1 Introduction

The low frequency generator SG66 is one of a series of Advance Signal Generators and provides both sine and square waves from 5c/s to 125kc/s, with low hum and noise content at all signal levels.

Frequency selection is provided by a range switch, selecting one of five ranges, and a calibrated dial that is easy to read. The output level is indicated by the reading on a calibrated meter and the setting of a 50dB decade attenuator.

When using the sine wave output, alternative impedances of 600Ω floating and 5Ω unbalanced are available with output levels that are continuously variable from 0 to 30V r.m.s. and from 0 to 1W, respectively. A square wave output is also available at separate terminals and is adjustable from 0 to 30V peak to peak. The maximum rise and fall time of the square wave is 0·75μs over the whole frequency range.

2 Specification

Frequency Range 5c/s to 125kc/s in five ranges:

5c/s to 50c/s
50c/s to 500c/s
500c/s to 5,000c/s
5kc/s to 50kc/s
50kc/s to 125kc/s

Frequency Accuracy ±1% or ±1c/s whichever is the greater.

Hum and Noise Level Less than 0·25% of maximum output.

Sine Wave Output impedance 600Ω approximately, floating unbalanced, 5Ω unbalanced.

Output Levels 0 to 30V r.m.s. into 600Ω. Level indicated by calibrated meter and setting of 50dB decade attenuator. Meter calibrated −10dB to +2dB relative to 1mW into 600Ω. 0 to 1W into 5Ω.

Output Voltage Accuracy Decade attenuator ±2%. Meter ±5% F.S.D.

Distortion Less than 1% at 1W.

Square Wave Output impedance varies up to 5kΩ with level setting. Output level 0 to 30V pk.pk. Rise and fall times 0·75μs maximum. (Sine wave output available at same time with some distortion.)

Power Supply 100, 110, 120, 130V ±7%
200, 220, 240, 260V ±7% a.c. supply 40 to 60c/s.

Power Consumption Approximately 100W.

Accessories Supplied One red 4mm plug, Part No. 12178. One black 4mm plug, Part No. 12179. One Instruction Manual, Part No. 2894.

Dimensions

Width	*Height*	*Depth*
16½in.	10½in.	8¾in.
(42cm)	(27cm)	(22cm)

Weight 32¼lb (14·6kg).

Finish Dark blue metal case with light grey front panel and medium grey surround. All colours to B.S.2660; case tint No. 7–086, front panel tint No. 9–093, front panel surround tint No. 9–095.

4 Circuit Description

4.1 General

The basic circuit of the instrument is illustrated in the functional diagram (*fig.1*) and the full circuit diagram in *fig.2*. It is seen that a Wien Bridge Oscillator forms the source of both sine and square wave signals. The square wave output is obtained using a Schmitt trigger circuit and clipper circuits, as described in later paragraphs.

4.2 Wien Bridge Oscillator

The valves V2A and V2B form the basis of the oscillator circuit and, together with the associated cathode followers V1A and V1B, are connected to that part of the h.t. supply which is stabilised by the neons NS1, NS2.

The high impedance grid circuit of the cathode follower V1A is connected to the mid-point of the potential divider formed by R1/R3, R2/R4 etc. which is connected in parallel with C25 and forms one arm of the bridge. The other bridge arm is formed by the series elements R8/RV1, R9/RV2 etc. connected in series with C26 and the fixed trimmer C27, and preset trimmers C1 to C5.

The drive to the bridge is derived from the low impedance circuit of the cathode follower V1B. C7 forms a negative feedback path between V2B cathode and V1A grid circuits. Other forms of negative feedback are derived from the negligible decoupling in the cathode circuit of V2A (C9 is only effective on the highest frequency range) and by the absence of decoupling across R24 in the cathode circuit of V2B.

4.3 Sine Wave Output

The oscillator output is passed via C14 to the sine wave level control RV7 (ADJUST VOLTS) which is located in the grid circuit of the triode V4B. This triode forms a straight-forward driver stage for the single ended push–pull circuit formed by the series coupled valves V5 and V6. Negative feedback is provided via the loop C19, R41 and by the lack of decoupling in the cathode circuit of V4B.

The sine wave signals are fed to one of two output transformers via capacitor C31. Transformer T1 is used on the two lower frequency ranges from 5c/s to 500c/s, and T2 on the three higher frequency ranges from 500c/s to 125kc/s.

One output is floating with an impedance of 600Ω and is monitored by the output level meter VM1. The level meter monitors the input to the decade attenuator, and the attenuator output is connected direct to the 600Ω output terminals. The alternative 5Ω sine wave output is taken from a separate winding on transformer T1 or T2 and is unbalanced to earth.

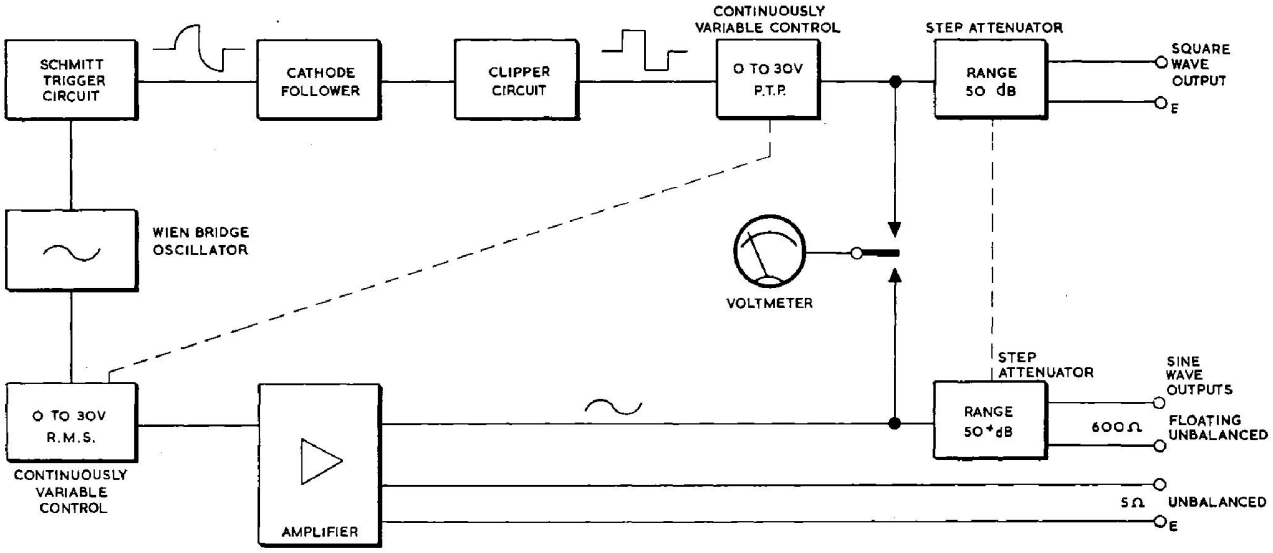


Fig.1. Functional Diagram SG66

4.4 Square Wave Output

The input to the Schmitt trigger circuit V3 is earthed when the output selector switch is in the SINE position. Moving this switch to the alternative SINE/SQUARE position removes this earth connection, and passes part of the sinusoidal signal across R28 to the grid of the trigger valve V3.

When the input signal is positive, and with the earth connection removed from the grid, V3A will conduct. The

input signal going negative at V3A grid will cause reduction in current through the valve, resulting in an increased positive potential at the anode which is passed to the grid of V3B via R51. Thus V3A will tend to cut-off and V3B will now conduct. Therefore, the application of the sinusoidal signal to the grid of V3A will result in a waveform from the anode of V3B that is approximately square in shape (*fig.1*).

The cathode follower V4A acts as a buffer stage between the high impedance output of the trigger circuit and the relatively low impedance of the following clipper circuit. In this way the pulse shape of the trigger output is preserved.

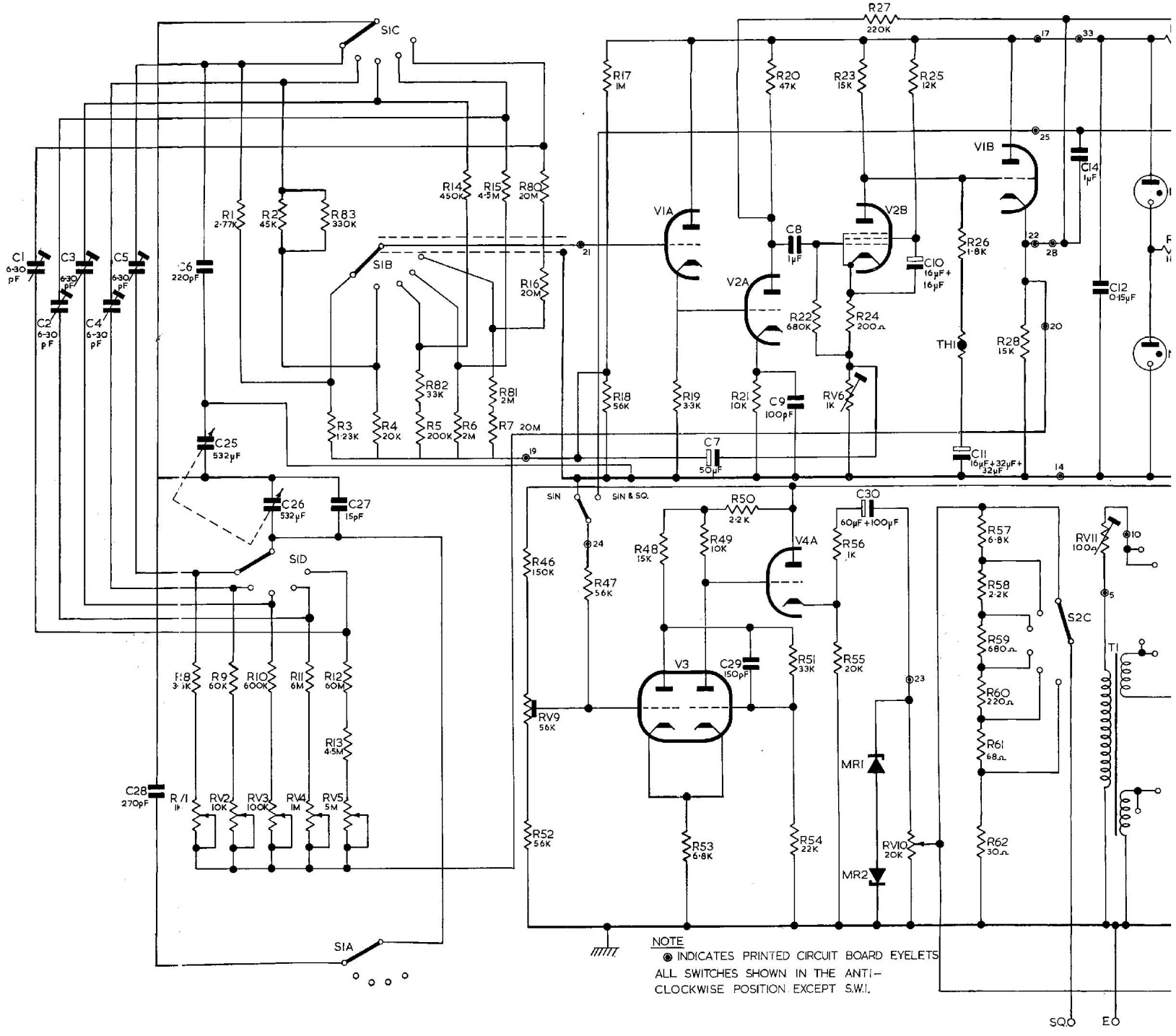
From V4A the signal is passed to the clipper circuit formed by zener diodes MR1 and MR2, where the output of the trigger circuit is shaped into an improved square wave. The square wave output level is controlled by the potentiometer RV10 (ADJUST VOLTS) and the decade attenuator formed by R57 to R62. The output level meter VM1 indicates the signal level immediately preceding the attenuator except in the +30dB position of the attenuator, when the meter indicates the level at the output terminals. In positions +20dB to −20dB the output of the attenuator is connected to the square wave output terminals.

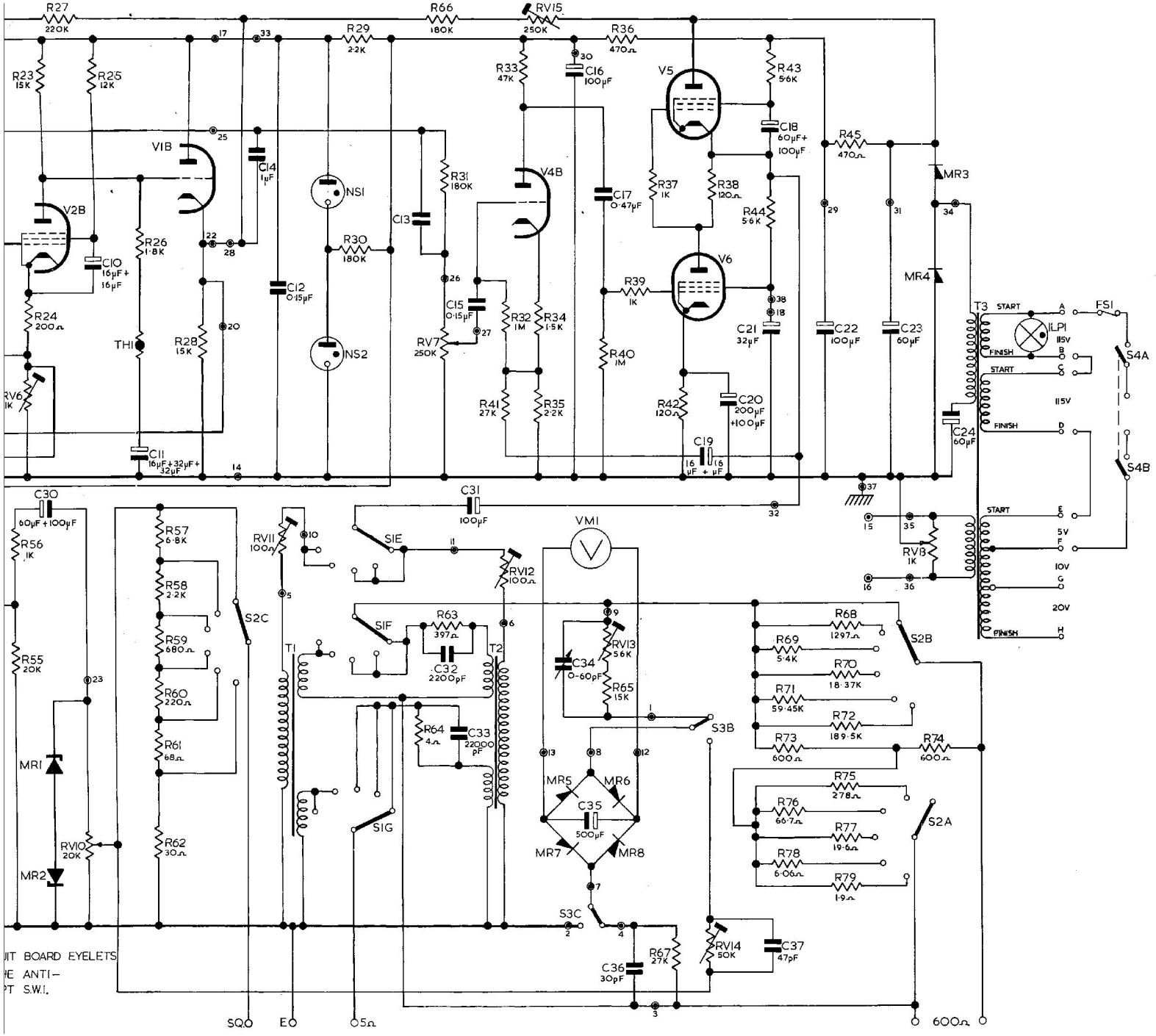
4.5 Power Supply Circuit

The d.c. supply for the signal generator is derived from a.c. supplies (100 to 130V or 195 to 265V) via transformer T3 and a conventional voltage doubler circuit consisting of C24, MR4, MR3 and C23. The components R45 and C22 form a simple smoothing circuit. The h.t. supply to oscillator valves V2A and V2B is stabilised by neons NS1 and NS2.

The valve heaters are supplied from a separate winding on T3. A centre-tap earth connection is provided by the slider of RV8 which may be adjusted to produce minimum hum in the output signal.

The supply indicator lamp ILP1 is connected directly across one 115V winding of T3.


SIC
SIB
SID
SIA
R27 220K
R17 1M
R20 47K
R23 15K
R25 12K
VIB
VIA
V2B
V2A
C8 1μF
C10 16μF+16μF
R26 1·8K
C14 1μF
C12 0·15μF
R22 680K
R24 200Ω
TH1
R28 15K
R14 450K
R15 4·5M
R80 20M
R16 20M
R1 2·77K
R2 45K
R83 330K
C1 6-30 pF
C2 6-30 pF
C3 6-30 pF
C4 6-30 pF
C5 6-30 pF
C6 220pF
R82 33K
R81 2M
R3 1·23K
R4 20K
R5 200K
R6 2M
R7 20M
R18 56K
R19 3·3K
R21 10K
C9 100pF
RV6 1K
C7 50μF
C11 16μF+32μF+32μF
C25 532μF
C26 532μF
C27 15pF
SIN
SIN & SQ.
R50 2·2K
C30 60μF+100μF
R48 15K
R49 10K
V4A
R56 1K
R46 150K
R47 56K
R57 6·8K
R58 2·2K
RVII 100Ω
S2C
T1
R59 680Ω
R60 220Ω
R61 68Ω
V3
C29 150pF
R51 33K
R55 20K
RV9 56K
MR1
MR2
RV10 20K
R62 30Ω
R52 56K
R53 6·8K
R54 22K
R8 3·3K
R9 60K
R10 600K
R11 6M
R12 60M
R13 4·5M
C28 270pF
R/I 1K
RV2 10K
RV3 100K
RV4 1M
RV5 5M
SQ.O
E.O
NOTE
◉ INDICATES PRINTED CIRCUIT BOARD EYELETS
ALL SWITCHES SHOWN IN THE ANTI-CLOCKWISE POSITION EXCEPT S.W.I.


R27 220K
R66 180K
RV15 250K
R29 2·2K
R36 470Ω
R23 15K
R25 12K
R33 47K
C16 100μF
V5
R43 5·6K
C18 60μF+ 100μF
R45 470Ω
MR3
V1B
C14 1μF
NS1
R31 180K
V4B
C17 0·47μF
R37 1K
R38 120Ω
R44 5·6K
V2B
R26 1·8K
R30 180K
C13
C10 16μF+ 16μF
C12 0·15μF
V6
R39 1K
MR4
T3 START
FSI
ILP1 115V
S4A
R24 200Ω
THI
R28 15K
NS2
C15 0·15μF
R32 1M
R34 1·5K
RV7 250K
R40 1M
C21 32μF
C22 100μF
C23 60μF
FINISH
START
S4B
RV6 1K
R41 27K
R35 2·2K
R42 120Ω
C20 200μF +100μF
C24 60μF
C11 16μF+32μF+ 32μF
C19 16μF + 16μF
C31 100μF
VM1
C30 60μF+100μF
R56 1K
R57 6·8K
RV11 100Ω
SIE
RV12 100Ω
RV8 1K
5V
10V
20V
R58 2·2K
S2C
R63 397Ω
SIF
C32 2200pF
T1
T2
C34 0-60pF
RV13 56K
R65 15K
R68 1297Ω
R69 5·4K
S2B
R55 20K
R59 680Ω
R70 18·37K
R71 59·45K
R60 220Ω
R72 189·5K
R64 4Ω
C33 22000pF
S3B
R73 600Ω
R74 600Ω
R61 68Ω
MR1
MR5
MR6
C35 500μF
R75 278Ω
R76 66·7Ω
S2A
RV10 20K
MR7
MR8
R77 19·6Ω
R62 30Ω
MR2
SIG
R78 6·06Ω
R79 1·9Ω
S3C
R67 27K
RV14 50K
C37 47pF
C36 30pF
JIT BOARD EYELETS
HE ANTI-
PT S.W.I.
SQ.O
E.O
5Ω
600Ω