

DIAGRAM SHOWS RA1000 OUTPUT STAGE. RA2000 AND RA3000 OUTPUT STAGES DIFFER IN THE NUMBER OF OUTPUT DEVICES PER RAIL. THE RA2000 USES 4 DEVICES PER RAIL AND THE RA3000 USES 6 DEVICES PER RAIL. ADDITIONAL OUTPUT DEVICES ARE CONFIGURED SIMILARLY WITH 560R GATE RESISTORS AS SHOWN.

ON AMPLIFIERS WITH FLAT PACK (J162\_K1058) MOSFETS  
FIT A 10pF >=250V WORKING ACROSS THE GATE, DRAIN OF EACH K1058 MOSFET

QUIESCENT VOLTAGE ADJUSTMENT  
THIS IS MEASURED ACROSS THE GATE DRIVE AT POINTS A\_B TO GIVE 300mV +/- 10mV

Title				CHANNEL 1 AMPLIFIER			
Size	Number	Revision		Date:		Sheet of	
A3	RAMAIN 2	3		1-Jul-1999		2 of 6	
File:				D:\PROTEI\RAMFW\RAMAIN S07		Drawn By: LMB	

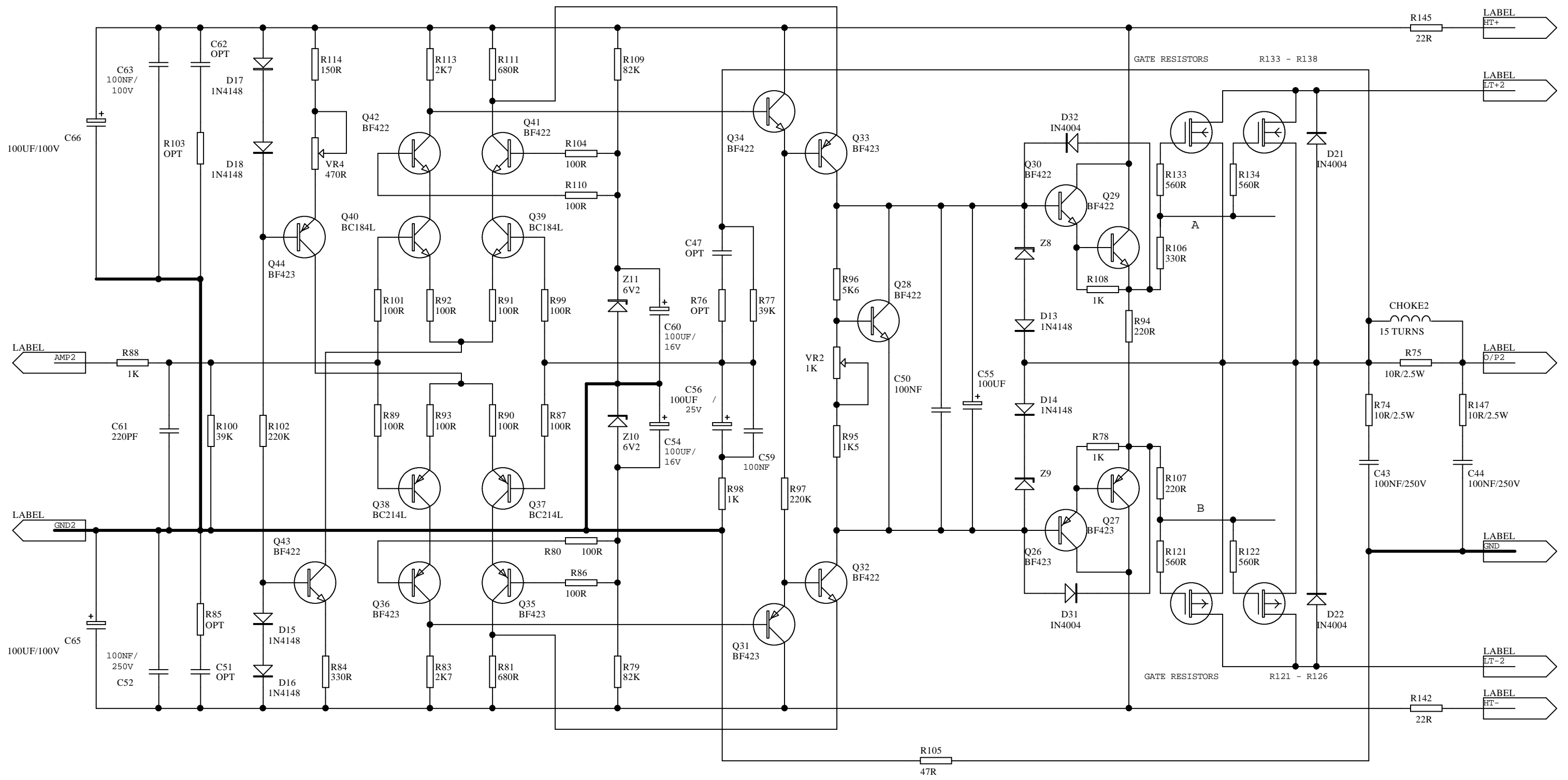
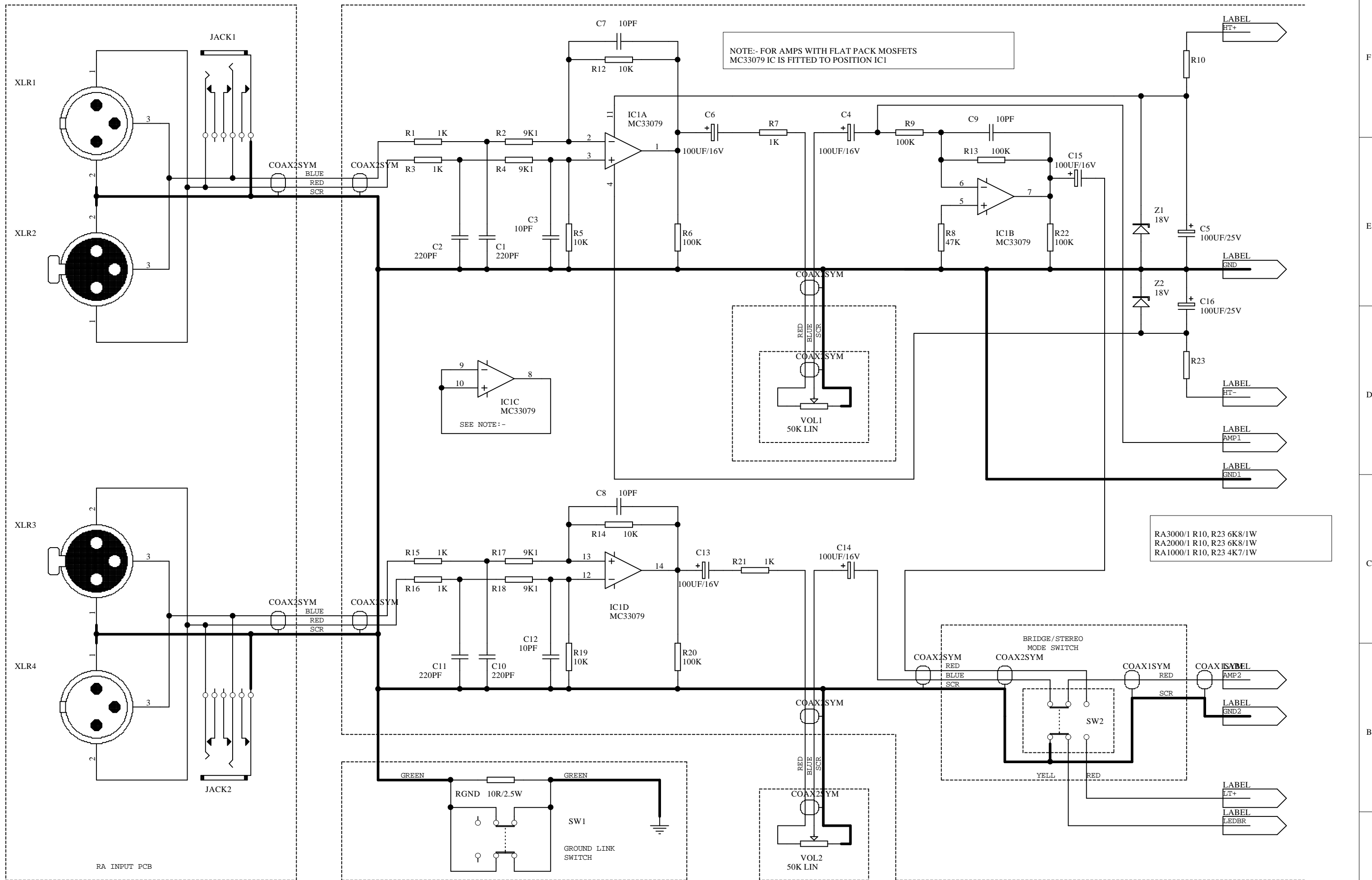


DIAGRAM SHOWS RA1000 OUTPUT STAGE. RA2000 AND RA3000 OUTPUT STAGES DIFFER IN THE NUMBER OF OUTPUT DEVICES PER RAIL. THE RA2000 USES 4 DEVICES PER RAIL AND THE RA3000 USES 6 DEVICES PER RAIL. ADDITIONAL OUTPUT DEVICES ARE CONFIGURED SIMILARLY WITH 560R GATE RESISTORS AS SHOWN.

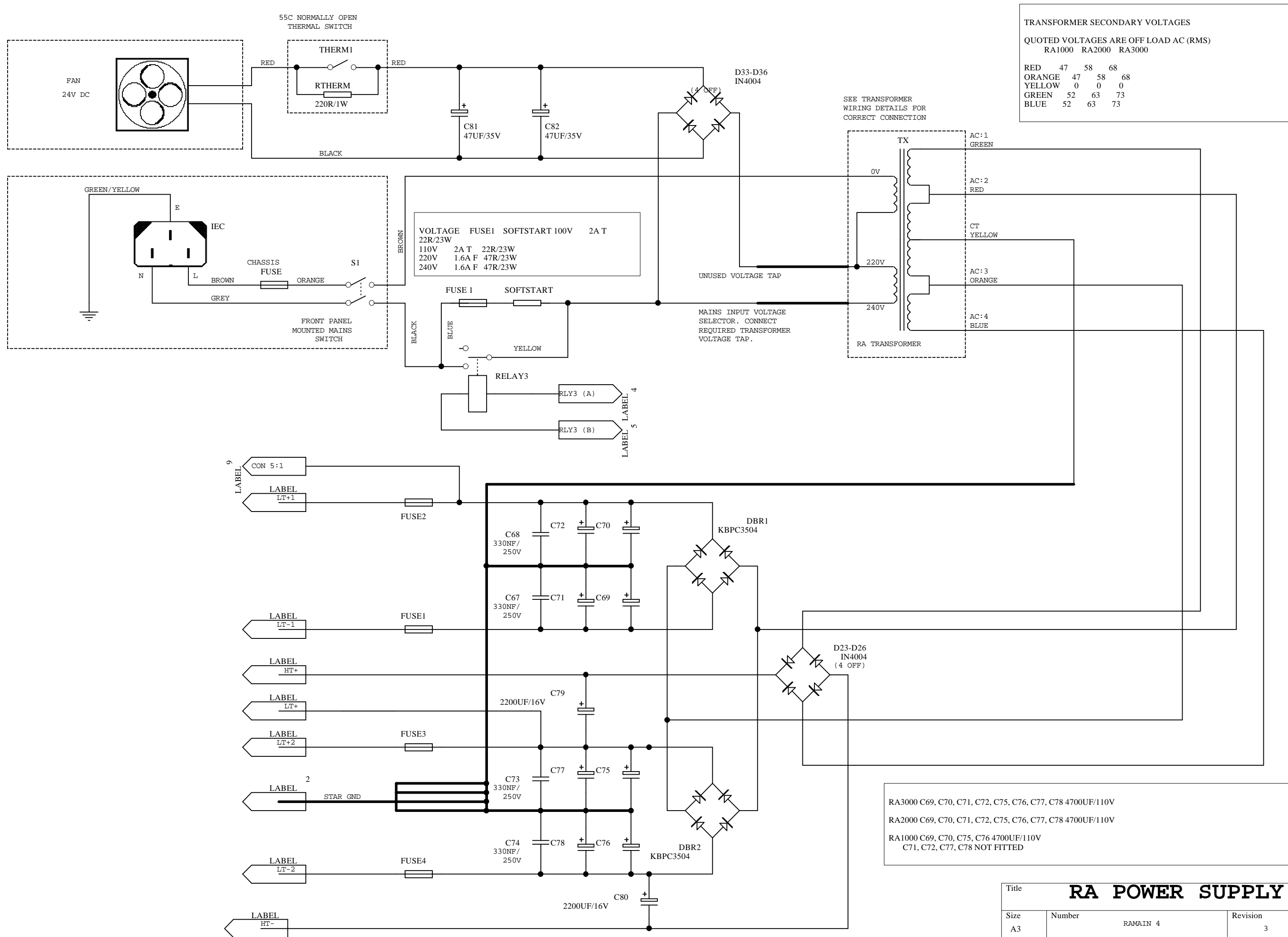
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 THIS IS MEASURED ACROSS THE GATE DRIVE AT POINTS A\_B TO GIVE 300mV +/- 10mV

Title				CHANNEL 2 AMPLIFIER			
Size	Number	Revision		Date:		Sheet of	
A3	RAMAIN 3	3		1-Jul-1999		3 of 6	
File:				D:\PROTFL\RAMFW\RAMAIN S03		Drawn By: LMB	



Title			
INPUT STAGE CIRCUITRY			
Size	Number	Revision	
A3	RAMAIN 1	3	
Date:	1-Jul-1999	Sheet of	1 6
File:	D:\PROTEI\1RANFW\RAMAIN S01	Drawn By:	LMB



**TRANSFORMER SECONDARY VOLTAGES**  
 QUOTED VOLTAGES ARE OFF LOAD AC (RMS)  
 RA1000 RA2000 RA3000

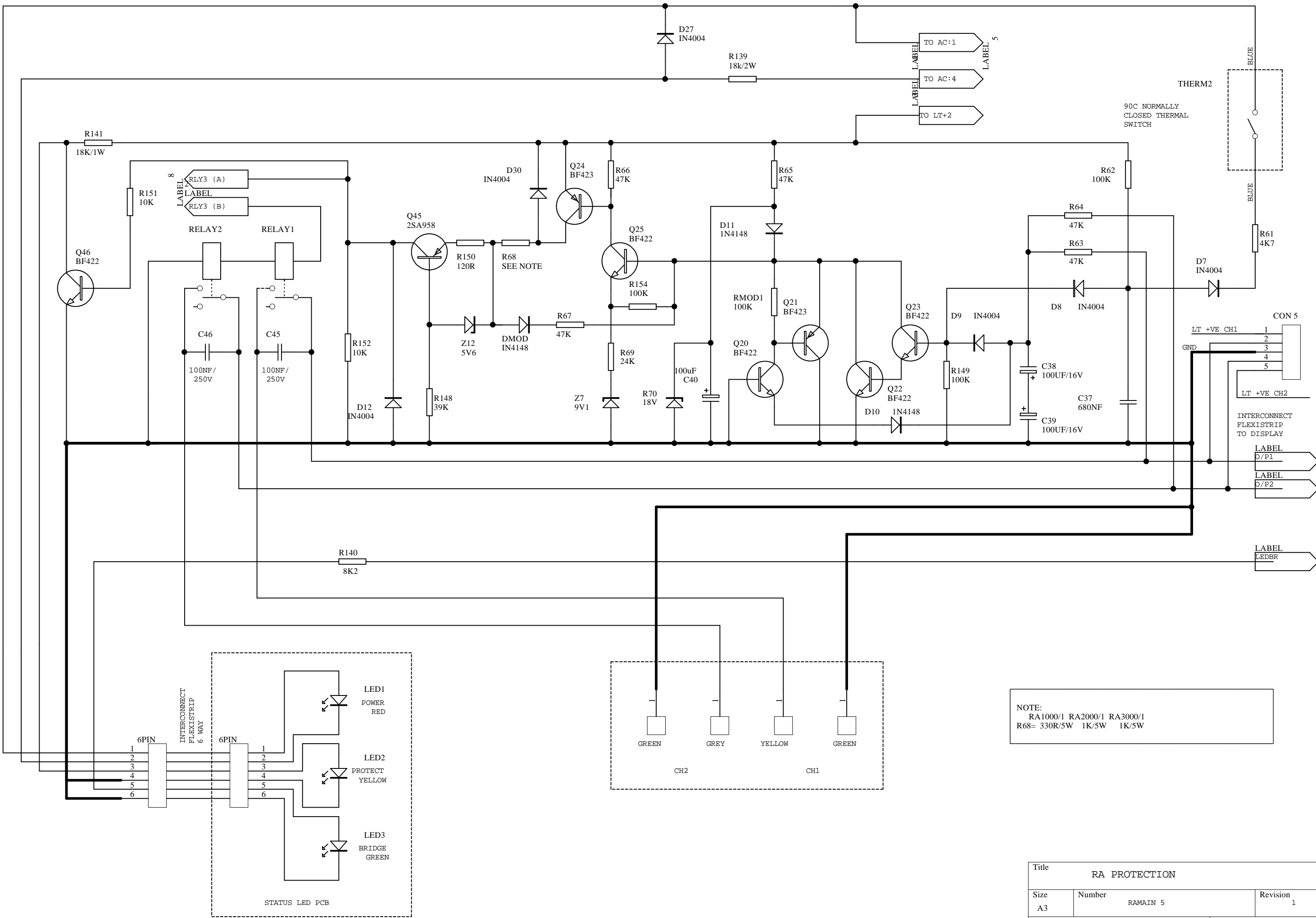
RED	47	58	68
ORANGE	47	58	68
YELLOW	0	0	0
GREEN	52	63	73
BLUE	52	63	73

**VOLTAGE FUSE1 SOFTSTART 100V 2A T**  
 22R/23W

110V	2A T	22R/23W
220V	1.6A F	47R/23W
240V	1.6A F	47R/23W

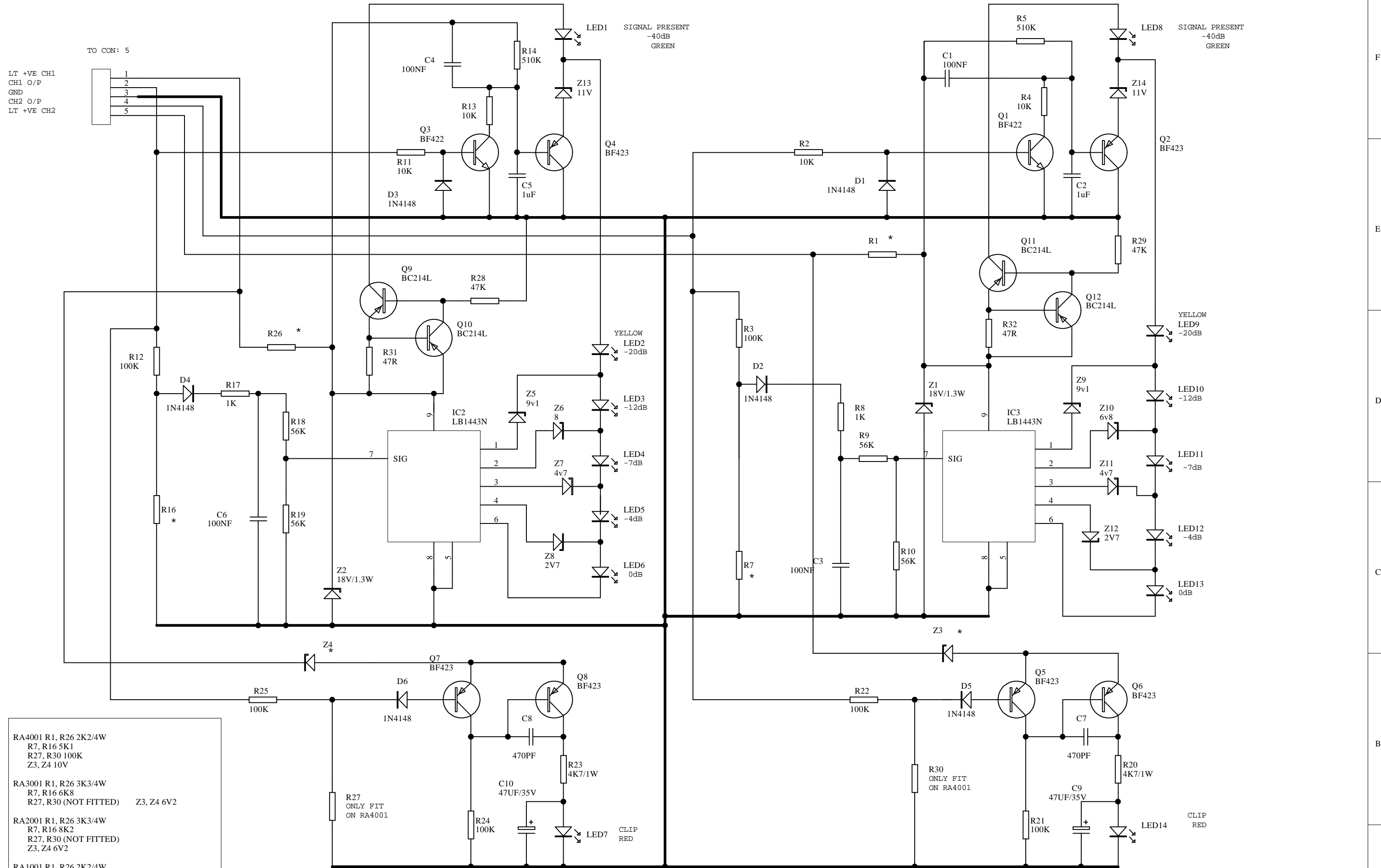
RA3000 C69, C70, C71, C72, C75, C76, C77, C78 4700UF/110V  
 RA2000 C69, C70, C71, C72, C75, C76, C77, C78 4700UF/110V  
 RA1000 C69, C70, C75, C76 4700UF/110V  
 C71, C72, C77, C78 NOT FITTED

Title <b>RA POWER SUPPLY</b>			
Size A3	Number RAMAIN 4	Revision 3	
Date: 1-Jul-1999	Sheet of 4	6	
File: D:\PROTFL\IRANFW\RAMAIN S04	Drawn By: LMB		



NOTE:  
 RA1000/1 RA2000/1 RA3000/1  
 R68= 330R/5W 1K/5W 1K/5W

Title		RA PROTECTION	
Size	Number	Revision	
A3	RAMAIN 5	1	
Date:	1-Jul-1999	Sheet of	5 6
File:	D:\PROTEI\1RANFW\RAMAIN S05	Drawn By:	LMB

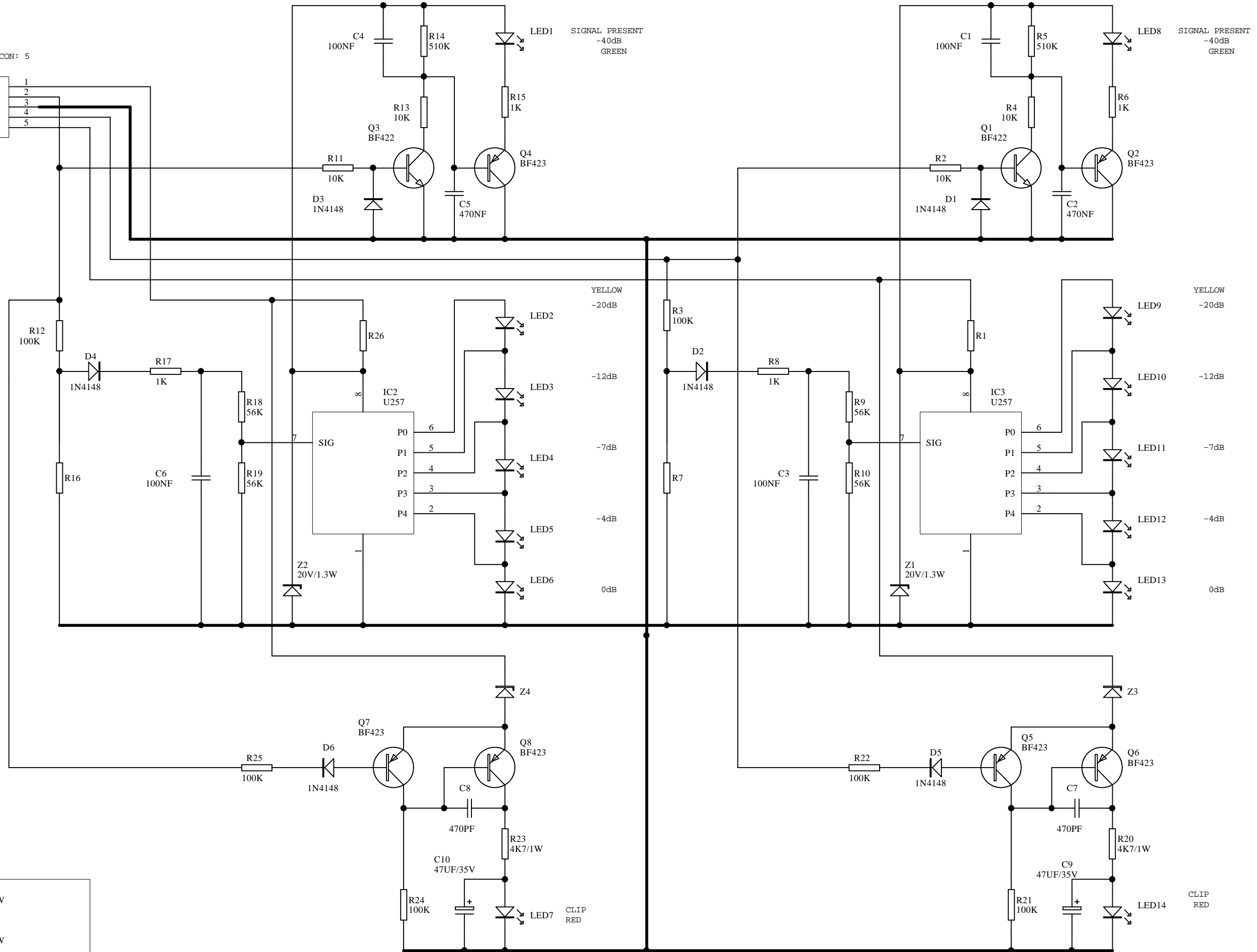


- RA4001 R1, R26 2K2/4W  
R7, R16 5K1  
R27, R30 100K  
Z3, Z4 10V
- RA3001 R1, R26 3K3/4W  
R7, R16 6K8  
R27, R30 (NOT FITTED) Z3, Z4 6V2
- RA2001 R1, R26 3K3/4W  
R7, R16 8K2  
R27, R30 (NOT FITTED)  
Z3, Z4 6V2
- RA1001 R1, R26 2K2/4W  
R7, R16 13K  
R27, R30 (NOT FITTED)  
Z3, Z4 7V5

Title			RA DISPLAY CARD		
Size	Number	Revision			
A3	RA DISPLAY	3			
Date:	1-Jul-1999	Sheet of	6	6	
File:	D:\PROTEI\1RANFW\NEWDISP S01	Drawn By:	LMB		

LT +VE CH1  
 CH1 O/P  
 GND  
 CH2 O/P  
 LT +VE CH2

TO CON: 5

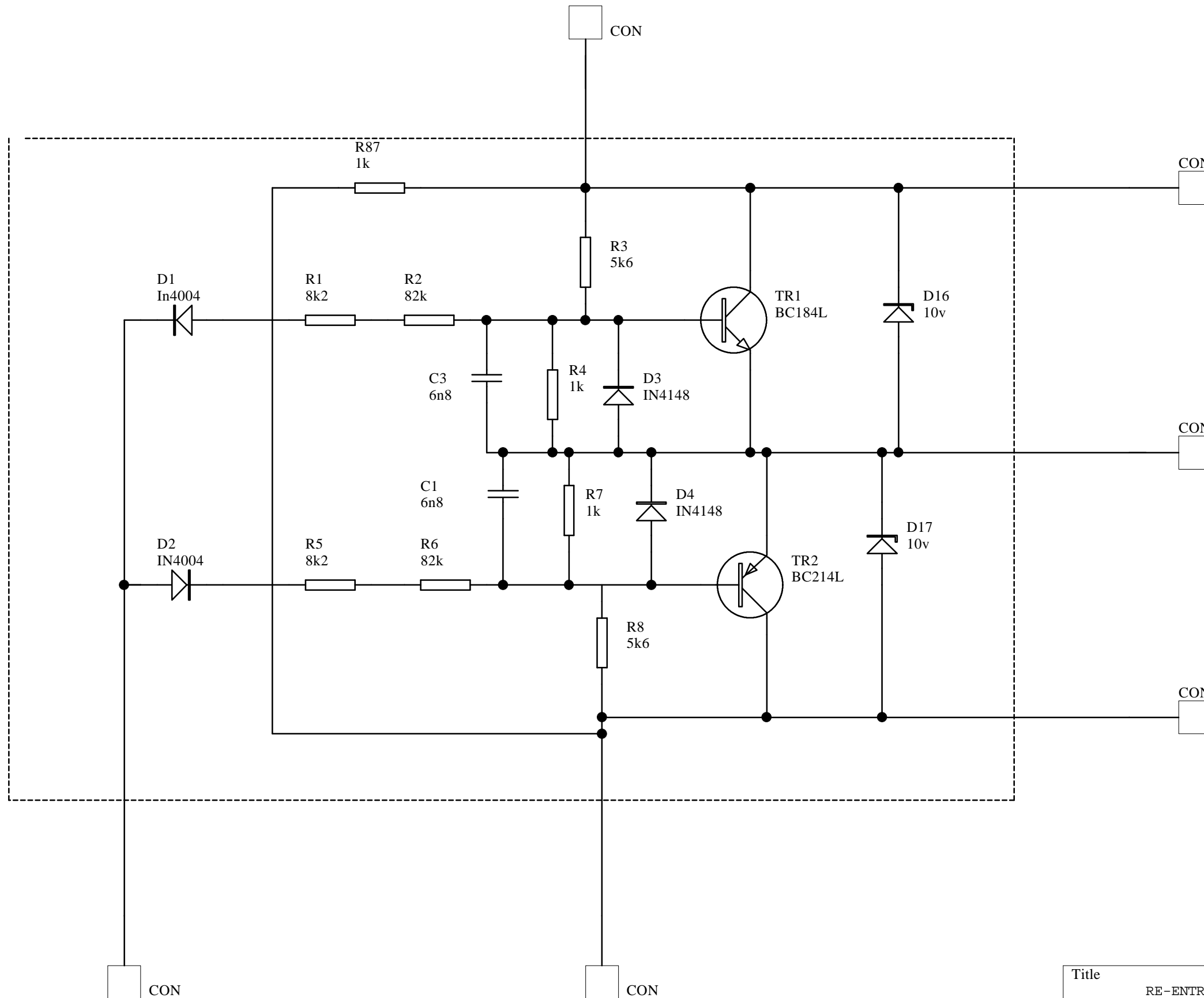


RA3000 R1, R26 3K3/4W  
 R7, R16 6K8  
 Z3, Z4 6V2

RA2000 R1, R26 3K3/4W  
 R7, R16 8K2  
 Z3, Z4 6V2

RA1000 R1, R26 2K2/4W  
 R7, R16 13K

Title			RA DISPLAY CARD		
Size	Number	Revision			
A3	RA DISPLAY	3			
Date:	1-Jul-1999	Sheet of	6	6	
File:	D:\PROTEI\LANFW\RADISP S06	Drawn By:	LMB		



Title		RE-ENTRANT PROTECT	ION PCB
Size	Number	Revision	
A4	PCB1042/P1		
Date:	22-Jul-1999	Sheet of	1 1
File:	D:\PROTEL\RANEW\REENTRY.S01	Drawn By:	L BASHAM



## Protection System

The protection system is based around Q20-Q25. Under normal conditions Q20 – Q23 will be off. At turn-on C40 will charge through R65 towards the +LT supply rail. The voltage is fed to the base of Q25 via D11. When the voltage across C40 reaches approximately 10V Q25 will turn on and thus turn on Q24. Resistor/diode network R67 & D38 connected between Q24 collector and Q25 base provides positive feedback in order to make the turn-on/turn-off of Q24 more defined. The collector of Q24 is connected via R68 R150 & Q45 to the coils of relays RLY1-3.

Transistors Q20 and Q21 are connected in such a way that a voltage of -650mV applied to the emitter of Q20 will turn on Q20 and hence Q21. This will rapidly discharge C40 and hence turn off Q25 and Q24 thus opening the output relays. Similarly Q23 is connected such that a base voltage of +650mV will turn it, and hence Q22, on with the same resultant opening of the output relays.

The output of each channel is fed via resistors R63 and R64 into C38-C39 and then via D9 and D10 to Q23 base and Q20 emitter respectively. The combination of C38-C39 with R63 and R64 forms a low-pass filter, and so at signal frequencies C38-C39 will have no voltage across it. In the event of a DC offset appearing at the output, however, C38-C39 will charge to a DC voltage, turning on Q23 & Q22 or Q20 & Q21 depending upon the polarity, and hence opening the output relays.

The Network consisting of R62, R61 and C37 provide the rapid turn-off feature of the protection system. R61 is connected through the 90 degree thermal switch to D37 and D7, which are connected to the secondaries of the mains transformer. The union of D37 and D7 will, therefore, show a full-wave rectified version of the secondary voltage. This is averaged by C37 to a **negative** DC voltage, reverse biasing D8 and, therefore, having no effect on the protection system. Should one of the thermal switches open, or the power be turned off, C37 will be rapidly charged towards the +LT rail via R61, forward biasing D8, turning Q23 on and opening the output relays. If there is no rapid turn off, suspect R62 (100k) this may be open circuit. It is worth noting that failure of this resistor will render the thermal shutdown useless.