Serial No.

# SERIES 250 VIDEO AMPLIFIER



## DESCRIPTION AND SPECIFICATION

### 1.1 DESCRIPTION

This is a linear Class A output video amplifier with a maximum differential output of 250V over the frequency range d.c. to 6MHz. The two outputs can be set to ±250V dc relative to each other using a bias control. This facility allows a low voltage electro optic amplitude modulator to be operated to any desired light output intensity level for any input signal level . The output bias does not introduce any limit to the signal output range.

The amplifier has been designed to drive transverse electro-optic modulators where the load is purely capacitive and does not exceed 100pf. The output is short circuit protected.

### 1.2 SPECIFICATION

| INPUT | A.C. COUPLED | D.C. COUPLED |
|---|---|---|
| SENSITIVITY | ≈ 2Vpp for full output | ≈ ± 1V for full output |
| LOWER FREQ'CY LIMIT | 500Hz | - |
| MAX. D.C. COMPONENT | 60 V | ± 5 V |
| INPUT IMPEDANCE | 50 Ω | 50 Ω |

OUTPUT ( Measured between BNC output sockets )

SINEWAVE RESPONSE

| | |
|---|---|
| 0 - 275 V | d.c. to 6 MHz @ -3 dB |
| 0 - 250 V | d.c. to 7 MHz @ -3 dB |

SQUARE WAVE RESPONSE

| | |
|---|---|
| 0 - 250 V | ≤ 65 ns ( 10 - 90 % ) rise & fall times |

OUTPUT MONITORS

100:1 attenuation nominal ( 10Hz - 10MHz)

Use high impedance probes.

BIAS CONTROL

| | |
|---|---|
| Range | ± 250 V dc across amplifier load |
| External bias | 0 - 5 V into 150 kΩ input impedance |

MAINS VOLTAGE SUPPLY

| | |
|---|---|
| Inputs | 110/220/240 V a.c. |
| Frequency | 50 - 60 Hz |
| Power requirements | 300 W |

NOTE The HT supply is unstabilised and the output voltage will be reduced if the supply voltage is below the stipulated level.

NOISE LEVEL Less than 5mV rms. measured between the BNC output sockets.

OPERATING TEMPERATURE RANGE

0° C to 45° C

MECHANICAL

| | |
|---|---|
| Cabinet size (mm) | Height 220 x width 530 x length 340 |
| Weight | 15 kg |

## 2. OPERATION

### 2.1 AMPLIFIER CONTROLS

| | |
|---|---|
| Mains ON/OFF | Fan on. Low voltage supplies on. ( +14 V and - 17 V ) |
| H.T. ON/OFF | H.T. supplies on to output stages. ( + 410 V and - 175 V ) |
| Input Selector | Selects a.c. or d.c. coupling. Switches amplifier to ground while disconnecting input. |
| D.C. Bias | Allows a dc bias of between ± 250 V to be applied to the electro-optic modulator. This does not affect the drive signal. |
| External Bias | The d.c. bias can be controlled by an external signal. ( 0 - 5 V ) |
| Output Monitors | Position for oscilloscope monitoring of attenuated outputs. 200:1 attenuation. |
| Output Overdrive | Visual indication of outputs running into non linearity |

2.2 **WARNING**

The power dissipated by the output stages of this amplifier is sufficient to produce a fire hazard if the fan intake is restricted or blocked. Allow at least 150mm behind the unit clear of any obstructions.

Thermal sensors are provided which will sense an air flow failure and switch of the HT.

The amplifier employs high voltage high current power supplies that could prove lethal if operated out of its cabinet.

**Only qualified electronic engineers understanding the dangers of high voltages should service or operate this amplifier.**

## 3. TEST AND SETTING UP PROCEDURES

### 3.1 SETTING UP PROCEDURES

1. Check that the mains selector is set to the appropriate position. i.e.110/220/240V a.c.
2. Switch the 'Power switch' on before the HT Switch and wait a few minutes before taking any measurements.
3. Set the Input Selector Switch to d.c. and connect a signal generator to the amplifier input. The signal input should not exceed 3 Vpp. Connect a dual beam oscilloscope to the Monitor positions. With the signal generator set to a 1 MHz square wave, adjust the input level to give you 250Vpp output. This corresponds to 1.25 Vpp at each monitor position. Set up the input level to give you a 250Vpp square wave output. ( 125 V at each monitor position ).
4. Use the output leads provided to connect a low voltage electro-optic modulator to the amplifier. The maximum lead length should be 1m using a low capacitance coaxial cable.
5. Using an electro-optic modulator with full amplitude square wave modulation, adjust the d.c. bias to give the best possible extinction ratio. The optical rise time should be better than that measured at the monitor position due to the sine squared characteristic of the electro-optic modulator.

### 3.2 Test Procedures

Only necessary if malfunction is suspected

1. Connect two high impedance meters with 10k stopper resistors to the collector ends of R76 and R77. They should both read 105V. Make amplitude adjustments using the VR6 and balancing adjustments using VR5.
2. Connect meters to the collectors of Q21 and Q22 and set both to 190V using VR8. If there is a difference of greater than 10V, balance the two collectors by readjusting VR2. The digital meter displaying the bias level should then read zero.

3. Connect a differential oscilloscope to the output sockets SKT3 and SKT4. Set C33 and C34 trimming capacitors to maximum. Using a 20ns rise time, 0.5Vp-p, 30-50Hz square wave signal connected to the amplifier d.c. input, adjust VR7 for best flat top low frequency square wave response.

4. Then increase the repetition rate to 1MHz and adjust C33 and C34 to give optimum rise and fall times. This is achieved with about 2% overshoot.

## 4. CIRCUIT DESCRIPTION

### 4.1 POWER SUPPLIES

The circuits used are shown on the Power Supply circuit diagram. All supplies are individually fused.

### 4.2 OUTPUT PROTECTION

The output stages are temperature monitored by TH1 and TH2. If their temperature reaches a predetermined value set by VR9, RLY1 latches on and removes the high voltage supplies. RLY1 is also activated if excessive current is supplied by Q16 - Q19. To reset, switch off all supplies and wait sufficient time for the unit to cool. Check that there is no restriction to the air flow to the back of the cabinet and that the amplifier is not being overdriven. Switch on the mains and the HT supply and recheck operation.

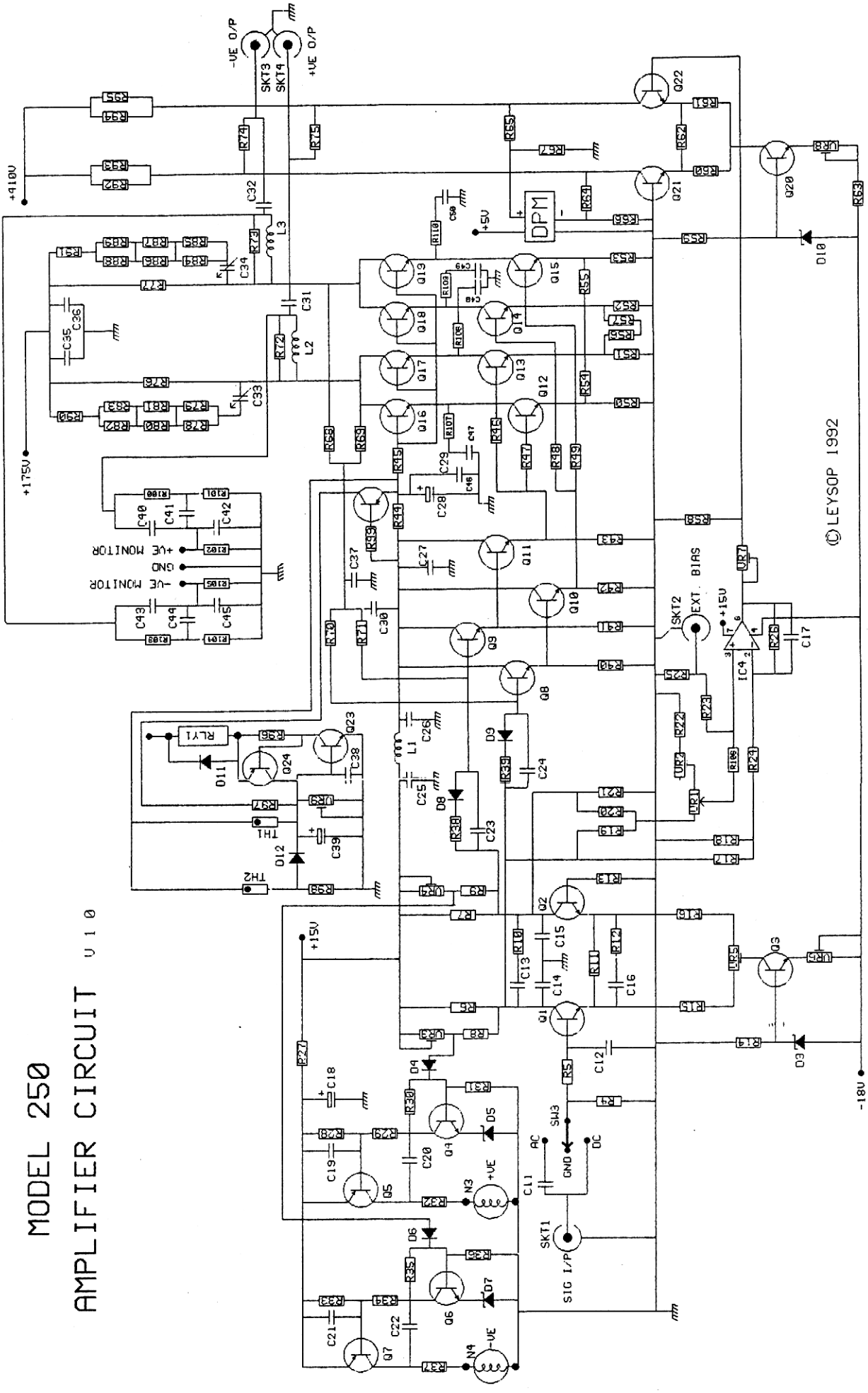
### 4.3 CIRCUIT OPERATION

The input signal is connected to a phase splitter formed by Q1 and Q2 and then to a power amplifier Q12 - Q19 via common emitter buffer stages Q8 -Q11. The collector loads for the two output stages R76 and R77 are formed by a series parallel combination of wire wound resistors. There are parallel RC networks involving C33 and C44 to compensate for collector load inductance.

L2, R72 and L1, R73 provide a low frequency lift. The power amplifier is coupled through to the output via C32 and C31 and then added by a cross over network to the output from the low power d.c. amplifier. The d.c. amplifier is formed by Q21 and Q22 and IC4.

The parallel d.c. amplifier also provides the bias supply and therefore requires the higher 410V HT rail.

The output from the input phase splitter (Q1, Q2) is sensed by the overdrive circuits Q4, Q5 and Q6, Q7. These circuits drive the output overload bulb indicators. Their switching levels are adjusted by VR3 and VR4. These levels are preset to indicate an overload condition when either side of the differential output exceeds 140Vpp.


MODEL 250
AMPLIFIER CIRCUIT U10
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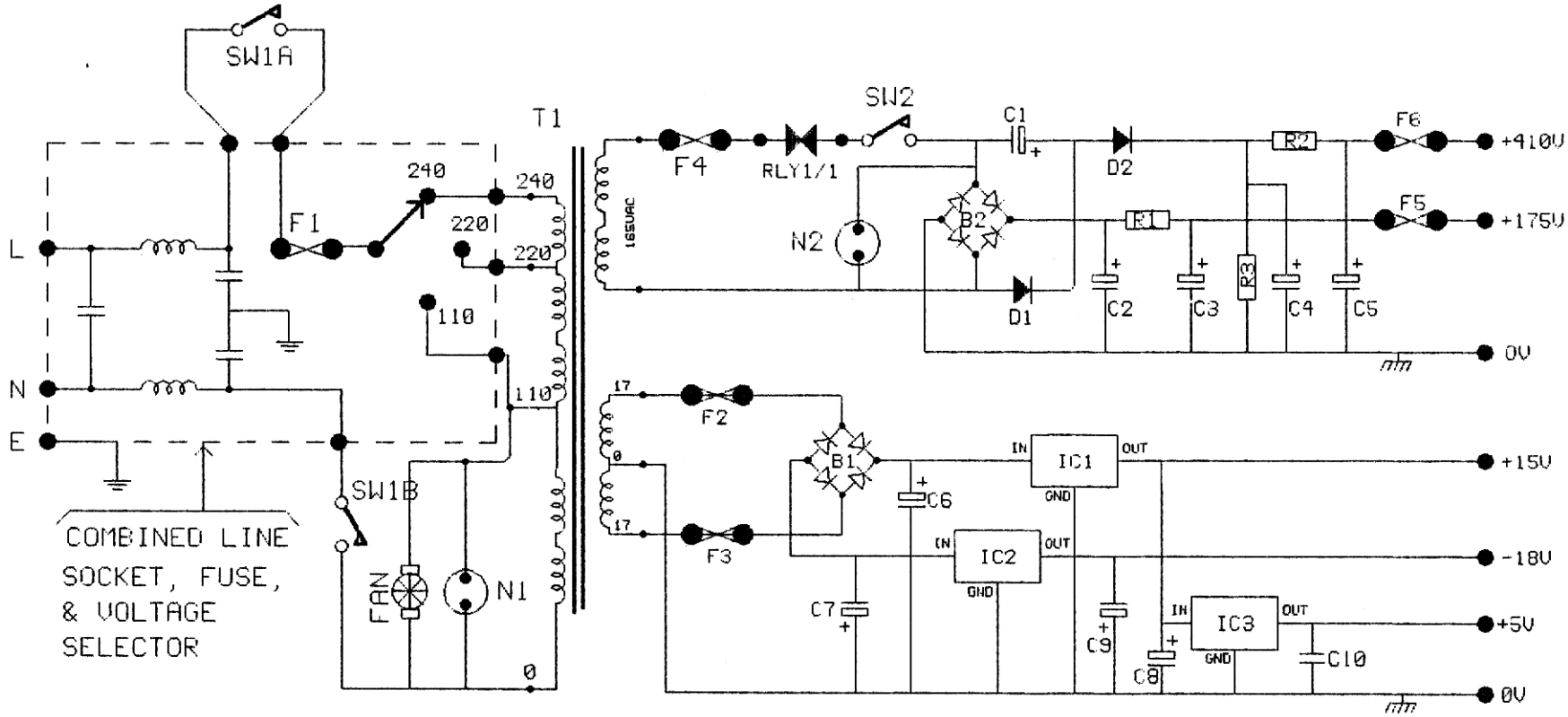
-VE O/P
+VE O/P
SKT3
SKT4
+410V
+175V
+15V
-18V
+5V
DPM
EXT. BIAS
SKT2
SKT1
SIG I/P
+VE MONITOR
GND
-VE MONITOR
RLY1
TH1
TH2
SW3
AC
DC
GND
+VE
-VE
N3
N4
IC4




# MODEL 250
# POWER SUPPLIES