a T box



Represents the defective component or the group of components in which one element is defective.

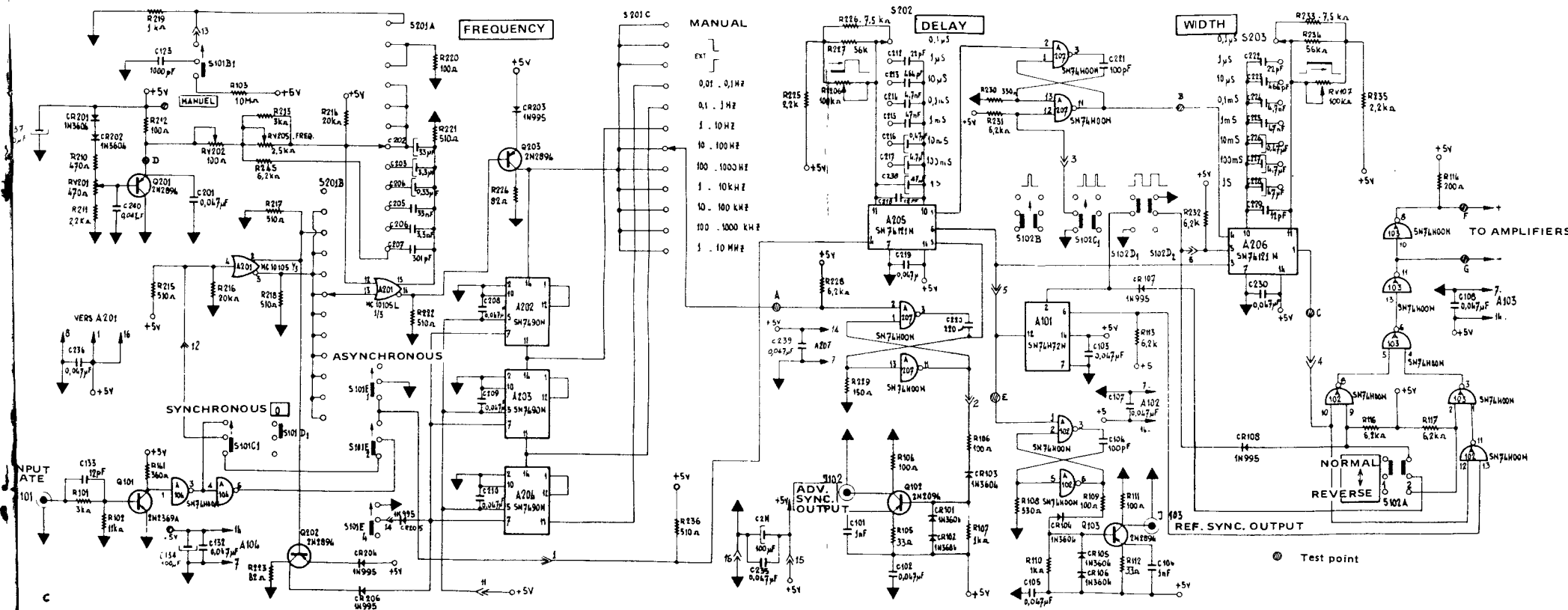


Represents a sub-function to be tested.

### 6 - 3.2. Example

Let us suppose one instrument presenting no output signal.

Function or sub-Function to be tested	Test point	Answer	Defective elements
Power supply checking	+ 15 V + 5 V - 15 V	yes yes yes	A 201-Q 203
Frequency checking from 10 Hz to 10 MHz	TP. A	no	
1.25 V between TP.D and + 5 V	TP. D	yes	



CLOCK SCHEMATIC

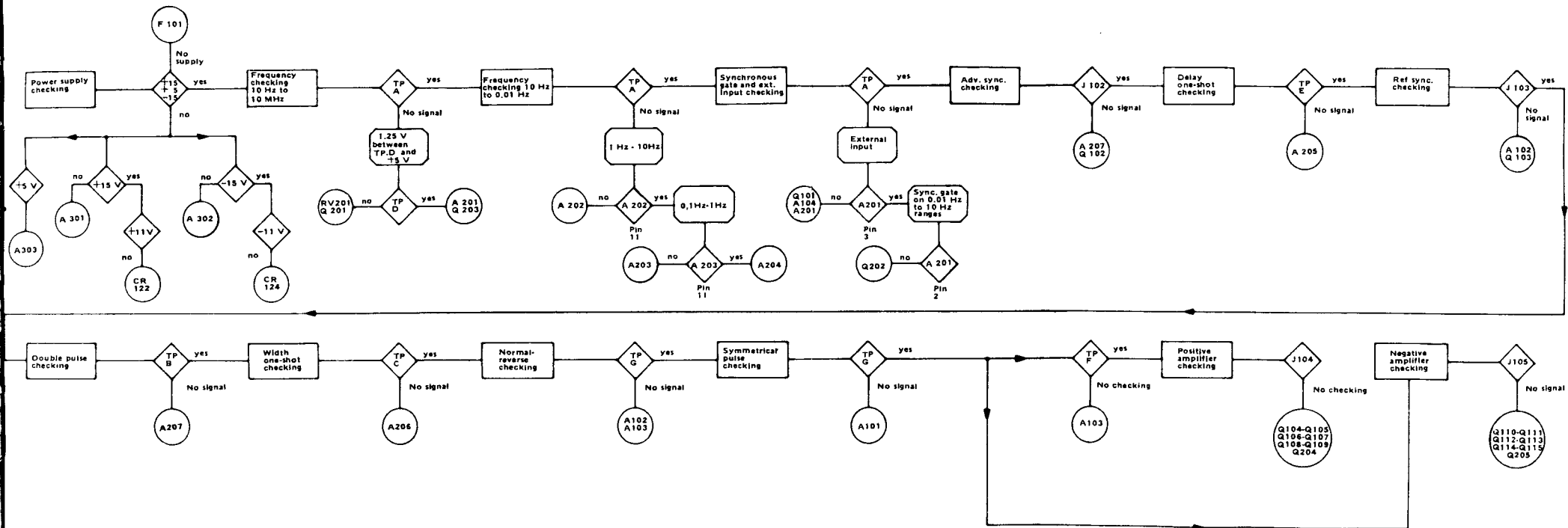


Figure 8 - SERVICING DIAGRAM



- FOLLOWING -

- Parts list
- Disassembly
- K 1414 PC board
- K 1416 PC board
- Power supply schematic
- Clock schematic
- Output amplifier schematic

TE 10 FINAL ASSEMBLY

80025254 X

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
CR114	DIODE 1N3600	FAIRCHILD		18428X
CR120	DIODE 1N3600	FAIRCHILD		18428X

SUB-ASSEMBLY K 1416

80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
A101	C. INTEGRE 74H72	TEXAS	SN74H72N	02007Y
A102	C. INTEGRE 74H00	TEXAS	SN74H00N	01987B
A103	C. INTEGRE 74H00	TEXAS	SN74H00N	01987B
A104	C. INTEGRE 74H00	TEXAS	SN74H00N	01987B
CR101	DIODE 1N3604	TEXAS	1N3604	01472S
CR102	DIODE 1N3604	TEXAS	1N3604	01472S
CR103	DIODE 1N3604	TEXAS	1N3604	01472S
CR104	DIODE 1N3604	TEXAS	1N3604	01472S
CR105	DIODE 1N3604	TEXAS	1N3604	01472S
CR106	DIODE 1N3604	TEXAS	1N3604	01472S
CR107	DIODE 1N995	SESCOSEM		11099F
CR108	DIODE 1N995	SESCOSEM		11099F
CR109	DIODE	ITT	ZPD 6,8	11117A
CR110	DIODE 1N3604	TEXAS	1N3604	01472S
CR111	DIODE	ITT	ZPD 6,2	11116Z
CR112	DIODE	ITT	ZD13	17655G
CR113	DIODE 1N3604	TEXAS	1N3604	01472S
CR115	DIODE	ITT	ZPD 10	11119C
CR116	DIODE 1N3604	TEXAS	1N3604	01472S
CR117	DIODE	ITT	ZPD 6,2	11116Z
CR118	DIODE	ITT	ZD13	17655G
CR119	DIODE 1N3604	TEXAS	1N3604	01472S

## SUB-ASSEMBLY K 1416

80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
CR121	PONT PC P2	COGIE		15853Y
CR122	DIODE	ITT	Z03,9	18305N
CR123	PONT PC P2	COGIE		15853Y
CR124	DIODE	ITT	Z03,9	18305N
CR125	PONT PC P2	COGIE		15853Y
CR126	VOYANT	OPCOA	CSL 3	17659L
C101	COND 400V 1000,000 PF 5%	MCB	CA115	12181G
C102	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C103	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C104	COND 400V 100,000 PF 5%	MCB	CA115	12150Y
C105	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C106	COND 400V 1000,000 PF 5%	MCB	CA115	12181G
C107	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C108	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C109	COND 400V 82,000 PF 5%	MCB	CA115	12149X
C110	AJUST 160V 7/35 PF	ROSENTHAL	STSB-7-N1500	11993C
C111	COND 63V 10,0UF 85DEGRE	SIC SAFCO	ALSIC-705-504	12244A
C112	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C113	COND 400V 47,000 PF 5%	MCB	CA115	12145T
C114	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C115	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C116	COND 400V 82,000 PF 5%	MCB	CA115	12149X

## SUB-ASSEMBLY K 1416

80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
C117	AJUST 160V 7/35 PF	ROSENTHAL	STSB-7-N1500	11993C
C118	COND 63V 10,0UF 85DEGRE	SIC SAFCO	ALSIC-705-504	12244A
C119	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C120	COND 400V 47,000 PF 5%	MCB	CA115	12145T
C121	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C122	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C123	COND 160V 1000,000 PF 10%	GAM	MPA	12027P
C124	COND 40V 470,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-415	12240W
C125	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C126	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C127	COND 40V 470,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-415	12240W
C128	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C129	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C130	COND 16V 1000,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-209	12235R
C131	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C132	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C133	COND 500V 12,000 PF 5%	LCC	GUP 608	11930J
C134	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
FE122	FERRITE	STACKPDLE	REF 57-1632	13381L
FE124	FERRITE	STACKPDLE	REF 57-1632	13381L
F101	FUSIBLE 0,25A	CEHESS	CI.TD.0,25A	11835F
J101	SUPPORT 16 BR.	TISCO	IC 016 ST 7560	11322Y

SUB-ASSEMBLY K 1416

80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
L101	INDUCTANCE 150UH	SECRE	301 ENROBE	13300Y
L102	INDUCTANCE 150UH	SECRE	301 ENROBE	13300Y
Q101	TRANSISTOR 2N2369A	TEKELEC SEVRES		101037U
Q102	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q103	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q104	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q105	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q106	TRANSISTOR 2N3013	TEKELEC SEVRES		11207Y
Q107	TRANSISTOR 2N3013	TEKELEC SEVRES		11207Y
Q108	TRANSISTOR 2N2905	TEKELEC SEVRES		16298G
Q109	TRANSISTOR 2N2905	TEKELEC SEVRES		16298G
Q110	TRANSISTOR 2N2369A	TEKELEC SEVRES		101037U
Q111	TRANSISTOR 2N2369A	TEKELEC SEVRES		101037U
Q112	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q113	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q114	TRANSISTOR 2N2219	TEKELEC SEVRES		101041Y
Q115	TRANSISTOR 2N2219	TEKELEC SEVRES		101041Y
RT101	RADIATEUR LP5 C38	IERC		17671Z
RT102	RADIATEUR LP5 C38	IERC		17671Z
RT103	RADIATEUR	COMATEL	RTC18-10	11270S
RT104	RADIATEUR	COMATEL	RTC18-10	11270S
R101	RESIS 0,25W 5,000% 3,0 KO	ROSENTHAL	LCA 0207	12426Y

SUB-ASSEMBLY K 1416

80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
R102	RESIS 0,25W 5,000% 11,00 KO	ROSENTHAL	LCA 0207	12440N
R103	RESIS 0,25W 5,000% 10,00 MO	ALLEN-BRADLEY	CB	12359A
R104	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R105	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R106	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R107	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R108	RESIS 0,25W 5,000% 330,00 OH	ROSENTHAL	LCA 0207	12403Y
R109	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R110	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R111	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R112	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R113	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R114	RESIS 0,25W 5,000% 200,00 OH	ROSENTHAL	LCA 0207	12398T
R116	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R117	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R118	RESIS 0,25W 5,000% 330,00 OH	ROSENTHAL	LCA 0207	12403Y
R119	RESIS 0,25W 5,000% 1,50 KO	ROSENTHAL	LCA 0207	12419R
R120	RESIS 0,50W 5,000% 220,00 OH	ROSENTHAL	LCA-414	12535S
R121	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R122	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R123	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R124	RESIS 0,25W 5,000% 330,00 OH	ROSENTHAL	LCA 0207	12403Y

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80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
R125	RESIS 0,50W 5,000% 20,00 OH	ROSENTHAL	LCA.414	12510P
R126	RESIS 0,50W 5,000% 20,00 OH	ROSENTHAL	LCA.414	12510P
R127	RESIS 0,25W 5,000% 1,50 KD	ROSENTHAL	LCA 0207	12419R
R128	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R129	RESIS 0,25W 5,000% 390,00 OH	ROSENTHAL	LCA 0207	12405A
R130	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R131	RESIS 0,50W 5,000% 220,00 OH	ROSENTHAL	LCA.414	12535S
R132	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R133	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R134	RESIS 0,25W 5,000% 33,00 OH	ROSENTHAL	LCA 0207	12379X
R135	RESIS 0,25W 5,000% 330,00 OH	ROSENTHAL	LCA 0207	12403Y
R136	RESIS 0,50W 5,000% 20,00 OH	ROSENTHAL	LCA.414	12510P
R137	RESIS 0,50W 5,000% 20,00 OH	ROSENTHAL	LCA.414	12510P
R138	RESIS 0,25W 5,000% 1,50 KO	ROSENTHAL	LCA 0207	12419R
R139	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R140	RESIS 0,25W 5,000% 240,00 OH	ROSENTHAL	LCA 0207	12400V
R141	RESIS 0,25W 5,000% 360,00 OH	ROSENTHAL	LCA 0207	12404Z
S101	CLAVIER TYPE 1	JEANRENAUD	1221-002 A	17663R
S102	CLAVIER TE10	JEANRENAUD	1221-006 A	17664S
S103	INVERSEUR 51 MP G.P	JEANRENAUD	BOUTON N H-5	1766DM
S104	INVERSEUR 51 MP G.P	JEANRENAUD	BOUTON N H-5	1766DM
T101	TRANSFO D'ALIMENTATION T.323 C	TRANSFO	TE.10	18455B

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80025251 U

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
XF101	PORTE FUSIBLE FAS 700/729	ARNOULO		17661N

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80025249 S

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
A201	C. INTEGRE	MOTOROLA	MC 10105L	17656H
A202	C. INTEGRE 7490	TEXAS	SN7490N	01893Z
A203	C. INTEGRE 7490	TEXAS	SN7490N	01893Z
A204	C. INTEGRE 7490	TEXAS	SN7490N	01893Z
A205	C. INTEGRE 74121	TEXAS	SN74121N	01902J
A206	C. INTEGRE 74121	TEXAS	SN74121N	01902J
A207	C. INTEGRE 74HDD	TEXAS	SN74HDDN	01987B
CR201	DIODE 1N3604	TEXAS	1N3604	01472S
CR202	DIODE 1N3604	TEXAS	1N3604	01472S
CR203	DIODE 1N995	SESCOSEM		11099F
CR204	DIODE 1N995	SESCOSEM		11099F
CR205	DIODE 1N995	SESCOSEM		11099F
CR206	DIODE 1N995	SESCOSEM		11099F
C201	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C202	COND 10 V 33,000 UF 5%	AIR-TRONIC	ATR-B	03564R
C203	COND 16 V 3,3 UF 5%	AIR-TRONIC	ATR-A	06492Y
C204	COND 35V 0,33 UF 5%	AIR-TRONIC	ATR-A	17654F
C205	COND 160V 0,033 UF 2%	GAM	CRA	12035Y
C206	COND 400V 3300,000 PF 2%	GAM	CRA	12033W
C207	COND 400V 301,00 PF 2%	MCB	CA115	10006T
C208	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C209	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L

## SUB-ASSEMBLY K 1414

80025249 S

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
C210	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C211	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C212	COND 400V 22,000 PF 5%	MCB	CA115	12140M
C213	COND 400V 464,0 PF 2%	MCB	CA115	12169U
C214	COND 250V 4700,000 PF 2%	GAM	CRA	12034X
C215	COND 160V. 0,047 UF 2%	GAM	CRA	12046K
C216	COND 35 V 0,47 UF 5 %	AIR-TRONIC	ATR-A	06487T
C217	COND 10 V 4,700 UF 5 %	AIR-TRONIC	ATR-A	03462E
C218	COND 500V 12,000 PF 5%	LCC	GUP 608	11930J
C219	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C220	COND 400V 220,000 PF 5%	MCB	CA115	12157F
C221	COND 400V 100,000 PF 5%	MCB	CA115	12150Y
C222	COND 400V 22,000 PF 5%	MCB	CA115	12140M
C223	COND 400V 464,0 PF 2%	MCB	CA115	12169U
C224	COND 250V 4700,000 PF 2%	GAM	CRA	12034X
C225	COND 160V. 0,047 UF 2%	GAM	CRA	12046K
C226	COND 35 V 0,47 UF 5 %	AIR-TRONIC	ATR-A	06487T
C227	COND 10 V 4,700 UF 5 %	AIR-TRONIC	ATR-A	03462E
C228	COND 20 V 47, UF 5 %	AIR-TRONIC	ATR-C	03636U
C229	COND 500V 12,000 PF 5%	LCC	GUP 608	11930J
C230	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C231	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V

## SUB-ASSEMBLY K 1414

80025249 S

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
C232	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C233	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C234	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C235	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C236	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C237	COND 40V 100,0UF 85DEGRE	SIC-SAFCO	ALSIC-705-407	12239V
C238	COND 20 V 47, UF 5 %	AIR-TRONIC	ATR-C	03636U
C239	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
C240	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
FE201	FERRITE	STACKPOLE	REF 57-1632	13381L
FE202	FERRITE	STACKPOLE	REF 57-1632	13381L
J201	SUPPORT 16 BR.	TISCO	IC 016 ST 7560	11322Y
Q201	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q202	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q203	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
Q204	TRANSISTOR 2N2369A	TEKELEC SEVRES		01037U
Q205	TRANSISTOR 2N2894	TEKELEC SEVRES		11205W
RV201	AJUST 20,000% 470,00 OH	OHMIC	VA.05.H	13162Y
RV202	AJUST 20,000% 100,00 OH	OHMIC	VA.05.H	13157T
RV203	AJUST 20,000% 220,00 OH	OHMIC	VA.05.H	13160W
RV204	AJUST 20,000% 220,00 OH	OHMIC	VA.05.H	13160W
RV205	POTEN LOG INV 20 % 2,5 KD	DRALOWID	66WD - 1590	17631F

SUB-ASSEMBLY K 1414

80025249 S

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
RV206	POTEN LOG NOR 20 % 100, KO	ORALOWIO	66W0- 1590 7	17653E
RV207	POTEN LOG NOR 20 % 100, KO	ORALOWIO	66W0- 1590 7	17653E
RV208	POTEN LIN 20 % 10, KO	ORALOWIO	66W0 - 1590	17633H
RV209	POTEN LIN 20 % 10, KO	ORALOWIO	66W0 - 1590	17633H
R210	RESIS 0,25W 5,000% 470,00 OH	ROSENTHAL	LCA 0207	12407C
R211	RESIS 0,25W 5,000% 2,20 KO	ROSENTHAL	LCA 0207	12423V
R212	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R213	RESIS 0,25W 5,000% 3,0 KO	ROSENTHAL	LCA 0207	12426Y
R214	RESIS 0,25W 5,000% 20,00 KO	ROSENTHAL	LCA 0207	12446V
R215	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R216	RESIS 0,25W 5,000% 20,00 KO	ROSENTHAL	LCA 0207	12446V
R217	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R218	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R219	RESIS 0,25W 5,000% 1,00 KO	ROSENTHAL	LCA 0207	12415L
R220	RESIS 0,25W 5,000% 100,00 OH	ROSENTHAL	LCA 0207	12391K
R221	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R222	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R223	RESIS 0,25W 5,000% 82,00 OH	ROSENTHAL	LCA 0207	12389H
R224	RESIS 0,25W 5,000% 82,00 OH	ROSENTHAL	LCA 0207	12389H
R225	RESIS 0,25W 5,000% 2,20 KO	ROSENTHAL	LCA 0207	12423V
R226	RESIS 0,25W 5,000% 7,50 KO	ROSENTHAL	LCA 0207	12436J
R227	RESIS 0,25W 5,000% 56,00 KO	ROSENTHAL	LCA 0207	12456F

SUB-ASSEMBLY K 1414

80025249 S

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
R228	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R229	RESIS 0,25W 5,000% 150,00 OH	ROSENTHAL	LCA 0207	12395P
R230	RESIS 0,25W 5,000% 330,00 OH	ROSENTHAL	LCA 0207	12403Y
R231	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R232	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
R233	RESIS 0,25W 5,000% 7,50 KO	ROSENTHAL	LCA 0207	12436J
R234	RESIS 0,25W 5,000% 56,00 KO	ROSENTHAL	LCA 0207	12456F
R235	RESIS 0,25W 5,000% 2,20 KO	ROSENTHAL	LCA 0207	12423V
R236	RESIS 0,25W 5,000% 510,00 OH	ROSENTHAL	LCA 0207	124080
R237	RESIS 0,25W 5,000% 82,00 OH	ROSENTHAL	LCA 0207	12389H
R238	RESIS 0,25W 5,000% 1,20 KO	ROSENTHAL	LCA 0207	12417N
R239	RESIS 0,25W 5,000% 300,00 OH	ROSENTHAL	LCA 0207	12402X
R240	RESIS 0,25W 5,000% 1,50 KO	ROSENTHAL	LCA 0207	12419R
R241	RESIS 0,25W 5,000% 82,00 OH	ROSENTHAL	LCA 0207	12389H
R242	RESIS 0,25W 5,000% 1,20 KO	ROSENTHAL	LCA 0207	12417N
R243	RESIS 0,25W 5,000% 300,00 OH	ROSENTHAL	LCA 0207	12402X
R244	RESIS 0,25W 5,000% 1,50 KO	ROSENTHAL	LCA 0207	12419R
R245	RESIS 0,25W 5,000% 6,20 KO	ROSENTHAL	LCA 0207	12434G
S201	COMMUTATEUR FREQUENCE	JEANRENAUD	1221-003 B	18442M
S202	COMMUTATEUR RETARD OUREE	JEANRENAUD	1221-005 B	18443N
S203	COMMUTATEUR RETARD OUREE	JEANRENAUD	1221-005 B	18443N

PARTS LIST (30-03-73)

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## REAR PANEL

80025253 W

REF N°	DESIGNATION	SUPPLIER	REFERENCE	CODE
A301	C. INTEGRE	SGS	LD37 T1	17657J
A302	C. INTEGRE	SGS	L037 T1	17657J
A303	C. INTEGRE	NSC	LM 309K	17658K
C301	COND 30V 0,047 UF	LCC	GFC 611C-20+80%	11978L
J 301	CONNECTOR AC 3G	H.H SMITH	8113375-10	11715A

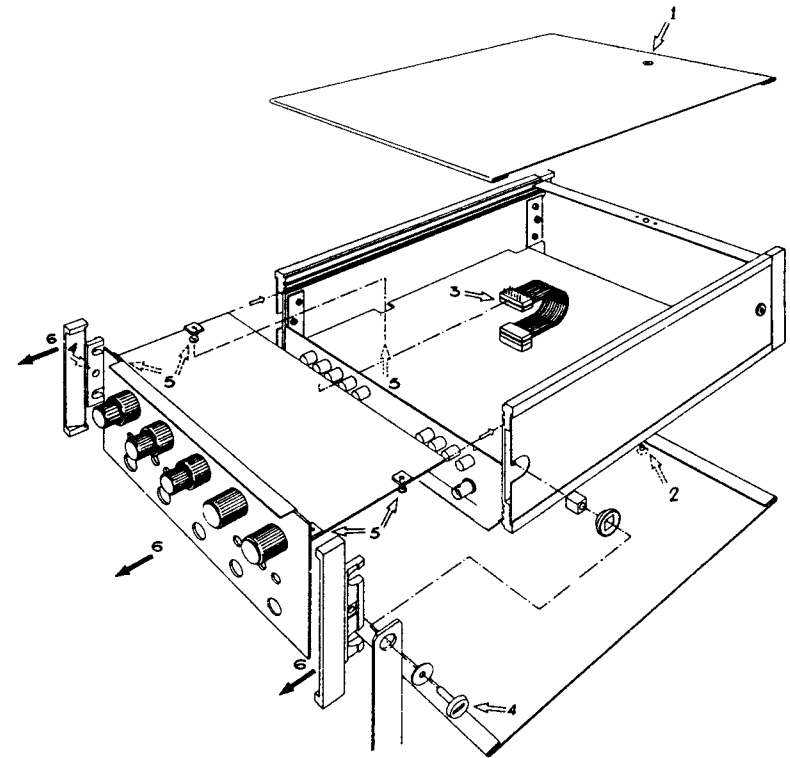
PARTS LIST (30-03-73)

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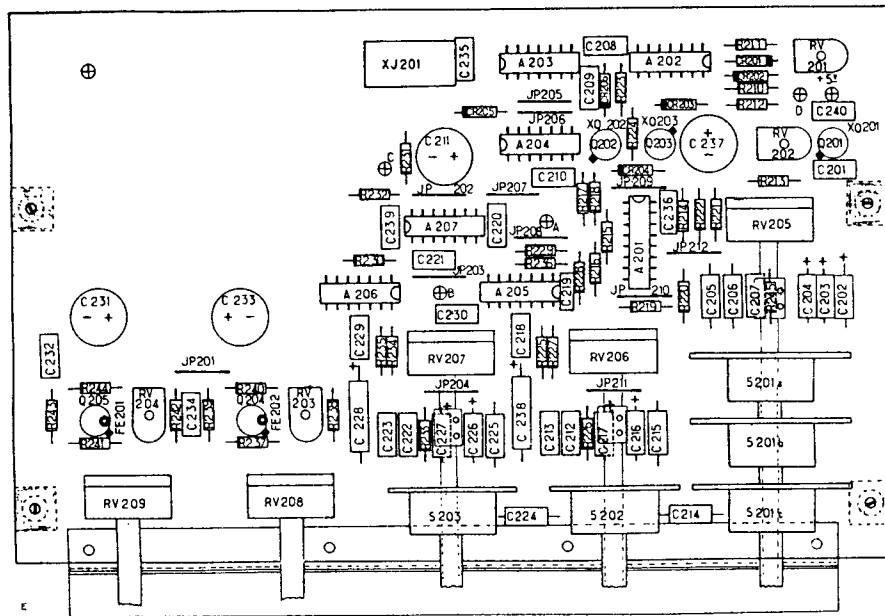
## FRONT PANEL

80025252 V

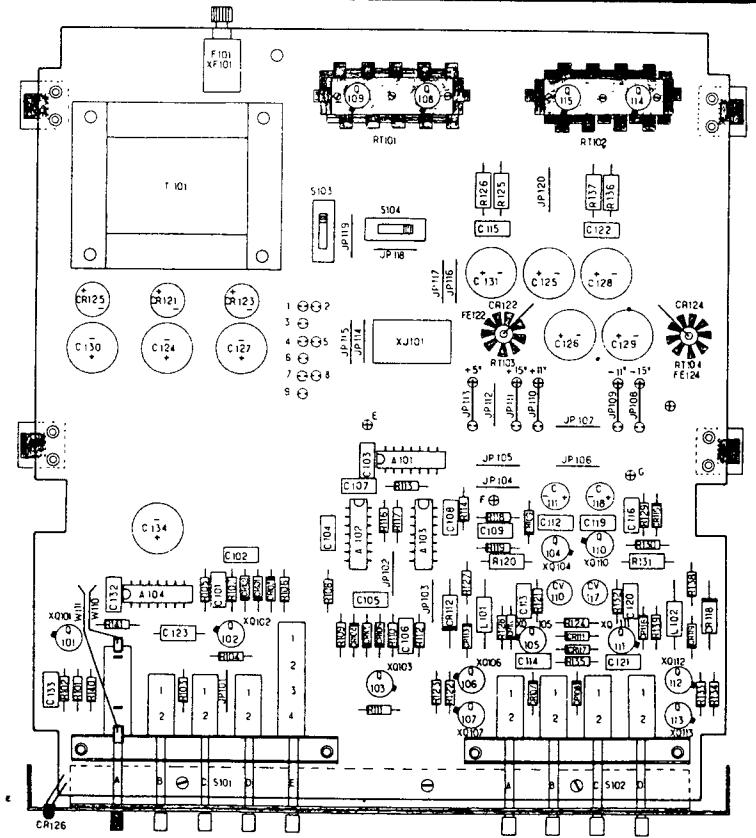
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J101	EMBASE BNC	UG 10948/U	RADIALL R.141 559	11774P
J102	EMBASE BNC	UG 10948/U	RADIALL R.141 559	11774P
J103	EMBASE BNC	UG 10948/U	RADIALL R.141 559	11774P
J104	EMBASE BNC	UG 10948/U	RADIALL R.141 559	11774P
J105	EMBASE BNC	UG 10948/U	RADIALL R.141 559	11774P



DISASSEMBLY

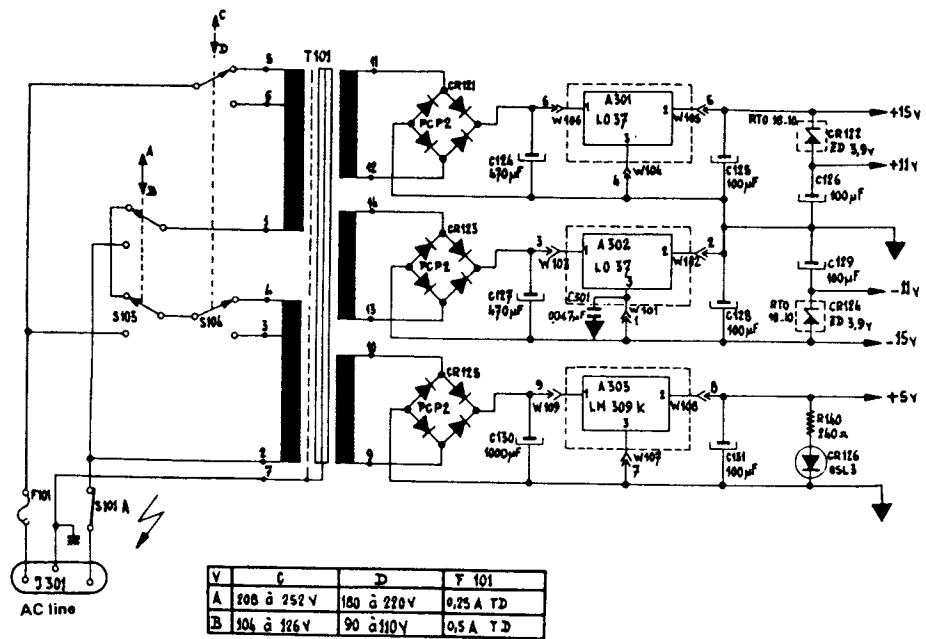


K 1414 PC Board

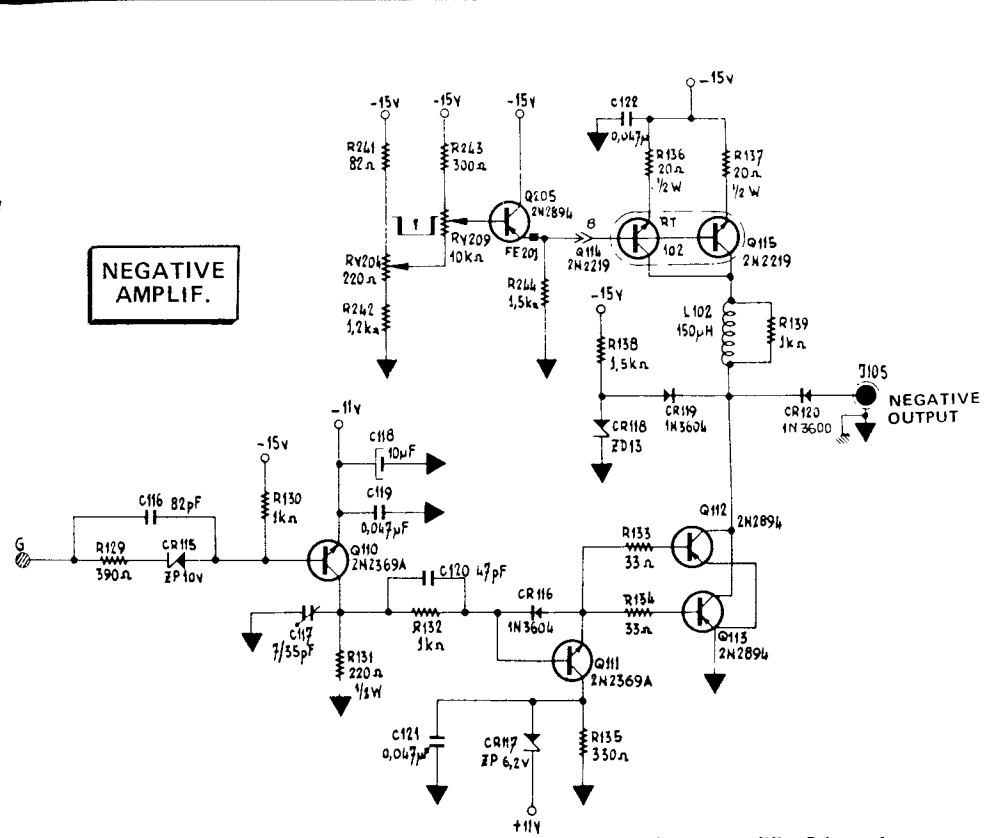
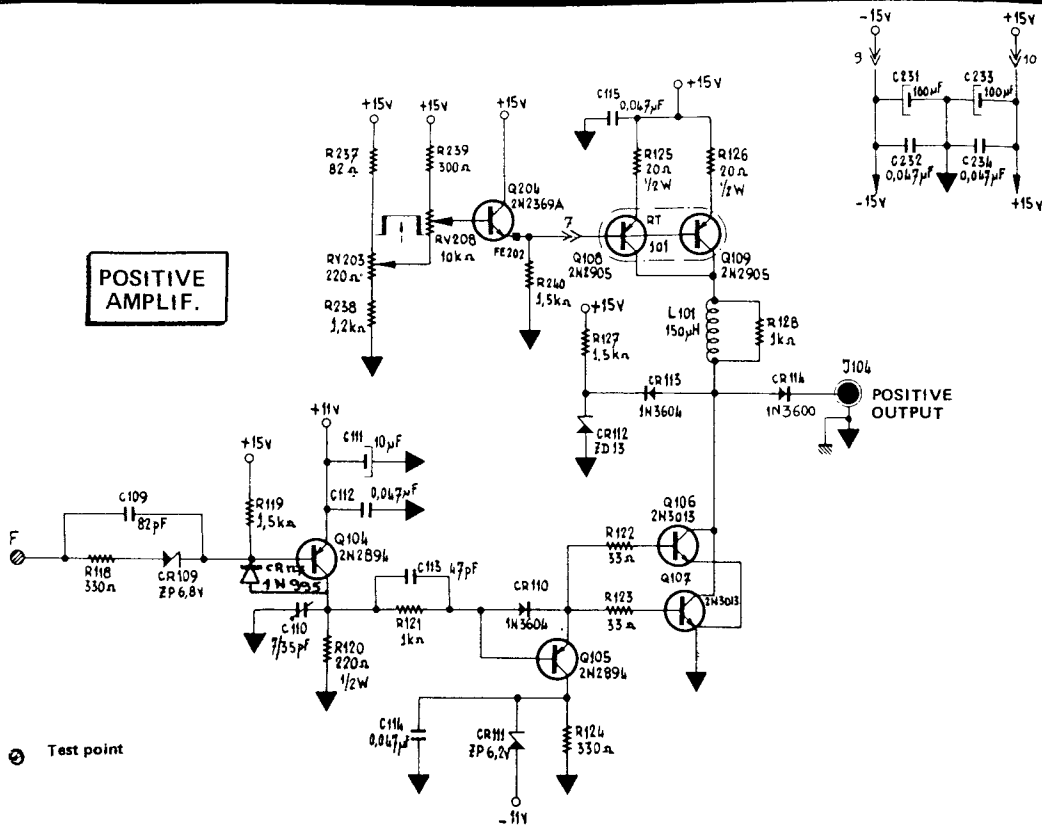


K 1416 PC Board





C  
Power Supply Schematic



Output amplifier Schematic