





®

DANGER



It is not possible to screen all high voltages, so care should be taken not to touch high voltage tags. Also where possible the instrument should be unplugged AND switched off during servicing. A BLEEDER PATH FOR THE EHT IS NOT PROVIDED, so after switching off and before touching any internal parts, the EHT should be discharged by temporarily shorting the appropriate points to chassis, (for instance the CRT cathode pin and PDA connector where applicable).



FOR SERVICING AND SPARES ENQUIRIES
SEE THE INFORMATION AT START OF SECTION 5.

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OSCILLOSCOPE
TYPE D63

INTRODUCTION

The D63, with two vertical plug-ins, is an all solid state dual beam oscilloscope with a single sweep horizontal system. An 8 x 10 div. CRT provides a bright and clear display. The features of the vertical system depend on the type of plug-in used and are given in the appropriate manuals.

The manual covers the mainframe, which houses the following.

- Calibrator
- Sweep Generator and Horizontal Amplifier
- Power Supplies
- Un-blanking Amplifier
- Vertical Amplifier, Output Stage

The design of this instrument is subject to continuous development and improvement, consequently this instrument may incorporate minor changes in detail from the information contained herein, which would, in the main, affect the Components List and Circuit Diagrams. The reader should pay particular attention to the notes at the beginning of Chapter 5.

NOTICE TO OWNER

To obviate the risk of damage during transit and facilitate packaging, the owner is requested to remove the power supply plug and NOT send the following items unless they are suspect, should this instrument be returned to TELEQUIPMENT for servicing:—

- Manual
- Probes
- Power Supply Lead
- Plug Assemblies

CHAPTER 1

SPECIFICATION

1.0 VERTICAL AMPLIFIER

provided by two of the following:—

- V1 Single trace
- V3 High gain differential
- V4 Dual trace
- V5 Single trace with signal delay

Reference should be made to the appropriate manual for details.

X – Y Mode

Operation

'Y'

'X'

Phase response

Two identical plug-ins

L.H. plug-in

R.H. plug-in

< 1° up to 100 kHz

2.0 HORIZONTAL AMPLIFIER

2.1 SWEEP OPERATING MODE

Repetitive

Single shot

2.2 TRIGGER

Mode

Auto

DC

AC

Sensitivity

Internal

Bright line 10 Hz – 15 MHz

DC – 15 MHz

10 Hz – 15 MHz

< 0.2 division at 1 MHz

< 0.5 division at 15 MHz

External

100 mV at 1 MHz

150 mV at 15 MHz

Polarity

+

–

From positive signal edge } By Rotation of
From negative signal edge } LEVEL CONTROL

Source

Internal

L.H. Vert

R.H. Vert

External

Line

From L.H. Amplifier

From R.H. Amplifier

From external source, DC or AC coupled

From supply frequency

2.3 SWEEP

Range

X1

X5

Variable (time) range

1 s – 200 ns/div

0.2 s – 40 ns/div max.

>2.5 to 1

Accuracy

X1

X5

± 3%

± 5%

2.4 EXT X input

Sensitivity
X1
X10
Bandwidth

1 V/div \pm 25%
0.2 V/div \pm 25%
>1 MHz

3.0 CATHODE RAY TUBE (CRT)

Display area
Phosphor standard
Overall accelerating potential

Dual beam mesh, CRT with internal graticule
8 x 10 div (each div 1.0 cm)
P31
8 kV

4.0 FRONT PANEL OUTPUTS

4.1 CALIBRATOR

Amplitude Pk to Pk

30 mV, 300 mV or
3 mA at 1 kHz when shorted together

Accuracy
Voltage
Frequency
Current

\pm 1%
 \pm 20%
 \pm 1%

4.2 GATE OUT

Impedance

Positive pulse at sweep width
3 k Ω approx.

4.3 SWEEP OUT

Amplitude
Impedance

10 V
5 k Ω approx.

5.0 Z MOD

Full blanking sensitivity
Input impedance
Frequency response

+ 20 V approx.
10 k Ω and 20 pF approx.
DC - 3 MHz approx.

6.0 GENERAL

6.1 POWER REQUIREMENTS

Voltage
Frequency
Consumption

100 - 125 V in 5 V steps
200 - 250 V in 10 V steps
48 - 400 Hz
75 VA

6.2 SIZE

Height
Width
Depth

290 mm
215 mm
520 mm

6.3 WEIGHT

Complete
Less plug-ins

14 kg
9.5 kg

6.4 COOLING

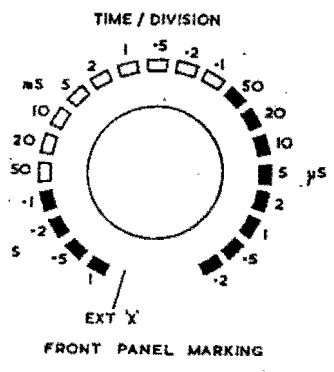
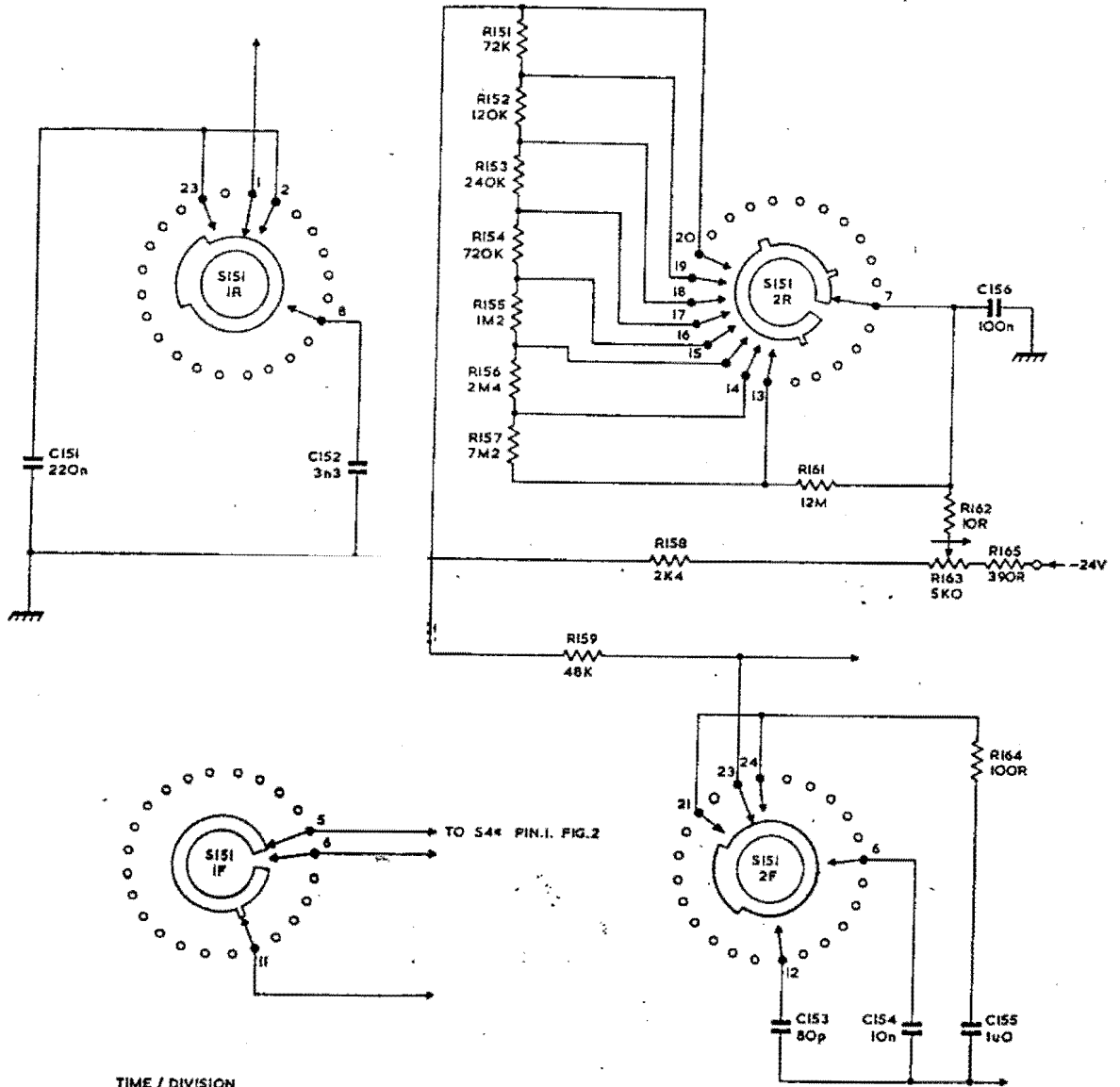
Convection

6.5 TEMPERATURE LIMITS, ambient

Operating
Non-operating

+ 5 to 40°C approx.
-25 to +70°C approx.

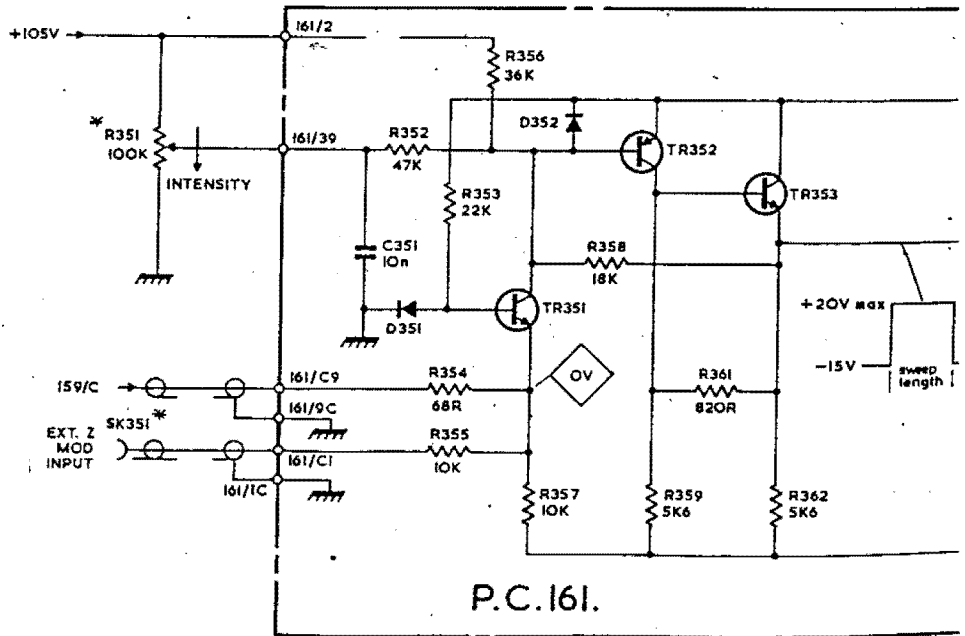
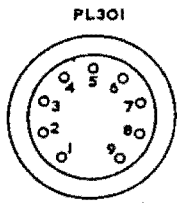
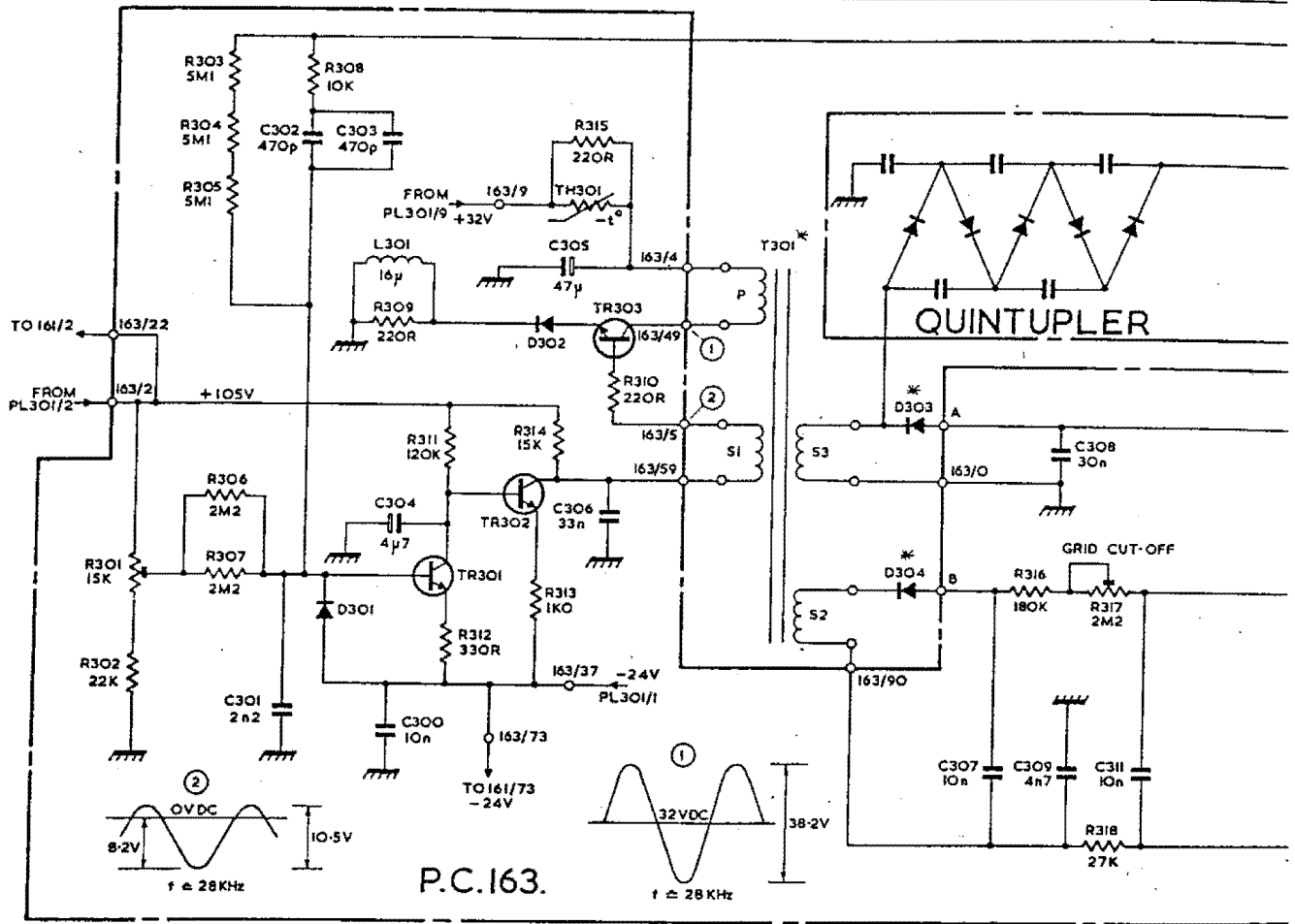
	151	152	159	158	161	162	163	164
								165
	151	152			153	154	155	156
	S151							



NOTES
 1. SWITCH IS SHOWN IN FULLY ANTICLOCKWISE POSITION.
 2. NUMBER OF POSITIONS 22.

TIME / DIV. SWITCH D63
 FIG. 3.

RESISTORS	301 302	303 304 305 306 307	308	309	311 312	313 314 315	352	353 354 355	356	357	358	359	361 362	
CAPACITORS		301 302	303 304 300		305	306	351				307	308 309	311	
MISC.			D301	L301	TR301	D302 TR302	TR303	T301		D303 D304	TR351	D352	TR352	TR353



CHAPTER 2

OPERATING INSTRUCTIONS

2.1 FUNCTION OF CONTROLS AND CONNECTORS

These are situated on the front panel except where otherwise specified. For those controls not covered below, reference should be made to Chapter 2 of the manual for "V" plug-in.

2.1.1 CRT

POWER	
PULL ON	power supply ON-OFF switch.
INTENSITY	varies the intensity of the display.
ASTIG	a preset used in conjunction with FOCUS for achieving the best overall definition.
FOCUS	controls the definition of the display.
TRACE LOCATE	when pressed brings the trace onto the screen and free runs the timebase.
POSITION	varies the position of the trace in the horizontal axis.
FINE	is a fine horizontal position control.
X5	when pulled magnifies trace 5 times in the horizontal axis; sweep calibrations must be divided by 5.
TRACE ROTATION	preset situated on the rear panel, used to align the trace in the horizontal axis.

2.1.2 SWEEP

TIME/DIV	controls the speed of the sweep. The sweep rates indicated are only valid if VARIABLE is fully clockwise and X5 is not selected. If X5 is selected and VARIABLE at CAL, the calibrations should be divided by 5 to ascertain the sweep speed.
VARIABLE	provides continuous coverage of sweep speeds in between those selected by TIME/DIV switch.
REP	pressed, selects repetitive triggering.
SINGLE	assists in viewing or photographing a non-recurrent signal. Upon application of a trigger pulse a single sweep only takes place. Sweep circuit is then disabled until the RESET button is pressed.
X - Y	connects R.H. VERT to 'X' and L.H. VERT to 'Y'.

2.1.3 TRIGGER

TRIG LEVEL	Selects the point on the waveform at which the sweep starts.
TRIG MODE	
AUTO	provides a horizontal trace in the absence of signal by permitting the timebase to free run until signal is applied. LEVEL range is reduced to approximately 1 division.
AC or DC	relates to the coupling of the trigger circuit. For very low input frequency signals, DC should be selected.
POLARITY	
±	selects triggering from the positive or negative-going slope of a waveform. Coupled to trig-level control.

L.H.VERT } R.H.VERT }	selects the respective vertical trigger signal.
LINE	provides trigger signal at the power supply frequency.
EXT	enables the sweep to be triggered from an external source.

2.1.4 VERTICAL

refer to respective 'V' Manuals.

2.1.5 CONNECTORS

INPUT

EXT TRIG
EXT X

share a common input BNC socket located on the front panel. Signals are then applied to the required circuit by selection of either the EXT TRIG button or EXT X on T/B switch.

Z MOD

input socket situated on the rear panel is DC coupled via Z mod amp. to the CRT grid. A negative-going signal is necessary to intensify the trace while a positive-going signal will blank it.

OUTPUTS

CAL

output sockets provide a 1 kHz waveform for checking the calibrations of the vertical channels and setting up probes. The two outputs provide 300 mV and 30 mV 1 kHz (approx.) squarewave, when linked a 3 mA peak to peak current passes.

SAWTOOTH



provides a positive-going ramp waveform when the sweep is running. A recurring sawtooth is produced when AUTO is selected. The resistance of an applied load should exceed 10kΩ.

GATE OUT



provides a fast-edged positive-going rectangular pulse lasting for the duration of the sweep. The resistance of an applied load should exceed 4.7 kΩ.

2.2 PRE-OPERATIONAL CHECKS

2.2.1 POWER SUPPLY

Check the following:

- 1 Correct plug-ins are plugged in.
- 2 Rear voltage-selector plug is indicating the local supply voltage or nearest value.
- 3 Fuse fitted is a 2 A for 100-125 V operation or 1 A for 220-250 V.

NOTE: The 3-core supply lead is colour coded as follows:

	Line	Neutral	Earth (Chassis)
or.	Brown Black	Blue White	Green/Yellow Green

- 4 The power supply cord is secured to the instrument with the nuts and screws provided.

2.2.2 Set controls as follows:

- 1 CRT
 - INTENSITY Central
 - FOCUS Central
 - TRACE ROTATION As set

POWER	Depressed
POSITION	Central and depressed
SWEEP	REP
TIME/DIV	5 ms
VARIABLE	Fully clockwise
TRIG MODE	Auto
POLARITY	Rotate to + \int
SOURCE	INT

2 Set 'V' plug-in controls as given in appropriate 'V' manuals.

2.3 OPERATION

- 1 Plug into the supply; pull POWER ON.
- 2 Allow a few minutes for warm up then press TRACE LOCATE and adjust POSITION controls for a display.
- 3 Adjust TRACE ROTATION, if necessary, to align trace horizontally.
- 4 Connect the CAL 30 mV to JINPUT via co-axial lead.
- 5 Set DC-GND-AC to DC.
- 6 Check amplitude is 6 divisions.

CHAPTER 3

CIRCUIT DESCRIPTION

3.1 VERTICAL AMPLIFIER

3.1.1 As both channels of the main amplifier are similar in design, only the left hand (LH) channel will be described in detail, the differences in the right hand (RH) channel will be described separately.

3.1.2 The interface, reference Figure 1, with the vertical plug-ins is via two 16 way sockets mounted on the mother board PC175. The sockets are designated SK802 (LH) channel and SK803 (RH) channel. The signal is carried via pins 5 and 13 to the shunt feedback amplifier TR801, TR802. To ensure that the main amplifier always has the same sensitivity, the gain is set by the series elements, R809, R812 and the shunt elements R805 R806. The total gain adjustment is approximately 18%.

3.1.3 The output of the shunt feedback amplifier drives directly into the output stage amplifier TR812, TR813. The collectors are connected to the CRT 'Y' plates. Adjustment of R869 sets the mean plate potential to 50 V. Emitter resistors, R845 R846, are normally earthed in the timebase via SK804/13. H.F. peaking is achieved by the network between the emitters formed by R849, C812.

3.1.4 TR805, TR806 are driven from the output of the shunt feedback stage and form the trigger amplifier. The output from TR805 collector is controlled via the switching diode D805, by the potential existing on SK802 pin 6. D803 is the path by which the trigger signal is fed to the timebase via SK804 pin 11. A second source of trigger signal is also applied to SK804 pin 11, and is derived from SK802 pin 7. If a V1 plug-in is plugged into SK802 the only trigger source available is from TR805, therefore a +24 V control voltage is applied to SK802/6 reverse biasing D805, the signal is therefore allowed to pass via D803 to the timebase socket SK804/11. If, however, the V1 plug-in is exchanged for a V5 plug-in, (This plug-in contains the delay cable), a pre-delay line trigger signal is required via SK802 pin 7. Therefore in this case SK802 pin 6 is connected to potential of -24 V, thereby forward biasing D805 and reverse biasing D803, thus switching off the source of trigger signal from TR805 collector.

3.1.5 SK804/13 and SK804/14 are joined together inside the timebase, via switch S4e/5, S4e/4 (X-Y switch) and then to earth via S3 (TRACE LOCATE). When the TRACE LOCATE button is pressed, the total current of both output stages is limited by R843 thus restricting the available collector swing of both output stages to within the confines of the tube, regardless of the POSITION. The POSITION control may then be set to centre the trace.

3.1.6 When the D63 is switched to X - Y mode, the LH vertical plug-in is used in the 'Y' axis but the RH plug-in is now used to drive the 'X' axis. However, as the D63 uses a split beam tube it becomes necessary to shift the RH channel beam off the screen. This is achieved in the following manner. When the X - Y switch S4 is pressed, the emitter resistors R847, R848 become disconnected from earth via SK804/14, hence the collectors of TR814 and TR815 rise to HT. However at the same time, S4 switches SK804/12 to earth, D811 (normally reverse biased by R868) becomes forward biased and the collector voltage of TR815 is lowered due to the potential divider formed by R865, collector load, and R861. Sufficient voltage differential now exists between the 'Y' plates to position the trace off the screen.

3.1.7 Whilst in X-Y mode, the timebase uses the RH trigger signal to drive the 'X' axis. As already explained, it is possible to obtain a trigger signal from two sources, i.e. direct from SK803/7

or from the collector of TR807 via D804, depending upon the type of 'V' plug-in used. Therefore to ensure the same amplitude of signal regardless of 'V' plug-in used, it is very desirable to use one trigger source only i.e. that from TR807. This is achieved in the following manner. The trigger source from TR807 is connected permanently to SK804/10. SK803/7 is connected to SK804/10 via diode D809. SK803/6, the trigger amplifier controlling voltage, is connected to diode D808. TR809 and TR811 form a bistable circuit. Now consider a V1 plug-in plugged into the RH channel, and the oscilloscope working normally, SK803/6 is at +24 V, therefore diode D808 is conducting, and TR811 is 'on' its collector is therefore at approximately -24 V, diode D807 is therefore conducting, D809 being reverse biased. No signal is therefore able to pass D809 to SK804/10. However TR809 is 'off', its collector being at approximately +24 V reverse biases D806, allowing D804 to pass the signal onto SK804/10. Now switching to X - Y mode, the junction of R847 and R848 rises in potential to approximately +17 V and thereby aiding TR811 to stay 'on'. The signal source remains as before i.e. via D804. However, consider a V5 plug-in in the RH channel and working normally. SK803/6 is now at -24 V, reverse biasing diode D808. SK804/14 is at earth therefore TR811 is 'off' its collector being at approx. +24 V reverse biasing D807. However, TR809 is now 'on' its collector being at approx. -24 V forward biasing D806 and switching off this signal source. But SK803/7 can now feed its signal via D809 to SK804/10. Now switching to X - Y, R847 R848 junction rises to +17 V and this is sufficient to turn TR811 'on' and once again D807 is forward biased, shunting the signal from SK803/7 to -24 V and also TR809 is once again 'off', reverse biasing D806 and permitting the signal to pass on to SK804/10 via D804. So, whichever amplifier is in situ, when X - Y is pressed the signal source is via TR807.

3.1.8 The RH channel trigger amplifier contains in its emitter circuit a DC TRIG BAL potentiometer. It is used to ensure that the start of a dc triggered trace is the same for RH channel as for LH channel.

3.2 TRIGGER AMPLIFIER

3.2.1 INTERNAL TRIGGER

Part of the signal to be displayed is "picked-off" from the appropriate vertical amplifier and fed via the 16 way socket, SK804, to diode D11 or D12, reference Figure 2. Selecting S4a or S4b causes the correct diode to conduct and passes the trigger signal on to the trigger pre-amplifier stage TR2. Switches S1b and S1c select DC and AC TRIG, respectively, while S4c allows triggering at supply frequency. Level and polarity controls are achieved with a centre-tapped dual ganged potentiometer, R38 and R61. Operating the pot between its fully anti-clockwise end and the centre tap selects the positive slope region of the displayed waveform while the range between the centre tap and the clockwise end selects the negative slope. The AUTO mode is selected with S1a, part of whose action is to reduce the triggerable range of the display to within 1 division on the screen.

The output of the trigger pre-amplifier TR2 is DC coupled via current limiting circuitry and a frequency compensation network, which improves the H.F. response at 5 MHz, to provide an analogue signal at pin 4 of I.C.1 the Sweep Control I.C. TR7 functions as a slope selector switch converting the positive or negative voltage at the wiper of R61 into corresponding logic levels for application to pin 5 of I.C.1.

3.2.2 EXTERNAL TRIGGER

The signal from an external triggering source is connected to the BNC socket on the timebase unit front panel. This is then coupled via emitter follower, TR1, to the base of TR2 through diodes D3, D7, which are turned on when S4d is selected.

When DC Trig Mode switch is selected the trigger signal is DC coupled all the way to the base of TR2 as both C1 and C11 are by-passed.

The circuit has an input impedance of approximately 100 k and is protected from voltage overloads by C2, R4.

3.3 SWEEP GENERATOR

3.3.1 The sweep generator, reference Figure 2, is basically a very high gain Miller integrator and a voltage comparator contained within a 10 pin integrated circuit in a T05 package, I.C.2. Interlinked with this unit is the "control" integrated circuit, I.C.1, in a 16 pin D.I.L. package.

The "control" I.C. is driven with positive logic, the convention used being, positive = logic '1', ground = logic '0'.

The operation of the two interlinked integrated circuits is best understood by referring to Tables 1, 2 and 3.

3.3.2 The 10 V sawtooth output produced at pin 8 of I.C.2 is converted into a current via R74 and fed to the base of TR101 in the X amplifier. Trimmer C22 in parallel with R74 is a sweep linearity control, while trimmer C19 is an adjustment for setting the timing on the fastest settings of the Time/Div switch. A measure of variable Hold-off is incorporated, when the trig level control is operated, by feeding back a portion of the volts via R37 to pin 11 of I.C.1 TR4 supplies a regulated +5 V to supply I.C.1.

3.4 HORIZONTAL AMPLIFIER

The input to the horizontal amplifier, reference Figure 4 is at the base of TR101 where the sweep is mixed with fine and coarse shift levels. The junction of R12/C5 and C7/R25, where the signal currents from External X and X-Y respectively are taken, is also connected to the base of TR101. The differential output from the collectors of TR102, TR103, drives the 'X' plates of the C.R.T. The amplifier incorporates a catching network D101/R104, to prevent TR102 from saturating. The X5 gain switch is incorporated in the emitters of the output pair.

R110, across the collectors of TR102 and TR103 is fitted for the DM63, storage version. This effectively reduces the gain of the stage by approximately 10% as the storage C.R.T. is that much more sensitive.

3.5 EXTERNAL X

When switched to this mode, (with the Time/Div switch) all functions of the timebase unit are overridden except the X-Y facility and Trace Locate button. The external driving voltage is applied to the BNC socket on the T.B. unit front panel and after passing through emitter follower TR1 passes to the horizontal amplifier via D1 and D4 reference Figure 2.

'Bright-up' is achieved by holding pin 15 of I.C.1 at about +0.8 V when R14 is connected to the -24 V line. At the same time pin 10 of I.C.1 rises to logic '1' to "lockout" the sweep.

3.6 X-Y MODE

In this mode all functions of the timebase unit are overridden except Trace Locate. Its function is such that a calibrated 'Y' co-ordinate (in the vertical direction) is available using the LH channel of the oscilloscope and also a calibrated 'X' co-ordinate (in the horizontal direction) via the RH channel. The 'Y' signal passes through the LH plug-in via the vertical amplifier on the mother board to the 'Y' plates of the CRT. The 'X' signal passes through the RH plug-in via SK804 on the mother board to D12 in the timebase unit. When S4e is selected, D12 conducts and the 'X' signal is passed to the base of TR101 in the horizontal amplifier via R29/R25/C7. S4e also disables the coarse shift control and unbalances the RH channel output amplifier. Bright-up is accomplished by taking pin 15 of I.C.1 to logic '1' when R6 is connected to the -24 V line. Pin 10 of I.C.1 also rises to logic '1' and the sweep is locked out.

3.7 TRACE LOCATE

When S3 is depressed and held, the currents of the horizontal amplifier and both vertical output amplifiers are reduced by about 50% restricting the display to within the screen area of the CRT. Also pin 2 of I.C.1 rises to logic '1' enabling the timebase to "free run". Trace Locate functions for all modes of operation of the oscilloscope.

3.8 CALIBRATOR

This (reference Figure 4) is a simple multivibrator running at about 1 kHz. Accuracy depends on resistors R124, R125, R128 and the -24 V line. Potentiometer R127 takes up the tolerance of R128. When SK101 and SK102 are shorted, 3 mA passes through the short circuit.

3.9 POWER SUPPLY

The -105 V, +24 V and -24 V lines, reference Figure 6, are all self regulating and protected from short circuits, they are connected to the remainder of the instrument via two plugs and sockets.

3.9.1 +24 V

Diodes D405, D406, D407 and D408 form a full wave bridge rectifying circuit whose reservoir capacitor is C405. The output of this line is dependent on -24 V line setting, the sampling chain resistors R424 and R426 provide bias to the control loop of TR408, TR406 and TR405. TR402, R407, R425 and R413 form a current limiting and foldback network to protect the output under overload conditions.

3.9.2 -24 V

This is used as a reference voltage for the other two lines and when set accurately will bias the +105 V and +24 V lines to their correct output voltages. Diodes D409, D411 and D413 form a full wave bridge rectifying circuit. TR411 and TR407 are a long tailed pair and in conjunction with TR409 and TR413 stabilise the circuit.

Current foldback and limiting is provided by TR403, R433, R420 and R405.

3.9.2 +105 V

Diodes D401, D402, D403 and D404 provide full wave bridge rectification. If a short circuit occurs on this line the instrument must be switched off and on again before the line returns to its normal voltage. Transistors TR414, TR412, TR415 and TR416 stabilise the output and TR401 and TR404 provide short circuit protection in the form of a bistable.

3.10 E.H.T.

The E.H.T. (reference Figure 5) is derived from a class C oscillator operating at approximately 28 kHz. The oscillator amplifying transistor TR303 uses transformer T301 as its load and main frequency determining component. R301 sets the cathode potential which is regulated by a feedback loop including a high gain amplifier formed by TR301 and TR302. The grid is set to the correct tube cut-off potential by adjusting R315. The output voltage is limited at switch on by thermistor TH301 whilst C304 inhibits E.H.T. feedback into the unregulated +30 V line. Diodes D303 and D304 provide half wave rectification from T301 for the cathode and grid supplies. The PDA is derived from a five stage multiplier (quintupler) whose input is taken from the same tapping on T301 as that used for the cathode supply. Tube focusing is achieved by adjusting R327 which is on the front panel.

3.11 UNBLANKING AMPLIFIER

The amplifier is a current in voltage out stage. A 2 mA change of input current produces an anti-phase 30 V output. The internal unblanking and external Z MOD signals are fed into TR351 emitter in current form at each potential. This current is transferred to the base of TR352 where it is mixed with the intensity control current. TR352 and TR353 form a stage whose gain is determined by R358.

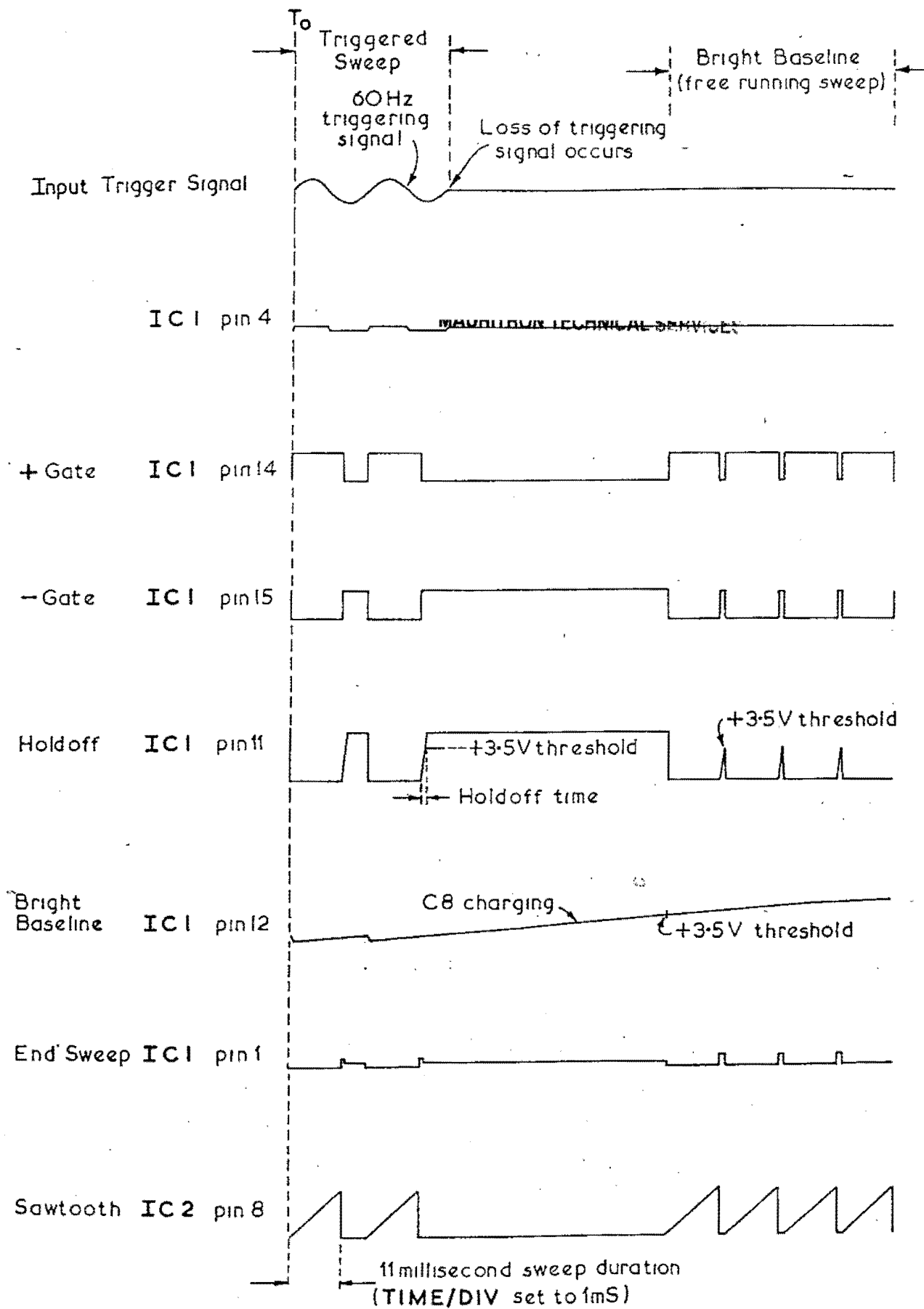
TABLE 1
I.C.1. Sweep Control I.C.

Pin No.	Function	Operation
1	END SWEEP	A logic '1' input causes logic '0' at pin 14 to end sweep (see pin 14).
2	FREE RUN	A logic '1' input causes logic '1' at pin 14 which if maintained, enables the sweep to free run at its "natural" selected frequency. Used to free run timebase when "Trace Locate" button is pushed.
3	INDEPENDENT GROUND	Connected to pin 8.
4	TRIGGER INPUT	Analogue input current from trigger pre-amp produces a train of "internal" pulses, in conjunction with a logic level at pin 5.
5	SLOPE SELECTOR	A logic '1' input allows a positive analogue signal at pin 4 to produce "internal" pulses. Logic '0' allows negative going analogue at pin 4 to produce "internal" pulses.
6	SINGLE SHOT CONTROL	A logic '1' input enables a repetitive sweep to continue. Logic '0' input allows a single sweep to be produced.
7	RESET	A logic '1' arms the timebase to receive a trigger signal and produces a single sweep. When Reset button is released pin returns to logic '0'.
8	SUBSTRATE	Connected to ground.
9	READY LAMP OUTPUT	A logic '0' output is produced when Single Shot button is pushed. This state allows ready state indicator, light emitting diode, to come on.
10	LOCKOUT	A logic '1' input disables the sweep, i.e., it cannot be started. A logic '0' allows normal operation.
11	HOLD-OFF TIMING	On receipt of an internal pulse, (generated at the end of the sweep), the timing components are connected allowing the pin to rise to threshold voltage of 3.5 V. A new sweep can commence upon receipt of next trigger pulse or if pin 12 is above its upper threshold voltage (see pin 12).
12	BRIGHT BASE LINE TIMING	Pin is allowed to rise to its threshold of 3.5 V when AUTO switch is selected. This then produces a logic '1' at pin 14 to start sweep and free run at "natural" selected frequency. If trigger signal is present or has a repetition rate >15 Hz, threshold voltage is never reached, pin goes to logic '0' and timebase is "triggered" in normal manner.
13	BRIGHT BASE LINE CONTROL	A logic '1' input keeps pin 12 at ground and disables B.B.L. operation. A logic '0' allows B.B.L. to function.
14	+ GATE OUTPUT	A logic '1' output is applied to pin 1 of I.C.2 to start the sweep and is maintained for duration of sweep. Logic '0' output to pin 1 of I.C.2 ends ramp and is maintained for whole of retrace period.
15	- GATE OUTPUT	Logic output is exactly 180° out of phase with pin 14. Output used as the bright up pulse.
16	POWER SUPPLY	Taken to +5 V line.

TABLE 2
I.C.2. Sweep Generator

Pin No.	Function	Operation
1	SWEEP GATE IN	Logic '1' input starts sweep and results in sawtooth output at pin 8.
2	OSCILLATION SUPPRESSOR	C17 and R65 connected to ground reduce gain of integrator and prevent internal oscillation.
3	GROUND	Connected to ground.
4	END SWEEP PULSE	Logic '1' output produced when ramp reaches its allowed maximum amplitude. Applied to pin 1 of I.C.1.
5	DELAYED GATE	Not used.
6	DELAY CONTROL IN	Maintained at +9.8 V and applied to one side of a voltage comparator inside i.e. the amplitude of the ramp is established at the other side.
7	POWER SUPPLY	Held at approximately +15.8 V by Zener diode, D24.
8	SAWTOOTH OUTPUT	Ramp output of approximately 10 V amplitude starting from 0 V, when logic '1' applied to pin 1.
9	TIMING CURRENT IN	Junction of timing capacitors and resistors taken to pin.
10	SUBSTRATE	Taken to -24 V line via R69, sits at approximately -6.7 V.

TABLE 3. RELATIONSHIP OF EVENTS IN AUTO MODE



CHAPTER 4

MAINTENANCE AND CALIBRATION

4.1 INTRODUCTION

4.1.1 The solid - state design of the instrument makes frequent adjustment of the internal components unnecessary. The appropriate part of the calibration procedure should be performed whenever the instrument fails to meet its specification or whenever a defective component is replaced. However, if R428 is adjusted to set the -24 V line, the full calibration procedure should be carried out.

4.1.2 For calibration procedure of VERTICAL plug-ins, see appropriate Vertical plug-in MANUAL.

4.1.3 For calibration, the tools and equipment required are:

- Low-capacitance trimming tool (for preset controls)
- Small screwdriver (for preset potentiometers)
- Two Vertical plug-ins V1
- Vertical Calibration Unit 067-0672-00
- D.C. Voltmeter $\pm 0.5\%$ accurate for measuring power supply voltages
- D.C. Voltmeter of input impedance greater than $25\text{ M}\Omega$ and $\pm 0.5\%$ accurate for measuring cathode potential (-1.35 kV)
- Squarewave Generator providing outputs of 25 mV and 250 mV at 1 kHz accuracy $\pm 1\%$
- Squarewave Generator providing 1 MHz rise time ≤ 3 ns
- Sinewave Generator providing 500 Hz to 50 kHz
- Constant Amplitude Sinewave Generator providing 50 kHz to 20 MHz for measuring bandwidth
- Time-mark Generator providing markers of 1 ms and 1 μ s.

4.2 MECHANICAL

4.2.1 ACCESS TO INTERIOR

The instrument has two vertical plug-ins, a timebase unit, a power supply unit and a EHT unit. The two cabinet covers of the instrument are removed as follows:

- 1 Disconnect the power lead.
- 2 Turn four buttons, two on each side cover, to release.
- 3 Lift the two side covers.

To remove the vertical plug-in(s):

Depress the plug-in retaining clip on the front and withdraw the plug-in(s).

To remove the sweep unit:

- 1 Unplug the two output leads from the CRT top pins.
- 2 Loosen one screw at the rear securing the unit.
- 3 Withdraw the unit.

To gain access to the preset controls inside the EHT box:

Remove the L-cover (one screw).

Power supply unit can be withdrawn from the rear of the instrument by removing the two retaining screws.

4.2.2 CRT REMOVAL

- 1 Remove the side covers as detailed above.
- 2 Earth the PDA connector with a screwdriver.
- 3 Disconnect the PDA connector.
- 4 Remove the rear cover (two screws).
- 5 Disconnect the CRT base connector.
- 6 Disconnect the CRT neck pins.
- 7 Unsolder the trace rotation coil connections.
- 8 Slacken CRT front clamp held by two screws on the top.
- 9 Slacken the top screw of the clamp holding the mumetal screen.
- 10 Remove the 2 clamp securing screws.
- 11 Remove CRT and mumetal screen by moving the CRT

backwards then to the side and forward.

- 12 Withdraw CRT from the screen.
- 13 Remove trace rotation coil from neck of tube.

4.2.3 CRT FITTING

Follow the above removal detail in reverse order.

4.3 CALIBRATION PROCEDURE

4.3.1 POWER SUPPLY

Adjustment of -24 V line or replacement of any of the transistors TR407, TR409, TR411 and TR413 would necessitate carrying out the entire calibration procedure as detailed in this chapter.

A voltmeter of better than 0.5% accuracy should be used for measuring the power supply voltages.

- 1.0 Check line voltages.
- 1.1 Remove cabinet covers.
- 1.2 Set meter range to cover -24 V DC.
- 1.3 Connect meter between earth and -24 V output (junction of R429 and C415).
- 1.4 Adjust R428 for -24 V.
- 1.5 Set meter range to cover +105 V DC.
- 1.6 Connect meter between earth and +105 V output (junction of R432 and C416).
- 1.7 Check voltage is within $\pm 2\%$ of +105 V i.e. +107.1 V, +102.9 V.
- 1.8 Set meter range to cover +24 V DC.
- 1.9 Connect meter between earth and +24 V output (junction of R424 and C414).
- 1.10 Check voltage is within $\pm 2\%$ of +24 V i.e. +24.48 V, +23.52 V.

4.3.2 E.H.T. and DISPLAY ADJUSTMENTS

A voltmeter of input impedance greater than $25\text{ M}\Omega$ and accuracy better than 0.5% should be used for measuring the cathode potential.

CAUTION: HIGH VOLTAGE

- 1.0 Check cathode potential.
- 1.1 Remove cabinet covers, EHT cover and rear cover plate.
- 1.2 Set meter range to cover -1.35 kV DC.
- 1.3 Connect meter between earth and pin 7 on tube base.
- 1.4 Adjust R301 for -1.35 kV.
- 2.0 Check beam equalisation.
- 2.1 Display two traces.
- 2.2 Turn INTENSITY control such that the two traces are just visible.
- 2.3 Rotate magnet at rear of the CRT to equalise intensity of the two traces.
- 3.0 Check grid cut-off.
- 3.1 Remove cabinet covers and EHT cover.
- 3.2 Check INTENSITY range.
- 3.3 Set TIME/DIV to EXT X
- 3.4 Turn INTENSITY fully anti-clockwise.
- 3.5 Adjust R317 for extinction of spot.
- 3.6 Set TIME/DIV to 10 ms.
- 3.7 Check INTENSITY range.
- 4.0 Raster distortion.
- 4.1 Apply 100 kHz sinewave to vertical input.
- 4.2 Adjust controls for 10 x 8 divs raster.
- 4.3 Adjust TRACE ROTATE to align the axes.
- 4.4 Adjust R332 (Geometry) for minimum raster distortion.

4.3.3 VERTICAL AMPLIFIER PC175 (Final Stage)

Switch off the instrument. Remove left-hand V plug-in and replace with vertical calibration unit 067-0672-00. Switch on

the instrument.

- 1.0 Set LH Y plate potential (R869).
- 1.1 Switch calibration unit to CALIBRATE.
- 1.2 Connect voltmeter of at least 1% accuracy between TR812 and TR813 collectors.
- 1.3 Adjust POSITION to achieve 0 V between collectors.
- 1.4 Connect voltmeter from one collector to earth.
- 1.5 Adjust R869 to obtain a reading of 50 V.
- 1.6 Repeat Ops 1.2 to 1.5.
- 1.7 Disconnect voltmeter.
- 2.0 Set LH channel gain (R805).
- 2.1 Connect 1 kHz squarewave of 250 mV amplitude to INPUT.
- 2.2 Set TIME/DIV to 1 ms.
- 2.3 Adjust R805 for precisely 5 divisions.
- 3.0 Set LH channel pulse response (R849 and C812).
- 3.1 Connect 200 mV 1 MHz ≤ 3 ns risetime squarewave to INPUT.
- 3.2 Set TIME/DIV to 0.2 μ s.
- 3.3 Adjust R849 and C812 for best pulse response.
- 4.0 Check LH channel bandwidth.
- 4.1 Connect 50 kHz sinewave to INPUT.
- 4.2 Adjust generator to give 5 div trace.
- 4.3 Set TIME/DIV to 1 ms.
- 4.4 Switch generator to 18 MHz.
- 4.5 Check amplitude > 3.5 divisions.
- 5.0 Set RH Y plate potential (R871).
Note: Place vertical calibration unit 067-0672-00 into right-hand channel.
- 5.1 Switch vertical calibration unit to CALIBRATE.
- 5.2 Connect voltmeter of at least 1% accuracy between TR814 and TR815 collectors.
- 5.3 Adjust POSITION to achieve 0 V between collectors.
- 5.4 Connect voltmeter from one collector to earth.
- 5.5 Adjust R871 to obtain a reading of 50 V.
- 5.6 Repeat Ops 5.2 to 5.5.
- 5.7 Disconnect voltmeter.
- 6.0 Set RH channel gain (R807).
- 6.1 Connect 250 mV 1 kHz squarewave to INPUT.
- 6.2 Set TIME/DIV to 1 ms.
- 6.3 Adjust R807 for precisely 5 divisions.
- 7.0 Set RH channel pulse response (R851 and C813).
- 7.1 Connect 200 mV 1 MHz ≤ 3 ns risetime squarewave to INPUT.
- 7.2 Set TIME/DIV to 0.2 μ s.
- 7.3 Adjust R851 and C813 for best pulse response.
- 8.0 Check RH channel bandwidth.
- 8.1 Connect 50 kHz sinewave to INPUT.
- 8.2 Adjust generator to give 5 div trace.
- 8.3 Set TIME/DIV to 1 ms.
- 8.4 Switch generator to 18 MHz.
- 8.5 Check amplitude > 3.5 divisions.
Note: Replace vertical calibration unit with normal 'V' plug-in.

4.3.4 VERTICAL PLUG-IN

See appropriate MANUAL.

4.3.5 TIME BASE PC158

- 1.0 Set trigger.
- 1.1 Select AUTO Trigger Mode and LH VERT Source buttons.
- 1.2 Set TIME/DIV switch to 1 ms.
- 1.3 Ensure that the main frame contains two calibrated V1, vertical plug-ins. Centralise traces of both channels.
- 1.4 Apply a 500 Hz sinewave to LH channel input socket and adjust its amplitude to display 0.5 division on the screen.

- 1.5 Adjust R57 so that the display "free runs" when the TRIG LEVEL control is at either extremity of its front panel + and - slope regions.
- 1.6 Select AC Trigger Mode button.
- 1.7 Increase amplitude of display to 8 divisions on the screen.
- 1.8 Check that by operating the TRIG LEVEL control the displayed waveform can be made to start at any point on its + or - slope.
- 1.9 Set start point of display on centre graticule line.
- 1.10 Select DC Trigger Mode button.
- 1.11 Adjust R32 for < 0.4 division change in position of the start point of the display when the Trigger Mode is switched between AC and DC on both + and - slopes.
- 1.12 Select DC Trigger Mode button. Apply the same signal also to RH channel input socket and ensure that both displayed waveforms are superimposed.
- 1.13 Adjust R841 on rear of Mother Board PC175 for no change in start point of display when switching between LH VERT and RH VERT Source buttons.
- 1.14 Disconnect the signal from both input sockets.
- 2.0 Set timing.
- 2.1 Set TIME/DIV switch to 1 ms, VARIABLE to CAL and horizontal gain to x1. Select LH VERT Source button.
- 2.2 Apply 1 ms markers to LH channel input socket and adjust to a suitable amplitude on the screen.
- 2.3 Adjust R114 for 1 marker per division.
- 2.4 Pull gain switch for x5 and adjust R108 for 1 marker per 5 divisions.
- 2.5 Alter input signal to 1 μ s markers.
- 2.6 Set TIME/DIV switch to 1 μ s.
- 2.7 Push gain switch for x1.
- 2.8 Adjust C19 for 1 marker per division.
- 2.9 Set TIME/DIV switch to 0.2 μ s.
- 2.10 Pull gain switch for x5.
- 2.11 Remove marker input signal and apply a 15 MHz sinewave.
- 2.12 Adjust C22 for best linearity at the start of the trace.
- 3.0 Set external trig.
- 3.1 Remove signal from inputs and connect LH channel input socket to Ext X socket on timebase front panel.
- 3.2 Push AUTO and DC Trigger buttons together and select EXT Source button.
- 3.3 Set LH channel VOLTS/DIV switch to 0.1 V and select x1 gain.
- 3.4 Set LH channel DC-GND-AC switch to GND, and centre the trace.
- 3.5 Set DC-GND-AC to DC and adjust R2 to return trace to centre of screen.
- 3.6 Repeat 3.4 and 3.5 until there is no more movement of trace.
- 3.7 Disconnect LH channel input and EXT X sockets op. 3.1.
- 4.0 Set X-Y gain.
- 4.1 Select RH VERT Source button on time base front panel.
- 4.2 Set RH channel DC-GND-AC switch to DC and LH channel DC-GND-AC switch to GND.
- 4.3 Set RH channel VOLTS/DIV switch to 5 mV.
- 4.4 Apply a 25 mV 1 kHz squarewave to RH channel input socket and ensure that the squarewave is 5 divisions high on the screen.
- 4.5 Select X-Y Source button.
- 4.6 Adjust R25 for 2 spots, 5 divisions apart in the horizontal direction on the screen.

4.3.6 CALIBRATOR ADJUSTMENT

Normally, no further amplitude adjustments are required to the calibrator outputs. In the event of its failure requiring resistor replacement then the amplitude should be checked and if required R127 should be adjusted.

CHAPTER 5

COMPONENT LIST

Values of resistors are stated in ohms or multiples of ohms; ratings at 70° C are in watts or sub-multiples of watts. Values of capacitors are stated in sub-multiples of farads; ratings at 70° C are in volts or kilovolts.

Whenever possible, exact replacements for components should be used, although locally available alternatives may be satisfactory for standard components.

Any order for replacement parts should include:

- | | |
|--------------------------------|--------------------------|
| 1. Instrument type | 4. Component part number |
| 2. Instrument serial number | 5. Component Value |
| 3. Component circuit reference | |

CIRCUIT REFERENCE BLOCKS

The table below gives the blocks of circuit references, so that the reader can relate the items listed in this chapter and their location in the circuitry and printed circuit boards in Chapter 6.

Circuit Reference		Circuit	Fig.	P.C. Board No.
From	To			
1	100	Trigger and Sweep Generator	2	158
101	140	X-Amplifier and Calibrator	4	158
151	170	Time/Div Switch	3	—
301	350	E.H.T. Control — CRT	5	163
351	370	Bright-Up	5	161
401	450	Power Supply	6	162
801	880	Mother Board	1	175

ABBREVIATIONS

BM	Button mica	CMP	Cermet preset	PS	Polystyrene
C	Carbon	E	Electrolytic	Se	Selenium
.CP	Carbon preset	Ge	Germanium	Si	Silicon
CV	Carbon variable	MF	Metal film	SM	Silver mica
CER	Ceramic	MO	Metal oxide	WW	Wire-wound
CT	Ceramic trimmer	PE	Polyester	WWP	Wire-wound preset
CM	Cermet thick film	PP	Polypropylene	WWV	Wire-wound variable.

TELEQUIPMENT, division of TEKTRONIX U.K. LIMITED

313 Chase Road Southgate London N14 6JJ England

Telephone: 01-882 1166

Telex: 262004

Cables: TELEQUIPT LONDON N14

All requests for repairs or replacement parts should be directed to the Tektronix Field Office or representative in your area. This procedure will assure you the fastest possible service.

CIR REF	PART NUMBER	VALUE F	DESCRIPTION			Eff. Ser. No.
			TYPE	TOL %	RATING Volts	
C1	285-0915-00	100 p	PE	20	100	
C2	281-0710-00	10 n	CER		250	
C3	285-0854-00	100 p	PS	2 p	350	
C6	281-0734-00	100 n	CER		30	
C7	285-0988-00	18 p	PS	1 p	350	
C8	290-0623-00	4.7 μ	E		25	
C9	285-0873-00	200 p	PS	5	350	
C10	281-0710-00	10 n	CER		250	
C11	281-0729-00	1.5 μ	PE	20	63	
C12	285-0854-00	100 p	PS	12 p	350	
C13	281-0710-00	10 n	CER		250	
C14	290-0627-00	22 μ	E		40	
C15	285-0874-00	470 p	PS	5	125	
C16	281-0734-00	100 n	CER		30	
C17	285-0873-00	200 p	PS	5	350	
C18	285-0873-00	200 p	PS	5	350	
C19	281-0155-00	2-22 p	PP		500	
C20	281-0734-00	100 n	CER		30	
C21	281-0734-00	100 n	CER		30	
C22	281-0154-00	2-12 p	PP		500	
C24	281-0734-00	100 n	CER		30	
C25	281-0734-00	100 n	CER		30	
C26	281-0734-00	100 n	CER		30	
C27	281-0710-00	10 n	CER		250	
C100	281-0734-00	100 n	CER		30	
C101	285-0870-00	120 p	PS	2	350	
C103	285-0845-00	68 p	PS	2 p	350	
C104	285-1015-00	4.7 n	PE	20	160	
C105	285-0800-00	10 n	PE	20	250	
C106	290-0556-00	22 μ	E		25	
C151	285-0899-00	220 n	PE	20	400	
C152	285-1070-00	3.3 n	PS	10	400	
C153	285-0941-00	80 p	PS	1	350	
C154	285-0942-00	10 n	PE	1	125	
C155	285-0943-00	1 μ	PE	1	160	
C156	281-0734-00	100 n	CER		30	
C300	281-0710-00	10 n	CER		250	
C301	285-0759-00	2.2 n	PS	5	125	
C302	281-0680-00	470 p	CER	20	1.5 k	
C303	281-0680-00	470 p	CER	20	1.5 k	
C304	290-0492-00	4.7 μ	E		25	
C305	290-0495-00	47 μ	E		40	
C306	285-0799-00	33 n	PE	20	250	
C307	281-0677-00	10 n	CER		2 k	

CIR REF	PART NUMBER	VALUE F	DESCRIPTION			Eff. Ser
			TYPE	TOL %	RATING Volts	
C308	281-0706-00	30 n	CER	20	1.5 k	
C309	285-1015-00	4.7 n	PE	20	160	
C311	281-0677-00	10 n	CER		2 k	
C312	281-0706-00	30 n	CER		1.5 k	
C313	281-0710-00	10 n	CER		250	
C351	281-0710-00	10 n	CER		250	
C352	285-0796-00	100 μ	PE	20	250	
C353	281-0710-00	10 n	CER		250	
C401	285-0793-00	10 n	PE	20	630	
C402	285-0793-00	10 n	PE	20	630	
C403	285-0793-00	10 n	PE	20	630	
C404	290-0547-00	330 μ	E		160	
C405	290-0624-00	2.2 m	E		40	
C406	290-0624-00	2.2 m	E		40	
C407	285-1058-00	10 n	PE	20	400	
C408	290-0494-00	47 μ	E		25	
C409	285-0915-00	100 n	PE	20	100	
C411	290-0635-00	4.7 μ	E		63	
C412	285-0870-00	120 p	PS	2	350	
C413	285-0796-00	100 n	PE	20	250	
C414	290-0556-00	22 μ	E		25	
C415	290-0556-00	22 μ	E		25	
C416	290-0664-00	4.7 μ	E		160	
C417	290-0556-00	22 μ	E		25	
C801	281-0710-00	10 n	CER		250	
C802	281-0710-00	10 n	CER		250	
C803	281-0710-00	10 n	CER		250	
C804	281-0710-00	10 n	CER		250	
C807	285-0800-00	10 n	PE	20	250	
C808	285-0800-00	10 n	PE	20	250	
C809	285-0941-00	80 p	PS	2 p	350	
C811	285-0854-00	100 p	PS	1	350	
C812	281-0191-00	10-60 p	CT		500	
C813	281-0191-00	10-60 p	CT		500	
C814	285-0869-00	47 p	PS	2 p	350	
C815	285-0869-00	47 p	PS	2 p	350	
C816	285-0842-00	15 p	PS	1 p	350	
C817	285-0842-00	15 p	PS	1 p	350	
C818	290-0377-00	1 m	E		16	
C819	281-0710-00	10 n	CER		250	

CIR REF	PART NUMBER	VALUE	DESCRIPTION	TYPE	TOL	RATING	Eff. Ser. N
D1	152-0062-01	75V	1N914	Si		50 mA	
D2	152-0062-01	75 V	1N914	Si		50 mA	
D3	152-0062-01	75 V	1N914	Si		50 mA	
D4	152-0062-01	75 V	1N914	Si		50 mA	
D5	152-0062-01	75 V	1N914	Si		50 mA	
D6	152-0062-01	75 V	1N914	Si		50 mA	
D7	152-0062-01	75 V	1N914	Si		50 mA	
D8	152-0062-01	75 V	1N914	Si		50 mA	

CIR REF	PART NUMBER	VALUE	DESCRIPTION	TYPE	TOL %	RATING	Eff. Ser.No.
D9	152-0062-01	75 V	1N914	Si		50 mA	
D11	152-0062-01	75 V	1N914	Si		50 mA	
D12	152-0062-01	75 V	1N914	Si		50 mA	
D13	152-0575-00		L.E.D.	Si			
D14	152-0062-01	75 V	1N914	Si		50 mA	
D15	152-0472-00	5.6 V	Zener	Si	5	300 mW	
D16	152-0062-01	75 V	1N914	Si		50 mA	
D17	152-0062-01	75 V	1N914	Si		50 mA	
D18	152-0062-01	75 V	1N914	Si		50 mA	
D19	152-0062-01	75 V	1N914	Si		50 mA	
D21	152-0062-01	75 V	1N914	Si		50 mA	
D22	152-0472-00	5.6 V	Zener	Si	5	330 mW	
D23	152-0469-00		Rectifier	Si			
D24	152-0416-00	8.2 V	Zener	Si	5	300 mW	
D101	152-0062-01	75 V	1N914	Si		50 mA	
D102	152-0062-01	75 V	1N914	Si		50 mA	
D103	152-0062-01	75 V	1N914	Si		50 mA	
D104	152-0062-01	75 V	1N914	Si		50 mA	
D105	152-0473-00	6.8 V	Zener	Si	5	330 mW	
D301	152-0062-01	75 V	1N914	Si		50 mA	
D302	152-0468-00	150 V	BAX16	Si		200 mA	
D303	152-0567-00	3 kV	SCM30	Si			
D304	152-0567-00	3 kV	SCM30	Si			
D305	152-0388-00	130 V	Zener	Si	5	330 mW	
D351	152-0062-01	75 V	1N914	Si		50 mA	
D352	152-0062-01	75 V	1N914	Si		50 mA	
D401	152-0341-00	450 V	Rectifier	Si		500 mA	
D402	152-0341-00	450 V	Rectifier	Si		500 mA	
D403	152-0341-00	450 V	Rectifier	Si		500 mA	
D404	152-0341-00	450 V	Rectifier	Si		500 mA	
D405	152-0339-00	50 V	1N4001	Si		500 mA	
D406	152-0339-00	50 V	1N4001	Si		500 mA	
D407	152-0339-00	50 V	1N4001	Si		500 mA	
D408	152-0339-00	50 V	1N4001	Si		500 mA	
D409	152-0339-00	50 V	1N4001	Si		500 mA	
D411	152-0339-00	50 V	1N4001	Si		500 mA	
D412	152-0339-00	50 V	1N4001	Si		500 mA	
D413	152-0339-00	50 V	1N4001	Si		500 mA	
D414	152-0348-00	6.2 V	Zener	Si	5	330 mW	
D415	152-0062-01	75 V	1N914	Si		50 mA	
D416	152-0062-01	75 V	1N914	Si		50 mA	
D417	152-0468-00	150 V	BAX16	Si		200 mA	
D801	152-0062-01	75 V	1N914	Si		50 mA	
D802	152-0062-01	75 V	1N914	Si		50 mA	
D803	152-0062-01	75 V	1N914	Si		50 mA	
D804	152-0062-01	75 V	1N914	Si		50 mA	
D805	152-0062-01	75 V	1N914	Si		50 mA	
D806	152-0062-01	75 V	1N914	Si		50 mA	
D807	152-0062-01	75 V	1N914	Si		50 mA	
D808	152-0062-01	75 V	1N914	Si		50 mA	
D809	152-0062-01	75 V	1N914	Si		50 mA	
D811	152-0062-01	75 V	1N914	Si		50 mA	
D812	152-0062-01	75 V	1N914	Si		50 mA	
D813	152-0062-01	75 V	1N914	Si		50 mA	

CIR REF	PART NUMBER	VALUE	DESCRIPTION	Eff. Ser.No.
FS401	159-0069-00	2 A	1.25" lg. 100-125 V	
FS401	159-0073-00	1 A	1.25" lg.	
FS402	159-0073-00	1 A	1.25" lg.	

IC1	155-0056-00		Inter: Circuit Tek	
IC2	155-0042-03		Inter: Circuit Tek	

L301	108-0483-00	16 μ H	Inductor Fixed	
L302	108-0753-00		Trace Rotate	

LP401	150-0074-00	6.5 V	Lamp 0.15 A	
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CIR REF	PART NUMBER	VALUE	DESCRIPTION	Eff. Ser.No.
		Ohms	TYPE TOL RATING	
			% W	
R1	317-0224-01	220 k	C 5 125 m	
R2	311-0756-00	47 k	CP 20 250 m	
R3	317-0224-01	220 k	C 5 125 m	
R4	317-0103-01	10 k	C 5 125 m	
R5	317-0682-01	6.8 k	C 5 125 m	
R6	317-0682-01	6.8 k	C 5 125 m	
R7	317-0471-01	470	C 5 125 m	
R8	317-0432-01	4.3 k	C 5 125 m	
R9	317-0622-01	6.2 k	C 5 125 m	
R10	317-0471-01	470	C 5 125 m	
R11	317-0392-01	3.9 k	C 5 125 m	
R12	317-0432-01	4.3 k	C 5 125 m	
R13	317-0822-01	8.2 k	C 5 125 m	
R14	317-0682-01	6.8 k	C 5 125 m	
R15	317-0183-01	18 k	C 5 125 m	
R16	317-0473-01	47 k	C 5 125 m	
R17	317-0273-01	27 k	C 5 125 m	
R18	317-0273-01	27 k	C 5 125 m	
R19	317-0471-01	470	C 5 125 m	
R20	317-0561-01	560	C 5 125 m	
R21	317-0223-01	22 k	C 5 125 m	
R22	317-0273-01	27 k	C 5 125 m	
R23	317-0561-01	560	C 5 125 m	
R24	317-0562-01	5.6 k	C 5 125 m	
R25	311-0802-00	4.7 k	CP 20 250 m	
R26	317-0123-01	12 k	C 5 125 m	
R27	317-0273-01	27 k	C 5 125 m	
R28	317-0222-01	2.2 k	C 5 125 m	
R29	317-0822-01	8.2 k	C 5 125 m	
R30	317-0102-01	1 k	C 5 125 m	
R31	317-0472-01	4.7 k	C 5 125 m	
R32	311-0798-00	2.2 k	CP 20 250 m	
R33	317-0123-01	12 k	C 5 125 m	
R34	317-0472-01	4.7 k	C 5 125 m	
R35	317-0472-01	4.7 k	C 5 125 m	
R36	317-0682-01	6.8 k	C 5 125 m	
R37	317-0125-01	1.2 M	C 5 125 m	
R38	317-0821-01	820	C 5 125 m	
R39	317-0201-01	220	C 5 125 m	
R40	317-0561-01	560	C 5 125 m	
*R41	311-1540-00	22 k	CV 20 250 m	
R42	317-0104-01	100 k	C 5 125 m	
R43	317-0822-01	8.2 k	C 5 125 m	
R44	317-0103-01	10 k	C 5 125 m	
R45	317-0242-01	2.4 k	C 5 125 m	
R46	317-0103-01	10 k	C 5 125 m	
R47	317-0472-01	4.7 k	C 5 125 m	

* R41 & R61 ganged

CIR REF	PART NUMBER	VALUE	DESCRIPTION	TOL %	RATING W
		Ohms	TYPE		
R48	317-0472-01	4.7 k	C	5	125 m
R49	317-0911-01	910	C	5	125 m
R51	317-0822-01	8.2 k	C	5	125 m
R52	317-0105-01	1 M	C	5	125 m
R53	317-0100-01	10	C	5	125 m
R54	317-0752-01	7.5 k	C	5	125 m
R55	317-0471-01	470	C	5	125 m
R56	317-0103-01	10 k	C	5	125 m
R57	311-1091-00	6.8 k	CP	20	250 m
R58	317-0680-01	68	C	5	125 m
R59	317-0123-01	12 k	C	5	125 m
*R61	311-1540-00	22 k	CV	20	250 m
R62	317-0223-01	22 k	C	5	125 m
R63	317-0562-01	5.6 k	C	5	125 m
R64	317-0332-01	3.3 k	C	5	125 m
R65	317-0121-01	120	C	5	125 m
R66	317-0223-01	22 k	C	5	125 m
R67	317-0561-01	560	C	5	125 m
R68	321-0850-48	27 k	MF	1	125 m
R69	317-0122-01	1.2 k	C	5	125 m
R73	321-1313-48	18 k	MF	1	125 m
R74	317-0103-01	10 k	C	5	125 m
R75	317-0243-01	24 k	C	5	125 m
R76	317-0272-01	2.7 k	C	5	125 m
R77	317-0472-01	4.7 k	C	5	125 m
R100	321-0850-48	27 k	MF	1	125 m
R101	317-0223-01	220 k	C	5	125 m
R102	317-0103-01	10 k	C	5	125 m
R103	301-0223-01	22 k	C	5	500 m
R104	317-0681-01	680	C	5	125 m
*R105	311-1546-00	100 k	CV	20	250 m
R106	307-0424-00	4.3 k	MO	5	3
R107	301-0272-01	2.7 k	C	5	500 m
R108	311-0712-00	100	CP	20	250 m
R109	311-1541-00	22 k	CV	20	250 m
R111	315-0273-02	27 k	C	5	250 m
R112	317-0561-01	560	C	5	125 m
R113	317-0101-01	100	C	5	125 m
R114	311-0995-00	680	CP	20	250 m
R116	307-0424-00	4.3 k	MO	5	3
R117	301-0272-01	2.7 k	C	5	500 m
R119	301-0223-01	22 k	C	5	500 m
R120	317-0391-01	390	C	5	125 m
R121	315-0222-01	2.2 k	C	5	250 m
R122	317-0154-01	150 k	C	5	125 m
R123	317-0822-01	8.2 k	C	5	125 m
R124	325-0123-00	10.1	MF	0.5	125 m
R125	321-0093-42	90.9	MF	0.5	125 m
R126	317-0103-01	10 k	C	5	125 m
R127	311-0717-00	220	CP	20	250 m
R128	321-0280-48	8.06 k	MF	1	125 m
R129	317-0683-01	68 k	C	5	125 m
R130	317-0330-01	33	C	5	125 m

** with S101

CIR REF	PART NUMBER	VALUE Ohms	DESCRIPTION			Eff. Ser.No.
			TYPE	TOL %	RATING W	
R151	321-1606-48	72 k	MF	1	125 m	
R152	321-1392-48	120 k	MF	1	125 m	
R153	321-1421-48	240 k	MF	1	125 m	
R154	321-1604-48	720 k	MF	1	125 m	
R155	325-0157-00	1.2 M	MF	1	250 m	
R156	325-0158-00	2.4 M	MF	1	250 m	
R157	324-0619-40	7.2 M	MF	1	1	
R158	321-1229-48	2.4 k	MF	1	125 m	
R159	321-1605-48	48 k	MF	1	125 m	
R161	324-1584-40	12 M	MF	1	1	
R162	317-0100-01	10	C	5	125 m	
R163	311-1547-00	5 k	CV	20	250 m	
R164	317-0101-01	100	C	5	125 m	
R165	317-0391-01	390	C	5	125 m	
R301	311-0850-00	15 k	CP	20	250 m	
R302	315-0223-01	22 k	C	5	250 m	
R303	301-0515-01	5.1 M	C	5	500 m	
R304	301-0515-01	5.1 M	C	5	500 m	
R305	301-0515-01	5.1 M	C	5	500 m	
R306	301-0225-01	2.2 M	C	5	500 m	
R307	301-0225-01	2.2 M	C	5	500 m	
R308	317-0103-01	10 k	C	5	125 m	
R309	317-0221-01	220	C	5	125 m	
R310	317-0221-01	220	C	5	125 m	
R311	317-0124-01	120 k	C	5	125 m	
R312	317-0331-01	330	C	5	125 m	
R313	317-0102-01	1 k	C	5	125 m	
R314	307-0184-00	15 k	MO	5	1.5	
R315	317-0221-00	220	C	5	125 m	
R316	317-0184-01	180 k	C	5	125 m	
R317	311-0910-00	2.2 M	CP	20	250 m	
R318	317-0273-01	27 k	C	5	125 m	
R321	301-0915-02	9.1 M	C	5	500 m	
R322	301-0915-02	9.1 M	C	5	500 m	
R323	317-0103-01	10 k	C	5	125 m	
R324	301-0395-01	3.9 M	C	5	500 m	
R325	301-0395-01	3.9 M	C	5	500 m	
R326	301-0395-01	3.9 M	C	5	500 m	
R327	311-1545-00	1 M	CP	20	250 m	
R328	311-1544-00	5 k	CP	20	250 m	
R329	317-0223-01	22 k	C	5	125 m	
R331	317-0223-01	22 k	C	5	125 m	
R332	311-0765-00	100 k	CP	20	250 m	
R333	311-1542-00	100 k	CP	20	250 m	
R351	311-1543-00	100 k	C	20	250 m	
R352	317-0473-01	47 k	C	5	125 m	
R353	317-0223-01	22 k	C	5	125 m	
R354	317-0680-01	68	C	5	125 m	
R355	317-0103-01	10 k	C	5	125 m	
R356	317-0363-01	36 k	C	5	125 m	
R357	317-0103-01	10 k	C	5	125 m	
R358	317-0183-01	18 k	C	5	125 m	
R359	317-0562-01	5.6 k	C	5	125 m	

CIR REF	PART NUMBER	VALUE Ohms	DESCRIPTION			Eff. Ser.N.
			TYPE	TOL %	RATING W	
R361	317-0821-01	820	C	5	125 m	
R362	317-0562-01	5.6 k	C	5	125 m	
R363	317-0100-01	10	C	5	125 m	
R402	316-0683-01	68 k	C	10	250 m	
R403	315-0562-02	5.6 k	C	5	250 m	
R404	317-0223-01	22 k	C	5	125 m	
R405	308-0725-00	2.7	WW	10	1	
R406	308-0725-00	2.7	WW	10	1	
R407	308-0726-00	1.5	WW	10	1	
R408	317-0274-01	270 k	C	5	125 m	
R409	317-0100-01	10	C	5	125 m	
R410	317-0471-01	470	C	5	125 m	
R411	317-0332-01	3.3 k	C	5	125 m	
R412	317-0334-01	330 k	C	5	125 m	
R413	317-0472-01	4.7 k	C	5	125 m	
R414	315-0472-02	4.7 k	C	5	250 m	
R415	307-0144-00	10 k	MO	5	1.5	
R416	317-0562-01	5.6 k	C	5	125 m	
R417	317-0103-01	10 k	C	5	125 m	
R418	317-0822-01	8.2 k	C	5	125 m	
R419	316-0183-01	18 k	C	10	250 m	
R420	317-0101-01	100	C	5	125 m	
R421	317-0104-01	100 k	C	5	125 m	
R422	317-0683-01	68 k	C	5	125 m	
R423	317-0103-01	10 k	C	5	125 m	
R424	321-0296-48	11.8 k	MF	1	125 m	
R425	317-0101-01	100	C	5	125 m	
R426	321-0298-48	12.4 k	MF	1	125 m	
R427	321-0871-48	6.8 k	MF	1	125 m	
R428	311-1419-00	1.5 k	WWP	10	1	
R429	321-1313-48	18 k	MF	1	125 m	
R431	316-0473-01	47 k	C	10	250 m	
R432	321-0361-48	44.2 k	MF	1	125 m	
R433	317-0472-01	4.7 k	C	5	125 m	
R434	321-0289-48	10 k	MF	1	125 m	
R435	307-0427-00	2.2	C	5	125 m	
R801	317-0182-01	1.8 k	C	5	125 m	
R802	317-0182-01	1.8 k	C	5	125 m	
R803	317-0182-01	1.8 k	C	5	125 m	
R804	317-0182-01	1.8 k	C	5	125 m	
R805	311-1449-00	4.7 k	CP	20	75 m	
R806	317-0271-01	270	C	5	125 m	
R807	311-1449-00	4.7 k	CP	20	75 m	
R808	317-0271-01	270	C	5	125 m	
R809	317-0820-01	82	C	5	125 m	
R811	317-0621-01	620	C	5	125 m	
R812	317-0820-01	82	C	5	125 m	
R813	317-0820-01	82	C	5	125 m	
R814	317-0621-01	620	C	5	125 m	
R815	317-0820-01	82	C	5	125 m	
R816	317-0561-01	560	C	5	125 m	
R817	317-0101-01	100	C	5	125 m	
R818	317-0101-01	100	C	5	125 m	
R819	317-0561-01	560	C	5	125 m	

CIR REF	PART NUMBER	VALUE	DESCRIPTION			Eff. Ser.No.
			TYPE	TOL %	RATING W	
R821	317-0561-01	560	C	5	125 m	
R822	317-0101-01	100	C	5	125 m	
R823	317-0101-01	100	C	5	125 m	
R824	317-0561-01	560	C	5	125 m	
R825	317-0391-01	390	C	5	125 m	
R826	317-0391-01	390	C	5	125 m	
R827	317-0391-01	390	C	5	125 m	
R828	317-0391-01	390	C	5	125 m	
R832	317-0681-01	680	C	5	125 m	
R833	317-0681-01	680	C	5	125 m	
R834	317-0182-01	1.8 k	C	5	125 m	
R835	317-0182-01	1.8 k	C	5	125 m	
R836	317-0152-01	1.5 k	C	5	125 m	
R837	317-0152-01	1.5 k	C	5	125 m	
R838	317-0103-01	10 k	C	5	125 m	
R839	317-0152-01	1.5 k	C	5	125 m	
R841	317-1447-00	470	CP	20	75 m	
R842	317-0184-01	180 k	C	5	125 m	
R843	302-0271-01	270	C	10	500 m	
R844	317-0823-01	82 k	C	5	125 m	
R845	303-0561-00	560	C	5	1	
R846	303-0561-00	560	C	5	1	
R847	303-0561-00	560	C	5	1	
R848	303-0561-00	560	C	5	1	
R849	311-1446-00	220	CP	20	75 m	
R851	311-1446-00	220	CP	20	75 m	
R852	317-0103-01	10 k	C	5	125 m	
R853	317-0223-01	22 k	C	5	125 m	
R854	317-0391-01	390	C	5	125 m	
R855	317-0223-01	22 k	C	5	125 m	
R856	317-0432-01	4.3 k	C	5	125 m	
R857	317-0432-01	4.3 k	C	5	125 m	
R858	317-0560-01	56	C	5	125 m	
R859	317-0560-01	56	C	5	125 m	
R861	307-0284-00	540	MO	5	3.25	
R862	307-0420-00	1 k	MO	5	5	
R863	307-0420-00	1 k	MO	5	5	
R864	307-0420-00	1 k	MO	5	5	
R865	307-0420-00	1 k	MO	5	5	
R866	307-0426-00	360	MO	5	1.5	
R867	307-0426-00	360	MO	5	1.5	
R868	317-0104-01	100 k	C	5	125 m	
R869	311-1472-00	100	CMP	20	500 m	
R871	311-1472-00	100	CMP	20	500 m	

CIR REF	PART NUMBER	DESCRIPTION	TYPE	Eff. Ser.No.
S1	260-1566-00	Push button Trig Mode		
S2	260-1567-00	Push button Sweep		
S3	260-1565-00	Push button Trace Locate		
S4	260-1563-00	Push button Trig Source		
S101 with R105		Push Pull X 5		
S151	260-1562-00	Rot. 22 Pos. T/DIV		
S401	260-1586-00	Toggle ON/OFF		
SK1	131-0650-01	Ext. X & Trig.		
SK2	131-1268-00	Sweep out		
SK3	131-1268-00	Gate out		
SK101	131-1268-00	Cal. 30 mV		
SK102	131-1268-00	Cal. 300 mV		

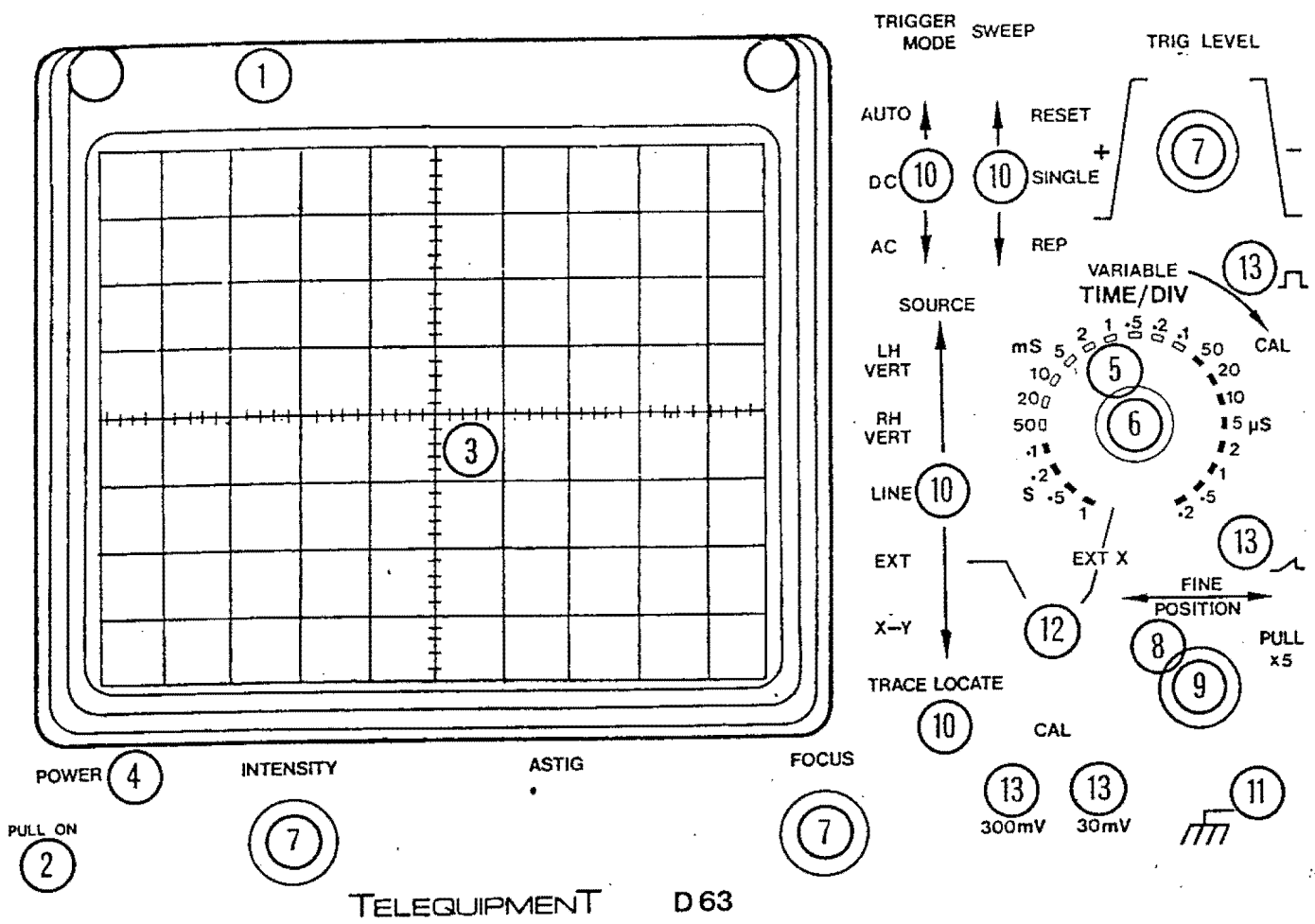
CIR REF	PART NUMBER	DESCRIPTION	TYPE		
SK351	131-0650-01	Ext. Z Mod.			
SK401	136-0293-00	Valve PC. mtg.			
SK801	131-1444-00	Edge Conn. 8 way			
SK802	131-1282-00	Edge Conn. 16 way			
SK803	131-1282-00	Edge Conn. 16 way			
SK804	131-1443-00	Edge Conn. 16 way			
T301	120-0861-00	E.H.T.			
T401	120-0862-00	Power			
TH301	307-0258-00	NTC. 130 Ω \pm 20% at 25° C 500 mW			
TR1	151-0445-00	ZTX214	Si		PNP
TR2	151-0127-02	BSX20	Si		NPN
TR3	151-0317-00	BC109C	Si		NPN
TR4	151-0317-00	BC109C	Si		NPN
TR101	151-0127-02	BSX20	Si		NPN
TR102	151-0257-03	FRB749	Si		NPN
TR103	151-0257-03	FRB749	Si		NPN
TR104	151-0326-00	BC107	Si		NPN
TR105	151-0326-00	BC107	Si		NPN
TR301	151-0317-00	BC109C	Si		NPN
TR302	151-0317-00	BC109C	Si		NPN
TR303	151-0400-00	2N5191	Si		NPN
TR351	151-0326-00	BC107	Si		NPN
TR352	151-0320-01	MPS6518	Si		PNP
TR353	151-0242-00	2N3904	Si		NPN
TR401	151-0257-03	FRB749	Si		NPN
TR402	151-0326-00	BC107	Si		NPN
TR403	151-0326-00	BC107	Si		NPN
TR404	151-0326-00	BC107	Si		NPN
TR405	151-0400-00	2N5191	Si		NPN
TR406	151-1080-00	FRB750	Si		NPN
TR407	151-0317-00	BC109C	Si		NPN
TR408	151-0326-00	BC107	Si		NPN
TR409	151-1080-00	FRB750	Si		NPN
TR411	151-0317-00	BC109C	Si		NPN
TR412	151-0257-03	FRB749	Si		NPN
TR413	151-0400-00	2N5191	Si		NPN
TR414	151-0320-01	MPS6518	Si		PNP
TR415	151-0257-01	BF305	Si		NPN
TR416	151-0311-00	MJE340	Si		NPN
TR801	151-0127-02	BSX20	Si		NPN
TR802	151-0127-02	BSX20	Si		NPN
TR803	151-0127-02	BSX20	Si		NPN
TR804	151-0127-02	BSX20	Si		NPN
TR805	151-0320-01	MPS6518	Si		PNP
TR806	151-0320-01	MPS6518	Si		PNP
TR807	151-0320-01	MPS6518	Si		PNP
TR808	151-0320-01	MPS6518	Si		PNP
TR809	151-0326-00	BC107	Si		NPN
TR811	151-0326-00	BC107	Si		NPN
TR812	151-1080-00	FRB750	Si		NPN
TR813	151-1080-00	FRB750	Si		NPN
TR814	151-1080-00	FRB750	Si		NPN
TR815	151-1080-00	FRB750	Si		NPN
V301	154-0702-00	C.R.T. Phillips Type 95470			

ASSEMBLIES

ASSEMBLY	PART NUMBER	INCLUDES
Display Module	640-0501-00	Pt. Nos. 426-1069-00, 644-0046-00, 626-0448-00 and 670-3053-00 Cir. Ref. LP401, R327, R328, R333, R351 and SK351.
EHT Unit	670-3053-00	Pt. No. 650-0021-00 Cir. Ref. PC161, PC163, D303, D304 and T301.
Quintupler	650-0021-00	Sealed Unit.
PC161 Wired Bright-up	670-3039-00	Cir. Ref. C351 to C353, D351, D352, R352 to R359, R361 to R363 and TR351 to TR353.
PC163 Wired E.H.T.	670-3041-00	Cir. Ref. C300 to C309, C311 to C313, D301, D302, L301, R301 to R319, R321 to R326, R329, R331, R332, TH301 and TR301 to TR303.
Shield CRT	626-0448-00	
Timebase Unit	644-0046-00	Pt. No. 262-0972-00 Cir. Ref. PC158, R41, R61, R105, R109, S2, SK1, SK2, SK3, SK101 and SK102.
PC158 Trig & Sweep Gen. "X" Amp and Cal.	670-3036-01	Cir. Ref. C2 to C9, C11 to C20, C22 to C26, C100 to C106, D1 to D9, D11, D12, D14 to D17, D19, D21 to D23, D101 to D105, R1 to R37, R39, R40, R42 to R49, R51 to R58, R62 to R69, R71, R73 to R76, R100 to R104, R106, R107, R111 to R114, R116 to R117, R119, R121 to R129, S1, S3, S4, TR1 to TR4, TR101 to TR105.
Switch T/Div	262-0972-00	Cir. Ref. C151 to C156, R151 to R159, R161 to R163 and S151.
Frame work		
Display Module	426-1069-00	
Power Module	426-1070-00	
Power Module	620-0237-00	Pt. Nos. 426-1070-00 and 620-0238-00
Power Supply	620-0238-00	Cir. Ref. PC162, FS401, S401 and T401.
PC162 Wired Power Supply	670-3040-00	Cir. Ref. C401 to C409, C411 to C417, D401 to D409, D411 to D417, FS402, R402 to R417, R419 to R429, R431 to R435, SK401, TR401 to TR409, TR411 to TR416.
PC175 Wired Mother Board	670-3356-00	Cir. Ref. C801 to C804, C807 to C809, C811, C813 to C819, D801 to D809, D811, R801 to R809, R811 to R819, R821 to R828, R832 to R839, R841 to R849, R851 to R859, R861 to R869, TR801 to TR809 and TR811 to TR815.

MECHANICAL

DESCRIPTION	PART NUMBER	LOCATION
Bezel	200-1579-00	1
Board terminal	392-0230-01	E.H.T.
Bush	358-0425-00	Display Module
Card Instruction	334-1305-00	Accessory
Clip	344-0261-00	2
Clip	344-0245-00	Power Unit
Clip Fuse	344-0247-00	PC162
Clip push on	344-0246-00	Power Unit
Connector Cap PDA	200-0904-00	CRT
Connector, Button PDA	131-0644-00	CRT
Connector Male BNC	131-0649-00	Accessory
Coupling Assy.	640-0030-00	2
Cover Cabinet	390-0277-00	
Cover, Rear	200-1578-01	
Eyelet	210-0735-00	PCB
Eyelet	210-0739-00	PCB
Filter	378-0819-00	3
Foot, Lifting	348-0169-00	
Foot	348-0168-00	
Guide	351-0336-00	PC175
Grommet 3/8" i/d	348-0160-00	E.H.T.
Grommet 1/4" i/d	348-0161-00	E.H.T.
Handle	367-0168-00	
Holder Bulb	136-0311-00	4
Holder Fuse	352-0153-00	Power Unit
Holder Fuse	352-0152-00	PC162
Holder Transistor	136-0183-00	PCB
Holder Transistor	136-0343-00	PCB
Holder Valve	136-0293-00	PC162
Knob	366-1404-00	2
Knob, Grey/black	366-1387-00	5
Knob, Red	366-1268-01	6
Knob, Grey/black	366-1239-02	7
Knob, Grey/black	366-1254-01	8
Knob, Red	366-1255-00	9
Knob Pushbutton	366-1403-00	10
Key Allen 1.5 mm A/F	033-0674-00	Accessory
Key Polarizing	131-1364-00	Socket Edge Conn.
Latch	105-0348-00	Cover
Lug, Solder 3/8 i/d	210-0275-00	Display & Timebase unit
Lug, Pillar	210-0291-00	E.H.T.
Nut, Terminal	220-0647-00	11
Nut, Chrome	220-0527-00	5, 7 & 9
Nut, Angle	220-0696-00	E.H.T.
Power Cord UK	161-0084-00	
Power Cord USA/Aust.	161-0084-01	
Post, Terminal	129-0374-00	11
Packaging	004-0872-00	Accessory
Quintupler	650-0021-00	E.H.T.
Spacer	361-0479-00	Cover
Spacer	385-0209-00	Display Module
Spacer	361-0575-00	Display Module
Screw 3 x 3 mm	213-0248-00	5 - 9
Screw	213-0339-00	E.H.T. Cover
Spacer	385-0215-00	PC161
Spacer	361-0198-00	PC163
Spacer	385-0206-00	PC158
Socket BNC	131-0650-01	Z. Mod. & 12
Socket Black	131-1268-00	13
Socket Side Pin	131-0645-00	CRT
Socket Edge conn. 8 Way	136-0292-00	PC175
Socket Edge conn. 16 Way	131-1282-00	PC175
Socket Edge conn. 16 Way		PC175
Tape PVC Adhesive	253-0108-00	CRT
Washer	210-1075-00	Foot



PANEL, FRONT.

CHAPTER 6

CIRCUIT DIAGRAMS AND PC BOARDS

To minimize the risk of misinterpretation of component values on circuit diagrams, the decimal point has been replaced by the multiplier or sub-multiplier of the basic unit. For instance, 2.2 megohms is shown as 2M2 and 1.8 picofarads is shown as 1p8.

To aid the reader further, in addition to the block Circuit Reference Table in Chapter 5.1, to locate a component in the circuit diagrams, a table is provided at the top of each circuit diagram, in which the circuit reference will appear, where practicable, directly above the component being sought.

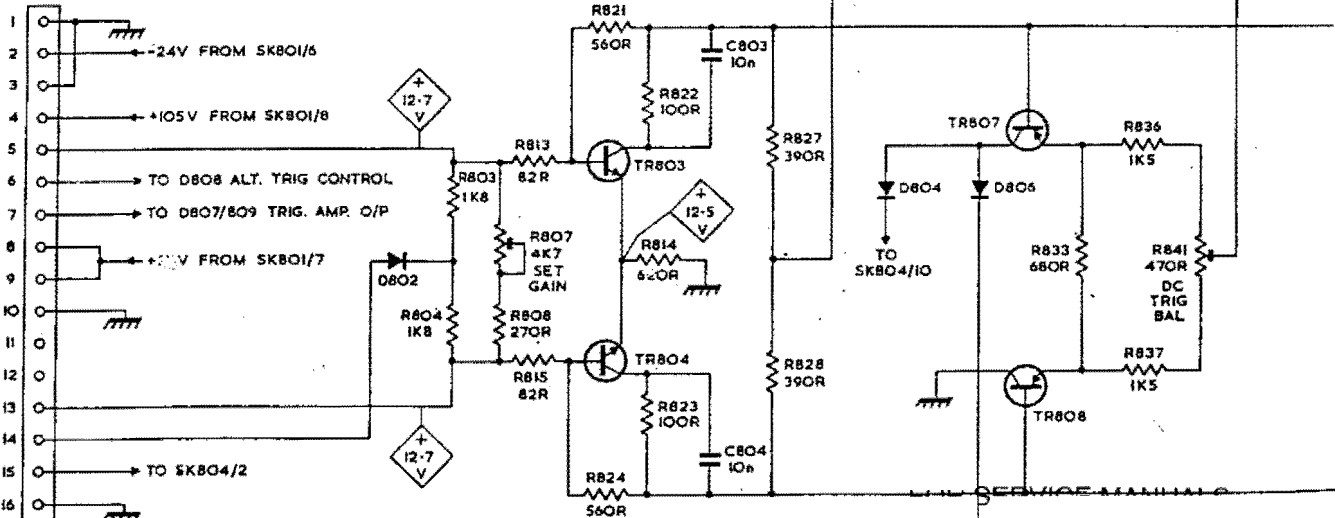
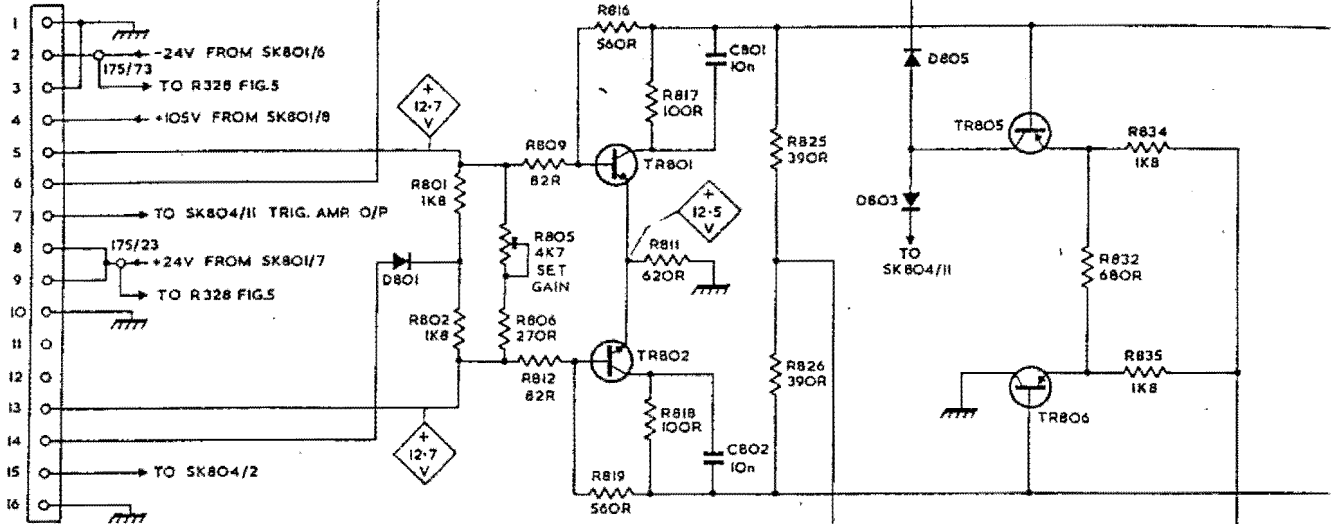
PRINTED CIRCUIT

Brown shows the rear track as seen through the board, blue the component side track.

Location of components are listed on the page preceding the PCBs.

RESISTORS	801	805	809	816	817	825	832	834
	802	806	813	819	818	826	833	835
	803	807	812	821	822	827		836
	804	808	815	824	823	828		837
				811	814			841
CAPACITORS						801		
						802		
						803		
						804		
MISC.	D801			TR801			D803	TR805
SK802	D802			TR802			D804	TR806
SK803				TR803			D805	TR807
				TR804			D806	TR808

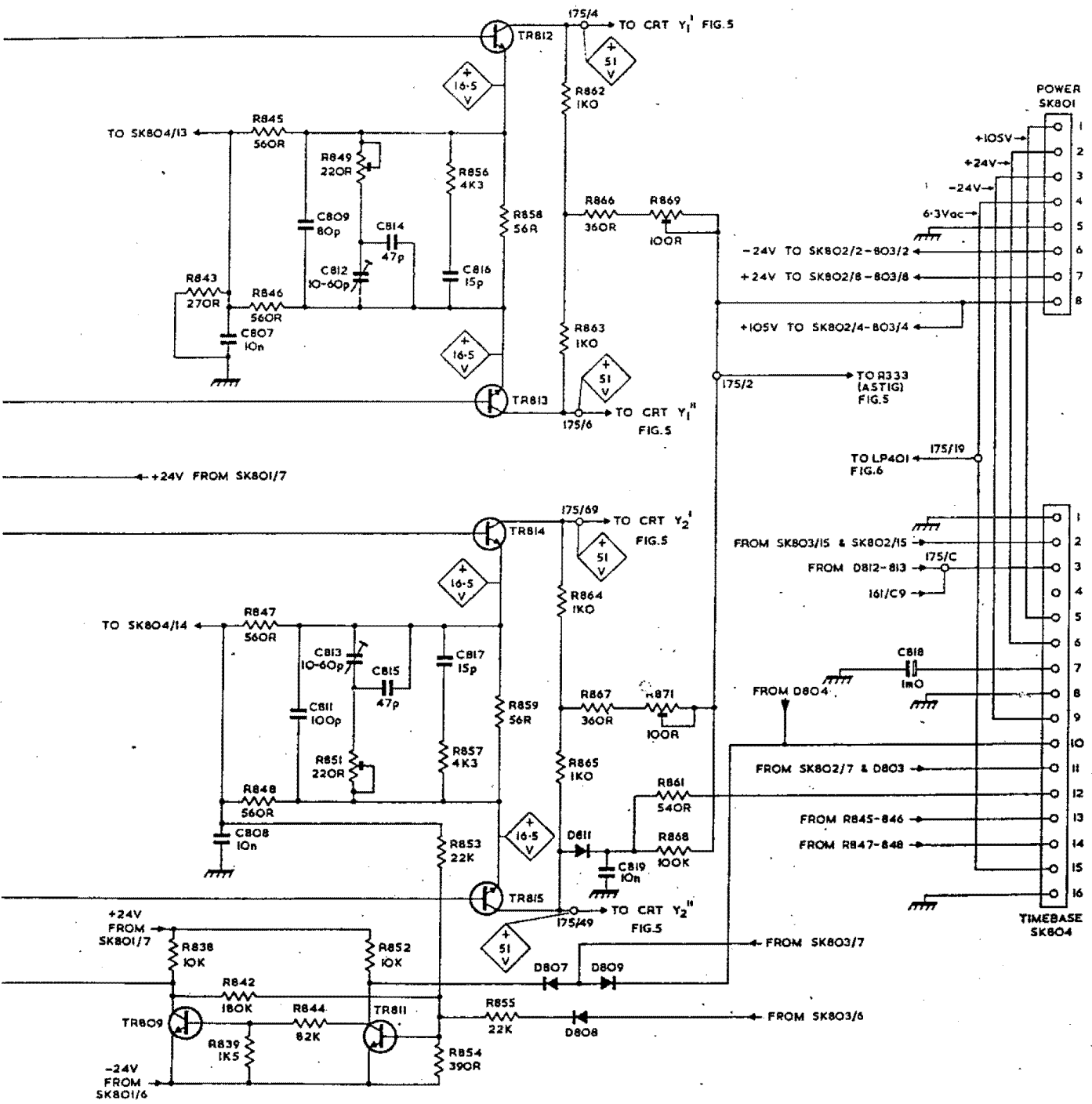
PLUG-IN LEFT
SK802



PLUG IN RIGHT
SK803

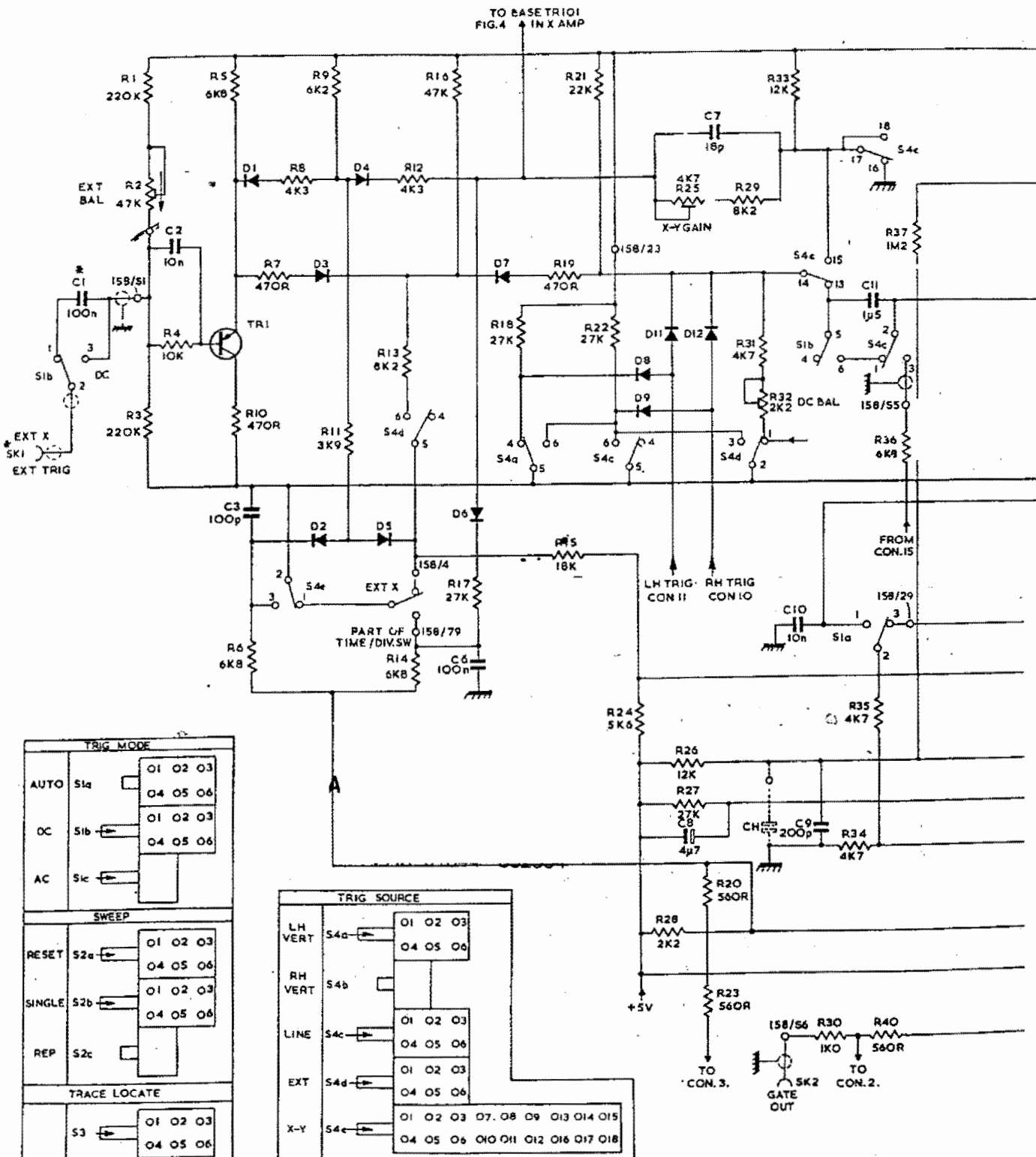
NOTES.
1. * DENOTES COMPONENTS NOT MOUNTED ON P.C. BOARD.
2. 175/23 DENOTES P.C. BOARD/EYELET OR TERMINAL No. CONNECTION.

838	845	844	849	856	858	862	866	869
843	846	851		857	859	863	867	871
	847					864		
	848	852		853	855	865		861
	839			854				868
807	809	812		816			819	818
808	811	813	814	817				
			815					
				TR812	D807	D808		SK801
				TR813		D809		SK804
				TR814				
				TR815		D811		

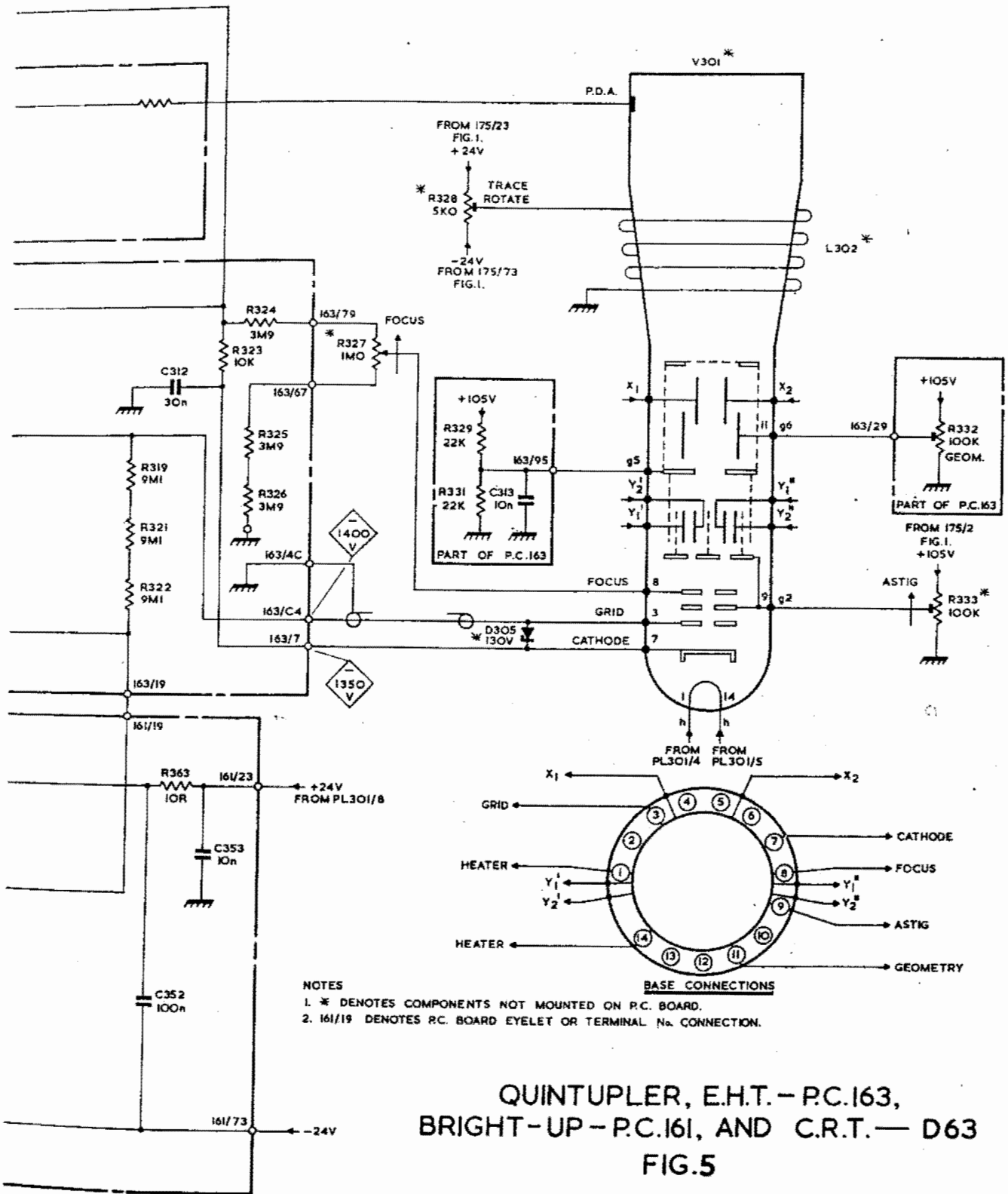


MOTHER BOARD - P.C. 175 - D63
FIG. 1

RESISTORS	1	5	7	8	9	11	12	13	14	16	17	18	19	21	22	24	25	26	27	28	29	30	31	32	33	34	35	36	
	2	4	6	10	15	20	23																						
CAPACITORS	2	3																											
MISC																													
	SKI	S1b																											

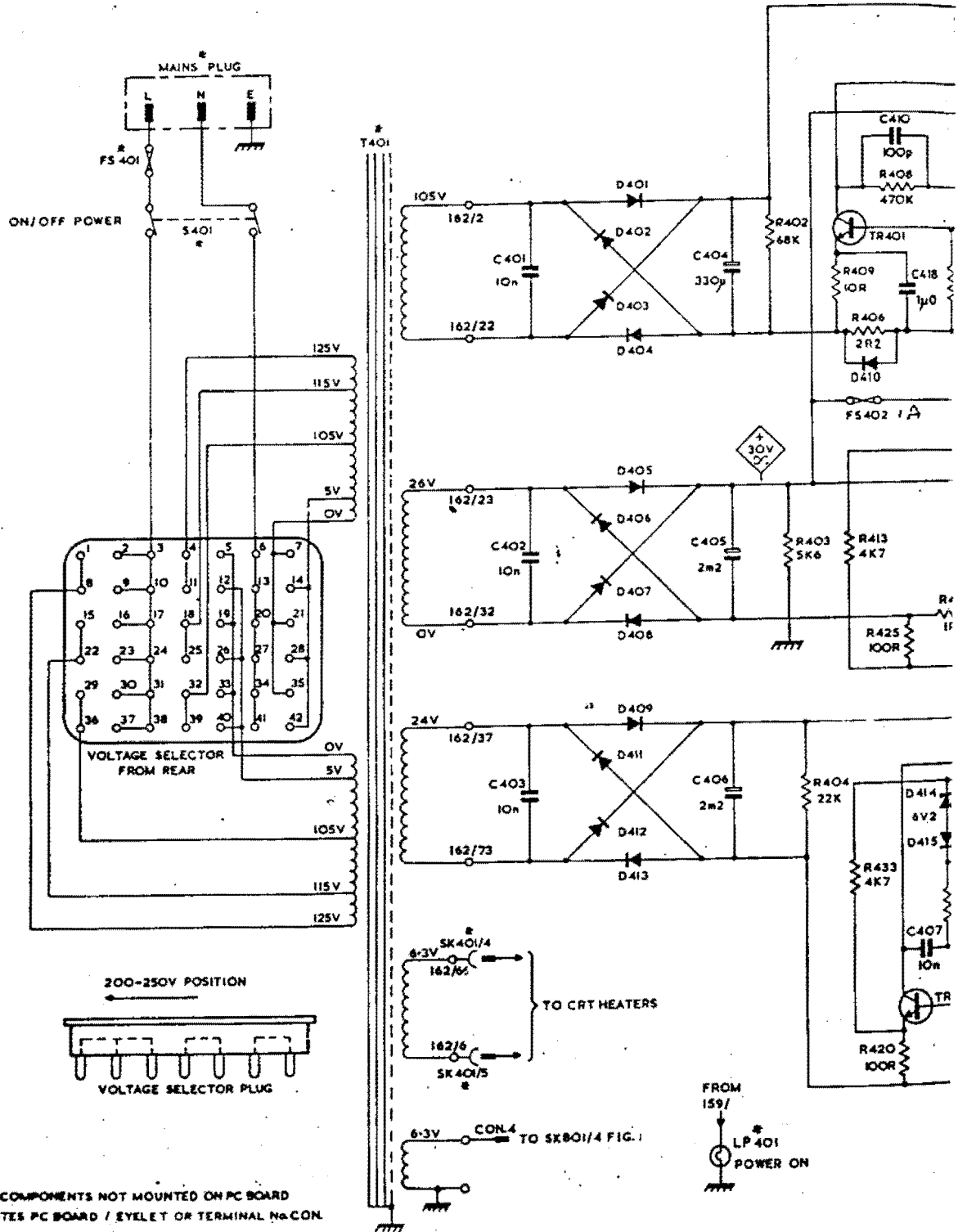


319	323	324	327	328	332
321		325		329	333
322	363	326		331	
312	353		313		
352					
			D305	V301	L302



QUINTUPLER, E.H.T. - P.C.163,
 BRIGHT-UP - P.C.161, AND C.R.T. - D63
 FIG.5

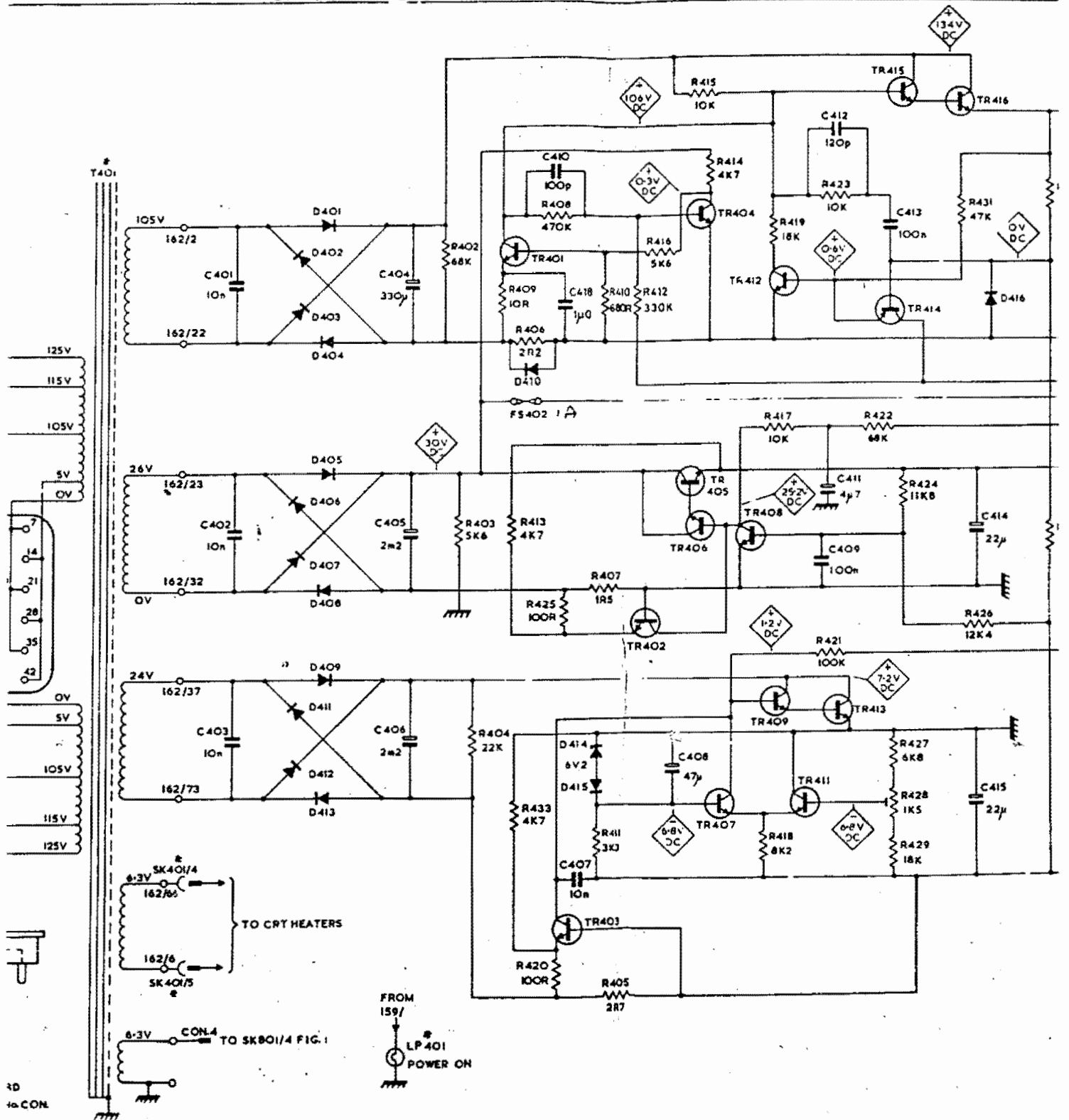
TRANSFORMERS				402	408	420	40
				403	409	406	410
				404	413	425	412
					433		411
CAPACITORS			401	404		410	
			402	405		418	
			403	406		407	
MISC.	FS401	S401	T401	D401	D405	D409	TR401
				D402	D408	D411	FS402
				D403	D407	D412	
				D404	D406	D413	D410
							TR403
					LP401		D414
							D415



NOTES:
 1. L & E DENOTES COMPONENTS NOT MOUNTED ON PC BOARD
 2. 162/2 DENOTES PC BOARD / EYELET OR TERMINAL No.CON.

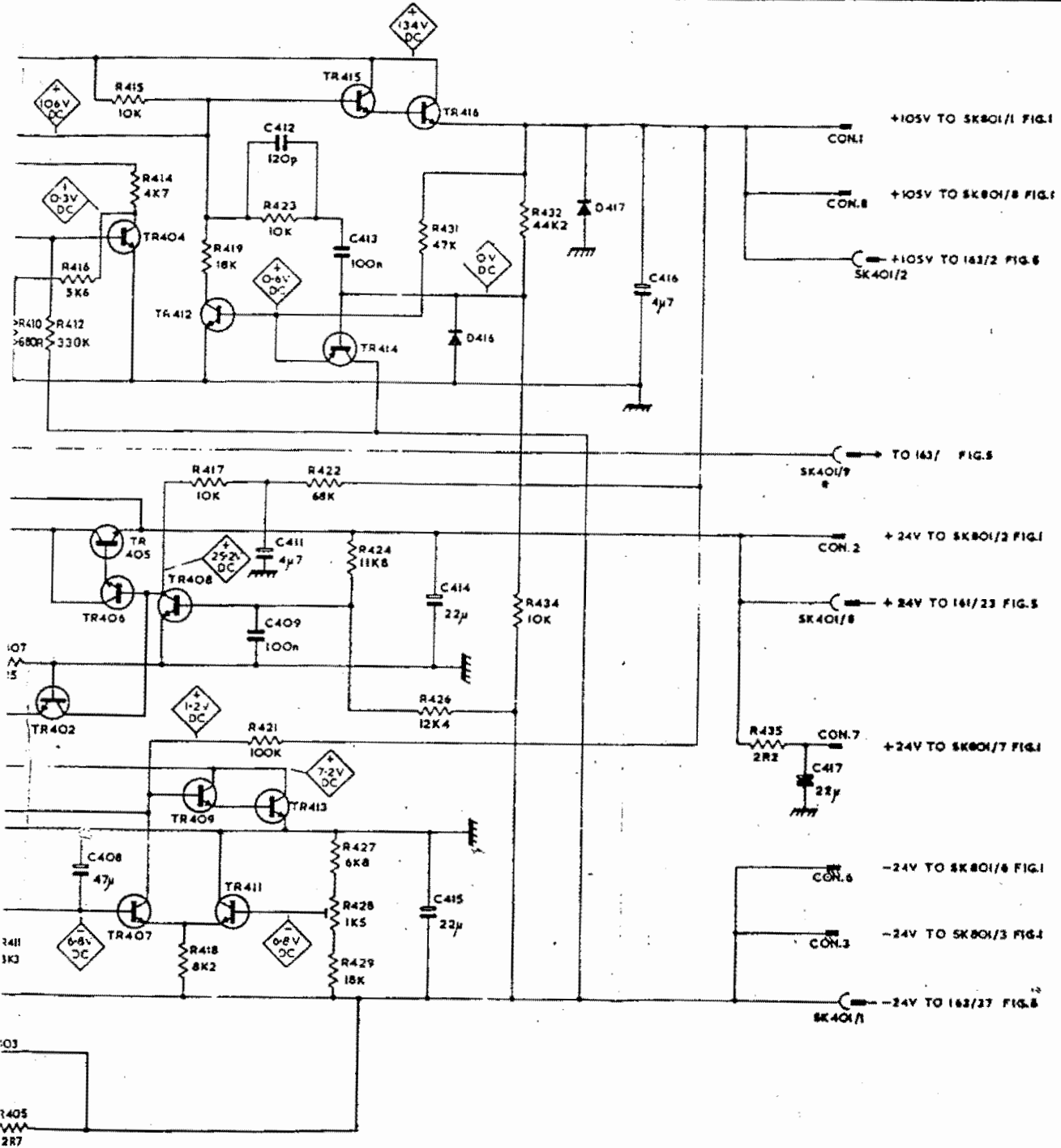
POWER SUPPLY PC 1A

				402	408	420	407				424				
				403	409	406	410	405	416	415	419	423	427	431	432
				404	413	425	412	411		414	417	421	422	428	434
					433						418	422	428	429	
				401			410				412				
				402			418				411				
				403			407		408		409	413			414
															415
T401	D401	D405	D409					TR401	TR402	TR404	TR412	TR415			
	D402	D406	D411					FS402		TR405	TR408	TR414			
	D403	D407	D412				D414	D414	D415	TR406	TR409	TR414			
	D404	D408	D413	LP401			D410	TR403		TR407		TR411	TR413		D416
															TR416

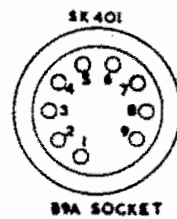


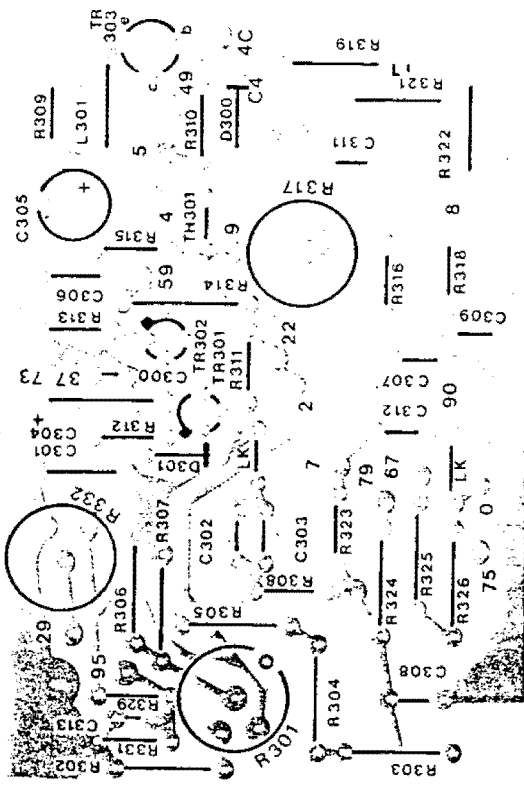
POWER SUPPLY PC 1.62 — D63 FIG.6

07						424				
405	416	415		419	423	427	431		432	
12		414		417	421	422	426			
11				418		429			434	438
				412						
				411	413		414		416	417
	408			409			415			
	TR402	TR404	TR412	TR415	TR415					
		TR405	TR408	TR414	TR414					
		TR406	TR409							
		TR407		TR411 TR413			D416		D417	
							TR416			

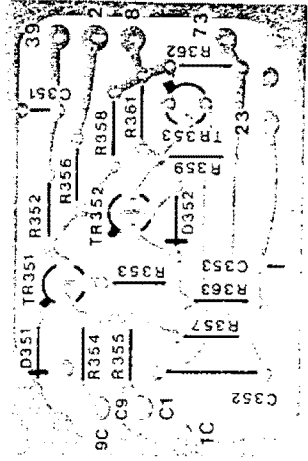


2 — D63 FIG.6





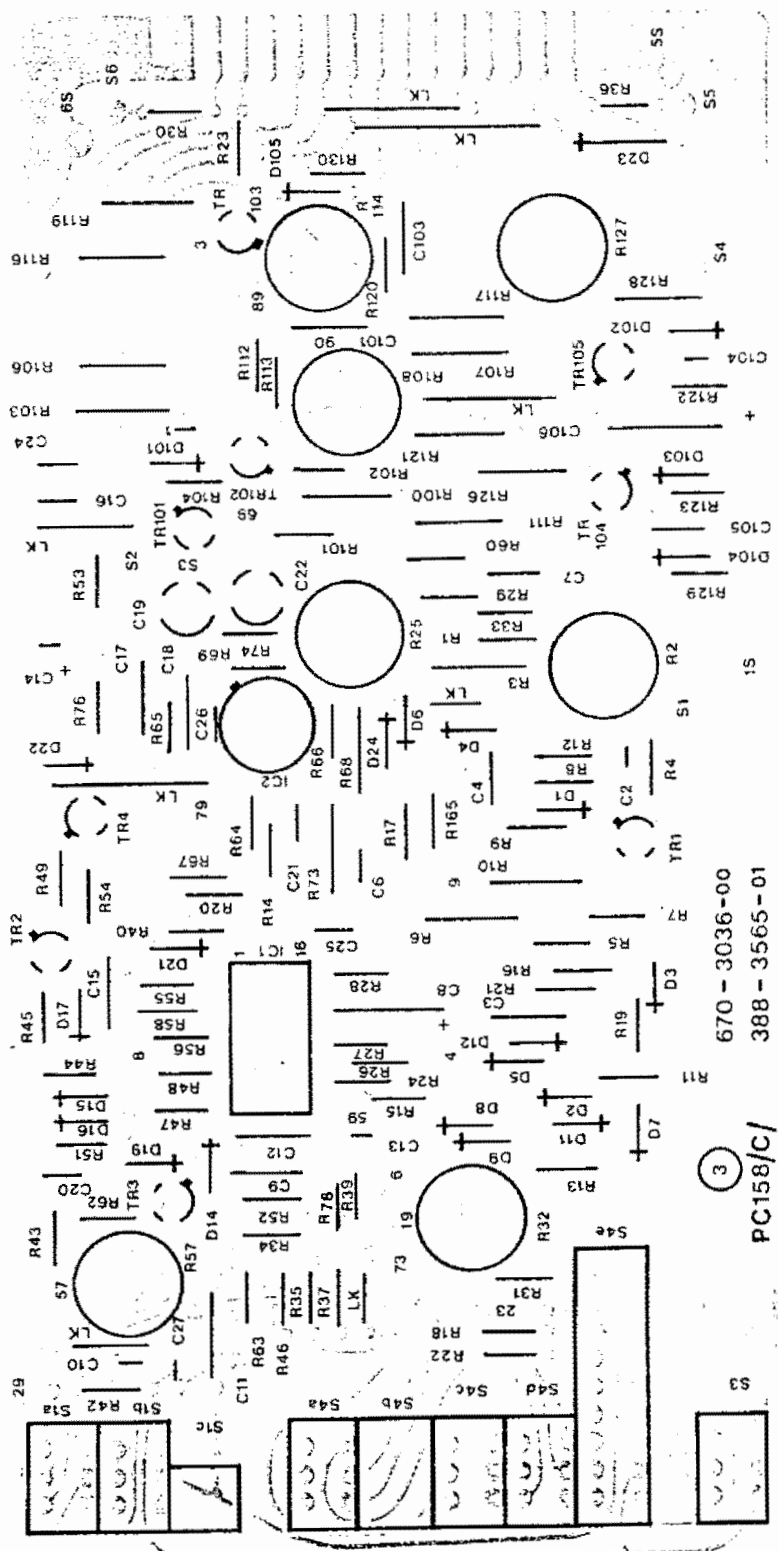
PC.163



PC.161

PRINTED CIRCUIT BOARDS

FIG. 7

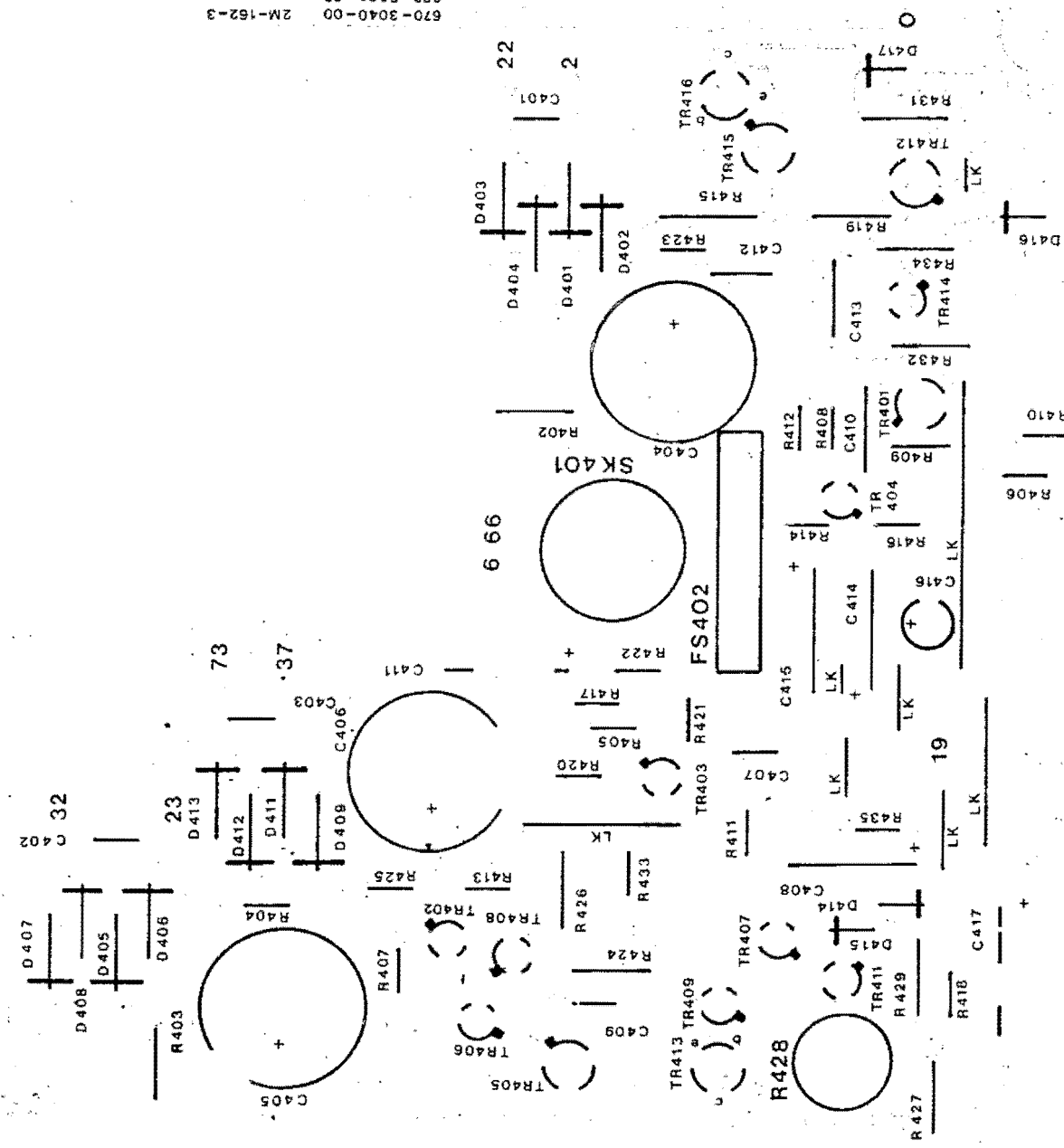


670 - 3036-00
 388 - 3565-01
 PC158/C/

PRINTED CIRCUIT BOARD P.C.158

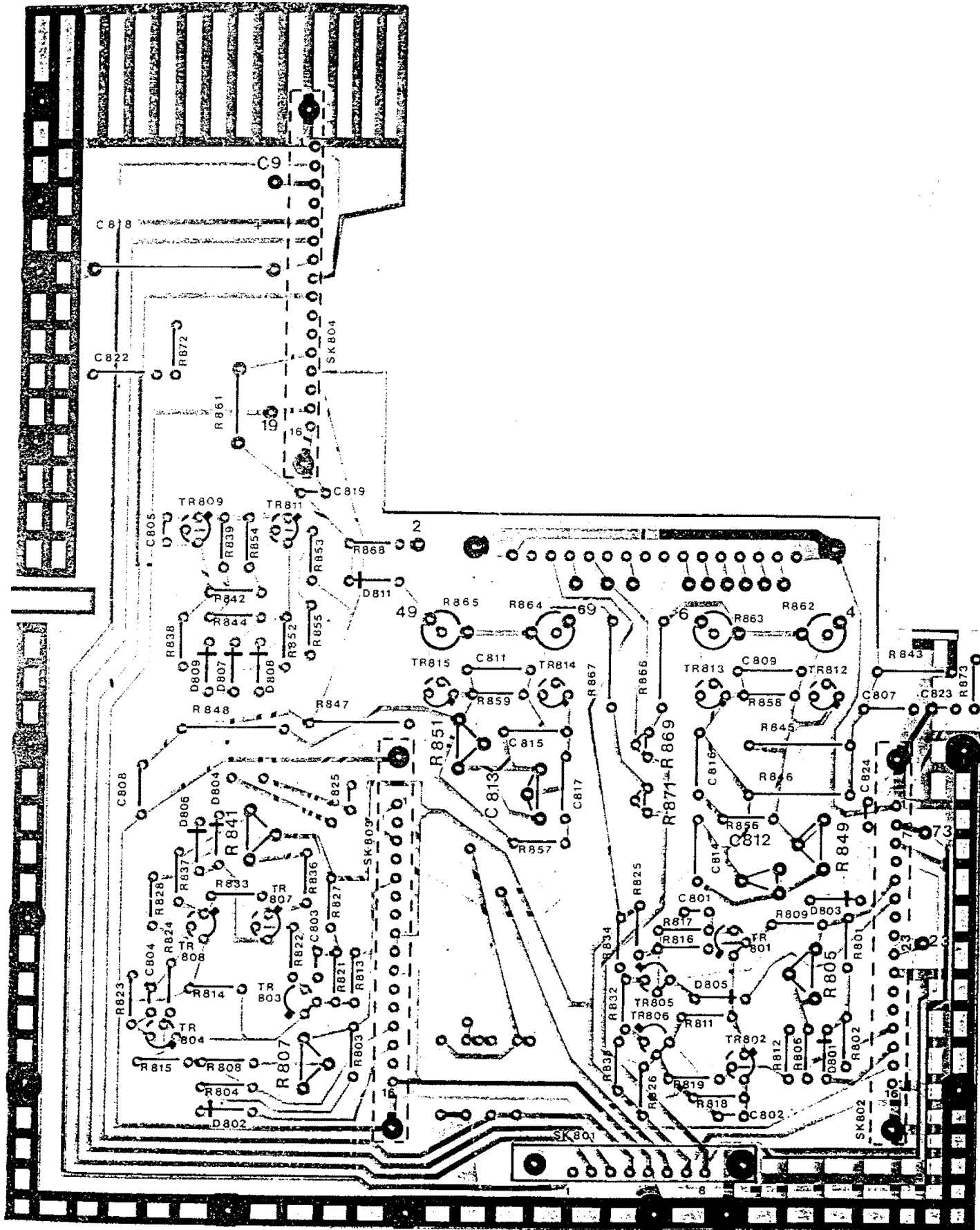
FIG. 8.

670-3040-00 2M-152-3
 388-3569-03



PRINTED CIRCUIT BOARD P.C.162

FIG. 9.



PRINTED CIRCUIT BOARD P.C.175

FIG. 10