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Colin Hinson
In the village of Blunham, Bedfordshire.

COSSOR

# CDU 150 CT 531/3
# OSCILLOSCOPE
# 6625-99-223-1190

## HANDBOOK


COSSOR ELECTRONICS LIMITED

*A subsidiary of A. C. COSSOR LTD. and of RAYTHEON COMPANY U.S.A.*

THE PINNACLES · ELIZABETH WAY · HARLOW · ESSEX · ENGLAND

Telephone : Harlow 26862
Telegrams : Cossor Harlow

Telex: 81228

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# COSSOR OSCILLOSCOPE
# CDU150 CT531/3

## LIST OF CONTENTS



## LIST OF ILLUSTRATIONS

# INTRODUCTION

THIS HANDBOOK describes an oscilloscope and accessories listed below:

OSCILLOSCOPE

CDU150-CT531/3 comprising:

| | | |
|---|---|---|
| 1 Oscilloscope | D/GA80490 | 6625-99-223-1190 |
| 1 Mains Lead | | |
| 1 Plug (for single sweep) | | |
| 1 Handbook | | |

ACCESSORIES, not included with the above:

D/GA80491 Panel Protection Cover and Accessories,

| | | |
|---|---|---|
| including: | 2 - Fuses 2A | A912423/17 |
| | 2 - Fuses 1A | KS92497/11 |
| | 3 - Fuses 500mA | KS92497/19 |
| | 1 - Fuse 250mA | KS92497/12 |
| | 1 - Viewing Hood | C73176 |
| | 1 - Polarized Viewer | C73127 |
| | 1 - Camera Adaptor Plate | C73100 |
| | 2 - 10:1 Probe Kits | C73166 |
| | 2 - 50Ω Terminations | A73167 |

OPTIONS

The undermentioned options can be supplied if specified at the time or ordering.

| | |
|---|---|
| OPT.01 | 'B' Timebase 2ms/cm instead of 1ms/cm. |
| OPT.02 | CRT with P7 Phosphor (Part No.B913054) instead of P31. |
| OPT.03 | A mains lead (Part No.B73333) with American flat-pin moulded rubber plug instead of the standard lead. |

# SECTION 1

# DATA SUMMARY AND CHARACTERISTICS

# OSCILLOSCOPE

## SECTION 1

## DATA SUMMARY AND CHARACTERISTICS

The CDU 150-CT531/3 is a solid-state general purpose oscilloscope featuring:

Bandwidth DC to 35MHz at 5mV/cm - dual channel
High brightness display (8 x 10cm)
Full delayed timebase with gated mode
Measuring accuracy; ± 3% 'X' & 'Y' on all ranges.

VERTICAL DEFLECTION SYSTEM (two identical channels)

| | |
|---|---|
| Sensitivity | 5mV/cm to 20V/cm in 12 steps with 1-2-5 sequence. A variable gain control covers between steps and increases the range to 50V/cm |
| Bandwidth | D.C. to 35MHz (-3dB)<br>A.C. 2Hz to 35MHz (-3dB)<br>0.2Hz to 35MHz (-3dB) with X10 probe. |
| Rise Time | 10ns |
| Input impedance | 1MΩ shunted by 25pF |
| Max. Input Voltage | ±600V peak (combined D.C. & A.C.) |
| Measuring Accuracy | ±3% |
| Display Modes | Channel 1 only<br>Channel 2 only<br>Channels 1 & 2 (alternate sweeps)<br>Chopped (500KHz)<br>Channels 1 & 2 added algebraically<br>(either channel may be inverted) |

## DATA SUMMARY & CHARACTERISTICS

| | |
|---|---|
| Signal Delay Line | 180ns |
| Cascade | Channels 1 & 2 cascaded internally to give a sensitivity of 1mV/cm (± 3%). Bandwidth, 2.5Hz to 1MHz (-3dB) |
| X Y Mode | Channel 2 input and attenuator can be switched to provide calibrated 'X' amplifier sensitivities of 5mV/cm to 20V/cm, ± 3%. Bandwidth D.C. to 3MHz (-3dB) |
| Internal Trigger | Normal, Channel 1 or channel 2 |
| Invert Facility | Both channels |

### HORIZONTAL DEFLECTION SYSTEM

| | |
|---|---|
| Timebase 'A' Sweep Range | 0.1μs/cm to 1s/cm in 22 steps with 1-2-5 sequence. Accuracy ± 3%. A variable control gives complete coverage and extends the range to 2.5s/cm. A front panel lamp indicates uncalibrated sweep rates. |
| Timebase 'B' Sweep Range | 1.0μs/cm to 10ms/cm in decade steps. Accuracy ± 3%. A ten-turn multiplier controls delay time to within ± 1% of the selected range. Jitter better than 1 part in 20,000. |
| Timebase 'A' Sweep Modes | Auto, triggered or single shot (armed). |
| Timebase 'B' Sweep Modes | Triggered |
| X5 Magnifier | Increases all sweep speeds by a factor of 5; i.e. extends fastest sweep Timebase 'A' to 20ns/cm and Timebase 'B' to 0.2 μs/cm. Overall timebase accuracy, with magnifier in use, ± 3%. A front panel lamp indicates magnifier in operation. |

## DATA SUMMARY & CHARACTERISTICS

| | |
|---|---|
| Timebase Modes | 'A'<br>'A' brightens 'B'<br>'A' delayed by 'B'<br>'A' delayed by 'B' Gated. Separate slope switch and trigger level control incorporated. |
| Sweep Out | Timebase 'A' sawtooth, d.c. coupled; amplitude 10V minimum into 10KΩ. |
| Trigger Source | Internal, External or Line |
| Trigger Requirements | Internal: 2mm at D.C. rising to 1cm at 35MHz<br>External: 200mV p-p at D.C. rising to 1V at 35MHz. |
| Trigger Level | Internal: positive or nagative slope, variable over full 8cm C.R.T. display height.<br>External: positive or negative slope, variable over +20V to -20V. |
| Trigger Coupling | A.C., A.C. with LF reject, or D.C. |
| Automatic Triggering | Timebase free runs to give bright display until a vertical signal of 1cm appears on C.R.T., timebase then triggers automatically. |
| X Amplifier | Sensitivities: 100mV/cm, 200mV/cm, 500mV/cm, 1V/cm and 5V/cm. Accuracy ± 3%.<br>Input impedance: 1MΩ ± 1% shunted by 25pF<br>Bandwidth: D.C. to 3MHz, or A.C. 2Hz to 3MHz |
| Cathode Ray Tube | Display area 8cm X 10cm. Single gun P.D.A tube with 12kV overall accelerating potential. Direct access to C.R.T. plates. |

## DATA SUMMARY & CHARACTERISTICS

| | |
|---|---|
| Brightness Modulation | A.C. coupled and requires 10V for visible modulation of the trace. |
| Graticule | Illuminated, and light filter provided. |
| Beam Finder | Overrides brilliance, vertical and horizontal shift control to bring bright trace onto C.R.T. face. |
| Calibrator | 1KHz square wave; amplitude 25mV and 250mV p-p. Accuracy (frequency and amplitude) ± 1% |
| Power Requirements | 100V-120V ± 6% or 200V-250V ± 6%, 45 to 440Hz, consumption 110VA. |
| Size | 10in (26cm) wide, 10 in (26cm) high, and 16in (41cm) deep overall, including protection lugs. |
| Weight | 27lb (12.5kg) approx. |
| Environmental | Designed to meet REMC/20/FR Cat.3 Issue 4 (General Requirements for Joint Service Electronic and Electrical Test Equipment), i.e. relevant clauses for Defence Spec. DEF133<br>Working Temperature Range: - 10°C to ±55°C<br>Accuracy: ± 5% at extremes of range, ± 3% from +10°C to +30°C<br>Storage Temperature Range: -40°C to +70°C. |

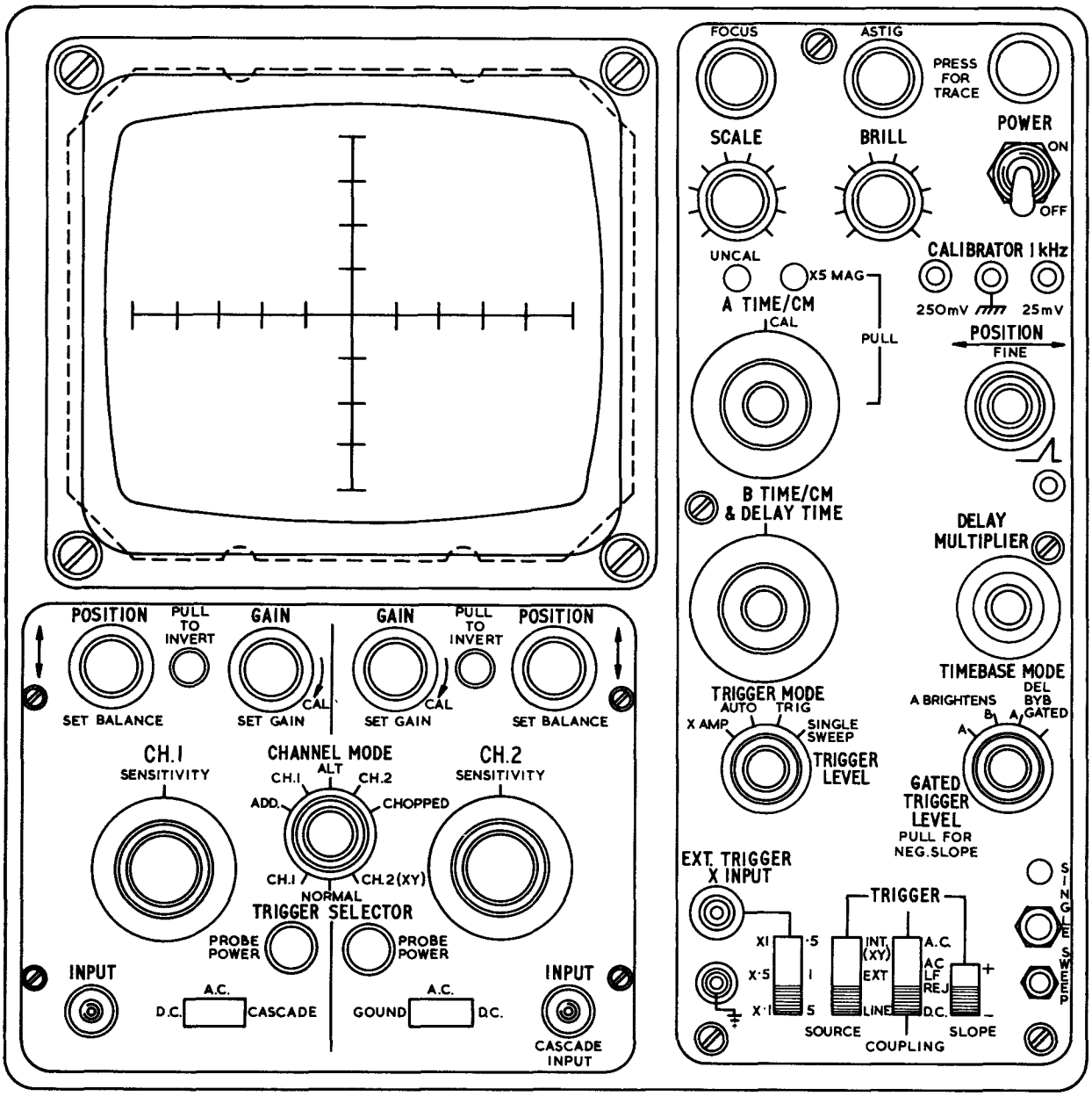



FIG. 2.1 CONTROLS ON FRONT PANEL

## SECTION 2
## DESCRIPTION OF CONTROLS

### DUAL-CHANNEL VERTICAL DEFLECTION SYSTEM

The dual-channel vertical deflection system permits two waveforms of amplitude not greater than 600V to be displayed either singly or simultaneously. The input impedance is 1MΩ in parallel with 25pF.

### INPUTS

| | |
|---|---|
| CH1 | BNC connector for Channel 1 deflection signals, or Y axis deflection signals using X-Y mode. |
| CH2 (CASCADE) | BNC connector for Channel 2 deflection signals, X axis deflection signals using X-Y mode or the input when using CASCADE. |

### CONTROLS

#### INPUT (Coupling)

| | |
|---|---|
| AC | couples the input via a capacitor, blocking any d.c. component present in the input signal. |
| DC | couples all components of the input signal to the input amplifier. |
| GROUND | grounds the input of CH2 input amplifier and disconnects the input signal |
| CASCADE | couples the output of CH2 preamplifier to CH1 input. |

| | |
|---|---|
| SENSITIVITY | determines the input amplitude required to give 1cm vertical deflection providing the GAIN control is in the CAL position. |
| GAIN | Provides continuous adjustment of sensitivity between the calibrated positions of the SENSITIVITY switch. |

## DESCRIPTION OF CONTROLS

| | |
|---|---|
| CAL | Position of GAIN control which gives calibrated sensitivity. |
| SET GAIN | Screwdriver adjustment to align the amplifier gain with the SENSITIVITY setting. |
| POSITION | Controls the vertical position of the display |
| SET BALANCE | Screwdriver adjustment to minimize vertical shift of the display when the GAIN control is varied. |

PULL TO INVERT

| | |
|---|---|
| IN | positive input gives upward deflection |
| OUT | positive input gives downward deflection |

CHANNEL MODE

| | |
|---|---|
| CH1 | Channel 1 input displayed |
| CH2 | Channel 2 input displayed |
| ALT | Channel 1 and Channel 2 inputs displayed on alternate sweeps |
| CHOPPED | Channel 1 and Channel 2 inputs displayed on the same sweep by switching between channels at approximately 500 kHz |
| ADD | the algebraic sum of Channel 1 and Channel 2 inputs is displayed. The algebraic difference is obtained by inverting either channel (PULL TO INVERT) |

TRIGGER SELECTOR

Selects the source of internal triggering; also selects the source of the X signal when using the X-Y mode.

DESCRIPTION OF CONTROLS

| | |
|---|---|
| CH1 | horizontal sweep circuits triggered only from CH1 |
| NORMAL | each sweep is triggered from the waveform it displays. |
| CH2 (X Y) | horizontal sweep circuits triggered only from CH2 input signal.<br>NOTE: When using the X-Y mode, CH2 input is connected to the horizontal deflection amplifier. |
| PROBE POWER | provides power supplies for an active probe. |

HORIZONTAL DEFLECTION SYSTEM

The horizontal deflection system is capable of producing two linear timebases, A and B. The main timebase A, is used either in the single timebase mode, or delayed by means of the other timebase B. Control settings determine whether the A timebase triggers immediately after the delay period or is primed (GATED) to trigger from the next input signal after the delay period. The unit also provides for internal or external triggering of the timebases together with single sweep operation of the A timebase. The horizontal deflection amplifier may also be used as the X axis for X-Y operation.

CONTROLS

| | |
|---|---|
| FOCUS | provides optimum display definition |
| ASTIG/PRESS FOR TRACE | provides optimum display definition when used in conjunction with the FOCUS control.<br>PRESS FOR TRACE operates the beam finder switch and brings the display within the area of the graticule irrespective of the POSITION and BRILL controls and of the nature of the input signal. |

## DESCRIPTION OF CONTROLS

| | |
|---|---|
| SCALE | controls graticule illumination |
| BRILL | controls display brightness |
| POWER ON/OFF | switches power to the instrument (adjacent neon indicator). |
| CALIBRATOR 1KHz | sockets provide 25mV and 250mV 1KHz square wave, accurate to ±1% amplitude and frequency for calibration purposes. |
| POSITION | concentric controls for coarse and fine adjustment of the horizontal position of the display |
| A TIME/CM | selects the sweep rate of the A timebase to give 1cm of horizontal deflection, providing that the concentric variable control is in the CAL position. The variable control provides continuous adjustment of the A timebase sweep rate between the calibrated positions of the A TIME/CM switch. Pulling out the variable control increases the gain of the horizontal deflection amplifier 5 times increasing the sweep rates of the A or B timebases accordingly, and producing a corresponding increase in X axis sensitivity when operated in the X-Y mode. |
| UNCAL Neon | indicates that the A variable control is not in the CAL position. |
| X5 MAG neon | indicates that the horizontal deflection is 5 times magnified. |
| B TIME/CM & DELAY TIME | selects the sweep rate of the B timebase and in conjunction with the DELAY MULTIPLIER, the delay time. |

## DESCRIPTION OF CONTROLS

**DELAY MULTIPLIER** — provides variable sweep delay between 0.5 and 10.5 times the delay time indicated on the B TIME/CM & DELAY TIME switch.

A — socket provides the sawtooth waveform of the A timebase.

**TRIGGER MODE**

X AMP — routes the internal or external X input signals to the horizontal deflection amplifier.

AUTO — displays the A timebase as a free-running trace in the absence of a trigger signal. An internal trigger signal resulting from a vertical display of 1 cm or greater will trigger the A timebase at a preset level.

TRIG — routes the internal or external trigger signals to either the A or B timebase as determined by the TIMEBASE MODE switch

SINGLE SWEEP — permits a single sweep of the triggered A timebase. A further display cannot occur until the SINGLE SWEEP push button is operated, or a short-circuit applied remotely through the jack.

**TRIGGER LEVEL** — concentric with the TRIGGER MODE switch. A continuously variable control which determines the point on the trigger signal at which the A or B timebase is triggered.

**TIMEBASE MODE**

A — horizontal deflection provided by the A timebase.

## DESCRIPTION OF CONTROLS

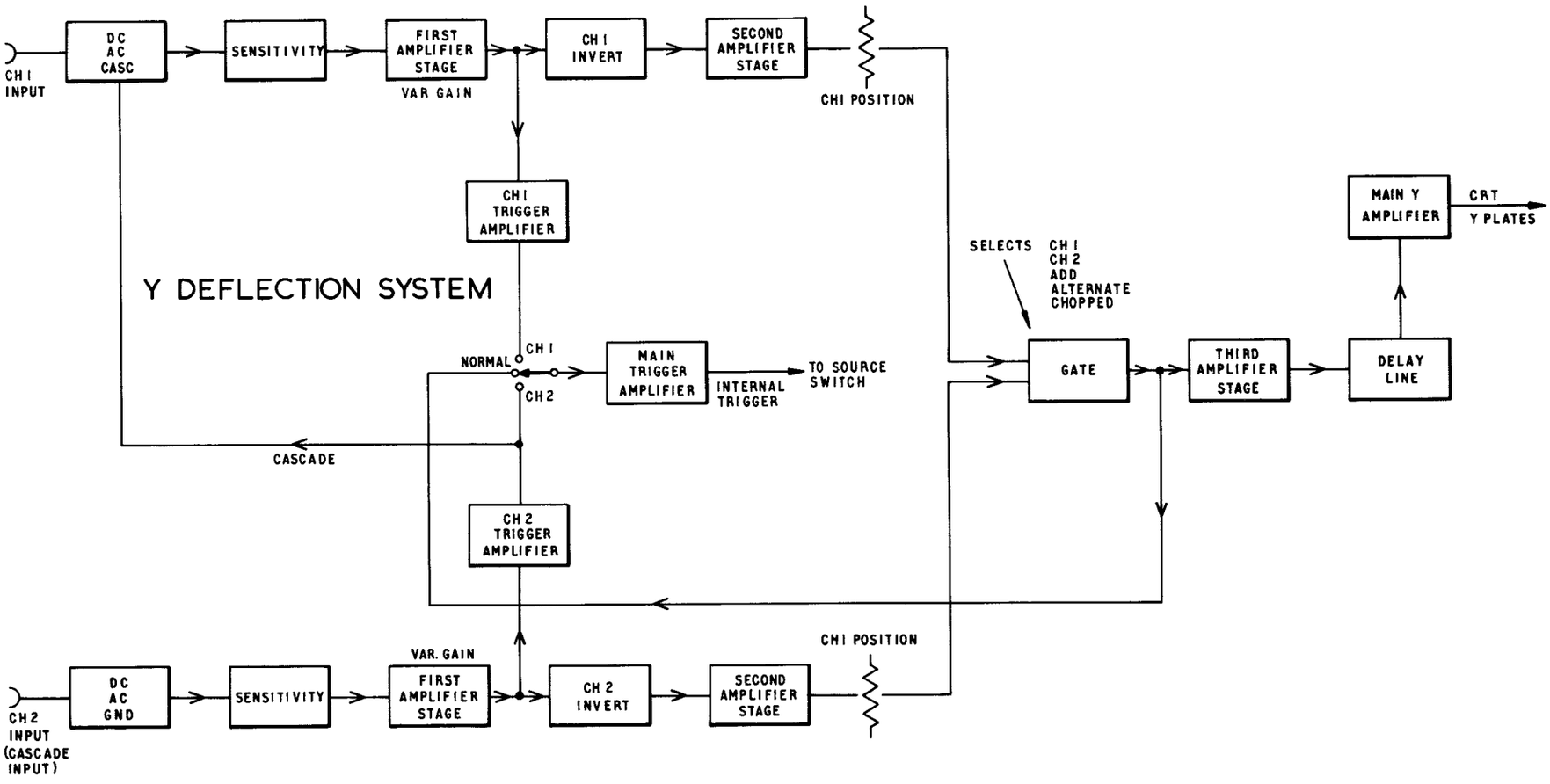
| | |
|---|---|
| A BRIGHTENS B | horizontal deflection provided by the B timebase, but having an intensified region on the display showing the position and duration of the A timebase (delayed sweep) with respect the B timebase (delaying sweep), its position being determined by the DELAY MULTIPLIER, and duration by A TIME/cm. |
| A DEL BY B | horizontal deflection provided by the A timebase (delayed sweep) represented by the intensified region of the previous setting. |
| GATED | horizontal deflection provided by the A timebase (delayed sweep) as for A DEL BY B, with the exception that the A timebase is triggered from the input signal waveform following the completion of the delay time. |
| GATED TRIGGER LEVEL | a continuously variable control which determines the point on the A timebase (delayed sweep) at which the timebase is triggered. With the GATED TRIGGER LEVEL pushed IN the timebase is triggered from a positive-going transition on the waveform, and with the control pulled OUT the timebase is triggered from a negative-going transition on the waveform. |
| EXT TRIGGER/X INPUT | BNC connector for external trigger or X input. Adjacent 3-position slider switch provides calibrated attenuation of the EXT TRIGGER input, and calibrated sensitivities for the X INPUT when used in the X-Y mode. |

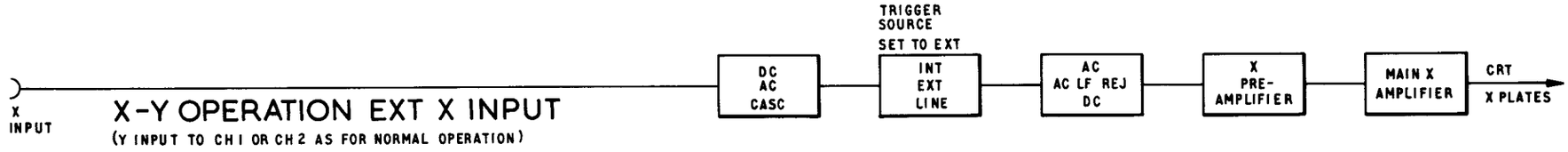
## DESCRIPTION OF CONTROLS

| | |
|---|---|
| TRIGGER SOURCE | selects the source of the trigger or X axis signal. |
| INT (XY) | selects the internal trigger signal from the vertical display unit, or the CH2 output as the X axis when used in the X-Y mode (TRIGGER SELECTOR at CH2 - X Y) |
| EXT | selects the external trigger signal or the X input from the EXT TRIGGER X INPUT socket. |
| LINE | selects a trigger signal derived from the a.c. power supply to the instrument. |
| TRIGGER COUPLING | selects the method of coupling the trigger or X signals. |
| AC | input coupled via a capacitor, blocking any d.c. component present. A.C. response -3dB at 20Hz |
| AC LF REJ | input coupled via a capacitor, blocking any d.c. component present. A.C. response -3dB at 1.6kHz |
| DC | accepts all components of the input signal. |
| TRIGGER SLOPE | determines whether the timebase selected is triggered from a positive-going or negative-going transition of the trigger signal waveform. |
| SINGLE SWEEP | used when operating the A timebase in the Single Sweep mode. |
| Push Button | primes the A timebase to trigger from the next input signal. |
| Neon | indicates that the A timebase is primed. |
| Jack | for remote operation, simulating the push-button operation. |

## DESCRIPTION OF CONTROLS

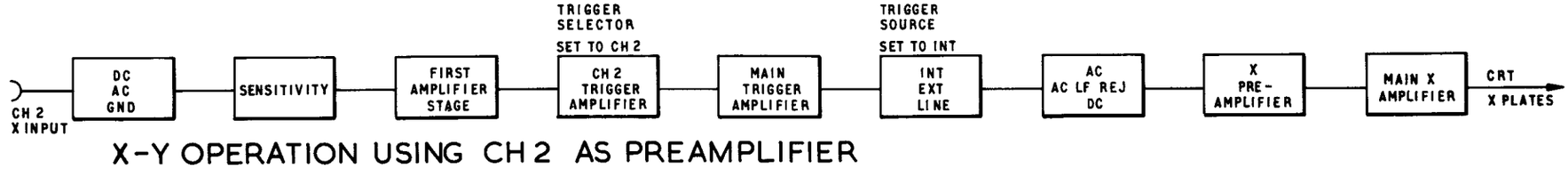
| | |
|---|---|
| TOP LEFT HAND REAR CONTROLS | (release chrome screw & lift hinged flap) |
| GEOMETRY | continuously variable control for overall orthogonal setting of the display. |
| TRACE TWIST | continuously variable control for aligning the display with the horizontal graduation of the graticule |
| Y-PLATES INPUT | direct connection to the C.R.T. Y plates. The input is applied to the Y PLATES sockets and the two-position slider switch set to EXT. For normal use set slider switch to INT. |
| X-PLATES INPUT | direct connection to the C.R.T. X plates. The input is applied to the X PLATES sockets and the two-position slider switch set to EXT. For normal use set slider switch to INT. |
| Z MOD | for intensity modulation of the display. The input is applied to the Z Mod sockets and the two-position alider switch set to EXT. For normal use set the slider switch to INT. |
| TOP RIGHT HAND REAR CONTROLS | (release chrome screw & lift hinged flap) |
| VOLTAGE SELECTOR PANEL | selects the line voltage operating range of the instrument. Line fuse is adjacent. |




X-Y OPERATION EXT X INPUT

(Y INPUT TO CH I OR CH 2 AS FOR NORMAL OPERATION)




X-Y OPERATION USING CH 2 AS PREAMPLIFIER

(Y INPUT TO CH I AS FOR NORMAL OPERATION)

FIG. 3.1

DEFLECTION MODES

A L.2, AUG.70

# OSCILLOSCOPE
## SECTION 3
## OPERATION

CAUTION Before connecting the oscilloscope to the power supply check that the setting of the mains voltage selector (located at top right-hand rear) is correct for the available supply voltage.

Do not operate the instrument with ventilation holes obstructed.

### Obtaining a Display

1. (1) Set front panel controls as follows: (Fig. 2.1)

| | |
|---|---|
| CHANNEL MODE | CH2 |
| TRIGGER SELECTOR | NORMAL |
| CH2 input | GROUND |
| A TIME/CM | 1ms |
| A VARIABLE | CAL. |
| X5 MAG | IN (X1) |
| TRIGGER MODE | AUTO |
| TIMEBASE MODE | A |
| TRIGGER SOURCE | INT |

(2) Switch ON and allow at least 30 seconds warming up.

(3) Press ASTIG control (PRESS FOR TRACE) and centralize the trace on the CRT using the CH2 POSITION and horizontal POSITION controls.

(4) Release PRESS FOR TRACE control and adjust BRILLIANCE, FOCUS and ASTIG to obtain a well defined trace.

### Single Channel Operation

2. The input signal may be applied to either CH1 or CH2 input socket and the associated front panel controls used.

If CH1 is used switch CHANNEL MODE to CH1 and TRIGGER SELECTOR to CH1 or NORMAL.

OPERATION

If CH2 is used switch CHANNEL MODE to CH2 and TRIGGER SELECTOR to CH2 or NORMAL.

Cascade Operation

3. Recommended only when sensitivities of 1mV/cm to 5mV/cm are required

| | |
|---|---|
| CH1 & CH2 SENSITIVITY | 5mV/cm |
| CHANNEL MODE | CH1 (CH1 controls operative) |
| TRIGGER SELECTOR | CH1 or NORMAL |
| CH2 input coupling | AC or DC |
| CH1 input coupling | CASCADE |

Apply the input signal to CH2 (CASCADE INPUT socket).

Dual Channel Operation

4. NOTE: The displays may be viewed separately as for single trace operation.

(a) ALTERNATE: recommended for input frequencies above 10KHz.=

(1) Apply the two input signals to CH1 and CH2 INPUT sockets.

(2) Switch CHANNEL MODE to ALT

(3) If the two input signals are not synchronous switch TRIGGER SELECTOR to NORMAL.

(4) If the two input signals are synchronous, and it is desired to display them in their true time relationship switch TRIGGER selector to CH1 or CH2 as desired.

(b) CHOPPED: recommended for input frequencies below 10KHz.

(1) Apply the two input signals to CH1 and CH2 INPUT sockets.

(2) Switch CHANNEL MODE to CHOPPED

(3) Switch TRIGGER SELECTOR to CH1 or CH2

(c) ADD: suitable for synchronous signal inputs only.

(1) Apply the two input signals to CH1 and CH2 input sockets.

(2) Switch CHANNEL MODE to ADD

(3) Push in INVERT switches on both channels.

(4) TRIGGER SELECTOR may be at CH1, NORMAL or CH2

(5) The algebraic sum of the two input signals will be displayed. To obtain the algebraic difference withdraw the invert switch on one channel.

Single Timebase Operation

5. (1) Apply the input signal(s) to CH1 and/or CH2 INPUT socket(s), and set controls for the desired mode of operation.

(2) Switch TIMEBASE MODE to A and select the desired sweep rate on the A TIME/CM control.

(3) Select the desired TRIGGER SOURCE, COUPLING and SLOPE.

(4) Switch TRIGGER MODE TO AUTO or TRIG.

NOTE: The TRIGGER LEVEL control is operative only when TRIG is selected.

Single Sweep Operation

6. (1) Set TRIGGER MODE to SINGLE SWEEP and other controls as for single timebase operation.

(2) Operation of the SINGLE SWEEP push button results in one scan of the timebase, providing the TRIGGER LEVEL control is set correctly. But, if the button is operated when there is no input signal the A timebase is primed and the neon lamp glows. One scan of the A timebase will now be produced when an input signal is applied, providing the TRIGGER LEVEL control is set correctly.

## OPERATION

### Delayed Sweep Operation

7. (1) Apply input signal to CH1 and/or CH2 INPUT socket(s) and set controls as desired.

(2) Switch TIMEBASE MODE to A BRIGHTENS B

(3) Switch B TIME/CM and DELAY TIME to the required range, and set the DELAY MULTIPLIER to give the required delay time.

(4) Select the TRIGGER SOURCE, COUPLING and SLOPE for the delaying sweep (B timebase).

(5) Switch TRIGGER MODE to TRIG and adjust TRIGGER LEVEL to trigger the B timebase.

(6) Select the appropriate A TIME/CM range to determine the duration of the delayed sweep (A timebase) indicated by the brightened-up region of the display.

(7) Switch TIMEBASE MODE to A DEL BY B to display the delayed sweep.

NOTE: To eliminate any jitter, switch TIMEBASE MODE to GATED and use the GATED TRIGGER LEVEL control in conjunction with the GATED SLOPE switch to trigger the delayed sweep.

### X-Y Operation (using X INPUT socket)

8. (1) Apply the Y axis input signal to CH1 or CH2 and set controls as required.

(2) Apply the X axis input signal to the X INPUT socket and select the desired X sensitivity on the adjacent switch.

(3) Switch TRIGGER SOURCE to EXT and select the desired TRIGGER COUPLING.

(4) Switch TRIGGER MODE to X AMP.

### X-Y Operation (using CH2 as a pre-amplifier)

9. (1) Apply the Y axis input to CH1 and set the controls for single-

channel operation, i.e. CHANNEL MODE to CH1.

(2) Apply the axis input to CH2 and switch TRIGGER SELECTOR to CH2 (X Y).

(3) Switch TRIGGER SOURCE to INT (X Y) and select the desired TRIGGER COUPLING.

(4) Switch TRIGGER MODE to X AMP.

Operation of Z Mod (Intensity Mod).

10. (1) Set controls for vertical and horizontal deflection as required.

(2) Raise the top, left-hand rear access panel and apply the intensity modulation signal to the Z MOD input sockets.

(3) Switch the two-position Z MOD slider switch to EXT.

Direct Connection to X & Y Plates

11. Raise the top, left-hand rear access panel and apply the input signal(s) to the X PLATES or Y PLATES as required, switch the appropriate two-position slider switch to EXT.

NOTES: (1) X and Y POSITION controls remain operative

(2) Do NOT apply signals to CH1 or CH2 INPUT sockets whilst using direct access to X or Y plates.

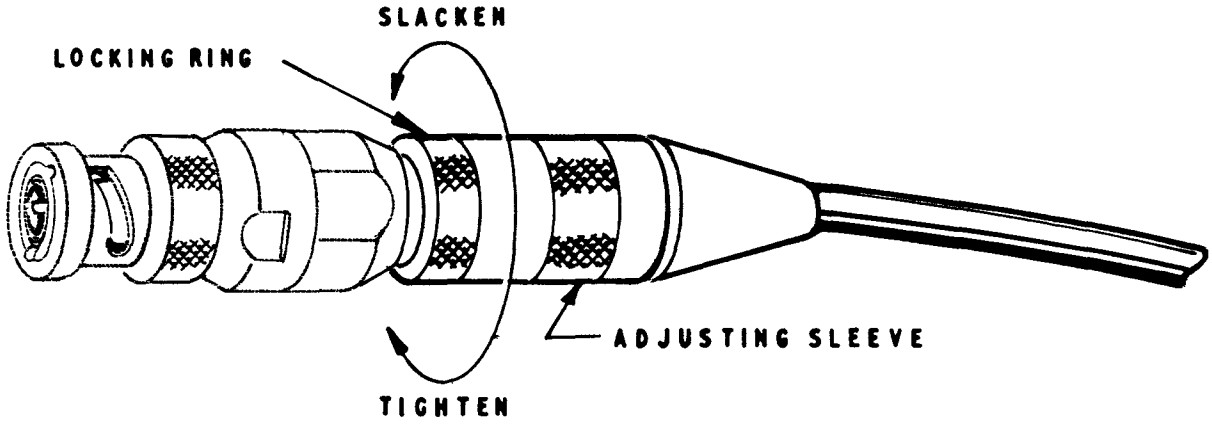
## PROBE COMPENSATION

Before using Passive Probe CPK 100 in the X10 condition, it is necessary to set up the compensation. This must be done every time the probe is transferred from one Oscilloscope to another.

Set the control as follows:

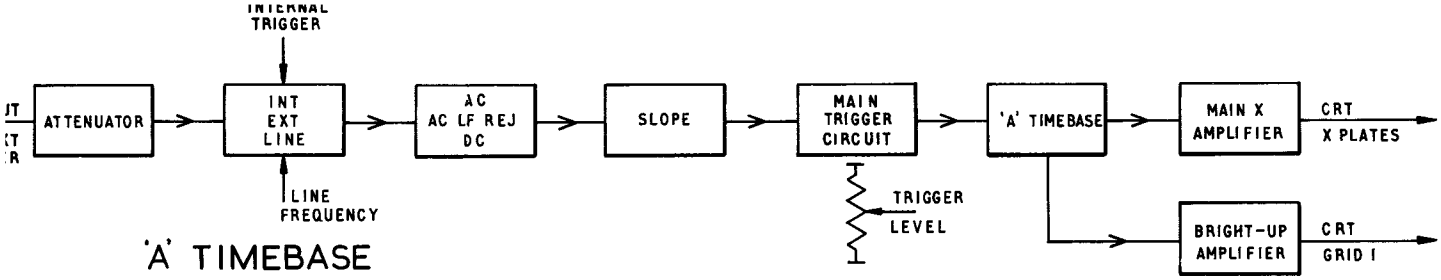
| | |
|---|---|
| Y deflection | 5mV/cm |
| Timebase | 500µs/cm |

Connect the probe tip to the 250mV output of the internal CALIBRATOR. Slacken the locking ring of the probe and turn the adjusting sleeve to obtain the best square-wave display without either overshoot or undershoot. Tighten the locking ring without moving the adjusting sleeve and recheck the waveform.

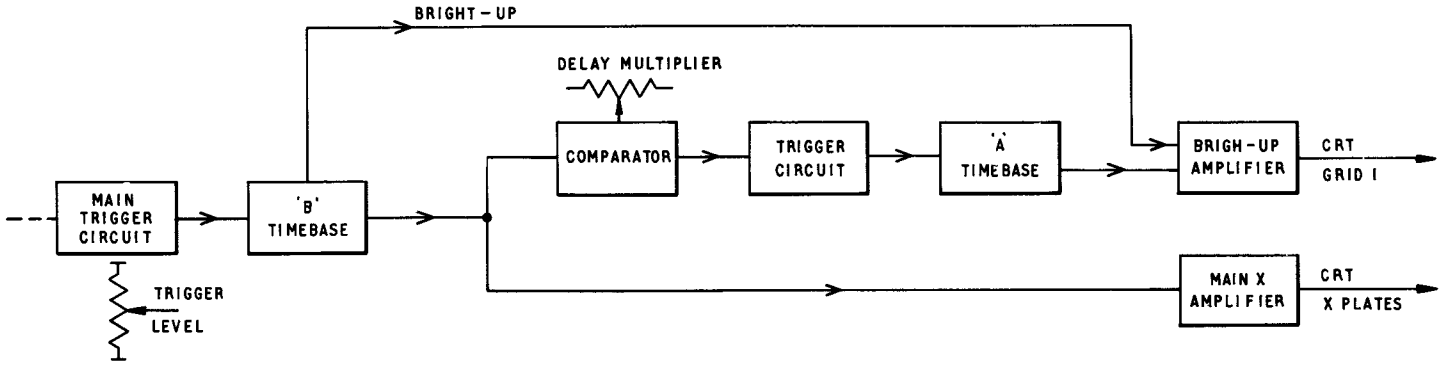



## PASSIVE PROBE CPK100
## SPECIFICATION

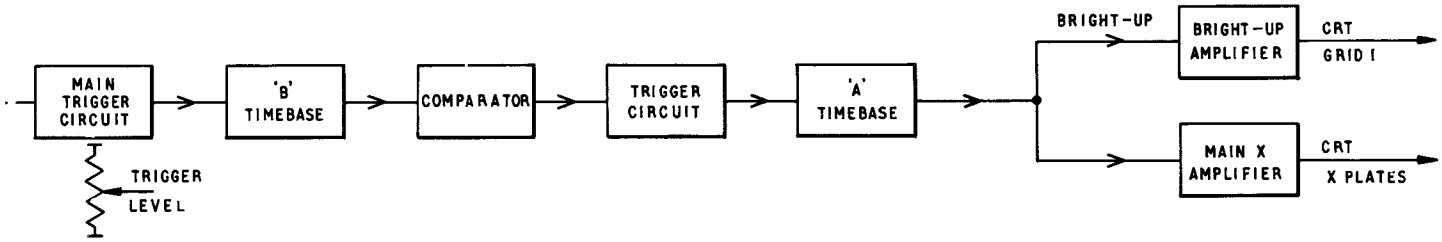
| | |
|---|---|
| ATTENUATOR RATIOS | X1 and X10 |
| INPUT RESISTANCE | 1MΩ on X1, and 10MΩ on X10 |
| INPUT CAPACITANCE | 11pF (nominal) on X10 |
| BANDWIDTH | D.C. to 50 Mc/S min. |
| RISE TIME | 7µs max. |
| OVERSHOOT | 2% max. |
| MAX. INPUT VOLTAGE | 600V peak (combined d.c. and a.c.) |



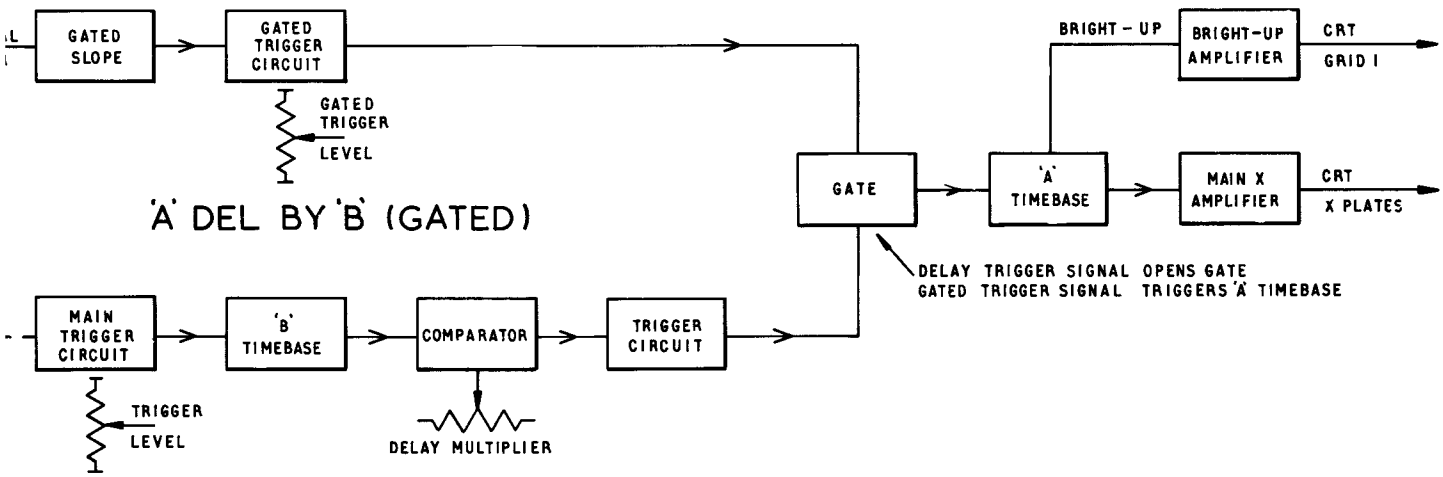

'A' TIMEBASE




'A' BRIGHTENS 'B'

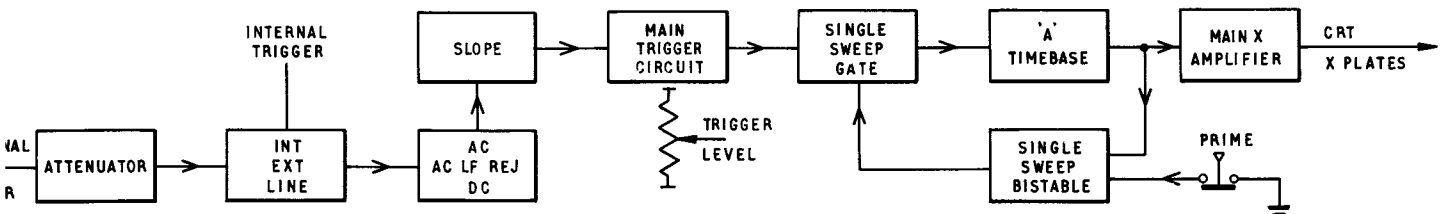



'A' DEL BY 'B'




'A' DEL BY 'B' (GATED)

SINGLE SWEEP



SECTION 4

# MAINTENANCE

# OSCILLOSCOPE

## SECTION 4

## MAINTENANCE

### GENERAL

This Section is divided into four parts viz:-

Calibration: assuming an oscilloscope in working order except for adjustments.

Waveforms: giving a ready means of checking that each of the circuits (except the Y preamplifiers) in the instrument is working as it should. The Y preamplifiers produce no waveforms of their own and therefore d.c. levels only are indicated.

Dismantling: giving advice on obtaining access to PCB's.

Performance Checks: indicating the correct functioning of parts of the instrument not capable of adjustment.

# OSCILLOSCOPE

## SECTION 4

## Part 1

## CALIBRATION AND SETTING-UP PROCEDURE

### GENERAL

The instructions below assume an oscilloscope which is in working order except for adjustments. It is important that the procedure be followed in the order given.
Unless indicated to the contrary all instructions refer to the CDU 150 oscilloscope under test. The word 'Oscilloscope', when used refers to the Oscilloscope in the list of TEST GEAR below. Where in any paragraph a particular control is not mentioned, its position is unchanged from that last mentioned. Instructions to connect a test instrument to a point on the CDU 150 imply that the earthing lead of the instrument is to be connected to chassis as close as possible to the live lead.

### TEST GEAR

The following list of test gear quotes suitable instruments. Other types may be used providing that their performance is adequate. In case of difficulty advice should be sought from

COSSOR ELECTRONICS LTD.,
SERVICE DEPT.
EDINBURGH PLACE
HARLOW : ESSEX
ENGLAND
Tel.Harlow 26624 Telex 81228

| | |
|---|---|
| Multimeter | AVO Model 8 |
| Oscilloscope | Cossor CDU 110 with CAM 111 Plug-in |
| Probe, 1:1 | |
| Probe, 10:1 (2 off) | |
| Digital Voltmeter | Solartron LM1450 |
| Electrostatic Voltmeter, 18kV | Pye Scalamp |
| Oscilloscope Calibrator | Bradley type 156 |

| | |
|---|---|
| Fast rise-time Pulse Generator | Cossor 1090 with 14 dB 75 Ω attenuator and 75 Ω termination |
| Square-wave Generator | Tektronix 106 |
| Constant Amplitude Signal Generator | Tektronix 191 |
| Time Mark Generator | Tektronix 184 |
| LC Meter | Tektronix 130 |
| 2 off BNC - BNC leads | |
| 1 off BNC - Tee-piece | |
| Crocodile clip-leads | |
| 1 off 0.1 μF capacitor | 2 kV d.c. working |

## PRELIMINARIES

Remove the covers as follows:- Remove four screws securing the back cover. Remove four screws securing the bottom cover. Slacken the screws securing the handle on top of the instrument and the screws securing the side trim. Ease out the two side covers.

Check that the mains voltage selector is adjusted to suit the available supply.

## LV POWER SUPPLIES

Connect the Digital Voltmeter, negative to chassis and positive to PCB A as below. Adjust the controls to obtain the readings shown:

| DVM Range | Connect to | Adjust Control | DVM Reading |
|---|---|---|---|
| 200V | Pin 7 | RV2 | +120.0V |
| 200V | Pin 15 | RV3 | + 50.0V |
| 20V | Pin 24 | RV4 | + 12.6V |
| 200V | Pin 33 | RV5 | - 50.0V |

## EHT SUPPLIES

WARNING: The oscilloscope under test MUST be switched off while the test gear is being connected and disconnected.

| | |
|---|---|
| FOCUS | Fully counter-clockwise |
| BRILL | Fully clockwise |
| RV4 (SET BEAM CURRENT) on rear upright of chassis | Fully counter-clockwise |

Connect AVO 8 set to 2500V d.c. range, neg. to TSD-3 on PCB B and pos. to chassis. Connect the electrostatic voltmeter between chassis and the junction of R37/B and C19/B on the rear panel of the instrument. Switch ON and adjust RV2 (SET EHT) on PCB B to obtain an indication of 1140V on the AVO. Check that the ESV reads between 8.8 and 11.2kV. Disconnect the AVO.

Connect the AVO, set to 2.5V d.c., neg. to TSD-3 and pos. to TSC-3 both on PCB B. WARNING: This AVO is 1.2kV from earth when connected. Adjust RV4/B (SET BEAM CURRENT) on left rear upright of chassis to obtain an indication of 0.4V on the AVO. Turn BRILL fully counter-clockwise and check that AVO reading falls to zero. Switch OFF and disconnect all testgear. Switch ON.

MEAN PLATE POTENTIALS

Set controls as follows:-

| | | | |
|---|---|---|---|
| TRIG MODE | X AMP | X5MAG | IN (X1) |
| CHAN MODE | CH2 | X,Y, and Z MOD INPUTS on PLATE SELECTOR board | INT |
| CH2 INPUT | GROUND | | |

Connect an AVO set to 100V d.c. range, across the X pins on the Plate Selector Board (top of instrument, left rear) and adjust X POSITION to obtain 0V on the AVO. Disconnect negative lead of AVO and connect it to chassis. Adjust RV6 (SET MEAN PLATE POTENTIAL) on PCB F to obtain +60V on the AVO. Check that both X pins are between +59 and +61V. Disconnect the AVO.

Connect the AVO, set to 100V d.c. range, across the Y pins on the Plate Selector Board. Adjust CH2 POSITION control to obtain 0V on the AVO. Disconnect the negative lead of the AVO and connect it to chassis. Adjust RV2 (SET MEAN PLATE POTENTIAL) on PCB G to obtain +60V on the AVO. Check that both Y pins are between +59V and +61V. Disconnect the AVO. Adjust BRILL, FOCUS and ASTIG controls to obtain a sharply defined spot.

## PRESETTING A AND B TIMEBASES

Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | TRIG |
| TIMEBASE MODE | A |
| TRIGGER LEVEL | Fully counter-clockwise |
| A TIME/CM | 0.1 ms/cm |
| B TIME/CM | 100 μs/cm |

Connect an AVO set to the 2.5V d.c. range, pos. to pin 29 on PCB E and neg. to chassis. Adjust RV4 (SET BIAS) on PCB E to obtain a reading of 0.7V. Disconnect the AVO.

Connect an AVO set to the 2.5V d.c. range, pos. to pin 30 on PCB E and neg. to chassis. Adjust RV1 (STABILITY) on PCB E to obtain a reading of 1.0V. Disconnect the AVO.

Set the AVO to the 2.5V d.c. range and connect it, pos. to pin 6 on PCB D and neg. to chassis. Adjust RV1 (STABILITY) on PCB D to obtain a reading of 1.0V. Disconnect the AVO.

## X ATTENUATOR FREQUENCY COMPENSATION

Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | X AMP |
| TRIGGER SOURCE | EXT |
| X ATTENUATOR | 1V/cm |
| TRIGGER COUPLING | DC |

Connect the Oscilloscope, set to 50 mV/cm with a X10 probe (overall sensitivity 0.5V/cm) DC Coupled, to pin 8 on PCB C and chassis. Apply 2V p-p 1kHz square wave from the Bradley Calibrator to X INPUT and adjust C5 on PCB C to obtain optimum square wave response.

## PRESETTING TRIGGER CIRCUIT

Set the controls as follows:-

| | | | |
|---|---|---|---|
| X ATTENUATOR | 0.5V/cm | A TIME/CM | 0.1 ms/cm |
| TRIGGER SOURCE | EXT | B TIME/CM | 100μs/cm |
| TRIGGER COUPLING | AC | TIMEBASE MODE | A |
| TRIGGER SLOPE | +VE | TRIGGER MODE | TRIG |

Connect an AVO, set to the 2.5V d.c. range between pins 1 and 2 of PCB C. Adjust TRIGGER LEVEL to obtain a reading of OV.

Connect the Bradley Calibrator to X INPUT and set it to give a 1kHz square wave of 100mV p-p. Adjust RV3 (TRIGGER SLOPE BAL) on PCB C to obtain a stable trace on the CRT. Note the position of RV3.

Set SLOPE to -ve and readjust RV3 to obtain a stable trace. Note new position of RV3.

Set RV3 to a position midway between the two positions noted above, so that a trace is obtained whether SLOPE is set to +ve or -ve, ensuring that the AVO indication is maintained at OV. Disconnect the Calibrator and AVO.

TRACE TWIST

Set TRIGGER MODE to AUTO

Adjust RV6, TRACE TWIST on the Plate Selector Board to obtain a horizontal trace. If the range of adjustment is not enough, reverse the connections to RV6. See access instruction on page 4.33.

CH1 and CH2 INVERT BALANCE

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH2 | CH2 INVERT | IN |
| CH2 INPUT | GROUND | CH1 INPUT | DC |
| CH1 Var. GAIN | CAL | CH1 SENSITIVITY | 5mV/cm |
| CH2 Var. GAIN | CAL | CH2 SENSITIVITY | 5mV/cm |
| CH1 INVERT | IN | TRIGGER MODE | AUTO |

Centre the trace on the CRT screen by means of CH2 POSITION control. Rotate CH2 variable GAIN control counter-clockwise and note any displacement of the trace. Adjust CH2 SET BALANCE so that the trace remains stationary during rotation of CH2 variable GAIN control.

NOTE: CH2 POSITION control may be used if necessary to keep the trace in the middle of the screen.

Pull out CH2 INVERT control and note any displacement of the trace. Adjust RV11 (INVERT BALANCE) on PCB H1 so that the trace remains in the same position whether the INVERT control is in or out.

Set CHANNEL MODE to CH1 and put a short-circuited BNC Plug in CH1 INPUT socket. Repeat the above procedure but using CH1 controls and RV4 (INVERT BALANCE) on PCB H1. Remove shorting plug and disconnect AVO.

MESH AND GEOMETRY

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH2 | TIMEBASE MODE | A |
| CH2 INPUT | GROUND | A TIME/CM | 0.1 ms/cm |
| CH2 SENSITIVITY | 5mV/cm | X5 MAG | In (X1) |
| TRIGGER MODE | AUTO | MESH | Fully clockwise |

Adjust BRILL for a reasonably bright trace. Adjust FOCUS and ASTIG controls to obtain a sharply defined trace.

Set CH2 INPUT to AC and connect the Constant Amplitude Signal Generator to CH2 INPUT with a 1 MHz (approx) signal of level enough to obtain a vertical deflection of 6 cm p-p. Adjust RV8/B (GEOMETRY) on Plate Selector Board located at left rear of top of the instrument to obtain the optimum rectangular raster within the limits of the graticule.

Set CH2 INPUT to GROUND. Connect an AVO, set to the 100V d.c. range, pos. to the wiper of RV8/B (GEOMETRY) on the Plate Selector Board and neg. to the wiper of RV9 (MESH) on the left rear upright of framework. Adjust RV9 (MESH) for an AVO reading of 40V.

MAIN Y AMP GAIN

Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | AUTO |
| TRIGGER SELECTOR | NORMAL |
| TIMEBASE MODE | A |
| CHANNEL MODE | CH2 |
| CH1 & CH2 SENSITIVITY | 5mV/cm |
| CH1 & CH2 INPUT | AC |
| CH1 & CH2 Var. GAIN | CAL |

Connect the Oscilloscope with 10:1 probe and 10mV/cm on each channel, arranged to display difference between channels, one probe to pin 10 and the other pin 11 on PCB G. Apply a 1 kHz square wave to CH2 INPUT of amplitude enough to obtain 500mV (5 cm) p-p display on the Oscilloscope. Adjust RV1 (SET GAIN) on PCB G to obtain 6 cm p-p deflection on the instrument under test. Disconnect the Oscilloscope.

CH1 and CH2 GAIN

Set both CH1 and CH2 SET GAIN controls to approximately 60° from the clockwise end of their travel. Apply an input of exactly 25 mV p-p 1 kHz square wave from the Bradley Calibrator to CH2 INPUT. Adjust RV13 on PCB H1, CH2 PRESET GAIN, to give exactly 5 cm vertical deflection.

Apply the same input to CH1 INPUT and switch CHANNEL MODE to CH1. Adjust RV6 on PCB H1 to give exactly 5 cm vertical deflection. Disconnect the Calibrator.

TRIGGER LEVELS

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH2 | TRIGGER SELECTOR | NORMAL |
| CH2 INPUT | GROUND | A TIME/CM | 0.1 ms/cm |
| TRIGGER MODE | AUTO | CH1 INPUT | DC |
| | | (with s/c BNC plug in input socket) | |
| TIMEBASE MODE | A | | |

Set the Oscilloscope to 50mV/cm, DC coupled and free running timebase, d.c. zero set to middle of screen. Connect it with X10 probe to pin 4 of PCB C. Adjust CH2 position to bring the trace to middle of CRT of the instrument under test. Adjust RV3 (TRIG BAL) on PCB G to bring the trace on the Oscilloscope to the middle of the screen, i.e. 0V input.

Repeat the foregoing paragraph with the TRIGGER SELECTOR set to CH1 using RV5 on PCB H1 and CH2 using RV12 on PCB H1. Check that the voltage at pin 4 of PCB C remains within ± 2 mm as seen on the Oscilloscope with the TRIGGER SELECTOR switched to CH2, NORMAL or to CH1. Disconnect the Oscilloscope.

AUTO TRIGGER LEVEL

Set the controls as follows:-

| | | | |
|---|---|---|---|
| TRIGGER MODE | AUTO | CHANNEL MODE | CH2 |
| TRIGGER SOURCE | INT | CH2 INPUT | DC |
| TRIGGER COUPLING | AC | CH2 SENSITIVITY | 5mV/cm |

| | | | |
|---|---|---|---|
| TRIGGER SLOPE | +VE | CH2 Variable Gain | CAL |
| TRIGGER SELECTOR | CH2 | CH2 INVERT | In |
| TIMEBASE MODE | A | A TIME/cm | 0.2ms/cm |

With 4mV p-p 1kHz square wave to CH2 INPUT and adjust RV2 (AUTO PRESET) on PCB C to trigger the timebase half-way up the positive-going edge.

X AMP AND TIMEBASES

Set the controls as follows:-

| | | | |
|---|---|---|---|
| TRIGGER SOURCE | INT | TIMEBASE MODE | A |
| TRIGGER MODE | AUTO | A TIME/CM | 0.1 ms/cm |
| SLOPE | +VE | A TIME UNCAL | CAL |
| CHANNEL MODE | CH2 | B TIME/CM | 100µs/cm |
| CH2 INPUT | DC | X5 MAG | In (X1) |

Connect the Oscilloscope using a 10:1 probe and sensitivity 0.5V/cm d.c. coupled to pin 15 on PCB E. Adjust RV5 on PCB E to obtain 13V p-p ramp on the oscilloscope. Disconnect oscilloscope.

Apply 100µs/div. marker pulses from the Calibrator to CH2 INPUT, and set CH2 SENSITIVITY to obtain approx. 2 cm vertical deflection. Switch TRIGGER MODE to TRIG and adjust TRIGGER LEVEL to obtain a stable trace. Adjust RV4 (X1 GAIN) on PCB F to obtain approx 11 cm horizontal trace.

Adjust RV3 (SWEEP CAL) on PCB E in conjunction with the horizontal POSITION control to align the second and tenth pulses with the second and tenth divisions respectively on the graticule.

Set A TIME/CM to 1 µs/cm and the input to 1 µs/div. Adjust C11 on PCB E for 1 pulse/cm (2nd to 10th divisions on the graticule).

Check all timebase ranges adjusting RV3 and C11 as above to spread any errors and check that in no case does the error exceed ± 3 mm in 10 cm.

NOTE: C11 on PCB E is effective only on the 0.1µs/cm to 5µs/cm ranges.

With A TIME/CM set to 100µs/cm and the input to 20µs/div., pull out X5MAG and adjust RV5 (X5GAIN) on PCB F for 1 pulse/cm (2nd to 10th divisions on the graticule).

Set the A TIME/CM to 0.1μs/cm and the input to 20n/s/div. Rotate the X POSITION controls to observe the first ten pulses of the expanded trace. Ignore the first four pulses and adjust C5 on PCB F to obtain 1 pulse/cm from the fifth to the tenth divisions on the graticule. Push X5 MAG control in. Disconnect the Calibrator.

B TIMEBASE

Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | TRIG |
| TIMEBASE MODE | A BRIGHTENS B |
| A TIME/CM | 0.1 ms/cm |
| B TIME/CM | 1ms/cm |

Connect the Oscilloscope with 10:1 probe, sensitivity 0.5V/cm, DC coupled, to pin 13 on PCB D. Apply an input of 0.2μs/div. from the Calibrator to CH2 INPUT, and adjust RV3 (SWEEP LENGTH) on PCB D to obtain 13V p-p ramp on the Oscilloscope. Disconnect oscilloscope.

Set B TIME/CM to 1 ms/cm and the input to 1ms/div. Adjust RV2 (SWEEP CAL) on PCB D to align the second and tenth marker pulses with the second and tenth divisions respectively of the graticule.

Set B TIME/CM to 1μs/cm and the input tc 1μs/div. Adjust C6 on PCB D for 1 pulse/cm. (Second to tenth divisions).

Check all B TIME/CM ranges adjusting RV2 and C6 as above to spread any errors and check that in no case does the error exceed ± 3mm in 10cm.

NOTE: C6 is effective only on the 1μs/cm to 5μs/cm range.

Set the DELAY MULTIPLIER to 5.0 on dial, B TIME/CM to 100μs/cm and A TIME/CM to 10μs/cm. Set the input from the Calibrator to 100μs period, trigger the timebase by means of the TRIGGER LEVEL control, and adjust BRILL to show a brightened region approximately half-way along the trace.

Connect the Oscilloscope via a 0.1μF 2kV capacitor with a 10:1 probe, 1V/cm sensitivity (10V/cm overall) AC coupled, timebase 0.5ms/cm, to the junction of C2 and R9 at TSA2 on PCB B.

WARNING: TSA 2 is at -1290V with respect to earth.

Adjust RV1 on PCB B to obtain a flat top response of the step waveform displayed on the Oscilloscope within ± 1 mm. Disconnect the Oscilloscope.

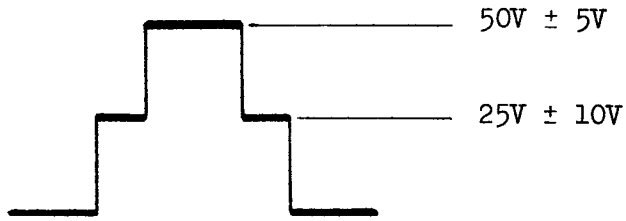



Fig.4.2 Waveform observed
during adjustment of Timebase 'B'

DELAY CALIBRATION

Turn the DELAY MULTIPLIER control fully counter-clockwise. Check that dial reads 0.5. If not, loosen the knob and set it to 0.5. Set B TIME/CM to 100μs/cm and A TIME/CM to 1μs/cm. Set the Calibrator to give 50μs/div. marker pulses and trigger the timebase by means of the TRIGGER LEVEL control.

Set the DELAY MULTIPLIER control to 10.5, adjust RV4 (SET MAX DELAY) on PCB D so that the brightened region just starts on the leading edge of the 22nd marker pulse. Turn DELAY MULTIPLIER to 0.5 and adjust RV5 (SET MIN DELAY) on PCB D so that the brightened region starts on the leading edge of the second pulse.

Repeat the foregoing paragraph until both conditions are satisfied. Turn the DELAY MULTIPLIER so that the brightened region starts at the leading edge of the 11th pulse and check that the dial reads between 4.95 and 5.05.

CASCADE

| | | | |
|---|---|---|---|
| CH 1 Var | CAL | TIMEBASE MODE | A |
| CH 1 SENSITIVITY | 5mV/cm | A TIME/CM | 0.5ms/cm |
| CH 1 INPUT | CASCADE | CHANNEL MODE | CH 1 |
| CH 2 VAR | CAL | TRIGGER SELECTOR | NORMAL |
| CH 2 SENSITIVITY | 5mV/cm | TRIGGER MODE | AUTO |
| CH 2 INPUT | AC | TRIGGER SOURCE | INT |

Apply an input of 5mV p-p, 1kHz square wave from the Calibrator to CH 2 INPUT. Adjust RV14 on PCB H to obtain 5 cm p-p vertical deflection.

X - Y OPERATION

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH1 | TRIGGER SELECTOR | CH2 (XY) |
| CH 1 INPUT | AC | TRIGGER MODE | X AMP |
| CH 2 INPUT | DC | TRIGGER SOURCE | INT (XY) |
| CH 2 SENSITIVITY | 5mV/cm | TRIGGER COUPLING | AC |

Put the short-circuited BNC plug in CH 1 INPUT socket. Apply an input of 1 kHz square wave 20mV p-p to CH 2 INPUT from the Calibrator. Adjust RV4 (SET TRIG GAIN) on PCB G to obtain 4cm p-p horizontal deflection.

NOTE: Adjustment of RV4 results in a small d.c. shift at pin 4 of PCB C. Disconnect the calibrator, repeat the procedure described under the heading TRIGGER LEVELS on page 4.8.

Y AMPLIFIER, H.F. COMPENSATION

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CH1 INPUT | DC | CH2 INPUT | DC |
| CH1 SENSITIVITY | 5mV/cm | CH2 SENSITIVITY | 5mV/cm |
| CH1 Var. gain | CAL | CH2 Var. gain | CAL |
| CHANNEL MODE | CH 1 | TIMEBASE MODE | A |
| TRIGGER SELECTOR | NORMAL | A TIME/CM | 0.5ms/cm |
| TRIGGER SOURCE | INT | TRIGGER MODE | AUTO |
| TRIGGER COUPLING | AC | TRIGGER SLOPE | +ve |
| | | X5 MAG | In (X1) |

Ensure that the instrument has been switched on for at least half an hour.

Connect the Cossor 1090 Fast rise-time pulse generator via the 14dB attenuator and the 75 ohm termination to CH 2 INPUT and adjust the input level to obtain 6cm p-p on the CRT at approximately 1 MHz.

Pull out the X5 MAG control and adjust X POSITION to observe the second pulse. Adjust C47 & C48 on PCB H1 and C24 on PCB G to minimum capacitance, i.e. maximum undershoot. Adjust C25 and C26 in turn bringing up the leading edge while maintaining a level pulse top. Adjust C24 and C23 in turn to bring up the leading edge still further.

Push in the X5 MAG control and adjust C25 to obtain a level pulse top. Pull out X5 MAG control.

Set CH2 variable GAIN fully counter-clockwise and adjust C48 on PCB H1 (rear trimmer) to obtain the fastest rise time with minimal pulse irregularities and overshoot. Restore CH2 variable GAIN control to CAL. Bring up the leading edge with C47 on PCB H (front trimmer) in conjunction with C23 on PCB G.

Disconnect the Cossor 1090, termination and attenuator from CH2 and connect the Constant Amplitude Signal Generator, set to a frequency of 50kHz, to CH2 INPUT. Set A TIME/CM to 0.1ms/cm and adjust the input level to obtain 8cm p-p display. Increase the frequency till the amplitude of the displayed waveform falls to 5.6 cm. Check that the frequency is not less than 35 MHz. Disconnect the Signal Generator.

Set CHANNEL MODE to CH1, A TIME/CM to 0.5μs/cm, with X5 MAG control pulled out. Apply an input from the Cossor 1090 to obtain a 6cm p-p vertical display. Adjust the X POSITION controls to observe the second pulse. Set CH1 Variable GAIN fully counter-clockwise and adjust C46 (rear trimmer) on PCB H1 for optimum pulse shape. Restore CH1 variable GAIN to CAL and adjust C45 (front trimmer) on PCB H1 for optimum pulse shape.

Ascertain the upper frequency 3dB point as detailed for CH2. If less than 35MHz it will be necessary to repeat the procedure, setting CH1 followed by CH2.

## ATTENUATORS, H.F. RESPONSE

Set the controls as follows:

| | | | |
|---|---|---|---|
| CH 1 INPUT | DC | CH2 INPUT | DC |
| CH 1 SENSITIVITY | 5mV/cm | CH 2 SENSITIVITY | 5mV/cm |
| CH 1 Var. gain | CAL | CH 1 Var. gain | CAL |
| TRIGGER SELECTOR | NORMAL | TIMEBASE MODE | A |
| TRIGGER SOURCE | INT | A TIME/CM | 1ms/cm |
| TRIGGER COUPLING | AC | TRIGGER MODE | TRIG |
| | | TRIGGER SLOPE | +ve |

Connect in Square Wave Generator to CH1 INPUT with or without the Capacitance Standardizer as detailed below the corresponding trimmers for optimum square wave response. Repeat for CH2 with the appropriate trimmers.

| SENSITIVITY | TRIMMER CAPACITOR | | ACTION |
|---|---|---|---|
| | CH1 (PCB J1) | CH2 (PCB J2) | |
| 5mV/cm | C14 | C28 | Connect the LC Meter on 30 pF FSD range across INPUT socket and adjust for 25pF |
| 10mV/cm | C12 | C26 | Apply 5kHz square wave input from TEK106, of such input as gives 5cm p-p (approx) deflection and adjust for optimum square wave |
| 20mV/cm | C10 | C24 | |
| 50mV/cm | C8 | C22 | |
| 0.1V/cm | C13 | C27 | |
| 0.2V/cm | C11 | C25 | |
| 0.5V/cm | C5 | C19 | |
| 5V/cm | C3 | C16 | |
| 5V/cm | C9 | C17 | Disconnect input. Connect LC Meter across INPUT socket and adjust for 25pF |
| 0.5V/cm | C6 | C20 | |
| 50mV/cm | C2 | C23 | |

CALIBRATOR

Set the controls as follows:

| | | | |
|---|---|---|---|
| CH 1 | AC | CH2 INPUT | AC |
| CH 1 SENSITIVITY | 5mV/cm | CH2 SENSITIVITY | 5mV/cm |
| CH 1 Var. gain | CAL | CH2 Var. gain | CAL |
| TRIGGER SELECTOR | CH2 | CHANNEL MODE | CH1 |
| TRIGGER SOURCE | INT | TRIGGER MODE | X AMP |
| TRIGGER COUPLING | AC | | |

Apply an input of 1kHz, 25mV p-p square wave from the Bradley Calibrator type 156 to CH2 input. Connect CH1 INPUT to the 25mV CALIBRATOR socket of the instrument under test. Check that the display is a 4 point Lissajou figure and adjust RV1 (FREQ.ADJ.) on PCB F to obtain a beat frequency of less than 1 Hz.

# OSCILLOSCOPE

## SECTION 4

## Part 2

## WAVEFORMS

Conditions of test

The tests described below will demonstrate the correct functioning of all parts of the circuit, but only if they are carried out in the order given. All the oscillograms are taken from an oscilloscope used as testgear, not from the CDU150-CT531/3 under test; in every case d.c. zero is on the horizontal centre-line of the oscillogram. Controls designated in CAPITALS are those of the CDU150-CT531/3 under test.

Control settings of both the CDU150-CT531/3 and the Oscilloscope must remain in the same position as for the preceding test unless explicit instructions to the contrary are given.

L.V. Power supply

(1) Ensure that the CDU150 is switched OFF. Connect it to a 50 Hz or 60 Hz supply variable between 210 and 250V. Set the Voltage Selector to 230V and adjust the supply to 230V. Remove FS4 on PCB A. Unsolder the two leads from pin 8 on PCB B, but leave them connected together and temporarily insulate the joint. Short-circuit C2 on PCB F. Switch ON.

(2) Using a digital voltmeter, check the supply voltages with respect to chassis as follows:-

| PCB A, pin | Voltage |
|---|---|
| 7 | +120 |
| 15 | + 50 |
| 24 | + 12.6 |
| 33 | - 50 |

(3) Using an oscilloscope with X1 probe, sensitivity 5mV/cm, a.c. coupled, timebase 10ms/cm, check 100 Hz ripple as follows:-

| Test Point | | Max. 100 Hz ripple |
|---|---|---|
| PBC A | - 7 | 10 mV p-p |
| | - 15 | 2 mV p-p |
| | - 24 | 2 mV p-p |
| | - 33 | 5 mV p-p |

(4) Using the oscilloscope as in (3) above, and the DVM, vary the supply voltage over the range 214 - 246V and check the following:-

| Test Points | | DVM limits | Max. 100 Hz ripple |
|---|---|---|---|
| PCB A | - 7 | 119.7 - 120.3 | 15 mV p-p |
| | - 15 | 49.88- 50.12 | 3 mV p-p |
| | - 24 | 12.57- 12.63 | 3 mV p-p |
| | - 33 | 49.88- 50.12 | 7.5 mV p-p |

(5) Switch power OFF, replace FS4 on PCB A, restore leads to pin 8 on PCB B and remove the shorting link from C2 on PCB F.

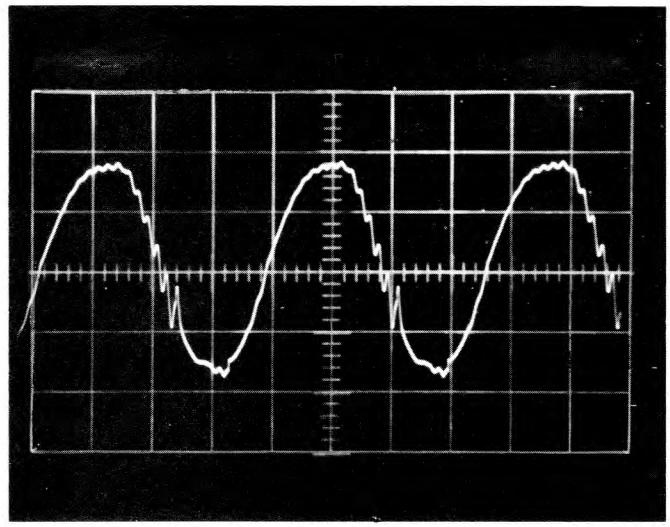
EHT Supply

Connect an AVO 8 set to the 2500V range, -ve to TSD/3 on PCB B, +ve to chassis. Connect an electrostatic voltmeter capable of indicating 15kV between the junction of R37 & C19 (circuit B) and chassis. Switch ON.

(1) Vary the BRILL control over its whole range and check that the AVO reading remains between 1140V and 1155V, and that of the ESV varies by not more than 10% of its reading at minimum brilliance. Restore the BRILL control to minimum brilliance immediately, switch off and disconnect both voltmeters.

(2) Connect an oscilloscope as follows and observe the oscillogram.

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| T1 b (cct B) | X10 probe |
| Chassis | 2V/cm |
| | a.c. coupled |
| | 10μs/cm |
| | -ve slope |



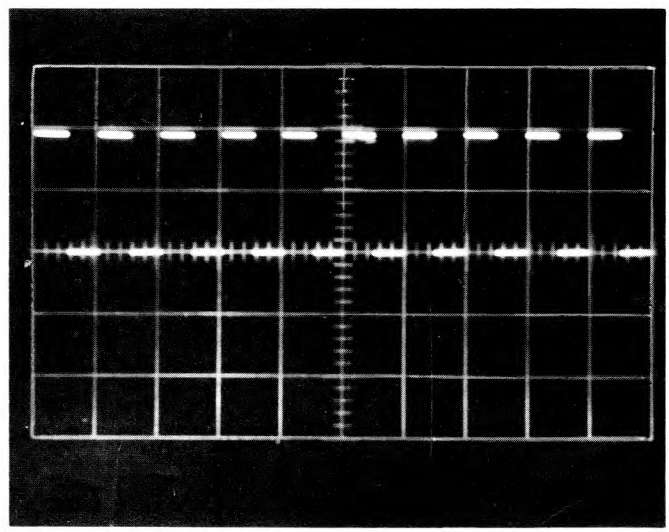
Trigger Circuit

(1) Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | XAMP |
| TRIGGER SOURCE | EXT |
| X ATTENUATOR | 0.5V/cm |

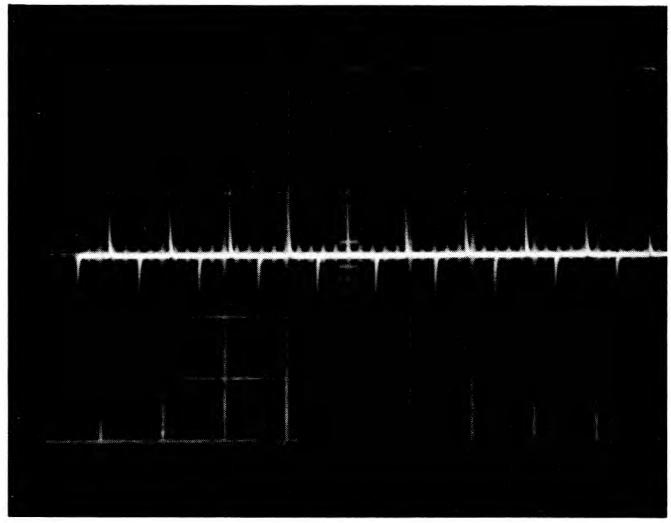
Apply an input of 1V p-p, 1kHz squarewave to X INPUT.

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 3 on PCB C | X10 probe |
| | 50mv/cm |
| | d.c. coupled |
| | 1ms/cm |
| | +ve slope |



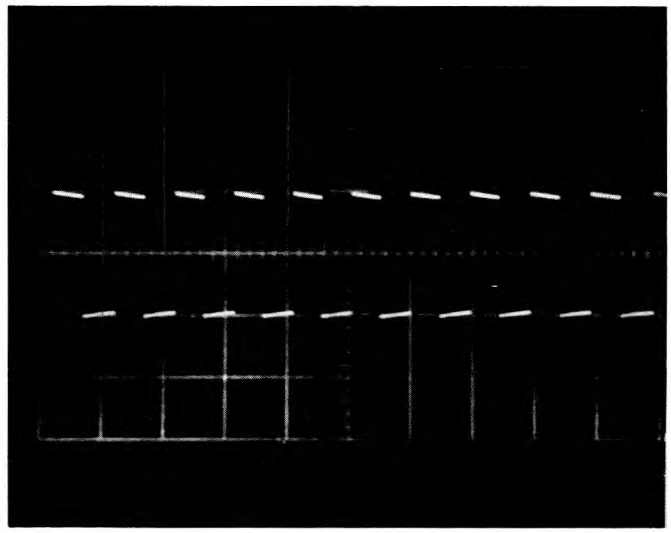
TRIGGER COUPLING - DC

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 3 on PCB C | X10 probe |
| | 50mv/cm |
| | d.c. coupled |
| | 1ms/cm |
| | +ve slope |



TRIGGER COUPLING - AC LF REJ

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 3 on PCB C | X10 probe |
| | 50mv/cm |
| | d.c. coupled |
| | 1ms/cm |
| | +ve slope |



TRIGGER COUPLING - AC

(2) Set the controls as follows:-

| | |
|---|---|
| TRIGGER COUPLING | AC |
| X ATTENUATOR | 1V/cm |

Increase the input to 2V p-p and check that Fig.4 is repeated. Set the X ATTENUATOR to 5V/cm and increase the input to 10V p-p. Check that Fig.4 is repeated.

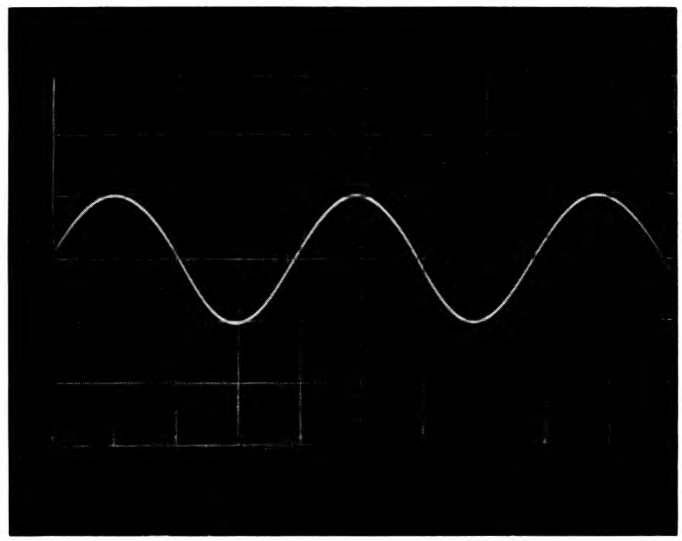
(3) Set the controls as follows:-

| | |
|---|---|
| X ATTENUATOR | X1 |
| TRIGGER MODE | AUTO |
| A TIME/cm | 5μs/cm |

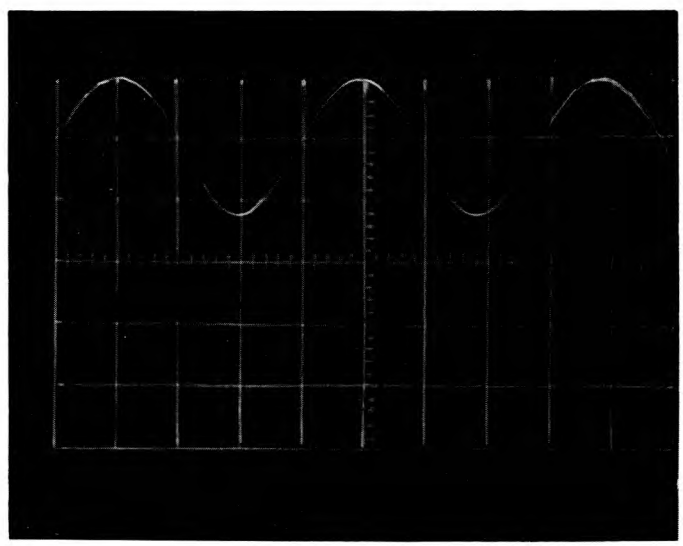
Adjust BRILL FOCUS and ASTIG for a sharply defined trace. Switch TRIGGER MODE to TRIG.

Apply an input of 1V p-p, 50kHz sine wave to X INPUT. Adjust TRIGGER LEVEL to trigger the timebase.

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| | x 10 probe |
| | 5μs/cm |

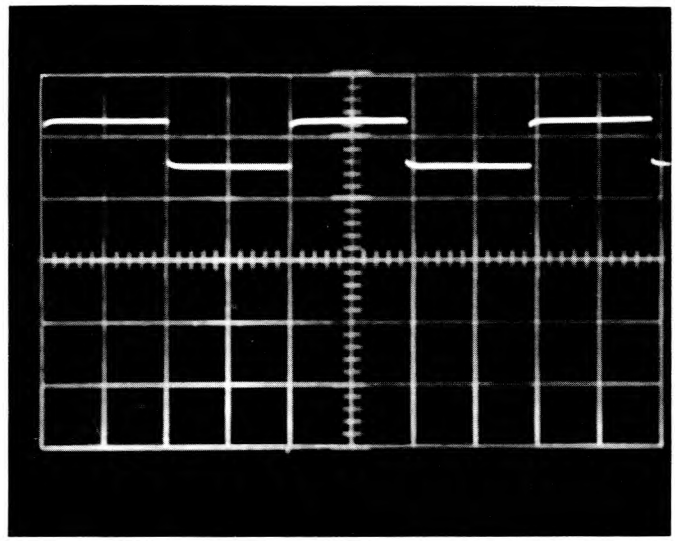


| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| | x 10 probe |
| Pin 7 on PCB C | |
| then | |
| Pin 1 on PCB C | |

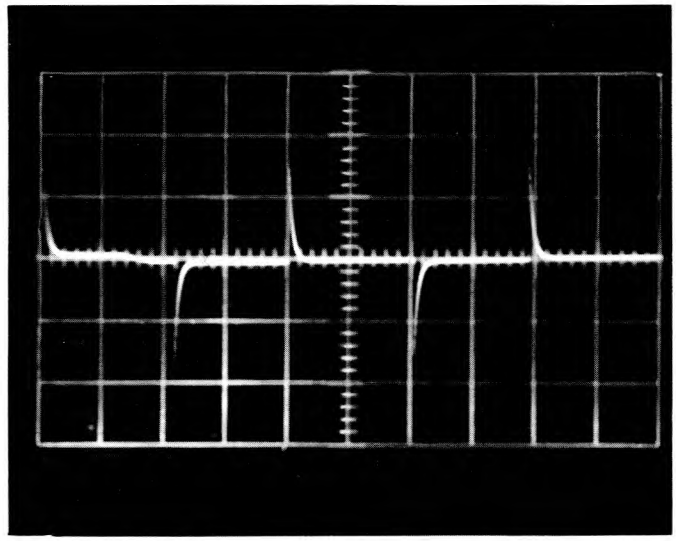


Transfer probe to Pin 2 on PCB C, set SLOPE to -ve and check that Fig.6 is repeated.

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| TR10 collector on PCB C | x 10 probe 0.5V/cm |



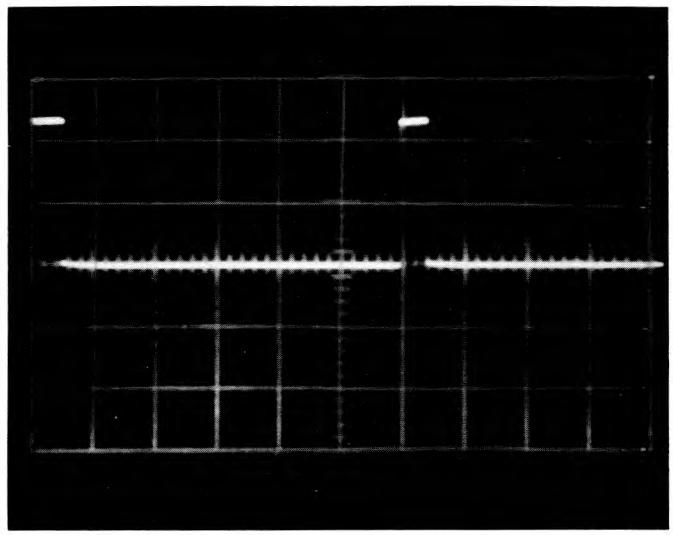
| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 11 on PCB C | x 10 probe 0.2V/cm |



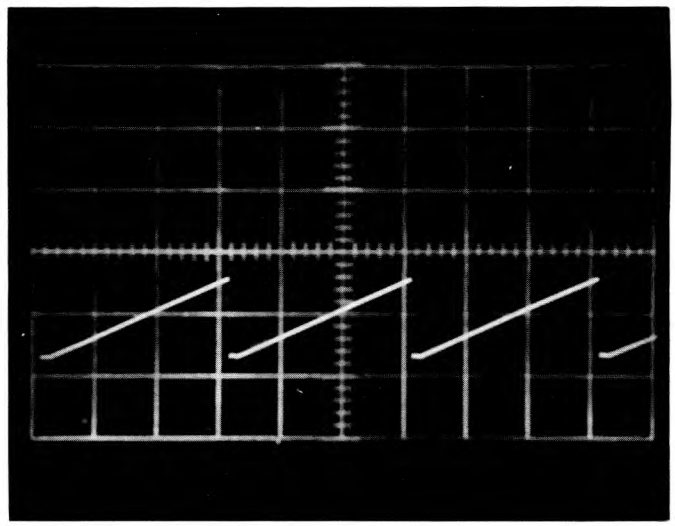
NB Negative-going spikes move with TRIGGER LEVEL control.

A Timebase

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 6 on PCB E | Check that Fig.8 is repeated |
| Oscilloscope connected to:- | Oscilloscope set to:- |
| TR4 collector on PCB E | x 10 probe<br>0.5V/cm<br>10μs/cm<br>+ve slope |

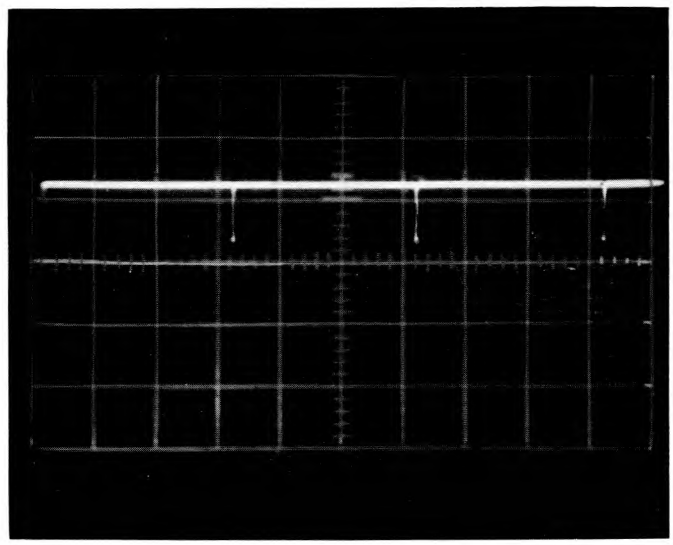


| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 15 on PCB E | x 10 probe<br>1V/cm<br>20μs/cm<br>-ve slope |

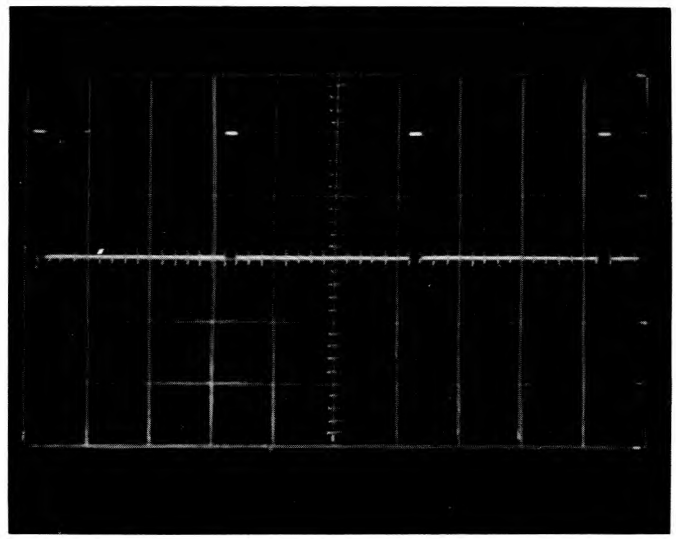


Set CHANNEL MODE to ALT

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 14 on PCB E | x 10 probe<br>0.5V/cm<br>+ve slope |



| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| | X10 probe |
| TR1 collector | 0.2V/cm |
| on PCB E | |



Switch CHANNEL MODE to CH2

X Amplifier

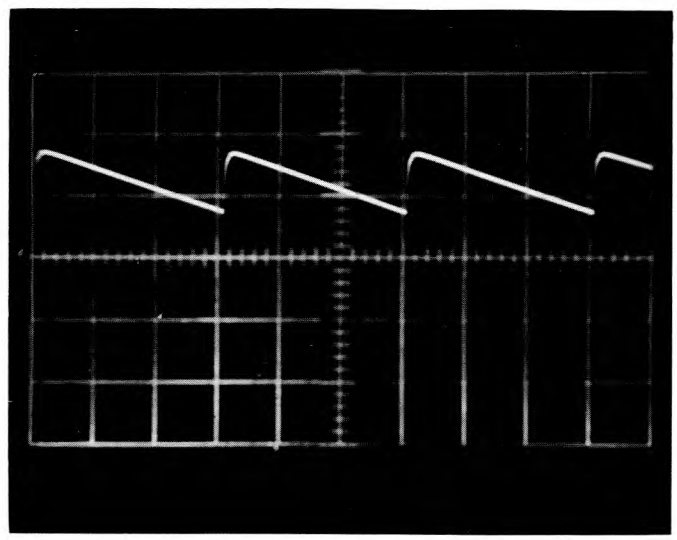
Adjust TRIGGER LEVEL to trigger the timebase

| Oscilloscope connected to:- | Oscilloscope set to:- X10 probe |
|---|---|
| Pin 7 on PCB F | 1V/cm |
| | -ve slope |

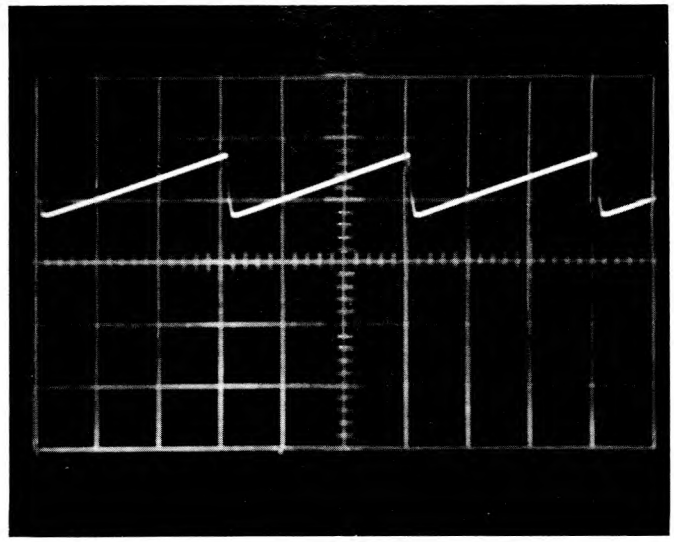
Check that Fig.10 is repeated

Connect an AVO on 100V d.c. range across pins 16 and 17 on PCB F and adjust Horizontal POSITION controls for 0V

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| | x 10 probe |
| Pin 16 on PCB F | +ve slope |
| | 5V/cm |

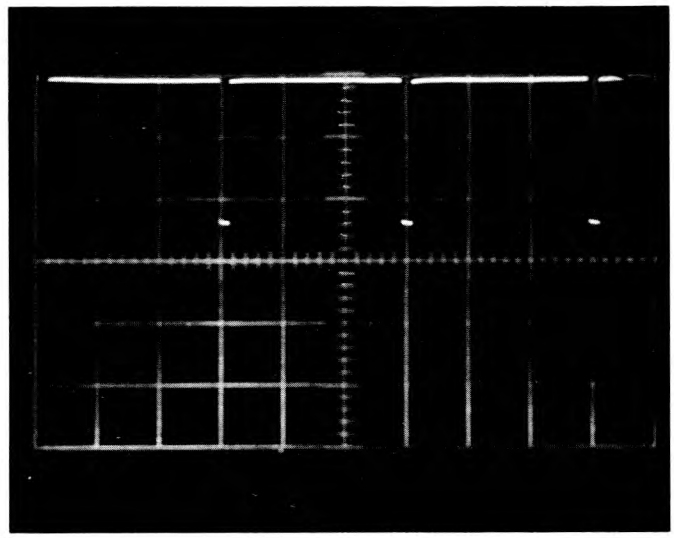


| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 17 on PCB F | -ve slope |



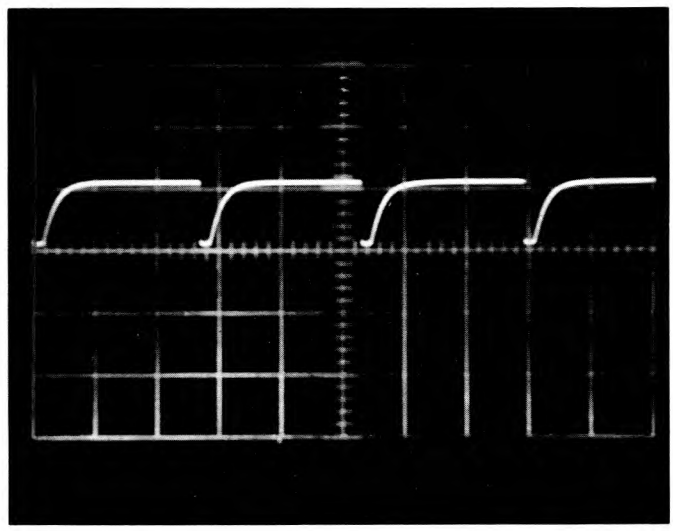
Bright-up

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 13 on PCB B | 2V/cm<br>+ve slope |



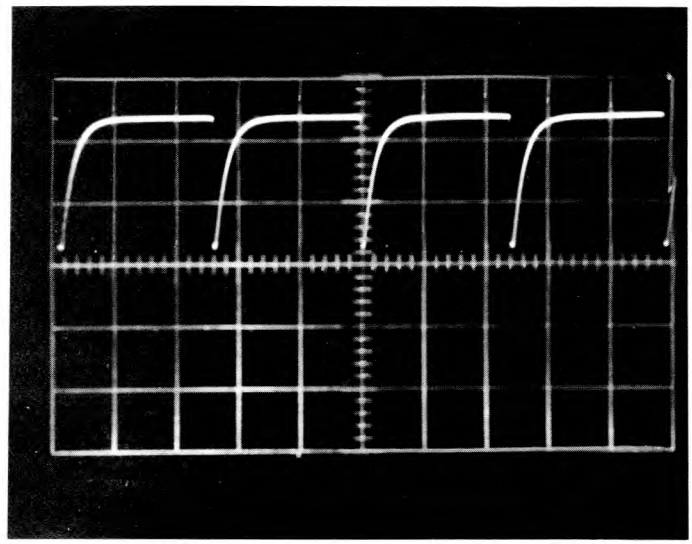
Set BRILL fully counterclockwise

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 14 on PCB B | 5V/cm<br>2μs/cm<br>-ve slope |



Set BRILL fully clockwise

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 14 on PCB B | 5V/cm |
| | 2μs/cm |
| | -ve slope |

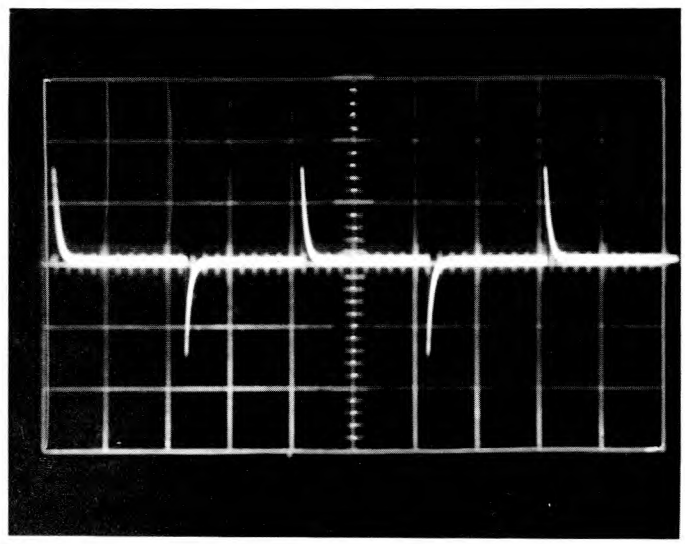


B Timebase

Set the controls as follows:-

| | |
|---|---|
| TIMEBASE MODE | A BRIGHTENS B |
| A TIME/cm | 1μs/cm |
| B TIME/cm | 10μs/cm |
| DELAY MULTIPLIER | 5.0 |

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| | 0.2V/cm |
| Pin 5 on PCB D | 5μs/cm |
| | +ve slope |



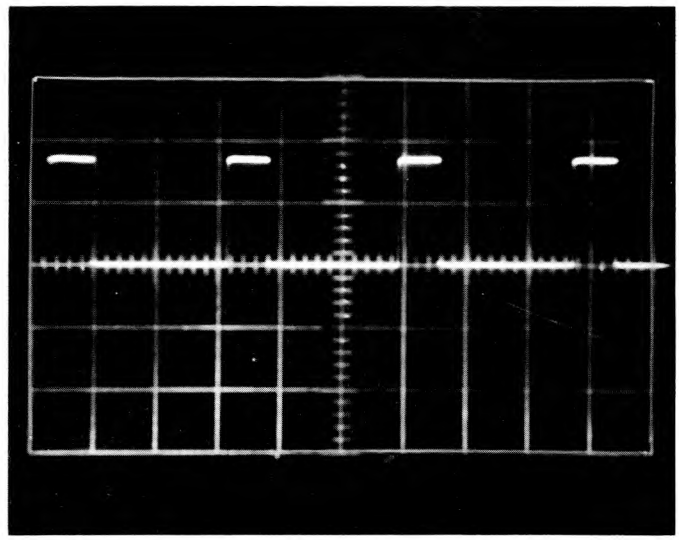
Oscilloscope connected to:-

Pin 7 on PCB D

Oscilloscope set to:-

0.5V/cm

50μs/cm



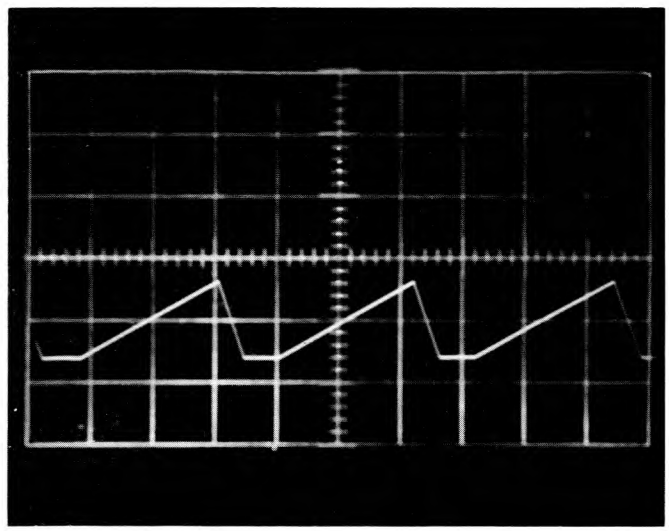
Oscilloscope connected to:-

Pin 13 on PCB D

Oscilloscope set to:-

1.0V/cm

-ve slope

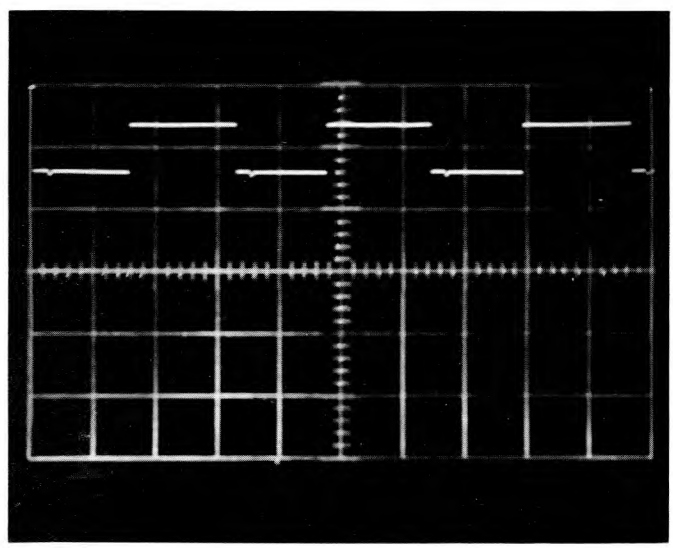


Oscilloscope connected to:-

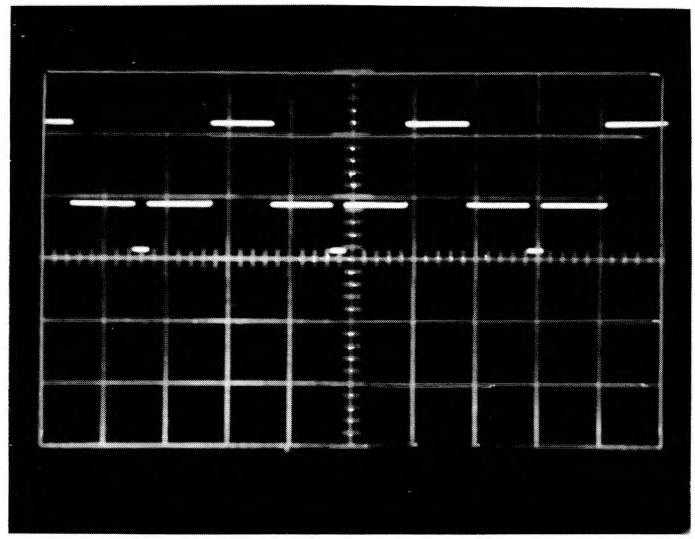
Pin 14 on PCB D

Oscilloscope set to:-

0.5V/cm



| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 1 on PCB D | 0.2V/cm<br>+ve slope |



Auto Trigger

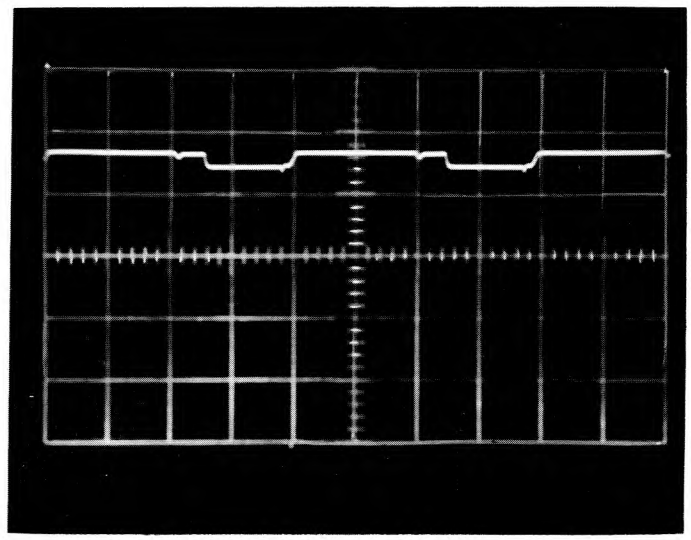
Set the controls as follows:-

TIMEBASE MODE A
TRIGGER MODE AUTO

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| Pin 18 on PCB D | 0.2V/cm<br>5μs/cm<br>+ve slope |

Check that the lower waveform on page 4.21 is repeated.

Pin 19 on PCB D



Remove input to CDU120-CT531/3 and check that a d.c. level of -1V is displayed on the oscilloscope.

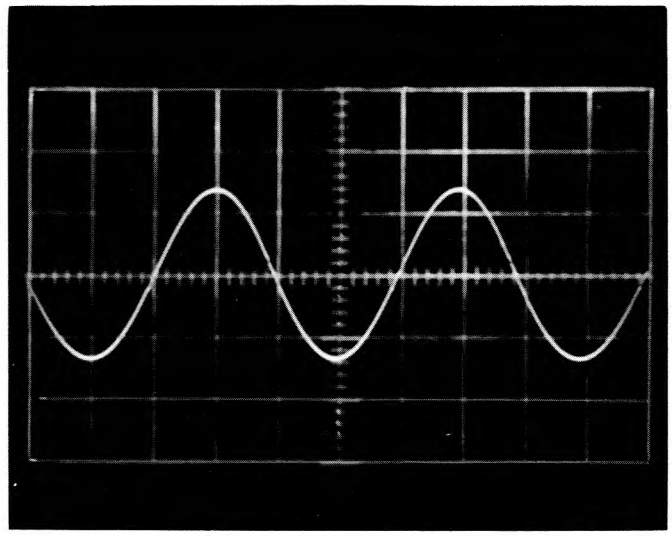
Gated

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CH2 INPUT | AC | TRIGGER SOURCE | INT |
| CH2 SENSITIVITY | 0.2V/cm | SLOPE | +VE |
| CHANNEL MODE | CH2 | GATED SLOPE | +VE (In) |
| TRIGGER SELECTOR | NORMAL | TIMEBASE MODE | A |
| TRIGGER MODE | TRIG | A TIME/CM | 5μs/cm |

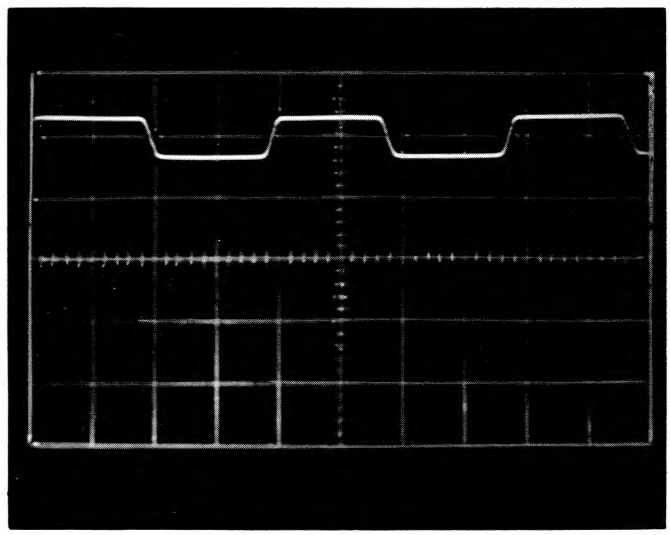
Transfer the 1V p-p 50kHz input to CH2 INPUT. Adjust TRIGGER LEVEL to trigger the timebase. Set TIMEBASE MODE to GATED and rotate GATED TRIGGER LEVEL to trigger the timebase halfway up the +ve-going slope. Centre the trace using the CH2 POSITION control.

| Oscilloscope connected to:- | Oscilloscope set to:- (CH2) |
|---|---|
| Pin 15 on PCB C | 0.1V/cm |



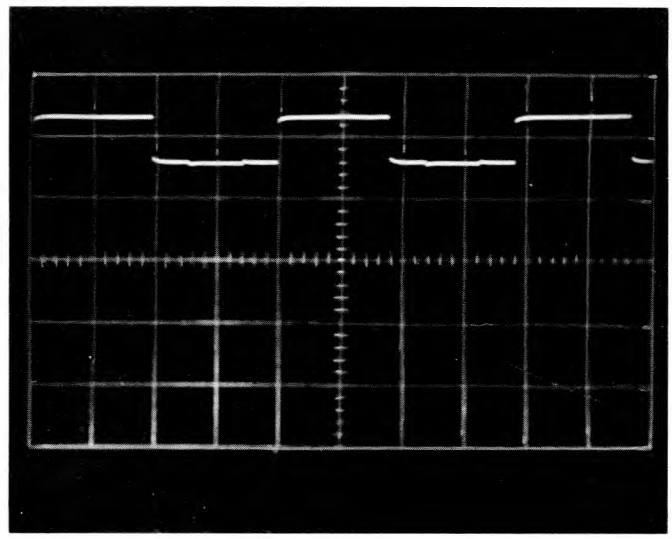
Switch TRIGGER SELECTOR to CH2. Oscilloscope display should remain stationary independant of CH2 POSITION control.

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| TR15 collector on PCB C | 0.5V/cm |

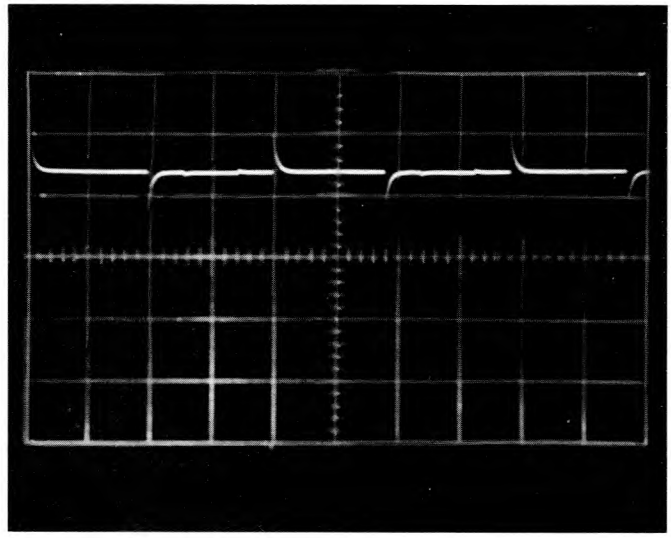


OSCILLOSCOPE

| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| TR21 collector on PCB C | 0.5V/cm |



| Oscilloscope connected to:- |
|---|
| Pin 20 on PCB C |



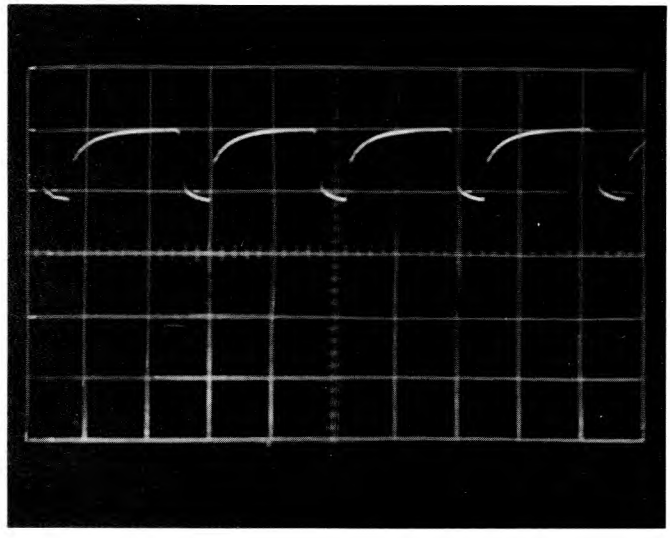
Chopped

Set the controls as follows:-

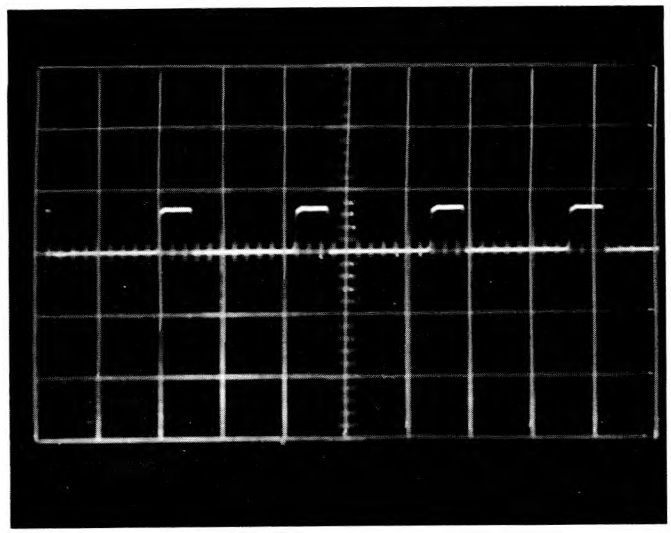
TIMEBASE MODE A

CHANNEL MODE CHOP

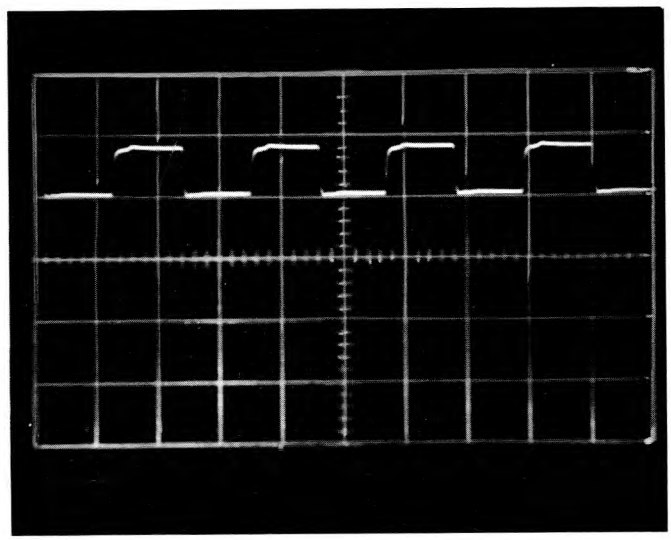
| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| PCB H2 | 0.5V/cm |
| TR32 collector | 0.5μs/cm |
| | -ve slope |



| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| PCB H2 | 0.5V/cm |
| TR34 collector | 0.5μs/cm |
| | -ve slope |



| Oscilloscope connected to:- | Oscilloscope set to:- |
|---|---|
| PCB H2 Pin 1 | 1μs/cm |



## Y DEFLECTION SYSTEM

The Y deflection system produces no waveforms of its own, and any input signal levels are of very small amplitude. A table of d.c. voltages, with the input sockets short-circuited, is therefore given. All measurements are made with an AVO.

VOLTAGES ON PCB H1

| TRANSISTOR | | | VOLTAGE | |
|---|---|---|---|---|
| | | | MIN | MAX |
| TR1 | TR18 | source | + 0.1 | + 4.1 |
| TR3 | TR20 | emitter | - 0 49 | + 3.49 |
| TR7 | TR24 | base | + 7.16 | + 8.44 |
| TR7 | TR24 | collector | + 6.46 | + 7.54 |
| TR5 | TR22 | emitter | - 1.29 | + 2.97 |
| TR10 | TR27 | collector | + 0.6 | + 0.8 |
| TR12 | TR28 | collector | + 9.8 | +10.2 |
| TR12 | TR88 | emitter | + 5.76 | + 6.94 |
| TR14 | | base | +10.6 | +10.9 |

VOLTAGES ON PCB H2

| | | | | |
|---|---|---|---|---|
| TR16 | | base | +14.5 | +15.6 |
| TR16 | | collector | +13.8 | +14.9 |

VOLTAGES ON PCB G

| | | | | |
|---|---|---|---|---|
| TR1 | TR2 | base | +13.8 | +14.9 |
| TR1 | TR2 | collector | +11.4 | +13.4 |
| TR3 | TR4 | collector | + 3.7 | + 5.3 |
| TR9 | TR10 | collector | + 9.6 | +10.6 |
| TR11 | TR12 | emitter | +11.6 | +12.2 |
| TR11 | TR12 | base | +12.3 | +12.8 |
| D3 | D7 | cathode | +60 | +60* |
| TR14 | | base | +3.2 | +5.4 |

* This voltage is established by the Mean Plate Potential adjustment, see Section 4 Part 1, calibration. If it is in error, the calibration procedure should be carried out.

OSCILLOSCOPE

SECTION 4

Part 3

# DISMANTLING

To obtain access to the printed circuit boards or to the components behind them the following procedure should be adopted.

To remove covers:-

Remove four screws securing the rear cover. Remove four screws securing the bottom cover. Slacken the screws securing handle and side-trims and ease out both side covers.

PCB A:-

Release five captive screws securing the PCB and hinge forward about the cableform.

PCB B:-

Unsolder D15 from the terminal strip, R47 from pin 5, and the leads from pins 2 and 4. Release the five captive screws securing the PCB and hinge about the cableform.

PCB C:-

Unsolder the leads from pins 1, 2, 3 and 4 and from pins 21, 22 and 23. Unplug the green socket from the plug on the centre metalwork. Release the five captive screws and the PCB can be hinged towards the centre.

PCB D:-

Release the five captive screws securing the PCB which can then be pulled forward, easing it carefully past adjacent cableforms.

PCB E:-

Release the five captive screws securing the PCB and ease it carefully past adjacent cableforms. It will then hinge downwards.

PCB F:-

Unplug the five coloured sockets from the pins in the centre metalwork. Release the six captive screws securing the PCB and hinge it outwards.

PCB G:-

Unsolder the leads from pins 1 and 2. Release the two screws immediately above the PCB and also the screw at the rear left-hand corner of the Plate Selector Board. Hinge the board forward about the lower edge.

Plate Selector Board:-

First hinge forward PCB G as directed in the previous paragraph. Unplug the red and black sockets from the Y-plate pins of the CRT and hinge up the board part-way. Unplug the yellow and blue sockets from the X-plate pins of the CRT and hinge up the board to its full extent.

Y Preamplifier:-

From the bottom of the instrument, unsolder all leads from the edge of PCB H2 including the coaxial lead. Remove four screws, two from the bracket fixed to the centre partition and two from the side-member of the chassis, taking care not to drop the spacers into the instrument. Turn the instrument right-way-up and remove four screws from the corners of the front panel of the unit. Withdraw the unit.

PCB H1:-

Unsolder the two earth braids on the INVERT switch operating rods and remove the rods. Remove, without unwiring, RV7 and RV15 POSITION potentiometers and RV2 and RV9, GAIN potentiometers.

Unsolder R38 from the earth tag inside the unit and the leads from pins 18 and 19. Remove six screws securing the PCB which can then be lifted. Further leads may be unsoldered to attain the desired degree of freedom.

PCB H2:-

Remove the four corner securing screws and unsolder such leads as are necessary to achieve the desired degree of freedom.

PCB J1 & PCB J2:-

Removal of these boards entails complete dismantling the pre-amplifier unit and should not be attempted.

Replacement of CRT:-

Hinge out PCB G and the Plate Selector Board (see above). Unplug the four deflector plate connectors and slacken the tube-neck clamp (if fitted) which appears through the tube screen adjacent to the Y-plate connectors. Remove the retaining stop (if fitted) from behind the tube base, and pull off the tube base taking care not to bend the tube pins. Remove the PDA connector (Red rubber) from the tube envelope just behind the front panel. Remove the bezel, graticule and filter by means of the four corner screws.

Push the tube forward from the rear and draw it out until the white twist-coil leads appear. Unsolder these and remove the tube.

Fit the new tube in the reverse order.

NOTE: The instrument will need recalibration when a new tube is fitted. See Section 4.

# OSCILLOSCOPE

## SECTION 4

## Part 4

## PERFORMANCE CHECKS

### GENERAL

The checks described in subsequent paragraphs will, in conjunction with the Calibration procedure described in Part 1 of this Section, prove the correct functioning of all circuits. The checks should be carried out in the order given. Where in any paragraph a control is not mentioned, its position is unchanged from that last mentioned.

### TESTGEAR

The testgear called for in this Part is to be selected from the list in Part 1, Calibration.

### CHECKS:-

### JITTER

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH.2 | TRIGGER SOURCE | EXT |
| CH2 INPUT | AC | TRIGGER SELECTOR | NORMAL |
| CH2 SENSITIVITY | 0.5V/cm | TRIGGER MODE | TRIG |
| TIMEBASE MODE | A | TRIGGER COUPLING | AC |
| A TIME/CM | 2μs/cm | SLOPE | +ve |
| B TIME/CM | 1ms/cm | X5 MAG | In (X1) |
| DELAY MULTIPLIER | Fully clock-wise | Variable sweep | CAL |

Using the Time Mark Generator apply 1ms/div time markers to CH2 INPUT socket and 10ms/div time markers to EXT TRIG socket simultaneously. Adjust TRIGGER LEVEL control to trigger the timebase. Set TIMEBASE MODE to A DEL BY B and rotate DELAY MULTIPLIER slowly counterclockwise until the leading edge of the first marker pulse

appears at the centre of the screen. Pull out the X5 MAG control and verify that the horizontal jitter is not greater than 1 cm. Any sideways drift should be ignored.

CASCADE BANDWIDTH

Set the controls as follows:-

| | |
|---|---|
| CH1 & CH2 variable GAIN | CAL |
| CH1 & CH2 SENSITIVITY | 5mV/cm |
| CH1 Input | CASCADE |
| CHANNEL MODE | CH1 |
| TRIGGER MODE | AUTO |
| A TIME/CM | 0.5ms/cm |
| TRIGGER SOURCE | INT |

Apply 5mV p-p 50 kHz sine wave from the Constant amplitude Signal Generator to CH2 INPUT. Increase the frequency and verify that the frequency at which the trace amplitude decreases to 3.5 cm (-3dB) is greater than 1MHz.

X AMPLIFIER BANDWIDTH

| | | | |
|---|---|---|---|
| X attenuator | 0.5V/cm | TRIGGER MODE | X AMP |
| CHANNEL MODE | CH2 | TRIGGER SOURCE | EXT |
| CH2 INPUT | GROUND | TRIGGER COUPLING | AC |

Apply 2.5V p-p 50 kHz sine wave from the Constant Amplitude Signal Generator to X INPUT and verify that the horizontal deflection is 5cm.

Increase the frequency and verify that frequency at which the horizontal deflection decreases to 3.5 cm is not less than 3MHz.

TRIGGER, INTERNAL and GATED

| | | | |
|---|---|---|---|
| TRIGGER MODE | AUTO | CHANNEL MODE | CH2 |
| TRIGGER SOURCE | INT | CH2 INPUT | AC |
| TRIGGER COUPLING | AC | CH2 SENSITIVITY | 5mV/cm |
| TRIGGER SLOPE | +ve | CH2 variable GAIN | CAL |
| TIMEBASE MODE | A | CH2 INVERT | In |
| A TIME/CM | 10μs | TRIGGER SELECTOR | NORMAL |
| B TIME/CM | 10μs | CH1 INPUT | AC |

Apply an input of 40mV p-p 50kHz sine-wave from the Constant Amplitude Signal Generator to CH.2 INPUT socket. Switch TRIGGER MODE to TRIG, and by operation of the TRIGGER LEVEL control, verify that the timebase can be triggered by any part of the +ve-going slope of the displayed waveform. Set SLOPE to -ve and verify triggering from the -ve-going edge.

Set SLOPE to +ve and TIMEBASE MODE to A DEL BY B, and verify that rotation of the DELAY MULTIPLIER causes sideways movement of the displayed waveform. Switch TIMEBASE MODE to GATED, adjust GATED TRIGGER LEVEL control to verify that the timebase can be triggered from any part of the positive-going edge of the displayed waveform. Pull GATED TRIGGER LEVEL (NEG.SLOPE) and verify that the timebase can be triggered of any part of the negative-going edge of the displayed waveform. Rotate DELAY MULTIPLIER) and note that there is no sideways movement of the waveform.

Set the controls as follows:-

| | |
|---|---|
| TIMEBASE MODE | A |
| CH2 SENSITIVITY | 50mV/cm |
| A TIME/CM | 20μs/cm |
| Input | 10mV p-p |

Verify that the waveform can be triggered from all parts of the displayed waveform. Set A TIME/CM to 0.1μs/cm and pull out X5 MAG. Increase the input to give 1 cm p-p deflection at 35MHz and verify that the timebase can be triggered from all parts of the displayed waveforms. Disconnect the input.

TRIGGER, EXTERNAL

Set the controls as follows:-

| | | | |
|---|---|---|---|
| X ATTENUATOR | 0.5V/cm | SLOPE | +ve |
| TRIGGER SOURCE | EXT | TIMEBASE MODE | A |
| TRIGGER MODE | TRIG | A TIME/CM | 0.1ms/cm |

TRIGGER COUPLING, DC

Apply an input of 200mV p-p 50kHz sine wave from the Constant Amplitude Signal Generator to the EXT TRIGGER socket and verify

that the timebase can be triggered from all parts of the displayed waveform. Increase the input to 1V p-p and frequency to 35MHz and repeat the test.

TRIGGER, LINE

Set the controls as follows:-

| | | | |
|---|---|---|---|
| A TIME/CM | 5ms/cm | TRIGGER SELECTOR | NORMAL |
| TRIGGER SOURCE | LINE | CH2 INPUT | AC |
| TRIGGER MODE | TRIG | CHANNEL MODE | CH2 |

Connect CH2 input to a suitable source to supply a triggering voltage at mains frequency. Set CH2 SENSITIVITY to obtain 2cm p-p deflection, and verify that the timebase can be triggered from all parts of the displayed waveform.

CHANNEL MODES, ADD

| | | | |
|---|---|---|---|
| CH1 & CH2 INPUT | DC | TRIGGER SELECTOR | NORMAL |
| CH1 & CH2 SENSITIVITY | 5mV/cm | TRIGGER MODE | TRIG |
| CH1 & CH2 variable GAIN | CAL | TRIGGER SOURCE | INT |
| CH1 & CH2 INVERT | In | TRIGGER COUPLING | AC |
| CHANNEL MODE | ALT | A TIME/CM | 1ms/cm |

Apply an input of 15mV p-p 1kHz square wave from the Calibrator to both channels simultaneously and adjust TRIGGER LEVEL control to trigger the timebase. Using the respective POSITION controls, place the CH1 trace above and CH2 trace below the horizontal centre-line and ensure that the amplitude of each waveform is 3 cm p-p.

Set the controls as follows in sequence and verify the results stated:-

| | | |
|---|---|---|
| CHANNEL MODE | to ADD | Vertical deflection 6 cm p-p |
| CH1 INVERT | pulled | Vertical deflection zero |
| CH2 INVERT | pulled | Vertical deflection 6 cm p-p |
| CH1 INVERT | restored | Vertical deflection zero |
| CH2 INVERT | restored | Vertical deflection 6 cm p-p |

CHANNEL MODE, ALTERNATE

| | | | |
|---|---|---|---|
| CH1 INPUT | DC | A TIME/CM | 0.5ms/cm |
| CH2 INPUT | GROUND | TRIGGER MODE | AUTO |
| TIMEBASE MODE | A | | |

Put a short-circuited BNC plug into CH1 INPUT socket. Adjust CH1 and CH2 POSITION controls to separate the traces approximately 3cm. Set A TIME/CM to 20ms/cm and verify that the traces appear alternately. Set A TIME/CM to 0.1ms/cm and verify that 3cm vertical shift of CH1 (using CH1 POSITION control) produces not more than 1 mm of vertical shift of the CH2 trace, and vice versa.

CHANNEL MODE, CHOPPED

Set the controls as follows:-

| | |
|---|---|
| CHANNEL MODE | CHOPPED |
| TRIGGER MODE | TRIG |

Adjust TRIGGER LEVEL control to trigger the timebase. Verify that the frequency of the displayed waveform is between 400kHz and 600kHz and that there is no visible vertical edge at maximum BRILL.

SINGLE SWEEP

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CHANNEL MODE | CH2 | A TIME/CM | 0.1sec/cm |
| CH2 SENSITIVITY | 5mV/cm | X5 MAG | In(X1) |
| CH2 INPUT | AC | TRIGGER MODE | TRIG |
| TRIGGER SELECTOR | NORMAL | TRIGGER SOURCE | INT |
| TIMEBASE MODE | A | TRIGGER COUPLING | AC |

Apply an input of 10mV p-p 1kHz square wave from the Calibrator to CH2 INPUT, and adjust TRIGGER LEVEL to trigger the timebase. Switch TRIGGER MODE to SINGLE SWEEP. The trace should disappear. Press the SINGLE SWEEP pushbutton and check that a single sweep of the timebase appears. Using the plug supplied, check that a single sweep occurs when the SINGLE SWEEP jack is short-circuited.

Set CH2 INPUT to GROUND. Press the SINGLE SWEEP pushbutton and check that the SINGLE SWEEP indicator lamp glows. Switch CH2 INPUT

to AC and check that a single sweep of the timebase occurs and that the SINGLE SWEEP lamp is extinguished. Disconnect the input from CH2.

Beamfinder PRESS FOR TRACE

Set the controls as follows:-

TRIGGER MODE AUTO

Obtain a trace at the centre of the screen. Turn the BRILL control fully counter-clockwise, and operate the PRESS FOR TRACE button (concentric with ASTIG) and hold it in. Check that the trace re-appears at full brilliance. Release the button and adjust BRILL to normal level.

Push PRESS FOR TRACE and hold in. Check that the trace cannot be moved off the graticule by operation of the CH2 and X position controls.

EXT X & Y INPUTS

Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | X AMP |
| CH2 INPUT | GROUND |
| X and Y plate* switches | EXT |

*Under hinged panel at rear top of the instrument.

By means of CH2 and X position controls bring the spot to the centre of the graticule. Apply an input of 30V p-p square wave between each Y plate socket and chassis in turn and check that the p-p vertical deflection is between 5 and 7 cm in each case.

Apply the same input to the X plate sockets in turn and check that the horizontal deflection is between 2.4 and 3.6 cm in each case. Restore the plate switches to INT.

Z MODULATION

Set the controls as follows:-

| | | | |
|---|---|---|---|
| CH2 SENSITIVITY | 5V/cm | A TIME/CM | 2μs/cm |
| CH2 INPUT | AC | TRIGGER MODE | TRIG |

Using a tee-piece, apply an input of 100kHz square wave from the Square Wave Generator set to high output and terminated in 50 Ω to CH2 INPUT and Z1 simultaneously. Adjust TRIGGER LEVEL control to trigger the timebase, and adjust the input to give a vertical deflection of approximately 2 cm p-p. Set the Z-MOD switch to EXT and check that the horizontal parts of the displayed waveform are extinguished, adjusting the BRILL control as necessary. Disconnect both inputs and restore the Z-MOD switch to INT.

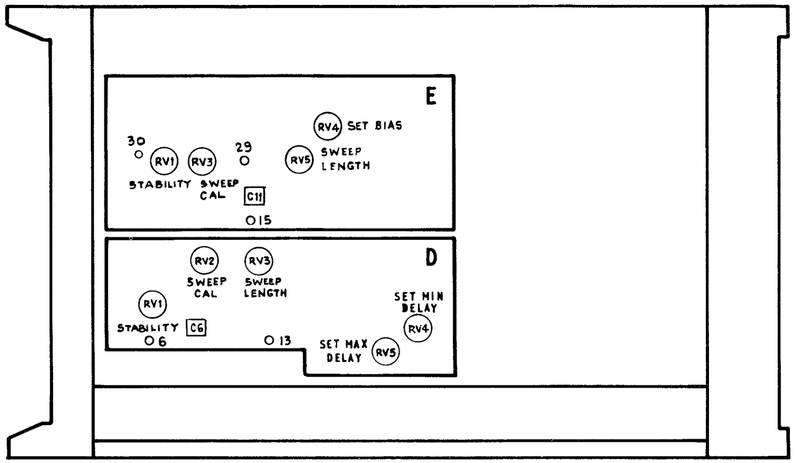
SWEEP OUT

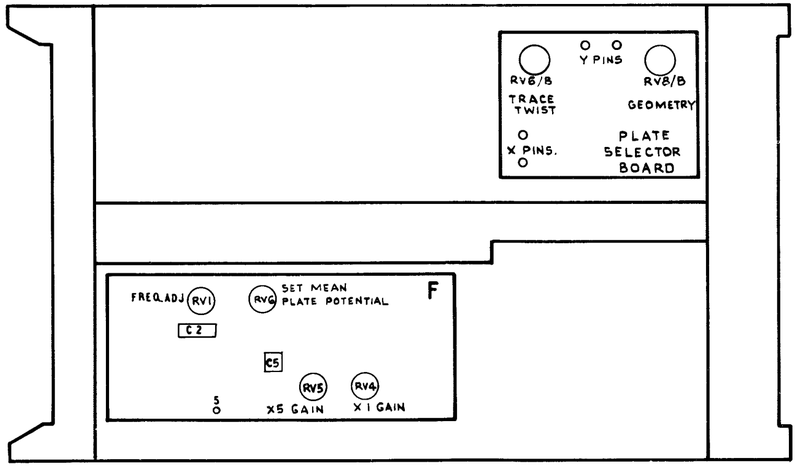
Set the controls as follows:-

| | |
|---|---|
| TRIGGER MODE | AUTO |
| TIMEBASE MODE | A |

Connect a 10kΩ 5% resistor from the SWEEP OUT socket to chassis. Connect an oscilloscope with X10 probe, 0.5V/cm sensitivity, d.c. coupled, -ve slope across this resistor and check that on all A TIME/CM ranges of the CDU150-CT531/3 timebase, a ramp, of at least 10V (2cm) is displayed on the oscilloscope

RIGHT HAND SIDE VIEW.

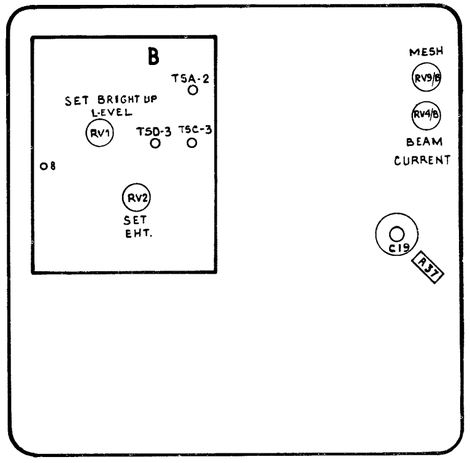


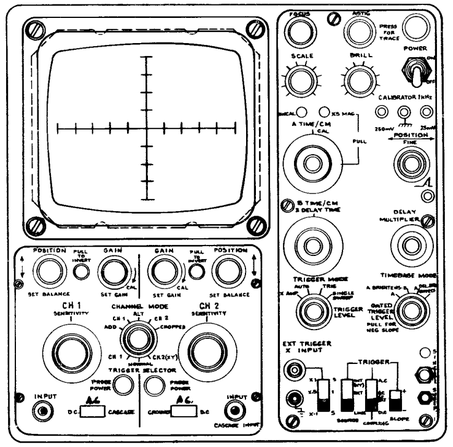




FRONT.

TOP VIEW

REAR VIEW

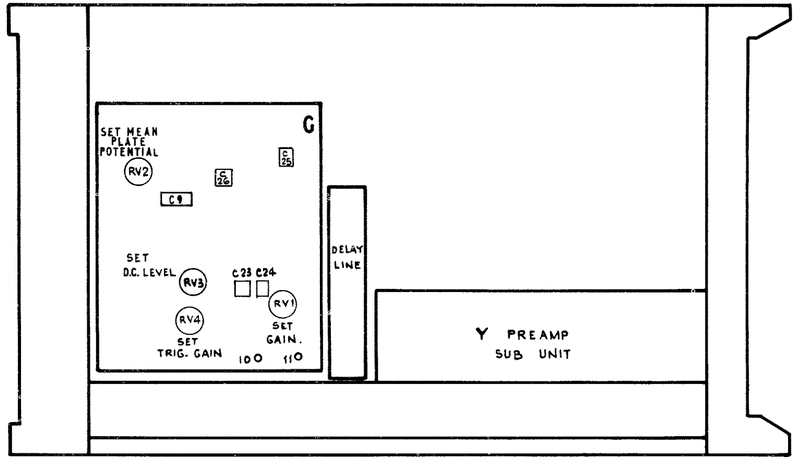


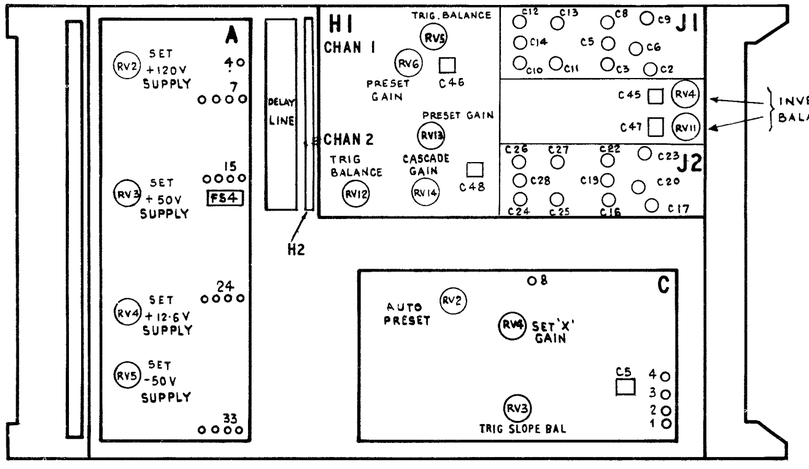




FRONT

NOT TO SCALE

LEFT HAND SIDE VIEW.




FRONT

UNDERSIDE VIEW

# LAYOUT SHOWING CALIBRATION ADJUSTMENTS

FIG.4.

# SECTION 5

# LAYOUTS, COMPONENT LIST AND CIRCUIT DIAGRAMS

# SECTION 5

## COMPONENT LISTS
with layouts and circuit diagrams.

## INTRODUCTION

Circuit diagrams are drawn on a functional basis, each comprising a printed-circuit board and, in some cases, associated components mounted on one or more of the three main assemblies: Main Frame, X-amplifier & Time-base Assembly, and Y amplifier assembly. For example, consider the Low Voltage Power Supply Fig.2., circuit diagram 80490 Sheet 5, circuit reference 'A'. This consists of a printed-circuit board, and a number of components on the Main Frame and on the X-amplifier & Timebase Assembly.

For each functional circuit is provided a components list showing every component in the circuit diagram, together with a diagram showing the location of components, both those mounted on the p.c.b., and those mounted elsewhere.

Each circuit has a reference letter, which is used as a suffix to the references of those components mounted elsewhere than on the p.c.b. The location of such components is shown in Figs. 1A and 1B, and Fig. 9A. The suffixes do not appear on the actual instrument.

In the following circuit diagrams and component lists, the units μF and Ω are omitted, e.g.

| | | | | |
|---|---|---|---|---|
| | C5 | 0.1 | 10 | 250V |

is to be understood as a capacitance of 0.1 microfarad

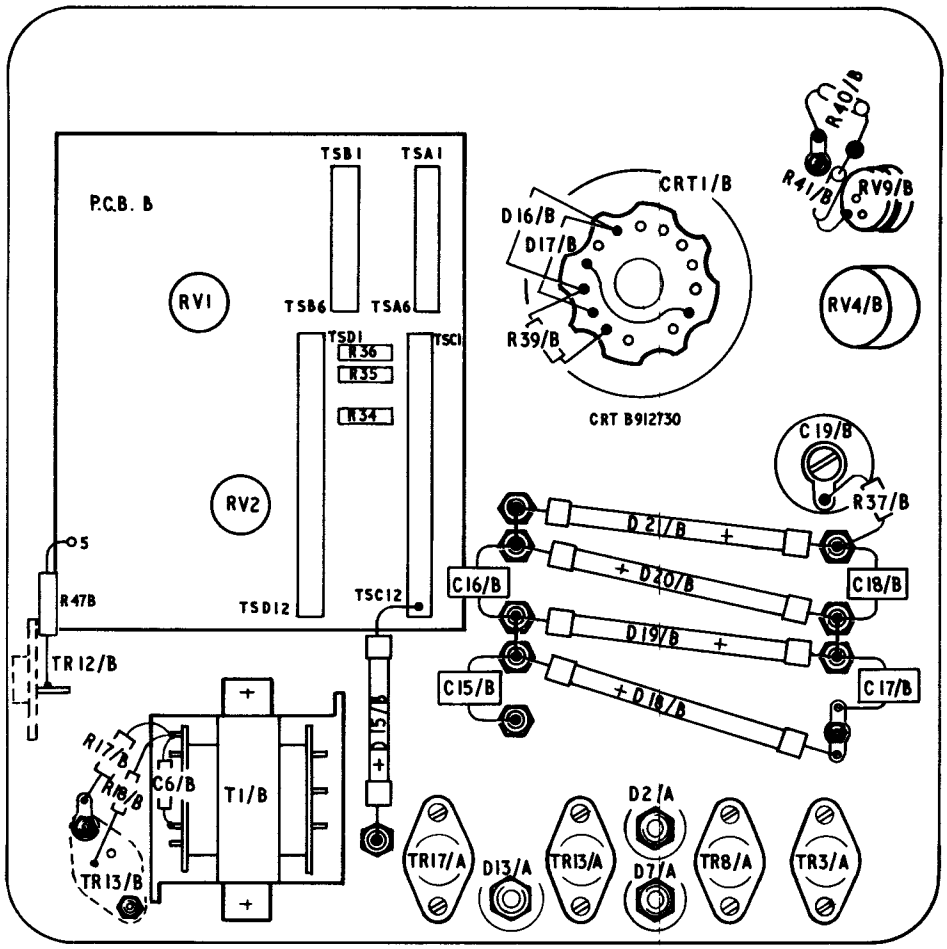
| | | | | |
|---|---|---|---|---|
| and | R22 | 10 | 5 | $\frac{1}{8}$W |

is to be understood as a resistance of 10 ohms.

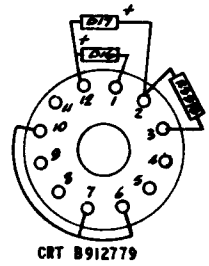
FIGURE 1

MAIN FRAME ASSEMBLY

X AMPLIFIER AND TIMEBASE ASSEMBLY




REAR VIEW WITH COVER REMOVED

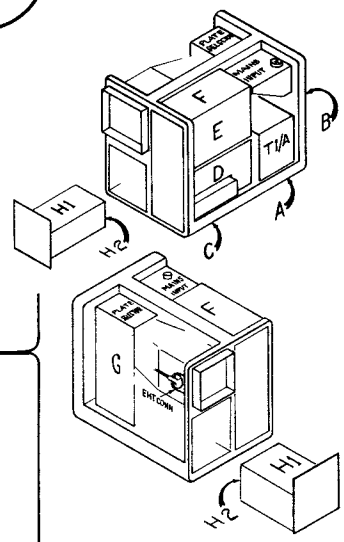


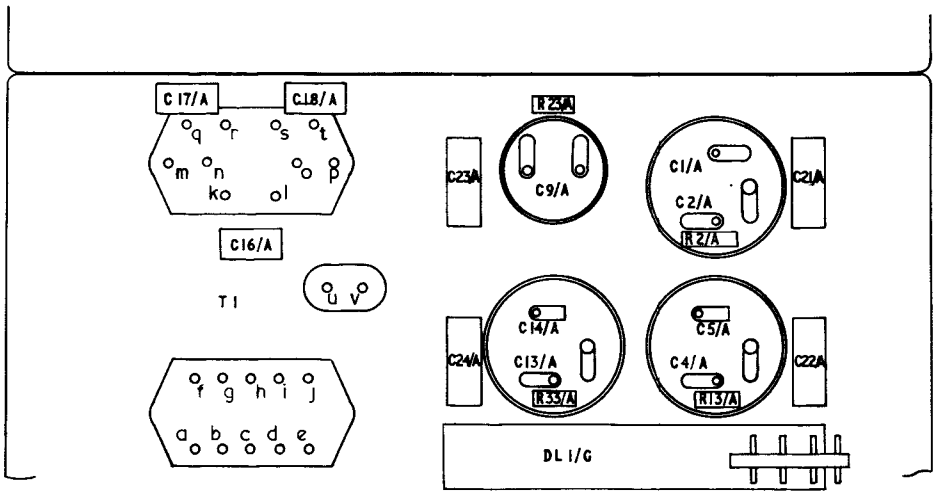

COMPONENTS NOT SHOWN

T1/A AT R H SIDE OF CHASSIS

FS1/A
PL1/A
SKT1/A
VS1/A
} AT TOP RIGHT REAR OF INSTRUMENT

ILP1/A
ILP2/A
} REAR OF FRONT PANEL




VIEW FROM BELOW , P C B 'A' REMOVED

FIG. 1

## COMPONENT LISTS

## MAIN FRAME ASSY. D/SA 80490/120

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| | FIG | | | | |
| | P.C.B. 'A' Assy. 2 | | | | C/SA 80490/100 |
| | P.C.B. 'B' Assy. 3 | | | | C/SA 80490/83 |
| | P.C.B. 'G' Assy. 8 | | | | C/SA 80490/104 |
| | Plate Selector Bd.80490 3 | | | | C/SA 80490/110 |
| CATHODE RAY TUBES & COMPONENTS | | | | | |
| | EITHER | | | | |
| C.R.T. Base | | | | | B912731 |
| CRT1/B | | | | | B912730 |
| L2/B | Twist Coil | | | | B/GA 31988 |
| R34/B | | 47K | 5 | 1W | B912637/89 |
| R35/B | | 680K | 5 | 1W | B912748/5 |
| R36/B | | 680K | 5 | 1W | B912748/5 |
| | OR | | | | |
| C.R.T. Base | | | | | A912732 |
| CRT1/B | | (B913054 for OPT01) | | | B912779 |
| L2/B | Twist Coil | | | | B832178 |
| R34/B | | 150K | 5 | 1W | B912748/4 |
| R35/B | | 470K | 5 | 1W | B912748/3 |
| R36/B | | 330K | 5 | 1W | B912748/2 |
| CAPACITORS | | | | | |
| C1/A<br>C2/A | | 500<br>50 | +50-20 | 200V | A912646 |
| C4/A<br>C5/A | | 500<br>50 | +50-20 | 200V | A912646 |
| C6/B | | .047 | 20 | 250V | B911476/7 |
| C9/A | | 2000 | +50-20 | 25V | A912647 |
| C13/A<br>C14/A | | 500 | +50-20 | 200V | A912646 |

## COMPONENT LISTS

## MAIN FRAME ASSY. D/SA 80490/120

| CVT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS (contd.) | | | | | |
| C14/B | | 500p | +100-0 | 8kV | A912647 |
| C15/B | | 500p | +100-0 | 8kV | A912647 |
| C16/A | | 1 | 10 | 250V | B911477/8 |
| C16/B | | 500p | +100-0 | 8kV | A912647 |
| C17/A | | 1 | 10 | 250V | B911477/8 |
| C17/B | | 500p | +100-0 | 8kV | A912647 |
| C18/A | | 1 | 10 | 250V | B911477/8 |
| C18/B | | 500p | +100-0 | 9kV | A912647 |
| C19/B | | 500p | +50-20 | 20kV | A912651 |
| C21/A | | 1 | 10 | 250V | B911477/8 |
| C22/A | | 1 | 10 | 250V | B911477/8 |
| C23/A | | 1 | 10 | 250V | B911477/8 |
| C24/A | | 1 | 10 | 250V | B911477/8 |
| DIODES | | | | | |
| D2/A | | | | | B912407/34 |
| D7/A | | | | | B912407/32 |
| D13/A | | | | | B912407/32 |
| D15/B | | | | | C912679/2 |
| D16/B | | | | | B910086/2 |
| D17/B | | | | | B910086/2 |
| D18/B | | | | | C912679/3 |
| D19/B | | | | | C912679/3 |
| D20/B | | | | | C912679/3 |
| D21/B | | | | | C912679/3 |
| FUSES | | | | | |
| FS1/A | Slow-Blow | 2A | | | A912423/17 |
| LAMPS | | | | | |
| ILP1/A | | | | | A912699/2 |
| ILP2/A | | | | | A912699/2 |
| PLUGS | | | | | |
| PL1/A | (3 way for mains) | | | | A912724/1 |
| PL1/K | See Cable Form page 1.8 | | | | |
| Uncoded | 6 off for CRT leads | | | | A912695/1 |

## COMPONENT LISTS

## MAIN FRAME ASSY. D/SA 80490/120

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **RESISTORS** | | | | | |
| R2/A | | 24K | 10 | 1W | ITB3533/24310 |
| R13/A | | 10K | 5 | ½W | B912636/73 |
| R17/B | | 8.2K | 5 | 1W | B912637/71 |
| R18/B | | 180 | 5 | ½W | B912636/31 |
| R23/A | | 2.7K | 5 | ½W | B912636/59 |
| R33/A | | 10K | 5 | ½W | B912636/73 |
| R37/B | | 4.7M | 10 | ½W | B912748/1 |
| R39/B | | 100K | 5 | ½W | B912636/97 |
| R40/B | | 47K | 5 | ½W | B912636/89 |
| R41/B | | 47K | 5 | ½W | B912636/89 |
| **RESISTORS, VARIABLE** | | | | | |
| RV4/B | | 100K | 20 | | B912643/3 |
| RV9/B | | 150K | 20 | | B912749/2 |
| **SOCKETS** | | | | | |
| SKT1/K | 25 Way<br>Latch (to secure plug) | | | | B96164/4<br>A912720 |
| **TRANSFORMERS** | | | | | |
| T1/A | Mains Transformer | | | | KA31881/CD |
| T1/B | E.H.T. Transformer | | | | KA31914/AD |
| **TRANSISTORS** | | | | | |
| TR3/A | | | | | B99160/2 |
| TR8/A | | | | | B99160/2 |
| TR12/B | | | | | B99160/2 |
| TR13/A | | | | | B99160/2 |
| TR13/B | | | | | C912306/1 |
| TR17/A | | | | | B99160/2 |

## COMPONENT LISTS

### MAIN FRAME ASSY. D/SA 80490/120

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| MISCELLANEOUS | | | | | |
| DL1/G | Delay Line Assy. | | | | C/SA80490/140 |
| VS1/A | Voltage Selector Assy. | | | | A/SA80490/138 |
| | Insulating Kit, Zener Diodes, | | | | A912744 |
| | Transistor Mounting Kit (TO-66) | | | | A912745 |
| | Fuseholder (FS1/A) | | | | A911939 |
| | Lamp Holder (ILP1/A & ILP2/A) | | | | A912759 |
| | Capacitor Clamp (3 off) | | | | A912722/2 or B912803/3 |
| | Capacitor Clamp (1 off) | | | | A912722/1 or B912803/2 |
| | Potentiometer Lock 2 off | | | | KS93660 |
| | Tube Screen | | | | D912774 |
| | Anode Connector Assy. including<br>Connector<br>Cable UR 43 (2 ft.) | | | | B/SA80490/139<br>A912738<br>1345-612-010 |
| | Lead Assy. 100Ω coax. cable ($12\frac{1}{2}$ in.) | | | | B/SA80490/147<br>A910186 |

## X AMP AND TIME BASE ASSY. D/SA 80490/96

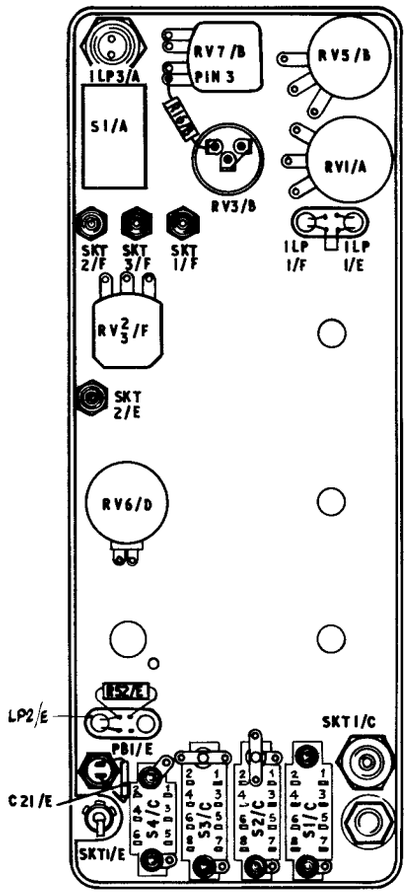
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| | **CIRCUIT REFERENCES** | | | | |
| | P.C.B. 'C' Fig. | 4 | | | |
| | P.C.B. 'D' Assy 80490 Sht.1 | 5 | | | |
| | P.C.B. 'E' Assy 80490 Sht.4 | 6 | | | |
| | P.C.B. 'F' Assy 80490 Sht.2 | 7 | | | |
| | Switch Assy (Cct Ref. 'D') | 5 | | | B/SA80490/127 |
| | Switch Assy (Cct Ref. 'E') | 6 | | | B/SA8049 /126 |
| | **CAPACITORS** | | | | |
| C1/C | | 33p | 5 | 630V | B912701/1 |
| C2/C | | 180p | 5 | 125V | B910931/107 |
| C3/C | | 0.01 | +80-20 | 750V | B910976/2 |
| C4/C | | 100p | 10 | 750V | C96964/85 |
| C21/E | | 0.01 | +80-20 | 100V | B911711/10 |
| C25/C | | 100p | 2.5 | 160V | B910931/18 |
| | **DIODES** | | | | |
| D1/C | | | | | A912675 |
| | **LAMPS** | | | | |
| ILP1/E | | | | | A912698 |
| ILP1/F | | | | | A912698 |
| ILP2/E | | | | | A912698 |
| ILP3/A | | | | | A912700 |
| | **RESISTORS** | | | | |
| R1/C | | 1.125M | 1 | | B912160/93 |
| R2/C | | 900K | 1 | | B912160/91 |
| R3/C | | 111K | 1 | | B912160/81 |
| R4/C | | 1M | 1 | | B912160/88 |
| R5/C | | 100K | 5 | ½W | B912636/97 |

## X AMP AND TIME BASE ASSY. D/SA 80490/96

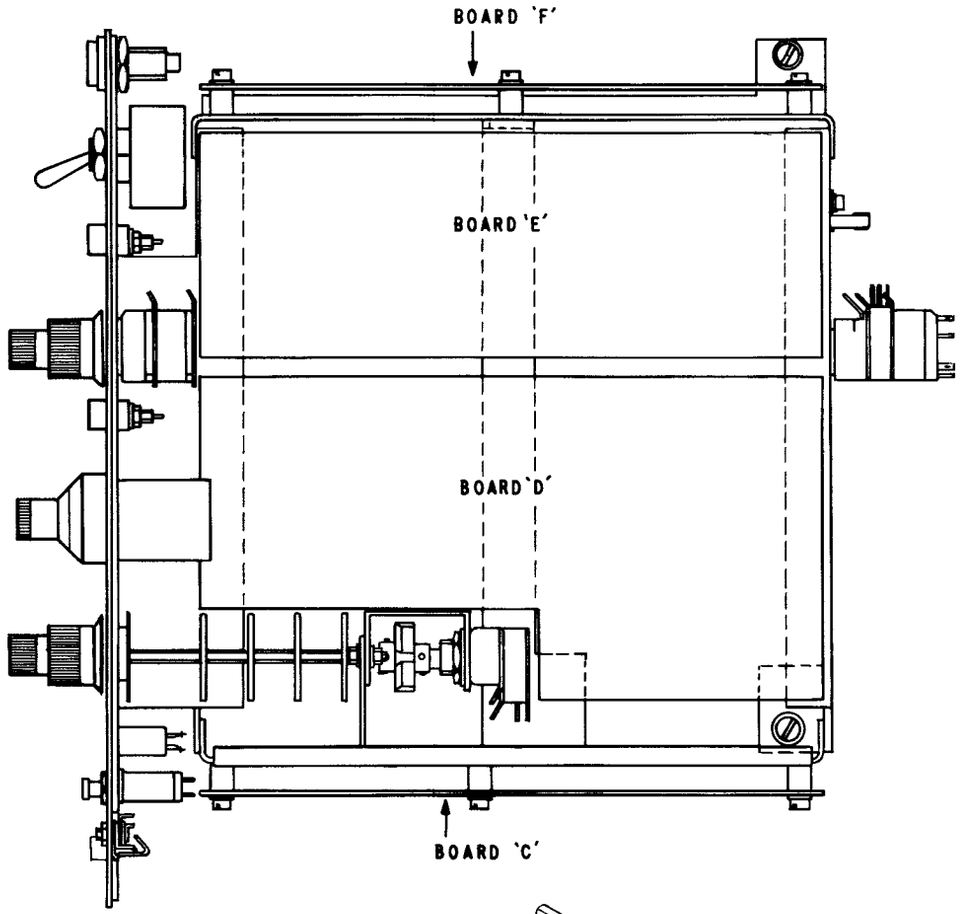
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **RESISTORS** (contd.) | | | | | |
| R6/C | | 1M | 1 | | B912160/88 |
| R14/C | | 47 | 5 | ½W | B912636/17 |
| R15/C | | 47 | 5 | ½W | B912636/17 |
| R16/B | | 4.7K | 5 | ½W | B912636/65 |
| R16/E | | 100K | 5 | ½W | B912636/97 |
| R20/E | | 1.2K | 5 | ½W | B912636/51 |
| R36/C | | 3.3K | 5 | ½W | B912636/61 |
| R37/C | | 3.3K | 5 | ½W | B912636/61 |
| R47/F | | 100K | 5 | ½W | B912636/97 |
| R52/E | | 33K | 5 | ½W | B912636/85 |
| **RESISTORS, VARIABLE** | | | | | |
| RV1/A | | 50 | | 2W | A910664/3 |
| RV2/E | | 4.7K | | | A912689/1 |
| RV2/F, RV3/F | | 22K+22K | | | A912631/1 |
| RV3/B | | 4.7K | | | B912749/3 |
| RV5/B | | 200K | | | B912643/3 |
| RV6/D | | 10K (10 turn) | | | A912633/8 |
| RV7/B | | 100K | | | A912690/1 |
| **SOCKETS** | | | | | |
| SKT1/C | | | | | B912589 |
| SKT1/E | | | | | A912727 |
| SKT1/F | | | | | B912761 |
| SKT2/E | | | | | B912761 |
| SKT2/F | | | | | B912761 |
| SKT3/F | | | | | B912761 |

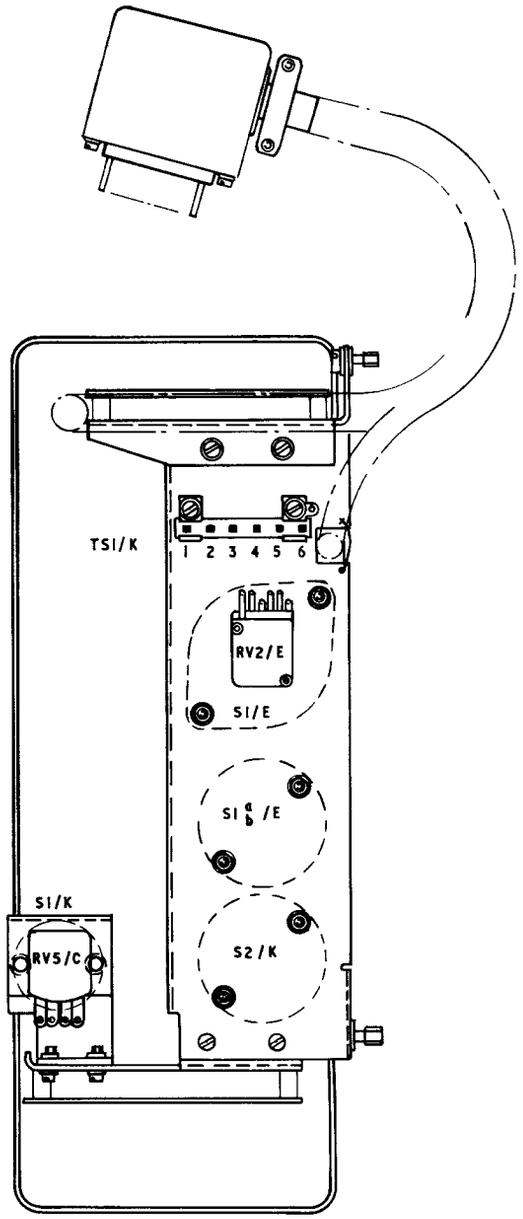
## X AMP AND TIME BASE ASSY. D/SA 80490/96

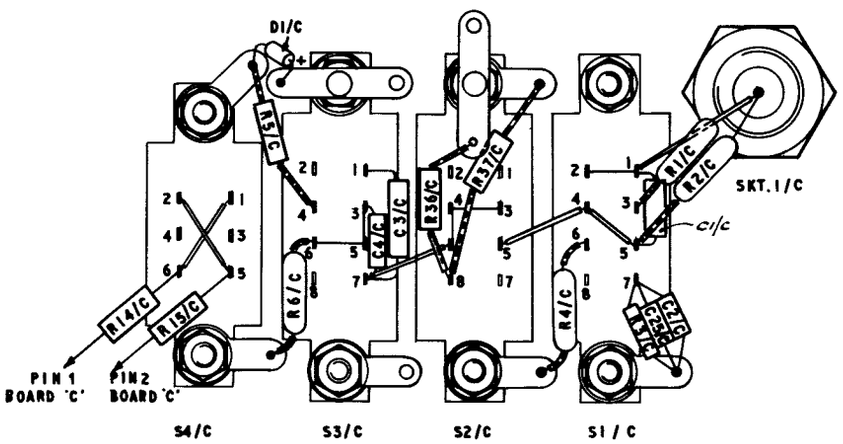
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **SWITCHES** | | | | | |
| S1/A | | | | | A912757 |
| S1/B | | | | | |
| S1/C | | | | | B912564 |
| S1/D | part of 80490/128 (below) | | | | |
| S1/E | part of 80490/126 below | | | | |
| S1/K | part of 80490/129 (below) | | | | |
| S2/C | | | | | B912564 |
| S2/K | part of 80490/128 (below) | | | | |
| S3/C | | | | | B912564 |
| S4/C | | | | | B912703 |
| PB1/E | | | | | B912702/2 |
| **MISCELLANEOUS** | | | | | |
| | Switch Assy | | | | B/SA80490/128 |
| | containing:- | | | | |
| RV1/C | Resistor, variable | 2.2K | | | B912749/1 |
| S1/D | Switch (22 way) | | | | A50490/40 |
| | Switch Assy | | | | B/SA80490/129 |
| | containing:- | | | | |
| RV5/C | Resistor, variable | 2.2K | | | A912632/1 |
| S1/K | Switch (12 way) | | | | A50490/39 |
| | Cableform A | | | | D/SA80490/130 |
| | containing:- | | | | |
| PL1K | Plug (25 way) | | | | B96113/4 |
| | Cover (Top entry) | | | | B97121/4 |



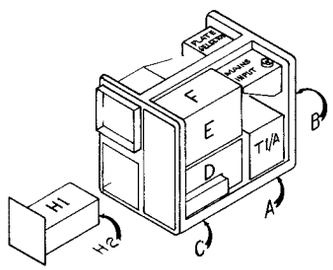

REAR VIEW OF FRONT PANEL

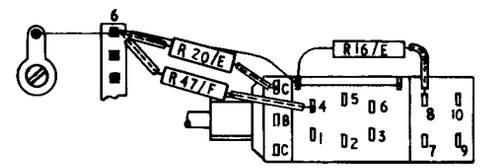


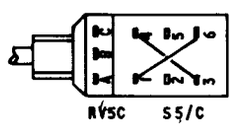



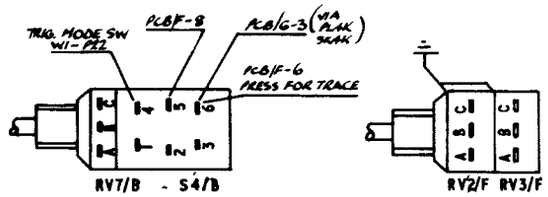

SCRAP VIEW SHOWING DETAILS OF WIRE LINKS & COMPONENTS FITTED TO SWITCHES.

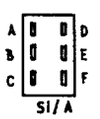


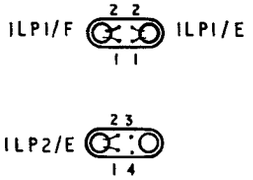




SKETCH SHOWING COMPONENTS CONNECTED TO RV2/E





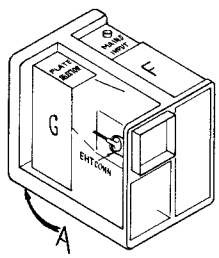
SKT 1/E
REAR VIEW

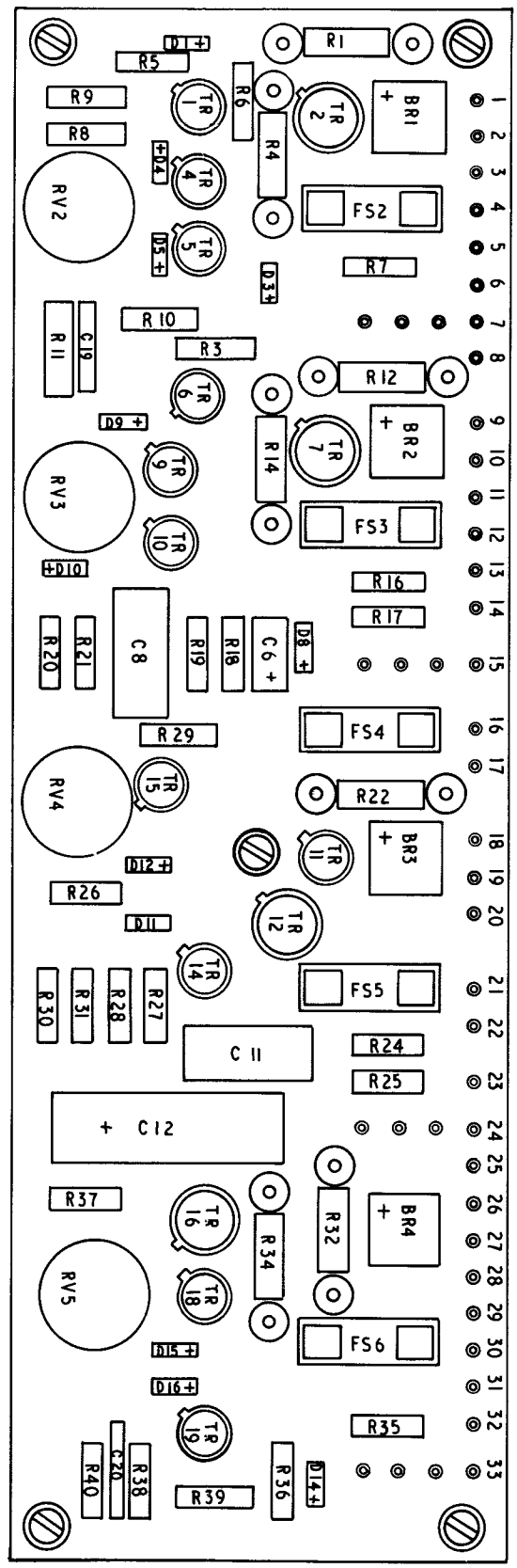
'X' AMP & TIMEBASE

FIG. 1 2

FIGURE 2

LOW VOLTAGE POWER SUPPLIES




C / SA80490/100

FIG. 2 1

PRINTED CIRCUIT BOARD 'A'

## P.C.B. 'A' C/SA 80490/100

## CIRCUIT REFERENCE 'A'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **BRIDGE RECTIFIERS** | | | | | |
| BR1 | | | | | A912686 |
| BR2 | | | | | A912686 |
| BR3 | | | | | A912686 |
| BR4 | | | | | A912686 |
| **CAPACITORS** | | | | | |
| C1 | Fig 1 | 500 | +50-20 | 200V | A912646 |
| C2 | Fig 1 | 50 | +50-20 | 200V | A912646 |
| C4 | Fig 1 | 500 | +50-20 | 200V | A912646 |
| C5 | Fig 1 | 50 | +50-20 | 200V | A912646 |
| C6 | | 10 | +50-10 | 16V | B910700/26 |
| C8 | | 100 | 20 | 100V | B911943/40 |
| C9 | Fig 1 | 2000 | +50-20 | 25V | A912647 |
| C11 | | 1.0 | 20 | 100V | B192282/11 |
| C12 | | 64 | +50-10 | 64V | B910208/29 |
| C13 | Fig 1 | 500 | +50-20 | 200V | A912646 |
| C14 | Fig 1 | 50 | +50-20 | 200V | A912646 |
| C16 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C17 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C18 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C19 | | 0.1 | 10 | 250V | B911477/2 |
| C20 | | 0.1 | 10 | 250V | B911477/2 |
| C21 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C22 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C23 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| C24 | Fig 1 | 1 | 10 | 250V | B911477/8 |
| **DIODES** | | | | | |
| Insulating Kit Zener Diodes | | | | 3 off | A912744 |
| D1 | | 3.3V | 5 | 400mW | A910099/3 |
| D2 | Fig 1 | | | | B912407/34 |

## P.C.B. 'A' C/SA 80490/100

### CIRCUIT REFERENCE 'A'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (contd.) | | | | | |
| D3 | | 5.6V | 5 | 400mW | A910099/9 |
| D4 | | 5.6V | 5 | 400mW | B910086/2 |
| D5 | | | | | B910086/2 |
| D6 | | | | | |
| D7 | Fig 1 | | | | B912407/32 |
| D8 | | 9V | 5 | | A912540/1 |
| D9 | | | | | B910086/2 |
| D10 | | | | | B910086/2 |
| D11 | | | | | B910086/2 |
| D12 | | | | | B910086/2 |
| D13 | Fig 1 | | | | B912407/32 |
| D14 | | 5.6V | 5 | 400mW | A910099/9 |
| D15 | | | | | B910086/2 |
| D16 | | | | | B910086/2 |
| FUSES | | | | | |
| FS1 | Fig 1 | 2A Slow-blow | | | A912423/17 |
| FS2 | | 500mA | | | KS92497/19 |
| FS3 | | 500mA | | | KS92497/19 |
| FS4 | | 250mA | | | KS92497/12 |
| FS5 | | 500mA | | | KS92497/19 |
| FS6 | | 1A | | | KS92497/11 |
| LAMPS | | | | | |
| ILP1 | Fig 1 | | | | A912699/2 |
| ILP2 | Fig 1 | | | | A912699/2 |
| PLUGS | | | | | |
| PL1 | 3 way for mains | | | | A912724/1 |
| PL1K | 25 way see Fig 1 for particulars | | | | |
| RESISTORS | | | | | |
| R1 | | 2 | 10 | 5W | B910174/99 |
| R2 | Fig 1 | 24k | 10 | 1W | 5905-99-013-5779 |

## P.C.B. 'A' C/SA 80490/100

## CIRCUIT REFERENCE 'A'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| R3 | | 68k | 5 | ½W | B912636/93 |
| R4 | | 2 | 10 | 5W | B910174/99 |
| R5 | | 56k | 5 | ½W | B912636/91 |
| R6 | | 1.8k | 5 | ½W | B912636/55 |
| R7 | | 100 | 5 | ½W | B912636/25 |
| R8 | | 39k | 5 | ½W | B912636/87 |
| R9 | | 36k | 2 | | 5905-99-013-6032 |
| R10 | | 1.6k | 2 | | 5905-99-013-6000 |
| R11 | | 36k | 2 | | 5905-99-013-5655 |
| R12 | | 2 | 1o | 5W | B910174/99 |
| R13 | Fig 1 | 10k | 5 | ½W | B912636/73 |
| R14 | | 2 | 10 | 5W | B910174/99 |
| R15 | | | | | |
| R16 | | 100 | 5 | ½W | B912636/25 |
| R17 | | 100 | 5 | ½W | B912636/25 |
| R18 | | 15k | 5 | ½W | B912636/77 |
| R19 | | 22k | 5 | ½W | B912636/81 |
| R20 | | 3.3k | 1 | | B912160/75 |
| R21 | | 16k | 1 | | B912160/77 |
| R22 | | 2 | 10 | 5W | B910174/99 |
| R23 | Fig 1 | 2.7k | 5 | ½W | B912636/59 |
| R24 | | 100 | 5 | ½W | B912636/25 |
| R25 | | 100 | 5 | ½W | B912636/25 |
| R26 | | 9.1k | 2 | ½W | 5905-99-013-6018 |
| R27 | | 1.6k | 2 | ½W | 5905-99-013-6000 |
| R28 | | 3.3k | 5 | ½W | B912636/61 |
| R29 | | 36k | 5 | ½W | B912636/86 |
| R30 | | 3.6k | 2 | ½W | 5905-99-013-6088 |
| R31 | | 5.6k | 2 | ½W | 5905-99-013-6013 |

## P.C.B. 'A' C/SA 80490/100

### CIRCUIT REFERENCE 'A'

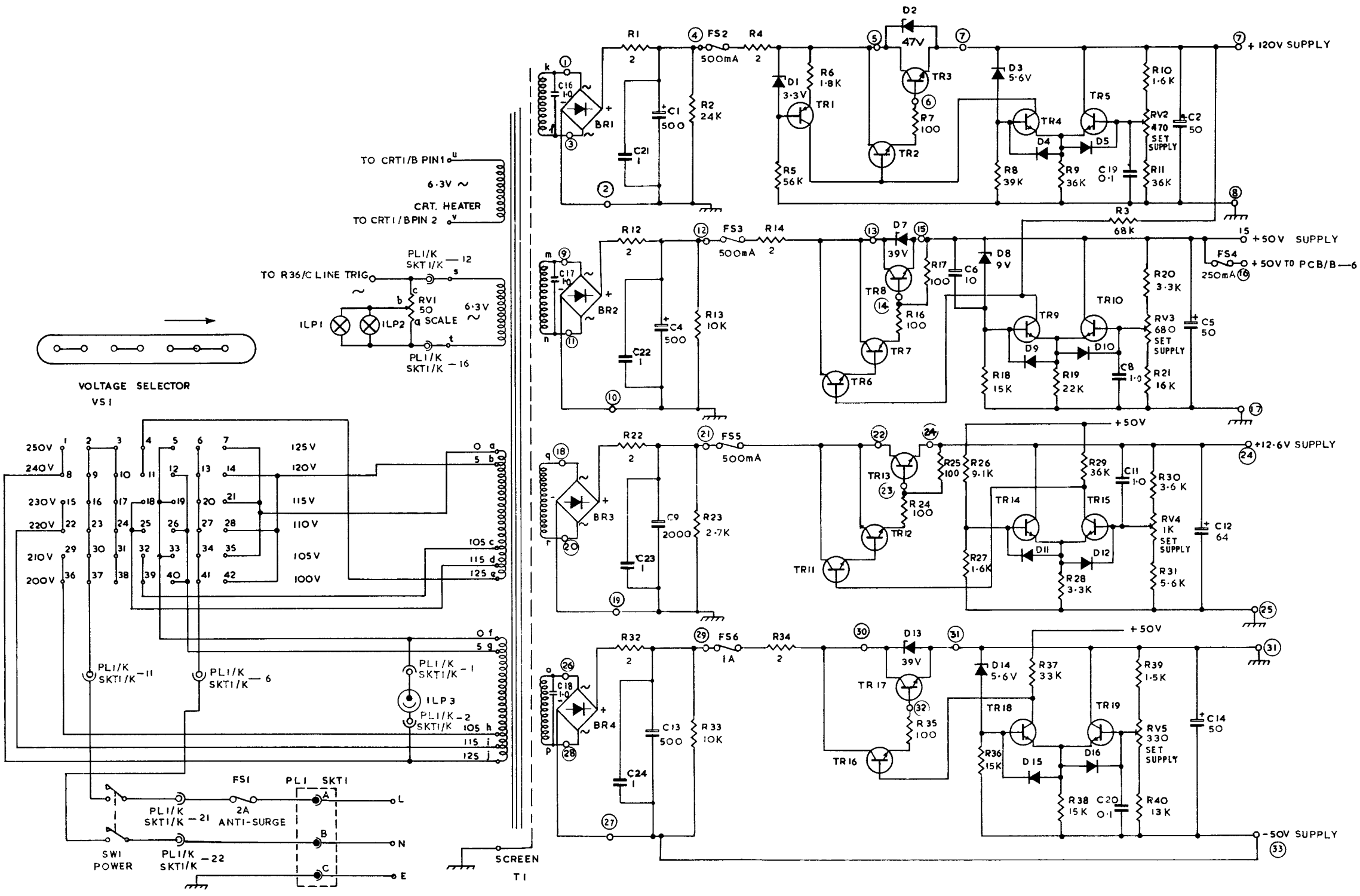
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R32 | | 2 | 10 | 5W | B910174/99 |
| R33 | Fig 1 | 10k | 5 | ½W | B912636/73 |
| R34 | | 2 | 10 | 5W | B910174/99 |
| R35 | | 100 | 5 | ½W | B912636/25 |
| R36 | | 15k | 5 | ½W | B912636/77 |
| R37 | | 33k | 5 | ½W | B912636/85 |
| R38 | | 15k | 5 | ½W | B912636/77 |
| R39 | | 1.5k | 2 | ½W | 5905-99-013-5999 |
| R40 | | 13k | 2 | ½W | 5905-99-013-6022 |
| RESISTORS, VARIABLE | | | | | |
| RV1 | Fig 1 | 50 | | 2W | A910664/3 |
| RV2 | | 470 | 20 | | A912635/2 |
| RV3 | | 680 | 20 | | A912635/15 |
| RV4 | | 1k | 20 | | A912635/9 |
| RV5 | | 330 | 20 | | A912635/8 |
| SOCKETS | | | | | |
| SKT 1K | See Fig 1 for particulars | | | | |
| PL 1K | 25 way (Fig 1) | | | | |
| SWITCHES | | | | | |
| S1 | Fig 1 | | | | A912757 |
| TRANSFORMERS | | | | | |
| T1 | | | | | KA31881/CD |
| TRANSISTORS | | | | | |
| TR1 | | | | | A910648 |
| TR2 | | | | | B99160/1 |
| TR3 | Fig 1 | | | | B99160/2 |
| TR4 | | | | | B912676/1 |

## P.C.B. 'A' C/SA 80490/100

## CIRCUIT REFERENCE 'A'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| TRANSISTORS (contd.) | | | | | |
| TR5 | | | | | B912676/1 |
| TR6 | | | | | B912676/1 |
| TR7 | | | | | B99160/1 |
| TR8 | | | | | B99160/2 |
| TR9 | | | | | B912676/1 |
| TR10 | | | | | B912676/1 |
| TR11 | | | | | B912676/1 |
| TR12 | | | | | B99160/1 |
| TR13 | Fig 1 | | | | B99160/2 |
| TR14 | | | | | B912676/1 |
| TR15 | | | | | B912676/1 |
| TR17 | Fig 1 | | | | B99160/1 |
| TR18 | | | | | B912676/1 |
| TR19 | | | | | B912676/1 |
| MISCELLANEOUS | | | | | |
| | Fuseholder | (5 off) | | | A912697 |
| | Transistor Mounting Pad T05 | (4 off) | | | A99286 |
| VS1 | Voltage selector assembly | | | | A/SA80490/138 |

| | | |
|---|---|---|
| R | 32, 1, 12, 22, 2, 13, 4, 14, 34, 5, 6, 16, 24, 35, 7, 17, 25, 26, 18, 8, 27, 36, 37, 9, 19, 28, 38, 29, 3, 39, 40, 20, 30, 10, 11, 21, 31, | R |
| C | 16, 17, 18, 21 22 23 24 1, 4, 9, 13, 6, 19, 20, 8, 11, 2, 5, 12, 14, | C |
| TR | 1, 11, 6, 16, 7, 13, 17, 3, 2, 12, 8, 18, 11, 9, 4, 5, 10, 15, 19, | TR |
| MISC. | VS1, S1, FS1, PL1, SKT 1, ILP1, ILP2, ILP3, RV1, T1, BR1, BR2, BR3, BR4, FS2, FS3, FS5, FS6, D1, D7, D2, D13, D14, D8, D3, D9, D11, D15, D4, D5, D10, D12, D16, RV2, RV3, RV4, RV5, FS4. | MISC. |




# LOW VOLTAGE POWER SUPPLY CIRCUIT REFERENCE 'A'

D/CD80490/5

FI 2 2

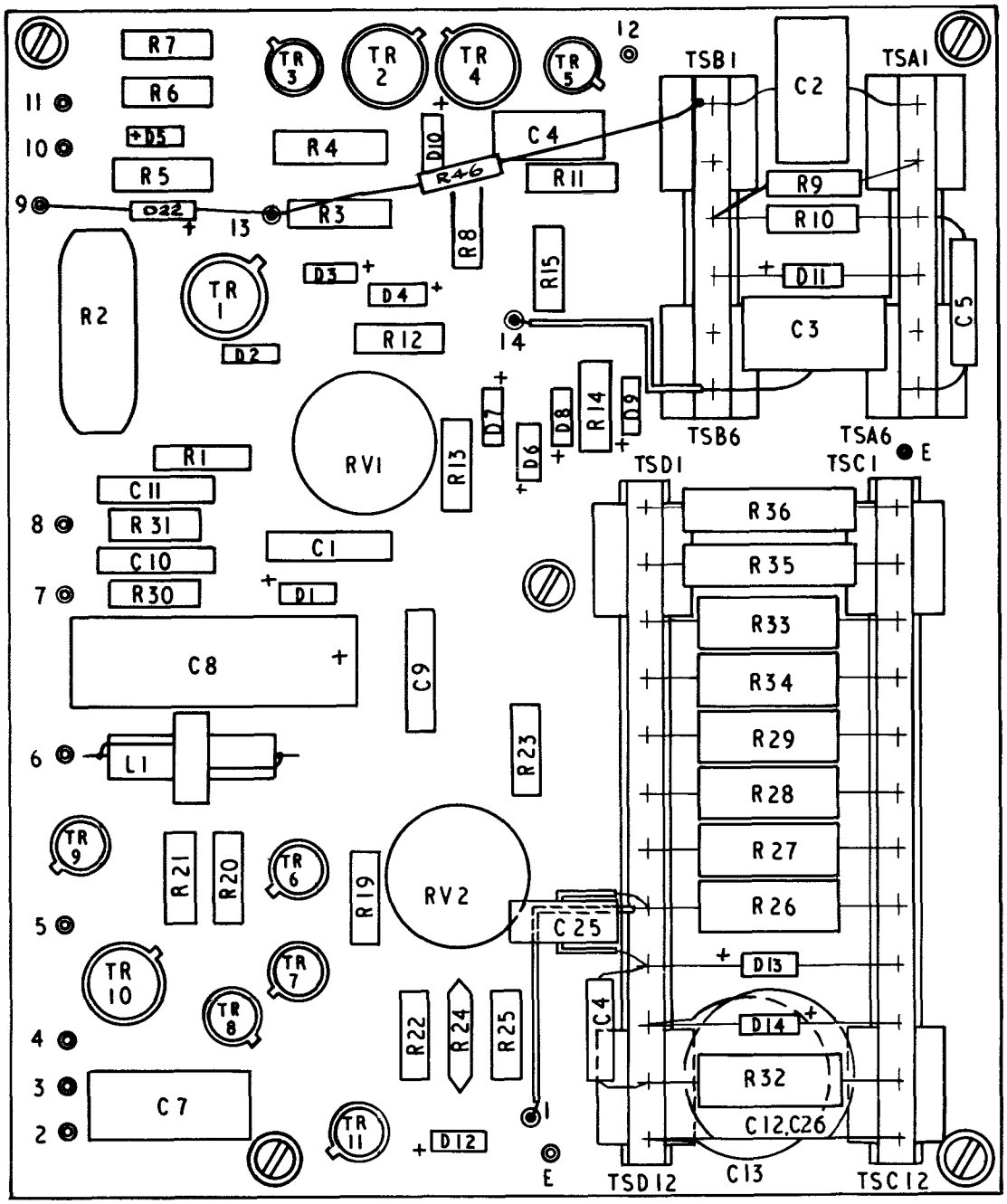
FIGURE 3

EHT AND BLANKING CIRCUITS

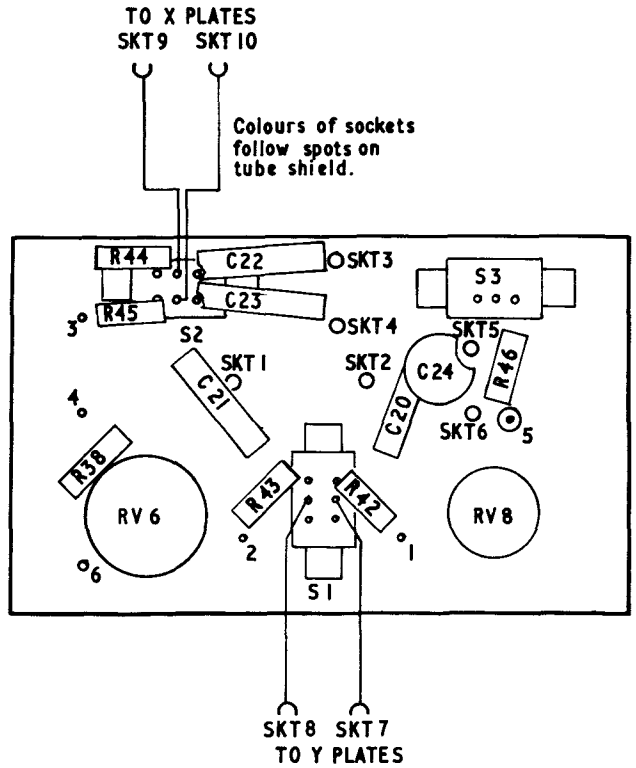
## P.C.B. 'B' C/SA 80490/83

## CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C1 | | 0.1 | 10 | 250V | B911477/2 |
| C2 | | 500p | -0+100 | 8kV | B912674 |
| C3 | | 500p | -0+100 | 8kV | B912674 |
| C4 | | 3300p | 20 | 500V | B911476/11 |
| C5 | | 0.1 | 10 | 250V | B911477/2 |
| C6 | | .047 | 20 | 250V | B911476/7 |
| C7 | | 1 | 20 | 100V | B911943/40 |
| C8 | | 64 | -10+50 | 64V | B910208/29 |
| C9 | | .047 | 20 | 250V | B911476/7 |
| C10 | | 0.1 | 10 | 250V | B911477/2 |
| C11 | | 0.1 | 10 | 250V | B911477/2 |
| C12 | | 4700p | -20+50 | 3kV | B912650/55 |
| C13 | | 4700p | -20+50 | 3kV | B912650/55 |
| C14 | | 0.1 | 10 | 250V | B911477/2 |
| C15 ) | | 500p | -0+100 | 8kV | A912674 |
| C16 ) | | 500p | -0+100 | 8kV | A912674 |
| C17 ) | Fig 1 | 500p | -0+100 | 8kV | A912674 |
| C18 ) | | 500p | -0+100 | 8kV | A912674 |
| C19 ) | | 500p | -20-+50 | 20kV | A912651 |
| C20-24 | See page 1.3 | | | | |
| C25 | | 500p | -0+100 | 8kV | B912674 |
| C26 | | 4700p | -20+50 | 3kV | B912650/55 |
| COILS | | | | | |
| L1 | | 470µH | | | A911210/1 |
| DIODES | | | | | |
| D1 | | 5 | 400MW | | A910099/13 |
| D2 | | | | | B910086/2 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | | | | B910086/2 |
| D6 | | | | | B910086/2 |
| D7 | | | | | B910086/2 |
| D8 | | 4.7V | 5 | | A910099/7 |




C/SA80490/83



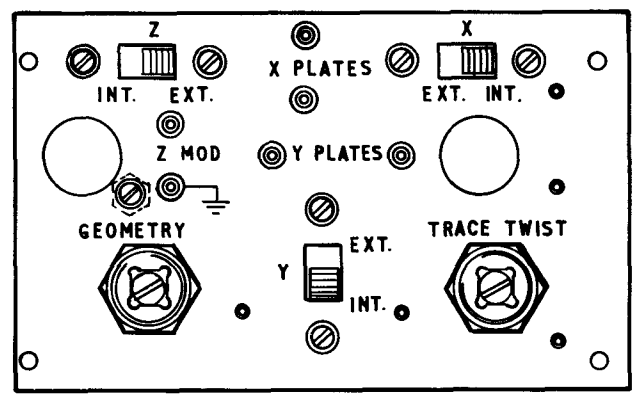




PLATE SELECTOR BOARD

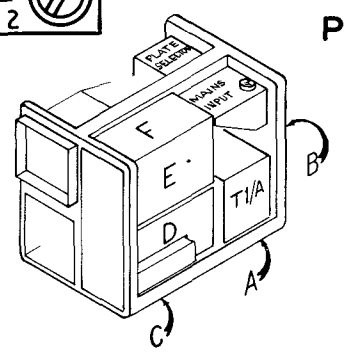



FIG 3 1

PRINTED CIRCUIT BOARD 'B'

## CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (contd.) | | | | | |
| D9 | | | | | B910086/2 |
| D10 | | | | | B910086/2 |
| D11 | | | | | B912688 |
| D12 | | | | | B910086/2 |
| D13 | | | | | A912687/14 |
| D14 | | | | | A912687/15 |
| D15 ) | | | | | C912679/2 |
| D16 ) | | | | | B910086/2 |
| D17 ) | Fig 1 | | | | B910086/2 |
| D18 ) | | | | | C912679/3 |
| D19 ) | | | | | C912679/3 |
| D20 ) | | | | | C912679/3 |
| D21 ) | | | | | C912679/3 |
| D22 | | | | | B910086/2 |
| PLUGS | | | | | |
| Fixed, uncoded, 6 off for CRT leads, white | | | | | A912695/1 |
| RESISTORS | | | | | |
| R1 | | 10k | 5 | ½W | B912636/73 |
| R2 | | 3.3k | 5 | 4W | B912639/61 |
| R3 | | 330 | 5 | ½W | B912636/37 |
| R4 | | 6.8k | 5 | 1W | 5905-99-013-5766 |
| R5 | | 3.9k | 5 | 1W | 5905-99-013-5760 |
| R6 | | 47 | 5 | ½W | B912636/17 |
| R7 | | 47 | 5 | ½W | B912636/17 |
| R8 | | 15k | 5 | ½W | B912636/77 |
| R9 | | 470k | 5 | ½W | B912636/113 |
| R10 | | 1M | 5 | ½W | B912636/121 |
| R11 | | 5.6k | 5 | ½W | B912636/67 |
| R12 | | 15k | 5 | 1W | 5905-99-013-5774 |
| R13 | | 22k | 5 | 1W | 5905-99-013-5778 |
| R14 | | 120k | 5 | ½W | B912636/99 |
| R15 | | 390k | 5 | ½W | B912636/39 |

## P.C.B. 'B' C/SA 80490/83

## CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| R16 ) | | 4.7k | 5 | ½W | B912636/65 |
| R17 ) | Fig 1 | 8.2k | 5 | 1W | B912637/71 |
| R18 ) | | 180 | 5 | ½W | B912636/31 |
| R19 | | 4.7k | 5 | ½W | B912636/65 |
| R20 | | 4.7k | 5 | ½W | B912636/65 |
| R21 | | 12k | 5 | ½W | B912636/75 |
| R22 | | 4.7k | 5 | ½W | B912636/65 |
| R23 | | 1k | 5 | ½W | B912636/49 |
| R24 | | 330k | 1 | | B912160/85 |
| R25 | | 100k | 5 | ½W | 5905-99-013-6164 |
| R26 | | 2.2M | 1 | | B912641/1 |
| R27 | | 2.2M | 1 | | B912641/1 |
| R28 | | 2.2M | 1 | | B912641/1 |
| R29 | | 1.5M | 1 | | B912641/3 |
| R30 | | 10 | 5 | ½W | B912636/1 |
| R31 | | 10 | 5 | ½W | B912636/1 |
| R32 | | 47k | 5 | 1W | B912637/89 |
| R33 | | 1k | 5 | 1W | B912637/49 |
| R34 ) | | | | | |
| R35 ) | See Fig 1 | | | | |
| R36 ) | | | | | |
| R37 ) | | 4.7M | 10 | ½W | B912748/1 |
| R39 ) | Fig 1 | 100k | 5 | ½W | B912636/97 |
| R40 ) | Fig 1 | 47k | 5 | ½W | B912636/89 |
| R41 ) | Fig 1 | 47k | 5 | ½W | B912636/89 |
| R46 | | 150 | 5 | ½W | B912636/29 |
| R47 | | 100 | 5 | ½W | B912636/25 |
| RESISTORS, VARIABLE | | | | | |
| RV1 | | 4.7k | 20 | | A912635/10 |
| RV2 | | 47k | 20 | | A912635/14 |
| RV3 ) | Fig 1 | 4.7k | - | | B912749/3 |

## CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS, VARIABLE, (contd.) | | | | | |
| RV4 ) Fig 1 | | 100k | 20 | | B912643/6 |
| RV5 ) Fig 1 | 10 turn | 200k | - | | B912643/3 |
| RV6 ) Page 3.6 | | - | - | | - |
| RV7 ) Fig 1 | | 100k | | | B912690/1 |
| RV8 ) Page 3.6 | | - | - | - | - |
| RV9 ) Fig 1 | | 150k | 20 | - | B912749/2 |
| TRANSISTORS | | | | | |
| TR1 | | | | | A912680 |
| TR2 | | | | | A912680 |
| TR3 | | | | | A912682 |
| TR4 | | | | | A912680 |
| TR5 | | | | | B912545 |
| TR6 | | | | Alternative | (B912777/2 (B912778 |
| TR7 | | | | | B912778 |
| TR8 | | | | | B912778 |
| TR9 | | | | | B912778 |
| TR10 | | | | | B99160/1 |
| TR11 | | | | Alternative | (B912777/2 (B912778 |
| MISCELLANEOUS | | | | | |
| | Mounting Pad TO5 | | | | A99286 (4 off) |

# PLATE SELECTOR BOARD C/SA 80490/110

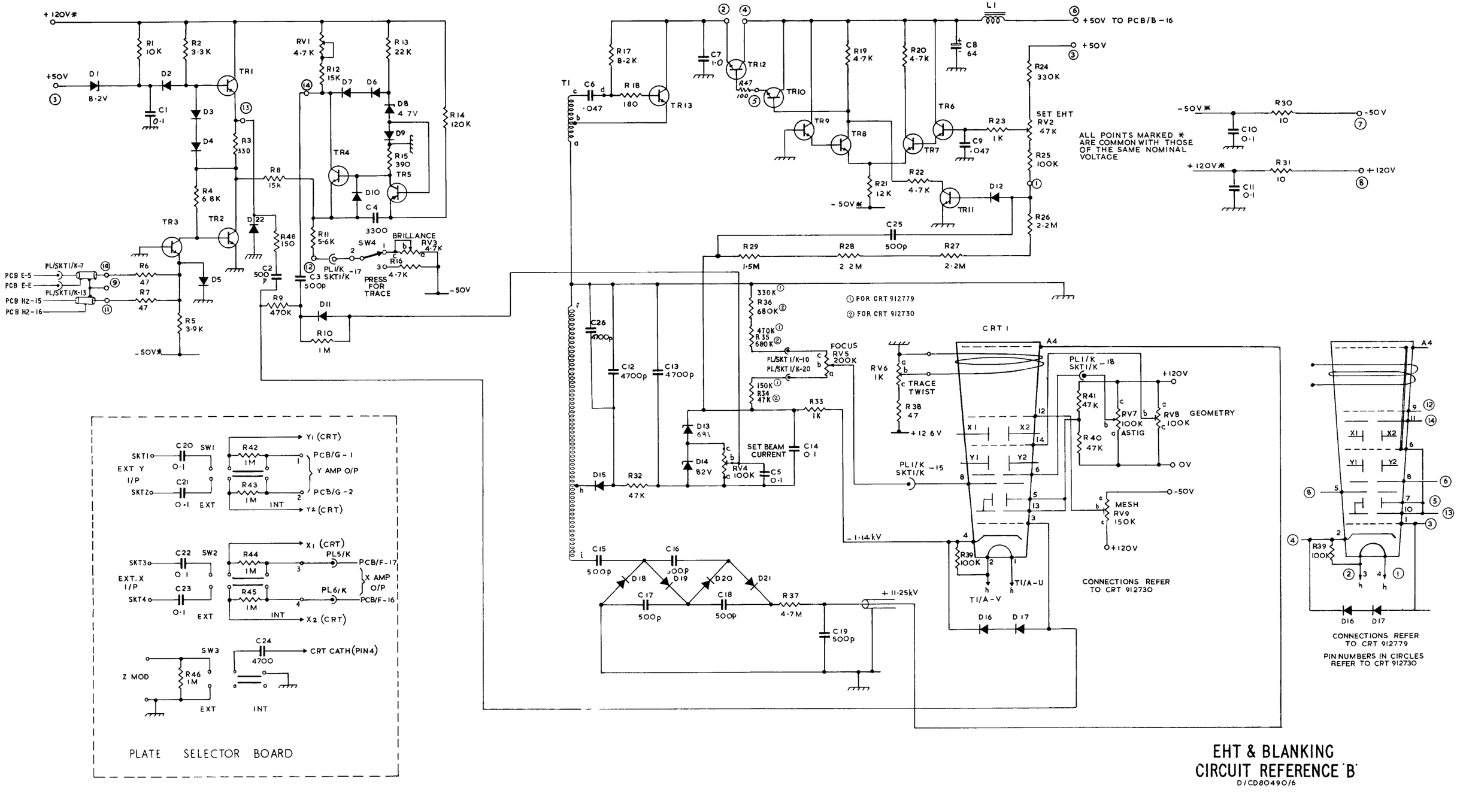
## CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **CAPACITORS** | | | | | |
| C20 | | 0.1 | 20 | 630V | B911625/31 |
| C21 | | 0.1 | 20 | 630V | B911625/31 |
| C22 | | 0.1 | 20 | 630V | B911625/31 |
| C23 | | 0.1 | 20 | 630V | B911625/31 |
| C24 | | 4700p | -20+50 | 3KV | B912650/55 |
| **RESISTORS** | | | | | |
| R38 | | 47 | 5 | ½W | B912636/17 |
| R42 | | 1M | 5 | ½W | B912636/121 |
| R43 | | 1M | 5 | ½W | B912636/121 |
| R44 | | 1M | 5 | ½W | B912636/121 |
| R45 | | 1M | 5 | ½W | B912636/121 |
| R46 | | 1M | 5 | ½W | B912636/121 |
| **RESISTORS, VARIABLE** | | | | | |
| RV6 | | 1K | | | B912643/2 |
| RV8 | | 100K | | | B912749/4 |
| **SWITCHES** | | | | | |
| SW1 | | | | | B912703 |
| SW2 | | | | | B912703 |
| SW3 | | | | | B912703 |
| **ASSEMBLIES** | | | | | |
| SKT1-6 | 'X' and 'Y' Mod.Board **containing:-** | | | | C/SA80490/111 |
| | **SKT1-6** | | | | A99280/10 **6 off.** |
| | C.R.T. Lead Assembly containing: | | | | A/SA80490/121 |
| | Socket (Yellow) (6 off) | | | | **A912696/3** |
| | C.R.T. Lead Assembly containing: | | | | A/SA80490/122 |
| | Socket (Blue) | | | | A912696/4 |

CIRCUIT REFERENCE 'B'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| ASSEMBLIES (contd.) | | | | | |
| | C.R.T. Lead Assembly containing: | | | | A/SA80490/123 |
| | Socket (Red) | | | | A912696/1 |
| | C.R.T. Lead Assembly containing: | | | | A/SA80490/124 |
| | Socket (Black) | | | | A912696/2 |
| MISCELLANEOUS | | | | | |
| | Pot Lock (2 off) | | | | KT93660 |

| | | |
|---|---|---|
| R | 1, 6, 7, 5, 46, 2, 4, 42, 44, 3, 43, 45, 9, 8, 46, 10, 11, 12, 13, 15, 16, 17, 18, 32, 36, 29, 35, 34, 37, 33, 28, 19, 21, 38, 20, 22, 27, 39, 23, 25, 24, 26, 41, 40, 30, 31, | R |
| C | 1, 20, 22, 21, 23, 24, 2, 3, 4, 6, 15, 12, 17, 13, 16, 7, 18, 5, 14, 19, 25, 8, 9, 10, 11, | C |
| D | 1, 2, 3, 4, 5, D22, 11, 7, 10, 6, 8, 9, 26, 15, 18, 19, 13, 14, 20, 21, 16, 12, 17 | D |
| MISC. | SW3, TR3, SW1, SW2, TR2, TR1, RV1, TR4, TR5, T1, TR13, RV4, TR12, RV5, TR10, TR9, TR8, RV6, TR7, TR6, TR11, L1, RV2, RV9, RV7, RV8. | MISC |




# EHT & BLANKING CIRCUIT REFERENCE 'B'

D/CD80490/6

FIG 3 2

FIGURE 4

TRIGGER CIRCUITS

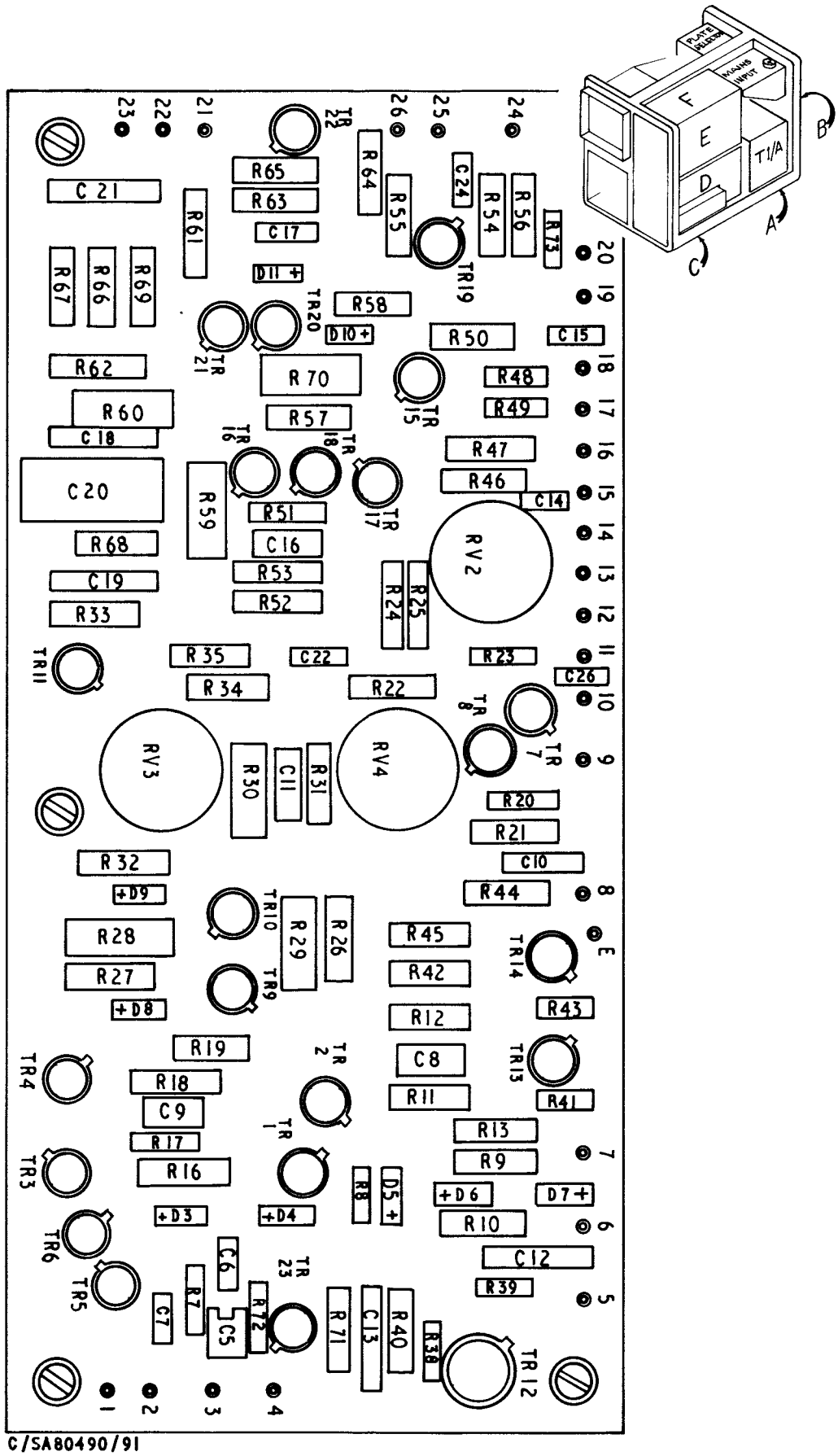



FIG. 4 1

PRINTED CIRCUIT BOARD 'C'

## P.C.B. 'C' C/SA 80490/91

## CIRCUIT REFERENCE 'C'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **CAPACITORS** | | | | | |
| C1 ) | | 33p | 5 | 630V | B91270V |
| C2 ) | | 180p | 5 | 125V | B910931/107 |
| C3 ) | Fig 1 | .01µ | +80-20 | 750V | B910976/2 |
| C4 ) | | 100p | 10 | 750V | C96964/85 |
| C5 | | 2-20p | | 50V | A912672/3 |
| C6 | | .01 | +80-20 | 100V | B911711/10 |
| C7 | | .01 | +80-20 | 100V | B911711/10 |
| C8 | | 56p | 10 | 160V | B910931/11 |
| C9 | | 1000p | 10 | 63V | B910222/9 |
| C10 | | 0.1 | +50-20 | 18V | B912282/11 |
| C11 | | 100p | 5 | 125V | B910031/104 |
| C12 | | 0.1 | 10 | 250V | B911477/2 |
| C13 | | 0.1 | 10 | 250V | B911477/2 |
| C14 | | 0.1 | +50-20 | 18V | B912282/11 |
| C15 | | .01 | +80-20 | 100V | B911711/10 |
| C16 | | 1000p | 10 | 63V | B910222/9 |
| C17 | | 100p | 5 | 125V | B910931/104 |
| C18 | | 0.1 | 10 | 250V | B911477/2 |
| C19 | | 0.1 | 10 | 250V | B911477/2 |
| C20 | | 1 | 20 | 100V | B911943/40 |
| C21 | | 0.1 | 10 | 250V | B911477/2 |
| C22 | | .01 | +80-20 | 100V | B911711/10 |
| C24 | | 0.1 | +50-25 | 18V | B912282/11 |
| C25 ) | Fig 1 | 100p | 2.5 | 160V | B910931/18 |
| C26 | | .01 | +80-20 | 100V | B911711/10 |
| **DIODES** | | | | | |
| D1 ) | Fig 12 | | | | A912675 |
| D3 | | | | | B910086/2 |
| D4 | | | | | A912684 |
| D5 | | | | | A912684 |
| D6 | | | | | B910086/2 |

## CIRCUIT REFERENCE 'C'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (contd.) | | | | | |
| D7 | | 10V | 5 | 400MW | B910099/15 |
| D8 | | 10V | 5 | 400MW | B910099/15 |
| D9 | | 8.2V | 5 | 400MW | B910099/13 |
| D10 | | 10V | 5 | 400MW | B910099/15 |
| D11 | | 8.2V | 5 | 400MW | B910099/13 |
| RESISTORS | | | | | |
| R1) | | 1.125M | 1 | - | B912160/93 |
| R2) | | 900k | 1 | - | B912160/91 |
| R3) | Fig 1 | 111k | 1 | - | B912160/81 |
| R4) | | 1M | 1 | - | B912160/85 |
| R5) | | 100k | 5 | ½W | B912160/97 |
| R6) | | 1M | 1 | - | B912160/88 |
| R7 | | 100k | 5 | ⅛W | B912638/97 |
| R8 | | 220 | 5 | ⅛W | B912638/33 |
| R9 | | 33k | 5 | ½W | B912636/85 |
| R10 | | 8.2k | 5 | ½W | B912636/71 |
| R11 | | 2.2k | 5 | ½W | B912636/57 |
| R12 | | 8.2k | 5 | ½W | B912636/71 |
| R13 | | 47 | 5 | ½W | B912636/17 |
| R14) | | 47 | 5 | ½W | B912160/88 |
| R15) | Fig 1 | 47 | 5 | ½W | B912160/88 |
| R16 | | 470 | 5 | ½W | B912636/41 |
| R17 | | 22 | 5 | ⅛W | B912638/9 |
| R18 | | 12k | 5 | ½W | B912636/75 |
| R19 | | 12k | 5 | ½W | B912636/75 |
| R20 | | 47 | 5 | ⅛W | B912638/17 |
| R21 | | 10k | 5 | ½W | B912636/73 |
| R22 | | 33k | 5 | ½W | B912636/85 |
| R23 | | 1k | 5 | ⅛W | B912638/49 |
| R24 | | 8.2k | 5 | ½W | B912636/71 |
| R25 | | 1.6k | 5 | ½W | B912636/54 |
| R26 | | 4.7k | 5 | ½W | B912636/65 |
| R27 | | 8.2k | 5 | ½W | B912636/71 |
| R28 | | 2.7k | 5 | ½W | 5905-99-013-5756 |
| R29 | | 4.7k | 5 | 1W | 5905-99-013-5762 |

## CIRCUIT REFERENCE 'C'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R30 | | 4.7k | 5 | 1W | 5905-99-013-5762 |
| R31 | | 390 | 5 | ½W | B912636/39 |
| R32 | | 75 | 5 | ½W | B912636/22 |
| R33 | | 6.2k | 5 | ½W | B912636/68 |
| R34 | | 6.2k | 5 | ½W | B912636/68 |
| R35 | | 330 | 5 | ½W | B912636/37 |
| R36) | Fig 1 | 3.3k | 5 | ½W | B912636/61 |
| R37) | | 3.3k | 5 | ½W | B912636/61 |
| R38 | | 2.7k | 5 | ⅛W | B912638/59 |
| R39 | | 68 | 5 | ⅛W | B912638/21 |
| R40 | | 6.8k | 5 | ½W | B912636/69 |
| R41 | | 300 | 5 | ½W | 5905-99-013-6103 |
| R42 | | 6.8k | 5 | ½W | B912636/69 |
| R43 | | 3.3k | 5 | ⅛W | B912638/61 |
| R44 | | 3.9k | 5 | ½W | B912636/63 |
| R45 | | 13k | 5 | ½W | B912636/76 |
| R46 | | 47k | 5 | ½W | B912636/89 |
| R47 | | 12k | 5 | ½W | B912636/75 |
| R48 | | 47 | 5 | ⅛W | B912638/17 |
| R49 | | 47 | 5 | ⅛W | B912638/17 |
| R50 | | 470 | 5 | ½W | B912636/41 |
| R51 | | 22 | 5 | ⅛W | B912638/9 |
| R52 | | 12k | 5 | ½W | B9126307/75 |
| R53 | | 12k | 5 | ½W | B9126307/75 |
| R54 | | 10k | 5 | ½W | B9126307/73 |
| R55 | | 2.4k | 5 | ½W | B9126307/58 |
| R56 | | 13k | 5 | ½W | B912636/76 |
| R57 | | 8.2k | 5 | ½W | B912636/71 |
| R58 | | 10k | 5 | ½W | B912636/73 |
| R59 | | 4.7k | 5 | 1W | 5905-99-013-5762 |
| R60 | | 4.7k | 5 | 1W | 5905-99-013-5762 |
| R61 | | 390 | 5 | ½W | B912636/39 |
| R62 | | 75 | 5 | ½W | B912636/22 |

## P.C.B. 'C' S/CA 80490/91

## CIRCUIT REFERENCE 'C'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R63 | | 6.2k | 5 | ½W | B912636/68 |
| R64 | | 6.2k | 5 | ½W | B912636/68 |
| R65 | | 330 | 5 | ½W | B912636/37 |
| R66 | | 10 | 5 | ½W | B912636/1 |
| R67 | | 10 | 5 | ½W | B912636/1 |
| R68 | | 10 | 5 | ½W | B912636/1 |
| R69 | | 10 | 5 | ½W | B912636/1 |
| R70 | | 2.7k | 5 | 1W | ITB 3533/27205 |
| R71 | | 10k | 5 | ½W | B913636/73 |
| R72 | | 100 | 5 | ⅛W | B913638/25 |
| R73 | | 150 | 5 | ⅛W | B913628/29 |
| RESISTORS, VARIABLE | | | | | |
| RV1 (Fig 1) | See also Fig 12 | 2.2k | | | B912749/1 |
| RV2 | | 2.2k | | 20 | A912635/1 |
| RV3 | | 10k | | 20 | A912635/11 |
| RV4 | | 2.2k | | 20 | A912635/1 |
| RV5 (Fig 1) | See also Fig 12 | 2.2k | | | B912632/1 |
| SOCKETS | | | | | |
| SKT1 (Fig 1) | | | | | B912589 |
| SWITCHES | | | | | |
| S1) | | | | | B912564 |
| S2) | | | | | B912564 |
| S3) Fig 1 | | | | | B912564 |
| S4) | | | | | B912703 |
| TRANSISTORS | | | | | |
| TR1) | | (matched pair) | | | A912677 |
| TR8) | | | | | |
| TR2 | | | | | A910649 |
| TR3 | | | | | A910649 |
| TR4 | | | | | A912682 |
| TR5 | | | | | A910649 |
| TR6 | | | | | A912682 |
| TR7 | | | | | A912682 |
| TR9 | | | | | A912682 |
| TR10 | | | | | A912682 |

## P.C.B. 'C' C/SA 80490/91

## CIRCUIT REFERENCE 'C'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| TR11 | | | | | B912545 |
| TR12 | | | | | B910008 |
| TR13 | | | | | A910649 |
| TR14 | | | | | A910648 |
| TR15 | | | | | A910649 |
| TR16 | | | | | A912682 |
| TR17 | | | | | A910649 |
| TR18 | | | | | A912682 |
| TR19 | | | | | A910649 |
| TR20 | | | | | A912682 |
| TR21 | | | | | A912682 |
| TR22 | | | | | B912545 |
| TR23 | | | | | A910649 |
| MISCELLANEOUS | | | | | |
| | Transistor Mtg. Pad. T05 | | | | A99286 |

| | | |
|---|---|---|
| R | 1, 2, 38, 36, 3, 37, 39, 40, 4, 5, 6, 7, 8, 10, 9, 11, 12, 41, 42, 43, 14, 19, 44, 16, 18, 45, 17, 19, 46, 47, 21, 22, 23, 48, 49, 25, 24, 50, 52, 51, 53, 27, 26, 54, 28, 55, 56, 29, 57, 58, 31, 30, 70, 59, 61, 32, 60, 62, 34, 33, 63, 64, 35, 65, 66, 67, 68, 69, | R |
| C | 1, 2, 13, 12, 3, 4, 5, 6, 7, 8, 9, 14, 10, 15, 16, 11, 17, 18, 19, 20, 21, 22, | C |
| TR | 12, 23, 1, 2, 13, 14, 4, 3, 5, 6, 7, 8, 15, 16, 17, 18, 19, 9, 20, 10, 21, 11, 22, | TR |
| MISC. | SW1, D1, SW2, SW3, D3, D4, D5, D6, D7, SW4, RV4, D12, D13, RV1, RV2, D8, RV3, RV5, D9, D10, D11, | MISC. |

ALL POINTS MARKED X ARE COMMON WITH THOSE OF THE SAME NOMINAL VOLTAGE

+50V* R66 10 (22) +50V
C18 0·1
-50V* R67 (23) -50V
C19 0·1
12·6VA R68 10
C20 1·0
(21) +12·6V
12·6VB
12·6VC R69 10
C21 0·1

TRIGGER MODE SWITCH W2 — PIN 10
TRIGGER MODE SWITCH W2 — PIN 8
D1
SW 2 SOURCE
SW 3 COUPLING
R5 100K
SW 1 ATTEN
TRIGGER OR OUT
SKT 1
R1 1·125M 5V/cm
R2 900K 1V/cm
C1 33p 5V/cm
x1
÷2
÷10
INT
EXT
LINE
AC
AC LF REJ (3)
DC
C3 ·01
C4 100p
R7 100K
C6 ·01
R8 220
C25 100p
C2 180p
R3 111K
R4 1M
R6 1M
C5 2-20p
6·3V AC
R36 3·3K
R37 3·3K
D3
D4
D5
D6
C7 ·01
TR1
TR2
C8 56p
R11 2·2K
R12 8·2K
R9 33K
R13 47
R10 8·2K
-10V
D7 10V
SLOPE
SW 4
R14 47 (1)
R15 47 (2)
TR3
TR4
TR5
TR6
R16 470
R17 22
C9 1000p
R18 12K
R19 12K
R20 47 (9)
C10 ·01
R21 10K
R22 33K
C26 ·01
TR7
TR8
TRIG LEVEL
RV1 2·2K
RV2 2·2K AUTO PRESET
R25 1·6K (14)
R24 8·2K (12)
R23 1K
TRIG. SLOPE BALANCE
RV3 10K
R26 4·7K
R27 8·2K
R28 2·7K
D8 10V
D9 8·2V
TR9
TR10
R31 390
C11 100p
R29 4·7K
R30 4·7K
R34 6·2K
R35 330
C22 ·01
(11) MAIN TRIGGER O/P
TRIGGER MODE SWITCH W5-PIN 7
R32 75
R33 6·2K
TR11
+50V
12·6VA
12·6VB
12·6VC
-50V*
(7) TRIGGER MODE SWITCH W1 — PIN 13
TRIGGER MODE SWITCH W1 - PIN 10
TRIGGER MODE SWITCH W5 — PIN 22
(10) TRIGGER MODE SWITCH W5 — PIN 1
(13) TRIGGER MODE SWITCH W5 — PIN 3

PL1/K SKT1/K-8
PL1/K SKT1/K-14
-5
-6
(6)
(5)
R39 68
R38 2·7K
TR12
TR23
R40 6·8K
R71 10K
C12 ·01
C13 ·01
R72 100 (4)
INT TRIGGER O/P
T/B MODE SWITCH W3 - PIN 12
-50V*

R41 220
R43 3·3K
TR13
TR14
RV4 2·2K
R44 3·9K
SET X AMP GAIN
R42 68K
R45 13K
O/P (8) TRIGGER MODE SWITCH W3 — PIN 9
(15) T/B MODE SWITCH W3 - PIN 4
X PRE-AMP

C15 ·01
R47 12K
C14 0·1
R46 47K
GATED SLOPE SW 5
(18)
(17)
(16)
R48 47
R49 47
TR15
TR16
TR17
TR18
R50 470
R51 22
C16 1000p
R52 12K
R53 12K
(19) R73 150
TR19
(26) RV5 2·2K GATED TRIG LEVEL
(25)
(24)
C24 0·1
R54 10K
R55 2·4K
R56 13K
D10 10V
D11 8·2V
TR20
R57 8·2K
R58 10K
R70 2·7K
R59 4·7K
R61 390
C17 100p
TR21
R60 4·7K
R62 75
R63 6·2K
R64 6·2K
R65 330
TR22
GATED TRIG O/P
(20) TB MODE SWITCH W3 - PIN 6
12·6V C
-50V*
GATED TRIGGER CCT

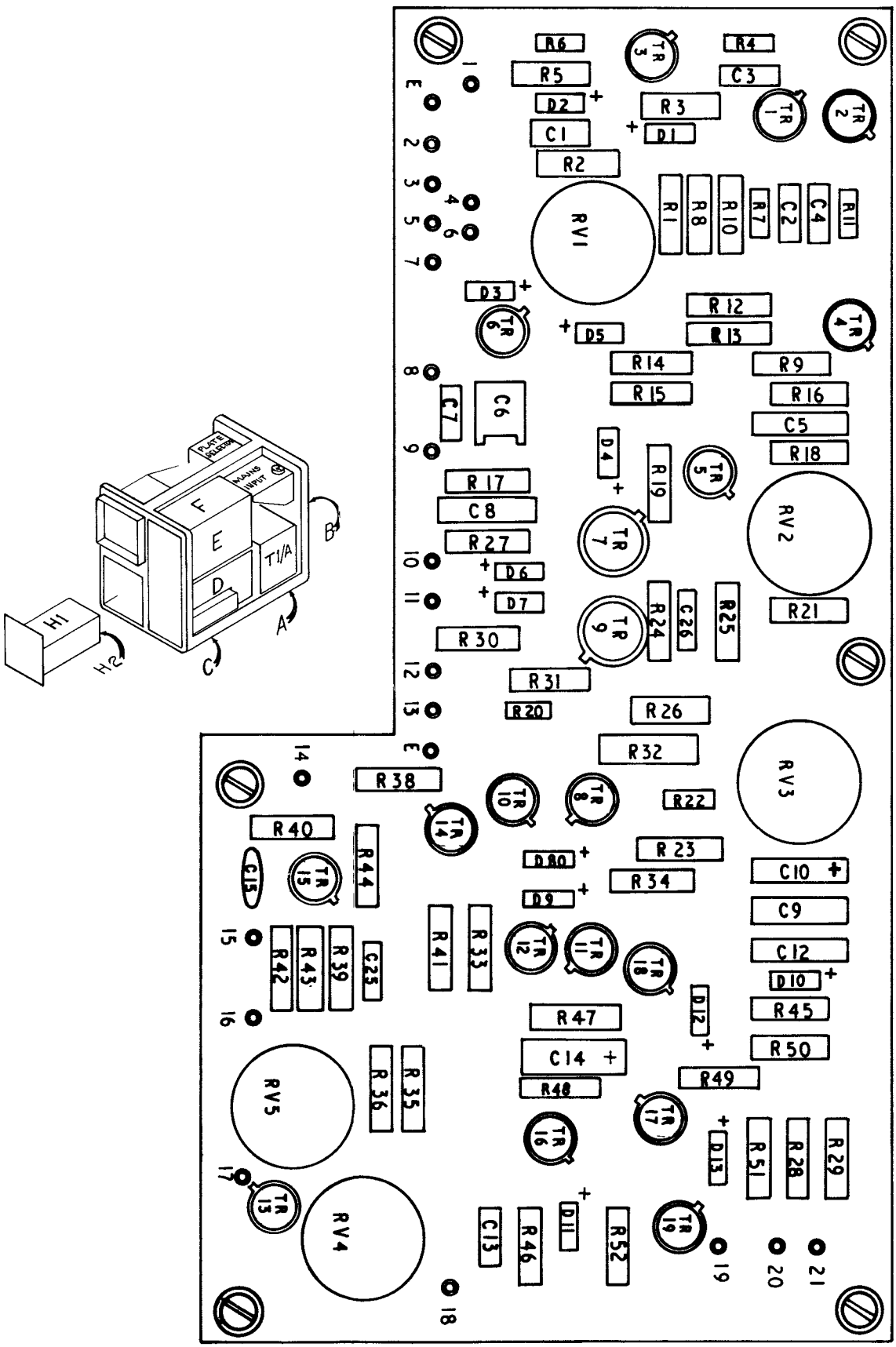
# TRIGGER CIRCUITS
# CIRCUIT REFERENCE 'C'

D/CD80490/4

FIG 4 2

FIGURE 5

'B' TIMEBASE, COMPARATOR and AUTO




C/SA80490/85

FIG. 5 1

PRINTED CIRCUIT BOARD 'D'

## P.C.B. 'D' C/SA 80490/85

## CIRCUIT REFERENCE 'D'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C1 | | 33p | 5 | 125V | B910931/99 |
| C2 | | 18p | 5 | 125V | B910931/96 |
| C3 | | 18p | 5 | 125V | B910931/96 |
| C4 | | 18p | 5 | 125V | B910931/96 |
| C5 | | 0.1 | 10 | 250V | B911477/2 |
| C6 | | 2-20p | | 50V | B912672/3 |
| C7 | | 82p | 5 | 125V | B910931/103 |
| C8 | | 0.1 | 10 | 250V | B911477/2 |
| C9 | | 0.1 | 10 | 250V | B911477/2 |
| C10 | | 5 | | 64V | B91070$^{0}$/45 |
| C11 | | 82p | 5 | 125V | B910931/103 |
| C12 | | 0.1 | 10 | 250V | B911477/2 |
| C13 | | 22p | 5 | 125V | B910931/97 |
| C14 | | 4 | +100-0 | 10V | B910700/19 |
| C15 | | 0.01 | +80-20 | 100V | B911711/10 |
| C16 | | 0.1 | 1 | 160V | B912645/101 |
| C17 | | 9900p | 1 | 160V | B912645/114 |
| C18 | | 900p | 1 | 350V | A912648 |
| C19 | | 1 | 20 | 100V | B911943/40 |
| C20 | | 0.1 | 20 | 100V | B911943/34 |
| C21 | | 0.01 | 20 | 100V | B911943/28 |
| C22 | | 1000p | 5 | 125V | B910931/115 |
| C23 | | 100p | 5 | 125V | B910931/104 |
| C24 | | 1 | 1 | 63V | B912644/3 |
| C25 | | 1000p | -20+40 | | B911711/9 |
| C26 | | 470p | | 160V | B910931/111 |
| DIODES | | | | | |
| D1 | | | | | B910086/2 |
| D2 | | | | | B910086/2 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | | | | B910086/2 |
| D6 | | 10V | 5 | 400mW | A910099/15 |

## P.C.B. 'D' C/SA 80490/85

## CIRCUIT REFERENCE 'D'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (contd.) | | | | | |
| D7 | | | | | B910086/2 |
| D8 | | | | | B910086/2 |
| D9 | | | | | B910086/2 |
| D10 | | 10V | 5 | 400mW | A910099/15 |
| D11 | | | | | B910086/2 |
| D12 | | | | | B910086/2 |
| D13 | | | | | B910086/2 |
| RESISTORS | | | | | |
| R1 | | 8.2k | 5 | ½W | B912636/71 |
| R2 | | 1.5k | 5 | ½W | B912636/53 |
| R3 | | 1.2k | 5 | ½W | B912636/51 |
| R4 | | 15k | 5 | ⅛W | B912638/77 |
| R5 | | 180 | 5 | ½W | B912636/31 |
| R6 | | 68k | 5 | ⅛W | B912638/93 |
| R7 | | 22k | 5 | ⅛W | B912638/81 |
| R8 | | 470k | 5 | ½W | B912636/113 |
| R9 | | 470k | 5 | ½W | B912636/113 |
| R10 | | 1.2k | 5 | ½W | B912636/51 |
| R11 | | 22k | 5 | ⅛W | B912638/81 |
| R12 | | 1.2k | 5 | ½W | B912636/51 |
| R13 | | 3.9k | 5 | ½W | B912636/63 |
| R14 | | 100k | 5 | ½W | B912636/97 |
| R15 | | 180k | 1 | ½W | B912981/13 |
| R16 | | 10k | 5 | ½W | B912636/73 |
| R17 | | 27k | 5 | ½W | B912636/83 |
| R18 | | 15k | 5 | ½W | 5905-99-013-6144 |
| R19 | | 27k | 5 | ½W | B912636/83 |
| R20 | | 100 | 5 | ⅛W | B912638/25 |
| R21 | | 47k | 5 | ½W | B912636/89 |
| R22 | | 10 | 5 | ⅛W | B912638/1 |
| R23 | | 1k | 5 | ½W | B912636/49 |
| R24 | | 10k | 5 | ½W | B912636/13 |
| R25 | | 2.7k | 5 | ½W | B912636/59 |

P.C.B. 'D' C/SA 8049C/85

CIRCUIT REFERENCE 'D'

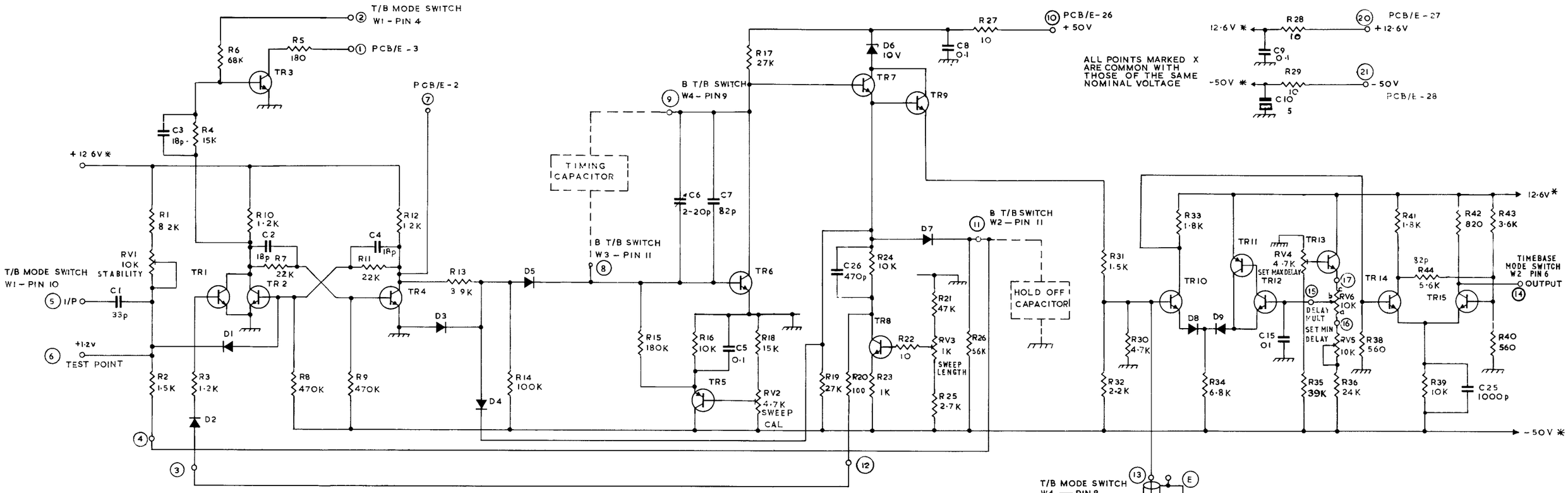
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R26 | | 56K | 5 | ½W | B912636/91 |
| R27 | | 10 | 5 | ½W | B912636/1 |
| R28 | | 10 | 5 | ½W | B912636/1 |
| R29 | | 10 | 5 | ½W | B912636/1 |
| R30 | | 4.7K | 5 | ½W | 5905/99/013-6132 |
| R31 | | 1.5K | 5 | ½W | 5905-99-013-6132 |
| R32 | | 2.2K | 5 | 1W | 5905-99-013-5754 |
| R33 | | 1.8K | 5 | ½W | B912636/55 |
| R34 | | 6.8K | 5 | ½W | B912636/69 |
| R35 | | 39K | 5 | ½W | 5905-99-013-6154 |
| R36 | | 24K | 5 | ½W | 5905-99-013-6149 |
| R38 | | 560 | 5 | ½W | B912636/43 |
| R39 | | 10K | 5 | ½W | B912636/73 |
| R40 | | 560 | 5 | ½W | B912636/43 |
| R41 | | 1.8K | 5 | ½W | B912636/55 |
| R42 | | 820 | 5 | ½W | B912636/47 |
| R43 | | 3.6K | 5 | ½W | B912636/62 |
| R44 | | 5.6K | 5 | ½W | B912636/67 |
| R45 | | 3.3K | 5 | ½W | B912636/61 |
| R46 | | 4.7K | 5 | ½W | B912636/65 |
| R47 | | 6.8K | 5 | ½W | B912636/69 |
| R48 | | 3.3K | 5 | ½W | B912636/61 |
| R49 | | 10K | 5 | ½W | B912636/73 |
| R50 | | 9.1K | 5 | ½W | B912636/72 |
| R51 | | 2.2K | 5 | ½W | B912636/57 |
| R52 | | 8.2K | 5 | ½W | B912636/71 |
| R53 | | 12 | 5 | ⅛W | B912683/3 |

## P.C.B. 'D' C/SA 80490/85

### CIRCUIT REFERENCE 'D'

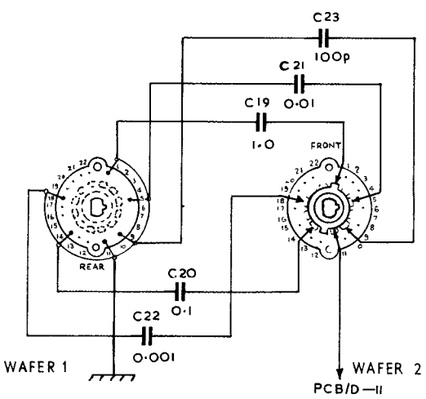
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS, VARIABLE | | | | | |
| RV1 | | 10k | 20 | | A912635/11 |
| RV2 | | 4.7k | 20 | | A912635/10 |
| RV3 | | 1k | 20 | | A912635/9 |
| RV4 | | 4.7k | 20 | | A912635/10 |
| RV5 | | 10k | 20 | | A912635/11 |
| RV6 (Fig 1) | 10 turns | 10k | - | | A912633/8 |
| SWITCHES | | | | | |
| Switch Assembly ('B' Timebase) Fig 1 includes S1 | | | | | B/SA80490/127 A50490/37 |
| TRANSISTORS | | | | | |
| TR1 | | | | | A912682 |
| TR2 | | | | | A912682 |
| TR3 | | | | | A912682 |
| TR4 | | | | | A912682 |
| TR5 | | | | | A910648 |
| TR6 | | | | | A912676/1 |
| TR7 | | | | | B99160/1 |
| TR8 | | | | | A910649 |
| TR9 | | | | | B99160/1 |
| TR10 | | | | | A910649 |
| TR11 | | | | | A910648 |
| TR12 | | | | | A910649 |
| TR13 | | | | | A910649 |
| TR14 | | | | | A912682 |
| TR15 | | | | | A912682 |
| TR16 | | | | | A910648 |
| TR17 | | | | | A910648 |
| TR18 | | | | | A910649 |
| TR19 | | | | | A910649 |
| MISCELLANEOUS | | | | | |
| | Transistor Mounting Pad. TO5 | | | | A99286 (2 off) |

| | | |
|---|---|---|
| R | 1, 2, 3, 4, 6, 10, 7, 5, 8, 9, 11, 12, 13, 53, 14, 15, 16, 46, 47, 17, 18, 45, 48, 19, 20, 49, 23, 24, 22, 21, 25, 26, 27, 50, 51, 52, 31, 32, 30, 33, 34, 28, 29, 37, 35, 36, 38, 41, 39, 42, 43, 40, | R |
| C | 19—23 1, 3, 2, 4, 18 16 24, 17, 6, 13, 12, 7, 5, 14, 26, 8, 9, 10, 15, 11, 25, | C |
| D | 2, 1, 3, 4, 5, 10, 6, 11, 7, 12, 13, 8, 9, | D |
| MISC. | RV1, TR1, TR2, TR3, TR4, TR5, TR6, TR16, TR17, TR7 TR8, TR9, RV3, TR18, TR19, TR10, TR11, TR12, RV4, TR13, RV6, TR14, RV5, TR15, | MISC. |

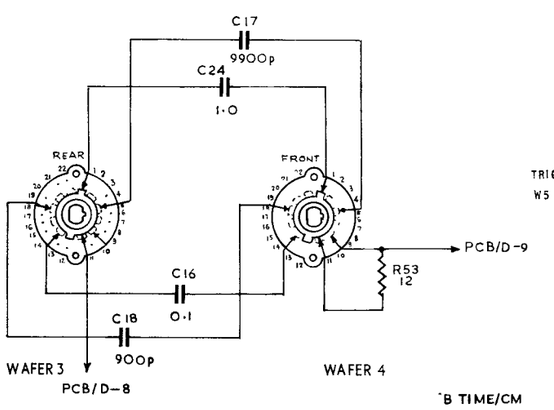



B TIMEBASE

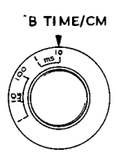
COMPARATOR

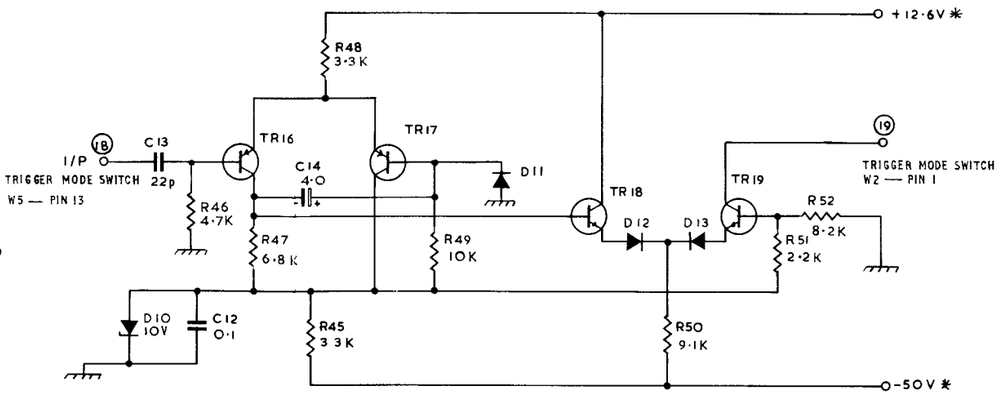



HOLD OFF CAPACITORS




TIMING CAPACITORS




AUTO

# 'B' TIMEBASE, COMPARATOR AND AUTO. CIRCUIT REFERENCE 'D'

D/CD80490 SHEET 3

## CIRCUIT REFERENCE 'E'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG% | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (contd.) | | | | | |
| D2 | | | | | B910086/2 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | | | | B910086/2 |
| D6 | | | | | A912684 |
| D7 | | | | | B910086/2 |
| D8 | | | | | B910086/2 |
| D9 | | | | | B910086/2 |
| D10 | | | | | B910086/2 |
| D11 | | | | | B910086/2 |
| D12 | | | | | B910086/2 |
| D13 | | | | | B910086/2 |
| D14 | | | | | B910086/2= |
| D15 | | | | | B910086/2 |
| D16 | | | | | B910086/2 |
| D17 | | | | | B910086/2 |
| D18 | | 10V | 5 | 400mW | A910099/15 |
| D19 | | 4.7V | 5 | 400mW | A910099/7 |
| INDICATOR LAMPS | | | | | |
| ILP1 | | | | | A912698 |
| ILP2 | | | | | A912698 |
| RESISTORS | | | | | |
| R1 | | 470 | 5 | ½W | B912636/41 |
| R2 | | 820 | 5 | ½W | B912636/47 |
| R3 | | 15k | 5 | ⅛W | B912638/77 |
| R4 | | 10k | 5 | ⅛W | B912638/73 |
| R5 | | 3.3k | 5 | 1W | 5905-99-013-5758 |
| R6 | | 18k | 5 | ⅛W | B912638/79 |
| R7 | | 470k | 5 | ½W | B912636/113 |
| R8 | | 470k | 5 | ½W | B912636/113 |
| R9 | | 18k | 5 | ⅛W | B912638/79 |

## CIRCUIT REFERENCE 'E'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R10 | | 3.3k | 5 | 1W | 5905-99-013-5758 |
| R11 | | 1.2k | 5 | ½W | B912636/51 |
| R12 | | 39k | 5 | ½W | B912636/87 |
| R13 | Not used | | | | |
| R14 | | 220 | 5 | ⅛W | B912638/33 |
| R15 | | 24k | 5 | ½W | B912636/82 |
| R16 | | 100k | 5 | ½W | B912636/97 |
| R17 | | 10k | 5 | ½W | B912636/73 |
| R18 | | 27k | 5 | ½W | B912636/83 |
| R19 | | 10 | 5 | ⅛W | B912638/1 |
| R20 | | 1.2k | 5 | ½W | B912636/51 |
| R21 | | 100 | 5 | ½W | B912636/25 |
| R22 | | 6.2k | 5 | 1W | 5905-99-013-5765 |
| R23 | | 1.5k | 5 | ½W | 5905-99-013-6120 |
| R24 | | 2.2k | 5 | 1W | 5905-99-013-5754 |
| R25 | | 150 | 5 | ⅛W | B912638/29 |
| R26 | | 2.2k | 5 | ½W | 5905-99-013-6124 |
| R27 | | 5.6k | 5 | ½W | 5905-99-013-6134 |
| R28 | | 10k | 5 | ½W | B912636/73 |
| R29 | | 4.7k | 5 | ½W | 5905-99-013-6132 |
| R30 | | 3.3k | 5 | ½W | B912636/61 |
| R31 | | 220 | 5 | ½W | B912636/33 |
| R32 | | 470 | 5 | ½W | B912636/41 |
| R33 | | 47k | 5 | ½W | B912636/89 |
| R34 | | 18k | 5 | ⅛W | B912638/79 |
| R35 | | 10k | 5 | ½W | B912636/73 |
| R36 | | 10k | 5 | ½W | B912636/73 |
| R37 | | 1k | 5 | ½W | B912636/49 |
| R38 | | 24k | 5 | ½W | B912636/82 |
| R39 | | 470 | 5 | ⅛W | B912638/41 |
| R40 | | 10k | 5 | ½W | B912636/73 |

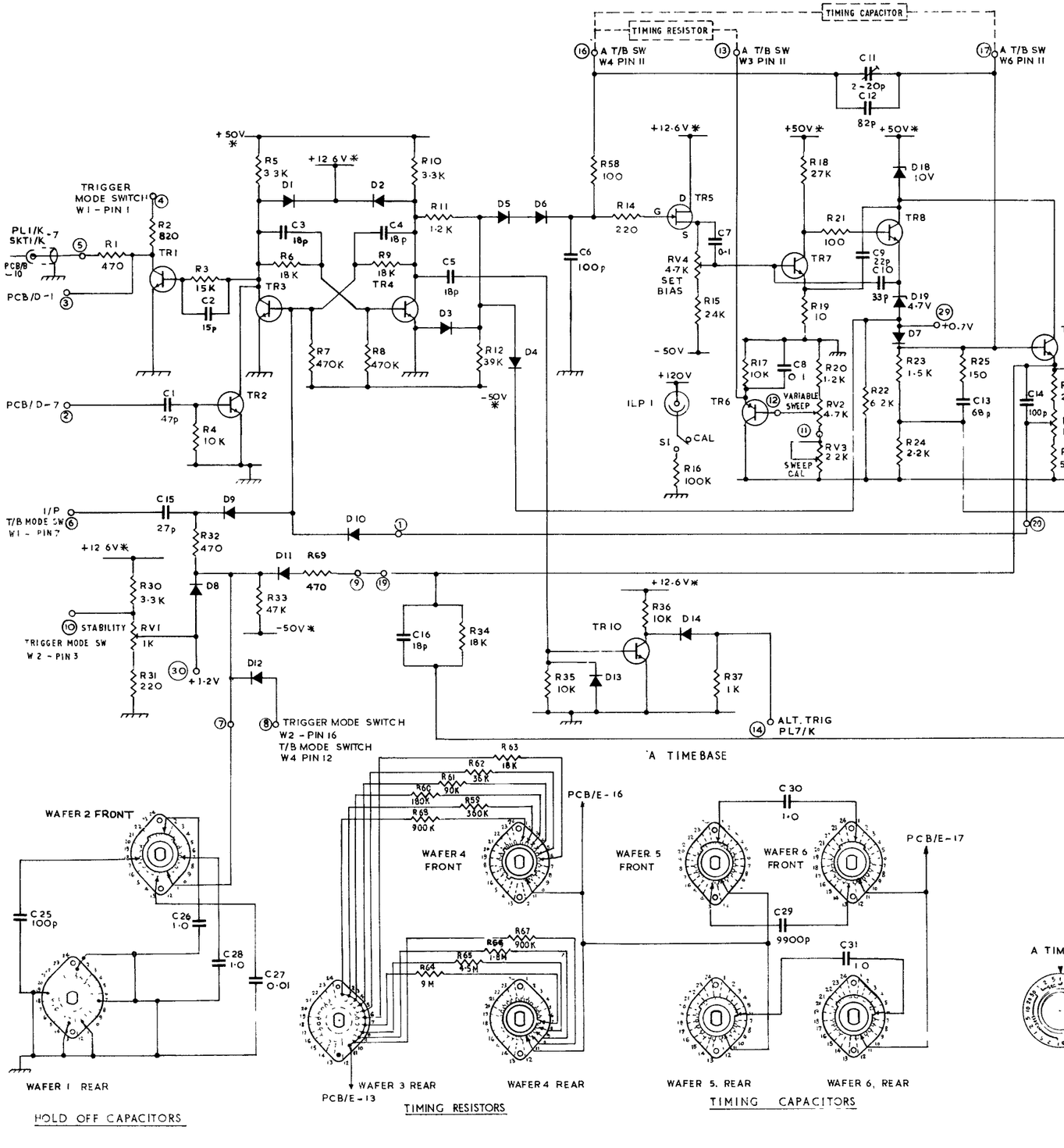
## CIRCUIT REFERENCE 'E'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R41 | | 1k | 5 | ½W | B912636/49 |
| R42 | | 1.2k | 5 | ½W | B912636/51 |
| R43 | | 10k | 5 | ⅛W | B912638/73 |
| R44 | | 150k | 5 | ½W | B912636/101 |
| R45 | | 150k | 5 | ½W | B912636/101 |
| R46 | | 10k | 5 | ⅛W | B912638/73 |
| R47 | | 1.2k | 5 | ½W | B912636/51 |
| R48 | | 1.2k | 5 | ⅛W | B912638/51 |
| R49 | | 56k | 5 | ⅛W | B912638/91 |
| R50 | | 33k | 5 | ⅛W | B912638/85 |
| R51 | | 47k | 5 | ½W | B912636/89 |
| R52 | | 33k | 5 | ½W | B912636/85 |
| R53 | | 10M | 10 | ½W | B912767/290 |
| R54 | | 2.2M | 10 | ½W | B912767/258 |
| R55 | | 10 | 5 | ½W | B912636/1 |
| R56 | | 10 | 5 | ½W | B912636/1 |
| R57 | | 10 | 5 | ½W | B912636/1 |
| R58 | | 100 | 5 | ½W | B912636/25 |
| R59 | | 360k | 1 | | B912160/87 |
| R60 | | 180k | 1 | | B912160/80 |
| R61 | | 90k | 1 | | B912160/79 |
| R62 | | 36k | 1 | | B912160/82 |
| R63 | | 18k | 1 | | B912160/78 |
| R64 | | 9M | 1 | | B9121762/1 |
| R65 | | 4.5M | 1 | | B912762/2 |
| R66 | | 1.8M | 1 | | B912160/89 |
| R67 | | 900k | 1 | | B912160/91 |
| R68 | | 900k | 1 | | B912160/91 |
| R69 | | 470 | 5 | ⅛W | B912638/41 |
| RESISTORS, VARIABLE | | | | | |
| RV1 | | 1k | 20 | | A912635/9 |

## CIRCUIT REFERENCE 'E'

| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RV2 (Fig 1) (See also SLF, Fig 7) | | 4.7k | - | | A912689/1 |
| RV3 | | 2.2k | 20 | | A912635/1 |
| RV4 | | 4.7k | 20 | | A912635/10 |
| RV5 | | 1k | 20 | | A912635/10 |
| **SOCKETS** | | | | | |
| SKT 1 | | | | | A912727 |
| SKT 2 | | | | | B912761 |
| **SWITCHES** | | | | | |
| PB1 Fig 1 Switch Assembly ('A' Timebase) (Fig 1) includes: | | | | | B/SA80490/126 |
| | S1 | | | | A50490/36 |
| | RV2 includes S1F. | 4.7k | | | A912689/1<br>B912702/2 |
| **TRANSISTORS** | | | | | |
| TR1 | | | | | A912682 |
| TR2 | | | | | A912682 |
| TR3 | | | | | A912682 |
| TR4 | | | | | A912682 |
| TR5 | | | | | A912681 |
| TR6 | | | | | A910648 |
| TR7 | | | | | B912676/1 |
| TR8 | | | | | B912676/1 |
| TR9 | | | | | B912676/1 |
| TR10 | | | | | A912681 |
| TR11 | | | | | B912545 |
| TR12 | | | | | A912681 |
| TR13 | | | | | A912681 |
| TR14 | | | | | A910649 |
| **MISCELLANEOUS** | | | | | |
| | Transistor Mtg. Pad. T05 | | | | A99286 (2 off) |

| | | |
|---|---|---|
| R | 1, 30,31, 2, 3,4,32, 33, 5, 6, 7,69, 8, 9, 10, 11, 34, 12, 35, 13, 58, 14, 36, 16, 15, 37, 17, 18, 19, 20,21, 22, 23, 24, 25, 26,27,29,28, 38, 39, 40,41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 54, 51,53,55,56,57, 52, | R |
| C | 1, 15, 2, 3, 4, 16, 5, 6, 7, 8, 9,10,11,12, 13, 14, 17, 18, 19, 20,21, | C |
| TR | 1, 2, 3, 4, 10, 5, 6, 7, 8, 9, 11, 12, 13, 14, | TR |
| MISC | RV1, D8, D9, D12, D1, D10, D11, D2, D3, D5, D4, D6, D13, D14, RV4, ILP1, RV2, RV3, D18,D19,D7, RV5, D15, D16, D17, PB1, SKT 1, ILP 2, | MISC |



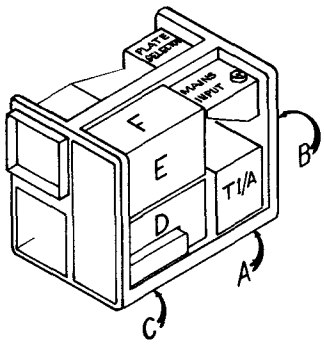

# 'A' TIMEBASE & SINGLE SHOT CIRCUIT REF. 'E'

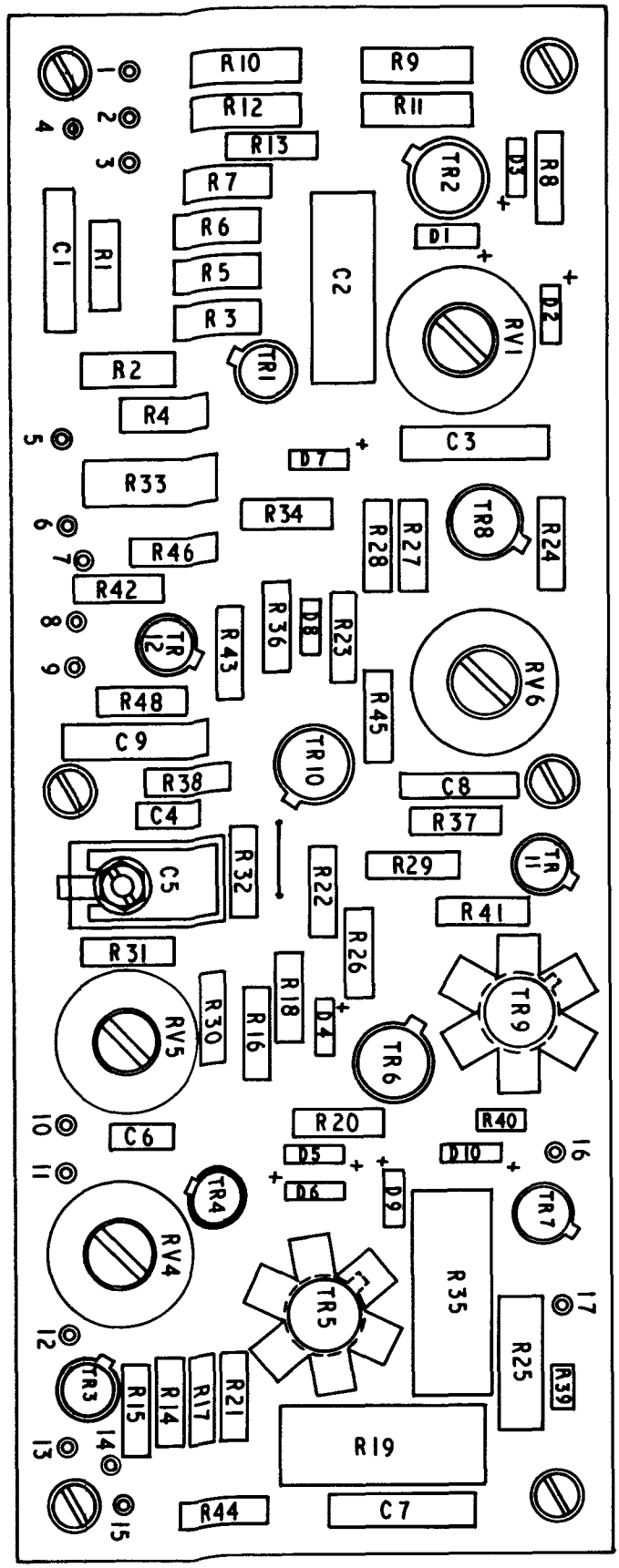
D/CD80490 SHT. 1

FIG 6 2

FIGURE 7

X - AMPLIFIER AND CALIBRATOR




C/SA 80490/102

FIG 7 1

PRINTED CIRCUIT BOARD 'F'

## P.C.B. 'F' C/SA 80490/102

## CIRCUIT REFERENCE 'F'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C1 | | 0.1 | 10 | 250V | B911477/2 |
| C2 | | 0.47 | 2 | 63V | B912644/5 |
| C3 | | 0.1 | 10 | 250V | B911477/2 |
| C4 | | 120p | 5 | 125V | B910931/105 |
| C5 | | 30-140p | | | B912673/4 |
| C6 | | 47p | 5 | 125V | B910931/101 |
| C7 | | 0.1 | 10 | 250V | B911477/2 |
| C8 | | 0.1 | +50-20 | 18V | B912282/11 |
| C9 | | 0.1 | 10 | 250V | B911477/2 |
| DIODES | | | | | |
| D1 | | 4.7V | 5 | 400MW | A910099/7 |
| D2 | | | | | B910086/2 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | | | | B910086/2 |
| D6 | | | | | B910086/2 |
| D7 | | | | | B910086/2 |
| D8 | | | | | B910086/2 |
| D9 | | | | | B910086/2 |
| D10 | | | | | B910086/2 |
| INDICATOR LAMPS | | | | | |
| ILP 1 | | | | | A912698 |
| RESISTORS | | | | | |
| R1 | | 10 | 5 | ½W | B912636/1 |
| R2 | | 12k | 5 | ½W | 5905-99-013-6142 |
| R3 | | 2.2k | 5 | ½W | 5905-99-013-6124 |
| R4 | | 15k | 5 | ½W | 5905-99-013-6144 |
| R5 | | 620 | 5 | ½W | 5905-99-013-6111 |
| R6 | | 56k | 5 | ½W | 5905-99-013-6158 |
| R7 | | 15k | 5 | ½W | 5905-99-013-6144 |

## P.C.B. 'F' C/SA 80490/102

## CIRCUIT REFERENCE 'F'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| R8 | | 10k | 5 | ½W | B912639/73 |
| R9 | | 20k | .5 | ½W | B912160/84 |
| R10 | | 10 | .5 | ½W | B912160/72 |
| R11 | | 20k | .5 | ½W | B912160/84 |
| R12 | | 100 | .5 | ½W | B912160/73 |
| R13 | | 470 | 5 | ½W | B912636/41 |
| R14 | | 8.2k | 5 | ½W | B912636/71 |
| R15 | | 39k | 5 | ½W | B912636/87 |
| R16 | | 39k | 5 | ½W | B912636/87 |
| R17 | | 3.3k | 5 | ½W | B912636/61 |
| R18 | | 33k | 5 | ½W | B912636/85 |
| R19 | | 3.9k | 5 | 4W | B912639/63 |
| R20 | | 5.6k | 5 | ½W | B912636/67 |
| R21 | | 330 | 5 | ½W | B912636/37 |
| R22 | | 22k | 5 | ½W | B912636/81 |
| R23 | | 1k | 5 | ½W | B912636/49 |
| R24 | | 12k | 5 | ½W | B912636/75 |
| R25 | | 18k | 5 | 1W | 5905-99-013-5776 |
| R26 | | 15k | 5 | ½W | B912636/77 |
| R27 | | 3.3k | 5 | ½W | B912636/61 |
| R28 | | 330 | 5 | ½W | B912636/37 |
| R29 | | 15k | 5 | ½W | B912636/77 |
| R30 | | 1.3k | 5 | ½W | B912636/52 |
| R31 | | 150 | 5 | ½W | B912636/29 |
| R32 | | 100 | 5 | ½W | B912636/25 |
| R33 | | 2.7k | 5 | 1W | 5905-99-013-5756 |
| R34 | | 100k | 5 | ½W | B912636/97 |
| R35 | | 3.9k | 5 | 4W | B912636/63 |
| R36 | | 1k | 5 | ½W | B912636/49 |
| R37 | | 330 | 5 | ½W | B912636/37 |
| R38 | | 22k | 5 | ½W | B912636/81 |
| R39 | | 10 | 5 | ⅛W | B912638/1 |
| R40 | | 10 | 5 | ⅛W | B912638/1 |

## P.C.B. 'F' C/SA 80490/102

## CIRCUIT REFERENCE 'F'

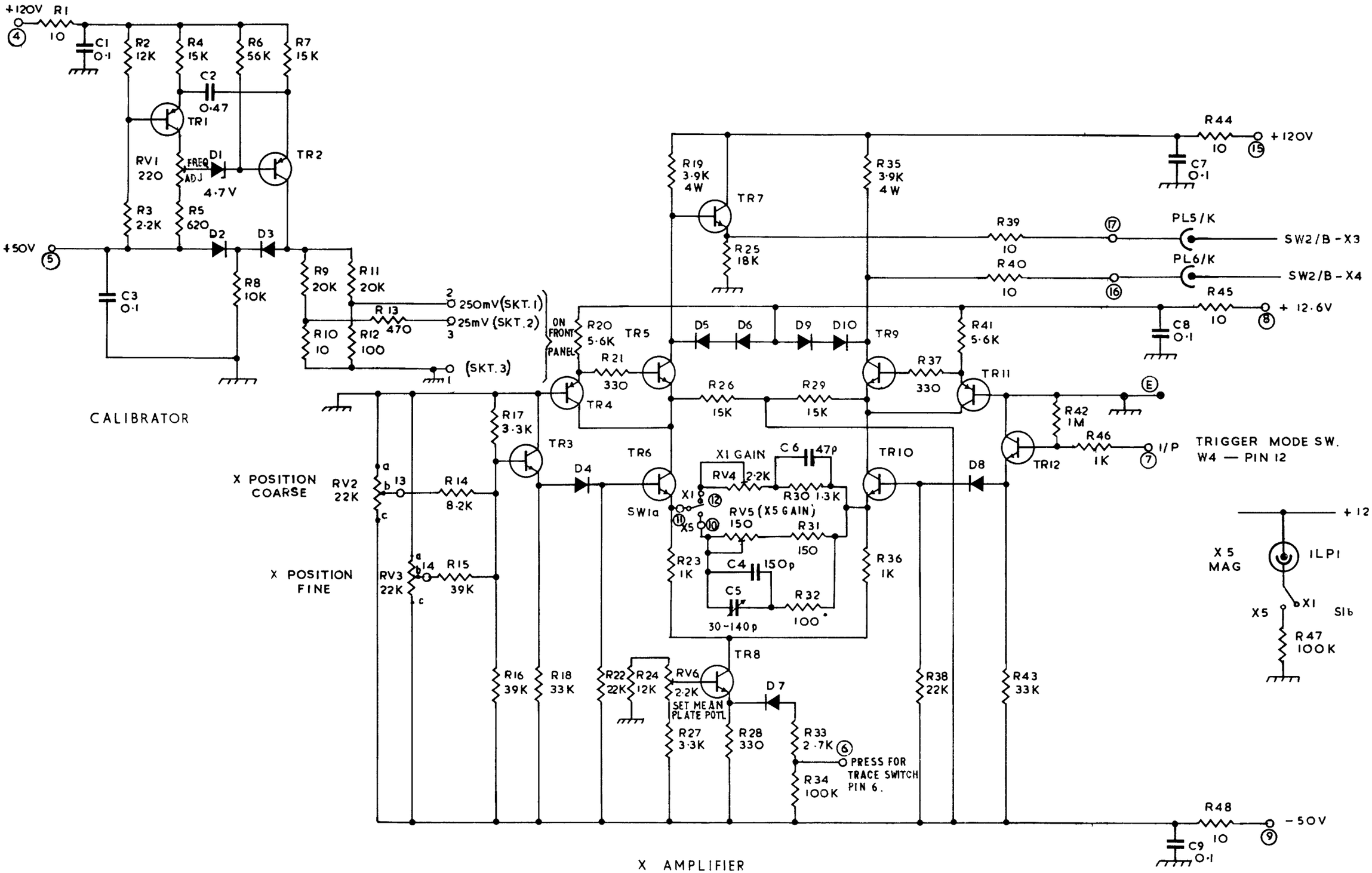
| CCT. REF. | DESCRIPTION | VALUE | TOL. | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **RESISTORS** (contd.) | | | | | |
| R41 | | 5.6k | 5 | ½W | B912636/67 |
| R42 | | 1M | 5 | ½W | B912636/121 |
| R43 | | 33k | 5 | ½W | B912636/85 |
| R44 | | 10 | 5 | ½W | B912636/1 |
| R45 | | 10 | 5 | ½W | B912636/1 |
| R46 | | 1k | 5 | ½W | B912636/49 |
| R47 (Fig 1) | | 100k | 5 | ½W | B912636/97 |
| R48 | | 10 | 5 | ½W | B912636/1 |
| **RESISTORS, VARIABLE** | | | | | |
| RV1 | | 220 | 20 | | A912635/12 |
| RV2) Fig 1<br>RV3) | | 22k+22k | | | A912631/1 |
| RV4 | | 2.2k | 20 | | A912635/1 |
| RV5 | | 150 | 20 | | B912635/16 |
| RV6 | | 2.2k | 20 | | B912635/1 |
| **SOCKETS** | | | | | |
| SKT 1)<br>SKT 2) Fig 1<br>SKT 3) | | | | | B912761 |
| **SWITCHES** | | | | | |
| S1 | Part of RV2E Figs 1 and 6 | | | | |
| **TRANSISTORS** | | | | | |
| TR1 | | | | | A910648 |
| TR2 | | | | | B99161/1 |
| TR3 | | | | | A910649 |
| TR4 | | | | | A910648 |
| TR5 | | | | | A912680 |
| TR6 | | | | | B99160/1 |
| TR7 | | | | | A912680 |
| TR8 | | | | | B99160/1 |
| TR9 | | | | | A912680 |

## P.C.B. 'F' C/SA 80490/102

## CIRCUIT REFERENCE 'F'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| TRANSISTORS (contd.) | | | | | |
| TR10 | | | | | B99160/1 |
| TR11 | | | | | A910648 |
| TR12 | | | | | A910649 |
| MISCELLANEOUS | | | | | |
| | Transistor Mtg. Pad. TO5 (7 off) | | | | A99286 |
| | Transistor Heat Sink TO5 (2 off) | | | | A99130 |

| | | |
|---|---|---|
| R | 1, 2, 3, 4,5, 6,8, 7, 9,10, 11, 12, 13, 14,15, 17, 16, 18, 20, 21,22, 24, 19, 23, 27,26, 28,25, 30, 31,32, 33, 34, 35, 36, 37,38, 41, 39, 40, 43, 42, 46, 45, 44, 48, 47 | R |
| C | 1, 3, 2, 4, 5, 6, 7, 8, 9, | C |
| TR | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, | TR |
| MISC | RV1, D1, D2, D3, RV2, RV3, D4, S1a, RV6, D5, RV4, RV5, D6, D7, D9, D10, D8 S1b | MISC. |



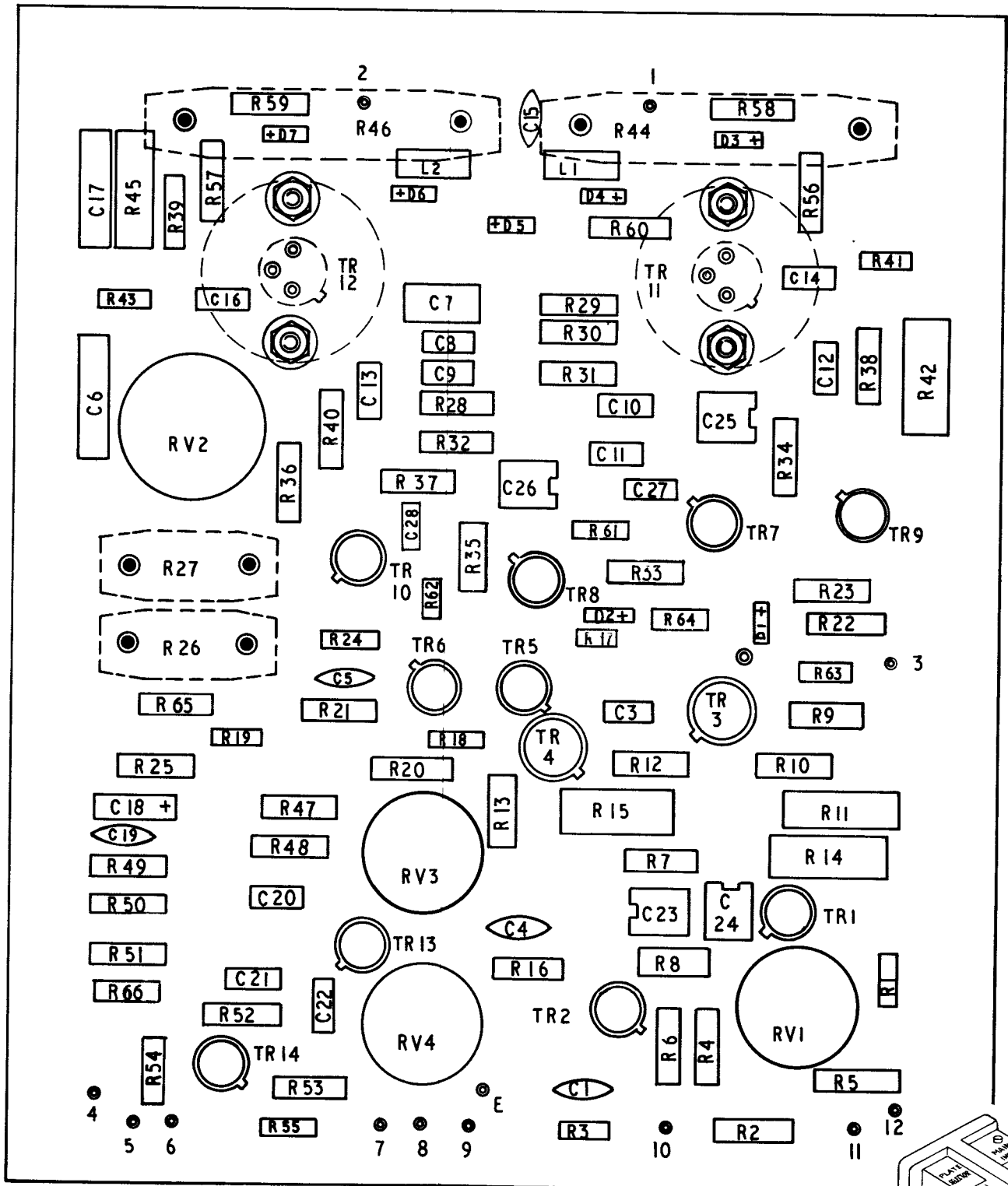

# X AMPLIFIER & CALIBRATOR CIRCUIT REFERENCE 'F'

C/CD80490 SHEET 2

FIG 7 2

FIGURE 8

Y OUTPUT AMPLIFIER




C/SA80490/104

FIG. 8 1

PRINTED CIRCUIT BOARD 'G'

P.C.B. 'G' C/SA 80490/104

CIRCUIT REFERENCE 'G'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C1 | | 0.01 | -20+80 | 100V | B911711/10 |
| C3 | | 39p | 5 | 125V | B910931/100 |
| C4 | | 0.01 | -20+80 | 100V | B911711/10 |
| C5 | | 0.01 | -20+80 | 100V | B911711/10 |
| C6 | | 0.1 | 10 | 250V | B911477/2 |
| C7 | | 680p | 2.5 | 160V | B910931/58 |
| C8 | | 39p | -20+80 | 125V | B910931/10 |
| C9 | | | 1pF | 160V | B910931/5 |
| C10 | | 12p | 1pF | 160V | B910931/2 |
| C11 | | 56p | 2.5 | 160V | B910931/12 |
| C12 | | 220p | 20 | 500V | B95964/7 |
| C13 | | 220p | 20 | 500V | B95964/7 |
| C14 | | 220p | 20 | 500V | B95964/7 |
| C15 | | 0.01 | -20+80 | 100V | B911711/10 |
| C16 | | 220p | 20 | 500V | B95964/7 |
| C17 | | 0.1 | 10 | 250V | B911477/2 |
| C18 | | 2.5 | -10+100 | 16V | B910700/25 |
| C19 | | 0.01 | -20+80 | | B911711/10 |
| C20 | | 33p | 5 | 125V | B910931/99 |
| C21 | | 82p | 2.5 | 30V | B910930/8 |
| C22 | | 100p | 2.5 | 30V | B910930/10 |
| C23 | | 2-20p | | 50V | A912672/3 |
| C24 | | 2-20p | | 50V | A912672/3 |
| C25 | | 2-20p | | 50V | A912672/3 |
| C26 | | 2-20p | | 50V | A912672/3 |
| C27 | | 10p | ±1pF | 125V | B910931/93 |
| C28 | | 0.01 | -20+80 | | B911711/10 |

## P.C.B. 'G' C/SA 80490/104

### CIRCUIT REFERENCE 'G'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| COILS | | | | | |
| L1 | | 4.7µH | 5 | | B910147/29 |
| L2 | | 4.7µH | 5 | | B910147/29 |
| DIODES | | | | | |
| D1 | | | | | B910086/2 |
| D2 | | | | | B910086/2 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | 6.8V | 5 | 400m/W | A910099/11 |
| D6 | | | | | B910086/2 |
| D7 | | | | | B910086/2 |
| RESISTORS | | | | | |
| R1 | | 47 | 5 | ⅛W | B912638/17 |
| R2 | | 160 | 5 | ½W | B912636/30 |
| R3 | | 47 | 5 | ⅛W | B912638/17 |
| R4 | | 6.8K | 5 | ½W | B912636/69 |
| R5 | | 10 | 5 | ½W | B912636/1 |
| R6 | | 6.8K | 5 | ½W | B912636/69 |
| R7 | | 300 | 5 | ½W | B912636/36 |
| R8 | | 360 | 5 | ½W | 5905-99-013 -6105 |
| R9 | | 1.5K | 5 | ½W | 5905-99-013 -6120 |
| R10 | | 100 | 5 | ½W | B912636/25 |
| R11 | | 1.2K | 5 | 1W | 5905-99-013 -5748 |
| R12 | | 100 | 5 | ½W | B912636/25 |
| R13 | | 1.5K | 5 | ½W | 5905-99-013 -6120 |
| R14 | | 2.7K | 5 | 1W | 5905-99-013 -5756 |

## CIRCUIT REFERENCE 'G'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R15 | | 2.7K | 5 | 1W | 5905-99-013 -5756 |
| R16 | | 82 | 5 | ½W | B912636/23 |
| R17 | | 47 | 5 | ⅛W | B912638/17 |
| R18 | | 47 | 5 | ⅛W | B912638/17 |
| R19 | | 10 | 5 | ½W | B912636/1 |
| R20 | | 330 | 5 | ½W | B912636/37 |
| R21 | | 330 | 5 | ½W | B912636/37 |
| R22 | | 470 | 5 | ½W | 5905-99-013 -6108 |
| R23 | | 68 | 5 | ½W | B912636/21 |
| R24 | | 68 | 5 | ½W | B912636/21 |
| R25 | | 10 | 5 | ½W | B912636/1 |
| R26 | | 1K | 5 | 4W | B912639/49 |
| R27 | | 1K | 5 | 4W | B912639/49 |
| R28 | | 270 | 5 | ½W | 5905-99-013 -6102 |
| R29 | | 12K | 5 | ½W | B912636/75 |
| R30 | | 12K | 5 | ½W | B912636/75 |
| R31 | | 3K | 5 | ½W | B912636/60 |
| R32 | | 330 | 5 | ½W | B912636/37 |
| R33 | | 10 | 5 | ½W | B912636/1 |
| R34 | | 10 | 5 | ½W | B912636/1 |
| R35 | | 10 | 5 | ½W | B912636/1 |
| R36 | | 10 | 5 | ½W | B912636/1 |
| R37 | | 33 | 5 | ½W | B912636/13 |
| R38 | | 47 | 5 | ½W | B912636/17 |
| R39 | | 10 | 5 | ½W | B912636/1 |
| R40 | | 47 | 5 | ½W | B912636/17 |

## P.C.B. 'G' C/SA 80490/104

### CIRCUIT REFERENCE 'G'

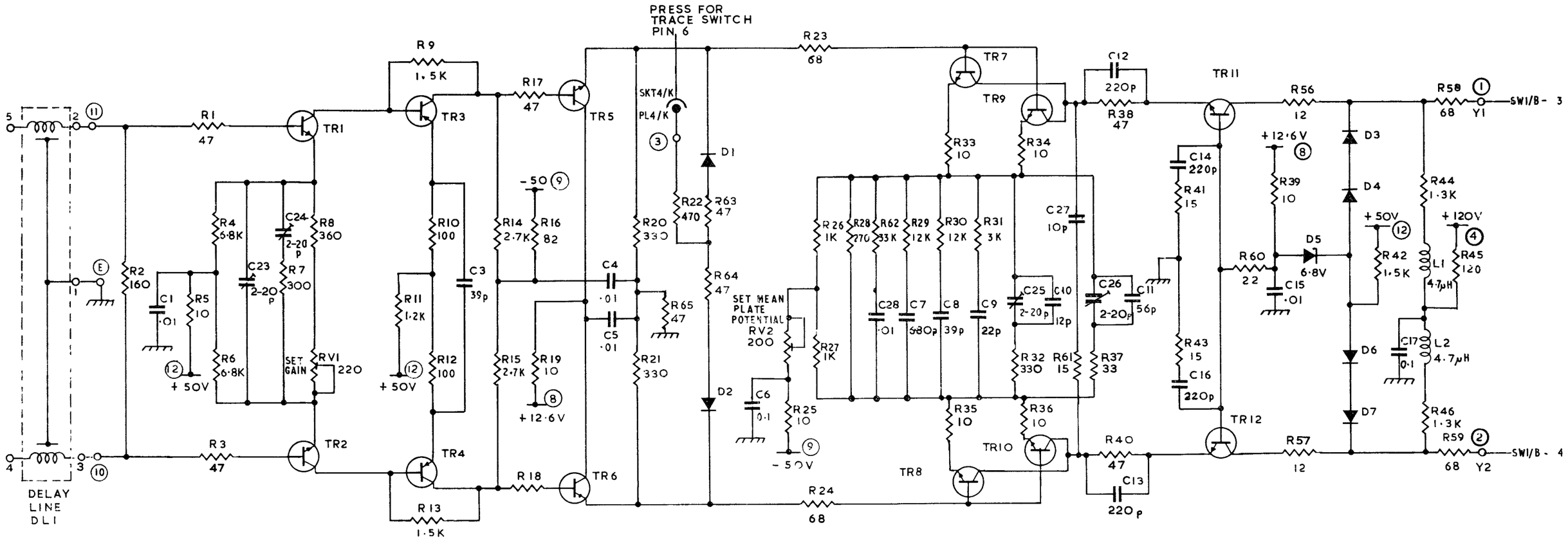
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| R41 | | 15 | 5 | ⅛W | B912638/5 |
| R42 | | 1.5K | 5 | 1W | 5905-99-013 -5750 |
| R43 | | 15 | 5 | ⅛W | B912638/5 |
| R44 | | 1.3K | | 8W | B912640/38 |
| R45 | | 120 | 5 | 1W | 5905-99-013 -5724 |
| R46 | | 1.3K | | 8W | B912640/38 |
| R47 | | 10 | 5 | ½W | B912636/1 |
| R48 | | 2.2K | 5 | ½W | B912636/57 |
| R49 | | 1K | 5 | ½W | B912636/49 |
| R50 | | 47 | 5 | ½W | B912636/17 |
| R51 | | 560 | 5 | ½W | B912636/43 |
| R52 | | 12 | 5 | ½W | B912636/3 |
| R53 | | 82 | 5 | ½W | B912636/23 |
| R54 | | 100 | 5 | ½W | B912636/25 |
| R55 | | 22 | 5 | ⅛W | B912638/9 |
| R56 | | 12 | 5 | ½W | B912636/3 |
| R57 | | 12 | 5 | ½W | B912636/3 |
| R58 | | 68 | 5 | ½W | B912636/21 |
| R59 | | 68 | 5 | ½W | B912636/21 |
| R60 | | 68 | 5 | ½W | B912636/21 |
| R61 | | 15 | 5 | ⅛W | B912638/5 |
| R62 | | 33K | 5 | ⅛W | B912638/85 |
| R63 | | 47 | 5 | ⅛W | B912638/17 |
| R64 | | 47 | 5 | ⅛W | B912638/17 |
| R65 | | 47 | 10 | | |
| R66 | | 820 | 5 | ⅛W | B912638/47 |
| RESISTORS, VARIABLE | | | | | |
| RV1 | | 220 | 20 | | A912635/12 |
| RV2 | | 220 | 20 | 3W | A912642 |
| RV3 | | 1K | 20 | | A912635/9 |
| RV4 | | 100 | 20 | | A912635/7 |

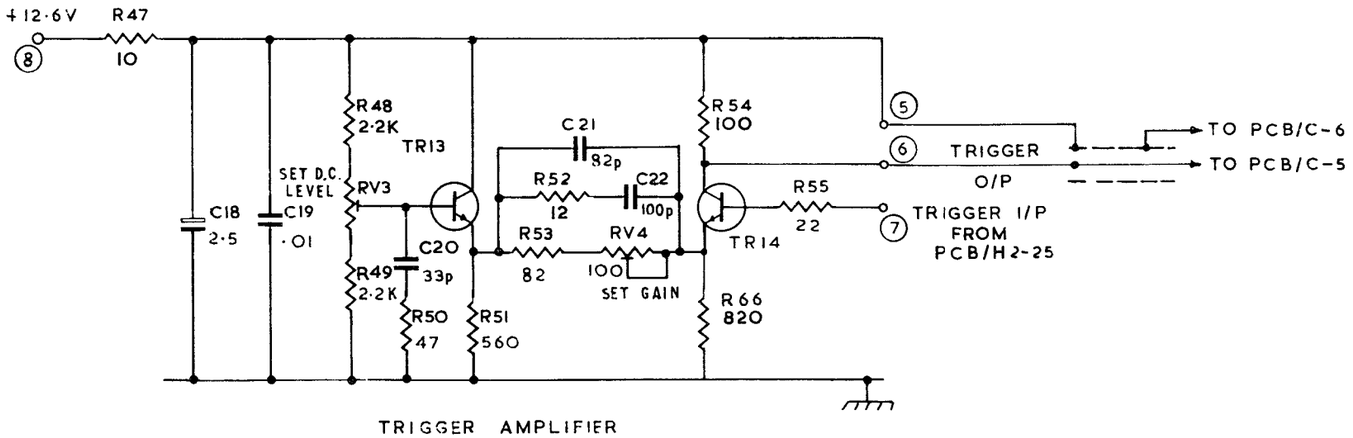
## P.C.B. 'G' C/SA 80490/104

## CIRCUIT REFERENCE 'G'

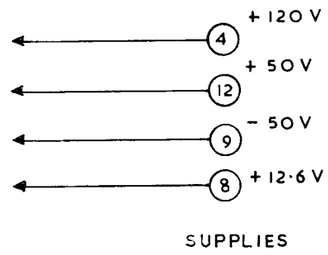
| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **RESISTORS, VARIABLE** | | | | | |
| RV1 | | 220 | 20 | | A912635/12 |
| RV2 | | 220 | 20 | 3W | A912642 |
| RV3 | | 1k | 20 | | A912635/9 |
| RV4 | | 100 | 20 | | A912635/7 |
| **SWITCHES** | | | | | |
| S1 | Part of RV2E, Fig. 5 | | | | |
| **TRANSISTORS** | | | | | |
| TR1 | | | | | B912545 |
| TR2 | | | | | B912545 |
| TR3 | | | | | B910008 |
| TR4 | | | | | B910008 |
| TR5 | | | | | B912398/1 |
| TR6 | | | | | B912398/1 |
| TR7 | | | | | B912398/1 |
| TR8 | | | | | B912398/1 |
| TR9 | | | | | B912398/1 |
| TR10 | | | | | B912398/1 |
| TR11 | | | | | A912685 |
| TR12 | | | | | A912685 |
| TR13 | | | | | B912398/1 |
| TR14 | | | | | B912398/1 |
| **MISCELLANEOUS** | | | | | |
| | Transistor Mtg. Pad TO5 | | | | A99286 (2 off) |
| | Heatsink TO5 | | | | A912758 (2 off) |
| DL1 | Delay Line (Fig 1) | | | | |

| | | |
|---|---|---|
| R | 2, 5, 1, 3, 4, 6, 47, 7, 8, 48, 49, 11, 50, 51, 10, 12, 13, 52, 53, 14, 15, 16, 17, 19, 18, 54, 20, 21, 55, 22, 65, 66, 63, 64, 25, 23, 24, 26, 27, 28, 62, 29, 30, 33, 35, 31, 32, 34, 36, 61, 37, 38, 40, 41, 43, 60, 39, 56, 57, 42, 44, 45, 46, 58, 59 | R |
| C | 1, 23, 18, 24, 19, 20, 3, 21, 22, 4, 5, 6, 28, 7, 8, 9, 25, 27, 10, 26, 12, 11, 13, 14, 16, 15, 17, | C |
| TR | 1, 2, 3, 4, 13, 5, 6, 14, 8, 7, 9, 10, 11, 12, | TR |
| MISC | RV1, RV3, RV4, D1, D2, RV2, D3 ——— D7, L1, L2 | MISC |




TRIGGER AMPLIFIER




# Y OUTPUT AMPLIFIER CIRCUIT REFERENCE 'G'

C/CD80490 SHT.7

FIG 8 2

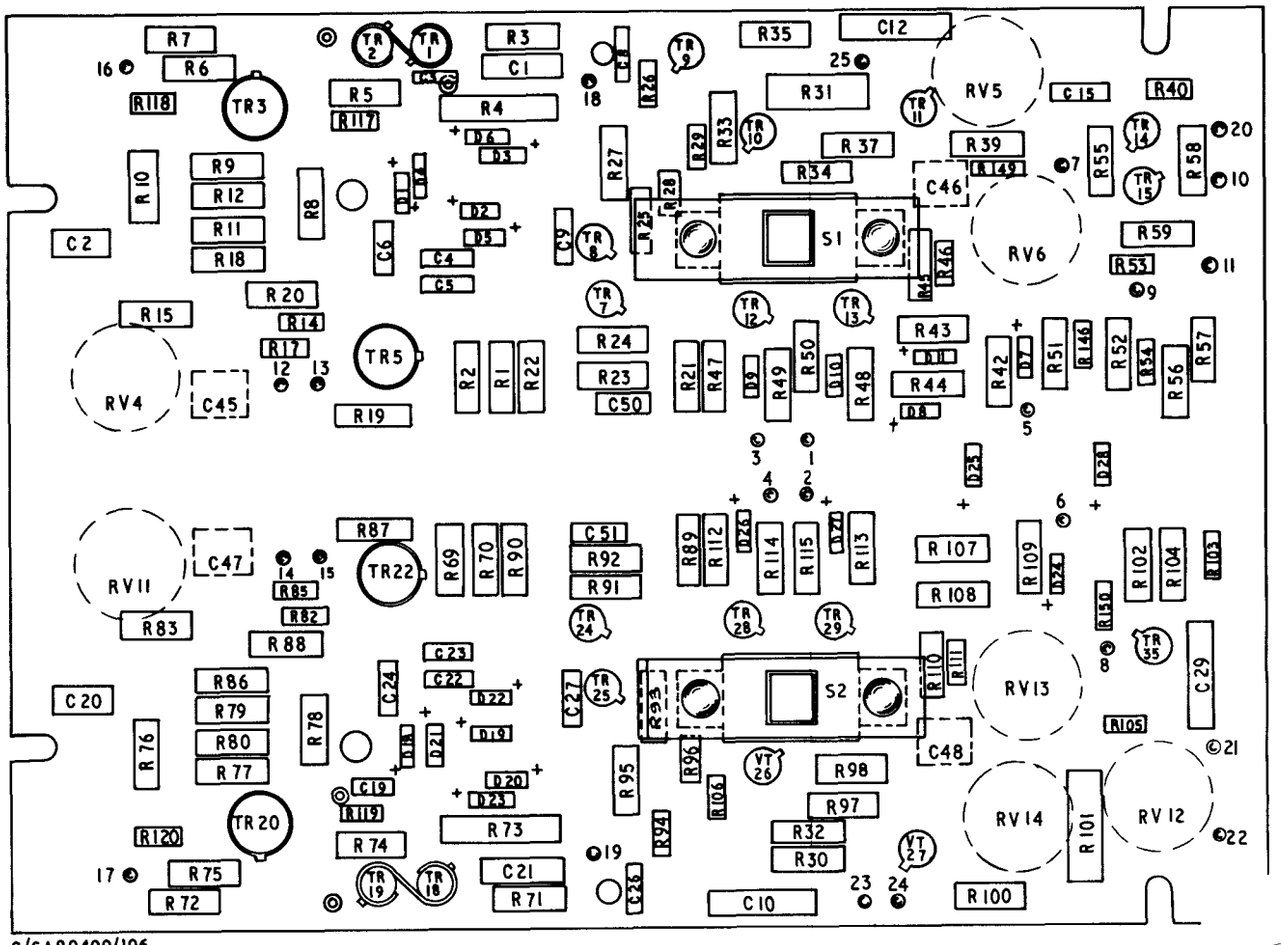
FIGURE 9

Y PREAMPLIFIER AND SWITCHING

## 'Y' AMP. ASSEMBLY C/SA 80490/81

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| | | | | | Drg. No. |
| | P.C.B. 'H1' Assy. | | | | C/SA 80490/106 |
| | P.C.B. 'H2' Assy. | | | C/ | C/SA 80490/108 |
| | Attenuator S/W Assy. | Fig. 10 | | | C/SA 80490/79 |
| **CAPACITORS** | | | | | |
| C1/J | | 0.1 | 20 | 630V | B911625/31 |
| C15/J | | 0.1 | 20 | 630V | B911625/31 |
| **RESISTORS** | | | | | |
| R16/H | | 47 | 5 | ½W | 5905-99-013-6084 |
| R38/H | | 10 | 5 | ½W | B912636/1 |
| R84/H | | 47 | 5 | ½W | 5905-99-013-6084 |
| **RESISTORS, VARIABLE** | | | | | |
| RV1/H<br>RV7/H | CH1 POSITION | 100K+10K | | | A912629/1 |
| RV2/H<br>RV3/H | CH1 GAIN | 250+100 | | | A912630/1 |
| RV8/H<br>RV15/H | CH2 POSITION | 100K+10K | | | A912629/1 |
| RV9/H<br>RV10/H | CH2 GAIN | 250+100 | | | A912630/1 |
| **SOCKETS** | | | | | |
| SKT 1/J | | | | | A912589 |
| SKT1/H | | | | | A912725 |
| SKT2/J | | | | | A912589 |
| SKT2/H | | | | | A912725 |
| **SWITCHES** | | | | | |
| S1/J | | | | | B912564 |
| S2/J | | | | | B912564 |
| **MISCELLANEOUS** | | | | | |
| | Cableform 'C' | | | | B/SA 80490/132 |
| | Cableform 'D' | | | | B/SA 80490/133 |
| | Cableform 'G' | | | | B/SA 80490/144 |



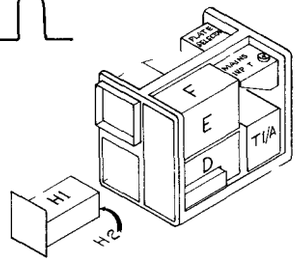




FIG. 9 1 PRINTED CIRCUIT BOARDS 'H1' & 'H2'

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C1 | | 4700p | 20 | 500V | B911476/12 |
| C2 | | .01 | 20 | 250V | B911476/13 |
| C3 | | 0.01 | +80-20 | 100V | B911711/10 |
| C4 | | 0.01 | +80-20 | 100V | B911711/10 |
| C5 | | 0.01 | +80-20 | 100V | B911711/10 |
| C6 | | 100p | 2.5 | 160V | B910931/18 |
| C8 | | 0.01 | +80-20 | 100V | B911711/10 |
| C9 | | 100p | 2.5 | 160V | B910931/18 |
| C10 | | 0.1 | 10 | 250V | B912771/2 |
| C12 | | 0.1 | | 18V | B912282/11 |
| C15 | | 0.01 | +80-20 | 100V | B911711/10 |
| C19 | | 0.01 | +80-20 | 100V | B911711/10 |
| C20 | | 0.01 | 20 | 250V | B911476/3 |
| C21 | | 4700p | 20 | 500V | B911476/12 |
| C22 | | 0.01 | +80-20 | 100V | B911711/10 |
| C23 | | 0.01 | +80-20 | 100V | B911711/10 |
| C24 | | 100p | 2.5 | 160V | B910931/18 |
| C26 | | 0.01 | +80-20 | 100V | B911711/10 |
| C27 | | 100p | 2.5 | 160V | B910931/18 |
| C29 | | 0.1 | | 18V | B912282/11 |
| C45 | | 2-20p | | 50V | B912672/3 |
| C46 | | 2-20p | | 50V | B912672/3 |
| C47 | | 2-20p | | 50V | B912672/3 |
| C48 | | 2-20p | | 50V | B912672/3 |
| C50 | | 330p | 2.5 | 63V | B912022/7 |
| C51 | | 330p | 2.5 | 63V | B912022/7 |
| DIODES | | | | | |
| D1 | | | | | B910086/2 |
| D2 | | | | | A912684 |
| D3 | | | | | B910086/2 |
| D4 | | | | | B910086/2 |
| D5 | | | | | A912684 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| DIODES (Contd.) | | | | | |
| D6 | | | | | B910086/2 |
| D7 | | | | | B910086/2 |
| D8 | | | | | B910086/2 |
| D9 | | | | | B910086/2 |
| D10 | | | | | B910086/2 |
| D11 | | | | | B910086/2 |
| D18 | | | | | B910086/2 |
| D19 | | | | | A912684 |
| D20 | | | | | B910086/2 |
| D21 | | | | | B910086/2 |
| D22 | | | | | A912684 |
| D23 | | | | | B910086/2 |
| D24 | | | | | B910086/2 |
| D25 | | | | | B910086/2 |
| D26 | | | | | B910086/2 |
| D27 | | | | | B910086/2 |
| D28 | | | | | B910086/2 |
| RESISTORS | | | | | |
| R1 | | 12K | 5 | ½W | B912636/75 |
| R2 | | 47K | 5 | ½W | B912636/89 |
| R3 | | 1M | 5 | ½W | B912636/121 |
| R4 | | 1M | 1 | 1W | B912981/21 |
| R5 | | 100 | 5 | ½W | 5905-99-013-6092 |
| R6 | | 47K | 5 | ½W | 5905-99-013-6156 |
| R7 | | 10 | 5 | ½W | 5905-99-013-6068 |
| R8 | | 33K | 5 | ½W | 912636/85 |
| R9 | | 33K | 5 | ½W | 912636/85 |
| R10 | | 10 | 5 | ½W | 912636/1 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (Contd.) | | | | | |
| R11 | | 1.2K | 5 | ½W | 912636/51 |
| R12 | | 1.2K | 5 | ½W | 912636/51 |
| R13 | | | | | |
| R14 | | 100 | 5 | ½W | B912639/25 |
| R15 | | 100 | 5 | ½W | 5905-99-013-6092 |
| R16 | | | | | |
| R17 | | 10 | 5 | ⅛W | B912638/1 |
| R18 | | 6.8K | 5 | ½W | B912636/69 |
| R19 | | 18K | 5 | ½W | B912636/79 |
| R20 | | 18K | 5 | ½W | B912636/79 |
| R21 | | 560 | 5 | ½W | B912636/43 |
| R22 | | 10 | 5 | ½W | B912636/43 |
| R23 | | 220 | 5 | ½W | 5905-99-013-6100 |
| R24 | | 220 | 5 | ½W | 5905-99-013-6100 |
| R25 | | 680 | 5 | ½W | B912636/45 |
| R26 | | 12 | 5 | ⅛W | B912638/3 |
| R27 | | 680 | 5 | ½W | B912636/45 |
| R28 | | 47 | 5 | ⅛W | B912638/17 |
| R29 | | 47 | 5 | ⅛W | B912638/17 |
| R30 | | 270 | 5 | ½W | 5905-99-013-6102 |
| R31 | | 3.9K | 5 | 1W | 5905-99-013-5760 |
| R32 | | 47 | 5 | ½W | B912636/17 |
| R33 | | 120 | 5 | ½W | 5905-99-013-6094 |
| R34 | | 5.6K | 5 | ½W | B912636/67 |
| R35 | | 5.6K | 5 | ½W | B912636/67 |
| R36 | | | | | |
| R37 | | 680 | 5 | ½W | 5905-99-013-6112 |
| R38 | | | | | |
| R39 | | 470 | 5 | ½W | B912636/41 |
| R40 | | 10 | 5 | ⅛W | B912638/1 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (COntd.) | | | | | |
| R41 | **Not used** | | | | |
| R42 | | 10K | 5 | ½W | 5905-99-013-6140 |
| R43 | | 330 | 5 | ½W | 5905-99-013-6104 |
| R44 | | 330 | 5 | ½W | 5905-99-013-6104 |
| R45 | | 150 | 5 | ½W | 5905-99-013-6096 |
| R46 | | 100 | 5 | ⅛W | B912638/25 |
| R47 | | 39K | 5 | ½W | 5905-99-013-6154 |
| R48 | | 39K | 5 | ½W | 5905-99-013-6154 |
| R49 | | 12K | 5 | ½W | 5905-99-013-6142 |
| R50 | | 12K | 5 | ½W | 5905-99-013-6142 |
| R51 | | 18K | 5 | ½W | B912636/79 |
| R52 | | 18K | 5 | ½W | B912636/79 |
| R53 | | 12 | 5 | ⅛W | B912638/3 |
| R54 | | 22 | 5 | ⅛W | B912638/9 |
| R55 | | 1.5K | 5 | ½W | 5905-99-013-6120 |
| R56 | | 220 | 5 | ½W | B912636/33 |
| R57 | | 220 | 5 | ½W | B912636/33 |
| R58 | | 1.5K | 5 | ½W | 5905-99-013-6120 |
| R59 | | 15K | 5 | ½W | B912636/77 |
| R69 | | 47K | 5 | ½W | B912636/89 |
| R70 | | 12K | 5 | ½W | B912636/75 |
| R71 | | 1M | 5 | ½W | B912636/121 |
| R72 | | 10 | 5 | ½W | 5905-99-013-6068 |
| R73 | | 1M | 1 | 1W | B912981/21 |
| R74 | | 100 | 5 | ½W | 5905-99-013-6092 |
| R75 | | 47K | 5 | ½W | 5905-99-013-6156 |
| R76 | | 10 | 5 | ½W | B912636/1 |
| R77 | | 33K | 5 | ½W | B912636/85 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (Contd.) | | | | | |
| R78 | | 33K | 5 | ½W | B912636/85 |
| R79 | | 1.2K | 5 | ½W | B912636/79 |
| R80 | | 1.2K | 5 | ½W | B912636/80 |
| R81 | | | | | |
| R82 | | 100 | 5 | ½W | B912638/25 |
| R83 | | 100 | 5 | ½W | 5905-99-013-6092 |
| R84 | | | | | |
| R85 | | 10 | 5 | ⅛W | B912638/1 |
| R86 | | 6.8K | 5 | ½W | B912636/69 |
| R87 | | 18K | 5 | ½W | B912636/79 |
| R88 | | 18K | 5 | ½W | B912636/79 |
| R89 | | 560 | 5 | ½W | B912636/43 |
| R90 | | 10 | 5 | ½W | B912636/1 |
| R91 | | 220 | 5 | ½W | 5905-99-013-6100 |
| R92 | | 220 | 5 | ½W | 5905-99-013-6100 |
| R93 | | 680 | 5 | ½W | B912636/45 |
| R94 | | 12 | 5 | ⅛W | B912638/3 |
| R95 | | 680 | 5 | ½W | B912636/45 |
| R96 | | 47 | 5 | ⅛W | B912638/17 |
| R97 | | 100 | 5 | ½W | 5905-99-013-6092 |
| R98 | | 5.6K | 5 | ½W | B912536/67 |
| R99 | | | | | |
| R100 | | 5.6K | 5 | ½W | B912536/67 |
| R101 | | 3.9K | 5 | 1W | 5905-99-013-5760 |
| R102 | | 680 | 5 | ½W | 5905-99-013-6112 |
| R103 | | 10 | 5 | ⅛W | B912638/1 |
| R104 | | 470 | 5 | ½W | B912636/41 |
| R105 | | 10 | 5 | ⅛W | B912638/1 |
| R106 | | 47 | 5 | ⅛W | B912638/17 |
| R107 | | 330 | 5 | ½W | 5905-99-013-6104 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

## CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R108 | | 330 | 5 | ½W | 5905-99-013-6104 |
| R109 | | 10k | 5 | ½W | 5905-99-013-6140 |
| R110 | | 150 | 5 | ½W | 5905-99-013-6096 |
| R111 | | 100 | 5 | ⅛W | B912638/25 |
| R112 | | 39k | 5 | ½W | 5905-99-013-6154 |
| R113 | | 39k | 5 | ½W | 5905-99-013-6154 |
| R114 | | 12k | 5 | ½W | 5905-99-013-6142 |
| R115 | | 12k | 5 | ½W | 5905-99-013-6142 |
| R116 | Not used | | | | |
| R117 | | 10 | 5 | ⅛W | B912638/1 |
| R118 | | 10 | 5 | ⅛W | B912638/1 |
| R119 | | 10 | 5 | ⅛W | B912638/1 |
| R120 | | 10 | 5 | ⅛W | B912638/1 |
| R146 | | 10 | 5 | ⅛W | B912638/41 |
| R149 | | 470 | 5 | ⅛W | B912638/41 |
| R150 | | 470 | 5 | ⅛W | B912638/41 |
| RESISTORS, VARIABLE | | | | | |
| RV4 | | 4.7k | 20 | | A912635/10 |
| RV5 | | 4.7k | 20 | | A912635/10 |
| RV6 | | 220 | 20 | | A912635/12 |
| RV11 | | 4.7k | 20 | | A912635/10 |
| RV12 | | 4.7k | 20 | | A912635/10 |
| RV13 | | 220 | 20 | | A912635/12 |
| RV14 | | 100 | 20 | | A912635/7 |
| RV1)<br>RV7) | | 100k<br>10k | | | A912629/1 |
| RV2)<br>RV3) | | 250Ω<br>100Ω | | | A912630/1 |
| RV8))<br>RV15) | | 100k<br>10k | | | A912629/1 |
| RV9 )<br>RV10) | | 250Ω<br>100Ω | | | A912630/1 |
| TRANSISTORS | | | | | |
| TR1)<br>TR2) | | Matched pair | | | A912677 |

## P.C.B. 'H1' ASSY. C/SA 80490/106

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| TRANSISTORS (contd.) | | | | | |
| TR3)<br>TR4) | | Double transistor | | | A912683 |
| TR5)<br>TR6) | | Double transistor | | | A912683 |
| TR7 | | | | | A912682 |
| TR8 | | | | | A912682 |
| TR9 | | | | | A912545 |
| TR10 | | | | | A912545 |
| TR11 | | | | | A912682 |
| TR12 | | | | | A912682 |
| TR13 | | | | | A912682 |
| TR14 | | | | | A912682 |
| TR15 | | | | | A912682 |
| TR18)<br>TR19) | | Matched pair | | | A912677 |
| TR20)<br>TR21) | | Double transistor | | | A912683 |
| TR22)<br>TR23) | | Double transistor | | | A912683 |
| TR24 | | | | | A912682 |
| TR25 | | | | | A912682 |
| TR26 | | | | | A912545 |
| TR27 | | | | | A912545 |
| TR28 | | | | | A912682 |
| TR29 | | | | | A912682 |
| TR35 | | | | | A912682 |
| MISCELLANEOUS | | | | | |
| | Invert Switch Assy. | | | | A/SA 80490/119 |
| | includes:<br>Slider Switch | | | | |
| | 2 pole, 2 posn. | | | | B912703 |
| Bead (4 off) | | | | | B910279 |

## P.C.B. 'H2' ASSY. B/SA 80490/108

### CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| CAPACITORS | | | | | |
| C17 | | 0.01 | -20+80 | 100V | B911711/10 |
| C18 | | 330pF | 2.5 | 160V | B910931/42 |
| C31 | | 0.01 | -20+80 | 100V | B911711/10 |
| C32 | | 22pF | 1pF | 63V | B912022/6 |
| C33 | | 22pF | 1pF | 63V | B912022/6 |
| C34 | | 22pF | 1pF | 63V | B912022/6 |
| C35 | | 22pF | 1pF | 63V | B912022/6 |
| C36 | | 1000pF | 2.5 | 63V | B912022/8 |
| C37 | | 47pF | 2.5 | 125V | B910931/10 |
| C38 | | 0.1 | +50-25 | 18V | B912282/11 |
| C39 | | 560pF | 2.5 | 160V | B910931/54 |
| C40 | | 0.1 | 10 | 250V | B911477/2 |
| C41 | | 100pF | 2.5 | 160V | B910931/18 |
| C42 | | 1 | 20 | 100V | B911943/40 |
| C43 | | 6.8 | 20 | 25V | B910860/19 |
| C44 | | 1 | 20 | 100V | B911943/40 |
| DIODES | | | | | |
| D12 | | | | | B910086/2 |
| D13 | | | | | B910086/2 |
| D14 | | | | | B910086/2 |
| D15 | | | | | B910086/2 |
| D16 | | | | | B910086/2 |
| D17 | | | | | B910086/2 |
| D29 | | | | | B910086/2 |
| D30 | | | | | B910086/2 |
| D31 | | | | | B910086/2 |
| RESISTORS | | | | | |
| R60 | | 6.8K | 5 | ½W | B912636/69 |
| R61 | | 6.8K | 5 | ½W | B912636/69 |
| R62 | | 1.3K | 5 | ½W | B912636/52 |
| R63 | | 1.1K | 5 | ½W | B912636/50 |
| R64 | | 470 | 5 | ½W | B912636/41 |

P.C.B. 'H2' ASSY. B/SA 80490/108

CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (Contd.) | | | | | |
| R65 | | 75 | 5 | ½W | 5905-99-013-6089 |
| R66 | | 5.6K | 5 | 1W | B912637/67 |
| R67 | | 6.8K | 5 | 1W | B912637/69 |
| R68 | | 75 | 5 | ½W | 5905-99-013-6089 |
| R121 | | 330 | 5 | ½W | B912636/37 |
| R122 | | 330 | 5 | ½W | B912636/37 |
| R123 | | 6.8K | 5 | ½W | B912636/69 |
| R124 | | 6.8K | 5 | ½W | B912636/69 |
| R125 | | 47K | 5 | ½W | B912636/89 |
| R126 | | 47K | 5 | ½W | B912636/89 |
| R127 | | 4.7K | 5 | ½W | B912636/65 |
| R128 | | 4.7K | 5 | ½W | B912636/65 |
| R129 | | 47K | 5 | ½W | B912636/89 |
| R130 | | 47K | 5 | ½W | B912636/89 |
| R131 | | 270 | 5 | ½W | B912636/35 |
| R123 | | 22 | 5 | ⅛W | B91263/9 |
| R133 | | 820 | 5 | ½W | B912636/47 |
| R134 | | 820 | 5 | ½W | B912636/47 |
| R135 | | 10K | 5 | ½W | B912636/73 |
| R136 | | 10K | 5 | ½W | B912636/73 |
| R137 | | 22K | 5 | ½W | B912636/81 |
| R138 | | 6.8K | 5 | ½W | B912636/69 |
| R139 | | 100K | 5 | ½W | B912636/97 |
| R140 | | 15K | 5 | ½W | B912636/77 |
| R141 | | 820 | 5 | ½W | B912636/47 |
| R142 | | 47 | 5 | ½W | B912636/17 |
| R143 | | 22 | 5 | ½W | B912636/9 |
| R144 | | 47 | 5 | ½W | B912636/17 |
| R145 | | 10 | 5 | ½W | B912636/1 |

P.C.B. 'H2' ASSY. B/SA 80490/108

CIRCUIT REFERENCE 'H'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG | COSSOR REF |
|---|---|---|---|---|---|
| RESISTORS (Contd.) | | | | | |
| R147 | | 18K | 5 | ½W | B912636/79 |
| R148 | | 470 | 5 | ½W | B912636/41 |
| TRANSISTORS | | | | | |
| TR16 | | | | | B912398/1 |
| TR17 | | | | | B912398/1 |
| TR30 | | | | | A912678 |
| TR31 | | | | | A912678 |
| TR32 | | | | | A912682 |
| TR33 | | | | | A912682 |
| TR34 | | | | | A912682 |

| | | |
|---|---|---|
| R | 4, 1, 3, 71, 6, 2, 7, 8, 78, 10, 117, 119, 11, 79, 18, 15, 83, 14, 17, 20, 88, 21, 23, 91, 22, 94, 35, 27, 30, 95, 97, 32, 29, 31, 106, 44, 101, 37, 108, 102, 149, 36, 46, 103, 105, 47, 112, 49, 114, 51, 57, 55, 59, 61, 124, 62, 133, 66, 132, 136, 65, 134, 140, 142, 144, 141, 73, 70, 5, 74, 75, 69, 72, 9, 77, 76, 118, 120, 12, 80, 86, 16, 84, 82, 85, 19, 87, 89, 24, 92, 90, 26, 25, 98, 93, 28, 96, 33, 34, 42, 43, 100, 109, 107, 45, 40, 38, 110, 104, 150, 111, 48, 113, 50, 115, 52, 146, 54, 53, 127, 58, 56, 121, 123, 129, 125, 131, 60, 126, 130, 122, 128, 137, 135, 63, 67, 139, 64, 68, 138, 147, 143, 145, 148 | R |
| C | 2, 20, 1, 3, 21, 19, 4, 5, 22, 23, 6, 24, 45, 47, 7, 7, 25, 51, 50, 8, 27, 26, 9, 10, 46, 48, 12, 29, 34, 15, 32, 31, 36, 16, 33, 35, 17, 37, 39, 18, 38, 40, 41, 42, 43, 44, 49 | C |
| TR | 1, 18, 19, 2, 3, 4, 20, 21, 5, 6, 22, 23, 7, 8, 24, 25, 9, 26, 10, 27, 11, 12, 13, 35, 28, 29, 14, 15, 30, 31, 16, 17, 32, 33, 4 | TR |
| MISC. | D1, D2, D3, D18, D19, D20, D4, D5, D6, D21, D22, D23, RV1, RV8, RV2, RV3, RV4, RV9, RV10, RV11, S1, 52, RV5, RV12, D7, D24, RV14, RV6, RV13, RV7, RV15, D8 — D11, D25 — D28, D29, D30, D12 — D17, D31 | MISC |

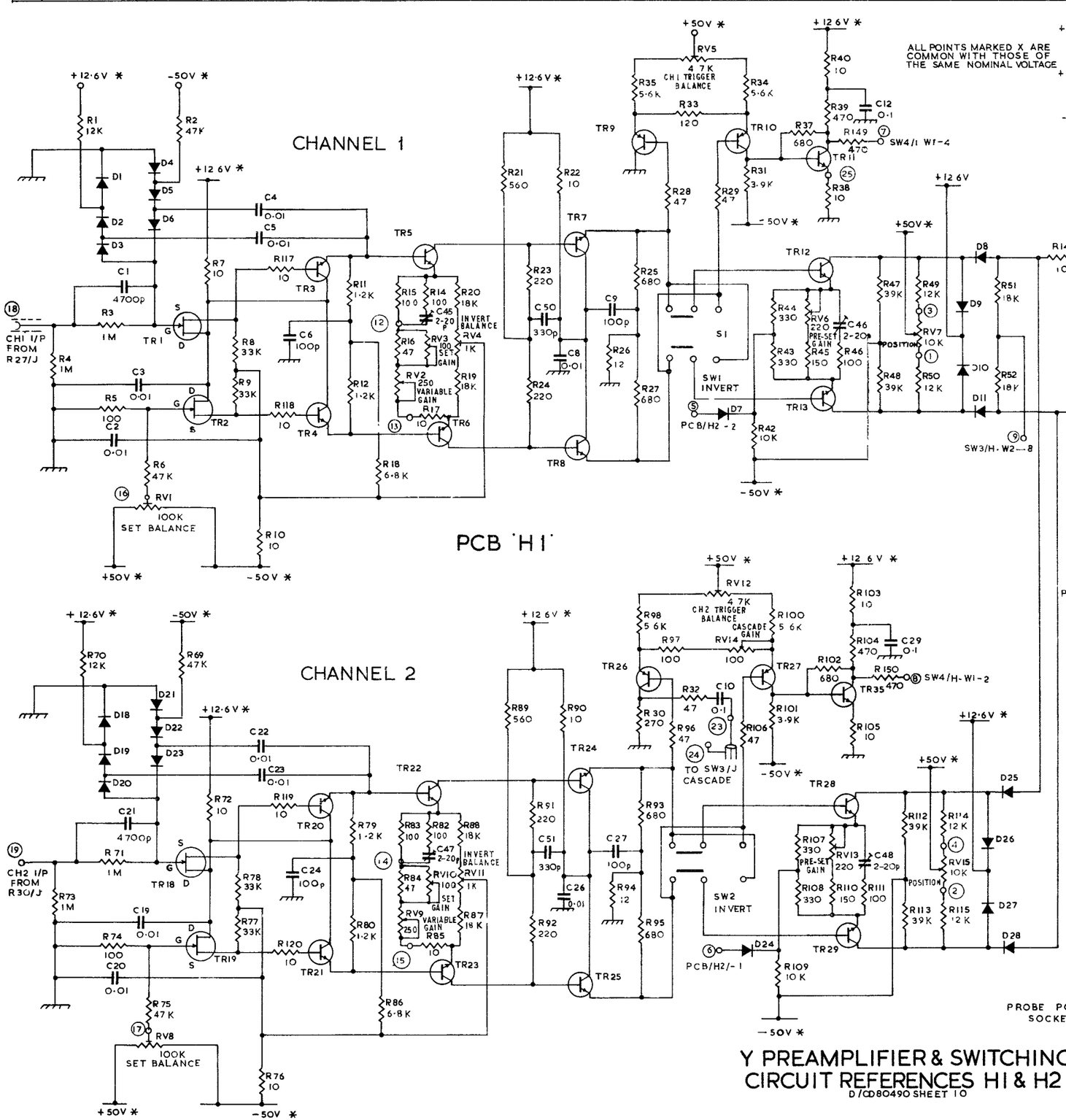
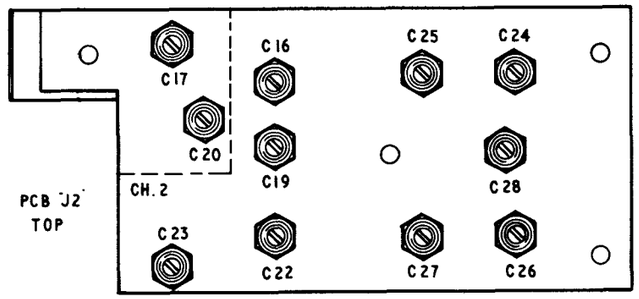
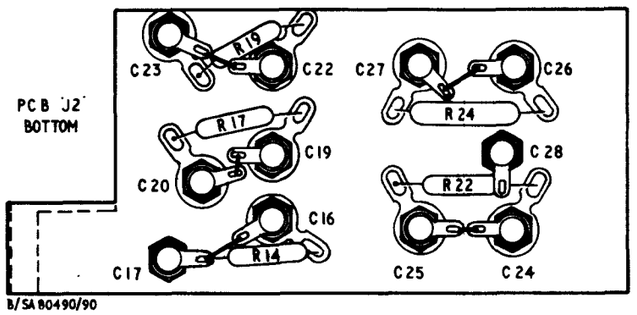
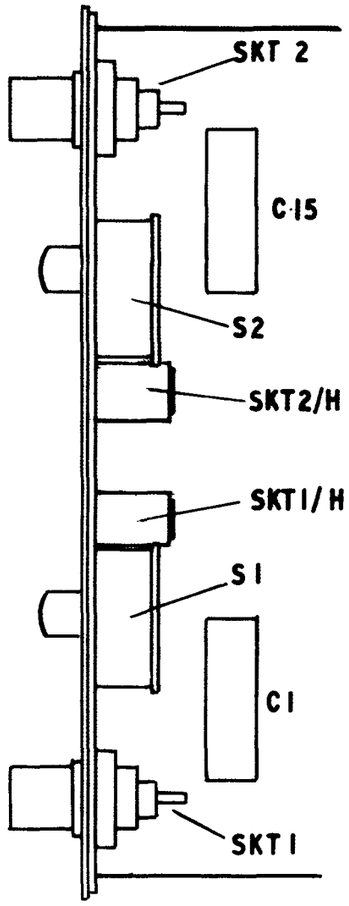


FIGURE 10

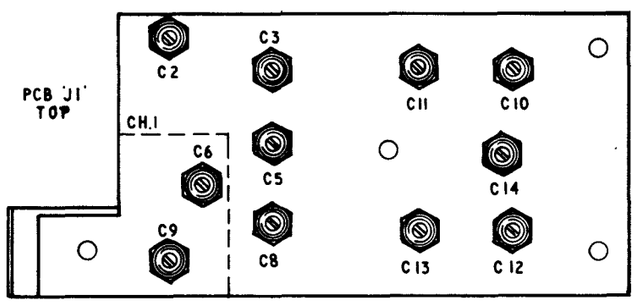
Y ATTENUATORS

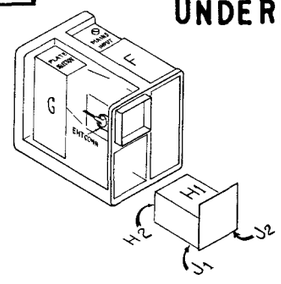



UNDERNEATH VIEW



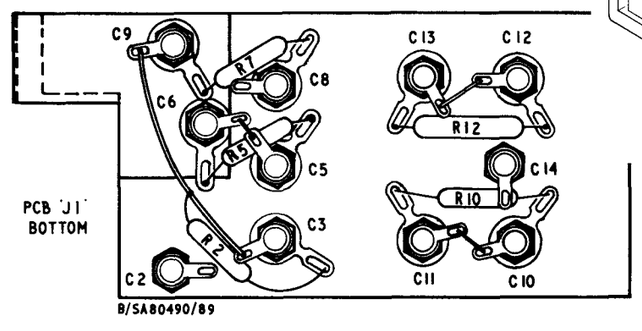




FIG. 10 1

PRINTED CIRCUIT BOARDS 'J1' & 'J2'

## ATTENUATOR Sw. ASSY. C/SA 80490/79

CIRCUIT REFERENCE 'J'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| **ASSEMBLIES** | | | | | |
| | Atten. Sw. & P.C.B. Assy. (RH) | | | | C/SA80490/141 |
| | Atten. Sw. & P.C.B. Assy. (LH) | | | | B/SA80490/142 |
| **MISCELLANEOUS** | | | | | |
| | Switch-Channel Selector | | | | A 50490/38 |

### ATTEN. Sw. & P.C.B. ASSY. (RH) C/SA 80490/141

| | | | | | |
|---|---|---|---|---|---|
| **ASSEMBLIES** | | | | | |
| | P.C.B. J2 Assy. (Chan.2) | | | | B/SA 80490/90 |
| | Atten. Sw. & Comp. Assy. (RH) | | | | C/SA 80490/77 |

### P.C.B. J2 Assy. B/SA 80490/90

| | | | | |
|---|---|---|---|---|
| **TRIMMERS** | | | | |
| C16 | | | | A910601/1 |
| C17 | | | | A910601/3 |
| C19 | | | | A910601/1 |
| C20 | | | | A910601/3 |
| C22 | | | | A910601/1 |
| C23 | | | | A910601/3 |
| C24 | | | | A910601/2 |
| C25 | | | | A910601/3 |
| C26 | | | | A910601/3 |
| C27 | | | | A910601/2 |
| C28 | | | | A910601/1 |
| **CAPACITORS** | | | | |
| C15 | 0.1µF | 20 | 630V | B911625/31 |
| C18 | 1200pF | 5 | 350V | B911480/27 |
| C21 | 270pF | 5 | 350V | A912649 |

## ATTENUATOR Sw. & COMP. ASSY. (RH) B/SA 80490/77

### CIRCUIT REFERENCE 'J'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS | | | | | |
| R13 | | 47 | 5 | ½W | B912636/17 |
| R14 | | 1M | 1 | ½W | B912981/21 |
| R15 | | 1k | 1 | ½W | B912981/3 |
| R16 | | 990k | 1 | ½W | B912981/20 |
| R17 | | 10.1k | 1 | ½W | B912981/5 |
| R18 | | 900k | 1 | ½W | B912981/19 |
| R19 | | 111k | 1 | ½W | B912981/12 |
| R20 | | 10 | 5 | ½W | B912636/1 |
| R21 | | 750k | 1 | ½W | B912981/18 |
| R22 | | 333k | 1 | ½W | B912981/15 |
| R23 | | 500k | 1 | ½W | B912981/17 |
| R24 | | 1M | 1 | ½W | B912981/21 |
| R28 | | 100 | 5 | ⅛W | B912638/25 |
| R29 | | 47 | 5 | ⅛W | B912638/17 |
| R30 | | 100 | 5 | ⅛W | B912638/25 |
| SWITCHES | | | | | |
| S2 | | | | | B912564 |
| SOCKETS | | | | | |
| SKT 2 | | | | | A912589 |
| MISCELLANEOUS | | | | | |
| | Atten. Sw. (RH) | | | | A/SA 80490/113 |

## ATTEN. Sw. & P.C.B. ASSY. (LH) B/SA 80490/142

### CIRCUIT REFERENCE 'J'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| ASSEMBLIES | | | | | |
| | P.C.B. J1 Assy. (Chan.1) | | | | B/SA 80490/89 |
| | Atten. Sw. & Comp. Assy. (LH) | | | | C/SA 80490/78 |
| | P.C.B. J1 ASSY. B/SA 80490/89 | | | | |
| TRIMMERS | | | | | |
| C2 | | | | | A910601/3 |
| C3 | | | | | A910601/1 |
| C5 | | | | | A910601/1 |
| C6 | | | | | A910601/3 |
| C8 | | | | | A910601/ |
| C9 | | | | | A910601/3 |
| C10 | | | | | A910601/2 |
| C11 | | | | | A910601/3 |
| C12 | | | | | A910601/3 |
| C13 | | | | | A910601/2 |
| C14 | | | | | A910601/1 |
| CAPACITORS | | | | | |
| C1 | See Fig 1B | 0.1μF | 20 | 630V | B911625/31 |
| C4 | | 1200pF | 5 | 350V | B911480/27 |
| C7 | | 270pF | 5 | 350V | A912649 |
| RESISTORS | | | | | |
| R1 | | 47 | 5 | ½W | B913636/17 |
| R2 | | 1M | 1 | ½W | B912981/21 |
| R3 | | 1k | 1 | ½W | B912981/3 |
| R4 | | 990k | 1 | ½W | B912981/20 |
| R5 | | 10.1k | 1 | ½W | B912981/5 |
| R6 | | 900k | 1 | ½W | B912981/19 |
| R7 | | 111k | 1 | ½W | B912981/12 |
| R8 | | 10 | 5 | ½W | B912636/1 |
| R9 | | 750k | 1 | ½W | B912981/18 |
| R10 | | 333k | 1 | ½W | B912981/15 |
| R11 | | 500k | 1 | ½W | B912981/17 |

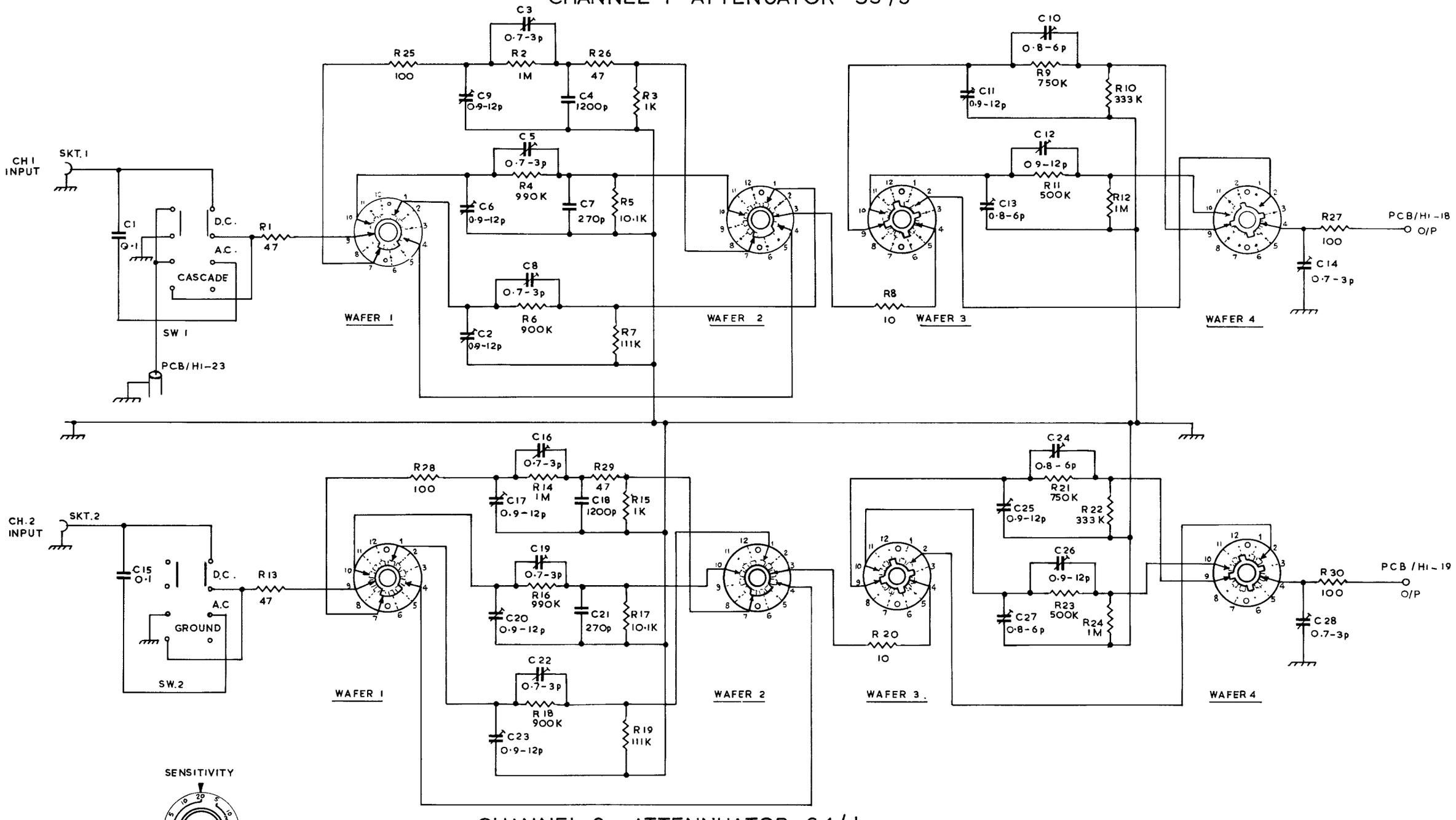
## ATTEN. Sw. & P.C.B. ASSY. (LH) B/SA 80490/142

### CIRCUIT REFERENCE 'J'

| CCT. REF. | DESCRIPTION | VALUE | TOL. % | RTG. | COSSOR REF. |
|---|---|---|---|---|---|
| RESISTORS (contd.) | | | | | |
| R12 | | 1M | 1 | $\frac{1}{2}$W | B912981/21 |
| R25 | | 100 | 5 | $\frac{1}{8}$W | B912638/25 |
| R26 | | 47 | 5 | $\frac{1}{8}$W | B912638/17 |
| R27 | | 100 | 5 | $\frac{1}{8}$W | B912638/25 |
| SOCKETS | | | | | |
| SKT 1 | | | | | A912589 |
| SWITCHES | | | | | |
| S1 | | | | | A912564 |
| MISCELLANEOUS | | | | | |
| | Atten. Sw. Assy. (LH) | | | | AεSA 80490/112 |

| | | |
|---|---|---|
| R | 1, 13, 25, 28, 2, 4, 6, 14, 16, 18, 26, 29, 5, 7, 15, 17, 19, 3, 8, 20, 9, 11, 21, 23, 22, 24, 10, 12, 27, 30, | R |
| C | 23, 4, 18<br>9, 6, 2, 3, 5, 8, 20, 16, 19, 22, 7, 21, 25, 10, 24,<br>11, 13, 27, 12, 26, 14, 28, | C |
| MISC. | SKT 1, SKT 2 | MISC. |

## CHANNEL 1 ATTENUATOR S3/J




## CHANNEL 2 ATTENNUATOR S4/J

Y INPUT ATTENUATORS
CIRCUIT REFERENCE 'J'
D/CD80490/9

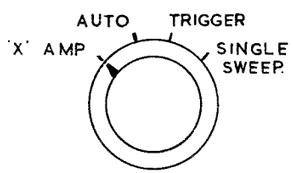
FIG 10 2

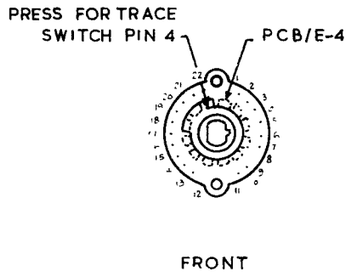
## TRIGGER MODE SWITCH ASSEMBLY
## B/SA 80490/128

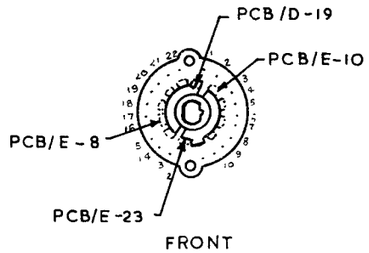
## TIMEBASE MODE SWITCH ASSEMBLY
## B/SA 80490/129

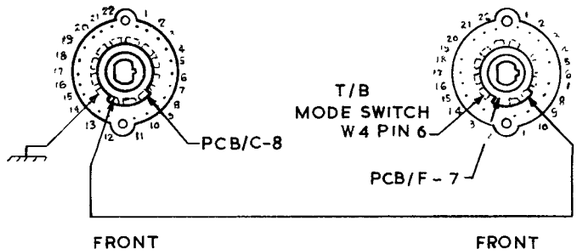
These switches interconnect various functional circuits and are wholly concerned with any one circuit. They are therefore listed separately

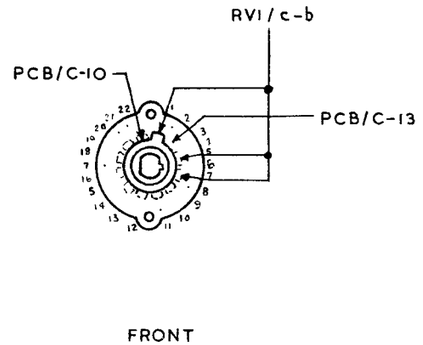
| | | |
|---|---|---|
| Trigger mode switch assembly | | B/SA 80490/128 |
| includes: | | |
| | Switch (22 way) | A 50490/40 |
| | Coupling | B912366/5 |
| RV1C | Resistor Variable (TRIGGER LEVEL) | B912749/1 |
| | | |
| Timebase mode switch assembly | | B/SA 80490/129 |
| includes: | | |
| | Bracket assembly | A/SA 80490/125 |
| | Bracket | A 50490/96 |
| | Switch (12 way) | A 50490/39 |
| | Coupling | B 912336/5 |
| RV5C | Resistor Variable (GATED TRIGGER LEVEL) | A912632/1 |
| includes: | | |
| S5C | Switch PULL NEG. SLOPE | |

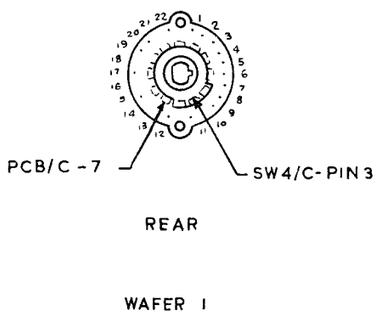


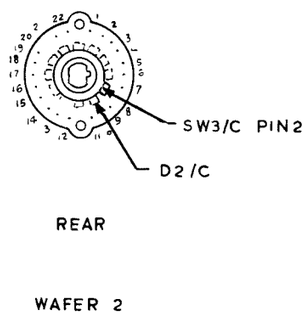



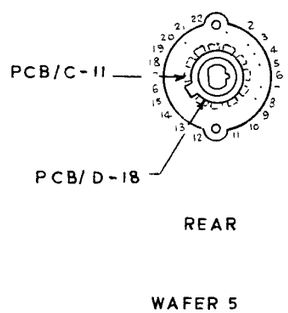



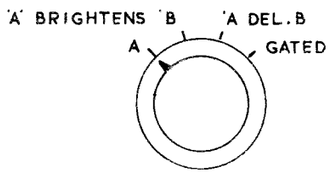



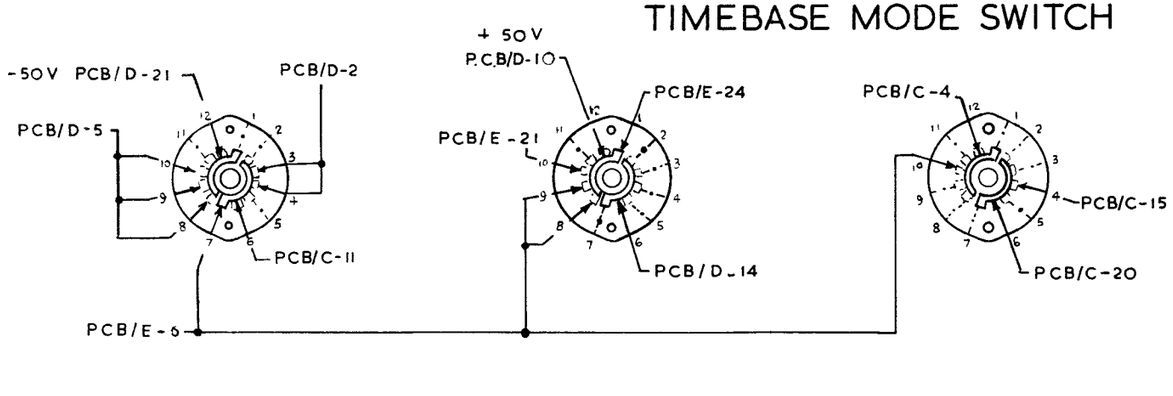



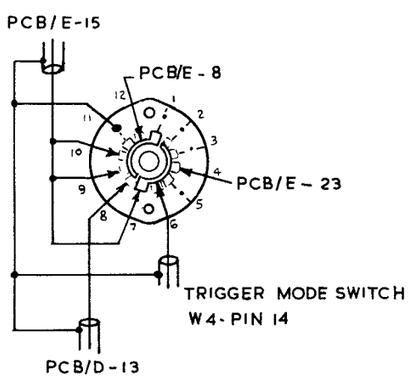

# TRIGGER MODE SWITCH




# TIMEBASE MODE SWITCH

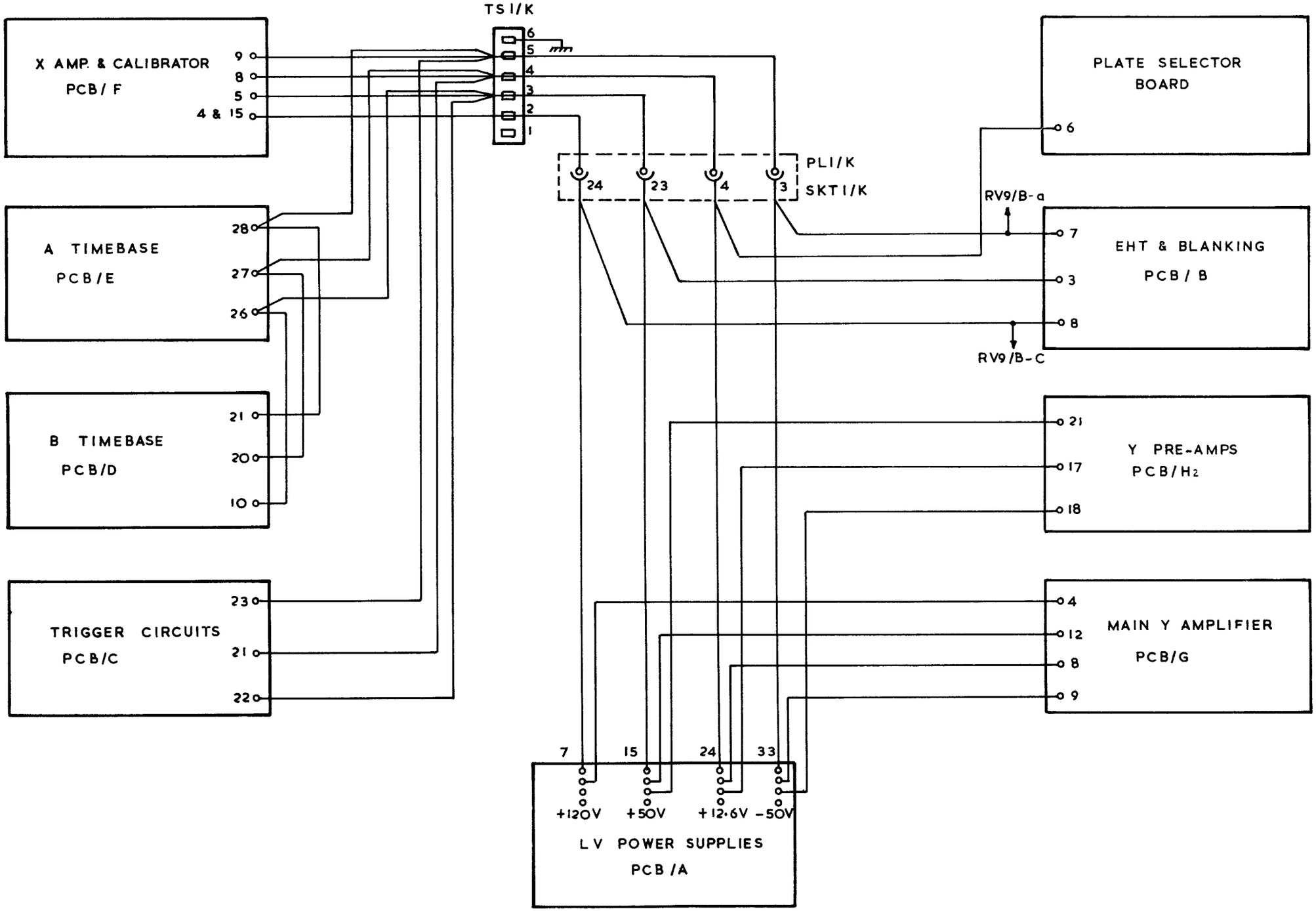



# TRIGGER MODE & TIMEBASE MODE SWITCHES

D/CD80490/8

FIG 11 2




# POWER DISTRIBUTION

C/CD80490 SHEET 11

FI
12

# GUARANTEE OF INSTRUMENTS

(U.K. Sales only)

The instruments manufactured by the Cossor Group of Companies are warranted to be free from defects caused by faulty material or workmanship for twelve months from the date of despatch to the original purchaser or his purchaser of each unused instrument, as the case may be. Such parties and no other shall have any rights under this warranty. Any instrument or part thereof which shall prove defective within the applicable twelve-month period will be repaired or at our option exchanged free of charge provided that:

1. the relevant purchaser notifies Cossor Electronics Ltd promptly of any defect and its cause
2. the relevant purchaser pays all expenses incurred in returning the defective instrument to Cossor Electronics Ltd, Service Department, Edinburgh Place, Temple Fields, Harlow, Essex.

Proprietary components (including valves, semi-conductors and cathode-ray tubes) not manufactured by the Cossor Group of Companies carry the same warranty which the Cossor Group of Companies receives from the manufacturers of such components.

Labour entailed in the fitting of any new part or parts supplied under this Guarantee will be charged to the relevant purchaser.

Damage to instruments (or components) caused by fair wear and tear, by unauthorized alteration or by substitution of non-standard parts, by incorrect installation, by accident, misuse or neglect or by usage otherwise than in accordance with the operating instructions is not covered by this guarantee.

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Cossor Electronics Ltd, The Pinnacles, Elizabeth Way, Harlow, Essex.

NOTE Special arrangements and conditions apply to instruments sold to users outside U.K. and may be obtained on request.

## SPARES AND SERVICE

To assure the prompt dispatch of spare parts, the order should quote the type number and serial number of the unit, the description of the part(s), the part number(s), and the quantity required.

While every effort is made by the Cossor Electronics Service Department to maintain an adequate supply of spare parts, a delay in dispatch of some parts, not normally expected to require replacement, may be unavoidable.

Where purchase of the instrument has been made through a Cossor Stockist or Agent, all service enquiries and orders should be addressed direct to that supplier.

Where the instrument has been obtained from Cossor Electronics Ltd, the purchaser should address enquiries and orders to:

Service & Installation Division,
Cossor Electronics Limited,
Edinburgh Place,
Temple Fields,
Harlow, Essex. Tel. Harlow 26624.

and add ENGLAND to this address, if writing from outside the United Kingdom.