HH SET THE STANDARD FOR PROFESSIONAL POWER AMPLIFIERS

HH are recognised as the leader in the field of professional power amplifiers, continually setting new standards for the industry. These HH amplifiers are superior by deliberate design and offer many advantages. A user-optimised rang of features, rugged mechanical design and solid-state technology . . . Power MOS-FETs.

The characteristics of MOS-FETs make them ideally suited for use in the output stages of linear amplifiers that must deliver distortion-free power into a reactive load such as a high performance loudspeaker or transformer.

Elegant circuit design incorporating + and − balanced devices throughout gives a superior symmetry, which results in a well controlled dc and ac balance from the first instant of turn-on. Additional benefits are a surge-free turn-on with a marked absence of output voltage excursion when compared to complicated bipolar transistor designs.

MOS-FET devices are virtually immune from thermal runaway. A temperature increase has the effect of reducing device current, thereby decreasing power dissipation and pushing the temperature back down. No thermal feedback is required and MOS-FETs easily operate at quiescent currents five times higher than those of bipolar transistors. This higher operating current lowers signal distortion, especially at high frequencies.

Because no thermal tracking is necessary, the HH power amplifiers work at an optimum from the moment of switch-on and the performance remains constant regardless of the temperature at the output devices. Thus, it has been found possible to replace the normally troublesome protection circuits with a much simpler arrangement, for excellent performance when driving highly reactive loads.

Furthermore, the MOS-FET devices are paralleled for increased current handling and higher power rating. If one device tends to take a larger share of the load current, that device's 'on' resistance will increase as the temperature rises, thus forcing part of its current to be shunted to the other devices in the circuit. Therefore current sharing is self-equalising.

SEARCHING MEASUREMENT TECHNIQUES REVEAL THE EXCELLENCE OF MOS-FET PERFORMANCE

MOS-FET devices have very high input impedance at audio frequencies, eliminating the need for high current gain driver stages. This circuit simplification permits ultra-low distortion without using a large amount of negative feedback. The reduced negative feedback results in improved amplifier stability.

The HH MOS-FET amplifiers provide superior high frequency performance for both open-loop and closed-loop operation. Their slew rate may be more than 60V/µsec, which is much faster than that of conventional bipolar transistor amplifiers, and the open-loop frequency response can be greater than 100kHz (an improvement by a factor of six). Far from being superfluous, this superior high-end performance means better sound quality when reproducing fast transients.

The inherent thermal control of MOS-FET devices enables the output stage quiescent current to be set considerably higher than bipolar transistor designs. This results in a complete absence of crossover notches.

Intermodulation distortion is audibly more annoying than harmonic distortion, and consists of the interaction between components not found in the original signal. HH MOS-FET amplifiers perform so brilliantly well as to be on or below the limit of the measuring equipment.

Difference frequency distortion is measured by introducing two test tones of very close frequencies into the amplifier and quantifying the difference between the two original sounds or multiples thereof. Measurement of the HH MOS-FET power amplifiers shows exceptionally good results on the bottom limits of the test equipment, even when driving a reactive load.

Transient intermodulation distortion arises in amplifiers due to the time delay in the feedback loop and the resultant overload of the amplifier within the feedback loop when a sudden change is applied to the input. Such distortion is not significantly present in HH MOS-FET amplifiers, due to their inherently wide bandwidth, super fast slew rate and minimum negative feedback.

V150L SINGLE CHANNEL MOS-FET POWER AMPLIFIER

Designed for demanding professional applications that require a single channel power amplifier of exceptional performance and reliability.

For maximum strength and durability, the amplifier chassis is made from heavy gauge steel. Massive cast transport handles are conveniently mounted on the 5mm thick aluminium front panel.

Two separate outputs are provided, 100 volt centre tapped balanced line for sound distribution systems, plus a normal low impedance 4 to 16 ohms output. Other output matching transformer options are available and XLR or binding post connectors are provided for both outputs.

Power output is 105 watts RMS into 8 ohms or 150 watts RMS into 4 ohms, 100 volt balanced line output – 100 watts RMS.

19" × 3½" rack mount panel size, dual professional input connectors (both XLR and ¼" jack), optional plug-in balanced input transformer provision, continuously rated toroidal mains power supply, separate circuit and chassis grounding on rear panel barrier strip.

M900 HIGH POWER TWO CHANNEL MOS-FET POWER AMPLIFIER

Many thousands of HH amplifiers are giving dependable power in a wide range of applications on the road or in permanent commercial and studio installations. Following this tradition, the M900 offers the many benefits of HH MOS-FET amplifier technology, but presented in a 'no-frills' rugged mechanical design of steel and heavy gauge aluminium with the emphasis on functional value for money. The M900 gives high power, high accuracy sound at low cost-per-watt and is designed to be used with mixers, frequency dividing networks and speakers – on the road or in permanent installations.

Power output per channel – 400 watts RMS into 4 ohms, 260 watts into 8 ohms, 520 watts into 2.5 ohms, 80 volt balanced line and bridged mono output, XLR input and outputs, silent running forced air cooling, lockable pre-set input potentiometers, 'Peak', 'Bridged' and 'Thermal' LEDs, 19" × 7" rack mount panel size.


bridged
peak
channel 1
channel 2
V200 MOS-FET
High Performance Professional
Power Amplifier
V500 MOS-FET
High Performance Professional
Power Amplifier
dB
below rated output
V800 MOS-FET
High Performance Professional
Power Amplifier
power

V200-TWO CHANNEL MOS-FET POWER AMPLIFIER

This definitive medium power, two channel amplifier performs exceptionally well as a stereo broadcast or recording studio monitor amplifier, a sound reinforcement/ PA amplifier or as an HF horn driver amplifier.

In use, this amplifier is remarkably clean; there is no tendency to shut down or "take off" into spurious oscillation, even when connected to highly reactive multi-speaker loads.

The V200 power supply is rated for continuous operation and equipped with 2 large value electrolytic capacitors, plus a torodial mains transformer.

Each channel features a red LED waveform clipping indicator which helps an operator to avoid over-driving a system into peak distortion.

The inputs are normally unbalanced; conversion to fully balanced input is achieved by simply plugging the optional transformers into pre-wired sockets located inside the amplifier. The V200 may be converted to a monoaural amplifier with an internal STEREO/BRIDGED switch. In this mode the output is "bridged" across the "hot" terminals of both channels, creating a balanced transformerless output of 200 watts mono into an 8 ohm load. An LED on the front panel illuminates when the amplifier is switched to mono operation.

V500-TWO CHANNEL HIGH POWER AMPLIFIER

Beautifully constructed, the V500 offers high accuracy performance at more than 250 watts per channel.

This amplifier works at an optimum from the moment of switch-on and the performance remains constant within specification into reactive loads. Because of the excellent thermal stability and ruggedness, it has been possible to replace the normally troublesome protection circuits with a much simpler arrangement. This results in clean performance when driving loads such as electrostatic loudspeakers, or transformers. Under really tough operating conditions (ie continuous drive into low load impedances), a silent cooling fan automatically cuts in. This well thought out arrangement allows the amplifier to be fitted in a rack with other (possibly hot running) equipment, without concern. Under intermittent short-circuit conditions, this HH amplifier will deliver clean audio power automatically, immediately the short is removed. The mains power supply is conservatively rated to deliver continuous high power under the most demanding circumstances.

The User Handbook included with every amplifier provides system data for loudspeaker connection. The V500 may be converted to a monoaural amplifier with an internal STEREO/BRIDGED switch creating a balanced transformerless output of 500 watts into an 8 ohm load. An LED on the front panel illuminates when the amplifier is switched to BRIDGED operation.

Pre-wired sockets and a retaining clamp for input transformers are located inside the amplifier. Input matching transformers (optional) are available for balanced matching and bridging applications.

V800-TWO CHANNEL HIGH POWER AMPLIFIER

The superlative V800 MOS-FET power amplifier is equally at home in a high power stereo studio monitor installation as it is driving mobile professional PA systems.

A sustained high quality output of no less than 400 watts from each channel will deliver the transient peaks present in today's dynamic music and will avoid much of the clipping distortion present in a lesser amplifier.

Sound quality is absolutely neutral right up to the limit of the amplifier's wide-rated bandwidth and beyond.

The ability to operate continuously under heavy load makes this HH amplifier ideal for live rock or disco sound systems as a powerful bass amplifier in a biamplified or triamplified system designed for working hard all night long.

Each of the output meters features 10 LEDs arranged in an arc, calibrated in decibels below rated power. The "0" dB LED indicates rated output voltage, the remainder ranging downwards to −33 dB. The LEDs function by comparing the amplifier output voltage to a reference voltage derived from the main power supply. This arrangement ensures that the output meters, when indicating 0 dB, are automatically corrected for different load impedances and maintain an accurate reading. The red LED indicates waveform clipping.

In common with all the HH V Series amplifiers, the V800 comes complete with rugged front and rear carrying handles.

PARAMETER	V150-L	V200	V500	V800	M900
Power Output at Clipping	105 watts RMS into 8 ohms at 1 kHz 150 watts RMS into 4 ohms	65 watts RMS into 8 ohms both channels driven at 1 kHz. 100 watts RMS into 4 ohms, both channels driven.	250 watts RMS into 4 ohms, 1 kHz, both channels driven. 150 watts RMS into 8 ohms.	400 watts RMS into 4 ohms, 1 kHz, both channels driven 260 watts RMS into 8 ohms.	400 watts RMS into 4 ohms 1 kHz, both channels driven. 260 watts RMS into 8 ohms 520 watts RMS into 2.5 ohms.
Balanced Line Output	100 watts RMS at 1 kHz into 100 ohms at less than 0.1% THD. (100 volt line output) transformer coupled.	N/A	60 volt balanced line (bridged mono)	80 volt balanced line (bridged mono)	80 volt balanced line (bridged mono)
Rated Power Output per Channel	100 watts RMS into 8 ohms with less than 0.03% THD over a bandwidth of 40 Hz to 20 kHz. 100 watts RMS into 8 ohms at 1 kHz at less than 0.02% THD.	60 watts RMS into 8 ohms at <0.03% THD over a bandwidth of 20 Hz to 20 kHz 60 watts RMS into 8 ohms at 1 kHz at 0.02% THD both channels driven.	150 watts RMS into 8 ohms at <0.03% THD over a bandwidth of 20 Hz to 20 kHz, 245 watts RMS into 4 ohms at 1 kHz at <0.02% THD both channels driven.	250 watts RMS into 8 ohms at <0.03% THD over a bandwidth of 20 Hz to 20 kHz, 390 watts RMS into 4 ohms 1 kHz at <0.02% THD, both channels driven.	250 watts RMS into 8 ohms at <0.03% THD 20 Hz to 20 kHz both channels driven. 390 watts RMS into 4 ohms at 1kHz at <0.02% THD both channels driven.
Frequency Response	100V-line output −3dB 30 Hz to 10 kHz 4–16 ohms output +0, −1.0dB 30 Hz to 50kHz	+0, −1.0 dB 10 Hz to 50 kHz	+0, −1.0 dB 10 Hz to 50kHz	+0, −1.0 dB 10 Hz to 50 kHz	+0, −1.0 dB 10 Hz to 50 kHz
Total Harmonic Distortion	Less than 0.02% at 100 watts 8 ohms, 1 kHz. Less than 0.03% at 100 watts 8 ohms 40 Hz to 20 kHz.	Less than 0.02% at 60 watts into 8 ohms, 1 kHz. Less than 0.03% at 60 watts 8 ohms 20 Hz to 20 kHz.	Less than 0.02% at 245 watts into 8 ohms, 1 kHz. Less than 0.03% at 150 watts 8 ohms 20 Hz to 20 kHz.	Less than 0.02% at 390 watts into 8 ohms, 1 kHz. Less than 0.03% at 250 watts 8 ohms 20 Hz to 20 kHz.	Less than 0.02% at 390 watts into 8 ohms, 1 kHz. Less than 0.03% at 250 watts 8 ohms 20 Hz to 20 kHz.
Intermodulation Distortion	Less than 0.03% using frequencies of 50 Hz and 7 kHz in 4 : 1 ratio at 100 watts into 8ohms.	Less than 0.03% using frequencies of 50 Hz and 7 kHz in 4 : 1 ratio at 60 watts per channel into 8 ohms.	Less than 0.03% using frequencies of 50 Hz and 7 kHz in 4 : 1 ratio at 245 watts per channel into 4 ohms.	Less than 0.03% using frequencies of 50 Hz and 7 kHz in 4 : 1 ratio at 400 watts per channel into 4 ohms.	Less than 0.03% using frequencies of 50 Hz and 7 kHz in 4 : 1 ratio at 400 watts per channel into 4 ohms.
Input Sensitivity	0.775V for full output into 4 ohms attenuator set maximum.				
Input Impedance	15k ohms minimum, unbalanced, optional 600 ohms or 10k matching transformers.				
Damping Factor (8 ohms)	Greater than 300 at 100 Hz.				
Hum and Noise	Greater than 100 dB down ref full output, 20 Hz to 20 kHz.				
Rise Time	3μS or less (10%–90%) of 1V, 1kHz.				

PARAMETER	V150-L	V200	V500	V800	M900
Slew Rate	45V/μS	45V/μS	45V/μS	45V/μS	45V/μS
Channel Separation	Greater than 70 dB at 1 kHz.				
Power Requirements	110/120/220/240V 50/60 Hz. Rear panel mounted voltage selector.	110/120/220/240V AC 50/60 Hz. Rear panel mounted voltage selector.	110/120/220/240V AC 50/60 Hz. Rear panel mounted voltage selector.	110/120/220/240V AC 50/60 Hz. Rear panel mounted voltage selector.	110/120/220/240V AC 50/60 Hz. Rear panel mounted voltage selector.
Input Connectors	1 × ¼" 3-pole jack and 1 XLR 3-31 female socket per channel.				1 off XLR 3-31 per channel
Output Connectors	One male XLR 3-32 and one pair binding posts per output.	One male XLR 3-32 and one pair binding posts per channel.	Two male XLR 3-32 and one pair binding posts per channel.		2 off XLR 3-32 per channel.
Bridged Mono Output	N/A	200 watts RMS into 8 ohms at less than 0.02% THD at 1 kHz. Internal switch for bridged operation. Input 1 operative.	500 watts RMS into 8 ohms at less than 0.03% THD at 1 kHz. Internal switch for bridged operation. Input 1 operative.	800 watts RMS into 8 ohms at less than 0.03% THD at 1 kHz. Internal switch for bridged operation. Input 1 operative.	800 watts RMS into 8 ohms at less than 0.02% THD at 1 kHz.
Indicators	One 'Peak' LED illuminates 1 dB before amplifier clip point. 'Thermal' shutdown indicator.	One 'Peak' indicating LED per channel. 'Peak' LED's illuminate 1dB before clip point. 'Thermal' shutdown indicator.		LED output display, calibrated CLIP, 0, −3, −6, −9, −12, −15, −21, −27, −33 dB. 'Thermal' shutdown indicator.	One 'Peak' indicating LED per channel. 'Thermal' shutdown indicator. Red LED 'bridged' indicator.
		Red 'bridged' LED indicates bridged mono operation.			
Protection	Short circuit, open circuit and mismatch proof. Thermal guard protects in case of inadequate ventilation. Mains fuse 2A A/S secondary fuses 6.3A (2 off).	Short circuit, open circuit and mismatch proof. Thermal guard protects in case of inadequate ventilation. Mains fuse 3.15A A/S secondary fuses 6.3A (2 off).	Short circuit, open circuit and mismatch proof. Thermal guard protects in case of inadequate ventilation. Mains fuse 6.3A A/S.	Short circuit, open circuit and mismatch proof. Thermal guard protects in case of inadequate ventilation. Mains fuse 10A A/S.	Short circuit, open circuit and mismatch proof.
Load Protection	N/A	N/A	Protection relay energised by presence of a DC fault condition at the amplifier output.		
Dimensions (W×H×D)	483×89×384mm	483×89×384mm	483×178×384mm	483×178×384mm	483×178×300mm
Weight	10.5kg	10.5kg	19.5kg	21.5kg	21.9kg
Cooling	Convection	Convection	Thermostatically controlled, quiet running fan.		

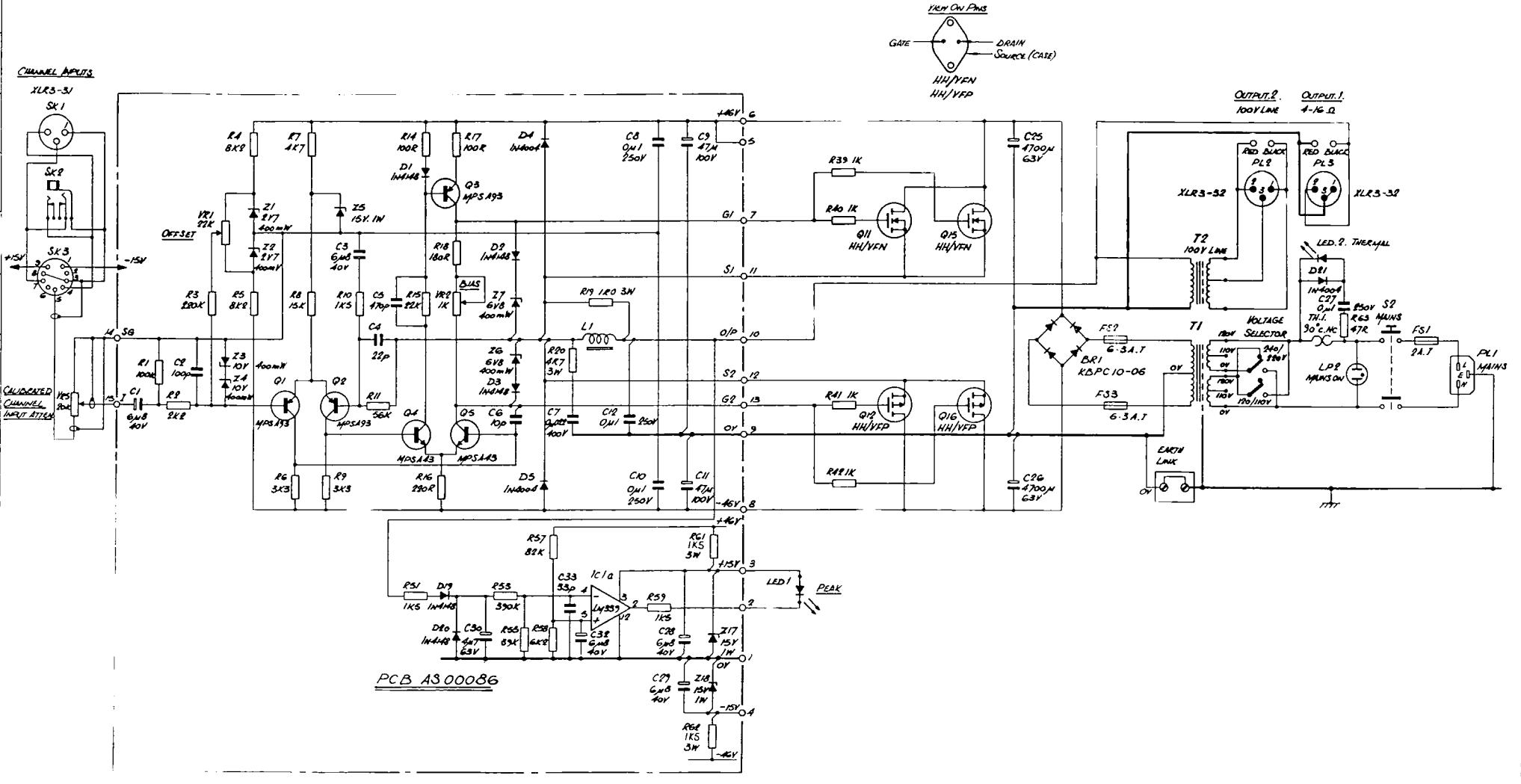
DRG. No.	USED ON	CAT. No.
C/AC20034	V150	

DO NOT SCALE DRAWING

REMOVE ALL BURRS AND SHARP EDGES

Note

SK3:- B9A BASE FOR OPTIONAL INPUT TRANSFORMER.



ISSUE	1	2	3	4
DATE	5-1-79	8-5-79	13-6-79	25-6-79
DESCRIPTION OF CHANGE		RC3 ADDED R19 WAS 5K6	DG/PL/300 V009	SK1 PL1200 004

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SCALE	CONFORM TO BS308	TOLERANCES UNLESS OTHERWISE STATED		
		LINEAR	ANGLES	HOLES Ø
APPROVED	DIMENSIONS IN			
CHECKED	PROJECTION 3RD ANGLE	MATERIAL		
DRAWN MS/HALLAM	DIMENSIONS APPLY AFTER PLATING	FINISH		

TITLE V150 CIRCUIT DIAGRAM

H|H electronic

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DRG. No. C/AC20034

DRG. No.	USED ON	CAT. No.
C/AC20033	V200	

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CHANNEL 1. INPUTS

CHANNEL 1.

CHANNEL 1. CALIBRATED INPUT ATTEN.

OFFSET

MODE SWITCH SW1 BRIDGED STEREO

CHANNEL 2. INPUTS

CHANNEL 2.

CHANNEL 2. CALIBRATED INPUT ATTEN.

OFFSET

VIEW ON PINS

HH/VFN HH/VFP

LED 4 THERMAL

VOLTAGE SELECTOR

EARTH LINK

PEAK CH. 1.

PEAK CH. 2.

PART PCB A300085

PART PCB A300085

NOTE

SK3 & SK6:- B9A BASE FOR OPTIONAL INPUT TRANSFORMER

SCALE

CONFORMS TO BS308

TOLERANCES UNLESS OTHERWISE STATED

LINEAR	ANGLES	HOLES Ø

APPROVED

DIMENSIONS IN

CHECKED

PROJECTION 3RD ANGLE

DRAWN MS Mellen

DIMENSIONS APPLY AFTER PLATING

MATERIAL

FINISH

REMOVE BURRS AND SHARP EDGES

TITLE V200 CIRCUIT DIAGRAM

DRG. No. C/AC20033

ISSUE	1	2
DATE	8.12.78	8.6.79
DESCRIPTION OF CHANGE		R53 ADDED

DRG. No.	USED ON	CAT. No.	
C/AC20035	V500		THIS DRAWING IS THE PROPERTY OF HARRISON INDUSTRIAL DEVELOPMENTS LTD. AND MUST NOT BE COPIED OR DISCLOSED TO A THIRD PARTY WITHOUT THE WRITTEN CONSENT OF HARRISON INDUSTRIAL DEVELOPMENTS LTD.

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ISSUE	1	2
DATE	17. 8. 79	4. 7. 79
DESCRIPTION OF CHANGE		

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APPROVED	DIMENSIONS IN
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DRAWN MA/ALLEN	DIMENSIONS APPLY AFTER PLATING

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LINEAR	ANGLES	HOLES Ø

MATERIAL

FINISH

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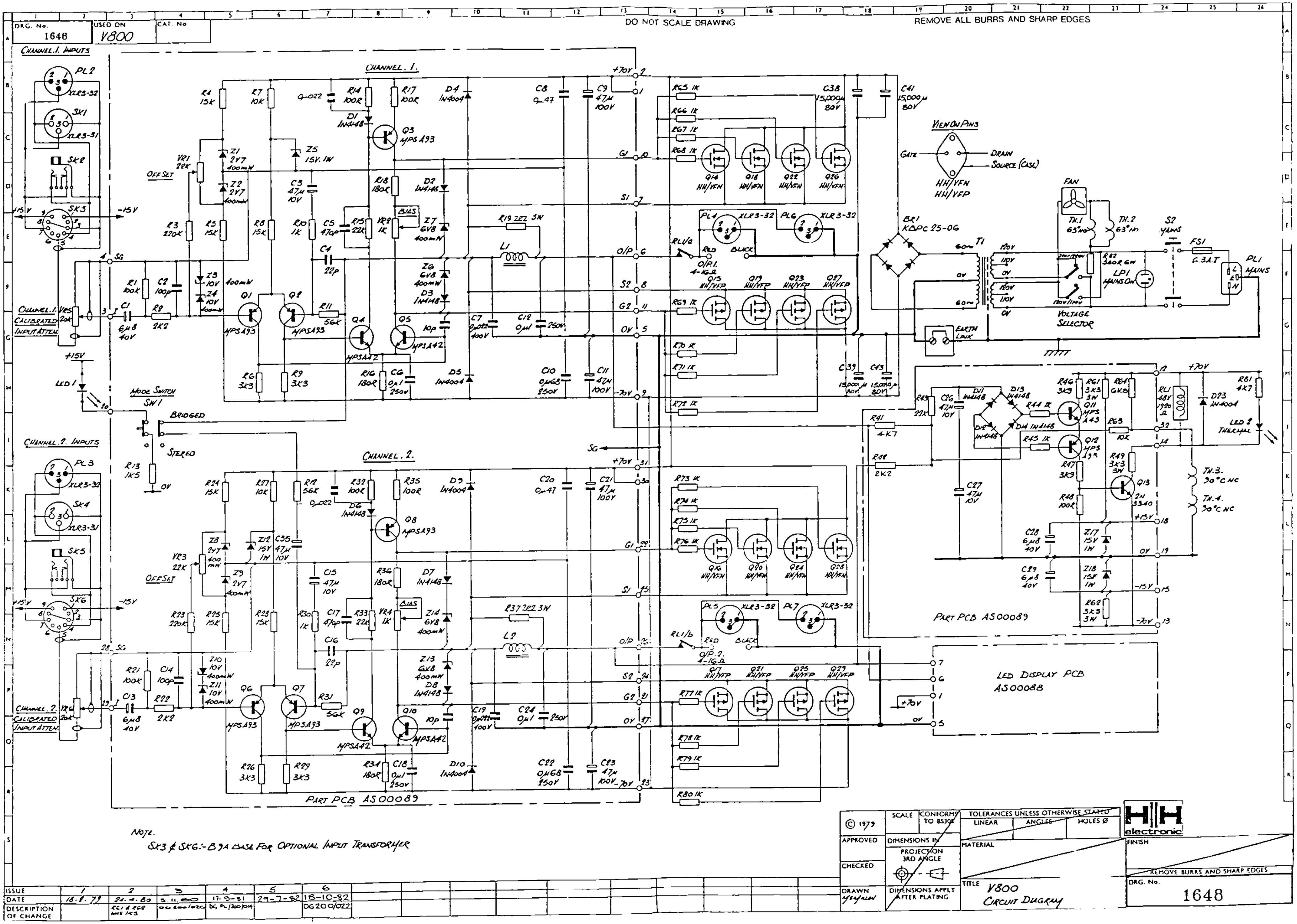
TITLE V500 CIRCUIT DIAGRAM

DRG. No. C/AC20035

H|H electronic


DRG. No. 1648
USED ON V800
CAT. No
DO NOT SCALE DRAWING
REMOVE ALL BURRS AND SHARP EDGES
CHANNEL. 1. INPUTS
PL2 XLR3-32
SK1 XLR3-31
SK2
SK3
+15V
-15V
OFFSET
CHANNEL. 1.
CHANNEL. 1. VR5 20K CALIBRATED INPUT ATTEN.
MODE SWITCH SW1
BRIDGED
STEREO
LED 1
R13 1K5
0V
VIEW ON PINS
GATE
DRAIN
SOURCE (CASE)
HH/VFN
HH/VFP
FAN
TH.1 63°NO
TH.2 63°NO
S2 MAINS
FS1 6.3A.T
PL1 MAINS
BR1 KBPC 25-06
T1
VOLTAGE SELECTOR
EARTH LINK
LP1 MAINS ON
PL4 XLR3-32
PL6 XLR3-32
RL1/a
RED
BLACK
O/P.1. 4-16Ω
CHANNEL. 2. INPUTS
PL3 XLR3-32
SK4 XLR3-31
SK5
SK6
CHANNEL. 2.
CHANNEL. 2. VR6 20K CALIBRATED INPUT ATTEN.
PL5 XLR3-32
PL7 XLR3-32
RL1/b
O/P. 2. 4-16Ω
PART PCB AS00089
LED DISPLAY PCB AS00088
RL1 48V 1920Ω
LED 2 THERMAL
TH.3. 90°C NC
TH.4. 90°C NC
NOTE.
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DIMENSIONS APPLY AFTER PLATING
TITLE V800 CIRCUIT DIAGRAM
DRG. No. 1648
HH electronic
ISSUE 1 2 3 4 5 6
DATE 18.8.79 24.4.80 5.11.80 17.9.81 29.7.82 18.10.82
DESCRIPTION OF CHANGE
DG200/022

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C/AC20037	V800		THIS DRAWING IS THE PROPERTY OF HARRISON INDUSTRIAL DEVELOPMENTS LTD. AND MUST NOT BE COPIED OR DISCLOSED TO A THIRD PARTY WITHOUT THE WRITTEN CONSENT OF HARRISON INDUSTRIAL DEVELOPMENTS LTD.

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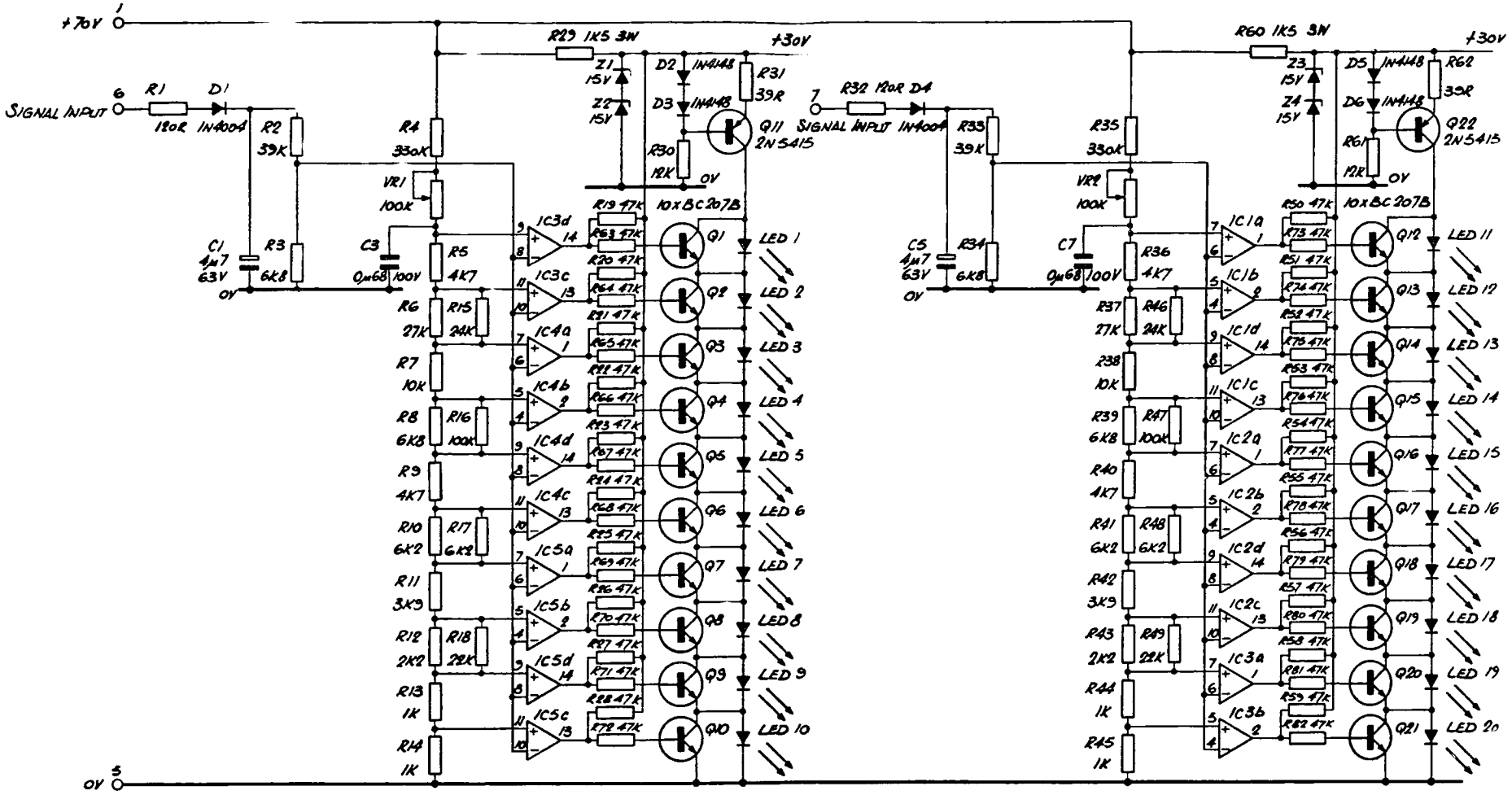

NOTE

IC1-5 LM339

POWER SUPPLIES ON PIN 3:- +30V AND PIN 12:- 0V.

ISSUE	1
DATE	4.1.79
DESCRIPTION OF CHANGE	

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SCALE

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DIMENSIONS IN

PROJECTION 3RD ANGLE

CHECKED

DRAWN MS Allen

DIMENSIONS APPLY AFTER PLATING

MATERIAL

FINISH

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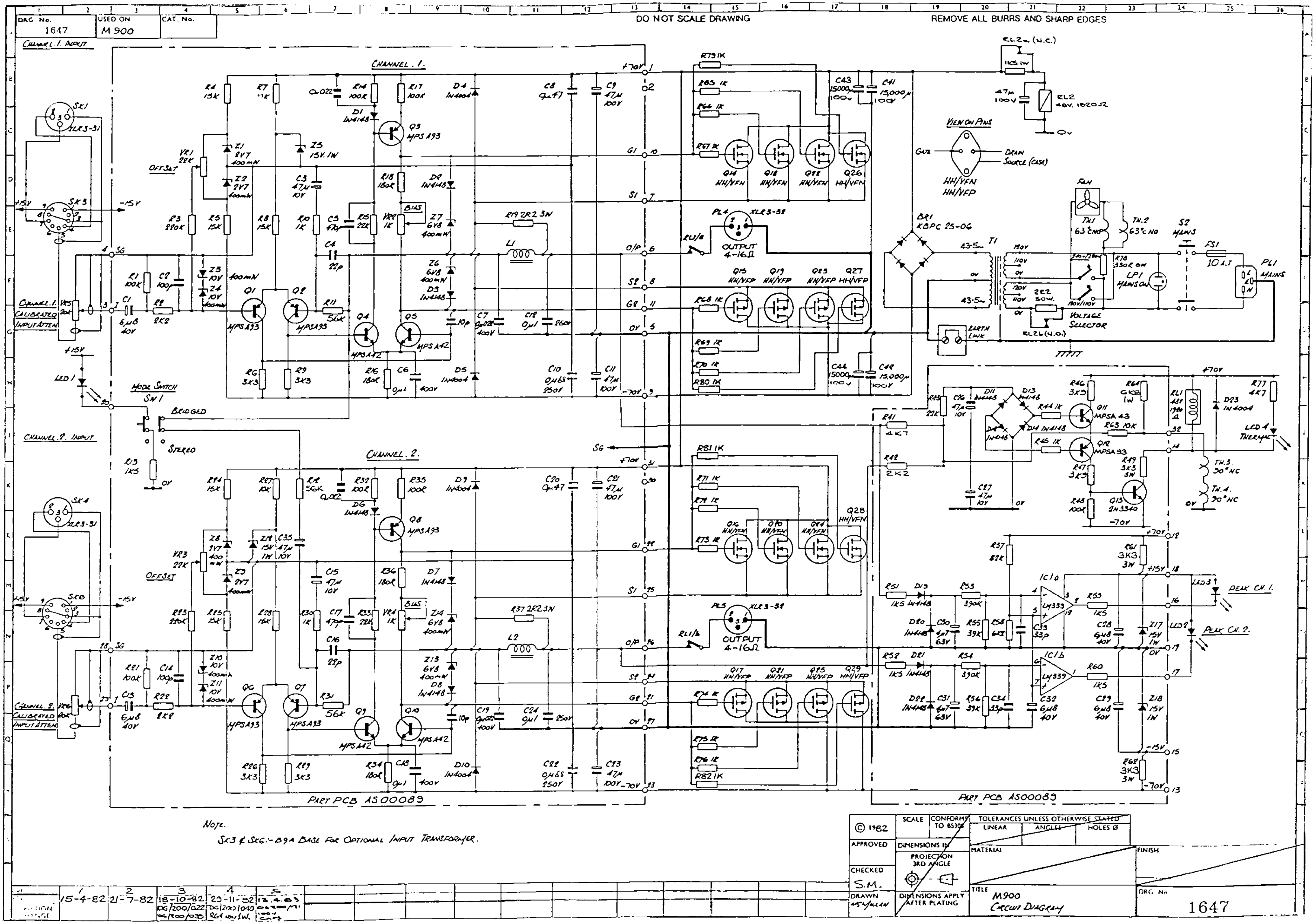
TITLE

LED DISPLAY PCB CIRCUIT DIAGRAM

DRG. No. C/AC20037


DRG. No. 1647
USED ON M 900
CAT. No.
DO NOT SCALE DRAWING
REMOVE ALL BURRS AND SHARP EDGES
CHANNEL. 1. INPUT
CHANNEL. 1.
CHANNEL. 2. INPUT
CHANNEL. 2.
MODE SWITCH SW1
BRIDGED
STEREO
OFFSET
BIAS
OUTPUT 4-16Ω
VIEW ON PINS
GATE
DRAIN
SOURCE (CASE)
VOLTAGE SELECTOR
EARTH LINK
MAINS
FAN
PEAK CH. 1.
PEAK CH. 2.
PART PCB AS00089
NOTE.
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DIMENSIONS IN
PROJECTION 3RD ANGLE
MATERIAL
FINISH
CHECKED S.M.
DRAWN
DIMENSIONS APPLY AFTER PLATING
TITLE M900 CIRCUIT DIAGRAM
DRG. No 1647
15-4-82
21-7-82
18-10-82
20-11-82
13.4.83

HH V RANGE - FAULT FINDING

COMMON PROBLEMS	CHECK FOR:
INTERMITTENT OPERATION	1. Faulty potentiometers 2. Faulty connections to potentiometers 3. Faulty input sockets 4. Dirty speaker relay contacts
INSTABILITY	1. Faulty Zobel network components. (Change all even if apparently OK)
LOW GAIN	1. C3 faulty (e.g. V800 Ch.1)
NO OUTPUT FROM ONE CHANNEL	1. Faulty speaker relay 2. Faulty potentiometer
INTERMITTENT Crackling/Rustling noise	1. Faulty offset preset
INTERMITTENT OR CONSTANT SEVERE DISTORTION	1. Dry joints on driver pcb
INTERMITTENT D.C. ON OUTPUT	1. Dry joints on output pcb
D. C. ON OUTPUT	1. Faulty components on driver pcb e.g. R4, R5, R7, R15 - V800 Ch.1 2. Faulty output FETs (Rare)
HUM	1. Faulty (ageing) smoothing capacitors
AMPLIFIER BLOWS MAINS FUSE	1. Faulty mains transformer 2. Damaged voltage selector 3. Faulty soft start relay/resistor 4. Faulty rectifier bridge