The Darlington connected pair TR641 TR642 maintains the constant output voltage determined by the reference diode D642. In the event of a current overload TR643 is turned on causing the output volts to drop thereby reducing the current and preventing damage to TR641 and TR642.

The output of D661, D662 and C661 is stabilised to provide the +20V rail. The voltage at the slider of RV661 is compared with that of the reference diode D663 by TR661 causing its collector voltage to vary so that the output voltage is maintained at +20V, TR664 gives overcurrent protection for TR662, TR663.

The -20V rail is obtained by stabilising the output of D681 D682 C681. The output voltage is compared against the +20 rail by TR681 whose collector volts vary to keep the output voltage constant. TR684 provides overcurrent protection.

Calibration

The advanced circuit design coupled with solid state reliability will make frequent recalibration unnecessary. Before assuming a fault condition exists always set up the oscilloscope as outlined in the first time operation; this will eliminate any apparent faults caused by incorrect settings of the controls.

Removal of Covers

The top cover can be removed by sliding it backwards and up after removing the two upper screws located on the rear of the two wide side trims. The two lower screws release the bottom cover. Having removed the covers great care should be exercised as the E.H.T. supply takes several minutes to completely discharge after switching off: DO NOT however, discharge the E.H.T. supply by shorting it to earth through any resistor less than 100KΩ.

Low Voltage Supplies

The 110V supply should be checked and should fall between 103V and 115V.

The +20 volt rail should be checked to be within ±.2V and if necessary adjusted. The -20V rail should now be within ± .4V.

High Voltage Supplies

The gun volts for the cathode ray tube can be checked at the junction of C615, D619 and should be between 1060V and 1160V.

The final anode supply can be measured at the top of the rear panel printed circuit board. This supply has a very high impedance and can only be measured at all accurately using an electrostatic voltmeter. The value will vary depending upon the intensity setting and mains input voltage but should lie between 4KV and 5KV.

Cathode Ray Tube Controls

Before recalibrating the instrument it is essential to correctly set the ASTIGMATISM and GEOMETRY controls as these have considerable effect on the cathode ray tube deflection sensitivities.

To adjust the ASTIG, apply a 10KHz approx. signal to 'A' channel and obtain a locked display of about 6 cycles 6cms. high, now select ALT with 'B' channel grounded and its position on the centre line. The ASTIGMATISM and FOCUS controls should be adjusted together to obtain the sharpest possible display in the horizontal and vertical axis.

In order to adjust the GEOMETRY control with the above signal applied, select a single trace display and approximately 1µS/cm sweep speed so that a raster is produced. The GEOMETRY control should now be adjusted to obtain the squarest and straightest edges to sides, top and bottom of this raster. If the GEOMETRY control has been reset the FOCUS and ASTIG should be rechecked.

Trigger Threshold

Select a single beam operation and apply a 10KHz sine wave to A channel to give 4 cm of display. Select 'A' channel on the TRIGGER SOURCE switch and with the TRIGGER SLOPE control pulled out rotate it to the mid position on the +ve slope. Rotating RV501 from its extreme anti clockwise point the trace will free run then lock. The correct setting is approximately clockwise 30^{o} beyond the point where the trace locks.

Sweep Timing

A range of accurate timing signals (i.e. better than $\pm$ 0.5%) is required to calibrate the timebase.

With the TIME/CM switch set to 1mS/cm and a source of 1mS timing pulses applied to 'A' channel obtain a locked display.

Adjust RV503 to give 1 pulse every cm. Pull the X5 magnifier and adjust RV502 to give 5 cms between each pulse.

Switch off the magnifier and select 1µS/cm. Apply 1µS timing pulses and adjust CV501 located on the TIME/CM switch to give one pulse every cm. Now check that all sweep speeds remain within specification.

Attenuator Compensation

Compensation of the attenuators will require a fast rise (less than 300nS) square pulse generator of accurate shape free from ringing and overshoot, adjustable in amplitude from 40mV to 100V, at approximately 2.5KHz. A correctly adjusted divider probe will also be required. A suitable screen with holes to permit adjustment of the trimmers must be fitted to simulate the bottom cover.

At each step the signal amplitude should be adjusted to give a display height of approximately 4cms where possible.

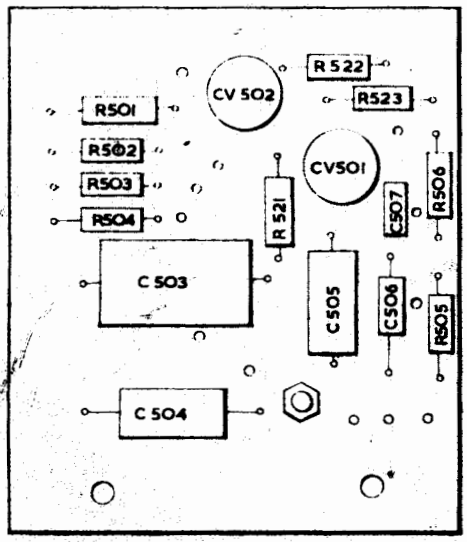
The trimmer capacitors should be adjusted in the following sequence to give the flattest top and squarest corner to the displayed waveform. The signal should be applied either direct to the oscilloscope input or to the probe which is then connected to the input. During these adjustments the compensation of the probe must not be altered.

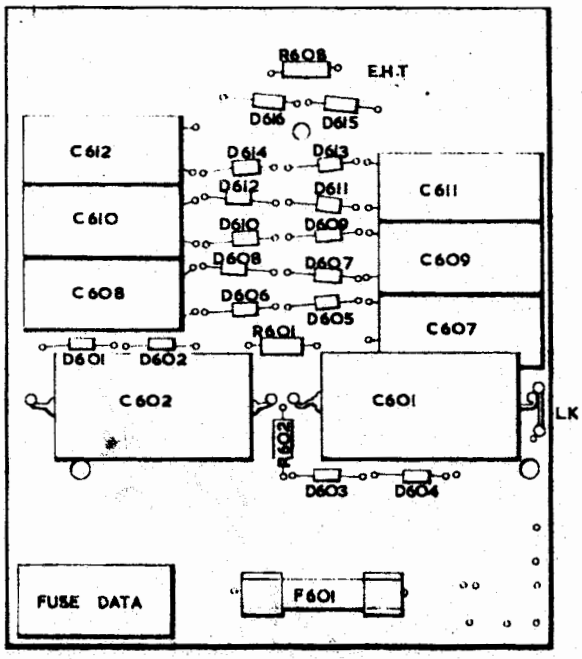
VOLTS/CM		ADJUST
10mV	Direct	CV10
10mV	Via Probe	CV9
20mV	Direct	CV8
20mV	Via Probe	CV7
50mV	Direct	CV6
50mV	Via Probe	CV5
100mV	Direct	CV4
100mV	Via Probe	CV3
1V	Direct	CV2
1V	Via Probe	CV1

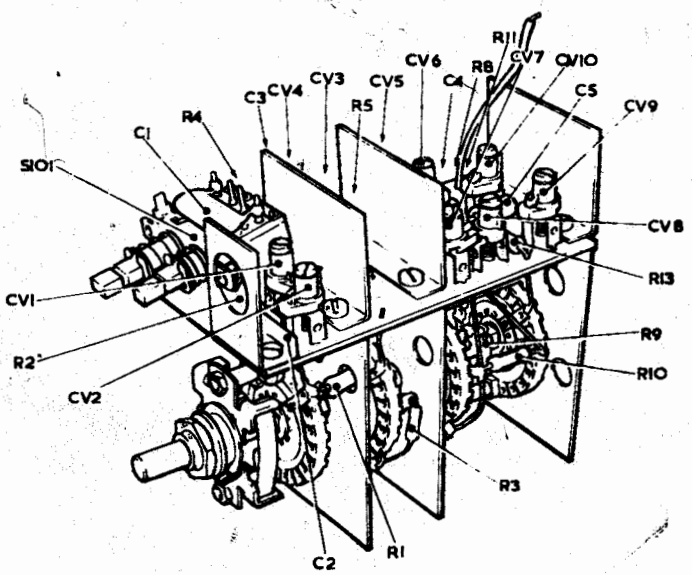
The remaining positions should be checked to see that they are correct.

Amplifier Gain

Apply an accurate $\pm$ .5% signal of 40mV direct to the input and adjust RV103 to give precisely 4cms of deflection.







TIME BASE AND ATTENUATOR

Amplifier Pulse Response

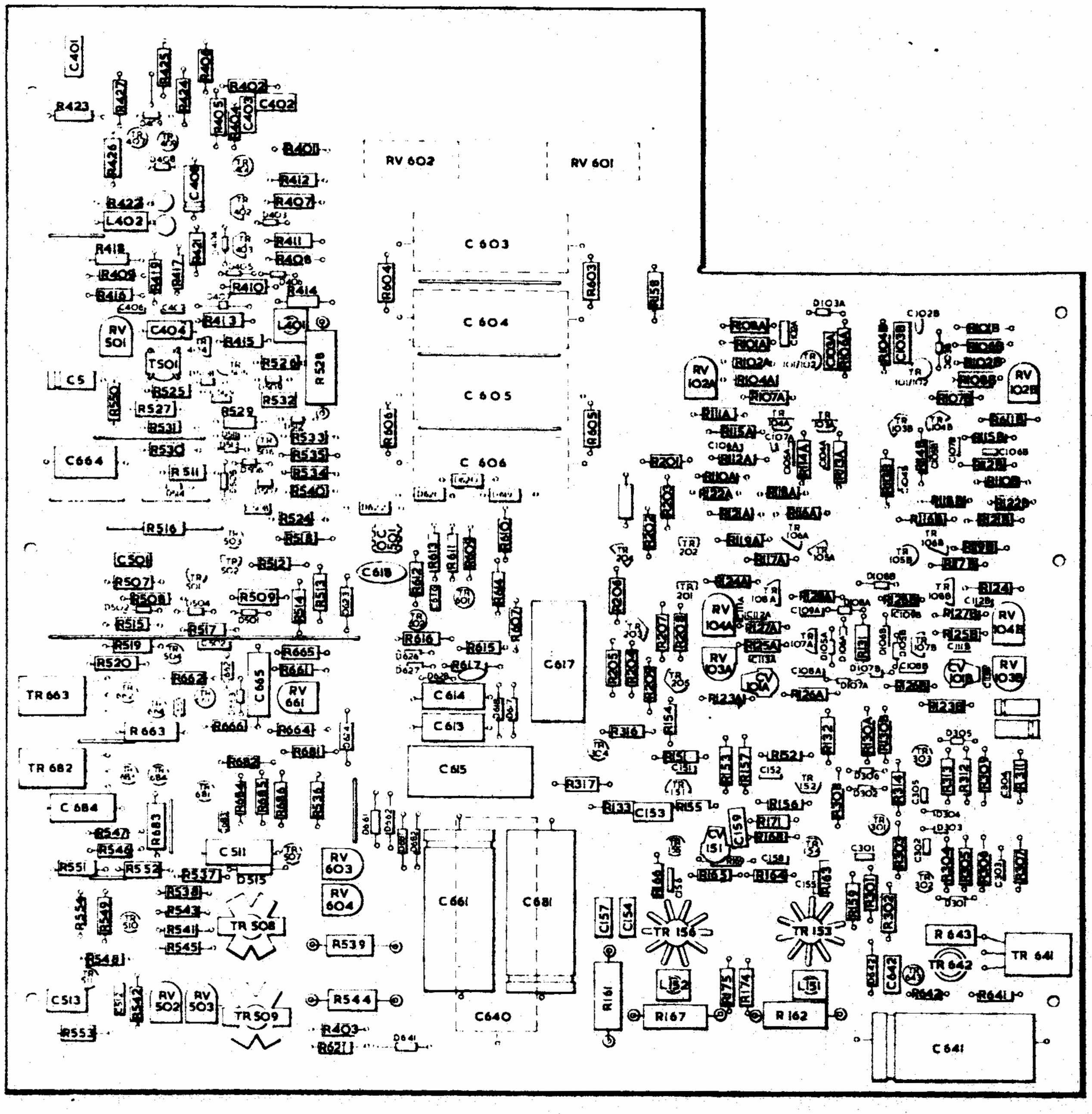
Pulse response adjustment requires a square pulse generator of accurate shape free from ringing and overshoot and a rise time not greater than 3nS. The output frequency should be adjustable between 250KHz and 1MHz with an output amplitude of 40mV. Before carrying out any adjustments set CV101A to its mid range.

Apply the signal direct to 'A' channel input using a suitable termination for the connecting cable. Turn the VOLTS/cm switch to 10mV, the TIME/cm to 0.2μS and obtain a locked display. Rotating RV104 will cause the trace to 'rock' about a point approximately 2 mm from the front edge of the pulse and should be adjusted to give the flattest top to the pulse after the rocking point. Now adjust CV151 to give the flattest top to the pulse before the rocking point. L151 and L152 should be adjusted to give the squarest corner to the pulse with a minimum of ringing.

The above procedure should be repeated for 'B' channel. Compromise settings of CV101A, CV101B and CV151 may be necessary to obtain the optimum pulse shape on both channels.

Servicing

To facilitate servicing the unblank amplifier it may become necessary to disable the -1100V power supply. The following procedure should be adopted: remove the link by the positive end of C601 on the E.H.T. board which will prevent the voltage doubler operating and temporarily connect a 47KΩ between the two pins adjacent to R549 to ensure that the -20V supply operates. The instrument will operate normally except that there will be no display on the Cathode Ray Tube.


RV 602
RV 601
C 603
C 604
C 605
C 606
C617
C 614
C 613
C615
C 661
C 681
C640
C 641
TR 663
TR 682
C 684
C664
C5
TS01
TR 508
TR 509
TR 156
TR 153
TR 641
TR 642
R 643
R 663
R528
R539
R544
R161
R167
R 162
C511
L152
L151
RV 501
RV 502
RV 503
RV 603
RV 604
RV 661
C513
C401
C402
C404
L402
L401
R423

MAIN BOARD