In the 'A' only mode, R307 is returned to 0V ensuring TR303 is bottomed and R305 is returned to +30V ensuring TR302 is always turned off. The CHOP mode returns both R305 and R307 to 0V and the stage becomes astable switching at approximately 100KHz. The ALT mode biasses the stage such that it becomes bistable and switching occurs only at the end of the sweep when TR301 is turned off by a pulse from the timebase.

Horizontal Circuits

The source of signal to the trigger stage is determined by the source switch S401. This signal is superimposed on a DC level determined by the setting of the TRIG LEVEL control RV401. This composite signal is applied to the input base of the Schmitt trigger circuit TR402 and TR403 via the emitter follower TR401 which provides a high input impedance to the signal. If the base potential of TR402 is more positive than the base of TR403 the current provided by R411 flows through D403 into TR402, any further positive excursions of the base of TR402 will have very little effect on the circuit condition. However, on any subsequent negative excursion a point may be reached where by cumulative action the stage switches rapidly (approx. 20ns). This switching action takes place when the base of TR402 is at approximately +15V. Thus the lower the potential set by RV401, the more positive the input signal must go before the stage switches. Should the potential set by RV401 be more positive than + 15V then only when the input signal is negative going will switching take place.

The antiphase outputs from the collectors of TR402 and TR403 are taken via the gating diodes D402 and D405 and differentiating capacitors C402 and C404 to the sweep generator. The resistors R407 and R412 ensure that the anodes of the gating diodes are negative with respect to their cathodes and are thus turned off thereby blocking the passage of the signals. Only when a diode is caused toconduct by applying a forward bias from the 220V rail will it allow the signal to pass to the timebase, S402 which is ganged to RV401 determines which diode shall conduct. A negative going trigger pulse is required to start the timebase.

A sample of the signal at the collector of TR403 is peak rectified by D406, D407 and C406 to turn off TR404. If for any reason (i.e. no input signal) the trigger stage is not producing pulses then TR404 conducts, causing the timebase to free run. Immediately trigger pulses are produced, TR404 is turned off and the timebase reverts to the triggered state.

In the quiescent state (i.e. ready to be started) the conditions in the timebase circuit are as follows. The Miller run down circuit formed by the field effect transistor TR503 is biassed such that its drain is at approx. +20V. Should it attempt to rise higher, the base of TR502 will go positive. The corresponding positive excursion at TR501 collector will allow the gate of TR503 to go positive which will act against the original rise to restore equilibrium.
The sweep gate multivibrator TR504, TR505 is biassed such that TR504 takes the current supplied by R514. Under this condition the collector of TR504 is at 0V holding the base of TR505 approximately 1V more positive than the base of TR504. This potential is set by D502, D503, D504. The collector of TR505 is approximately -25V and D508 is turned off. The collector of TR502 is negative with respect to earth and D506 is conducting.

A negative going trigger signal applied to the cathode of D506 causes it to conduct taking the collector of TR504 negative. By cumulative action the circuit switches so that TR505 now takes all the current supplied by R514. The collector of TR505 rises turning on D508, this positive going signal is also used to unblank the cathode ray tube. D505 is now reversed biassed and the Miller Stage is free to run down at a rate determined by the timing capacitors C551 to C555 and the timing resistors R551 to R554. During the run down period D501 is turned off and TR502 conducts all the current supplied by R506 thus elevating its collector to approximately +10V.

The run down continues until the base of TR504 becomes more negative than the base of TR505 whereupon the sweep gate multivibrator switches back to its quiescent state. The collector of TR505 falls to approximately -25V blanking the cathode ray tube and turning off D508. The current supplied by R505 now flows through D505 to the gate of TR503 causing it to turn off.

The current supplied by R511 flows into the timing capacitor causing the junction with the drain of TR503 to rise. Eventually a potential is reached whereby D501 starts to conduct and TR501 collector rises taking D505 in a positive direction re-establishing the stable quiescent state.
During the run down period and subsequent resetting action, the collector of TR502 has been at approx. +10V ensuring that D506 is turned off. This action prevents trigger pulses causing the timebase to run before it has completely reset. Only when the timebase has completely reset does the collector of TR502 fall sufficiently negative for D506 to pass a trigger signal.
The output from the time base is applied via the emitter follower TR506 to one input of the long tailed pair TR507, TR508 and the shift voltage from RV504 to the other input. The gain of the stage is set by R524 and RV502 which controls the amount of coupling between the emitters of TR507 and TR508. A further gain control R525 and RV503 can be switched in parallel by operating the magnifier switch S503 when the gain is increased by a factor of 5.
The low voltage supplies are obtained by conventional half wave rectification. The E.H.T. is obtained by voltage doubling the output from an overwind on the transformer. The supplies for the cathode ray tube are obtained by a conventional potential divider network which also incorporates the smoothing capacitors.

Calibration

The advanced circuit design coupled with solid state reliability will make frequent recalibration unnecessary. Before assuming that 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 covercan 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