BARCO

MULTI PURPOSE RUGGED COLOUR DISPLAY

MPRD 9600

TECHNICAL MANUAL

Barco n.v.
Display Systems

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MULTI PURPOSE RUGGED COLOUR DISPLAY

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TECHNICAL MANUAL

Manual Order nr. V598610 - 06 October 1993

SERVICE SAFETY PRECAUTIONS

WARNING: X-RADIATION

X-RADIATION CAN BE CAUSED IF CRITICAL COMPONENTS ARE REPLACED BY NON-CONFORM COMPONENTS. THESE COMPONENTS ARE MARKED IN THIS SERVICE MANUAL BY AN *.

WARNING: SAFETY

ELECTRIC SHOCK OR FIRE HAZARD CAN BE CAUSED IF CRITICAL COMPONENTS ARE REPLACED BY NON-CONFORM COMPONENTS. THESE COMPONENTS ARE MARKED IN THIS GUIDE BY A ⚠ SIGN.

REPLACE WITH CONFORM TYPES ONLY!

1. Comply with all caution and safety-related notes on or inside the instrument cabinet, on the chassis, or on the picture tube.

2. When service is required, maintain correct lead dress and parts placement. Extra precaution should be taken to assure proper lead dress in the High Voltage circuit area.
Where a malfunction has occurred, those components or circuits that indicate evidence of abnormality should be replaced or corrected. Always use the manufacturer's safety specified replacement components.

3. Do not remove, install or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away when picture tubes are handled. Keep the picture tube away from the body while handling.

4. Protective shields are provided on this chassis for the protection of both the service technician and the customer.
Protection shields removed for service convenience must be re-installed correctly and ANY MISSING SHIELD MUST BE REPLACED. DO NOT OPERATE THIS INSTRUMENT WITHOUT THE PROTECTIVE SHIELDS IN POSITION AND PROPERLY SECURED.

5. After any service intervention, the service technician must be sure that no protective device built into the instrument by the manufacturer has become defective, or inadvertently defeated during servicing. Therefore, the following checks are recommended for the continued protection of the customer and service technician.

GROUNDING CONTINUITY TEST

- Remove main plugs from wall outlet.

- With an Ω-meter in its lowest resistance range, measure resistance between the grounding prong of the mains plug and all accessible conductive parts.
THE METER MUST BE READ ZERO OHM.

- The mains plug still being removed from the wall outlet, switch on the instrument.
- Switch an Ω-meter in its highest resistance range, measure resistance between the grounding prong of the mains plug and the two other prongs of the mains plug.

BOTH METER READINGS HAVE TO BE MORE THAN 5 MEGOHM (5 MΩ).
ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE, THE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND CORRECTIVE ACTION MUST BE TAKEN BEFORE RETURNING THE INSTRUMENT TO THE Customer.

X-RADIATION AND HIGH-VOLTAGE LIMITS

The primary source of X-radiation in solid state display units is the picture tube. The picture tube is specially constructed to limit X-radiation emissions. The shields and mounting hardware for picture tubes have an X-radiation protection function and must be properly in place.
For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter. High voltage is maintained within specified limits by the use of close tolerance safety related components/ adjustments in the power supply circuit. Refer to the technician X-radiation warning note on the Chassis Schematic and Instrument Labels in the Basic Service Data for specific high-voltage limits of each chassis and X-radiation Protection Circuits. If high voltage exceeds specified limits, check each component specified in the chassis schematic diagram and take necessary corrective action.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in display units have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by then necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Data and its Supplements and Bulletins. Electrical components having such features are identified by ⚠ or * on the schematics and on the parts lists in this Data and its Supplements and Bulletins. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the parts lists in this Data and its Supplements and Bulletins, may create shock, fire, or excessive X-radiation.

NOTE FOR USERS IN THE UNITED KINGDOM

IMPORTANT:

The wires of the mains lead are coloured in accordance with the following code:
Green and Yellow : EARTH
Brown : NEUTRAL
Blue : LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:
- The wire which is coloured Green and Yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured Green and Yellow.
- The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Black.
- The wire which is coloured Brown must be connected to the terminal which is marked with the letter L or coloured Red.

WARNING: This apparatus must be earthed.

BARCO

N.V. Display Systems

9600 SERIES

IMPORTANT NOTICE

The material in this manual consists of information which is the property of BARCO N.V. Display Systems and is intended only for use by the purchasers of the type of monitor described in this manual.

9600 SERIES Monitors contain material in which BARCO N.V. Display Systems retains proprietary rights. Any act involving software reproduction or intervention is prohibited.

NOTE : This equipment has been tested and found to comply with the limits of a class A digital device, persuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmfull interference in which case the user will be required to correct the interference at his own expense.

This technical manual could include inaccuracies or typographical errors. Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible.

DIESES TECHNISCHE HANDBUCH
SOLLTE SORGFÄLTIG GELESEN WERDEN
BEVOR DIE NETZSPANNUNG ANGELEGT WIRD

ACHTUNG RÖNTGENSTRAHLUNG !!

ERHÖHTE RÖNTGENSTRAHLUNG KANN VERURSACHT WERDEN, WENN BESTIMMTE BAUTEILE DURCH TEILE ERSETZT WERDEN DIE NICHT DER SPEZIFIKATION DES HERSTELLERS ENTSPRECHEN. SOLCHE BAUTEILE SIND IN DIESER WARTUNGSANLEITUNG DURCH EIN * GEKENNZEICHNET.

ACHTUNG SICHERHEIT !!

WERDEN BESTIMMTE BAUTEILE DURCH TEILE ERSETZT, DIE NICHT DER SPEZIFIKATION DES HERSTELLERS ENTSPRECHEN, SO KANN EIN ELEKTRISCHER SCHLAG ODER BRANDGEFAHR DIE FOLGE SEIN. SOLCHE BAUTEILE SIND IN DIESER WARTUNGSANLEITUNG DURCH EIN ⚠ GEKENNZEICHNET.

WARTUNG

VOR DEM ÖFFNEN DES MONITOR
IST DIESER AB ZU SCHALTEN !

1. Sämtliche Sicherheitsvorschriften auf der Außen- oder Innenseite des Gerätes bzw. auf der Bildröhre sind zu beachten.

2. Ist eine Wartung erforderlich, so ist die richtige Verdrahtung und die korrekte Einbaulage der Teile zu beachten.
   Es ist besonders darauf zu achten, daß im Hochspannungsbereich eine korrekte Lage gewahrleistet bleibt. Nur solche Ersatzteile verwenden, die der Spezifikation gemäß den Sicherheitsvorschriften des Herstellers entsprechen.

3. Vor dem Ausbau der Bildröhre ist die Anodenleitung und die Anode der Bildröhre gegen den Chassisrahmen zu erden, damit eine vorhandene Ladung abgeleitet werden kann.
   Beim Aus- oder Einbau oder bei sonstiger Handhabung der Bildröhre muß eine Schutzbrille getragen werden. Wer keine derartige Schutzbrille trägt, darf sich nicht in den Bereich aufhalten, wo Bildröhren gehandhabt werden. Bildröhren sind bei ihrer Handhabung vom Körper weg zu halten.

4. Nach erfolgter Wartung muß der Kundendiensttechniker sicher sein daß während der Wartung keine vom Hersteller eingebaute Schutzvorrichtung beschädigt oder unabsichtlich zerstört wurde.
   Es empfiehlt sich daher, zum Schutz der Kunden und des Technikers folgende Kontrollen durchzuführen :

SCHUTZLEITERANSCHLUß UND BERÜHRUNGSCHUTZ

- Netzstecker aus der Steckdose ziehen.
- Mit einem auf kleinsten Widerstandsbereich eingestellten Ohmmeter den Widerstand zwischen der Erdung des Netzsteckers und allen zugänglichen leitenden Teilen messen.
  AM OHMMETER MUß < 0.1 OHM GEMESSEN WERDEN.

- Bei weiterhin gezogenem Netzstecker, das Gerät einschalten.
- Mit einem auf höchsten Widerstandsbereich eingestellten Ohmmeter den Widerstand zwischen der Erdung des Netzsteckers und den beiden anderen Stiften des Netzsteckers messen.
  ES MÜSSEN JEWEILS MEHR ALS 5 MEGOHM ABGELESEN WERDEN.

ERGEBEN DIE MESSUNGEN ABWEICHENDE WERTE, SO KÖNNTE DAS AUF EINE GEFÄHRLICHE BERÜHRUNGSSPANNUNG HINDEUTEN, SODAß ABHILFE GESCHAFFEN WERDEN MUß, BEVOR MAN DAS GERÄT DEM KUNDEN ZURÜCKGIBT.

Die Bildröhre ist Hauptverursacher von Röntgenstrahlung. Sie hat eine besondere Bauform um die Röntgenstrahlung auf ein Mindestmaß zu begrenzen.
Die Ersatzröhre muß vom gleichen Typ sein wie die Originalröhre, damit ein dauerhafter Schutz vor Röntgenstrahlen gewahrleistet ist.
Durch den Einbau von besonders maßgenauen Sicherheits Bauteilen / Abgleichungen im Netzteil wird die Hochspannung innerhalb der angegebenen Grenzwerte gehalten.
Die für Techniker bestimmte warnende Hinweise im Schaltbild, bezüglich der Röntgenstrahlung sowie die bei jedem Gerät aufgeführten Hochspannungsgrenzwerte sind zu beachten.
Liegen die Hochspannungswerte über den dort aufgeführten Höchstwerten, so muß jedes im Schaltbild spezifizierte Bauteil kontrolliert- und die nötige Abhilfe geschaffen werden.

Viele elektrische und mechanische Teile haben besondere Sicherheitsmerkmale. Bauteile die zu dieser Sicherheitskategorie gehören sind in den Schaltbildern und in der Stückliste dieser Wartungsanleitung sowie in den Nachträgen und Technischen Informationen mit einem ⚠ bzw. * versehen.
Der Einsatz von Ersatzteilen, die nicht den Sicherheitsauflagen, denen die Ersatzteile der Stückliste dieser Anleitung, der dazugehörigen Nachträge und technischen Informationen unterliegen, genügen, kann einen elektrischen Schlag, Brand oder eine übermäßige Röntgenstrahlung zur Folge haben.

ACHTUNG : DIESES GERÄT MUß GEERDET WERDEN !!

MPRD 9600 SERIES PRODUCT DESCRIPTION

The MPRD 9600 series offers 2 standard Multi Purpose Rugged color Displays, designed for reliable and safe operation under severe conditions.
CRT dimensions are 17" & 20".

Special 9600 features :

- AUTOLOCK : automatic syncronisation (47 - 94 Kc / 20") - (32 - 64 Kc / 17")
- AUTOSYNC : automatic selection between sync. on green or external sync. with priority for external sync.
- AUTOSET : automatic setting for all geometric and focus parameters

- high efficiency resonant converter power supply 28 VDC or 115/220 VAC
- built in test pattern generator to be able to control all display settings
- resonant degauss
- compact housing due to SMD / ASIC / HYBRID circuitry and state-of-the-art mechanical design
- ALL display settings software-controlled with keypad or remote
- full diagnose on keypad
- AKB (Automatic Kinescope Biasing)
- Differential video inputs with loopthrough, separated sync. or composite sync. loopthrough
- Softkey Control Panel with Ambient Light Controller

List of options described in this manual (section 9) :

- Magnetic Immune System (MIS)
- Second RGB input
- Portrait version

Other options described in separate manuals :

- Power factor corrector
- Fibre Optics Inputs
- Touch Screen and Touch Screen Controller
- Extended vibration range
- Stereo shutter

How to get started : All standard and derived (optional) versions of the RGB boards, the Deflection boards, the Power Supply boards, the Control panels and CRT Socket boards are described in section 2.

The Optional Input Board and the MIS board are described in section 9.

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LIST OF FIGURES

1. BOARD LOCATION

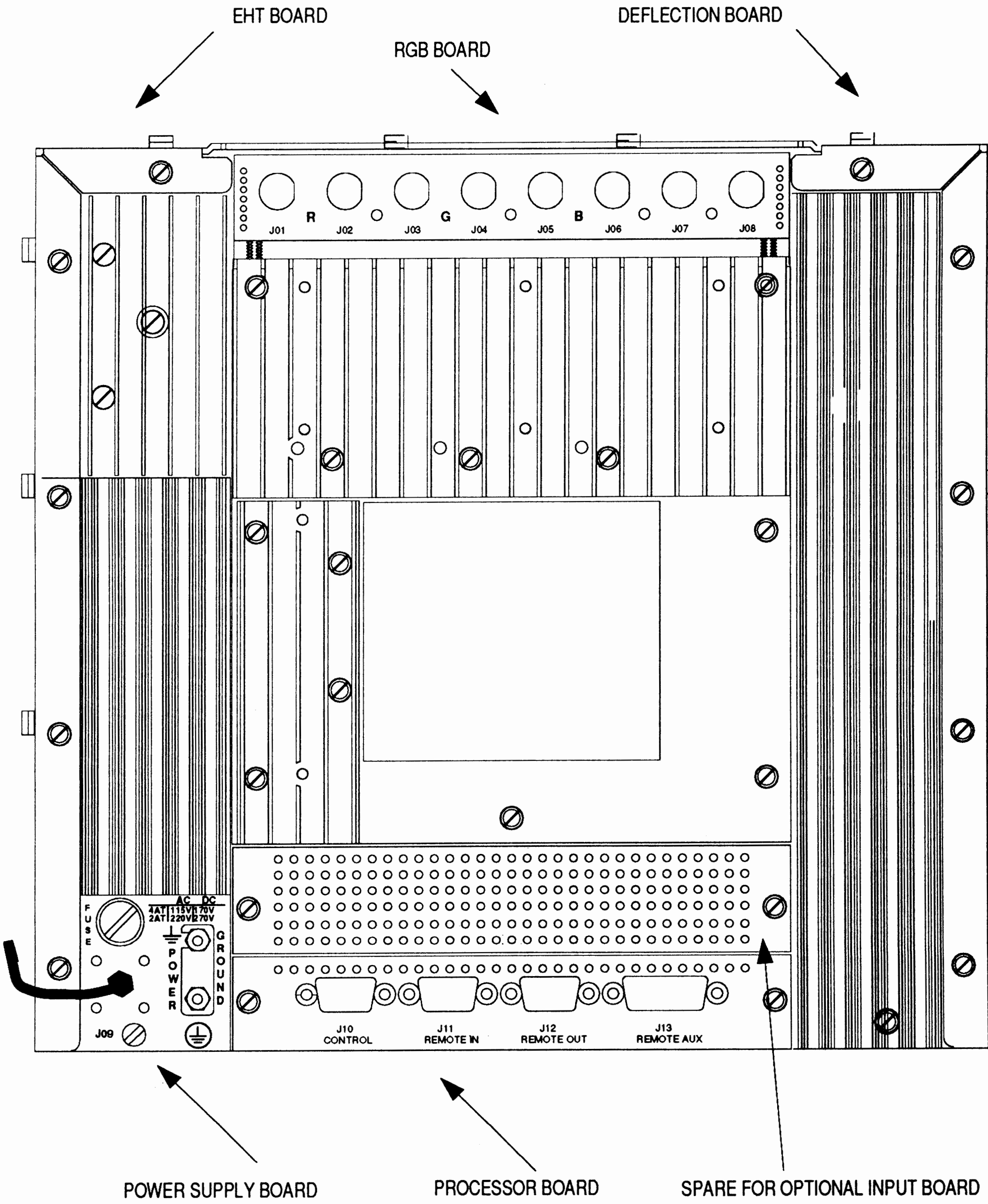


figure 1.1 : rear view board location

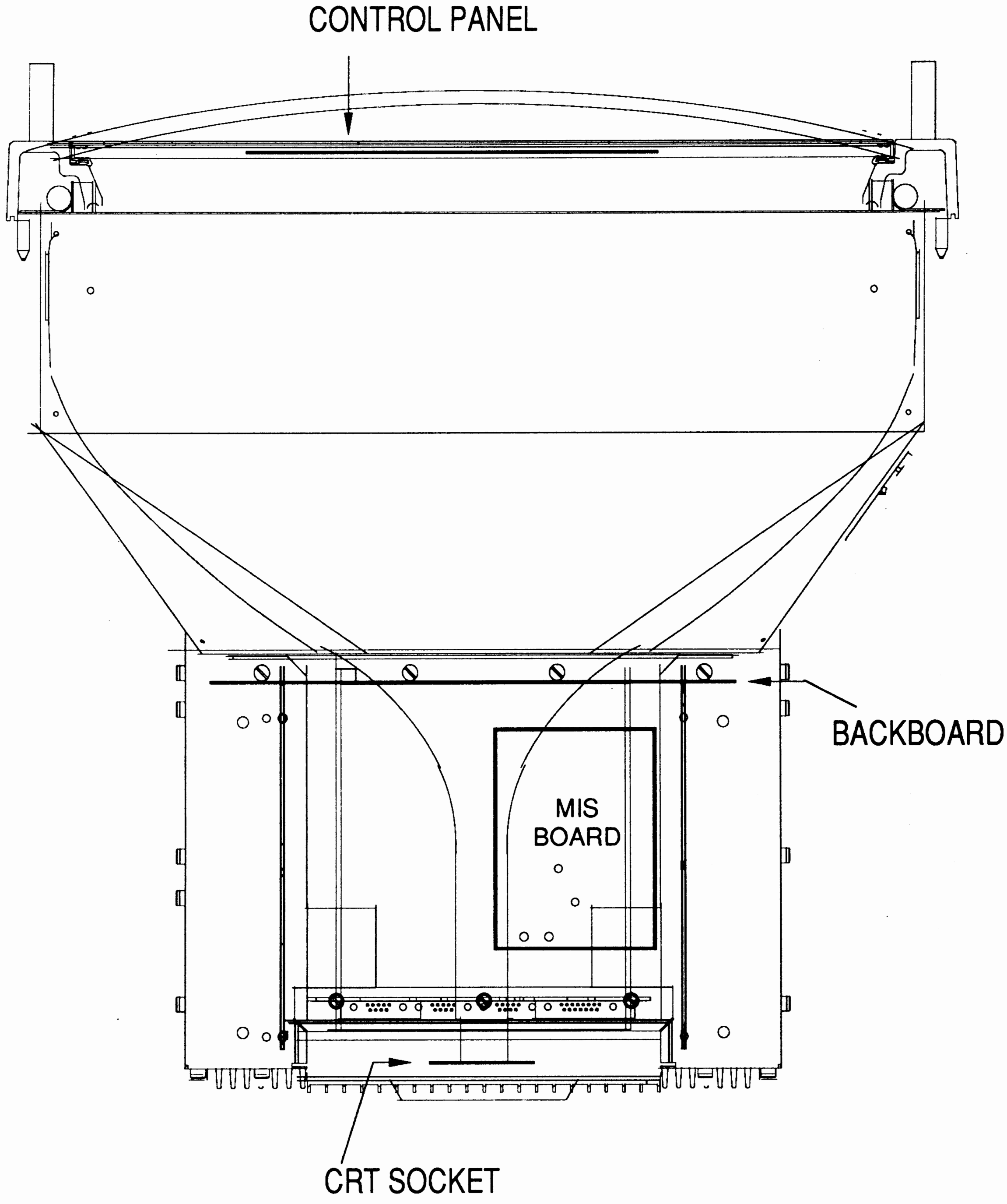


figure 1.2 : top view board location

2. SCHEMATICS DESCRIPTION AND PARTS LISTS

PARTS LIST STRUCTURE AND COMPONENT CODIFICATION GUIDE.

All components of the MPRD9600 are stored in several parts lists.

The parts list of a complete monitor shows all units (V56xxxx).

All these units have their own parts list, each item has an order number, a short (coded) description, the BARCO SUPPLIER and - if it is an electronic component - a sequence number (e.g. R211, C107, Q32, U5).

EXPLANATION OF THE MPRD9600 DETAILED MODULE OVERVIEW

Each complete MPRD96xx monitor has one unique BARCO identification number, V95077yy

The complete standard MPRD9643/51 monitor consists of 14 units, each unit has a name and a unique BARCO identification number.

	MONITOR TYPE	MPRD9643		MPRD9651
1.	RGB BOARD (A)		V5631210	
2.	PROCESSOR BOARD (C)		V5631220	
3.	DEFLECTION BOARD (D)	V5631235		V5631230
4.	EHT BOARD (E)		V5631240	
5.	CONTROL PANEL BOARD (O)		V5631260	
6.	POWER SUPPLY BOARD (P)		V5631275 (110/220 VAC fixed cord) or V5631270 (110/220 VAC power plug) or V5631271 (28 VDC power plug)	
7.	CRT SOCKET (T)		V5631280	
8.	BACKBOARD (B)		V5631200	
9.	FRAME		V5631180	
10.	PICTURE TUBE	V5631195		V5631190
11.	FRONT	V5631135		V5631130
12.	RACKMOUNTING KIT	V5631295		V5631290
13.	75Ω TERMINATORS		VOPTO472	
14.	FUSE SET 115/220		V5625745	

Each unit is defined by a parts list containing all the parts necessary to assemble the unit.
Each item in the parts list has an identification number Cxxxxx or Vxxxxx.

V75xxxx are printed circuit boards.

V68xxxx are parts lists of printed circuit boards with SMD components mounted on them.

- this parts list gives information on the SMD components mounted on the PCB,
- SMD components are identified by a Pxxxx identification number.

V56xxx within a module are programmed components (GALs, EPROMs, ...).

STANDARD MPRD 9643 (17")
STANDARD MPRD 9651 (20")

- RGB BOARD BNC V5631210
  - PARTSLIST Vxxxx Cxxxx
  - DIFF. INP. V681024
    - PARTSLIST PCB + SMD Pxxx
  - AKB V681025
    - PARTSLIST PCB + SMD Pxxx
  - SYNC. V681026
    - PARTSLIST PCB + SMD Pxxx
- µPROCESSOR BOARD V5631220
  - PARTSLIST Vxxxx Cxxxx
  - V681027
    - PARTSLIST PCB + SMD Pxxx
  - V5681841
    - SOFT LOW
  - V5681842
    - SOFT HIGH
  - V5681851
    - GAL U215
  - V5681861
    - GAL U216
- DEFLECTION BOARD V5631235 (17") V5631230 (20")
  - PARTSLIST Vxxxx Cxxxx
  - V681019
    - PARTSLIST PCB + SMD Pxxx
  - V5681931
    - SOFT DEFL. 32 - 64 Khz
  - V5681921
    - SOFT DEFL. 47 - 94 KHz
- EHT BOARD V5636240
  - PARTSLIST Vxxxx Cxxxx
- CONTROL PANEL V5631260
  - PARTSLIST Vxxxx Cxxxx
- POWER SUPPLY BOARD
  - V5631270 115/220 VAC power plug
    - PARTSLIST Vxxxx Cxxxx
  - V5631271 28 VDC power plug
    - PARTSLIST Vxxxx Cxxxx
    - V681028
      - PARTSLIST PCB + SMD Pxxx
  - V5631275 115/220VAC fixed cord
    - PARTSLIST Vxxxx Cxxxx
- BACKBOARD V5631200
  - PARTSLIST Vxxxx Cxxxx
- FRAME V5631180
  - PARTSLIST Vxxxx Cxxxx
- PICT. TUBE UNIT V5636195 (17") V5636190 (20")
  - PARTSLIST Vxxxx Cxxxx
- CRT SOCKET V5631280
  - PARTSLIST Vxxxx Cxxxx
- FRONT V5631135 (17") V5631130 (20")
  - PARTSLIST Vxxxx Cxxxx
- RACKMOUNTING KIT V5631295 (17") V5631290 (20")
  - PARTSLIST Vxxxx Cxxxx
- BNC 75Ω TERMIN. VOPTO472
  - PARTSLIST Vxxxx Cxxxx
- FUSE SET 115/220 V5625745
  - PARTSLIST Vxxxx Cxxxx

OPTIONAL MPRD 9600 BOARDS ALSO DESCRIBED IN THIS MANUAL

ORDER NUMBER	BOARD NAME	SHORT FORM BOARD DESCRIPTION
V5631212	RGB	TRIAX CONNECTORS
V5631213	RGB	TNC CONNECTORS INTERNALLY TERMINATED
V5631214	RGB	TNT CONNECTORS INTERNALLY TERMINATED
V5631217	RGB	TROMPETER CONNECTORS
V5631910	RGB	EQUALS V5631210 BUT COATED WITH FC722
V5631913	RGB	EQUALS V5631213 BUT COATED WITH H.SEAL 1B31
V5631914	RGB	TNT CONNECTORS AND COATED WITH FC722
V5631915	RGB	EQUALS V5631214 BUT COATED WITH FC722
V5631916	RGB	CERAMIC VERSION COATED WITH FC722
V5631920	PROCESSOR	EQUALS V5631220 BUT COATED WITH FC722
V5631921	PROCESSOR	EQUALS V5631220 BUT COATED WITH H.SEAL 1B31
V5631922	PROCESSOR	CERAMIC VERSION COATED WITH FC722
V5631231	DEFLECTION	MPRD9651 WATERCOOLED
V5631232	DEFLECTION	MPRD9651 32/64 KHz
V5631237	DEFLECTION	MPRD9643 40/80 KHz
V5631238	DEFLECTION	EQUALS V5631230 BUT WITH ADAPTED HEATSINK
V5631239	DEFLECTION	EQUALS V5631230 BUT WITH SHORT FLYBACK
V5631930	DEFLECTION	EQUALS V5631230 BUT COATED WITH FC722
V5631931	DEFLECTION	EQUALS V5631230 BUT COATED WITH H.SEAL 1B31
V5631932	DEFLECTION	EQUALS V5631232 BUT COATED WITH FC722
V5631933	DEFLECTION	CERAMIC VERSION COATED WITH FC722
V5636241	EHT	WATERCOOLED
V5636940	EHT	EQUALS V5631240 BUT COATED WITH FC722
V5636941	EHT	EQUALS V5631240 BUT COATED WITH H.SEAL 1B31
V5636943	EHT	CERAMIC VERSION COATED WITH FC722
V5631261	CONTR. PAN.	FUNCTION KEYS MPRD9651 LANDSCAPE
V5631265	CONTR. PAN.	FUNCTION KEYS MPRD9643 LANDSCAPE
V5631267	CONTR. PAN.	VERSION UP
V5631960	CONTR. PAN.	EQUALS V5631260 BUT COATED WITH FC722
V5631961	CONTR. PAN.	EQUALS V5631261 BUT COATED WITH FC722
V5631962	CONTR. PAN.	EQUALS V5631260 BUT COATED WITH H.SEAL 1B31
V5631273	POW. SUPPLY	EQUALS V5631271 BUT WATERCOOLED
V5631279	POW. SUPPLY	EQUALS V5631270 + ADDITIONAL TEMPERATURE SENSOR
V5631970	POW. SUPPLY	EQUALS V5631270 BUT COATED WITH FC722
V5631971	POW. SUPPLY	EQUALS V5631271 BUT COATED WITH FC722
V5631972	POW. SUPPLY	EQUALS V5631270 WITH MODIFIED POWER PLUG
V5631974	POW. SUPPLY	EQUALS V5631275 BUT MAINS SWITCH AND COATED WITH FC722
V5631973	POW. SUPPLY	EQUALS V5631972 BUT COATED WITH H.SEAL 1B31
V5631975	POW. SUPPLY	EQUALS V5631275 BUT COATED WITH FC722
V5631282	CRT SOCKET	PORTRAIT VERSION
V5631285	CRT SOCKET	EXTENDED ALTITUDE
V5631980	CRT SOCKET	EQUALS V5631280 BUT COATED WITH FC722
V5631981	CRT SOCKET	EQUALS V5631282 BUT COATED WITH H.SEAL 1B31
V5631900	BACKBOARD	EQUALS V5631200 BUT COATED WITH FC722
V5631901	BACKBOARD	EQUALS V5631200 BUT COATED WITH H.SEAL 1B31

BARCO N.V. DISPLAY SYSTEMS

MPRD 9600
MODULE OVERVIEW

DATE : 10/05/93

COMPONENT CODIFICATION

Each parts list starts with the reference to the unit, the unit name and the number to order a complete unit.

The next line shows the column headings : ORDER NUMBER, DESCRIPTION and ITEM.

The order number is the company order number.
The description is a coded description of the component.
Item refers to the sequence number in the schematic diagram.

Note that only a reduced list is supplied in this manual, the complete list is available on request.

RESISTOR KEYCODE PART 3.1

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2				
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5				
R																									RESISTOR keyword ,diagram seq.			
																										inserted device		
	#																									surface mounted device		
		P																									potmeter	
		M																									multiturn	
		T																									trimmer	
			C	A																					material	carbon		
			C	C																						carbon composite		
			C	E																						ceramic (cermet)		
			C	F																						carbon film		
			C	P																						conductif plastic		
			M	F																						metal film		
			M	O																						metal oxide		
			W	W																						wire wound		
			H	V																					type	high voltage		
					F																					fuse		
					N																					non inductif		
			L	D	R																					light dependent		
			N	T	C																					neg. temp. coeff.		
			P	T	C																					pos. temp. coeff.		
			V	D	R																					voltage dependent		
						H																			mounting	horizontal		
						R																				radial		
						V																				vertical		
		A																							array			
			B																							bussed		
			I																							isolated		
			D																							dual terminator		
				x	X																					number of circuits		
																											X ref, layout	
							x	x	X		x	x													std series of values in a decade			
										E															unit	ohm		
										K																kilo ohm		
										M																mega ohm		
							*	*	*	x	x	x													only for R_AD		*** R1	xxx R2
													F												tolerance	1%		
													G													2%		
													J													5%		
													K													10%		
													M													20%		
														x	X	W	x	x							power	watt/resistor		
													x	x	X	W										if power >99W,no tolerance		
																			A						res.law	linear		
																			B							logarithmic		
																			C							inverse logarithmic		
																			H							logarithmic with tap		
																			F							balance		

RESISTOR KEYCODE PART 3.2

Positions: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

21	22	23	24	25				
E	1				res.pitch	2,5mm	/2,54mm	
E	2					5 mm	/5,08mm	
E	3					7,5mm	/7,52mm	
E	X	x				E x numeric number		
x	x	x	x	X	voltage	for HV and VDR		
					SURFACE MOUNT DEVICE			
0	8	0	5		shape	chip	2 x1,25mm	
1	2	0	6				3 x1,6 mm	
1	2	1	0				3,2x2,6 mm	
2	0	1	0				5 x2,5 mm	
2	5	1	2				6,3x3,2 mm	
M	M	E	L	F		tubular	3,5x1,4 mm	
M	E	L	F				6 x2,3 mm	
S	O	1	4			array	small outline	
S	O	1	6					
S	O	M	1	4			small outline medium	
S	O	M	1	6				
S	O	L	1	4			small outline large	
S	O	L	1	6				
					STD DEVICE			
D	I	P			array	dual in line package		
S	I	P				single in line package		
			X	x			number of pins	
S	3				square		trimmer	3x 3mm
S	4						trimmer	4x 4mm
S	6						trimmer	6x 6mm
S	7						trimmer	7x 7mm
S	9						trimmer	9x 9mm
D	1	0			diameter		trimmer	10x10mm
D	1	0					trimmer,	10x12mm
D	1	4					trimmer	14x17mm
D	1	6			potmeter	dia 16mm		
D	1	8					trimmer	18x20mm
D	2	0					trimmer	dia 20mm
D	2	3			potmeter	dia 23mm		
R	1	2			potmeter	rectangular	modular	17x12mm
R	1	7						22x17mm
M	7				multiturn	square		7x 7mm
M	1	0						10x10mm
M	2	0				rectangular		19x 7mm
M	4	0				rectangular		42x 5mm
T	2	5			slide	mechanical travel		25mm
T	4	0						40mm
T	6	0						60mm
			T		trimming facilities		top	
			S				side	
			B				bottom	
			N				top and bottom	

RESISTOR KEYCODE PART 3.3																												
.									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2				
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5				
																								O	layout			open
																								C				closed
																								S				sealed

CAPACITOR KEYCODE PART 2.1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
C																									CAPACITOR	keyword,diagram seq.
																										inserted
	#																									surface mounted
		T																							TRIMMER	
			E	L																					ELECTROLYTIC	
			T	A																					TANTALIUM	
					5																					height 5mm
					7																					height 7mm
						B																				bipolair
							A	X																		axial
							R	A																		radial
							S	N																		snap in
			C	E																					CERAMIC	
			P	1	0	0																			class 1,temp coeff	P100
			N	P	0																					NPO
			N	0	7	5																				N075
			N	1	5	0																				N150
			N	2	2	0																				N220
			N	3	3	0																				N330
			N	4	7	0																				N470
			N	7	5	0																				N750
			N	1	5	2																				N1500
			C	O	G																					COG
					*	*																			class 2	no ceramic specificat.
			R	2	0	2																			ceramic art	R2000
			R	4	0	2																				R4000
			R	4	7	2																				R4700
			R	1	0	4																				R10000
			X	7	R																					X7R
			Y	5	V																					Y5V
			Z	M																						ZM
			Z	5	P																					Z5P
			Z	5	U																					Z5U
							D	I																	layout	disc
							M	I																		miniature
							M	U																		multilayer
							P	E																		pearl
							T	U																		tubulair
							T	R																		trapezium
							F	T																		feed through
			P	A																					material	paper
			P	O																						polyester
			P	C																						polycarbonate
			P	P																						polypropylene
			P	S																						polystyrene
			S	R																						styroflex
			P	E																						polyethylene
					M	E																			intermediate	metal film
					T	P																				tin plated

CAPACITOR KEYCODE PART 2.2

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2		
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5		
							A	X																	layout	axial
							R	A																		radial
		A																							array	
			B																							bussed
			I																							isolated
			D																							dual terminator
				x	x																					num. number of res.
									x	x	x	x	,	x											std series of values in a decade	
													P												unit	P : pf
													N													N : nF
													M													M : µF
													F													F : farad
															x										tolerance	see code letter table
																x	x	x							voltage	three figure code
																	6	3								63 volt
																1	0	0								100 volt
																2	5	0								250 volt
																1	0	2								1000 volt
																			E	1					pitch	2,5mm/ 2,54mm
																			E	2						5 mm/ 5,08mm
																			E	3						7,5mm/ 7,52mm
																			E	4						10 mm/10,16mm
																					x	x	x	x	**dim. for surface mounted devices**	
																					0	6	0	3	for ceramic chips	60x 30 mills
																					0	8	0	5		80x 50 mills
																					1	2	0	6		120x 60 mills
																					1	2	1	0		120x100 mills
																					1	8	0	8		180x 80 mills
																					1	8	1	2		180x120 mills
																					2	3	2	1		230x210 mills
																					3	2	1	6	for tantal chips	3,2x1,6mm
																					3	5	2	8		3,5x2,8mm
																					6	0	3	2		6 x3,2mm
																					7	3	4	3		7,3x4,3mm
																								1	for elco chips	
																							1	A		
																						4	x	3	for trim chips	4x3mm
																						4	x	4		4x4mm
																						D	x	x	for inserted trim	diameter + num.number
																				x	x	x	x	x	**dim. for arrays**	
																				D	I	P	X	x		dual in line package
																				S	I	P	X	x		single in line package
																									typical specs for cap	
																						1	0	5		max. temp. range
																							S	A		mains
																							X	Y		mains XY
																								X		mains X
																								Y		mains Y
																							H	V		high voltage

CHOKE KEYCODE

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2				
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5				
C	H	O	K	E																					CHOKE	keyword		
																									small pcs			
						A	X																			mounting	axial	
						R	A																				radial	
										S																properties	shielded	
									E	S																	electrostatic shielded	
									N	S																	not shielded	
									M	S																	magnetic shielded	
																									large pcs			
						T	O																			toroid		
									V																		horizontal mounting	
									H																		vertical mounting	
																										typical applications		
						M	A	I	N	S																	mains	
						S	M	P																			smp	
						H	O	R																			hor	
						V	E	R																			ver	
												*	*	*	*	,	*	*								numeric value		
																			u	H						unit	uH	
																			m	H							mH	
																					*	*	A	*				current
																						A	D	J		facilities	adjustable	

DIODE KEYCODE PART 2.1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
D																									**DIODE**		keyword,diagram seq.
																										inserted	
	#																									surface mounted	
		L	E	D																					**LED**		
						D																				diameter	
							x																				numeric dimension
						R																				rectangular	
							*	*	x	*	,	*															numeric dimension
						S																				square	
							X	x	,	x																	numeric dimension
						B	A	R																		bar display	
									*	*																	numeric quantity
													S														side entrance
													T														top entrance
															I	R											infra red
															x	x	x										color
															x	x	x	/	x	x	x						color/color common
															x	x	x		x	x	x						color/color separete
																							H	E			high efficiency
																							L	C			low current (2mA)
																							S	B			super bright
															H	O	L	D	E	R							
																			.	.	x	x	X	X			full industry part number
		Z	E	N																					**ZENER**		
						x	x	x	V	x																voltage	
												x	W	x	x											power	
																	B									tolerance	b:2%
																	C										c:5%
		X	X	X	x	x	x	.	.	.															**FULL INDUSTRY PART NUMBER**		
									.	.	.	x	x	x	X	X	X										
																	R										rectifier
																B	R										bridge rectifier
															F	S	R										fast soft recovery rectifier
															F		R										fast recovery rectifier
															T	V	S										transorb
																S	W										switch
															C	A	S										cascade
															P	H	O										photo
															D	E	T										detector
															P	I	N										pin diode
															V	A	R										varicap
															S	C	H										schottky diode
														A	F	S	R										avalanche

DIODE KEYCODE PART 2.2

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2			
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5			
																			X	X	x	x	.		case		
																			M	M	E	L	F			surface mounted	
																			M	E	L	F					
																			S	D	T	2	3				
																			S	O	T	1	4	3			
																			S	O	T	2	2	3			
																			S	O	T	8	9				
																			S	O	D	8	7				
																			S	O	D	6					
																			S	O	D	1	5				
																			D	P	A	C	K				
																										inserted	
																			D	O	7						
																			D	O	1	3					
																			D	O	1	4					
																			D	O	3	5					
																			D	O	4	1					
																			S	O	D	1	8				
																			S	O	D	5	7				
																			S	O	D	6	1				
																			S	O	D	6	4				
																			S	O	D	8	1				
																			T	O	9	2					
																			T	O	2	2	0				

TRANSISTOR KEYCODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
Q																														TRANSISTOR: keyword.		
																														inserted		
	#																													surface mounted		
		X	X	X	x	x	x	.	.	.	.																			full industry part number		
													P																		photo	
													D																		darlington	
													F																		fet	
													T	H																	thyristor	
													2																		dual transistor	
														N																	npn	
														N	P																npn/pnp pair	
														P																	pnp	
													T	R																	triac	
																S	S															small signal
																P																power (I>=1A)
		A	C	C																										accessories		
						A	L		O	X		W	A	F	E	R																
						F	I	X		C	L	I	P	S																		
						H	T	S	N	K																						
						I	N	S	U	L																					insulated	
												B	U	S	H																	
												C	A	P																		
												L	E	X	A	N																
												M	I	C	A																	
												S	H	E	E	T																
												W	A	S	H	E	R															
						M	O	U	N	T	I	N	G		P	A	D															
																		X	X	x	x	.	.							case		
																		*	*	x	*	*	*							dimension		
																									ß	ß	ß	ß	ß	ONLY ON MAPICS		
																														data		
																									x	x	X				voltage	
																												x	X		current	
																S	S								0	3	5	4	0		35 volt, 40mA	
																S	S								0	3	5	A	1		35 volt 100mA	
																P									0	6	0	1	2		60 volt 12A	
																P									1	5	2	0	8		1500 volt 8A	

INTEGRATED CIRCUIT KEYCODE

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	
U																									**INTEGRATED CIRCUIT keyword**
																									Inserted
	#																								Surface mounted
																									Lin,Analog,Cpu
		X	X	x	x	.	.																		industry pn. numeric part
										X	X	x	x	.	.	.									industry pn. alphabetic part
																									Memory
		D	R	A	M																				Dynamic RAM
		S	R	A	M																				Static RAM
						*	*	*	*	K	x	*	*												Organization
															2	5									Access time 25 nsec
														-	2	5									250 nsec
																									Package
																									Inserted
																	D	I	P						Dual In Line
																	S	I	P						Single In Line
																	Q	I	P						Quad In Line
																	Z	I	P						Zigzag In Line
																	P	G	A						Pin Grid Array
																	P	B							Piggy Back
																	S	D	I	P					Shrink Dual In Line
																	T	O	1	0	0				
																	T	O	2	2	0				
																	T	O	3						
																	T	O	3	B					
																	T	O	3	9					
																	T	O	9	2					
																									Surface mounted
																	Q	F	P						Quad Flat Package
																	S	O							Small Outline
																	S	O	L						Small Outline Large
																	T	S	O	P					Thin Small Outlirte Package
																	P	L	C	C					Plastic Leaded Chip Carrier
																	L	C	C	C					Leadless Ceramic Chip Carrier
																	S	O	J						Small Outline J bend
																	F	P							Flat Pack
																	V	S	O						Very Small Outline
																			X	X	x	x	.		Total number of pins
																									Material
																								P	plastic 0 to + 70°C
																								C	Ceramic 0 to + 70°C
																								I	Industrial -25 to + 85°C
																								B	Burn-in
																								M	Mil specs -55 to +125°C

PRINTED CIRCUIT BOARD KEYCODE

									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2			
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5			
P	C	B																							printed circuit board		
				S																						single side	
				D																						double side	
				M																						multilayer	
				C																						smd, Chips	
						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			customer description

CONNECTORS GENERAL RULE																									
									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	
J																									CONNECTOR : keyword,diagram seq.
																									inserted
	#																								surface mounted
		x	x	x	x	x																			kind of connectors, see page J2
								M																	male
								F																	female
								N																	male aNd female
									B																mounted on printed circuit Board
									C																mounted on Chassis
									W																mounted on Wire
									R																mounted on flat or Ribbon cable
										T															top entrance,input output angle 180∞
										S															side entrance,input output angle 90∞
										B															bottom entrance,input output angle 360∞
												P													pin, =number of circuits
												D													diameter
												M													metric dimension
												A													ampere
												H													widtH
															X										numeric quantity or dimension
														x	X										numeric quantity or dimension
													x	x	X										numeric quantity or dimension
													X	x	,	x									numeric quantity or dimension
																	S								thicknesS dimension
																	Q								wire section area in mm2
																	L								length
																	E								pitch in raster E=2,5 or 2,54mm
																	R								pitch in mm
																	G								anGle between two successive pins
																		X							numeric quantity or dimension
																		X	x						numeric quantity or dimension
																		X	,	x	x				numeric dimension
																		X	x	,	x				numeric dimension
																		X	x	x	x	.	.		numeric dimension or sum formula
																	A	W	G						american wire gauge
																				X	x		x	x	numeric dimension of AWG
												X	x	x	x	.	.								start description commun pcs.connector
																.	.	.	.	.	x	x	x	X	end description connectors
SPECIAL RULE																									
		B	S	C																					made by barco special components
								X	X	P															number of pins
											X	K													number of keys
													S												single input
													D												double input, top and bottom
														B											for printed circuit board
														W											for wire terminal
																X	X	X	X	X	X	X	X	X	use on
								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	modified by barco special components

CONNECTOR TYPE	DESCRIPTION	MANUFACTURER
1 2 3 4 5 6 7 8 9 10 11 12 13 14		
1189	wire to wire or board connector	molex
1190	wire to wire or board connector	molex
1292	wire to wire or board connector	molex
1380	wire to wire or board connector	molex
1951	wire to wire or board connector	molex
2870	wire to wire or board connector	molex
7429	wire to wire or board connector	molex
7430	wire to wire or board connector	molex
8020	wire to wire or chassis connector	elco
ALLIG	alligator terminal	
ANT	antenne connector	
BANAN	banana connector	
BAT	battery connector	
BLOCK	terminal blocks	weiland,phoenix,wago
BNC	bajonet coax connector	amp,
BSC	wire and board interconn system	bsc
CHAMP	equivalent is the blue ribbon conn.	amp
CINCH	audio or video connector	
CIS	commercial interconnection system	amp
CRT	cathode ray tube connector	smk,hosiden,sony
D	d din connector common pcs	amp,burndy,souriau
DA15	d din connector typical pcs	
DB25	d din connector typical pcs	
DC37	d din conn. typical pcs	
DE09	d din conn. typical pcs	
DE15	d din conn. all pcs,double density	
DIP	dual in plastic connector	3m
EDGE	male connector is the pcb	amp
EE	sensor connector	omron
EHT	extra high tension connector	alden,hobson,sangyo
EMK01	coax connector	kathrein
EMK71	coax connector	kathrein
EMK76	coax connector	kathrein
EURO	euro din connector din41612	amp,burndy
FFC	flat flex connector,ziflo	burndy,amp,sumitomo
FLEX	connector for sil cable 1,27	3m
H	wire to board conn. pitch 2,5mm	jst
HONDA	video audio connector	smk
JUMP	jump conn. between pcm 2,5/2,54	amp,
LS	speaker connector	preh,
LV	wire to board conn. pitch 6,2mm	jst
M_DIN	mini-din connector,svhs	amp
MAINS	mains connector,din norm,3 pins	feller,schaffner
MAS	wire to board connector,pcm5,08	panduit
MCARD	memory card connector	itt,cannon
MELOK	metalok bantam connector	burndy
MKF	conn. for sil cable 2,54	stocko
MKFL	conn. for sil cable 2,54,friction lock	stocko
MKS	conn. for deflection yoke 30ax	stocko
MM	mini-match	amp
MMC	mini-mate	burndy

MMH	mini-mate	burndy
MOD1	modulair system,single raw	amp
MOD2	modulair system,double raw	amp
MOLEX	kind of single leaf (amp)	molex
MPF	wire to board conn pcm3,81/5,08/7,62	stocko
MR	miniature rectangular connector	amp
MT	mass termination system	amp
MTEDGE	mass termination,edge (on pcb)	amp
MT_FL	mass termination -friction lock	amp
OB	round connector	lemo
OXLEY	clip-in pcb and wire connector	oxley
PERI	video,rgb,audio connector	esser,preh,metallo
PHONE	jack connector 2,5/3,5/6,3	smk,
PIN		
REC	receptable	amp
RING	ring terminal	amp,givatec
ROUND	din connector,pins 3/4/5/6/7/8	hirschman,vogt,preh
RTT	telephone connector	rtt
RTV	radio tv connector	amp
SCREW	mounted on pcb	
SIL	single in line connector	amp
SL	single leaf connector	amp
SMB	coax connector	suhner;radial
SP	connector for focus yoke	smk
SPADE	spade terminal	amp,givatec,
SPADEI	spade terminal insulated	amp,givatec,
SV	wire to board connector,pitch 5mm	jst
TAB		amp,vogt
TM	trio mate connector	amp
TUBE	receiver tube	
U0.3	U socket,raw spacing 0.3	amp,burndy
U0.6	U socket,raw spacing 0.6	amp,burndy
U BAT	U socket with battery	
U INT	U interface connector,	
ULTREX	wire to board connector pcm 5/7,5	amp
UMNL	universal mate-in-lock	amp
UTG	round connector	burndy,vero
V	wire to board conn,pitch 7,5 & 5mm	jst
VHR	wire to board connector pcm3,96	jst
XLR	speaker or mains connector	cannon,binder,
ZG20	coax connector	wisi

COMMON PARTS start pos 13																									
									1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	**DESCRIPTION**
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	
												A	D	A	P	T		C	I	N	C	H			adapter to cinch connector
												A	D	A	P	T		F	_	F					adapter female female
												A	D	A	P	T		M		2	F				adapter male - 2x female, T form
												A	D	A	P	T		M		F					adapter male - female
												B	R	A	C	K	E	T							
												E	H	T											extra high tension
												H	O	O	D										
												L	O	C	K		S	C	R		M	3			screwlock M3/M3
												L	O	C	K		S	C	R		4		4		screwlock 4.40/4.40
												L	O	C	K		S	C	R		4		M	3	screwlock 4.40/M3
												L	O	C	K		S	C	R		L	x			screwlock length part M3
												L	O	C	K		S	P	R						springlock
												S	L	E	E	V	E								
												S	P	A	C	E	R								
												X	x	x	x	x	x	x	x	x	x	x	x	x	crt description

LAST WORD, REF. POS. 25	DESCRIPTION
4PF	max.capacitance between pins
3KY	key position is on or near circuit 3
4X IN LINE	block of four connectors in line
6KY	key position is on or near circuit 6
9V	9volt
AG	silver plating
AM	amplitude modulation application
AU	gold plating
AUD	audio
AUTOSPL	autosplice,reeled contact form
BLA	black
BLU	blue
BRO	brown
BS	british standard
CLIPS	cable retainer for connectors
COAX	coaxial application for connectors
CVR	CoVeR (protection)
CPL	complete
CRIMPX,x	crimp terminal for cable diameter x,x
CUP	typical part of a connector
DUL	DUaL spring contact
ESD10	kind of antenne connector
FIX	all holders,fasteners
FLAT	typical for flat cable
FLATETCH	flat etching connector
FRM	FRaMe
FU	FUse
GRA	GRAy
GRE	GREen
HSG	cabinet,shell,hood,HouSinG,case
HV	High Voltage
ISO	ISOlation
KY	KeY, polarisation system
L	L form
LATCH	metal shell with spring contact
LOCK	
LG	LonG
LOW	
MET	METal
MONO	
NP	Non Polarised
ORA	ORAnge
PCB	typical application on printed circuit board
PCS	pieces
PIN	male contact for a connector
PLANE	
PMF	Power Mains Filter
P	Polarised
PUSH	connection form,push to connect
PVC	all plastics
RED	

RT	ReeL tapped
REV	REVerse system, all plugs are sockets
SCREWL	screwlock
SEAL	typical part of a connector
SEL	mains selector
S FU PMF	mains selector,fuse,power mains filter
SENSOR	typical connector application
SEV	swiss electrotechnical committee
SHLD	SHieLD
S	Short
SIL	single in line
SLV	SLeeVe
SN	tin plating
SOC	SOCket
SPG	SPrinG
SPR	SPaceR
SPMF	power mains filter with switch
SQUARE	form
STER	stereo
SW	SWitch
TAB	termination is a tab pin
TABx,x	terminal layout
TAG	solder terminal
TEST	testpoint
TRF	transformer
TUL	tulip ,typical form of a contact
UL	underwriters laboratories
VHFUHF	
WSHR	WaSHeR
WHI	white
WRAP	wrapping pins
YEL	yellow
ZFIX	connector pcb fix in Z form

Code	Resistor Tolerance	Color
A	+/- 0,05 %	Grey
B	+/- 0,10 %	Violet
C	+/- 0,25 %	Blue
D	+/- 0,50 %	Green
F	+/- 1 %	Brown
G	+/- 2 %	Red
H	+/- 2,50 %	
J	+/- 5 %	Gold
K	+/- 10 %	Silver
L	+/- 15 %	
M	+/- 20 %	Without

Code	Capacitance Tolerance	
	≥ 10 pF	**< 10 pF**
B	+/- 0,10 %	+/- 0,10 pF
C	+/- 0,25 %	+/- 0,25 pF
D	+/- 0,50 %	+/- 0,50 pF
F	+/- 1 %	+/- 1 pF
G	+/- 2 %	+/- 2 pF
H	+/- 2,50 %	
J	+/- 5 %	
K	+/- 10 %	
L	+/- 15 %	
M	+/- 20 %	
N	+/- 30 %	
P	+ 100% / - 0 %	
Q	+ 30% / - 10 %	
R	+ 30% / - 20 %	
S	+ 50% / - 20 %	
T	+ 50% / - 10 %	
U	+ 80% / - 20 %	
V	+ 100% / - 10 %	
W	+ 20% / - 0 %	
Y	+ 50% / - 0 %	
Z	+ 80% / - 20 %	

2.1 RGB BOARD

General.

The RGB board amplifies the RGB signals, processes the sync pulses and provides AKB (Automatic Kinescope Biasing). AKB ensures long-term stability of the black level in RGB signals, which guarantees stable contrast ratio for each colour and accurate colours, even at low intensity.
The module offers loopthrough for RGB; sync on green, composite sync or H & V sync.; sync. polarity is selected automatically. Picture controls are DC controlled.

On the RGB main module three SMD submodules are mounted:

- differential input (U1), for RGB and sync signals
- AKB (U12)
- Sync & Scaling (U5)

Optional RGB board versions are described in section 2.1.8 Customized Versions (Options)

2.1.1 IOPC DIAGRAM

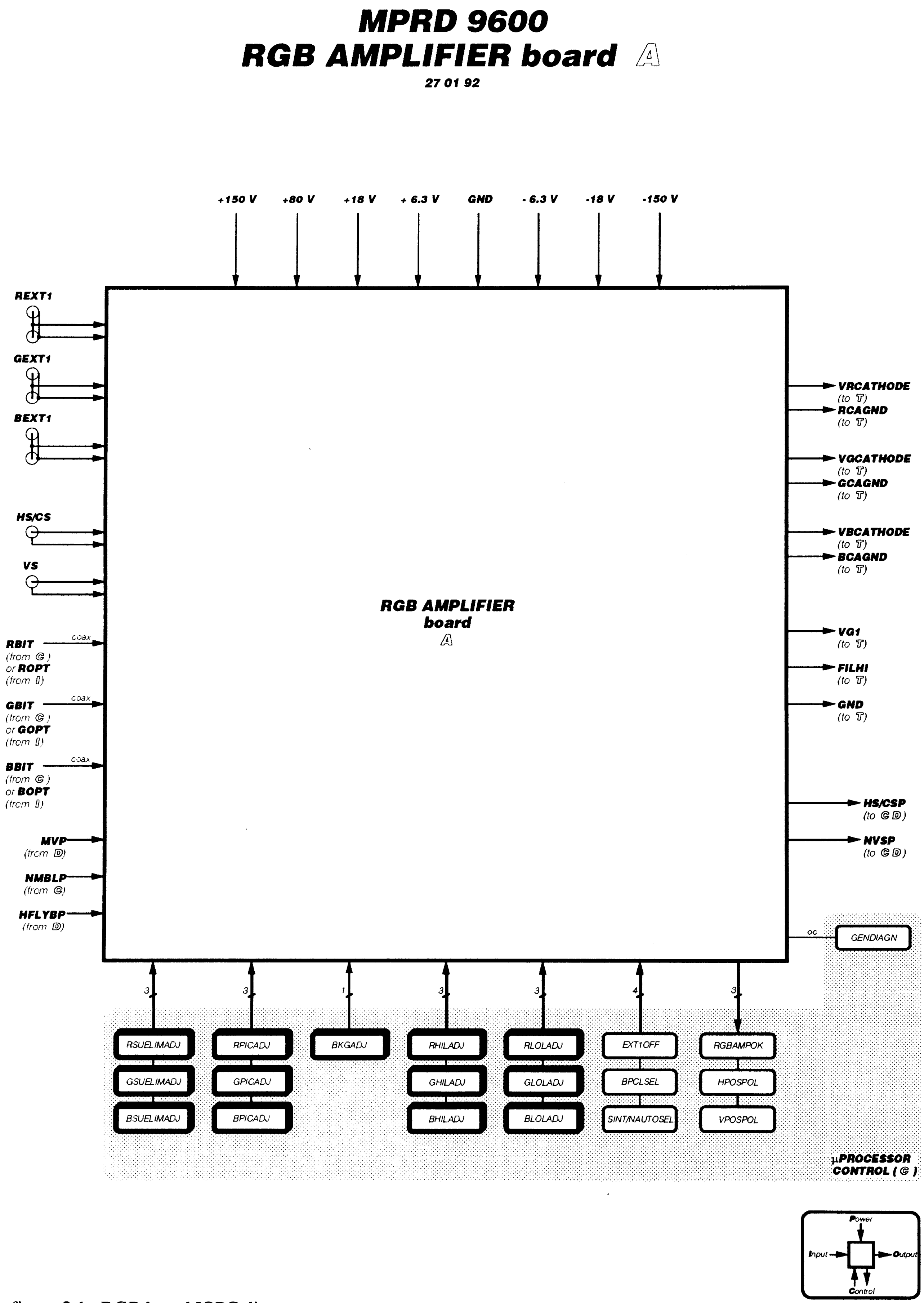


figure 2.1 : RGB board IOPC diagram

2.1.2 BLOCK DIAGRAM

MPRD 9600
RGB AMPLIFIER

27 01 92

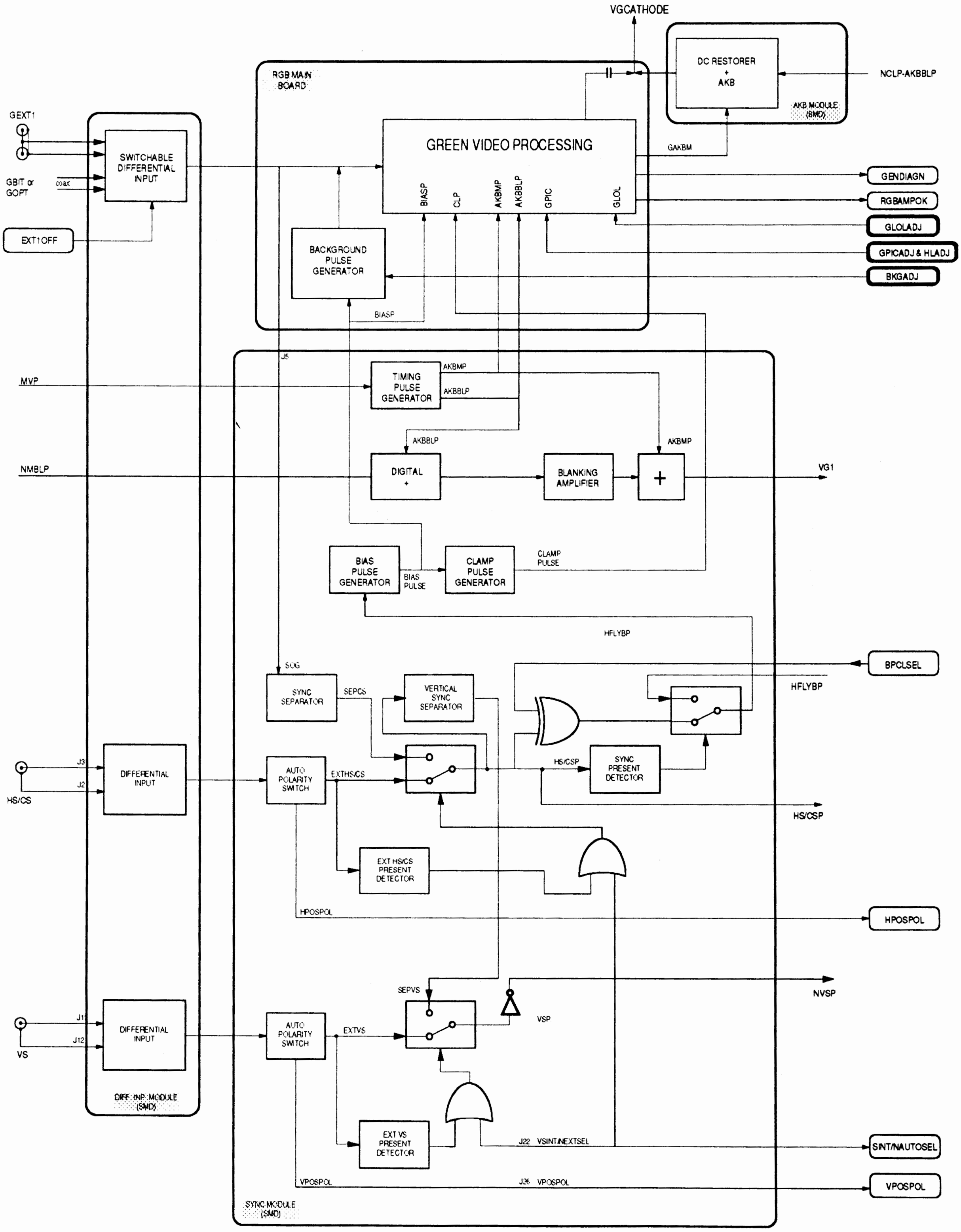


figure 2.2 : RGB board block diagram

2.1.3 CIRCUIT DESCRIPTION

RGB MAIN MODULE.

RGB, SYNC Inputs (RGB main module, sheet 2 of 8)

The RGB inputs (J1,J5,J8) offer loopthrough facilities (J2,J6,J9), as an option the outgoing RGB connectors can be auto terminating the RGB output connections with R4,5,6. If not, the loopthrough connectors must be terminated externally in 75Ω.
Horizontal Sync/Composite Sync Input (HS/CS) is connected via J11, Vertical Sync Input (VS) or CS Output is connected via J12, in case of CS it can be auto terminated with R8 (option).
J4,J7,J10 receive RGB from BIT, they are terminated in 75Ω; if an optional second RGB input is installed, these plugs will receive the outputsignal of the second RGB input board, via the optional RGB input board BIT can be selected.
J4,J7,J10 use sync on green.

As the RGB circuits are identical, only the G part will be explained.

The G signal is capacitively coupled to the differential input amplifier by C8,C9.

Amplifiers.

The schematic diagram, shown on RGB main module: AMPLIFIERS (sheet 1 of 3), contains components that are not used in MPRD9600 applications.

List of not mounted components : U2,3,4,U18
R9,10,11,12,14,16,17,18,19,20,21,22,23,24,25,26,27,31,32,33,43,46,49
C22,23,24,25,26,27,28,29,30,32,33,34,35,36,37,38,40,41,42,44,46,48,50,51,
52,122,123

GICONHI, coming from the differential input, is connected to U8 via C45; DC bias to the video input is through R29. The low frequency roll-off of the amplifier in U8 is set by these two components; R97 extends the black level clamp range. The gain of the amplifier (= contrast) is controlled by GHILADJ*. R45 extends the high frequency gain of the video amplifier by compensating for some of the internal high frequency roll off, it allows to trim the gain of this channel to correct for differences in the three CRT cathodes. C66,C70 prevent noise entering the IC, C56 is a clamp capacitor, C62 is the contrast capacitor, R36,C57,71 reduce the noise on the +12V, R39,40 determine the clamp level (0,52V = black). R51 feeds the video outputsignal back to the inverting clampinput. The black level is shifted down 3.9V by D2, R60 is connected to the -5V to increase the outputswing (U14,pin1 = -3V for black); the outputsignal (U8,pin8) is connected to Q2 via U9,pin12,14 and R56.
The videosignal enters at U14,pin1 and leaves at pin 8, U14 drives the green cathode, coupled via C105 (and a series resitor on the CRT socket board). L8,C102 filters the +80V, D28,31 are protection diodes, C93,94 filter -/+5V.
Shortly after vertical retrace, AKBBLP will be high, U9,pin13,14 will be closed, the base of Q2 is connected to GLOLADJ* (buffered by C129) for AKB-measurement (see also description AKB,U12).

Power and Blanking (RGB main module, sheet 3 of 8)

Q9,10,11 can switch g1 to -75,0 or +5V.
The -150V is reduced to -75V via D19, R94 and D20, C117 is a smoothing capacitor, D14,17 are protection diodes. D19 blocks current going back to the power supply.
During scanning (AKB disabled, NAKBMP = 1; Q11 on), the blanking is controlled by NMBLP-AKBBLP (hor. , vert. and other purpose blanking); if NMBLP-AKBBLP goes low (=blanking required),Q8 will go off, Q7 will go on, charging C113 via R91 will open Q10, charging C112 via R90 will close Q9, g1 is connected to -75V. When NMBLP-AKBBLP goes high (= no blanking required), Q8 goes on, Q7 goes off, discharging C113 via R91 will close Q10, discharging C112 via R90 will open Q9, g1 is connected to 0V.
During AKB, beamcurrent is required and blanking must be disabled. NMBLP-AKBBLP will remain high because AKBBLP is high, g1 is connected to 0V. When NAKBMP goes low, Q11 will go off and g1 is connected to +5V.

DIFFERENTIAL INPUTS (U1) (RGB submodule (U1), sheet 4 of 8, 5 of 8)

RGB Inputs

The differential input amplifier for green has additional circuitry for SOG, the green channel will be described.

The RGB have double differential inputs, G1HI,G1LO and G2HI,G2LO.
G1HI,G1LO receive the external inputsignals, via the connectors J1,5,8 on the rear panel (=INP1). G2HI,G2LO receive the internal signal from BIT or from the optional second input module (INP2).

The inputsignal is capacitively coupled to G1HI, G1LO, R94,116 bias for the bases of Q25,26.
The temperature compensated constant current source Q2,D12, is connected to Q9,10. Only one of both (Q9,10) can be on, depending on the level of GEXT1OFF
When GEXT1OFF is high, Q22 will be saturated, the collectorcurrent goes through D10, R52,53, the cathode of D10 will be at -7,3V and the b-e junction of Q9 will conduct. As Q22 is saturated there will be 0,7V on the collector, the base of Q24 will be at 0,4V, Q24 is off, the voltage drop over R56 is 0V and the b-e junction of Q10 is biased in reverse direction, Q10 is off and so are Q25,26.
The current source is connected to R30,32 via Q9; G2HI,G2LO is selected. As the base of Q9 is on a fixed potential, the emittervoltage of Q9 and the collectorvoltage of Q2 will not change; Q2 will not be modulated when Q20,21 are driven with a common mode signal, increasing the common mode rejection. The amplification is determined by R30,32; R31,C14 increase the amplification in the high frequency range; R78,86 increase the stability. Only part of the current through R10 goes through Q20, the other part goes through Q23. The base of Q23 is forced to a fixed potential by R54,55, D17,49, and so is the emittor; the current through R10 will be constant as well. Only part of the current through R9 goes through Q21, the other part goes through Q8. The base of Q8 is forced to a fixed potential by R54,55, D17,49, and so is the emittor; the current through R9 will be constant as well. This means that the differential amplifier Q20,21 is fed by a constant current and voltage, eliminating feedback, increasing high frequency stability by lowering the influence of the Miller capacitor.
The voltage differences at the input of the differential amplifier are converted into a current difference through Q23. The collectorcurrent of Q23 is converted into a voltage by R113, and buffered by Q39, an emitterfollower with low outputimpedance (not very sensitive to capacitve loads); D36 ensures temperature stabilisation for Q39. The outputsignal is present across R112.

Sync on green
The collectorcurrent of Q8 is converted into a voltage by R51, and inverted by Q41 because the other side of the differential amplifier was taken as signalsource; D32 ensures temperature stabilisation for Q41. The outputsignal is present across R108.

Protection circuits
D33,34,37,38 limit the inputvoltages on the bases of Q20,21,25,26; R110,115,129,132 limit the current through th diodes during flash.
C37,39, connected to the GxLO inputs, shorts undesired high frequency components.

Brightness
GSUELIMP is synchronised with the hor. defl. and has a variable pulse-amplitude.
During backporch (or synctip) the pulse goes to the analog level (positive or negative, determined by the brightness setting). The pulse forces a current through R109, as the voltage over R10 is kept constant, the current will go through Q23 and is found back over R121 and amplified by Q40. On the RGB board, the level of this additional pulse will be the reference for clamping, the videosignal will be dc-shifted by the amplitude of the GSUELIMP (=brightness control).

Sync Inputs

The horizontal or combined sync signal is connected to the HS/CSLO,HS/CSHI input, the vertical sync signal is connected to the VSLO,VSHI input.
HS/CSLO,HS/CSHI receive the syncsignal via connector J11 on the rear panel, VSLO,VSHI receive the syncsignal via the connector J12 on the rear panel. As both differential amplifiers are identical, only the HS/CS channel will be described.

Q5,D4,R2,22 is a temperature compensated constant current source. The bases of Q36,37 are DC-biased by R83,71; the amplification is determined by R72,74; D5,6,20,25 are protection diodes; R98,99 limit the current through the protectiondiodes during flash; C28 shorts undesired HF-components on HS/CSLO to ground, the outputsignal is capacitively coupled via C26

AKB (U12) (RGB main module : AMPLIFIERS sheet 1 of 8 and RGB submodule (U12), sheet 6 of 8)

During AKB measurement, the cathode is forced close to cut-off, g1 of the CRT is switched from 0 to +5V, this wil result in a very small cathode current. This current is sensed by R76 (during normal scan, the voltage over R76 is limited to 2.8V by D5). The cathode clamp voltage will be regulated to obtain a cathode current of approximately 1µA.
The outputstage of U14 is a class AB push-pull amplifier with additional buffering, during the measurement of the current through R76 the bias current in the outputstage must not interfere with the supplementary AKB current. For this reason, the input of the internal buffer in U14 will be short-circuited (via U14,pin6), the outputstage will be insulated from the buffer and will not interfere.
U14,pin6 is driven by GAKBBLP, via Q5 and R74.
The signal across R76 is amplified by U4 (2 stages), the signal leaves at U4,pin7. During AKBBLP = 1, U3,pin14,13 will be closed, the amplified pulse is coupled capacitively via C16 to U3,pin15. During AKB measurement U3, pin15,1 will close, the signal enters a sample and hold circuit (C7,R6,U4,pin8,9,10).
If GAKBM pulses are present, U4,pin8 will be positive, C5 is charged via R5.
The voltage across C5 drives the clamp voltage regulator (U4,pin12,13,14,R7,16,55,83,C99,D24,Q8). If the voltage across C5 rises, U14,pin4 will go less positive, Uce of Q8 will rise. The sum of the voltages across R55,Uce Q8 and D24 equals the clamp voltage (= U_{C100}). This means that if the amplitude of the AKB measuring pulses rises, the clampvoltage will rise as well; the CRT is driven closer to cut-off and the amplitude of the AKB measuring pulses will decrease.

If no GAKBM pulses are present, or if their level is too low :

- U8,pin4 will not exceed U8,pin5 (approx. 50 mV),
- U8,pin12 will go low, led D6 will light,
- via D5 GENDIAGN goes low, via D4 RGBAMPOK goes low,
- the input voltage (U4,pin13) of the clamp voltage regulator wil decrease, U4,pin14 will go more positive,Vce of Q8 will drop and so will the clampvoltage,

- as soon as the voltage across C100 drops below a certain level, the Schmitt Trigger (U8,pin7,9,10,R27,49,67,68, 70,52) will be activated, the output pin7 goes high, via D12 U4,pin14 goes high, U4,pin14 goes lower and Vce of Q8 will increase. The voltage across C100 will rise, exceeding a certain level forcing U8,pin7 to go low again. As soon as AKB measuring pulses are present again they will regulate and stabilise the clamp voltage.

The DC-restauration (=clamping) must be disabled during AKB, for this purpose GNCLP-AKBBLP is used as trigger for clamping. When GNCLP-AKBBLP goes low (clamping required) C23 will be charged via R71, Q2 will be on, Q9 will be off. The current, powered by the +150V goes through R33, Q2, C31 (turning on Q7 for a short moment); the cathode is forced to the clamp voltage. When GNCLP-AKBBLP goes high, C23 will be discharged, Q2 goes off, Q9 goes on, Q7 goes off. During clamping D25,26 will conduct, during active video D25,26 will be off and the cathode is insulated from the clamp circuit.

SYNC & SCALING (U5)

Scaling (RGB sub module : SYNC & SCALING : SCALING sheet 8 of 8)

The signals iPICADJ, iHILADJ, iLOLADJ, iSUELIMADJ are generated on the processorboard; the are rescaled according to the needs of the RGB board.

Sync (RGB sub module : SYNC & SCALING : SYNC sheet 7 of 8)

SOG (Sync on green)

SOG, coming from the differential input amplifiers, is buffered by Q2; DC-restored (R19,29,C1) and clamped C12,D3. Q3 amplifies approximately 6 times to increase noise immunity; the collectorsignal is clamped by C16,D4, R101 stabilizes the current through D4 to reduce sync phase jitter. The output of comparator U1,pin12 is only driven by the sync pulses and connected to the switch input line U8,pin1 (Y1B).

HS/CSICON

U1,pin7,9,10 is a pulseshaper to reduce the risetime of HS/CSICON, followed by an autopolarizing circuit U10,pin4,5,6,R69,C26. Independent from the sync polarity U10,pin6 will deliver positive sync ouput. Negative sync polarity will charge C26, U10 will invert the signal on pin5; positive sync will not charge C26, U10 will buffer the signal on pin5. U10,pin6 is followed by an 'external sync present detector' R67,75,D18,C30; the signal is inverted by U9,pin1,2 and connected via D5 to the switch control line U8,pin10 (SB). U10,pin6 is also connected to the switch input line U8,pin2 (Y0B)

If U8,pin10 is low (= external sync present) U8,pin2 (external sync) wil be connected with U8,pin15, U8,pin10 is high (= external sync NOT present) U8,pin2 (SOG) will be connected with U8,pin15.

U8,pin15 (=ZB) is connected to inverter U9,pin5,6 (output NHS/CSP on J12) followed by a sync present detector R6,8,10,C5,6,D10,11,Q1(= invertor) connected to the switch control line U8,pin9 (SC). U8,pin15 is also connected to U10,pin2; depending on the level of BPCLSEL the U10,pin1,2,3 will act as an inverter or a buffer. U10,pin3 is connected to switch input line U8,pin5 (Y0C). If U8,pin9 is low (= no internal sync (SOG) and no external sync present) HFLYBP will be used as a substitute (deflection is active even if no sync is present). U9,pin6 also drives the vertical sync seperator R9,22,34,36,C15,31,D9,15,U10. The seperated vertical sync pulses are connected to switch input line U8,pin13 (Y1A).

VSICON

U7,pin2,3,7 is a pulseshaper to reduce the risetime of VS, followed by an autopolarizing circuit U10,11,12,13, R5,C3. Independent from the sync polarity U10,pin11 will deliver positive sync output. Negative sync polarity will charge C3, U10 will invert the signal on pin12; positive sync will not charge C3, U10 will buffer the signal on pin12. U10,pin11 is followed by an 'external sync present detector' R33,68,74,C25,Q4; the signal is inverted by U9,pin8,9 and connected via D8 to the switch control line U8,pin11 (SA). U10,pin11 is also connected to the switch input line U8,pin12 (Y0A). If U8,pin11 is low, U8,pin14 will be connected to U8,pin12 and the vertical sync pulses VSICON will be used, if U8,pin11 is high, U8,pin14 will be connected to U8,pin13 and the seperated vertical sync pulses VSICON will be used.

The signal at U8,pin14 triggers a monostable U2,pin1,2,3,13,14,15,R35,C18, output pin13 drives another monostable U2,pin5,6,7,9,10,11,12,R11,C7; at pin5 leaves VSP, at pin 12 NVSP.

The signal at U8,pin4 triggers monostable U12,pin1,2,3,4,13,14,15,R70,C21; output U12,pin13 is the BIASP used for BACKGROUND adjust. U12,pin4 triggers monostable U12,pin5,6,7,8,9,10,11,R76,C33. U12,pin5 drives invertor U13,pin3, at U13,pin2 leaves NCLP, this pulse (starting later and ending before BIASP ends) times the clamping.

MVPEAKP triggers monostable U14,pin1,2,3,4,13,14,15,R40,C8; output U14,pin13 triggers monostable U14,pin5,6,7,9,10,11,12,R71,C34. U14,pin4 is delayed by R37,C11; the delayed signal and output U14,pin12 are ANDed by U3,pin8,9,10. U3,pin8 is connected to U3,pin4,5 via R12,C10,D12 (delaying only the rising edges). Output U14,pin12 is inverted by U13,pin9,10; the outputsignal AKBMP times the AKB measurement and will go low earlier than all signals processed by U3,pin4,5,6.

Output U3,pin6 is connected to inverters U11,pin9,10, U11,pin11,12 an U11,pin14,15; the (identical) outputsignals are RAKBBLP,GAKBBLP and BAKBBLP.
U3,pin1,2,3 ANDs CLP and NAKBBLP, output U3,pin3 is inverted by U11,pin2,3, U11,pin4,5 and U11,pin6,7; the outputsignals are RNCLP-AKBBLP, GNCLP-AKBBLP and BNCLP-AKBBLP.

2.1.4 PCB LAYOUT

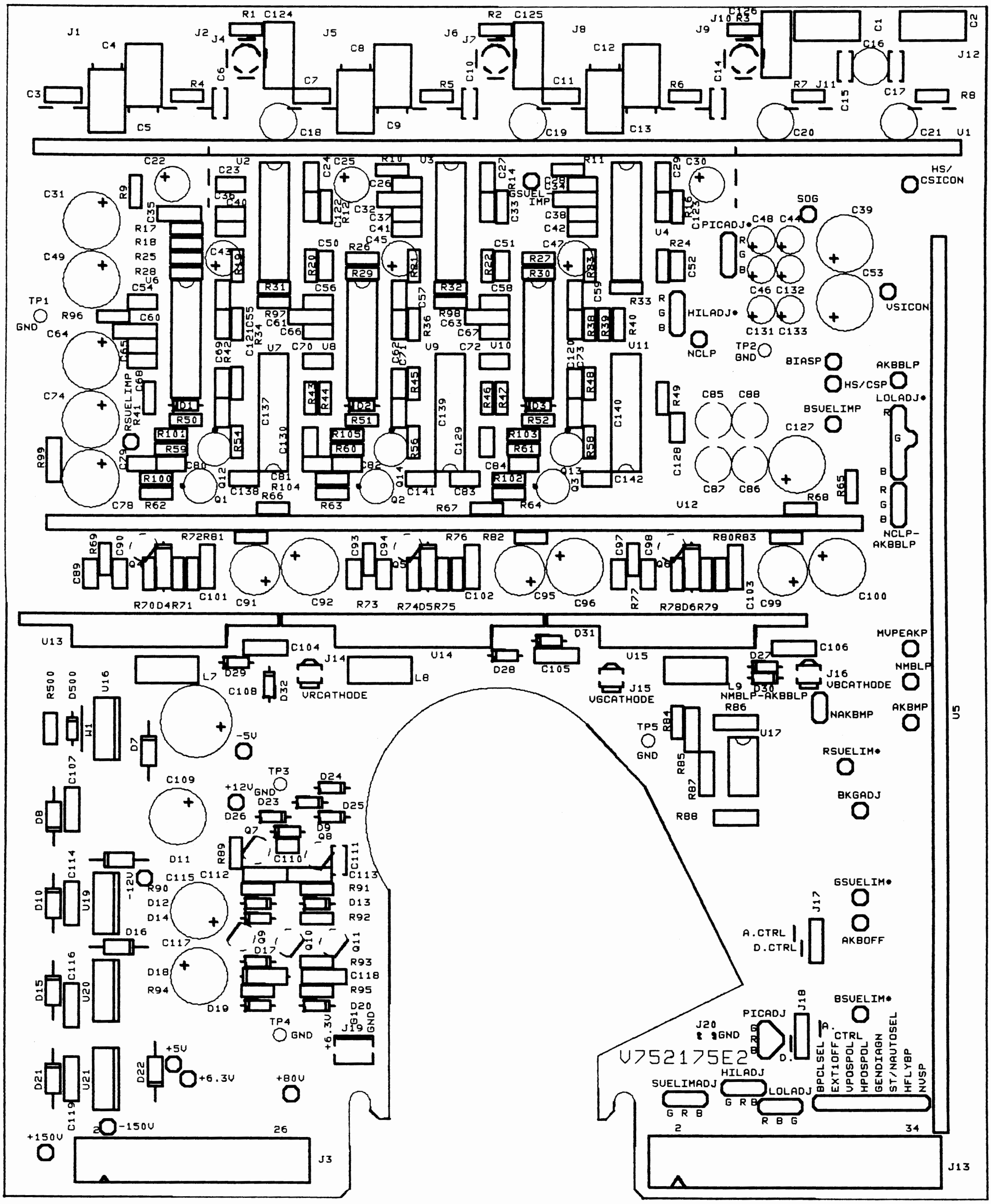


figure 2.3 : RGB BOARD component side

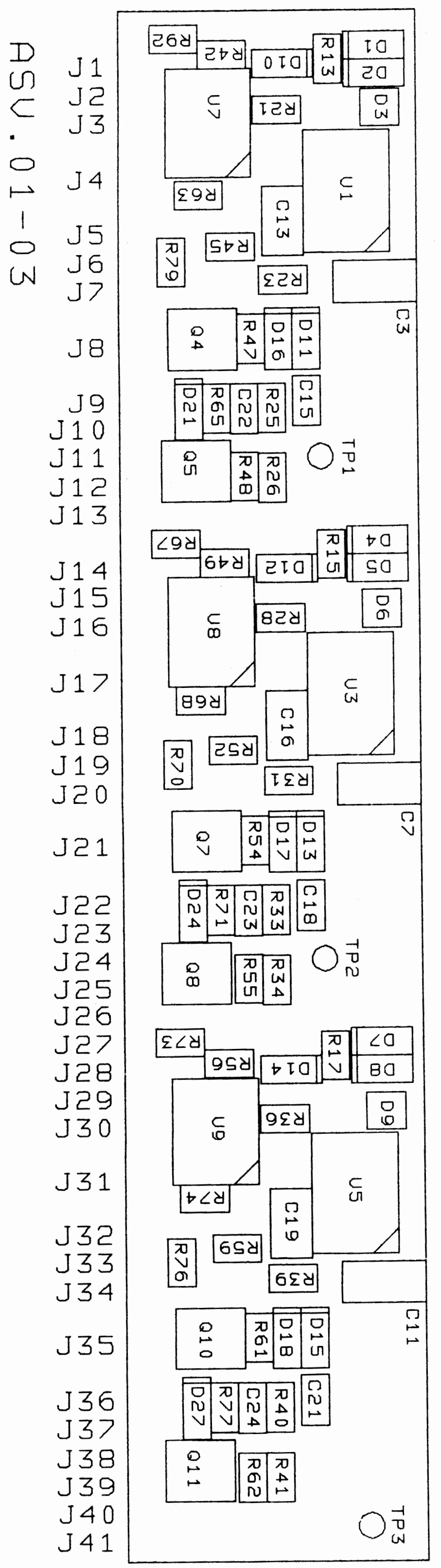


figure 2.4 : AKB SMD module component side

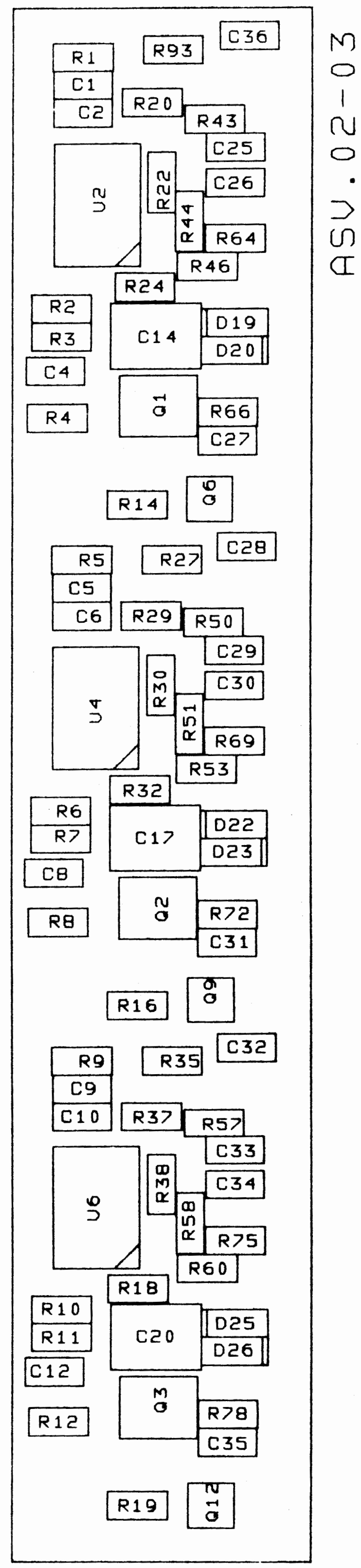


figure 2.5 : AKB SMD module solder side

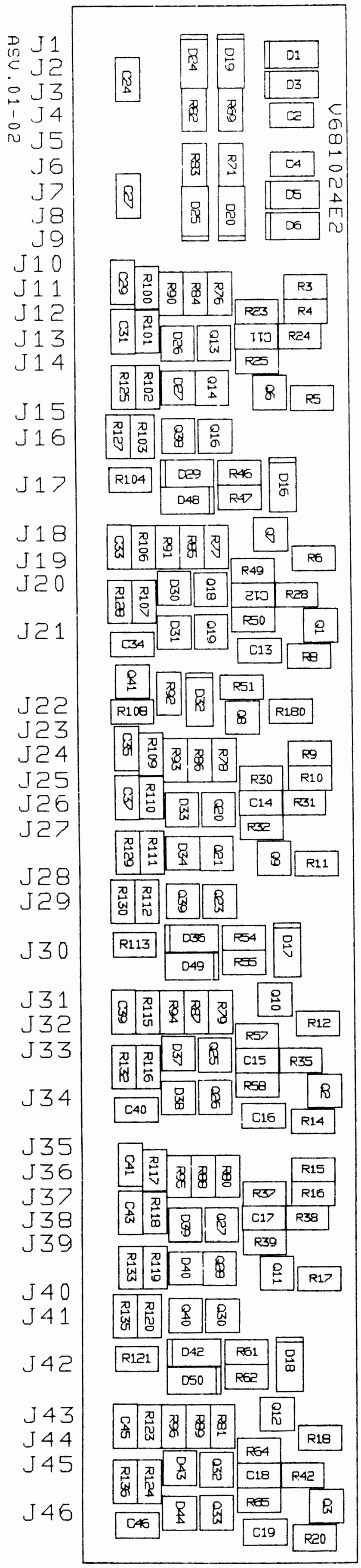


figure 2.6 : DIFF. INP. SMD module component side

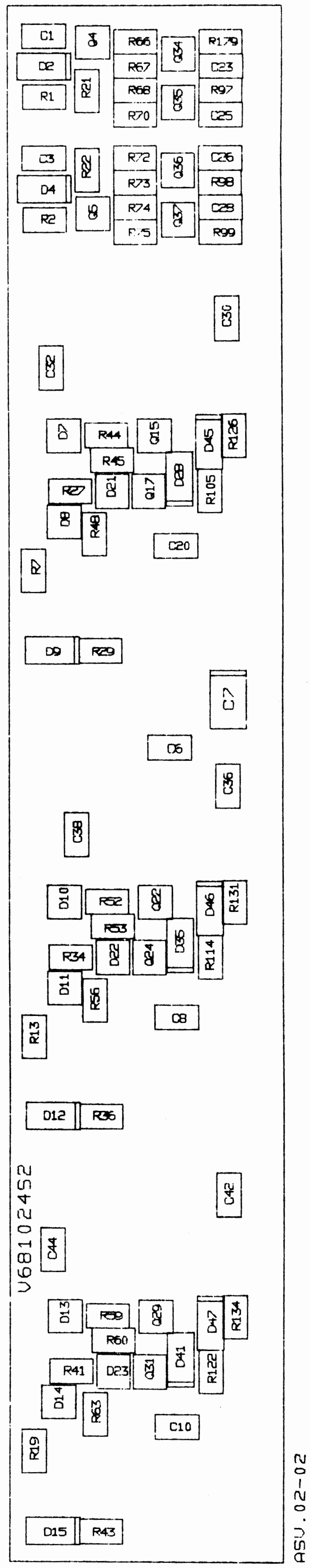


figure 2.7 : DIFF. INP. SMD module solder side

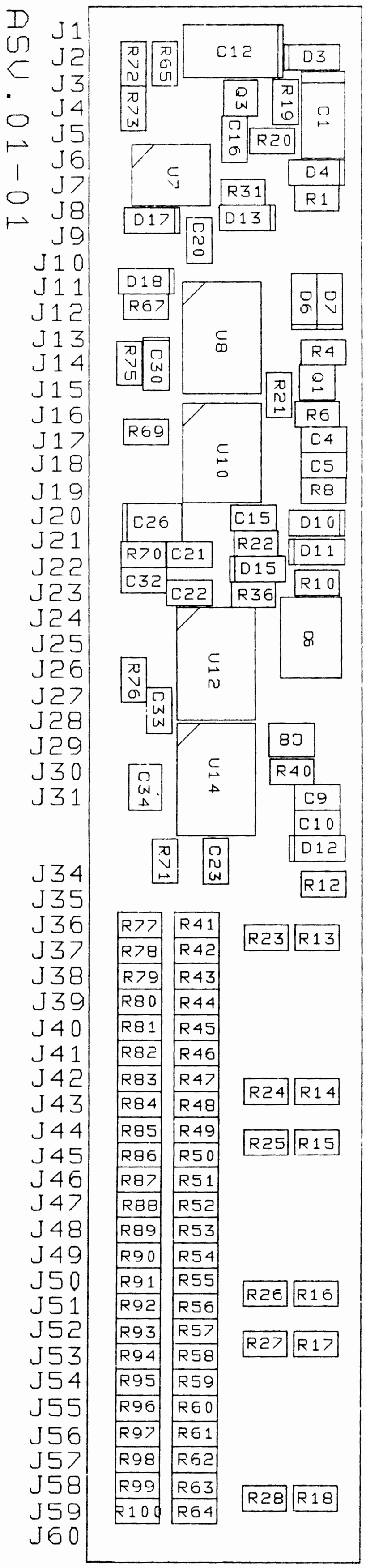


figure 2.8 : SYNC. SMD module component side

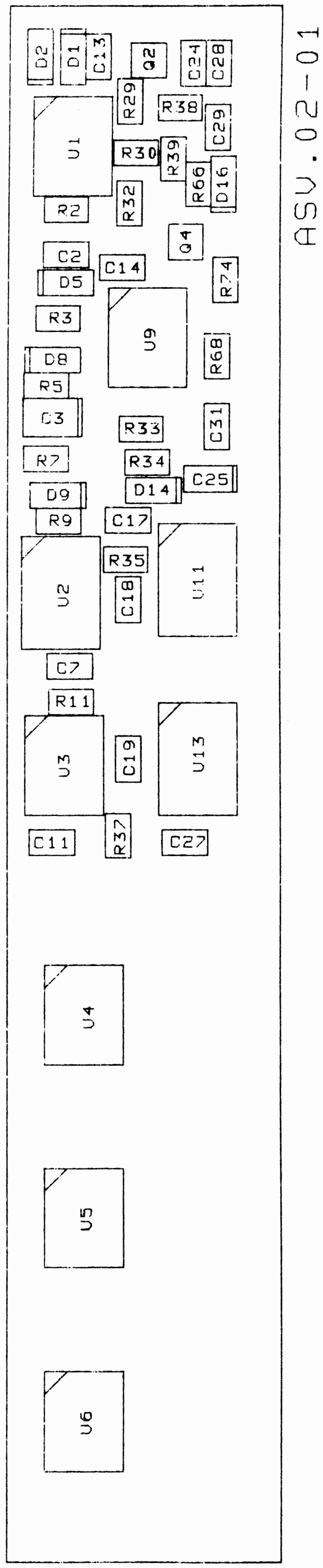


figure 2.9 : SYNC. SMD module solder side

2.1.5 PARTSLIST

Order number of a complete RGB BOARD BNC : V5631210 12 Date : 01/12/92

Order number	Description	Item
V101500	R MF H 1E F 0W4 E2	R93
V101512	R MF H 10E F 0W4 E2	R84
V101516	R MF H 22E F 0W4 E2	R100,R102,R104,R54 ,R56 ,R58
V101523	R MF H 82E F 0W4 E2	R42
V1015231	R MF H 75E F 0W4 E2	R1 ,R2 ,R3 ,R4 ,R5 ,R6 , R7 ,R8
V101524	R MF H100E F 0W4 E2	R45 ,R48
V101527	R MF H180E F 0W4 E2	R101,R103,R105,R62 ,R63 ,R64
V101528	R MF H220E F 0W4 E2	R34 ,R36 ,R38
V101529	R MF H270E F 0W4 E2	R69 ,R73 ,R77
V101533	R MF H560E F 0W4 E2	R59 ,R60 ,R61 ,R99
V101536	R MF H 1K F 0W4 E2	R65 ,R89 ,R92
V101537	R MF H 1K2 F 0W4 E2	R40
V101541	R MF H 2K7 F 0W4 E2	R50 ,R51 ,R52
V101543	R MF H 3K9 F 0W4 E2	R72 ,R76 ,R80
V101548	R MF H 10K F 0W4 E2	R28 ,R29 ,R30 ,R90
V101550	R MF H 15K F 0W4 E2	R41 ,R44 ,R47
V101551	R MF H 18K F 0W4 E2	R39 ,R96 ,R97 ,R98
V101555	R MF H 39K F 0W4 E2	R71 ,R75 ,R79
V101556	R MF H 47K F 0W4 E2	R70 ,R74 ,R78 ,R94
V101557	R MF H 56K F 0W4 E2	R66 ,R67 ,R68
V101560	R MF H100K F 0W4 E2	R91 ,R95
V101572	R MF H 1M F 0W4 E2	R81 ,R82 ,R83
V1026007	R MF H 10K F 0W6	R85
V1026357	R MF H 23K2 F 0W6	R87
V1026467	R MF H 30K1 F 0W6	R88
V1026517	R MF H 34K F 0W6	R86
C1113889	C EL RA 47M M100E2 85	C117
V1114165	C EL RA 10M M200E2 105	C100,C127,C92 ,C96
V1114689	C EL RA 470M M 16E2 105	C53 ,C74 ,C78
V111478	C EL RA 220M M 25E2 105	C109,C31 ,C39 ,C49 ,C64
V111484	C EL RA 100M M100E2 105	C108
V1114942	C EL RA 10M M 50E1 105	C131,C132,C133
V1114969	C EL RA 47M M 63E2 105	C115
V1115319	C EL RA 10M M 50E2 105	C43 ,C45 ,C47
V1115657	C EL RA 1M M200E1 105	C91 ,C95 ,C99
V111679	C EL BRA 10M M 25E2 85	C1 ,C12 ,C124,C125,C126,C13 , C16 ,C18 ,C19 ,C2 ,C20 ,C21 , C4 ,C5 ,C8 ,C85 ,C86 ,C87 , C88 ,C9
V112232	C NP0 MI 15P G 63E2	C11 ,C3 ,C7
V1127030	C X7R MU 100N K200E2 125	C101,C102,C103,C104,C105,C106, C112,C113,C118
V1127500	C X7R MU 8N2K 50E2 125	C110
V1127830	C X7R MU 100N K 50E2 125	C111
V1127870	C X7R MU 330N K 50E2 125	C107,C114,C116,C119
V1127930	C X7R MU 1M K 50E2 125	C60 ,C61 ,C63
V1127990	C X7R MU 100N K100E2 125	C120,C121,C128,C129,C130,C137, C138,C139,C140,C141,C142,C54 , C55 ,C56 ,C57 ,C58 ,C59 ,C62 , C65 ,C66 ,C67 ,C68 ,C69 ,C70 , C71 ,C72 ,C73 ,C79 ,C80 ,C81 , C82 ,C83 ,C84 ,C89 ,C90 ,C93 , C94 ,C97 ,C98

Order number	Description	Item
V1137160	C COG MU 220P J500E2 125	C10 ,C14 ,C143,C144,C145,C15 , C17 ,C6
V1316211	D 1N4148 SW DO35	D23 ,D24 ,D25 ,D26
V131627	D BAV21 SW DO35	D14 ,D17 ,D19 ,D27 ,D28 ,D29 , D30 ,D31 ,D32
C131646	D 1N4007 R DO41	D10 ,D11 ,D15 ,D16 ,D21 ,D22 , D7 ,D8
V131712	D ZEN 2V8 0W4 C DO7	D18 ,D4 ,D5 ,D6
C131720	D ZEN 6V2 0W5 C DO35	D9
V131752	D ZEN 75V 0W5 C DO35	D20
V131754	D ZEN 3V3 0W5 C DO35	D1 ,D2 ,D3
V131758	D ZEN 15V 0W5 C DO35	D12 ,D13
V132597	Q BFQ63 N SS TO72	Q1 ,Q12 ,Q13 ,Q14 ,Q2 ,Q3
V132618	Q BSS101 FN SS TO92	Q4 ,Q5 ,Q6 ,Q9
V132624	Q BSS92 FP SS TO92	Q10
V132631	Q BSS98 FN SS TO92	Q11 ,Q8
V132632	Q BSS110 FP SS TO92	Q7
V133076	Q ACC WSHR TO5	0060,0120
V133082	Q ACC INSUL BUSH TO220	0033,0043
V1340022	U 7812 TO220 P	U19
V1340162	U 2990-12 LM TO220 M	U20
V1340281	U 2990-5 LM TO220 M	U16
V134044	U 2940-5 LM TO220 P	U21
V134137	U 1201 LM DIP16 P	U10 ,U6 ,U8
V1341431	U 062I TL DIP8 I	U17
V137537	U 74HCT4053 DIP16 P	U11 ,U7 ,U9
C302108	CORE 3.7X 1.2X 3.5	0090
V306100	CHOKE AX NS 9 UH	L7 ,L8 ,L9
V3131400	J BNC FCT P 1 50E S	0072
V313202	J SMB MBT P 1 50E	J10 ,J4 ,J7
V3133691	J BNC ACC WHSR	0073
V313392	J MD JMP P 1 E1AU	0080
V313393	J MD1 MBT P 3 E1AU	J17 ,J18
V313470	J FLT2 MBT P26 E1AU	J3
V313472	J FLT2 MBT P34 E1AU	J13
V3139132	J DUBX1 MBT P 2 E1AU	J14 ,J15 ,J16
V3139134	J DUBX1 MBT P 3 E1AU	J19
V315310	J TAB1 MBT H 2.8S0.5	0140
V3153108	J TAB1 MBT H 2.8S0.8	TP5
V345015	WIRE 1.0 MM CU SN Y	0074
V346993	SLE SHR 9.5 2:1 BLA	0150
C347053	SLE SHR 6.0 3:1 BLA	0038
V3481024	W JUMP 0.6 7.62	D500
C3481042	W JUMP 0.51 12.5 ISO	0110
V3481118	W JUMP 0.51 30.48 ISO	0111
V349637	WIRE UN GROUND 9600 01	0037
V3620216	SMP-I AM3 X 6 D 84	0032,0042,0101
V3620226	SMP-I AM3 X 8 D 84	0035
V3673906	WASHER CRINKLE I M3	0034,0044,0102
V3685506	STANDOFF M3-14 INOX	0100
V603593	RGB INPUT BNC 01	0070
V603643	HEATSINK HYBRIDE 01	0030
V603644	HEATSINK RGB POWER 01	0040
V603646	SMD STEUN 00	0050
V603649	SOLDERLUG RGB 02	0071
V603693	ISOLATION HYBRIDE RGB 00	0031
V603694	ISOLATION POWER RGB 00	0041

Order number	Description	Item
V681024	SMD DIF.INPUT MPRD9600 01	U1
V681025	SMD AKBMOD MPRD9600 $$$03	U12
V681026	SMD SYNC.MOD. MPRD9600 04	U5
V715895	HYBRIDE RGB MPRD 9000 00	U13 ,U14 ,U15
V716543	PCB TESTPOINT 05	TP1 ,TP2 ,TP3 ,TP4
V7508573	SMC SCREW ISOL.3.4-5.1 00	0036
V752175	PCB RGB AMPL. 9000 01	0010

Order number of a SMD DIF. INPUT : V681024 DATE : 01/12/92

Order number	Description	Item
P200033	R# CE H 22E J 0W12 1206	R11 ,R12 ,R17 ,R18 ,R5 ,R6
P200043	R# CE H 56E J 0W12 1206	R127,R130,R135
P200049	R# CE H100E J 0W12 1206	R101,R106,R110,R115,R118,R123, R125,R128,R129,R13 ,R132,R133, R136,R19 ,R46 ,R54 ,R61 ,R7
P200053	R# CE H150E J 0W12 1206	R180
P200055	R# CE H180E J 0W12 1206	R66 ,R68 ,R72 ,R74
P200057	R# CE H220E J 0W12 1206	R103,R104,R112,R113,R120,R121, R51
P200065	R# CE H470E J 0W12 1206	R108,R179,R92 ,R97 ,R98 ,R99
P200071	R# CE H820E J 0W12 1206	R1 ,R2
P200073	R# CE H 1K J 0W12 1206	R126,R131,R134,R29 ,R36 ,R43 , R47 ,R55 ,R62
P200075	R# CE H 1K2 J 0W12 1206	R67 ,R70 ,R73 ,R75
P200079	R# CE H 1K8 J 0W12 1206	R21 ,R22
P200091	R# CE H 5K6 J 0W12 1206	R100,R109,R117
P200093	R# CE H 6K8 J 0W12 1206	R105,R114,R122,R14 ,R20 ,R45 , R53 ,R60 ,R8
P200095	R# CE H 8K2 J 0W12 1206	R24 ,R28 ,R31 ,R35 ,R38 ,R42
P200105	R# CE H 22K J 0W12 1206	R102,R107,R111,R116,R119,R124, R69 ,R71 ,R82 ,R83 ,R90 ,R91 , R93 ,R94 ,R95 ,R96
P200121	R# CE H100K J 0W12 1206	R27 ,R34 ,R41
P200129	R# CE H220K J 0W12 1206	R44 ,R48 ,R52 ,R56 ,R59 ,R63
P200381	R# CE H 56E F 0W12 1206	R76 ,R77 ,R78 ,R79 ,R80 ,R81 , R84 ,R85 ,R86 ,R87 ,R88 ,R89
P200387	R# CE H100E F 0W12 1206	R23 ,R25 ,R30 ,R32 ,R37 ,R39 , R49 ,R50 ,R57 ,R58 ,R64 ,R65
P200399	R# CE H330E F 0W12 1206	R10 ,R15 ,R16 ,R3 ,R4 ,R9
P210013	C(S)CEC1CH1206COG102J 50	C11 ,C12 ,C14 ,C15 ,C17 ,C18
P210122	C(S)CEC2CH1206X7R104K 50	C1 ,C10 ,C13 ,C16 ,C19 ,C2 , C20 ,C24 ,C25 ,C26 ,C27 ,C29 , C3 ,C30 ,C32 ,C34 ,C35 ,C36 , C38 ,C4 ,C40 ,C41 ,C42 ,C44 , C46 ,C6 ,C8
P210152	C(S)CEC2CH1206X7R153K 50	C23 ,C28 ,C31 ,C33 ,C37 ,C39 , C43 ,C45
P212006	C(S) TACH3528 475M 16	C7
P232004	SMC(S)TRA BC849C	Q1 ,Q10 ,Q11 ,Q12 ,Q2 ,Q3 , Q6 ,Q7 ,Q9
P232051	SMC(S)TRA BC847B	Q4 ,Q5
P232069	SMC(S)TRA BT2369	Q34 ,Q35 ,Q36 ,Q37
P232090	SMC(S)TRBB BFR92A SOT23	Q13 ,Q14 ,Q18 ,Q19 ,Q20 ,Q21 , Q25 ,Q26 ,Q27 ,Q28 ,Q32 ,Q33 , Q38 ,Q39 ,Q40 ,Q41
P232091	SMC(S)TRBB BFT92 SOT23	Q16 ,Q23 ,Q30 ,Q8

Order number	Description	Item
P232101	SMC(S)TRPNP BC859C SOT23	Q15 ,Q17 ,Q22 ,Q24 ,Q29 ,Q31
P234013	SMC(S)DIOZEN BZX84C4V7	D10 ,D11 ,D13 ,D14 ,D7 ,D8
P234018	SMC(S)DIOZEN BZV55C6V2	D48 ,D49 ,D50
P234047	SMC(S)DIO BAV99	D26 ,D27 ,D30 ,D31 ,D33 ,D34 , D37 ,D38 ,D39 ,D40 ,D43 ,D44
P234055	SMC(S)DIO BAT54	D21 ,D22 ,D23
P234099	SMC(S)DIO 4148	D1 ,D12 ,D15 ,D16 ,D17 ,D18 , D19 ,D20 ,D24 ,D25 ,D28 ,D29 , D3 ,D32 ,D35 ,D36 ,D41 ,D42 , D45 ,D46 ,D47 ,D5 ,D6 ,D9
P234127	SMC(S)DIZEN BZV55C5V1 DMM	D2 ,D4
P313290	CONMOBTE	J
P900897	PRINT - P1323897	S

Order number of a complete AKB : V681025 Date : 01/12/92

Order number	Description	Item
P200025	R# CE H 10E J 0W12 1206	R25 ,R33 ,R40
P200041	R# CE H 47E J 0W12 1206	R12 ,R18 ,R24 ,R32 ,R4 ,R8
P200071	R# CE H820E J 0W12 1206	R13 ,R15 ,R17
P200073	R# CE H 1K J 0W12 1206	R48 ,R55 ,R62
P200085	R# CE H 3K3 J 0W12 1206	R66 ,R72 ,R78
P200087	R# CE H 3K9 J 0W12 1206	R11 ,R3 ,R7
P200089	R# CE H 4K7 J 0W12 1206	R21 ,R28 ,R36 ,R45 ,R52 ,R59
P200097	R# CE H 10K J 0W12 1206	R10 ,R2 ,R47 ,R54 ,R6 ,R61 , R65 ,R71 ,R77
P200109	R# CE H 33K J 0W12 1206	R63 ,R68 ,R74
P200111	R# CE H 39K J 0W12 1206	R44 ,R51 ,R58
P200113	R# CE H 47K J 0W12 1206	R14 ,R16 ,R19
P200121	R# CE H100K J 0W12 1206	R1 ,R26 ,R34 ,R41 ,R5 ,R9
P200129	R# CE H220K J 0W12 1206	R42 ,R49 ,R56 ,R67 ,R73 ,R92
P200131	R# CE H270K J 0W12 1206	R43 ,R50 ,R57
P200137	R# CE H470K J 0W12 1206	R23 ,R31 ,R39
P200145	R# CE H 1M J 0W12 1206	R27 ,R35 ,R70 ,R76 ,R79 ,R93
P200453	R# CE H 56K F 0W12 1206	R22 ,R30 ,R38 ,R64 ,R69 ,R75
P200465	R# CE H180K F 0W12 1206	R20 ,R29 ,R37 ,R46 ,R53 ,R60
P210013	C(S)CEC1CH1206COG102J 50	C1 ,C5 ,C9
P210122	C(S)CEC2CH1206X7R104K 50	C10 ,C12 ,C2 ,C25 ,C26 ,C28 , C29 ,C30 ,C32 ,C33 ,C34 ,C36 , C4 ,C6 ,C8
P210211	C(S)CEC2CH1206X7R472K 200	C15 ,C18 ,C21
P210212	C(S)CEC2CH2220X7R104K 200	C14 ,C17 ,C20
P210215	C(S)CEC1CH1206COG220J 200	C27 ,C31 ,C35
P210216	C(S)CEC2CH1206X7R222K 200	C22 ,C23 ,C24
P215017BVC	C POMEPO330NF K5 50V	C11 ,C3 ,C7
P215101	C(S)MKTFILM22NFJ25V C1812	C13 ,C16 ,C19
P230030	SMC(S)ICCMOS 4053	U1 ,U3 ,U5
P230061	SMC(S)ICLQUA TL074I	U2 ,U4 ,U6
P230488	SMC(S)ICCOM LM219 SO14	U7 ,U8 ,U9
P232062	SMC(S)TRA BF622	Q11 ,Q5 ,Q8
P232115	SMC(S)TRFET BSS131 SOT23	Q12 ,Q6 ,Q9
P232122	SMC(S)TRNPN BCX56 SOT89	Q10 ,Q4 ,Q7
P232128	SMC(S)TRFET BSS192 SOT89	Q1 ,Q2 ,Q3
P234040	SMC(S)DIOLED LSS260	D3 ,D6 ,D9

Order number	Description	Item
P234046	SMC(S)DIOZEN BZV55C12	D11 ,D13 ,D15 ,D16 ,D17 ,D18
P234087	SMC(S)DIO BAV102	D19 ,D20 ,D22 ,D23 ,D25 ,D26
P234099	SMC(S)DIO 4148	D1 ,D10 ,D12 ,D14 ,D2 ,D4 , D5 ,D7 ,D8
P234203	SMC(S)DIZENBZV55C51DMMELF	D21 ,D24 ,D27
P242012BVC	PCB TESTPIN /V716543	TP1 ,TP2 ,TP3
P313290	CONMOBTE	J
P900885	PRINT - P1319885	S

Order number of a complete SMD SYNC : V681026 Date : 01/12/92

Order number	Description	Item
P200041	R# CE H 47E J 0W12 1206	R22
P200049	R# CE H100E J 0W12 1206	R33 ,R67 ,R72
P200053	R# CE H150E J 0W12 1206	R20
P200069	R# CE H680E J 0W12 1206	R73
P200073	R# CE H 1K J 0W12 1206	R10 ,R2 ,R32 ,R37 ,R7
P200074	R# CE H 1K1 J 0W12 1206	R48 ,R56 ,R64
P200077	R# CE H 1K5 J 0W12 1206	R19
P200081	R# CE H 2K2 J 0W12 1206	R34 ,R38
P200089	R# CE H 4K7 J 0W12 1206	R21 ,R36 ,R5 ,R69
P200095	R# CE H 8K2 J 0W12 1206	R29
P200097	R# CE H 10K J 0W12 1206	R12 ,R30 ,R39 ,R9
P200105	R# CE H 22K J 0W12 1206	R11 ,R3 ,R4 ,R68 ,R75
P200109	R# CE H 33K J 0W12 1206	R35
P200111	R# CE H 39K J 0W12 1206	R65
P200113	R# CE H 47K J 0W12 1206	R6
P200118	R# CE H 75K J 0W12 1206	R13 ,R15 ,R17
P200131	R# CE H270K J 0W12 1206	R31
P200143	R# CE H820K J 0W12 1206	R66 ,R74 ,R8
P200145	R# CE H 1M J 0W12 1206	R101
P200363	R# CE H 10E F 0W12 1206	R77 ,R78 ,R79 ,R80 ,R85 ,R86 , R87 ,R88 ,R93 ,R94 ,R95 ,R96
P200414	R# CE H 1K3 F 0W12 1206	R76
P200416	R# CE H 1K6 F 0W12 1206	R70
P200432	R# CE H 7K5 F 0W12 1206	R40 ,R71
P200435	R# CE H 10K F 0W12 1206	R41 ,R42 ,R43 ,R44 ,R49 ,R50 , R51 ,R52 ,R57 ,R58 ,R59 ,R60
P200442	R# CE H 20K F 0W12 1206	R100,R14 ,R16 ,R18 ,R24 ,R26 , R28 ,R46 ,R47 ,R54 ,R55 ,R62 , R63 ,R81 ,R82 ,R83 ,R84 ,R89 , R90 ,R91 ,R92 ,R97 ,R98 ,R99
P206419	R# CE H 23K2 F 0W12 1206	R45 ,R53 ,R61
P206435	R# CE H 34K F 0W12 1206	R23 ,R25 ,R27
P210045	C(S)CEC2CH1206X7R473K 50	C18
P210067	C(S)CEC2CH2321X7R105M 50	C6
P210076	C(S)CEC1CH1206COG221J 50	C11
P210092	C(S)CEC2CH1206X7R103K 50	C7
P210102	C(S)CEC1CH1206COG471J 50	C21 ,C33
P210121	C(S)CEC1CH1206COG331J 50	C10
P210122	C(S)CEC2CH1206X7R104K 50	C13 ,C14 ,C16 ,C17 ,C19 ,C2 , C20 ,C22 ,C23 ,C24 ,C27 ,C28 , C29 ,C32 ,C4 ,C5 ,C9
P210137	C(S)CEC1CH1206COG101J 50	C31

Order number	Description	Item
P210150	C(S)CEC2CH1206X7R332K 50	C15
P210154	C(S)CEC1CH1210COG562J 50	C34 ,C8
P212006	C(S) TACH3528 475M 16	C26 ,C3
P212009	C(S) TACH3216 105M 16	C25 ,C30
P212018	C(S) TACH6032 106M 16	C1
P212024	C(S) TACH7343 106M 35	C12
P230030	SMC(S)ICCMOS 4053	U8
P230103	SMC(S)ICCMOS 74HCT04	U9
P230328	SMC(S)ICLQUA TL064I	U4 ,U5 ,U6
P230422	SMC(S)ICHCT 74HCT08 SO14	U3
P230478	SMC(S)ICHCT 74HCT86 SO14	U10
P230479	SMC(S)ICHCT 74HCT221 SO16	U12 ,U14 ,U2
P230488	SMC(S)ICCOM LM219 SO14	U1
P230580	SMC(S)ICCOM LM211 SO8	U7
P230617	SMC(S)ICHC 74HC4049 SO16	U11 ,U13
P232004	SMC(S)TRA BC849C	Q1
P232067	SMC(S)TRA BC857C	Q2
P232069	SMC(S)TRA BT2369	Q3
P232104	SMC(S)TRNPN BC847C SOT23	Q4
P234099	SMC(S)DIO 4148	D1 ,D10 ,D11 ,D12 ,D13 ,D14 , D16 ,D17 ,D18 ,D2 ,D3 ,D5 , D6 ,D7 ,D8
P234140	SMC(S)DIOSCH LL101A	D15 ,D4 ,D9
P313290	CONMOBTE	J
P900901	PRINT - P1335901	S

2.1.6 SCHEMATIC DIAGRAM

2.1.7 BACKBOARD CONNECTIONS

RGB AMPLIFIER Board Connector J3 is connected with BACKBOARD Connector J3 by a 26 pins Flat Cable.

J3 pin nr	signal name	to	from
1	**+150 V**		P
2	**+150 V**		P
3	nc/ntbu		
4	nc/ntbu		
5	**-150 V**		P
6	**-150 V**		P
7	nc/ntbu		
8	nc/ntbu		
9	**+80 V (or +40 V)**		P
10	**+80 V (or +40 V)**		P
11	nc/ntbu (or -40 V)		(P)
12	nc/ntbu (or -40 V)		(P)
13	**GND**		P
14	**GND**		P
15	**+6.3 V / A**		P
16	**+6.3 V / A**		P
17	**-18 V**		P
18	**-18 V**		P
19	**GND**		P
20	**GND**		P
21	**GND**		P
22	**GND**		P
23	**+18 V**		P
24	**+18 V**		P
25	**-6.3 V**		P
26	**-6.3 V**		P

RGB AMPLIFIER Board Connector J13 is connected with BACKBOARD Connector J13 by a 34 pins Flat Cable.

J13 pin nr	signal name	to	from
1	RSUELIMADJ		C
2	GSUELIMADJ		C
3	BSUELIMADJ		C
4	GND		
5	RPICADJ		C
6	GPICADJ		C
7	BPICADJ		C
8	GND		
9	RHILADJ		C
10	GHILADJ		C
11	BHILADJ		C
12	BKGADJ		C
13	GND		
14	RLOLADJ		C
15	GLOLADJ		C
16	BLOLADJ		C
17	GND		
18	AKBOFF		C
19	EXT1OFF		C
20	STCLSEL		C
21	HPOSPOL	C	
22	VPOSPOL	C	
23	RGBAMPOK	C	
24	GENDIAGN oc/int	C	DEILMO
25	SINT/NAUTOSEL		C
26	MVP		D
27	GND		
28	HFLYBP		D
29	GND		
30	NVSP	CD	
31	GND		
32	HS/CSP	CD	
33	GND		
34	NMBLP		C

2.1.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

RGB BOARD WITH TRIAX CONNECTORS V5631212

Order number of a complete RGB BOARD TRIAX : V5631212 07 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TRIAX V5631212 07

NOT MOUNTED

Item

0071
0073

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035932	RGB INPUT TRIAX	01		
V3131400	J BNC FCT P 1 50E		0072	replaced by
V313150	J BNT P 1 50E			
V3685506	STANDOFF M3-14 INOX		0100	replaced by
V3685496	STANDOFF M3-12 INOX			

RGB BOARD WITH TNC CONNECTORS INTERNALLY TERMINATED V5631213

Order number of a complete RGB BOARD TNC TERM : V5631213 07 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TNC TERM V5631213 07

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035936	RGB INPUT TNC NLT	00		
V3131400	J BNC P 1 50E		0072	replaced by
V313117	J TNC FCT P 1 50E			

RGB BOARD WITH TNT CONNECTORS INTERNALLY TERMINATED V5631214

Order number of a complete RGB BOARD TNT TERM : V5631214 00 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM V5631214 00

NOT MOUNTED

Item
0071
0073

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035934	RGB INPUT TNT	00		
V3131400	J BNC P 1 50E		0072	replaced by
V313152	J TNT FCT P 1 50E			

RGB BOARD WITH TROMP CONNECTORS INTERNALLY TERMINATED V5631217

Order number of a complete RGB BOARD TROMP : V5631217 04 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TROMP V5631217 04

NOT MOUNTED

Item
0036
0071
0073

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035932	RGB INPUT TRIAX	01		
V3131400	J BNC P 1 50E		0072	replaced by
V313155	J BNT FCT P 1 50E			
V3685506	STANDOFF M3-14 INOX		0100	replaced by
V3685496	STANDOFF M3-12 INOX			

RGB BOARD WITH BNC CONNECTORS FC722 COATING V5631910

Order number of a complete RGB BOARD BNC FC722 : V5631910 01 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD BNC FC722 V5631910 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD WITH TNC CONNECTORS INTERN. TERM. H.SEAL V5631913

Order number of a complete RGB BOARD TNC TERM HSEAL : V5631913 00 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TNC TERM HSEAL V5631913 00

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035936	RGB INPUT TNC NLT	00		
V3131400	J BNC P 1 50E		0072	replaced by
V313117	J TNC FCT P 1 50E			

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0200

RGB BOARD WITH TNT CONNECTORS FC722 V5631914

Order number of a complete RGB BOARD TNT TERM : V5631914 00 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM V5631914 00

NOT MOUNTED

Item
0071
0073

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035934	RGB INPUT TNT	00		
V3131400	J BNC P 1 50E		0072	replaced by
V313152	J TNT FCT P 1 50E			

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD WITH TNT CONNECTORS INTERNALLY TERMINATED FC722 V5631915

Order number of a complete RGB BOARD TNT TERM FC722 : V5631915 00 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD TNT TERM FC722 V5631915 00

NOT MOUNTED

Item
0071
0073

SUBSTITUTES

Order Number	Description		Item	
V603593	RGB INPUT BNC	01	0070	replaced by
V6035937	RGB INPUT TNT NLT	00		
V3131400	J BNC P 1 50E		0072	replaced by
V313152	J TNT FCT P 1 50E			

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

RGB BOARD CERAM. FC722 V5631916

Order number of a complete RGB BOARD CERAM. FC722 : V5631916 00 Date : 01/12/92
Differences between RGB BOARD BNC V5631210 and RGB BOARD CERAM. FC722 : V5631916 00

SUBSTITUTES

Order Number	Description				Item	
V137537	U 74HCT4053		DIP16	P	U7,U9,U11	replaced by
V1375370	U 74HCT4053		DIP16	M		
V1341431	U 062I	TL	DIP8	I	U17	replaced by
V1321940	U 072	TL	DIP8	M		

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

2.2 DEFLECTION BOARD

General

Following tasks are done by the deflection board:

- horizontal deflection
- vertical deflection
- quick degauss (resonant type)
- vertical magnetic field compensation
- axial magnetic field compensation
- generate parabolic waveforms for dynamic focus
- generate control or drive signals for other units

The deflection unit is very flexible:

- real multisync, autolock
  - horizontal: 47 - 94 KHz (type I, MPRD9651) / 32 - 64 KHz (type II, MPRD9643)
  - vertical: 40 - 120 Hz
- equalizing pulses do not destabilize synchronization
- yoke impedances from 80 to 180 µH can be driven
- minimum hor. blanking : 3,2 µs
- minimum vert. blanking : 250 µs
- flyback pulse width of 2,6 +/- 0,1 µs (120 µH yoke)

The deflection unit, together with the processor unit set up an intelligent deflection system that recognizes and locks on different scanning systems.
In addition, several corrections to obtain a good image geometry are executed automatically.
If desired, the image geometry for a particular scanning can be adjusted or optimized by altering only 4 scanparameters on the keypad.

To achieve this, a microprocessor (68000) and a microcontroller (8031) are built in.
The microprocessor on the processor board does all the arithmetic, as well as the logic control, the 8031 integrated with the deflection board only supports the microprocessor unit and has two major tasks:

- measure the frequency of horizontal and vertical scanning and send the data to the microprocessor unit
- generate 11 DC signals (digital-analog conversion with sample and hold) and some digital references for the geometrical corrections, the dynamic focus and the magnetic compensation fields
  (the data, necessary to generate the signals and references is sent by the microprocessor unit via a serial link)

If scanparameters change (or if the monitor is placed in another magnetic field), the 11 DC signals and the digital references completely execute the adjustments on the deflection unit.
This means no trimmers on the deflection board have to be adjusted, even shift and linearity are adapted.
An adjustable coil on the deflection board is factory tuned (centre frequency of the PLL), it does not require alignment.

After the initial start-up, the keypad is used to adjust the settings for one scanning system. From now on, the processor will automatically adapt the settings for other scanning systems, only 4 settings on the keypad have to be entered for superior image geometry.

Optional Deflection board versions are described in section 2.2.8 Customized Versions (Options)

2.2.1 IOPC DIAGRAM

MPRD 9600
DEFLECTION board D
27 01 92

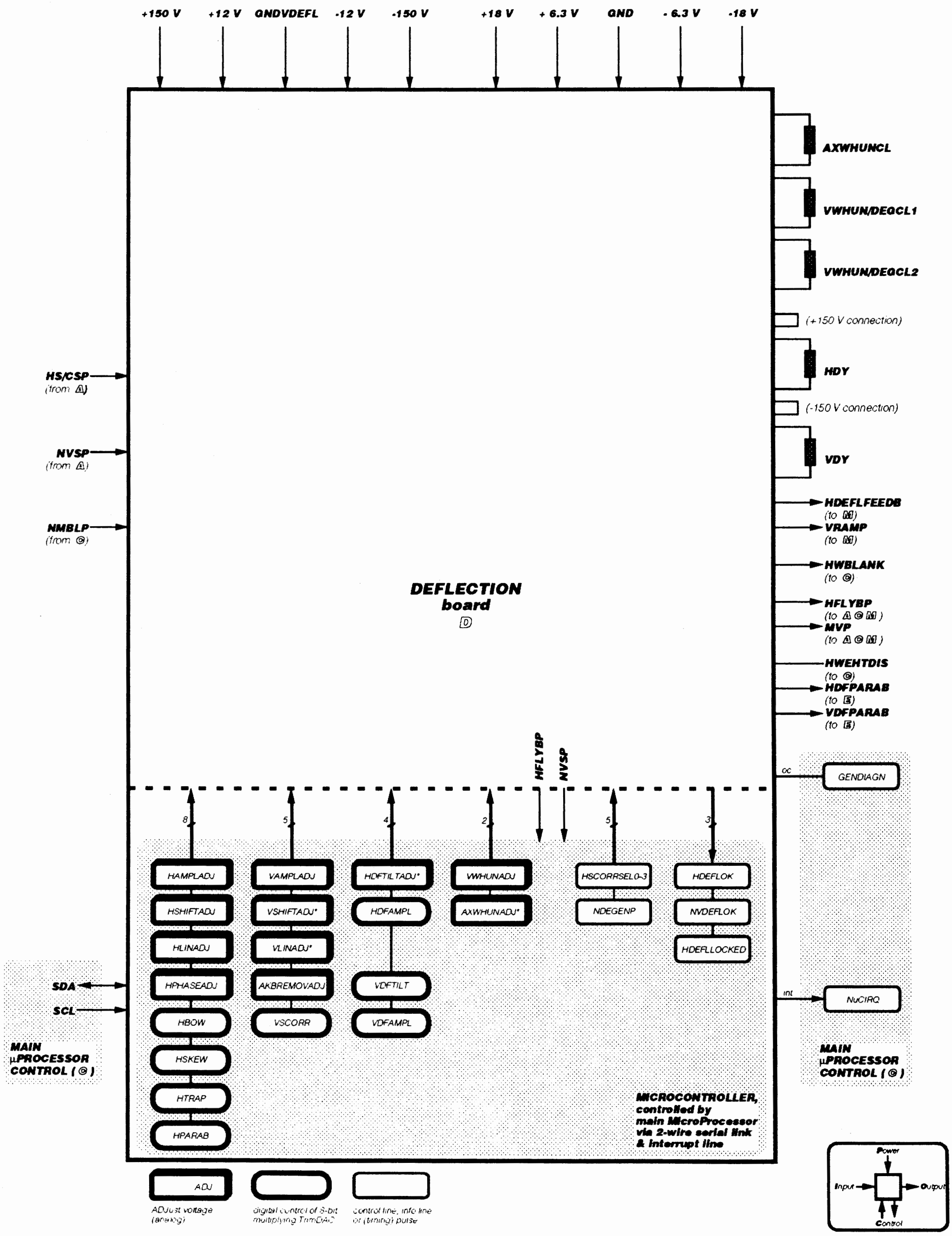


figure 2.10 : DEFLECTION board IOPC diagram

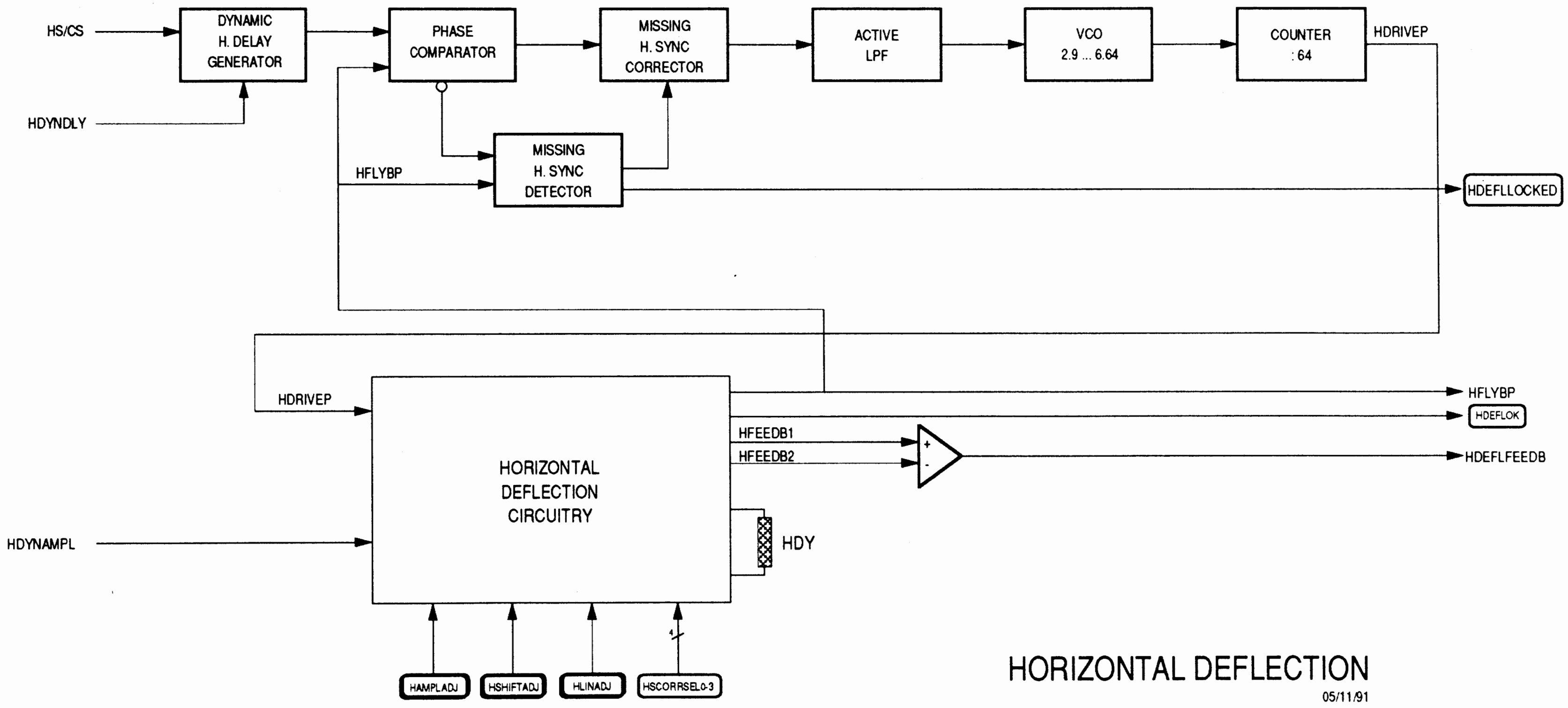


figure 2.11 : horizontal deflection block diagram

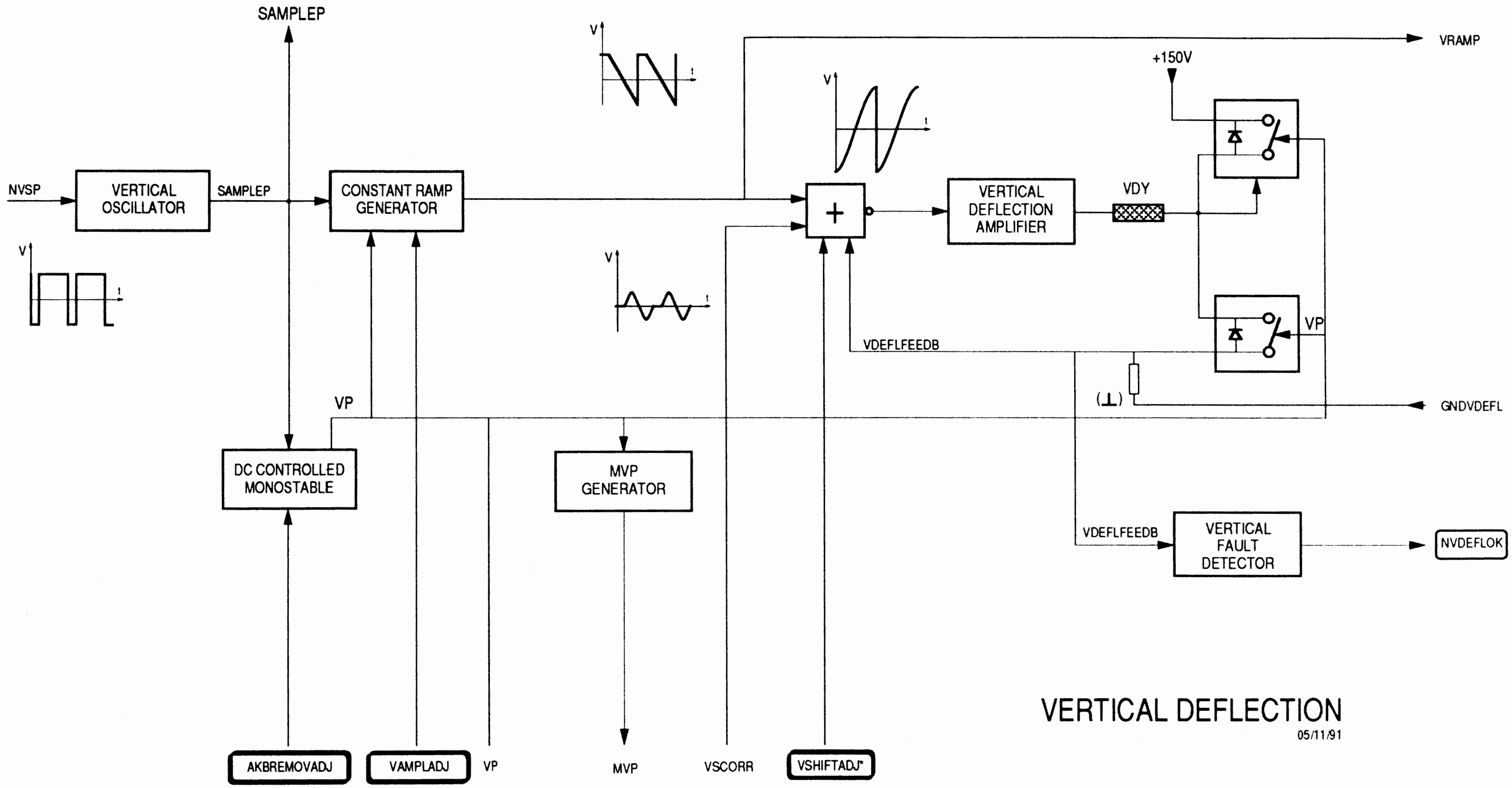


figure 2.12 : vertical deflection block diagram

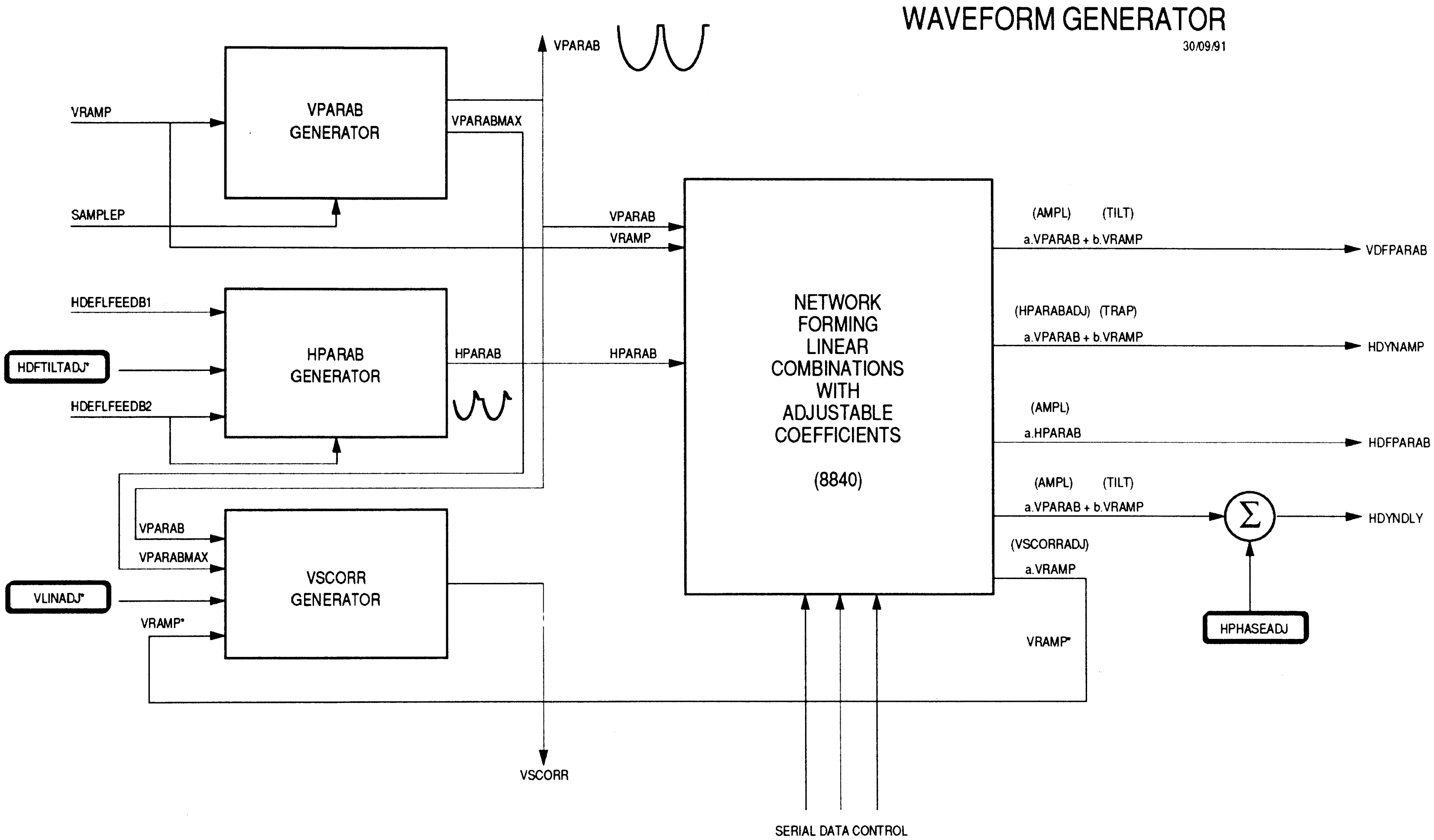


figure 2.13 : waveform generator block diagram

2.2.3 CIRCUIT DESCRIPTION

HORIZONTAL DEFLECTION

PLL Section (sheet 3 of 7)

The signal coming from the VCO (Q11, D509) is buffered (Q12) and frequency divided by 64 (U10).
The drivepulses for the power stage leave at U10, pin4.

As feedback signal, the falling edges of the horizontal flyback pulse (600V - 2µs typ.) are used because flyback is always present during deflection.
The horizontal flyback pulses are clamped to 180 V (D515), attenuated (R507, R40), inverted (U6); the rising edges will trigger the phase comparator (U5).

As reference signal for the phase comparator, the rising edges of the delayed horizontal sync pulses will be used. The signal HS/CSP (processed horizontal or composite sync pulses) clocks the data FF (U13), Q* goes low, the constant current source (Q18) starts charging C558 (= ramp generator).
If pin 6 of the comparator (U15) gets more positive than pin 5 (HDYNDLY), the data FF will be reset and Q* goes high. The signal on pin 5 (U15) is the sum of a DC component (HPHASEADJ), a parabola (bowing) and a sawtooth (skewing), this means that the value of this signal can vary in accordance with the position of the spot.
If horizontal sync is present, the switch (U11, pin 10, 11) will be closed and the delayed horizontal sync pulses enter the phase comparator (U5).

Frequency correction

VCO frequency correct
When not triggered, the output of the PLL (U5) is floating. A rising edge on PCBin (pin 3) (hor. sync) will force the output to 0V, a rising edge on PCAin (pin 14) (flyback) will force the output to go +5V.

If the falling edge of the flyback pulse is virtually coincidental (less than 50 ns) with the delayed rising pulse of the horizontal sync pulse, the output of the PLL (pin13) will be +5V for a very short time. This short pulse will restore the charge that was dissipated in R54. R54 inserts a phase error but results in the fact that the phase comparator settles outside the dead zone with correct VCO frequency. Correct VCO frequency inside dead zone would result in jitter.

Through the switch (U11, pin 1, 2) and R81 the pulse enters the low pass filter (U12, C33) with phase lead correction (C27, R67). C556,D86,87 limit the frequencystep when scanningparameters change.

VCO frequency too low
If the falling edge of the flyback pulse is delayed, the output of the PLL (pin13) will be 0V during the delay time. As a result the negative pulse will be integrated by the low pass filter and affect the VCO frequency because it was not filtered out. The output of the opamp will rise (pulse arrives at the inverting input), this will result in a higher VCO frequency.

VCO frequency too high
If the falling edge of the flyback pulse arrives too early, the output of the PLL (pin13) will be +5V until the rising edge of the hor. sync pulse. As a result the positive pulse will be integrated by the low pass filter and affect the VCO frequency because it was not filtered out. The output of the opamp will lower (pulse arrives at the inverting input), this will result in a lower VCO frequency.

Sync fail

Under normal conditions, the filter C13, R25 will not react because PCPout (pin 1) only goes down low during the very short time interval between hor. flyback and hor. sync. If the time interval gets longer than 400ns, C13 will discharge and the circuit made up of U1 and U2 will be activated.

IC1, pin 3, 4 and 5 were low, now also pin 2 gets low, the output (pin 1) goes high and U2 (both 4 bit decade counters) are reset. As a result: - the switch (U11, pin 3, 4) will be closed
- Q0 - Q3 (of both counters in U2) go low
- U6 (pin1, 2) inverts the low into high and charges C15 through R39
- pin 9-14 (U1) are low, output of U1 (pin13) goes high
- inverter U6 inverts the low level into high and the switch (U11, pin1, 2) opens

Because the low pass filter was switched off too late (time necessary to discharge C13), it has to be restored to its original value (before hor. sync was missing) by recharging the opposite amount (inverter U6 pin11,10) into the low pass filter during the same interval of time. The duration is determined by C15, R39 having the same time constant as C13, R25. The output of U1 (pin1) goes low and switch U11 (pin3,4) is opened again, ending the restore sequence. Both switches (U11 pin1,2 and pin3,4) are now open, the input of the low pass filter is floating and the VCO will oscillate on a fixed frequency.
Meanwhile U2 is counting flyback pulses; after 8 flyback pulses, Q3 (pin6) goes high, 2 flybackpulses later Q3 (pin6) goes low again.
On the falling edge the other counter in U2 is clocked and Q0 (pin11) goes high. The output of the nor gate U1 (pin13) goes low. Inverter U6 (pin8, 9) closes switch U11 (pin1, 2), the low pass filter is reconnected with the phase comparator and the VCO can lock again.
The VCO needs some time to be able to lock, for this reason another 70 flybackpulses will be counted before Q3 (U2) goes high. As long as U2.Q3 was low, pin3 of U1 was high and thereby disabling a new "hor. sync lost" sequence.

Three output signals of the PLL are used for driving other circuits:
- the DRIVEPULSE 50% DC (U10, pin4)
- the hor. flyback pulse 5Vpp
- PWMTRP, a signal to modulate the scanvoltage
  - normally it is the inverted HFLYBP, but after start-up when deflection is still disabled this signal will be the inverted DRIVEPULSE

Horizontal Output Stage (sheet 4 of 7)

The two deflection transistors (Q508, Q509) are driven by a single transformer (T500). This has several advantages:
- 1000 V transistors can be used because the flyback pulse is symmetrical against 0V
- storage time equalizing is obtained by use of identical, bifilar wounded secondary windings
- energy saving.

The deflectioncurrent (sawtooth) is generated by discharging C509 via the current sense (T502), the deflection yoke, the pump (T503), and the power transistors (Q508, 509). During the first half of flyback (Q508, 509 go off after storagetime), the energy in the deflection yoke will charge the flyback capacitors (C518, C513), the current will drop to 0A rapidly because of the increasing opposite voltage. During the second half of flyback, the flyback capacitors will discharge (current goes in opposite direction) via the deflection yoke, the pump and the current sense transformer. As soon as the flyback capacitors are discharged, the diodes (D501, D502) take over (= end of flyback).
The horizontal scan (left to right, spot is now on the left side) starts, the current through the deflection yoke drops (scanvoltage forces current in other direction), little time before the current would be 0A (spot in middle), the powertransistors will be driven again by T500, C509 is discharging again.
The difference in storage time of the deflectiontransitors is automatically equalized by T500.
The fastest transistor (shortest storage time) will be off first, and have a lower voltage over the b-e junction than the slower transistor. A different voltage across the identical secondary windings of T500 will result in a current, as these secondary windings are bifilary wound. The current is powered by the slower transistor, turning off itself rapidly.

Driving circuit for T500

The base current of Q508,509 is determined by the energy stored in the magnetic field of T500. T500 operates in flyback mode, when Q511 is blocked by the inverted drivepulse the energy in the magnetic field will generate current in the secondary windings and drive Q508,509.

Base current modulation

The gate of Q510 is driven by a pulse width modulated signal, the pulse width is determined by HAMPLADJ and the voltage over R508//C63 (T500 primary current sense), the drivepulse will trigger the circuitry.

When the drivepulse (duty cycle 50%) goes high:

- Q1 will conduct and C517 discharges instantly
- the output of the comparator (U18, pin1) will be low
- Q3 and Q510 will be on.
- the rising edge of the drivepulse is inverted by Q9, Q511 goes off, Q508,509 are on.

The resistors R505,506 make sure that both deflectiontransistors have equal base current (current drive).

When the drivepulse goes low:

- Q511 will be on, the current through Q510, T500 and Q511 is sensed by R508//C63
- the difference between the current sense signal and HAMPLADJ is integrated (U14, R77, C39)
- Q1 goes off and the ramp across C517 starts
- Q508,509 are off after storage time (D504,505 ensure fast switch off)

As soon as the ramp across C517 exceeds the voltage across R94 the output of U18 (pin1) will be floating. Q3,510 will be off, Q4 is on. T500 tries to prolong the current through Q511 and D508 until the drivepulse goes high again. D15 ensures a minimum pulse width, to be sure Q508,509 are off during flyback.
Larger pulsewidth is obtained by a higher HAMPLADJ. This will force U14 pin1 to a higher level, the ramp will need more time to exceed this higher level, Q510 will be on for a longer time, resulting in more energy stored in the magnetic field of T500.

S-correction capacitors

For different frequencies and amplitudes an adapted value of the S-correction is required. C505 - C508 can be switched in parallel with the main S-correction capacitor (C509).
This can be done by switching the fets (Q504 - Q507). These fets have common source, because the sources receive flybackpulses, the gates are driven by optocoupler.
The flybackpulse is capacitively coupled (C503), D5 prevents discharging C24 after flyback, D6 limits the voltage across C24 to 10V, D4 discharges C503 after flyback.
The 4 fets are turned on by the voltage across C24, the phototransistors inside the optocouplers are off if HORCORRSELX is low. A high level of HORCORRSEL0-3 will switch OFF the S-correction capacitors C505-508. R8-11 limit the current through the fets after power up or switching.

Horizontal linearity coil

The premagnetization of the linearity coil (T503), regulating the horizontal linearity, is determined by the current in the slightly coupled secondary.
The current is sensed by R259(negative polarity), this signal is compared with HLINADJ (a fixed positive DC-voltage for a certain frequency and scan amplitude). Both signals are connected with the inverting input of U17, the non-inverting input is connected to 0V. The output voltage of U17 will regulate the base current of Q514, according to the level of HLINADJ. If the current through the secondary of T503 is too high (low), the inverting input of U17 will be more (less) negative and the base current of Q514 and the current in the secondary winding of T503 will decrease (increase). D52 protects Q514 against reverse signals.
To reduce ringing in the deflectionyoke, T503 is damped. During flyback D68 will be polarised inversely and there will be no damping (spot is invisible during flyback, energy saving), immediately after flyback D68 will conduct and the ringing will be damped by R528.

Horizontal shift

Horizontal shift is obtained by sending a DC-current through the horizontal deflection yoke, this current is powered by T501. The primary of T501 is driven by a pulse width modulator.
After flyback, the DRIVEPULSE turns on Q2 during a very short time (capacitively coupled with C38). C516 is discharged instantly, when Q2 goes off again C516 is charged by R93.
The current in the primary of T501 is sensed by R512 and connected to the inverting input of U17,pin6. U17 integrates the difference between the current sense signal and HSHIFTADJ. The ramp across C516 is compared with the clipped outputsignal of U17,pin7, as long as the level of the ramp (U15,pin3) does not exceed the level of U15,pin2 the output (U15,pin1) will sink current, Q21 is on and powering T501. As soon as the level of the ramp exceeds the level of U15,pin2 Q21 is switched off. C124 accelerates Q21 switch-on, R141 accelerates Q21 switch-off, resulting in a lower power dissipation; D37 limits inverse polarisation of Q21.

The current pulses in the secondary are rectified and buffered by C533. The voltage across C533 will force a dc current through the shiftchoke (L504), T503, the horizontal deflection yoke and the current sense (T502).
The shiftchoke (9,2mH) prevents the deflection current going through D511,T501 and C533.
This circuit can only shift the picture on the CRT to the left hand side.
By blanking the ringing, the picture will be a little to the right hand side, shifting to the left hand side will centre the picture.

+B Modulation (HAMPLMODULATION)

The scanvoltage across C509 is powered by the + and -148V power supply.
The scanvoltage determines the scanamplitude and so the width of the image on the screen.
The scanvoltage is pulse width controlled.
The current through the deflection yoke is sensed by a current transformer (T502). The hundredth part of the deflectioncurrent flows through the secondary of T502 and is rectified by D36,38,41,44 (full-wave rectifier).
T502 forces the current to flow, independent from the voltage drop over the diodes and R513,514,515. The voltage across R513 is a measure for the average value of absolute value of the deflection current, the ripple is attenuated by C79, R154 and C78. The smoothed signal is connected to the inverting input of U14(pin6), together with HDYNAMPL (east-west and trapezium), the non-inverting input (pin5) receives HAMPLADJ. The opamp (U14), compensated by C515,R509 and C522,R510, amplifies the difference between both signals. The output of U14 (pin7) is connected via R127,C82 (smoothing), D34 (+5V clamping) and D29 (-0,7V clamping).
A rising edge of PWMTRP (= inverted HFLYBP) will switch on Q6 shortly, discharging C514, the voltage at pin6 of the comparator (U18) will be 0, the output of U18(pin7) will be high, powering the horizontal deflection output stage. As soon as the ramp across C514 exceeds the level on pin5 (U18), the output of the comparator (U18,pin7) will go low and the horizontal output stage will not be powered any more.
On +A (+148V) powerfailure, the +15V will charge C514 to limit the duty cycle to a safe value; D14,17 protect U18 against overvoltage.

As soon as U18,pin5 goes high:

on the +148V side
- Q20 will go on
- the gate-source capacitor of Q512 will be discharged by Q19 (Q512 goes on)
- Q19 will go on during discharging
- Q15 will go off

on the -148V side
- Q25 will go on
- the gate-source capacitor of Q513 will be charged by Q24 (Q513 goes on)
- Q24 will go on during charging
- Q26 will go off

As soon as U18,pin5 goes low:

on the +148V side
- Q20 will go off
- the gate-source capacitor of Q512 will be charged by Q15 (Q512 goes off)
- Q15 will be on during charging
- Q19 was off already

on the -148V side
- Q25 will go off
- the gate-source capacitor of Q513 will be discharged by Q26 (Q513 goes on)
- Q26 will be on during discharging
- Q24 was off already

The signal PWMTRP goes high, immediately after flyback.
Only the +148V side will be described, the -148V side is identical.
Q512 goes on, D502 is conducting (always after flyback), the full+148 Vdc stands across L500, the current through L500 starts from 0 and increases. Little later, Q512 is switched off and the current through L500 remains stable going through D502 and D510. Before the deflectioncurrent becomes 0, Q508,509 will go on, the current forced by L500 now goes through Q509,D510. When Q508,509 are off again, flyback starts and the current forced by L500 will help charging C513 (first half of flyback). The energy from the powersupply, first stored in the magnetic field of T500

will now be transferred to C513. When C513 discharges (second half of flyback) the energy from the powersupply will be stored in C509, in this way the scanvoltage is sustained.

However, the high amplitude of the flybackpulse (voltage across C513) will inject a current through L500 in the opposite direction. Near the end of flyback, the sense of the current through L500 changes and C521 will charge to 148V. Once C521 is charged to 148V, the internal diode of Q512 will conduct and energy will be delivered to the +148V power supply. This means that not all the energy stored in L500 will be used to sustain the scanvoltage.
The charging of C521 has an important advantage, when Q512 is switched on again (shortly after flyback C521 is still charged) the fet will not dissipate because it has the same voltage on drain and source. When Q512 is switched of rapidly, the drainvoltage will only be a little smaller than the sourcevoltage and power losses by switching will be very small.
Another target of C512 is to reduce the slew rate of the drainvoltage. When Q512 is switched off, D510 will conduct and the voltage at the drain drops to 0V. All this happens during active video, via the parasitic capacitance of L500 an oscillation in the deflection current could be provoked but it will be attenuated by C521.

Vertical Scanfail Detection (VSCANFAILDET) (sheet 3 of 7)

The symmetrical sawtooth VFEEDBACK is clamped by D43 to limit the negative alternations to 0.3V, C91 eliminates noise. R170, R180 give positive feedback, due to hysteresis the signal on U22,pin 8 will need minimum amplitude to switch the output U22,pin14 to low or high. If the VFEEDBACK is ok, a square wave will be present at U22, pin14. This square wave is capacitively coupled (C84) to the rectifier D40, D45 and C94.
If the vertical deflection is ok, C94 will be charged, Q28 is on, NVDEFLOK is low.
If the vertical deflection fails, Q28 will be off, NVDEFLOK goes high limited to 5V by D47, HWBLANK goes high, Q34 goes on, via D51,R210 Q29 is switched on and HWEHTDIS (on the processorboard connected to the +5V by R86) goes low. Led D518 will light, via D59 GENDIAGN goes low, the microprocessor will order a diagnose. Q34 shorts VP to ground, this to prevent the AKB-circuitry from interfering with HWBLANK.

Horizontal Scanfail Detection (HSCANFAILDET)

HAMPLSENSE is used to detect HSCANFAILDET. This is a smoothed signal, coming from the horizontal current sense. This signal is smoothed again by R178,C87. If the signallevel on U22, pin5 exceeds the signallevel on U22,pin4 the horizontal deflection amplitude is considered to be normal; U22,pin2 (=HDFLOK) will be +5V, (limited by the internal protection diode of U11,pin6); Q27 will be on.
If the horizontal deflection fails, HDEFLOK goes low, Q27 will be off, via D48,R210 Q29 is switched on, HWBLANK goes high, Q34 goes on and HWEHTDIS (on the processorboard connected to the +5V by R86) goes low. Led D518 will light, via D59 GENDIAGN goes low, the microprocessor will order a diagnose. Q34 shorts MVP to ground, this to prevent the AKB-circuitry from interfering with HWBLANK.

Overcurrentprotection

The signal HAMPLSENSE is also used for the overcurrentprotection. If HAMPLSENSE exceeds the signallevel of U22,pin10 it means that the amplitude of the horizontal deflection current is too high. In this case, U22 pin13 will go low, C75 will be discharged instantly, SOFTSTART is pulled to ground. C82 will be discharged (see also deflection board sheet 4 of 7 HAMPLMODULATION and the paragraph +B Modulation) via Q42,D88, reducing the pulsewidth and the horizontal deflectioncurrent.

Soft Start

During power up, as long as the +15V does not exceed 10V yet, Q23 will be off, Q22 will be on, C75 can not be charged and the pulsewidth (=horizontal amplitude) is limited.When the +15V exceeds 10V, Q23 will be on, Q22 will be off and C75 is charged slowly by R153, Q42 will go off slowly a little later, the horizontal amplitude can now increase gradually, controlled by HAMPLSENSE.

Power fail

As soon as the +15V power supply drops below 10V, Q23 will be off, Q22 will be on discharging C75 rapidly, the pulsewidth drops to a low level, the deflectiontransistors Q508,509 will dissipate little power, the amplitude of the flybackpulses are reduced to a safe level. In case that, due to powerfail, the base current modulation circuit would not be triggered in a proper way, the deflectiontransistors Q508,509 will not be damaged or destructed.

VERTICAL DEFLECTION (sheet 6 of 7)

The vertical deflectioncoil is connected to a class AB push-pull amplifier. The powertransistors Q501,503 are driven by Q500,502. Physically the vertical deflection has a separate ground (GNDVDEFL), however, it is electrically connected with the common ground of the deflection board.
The vertical deflectioncurrent is sensed by R524//R525.

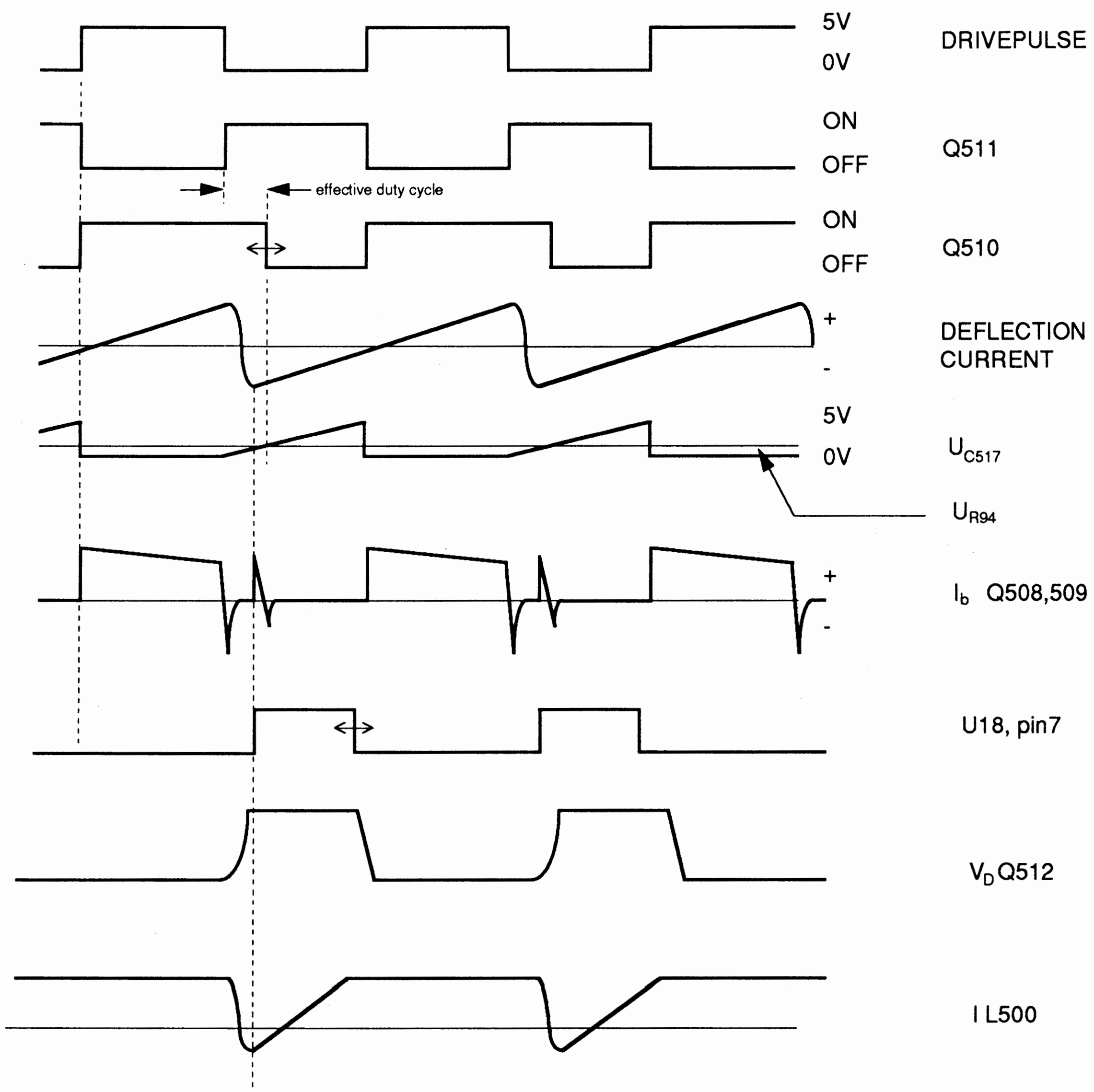


figure 2.14 : horizontal deflection waveforms

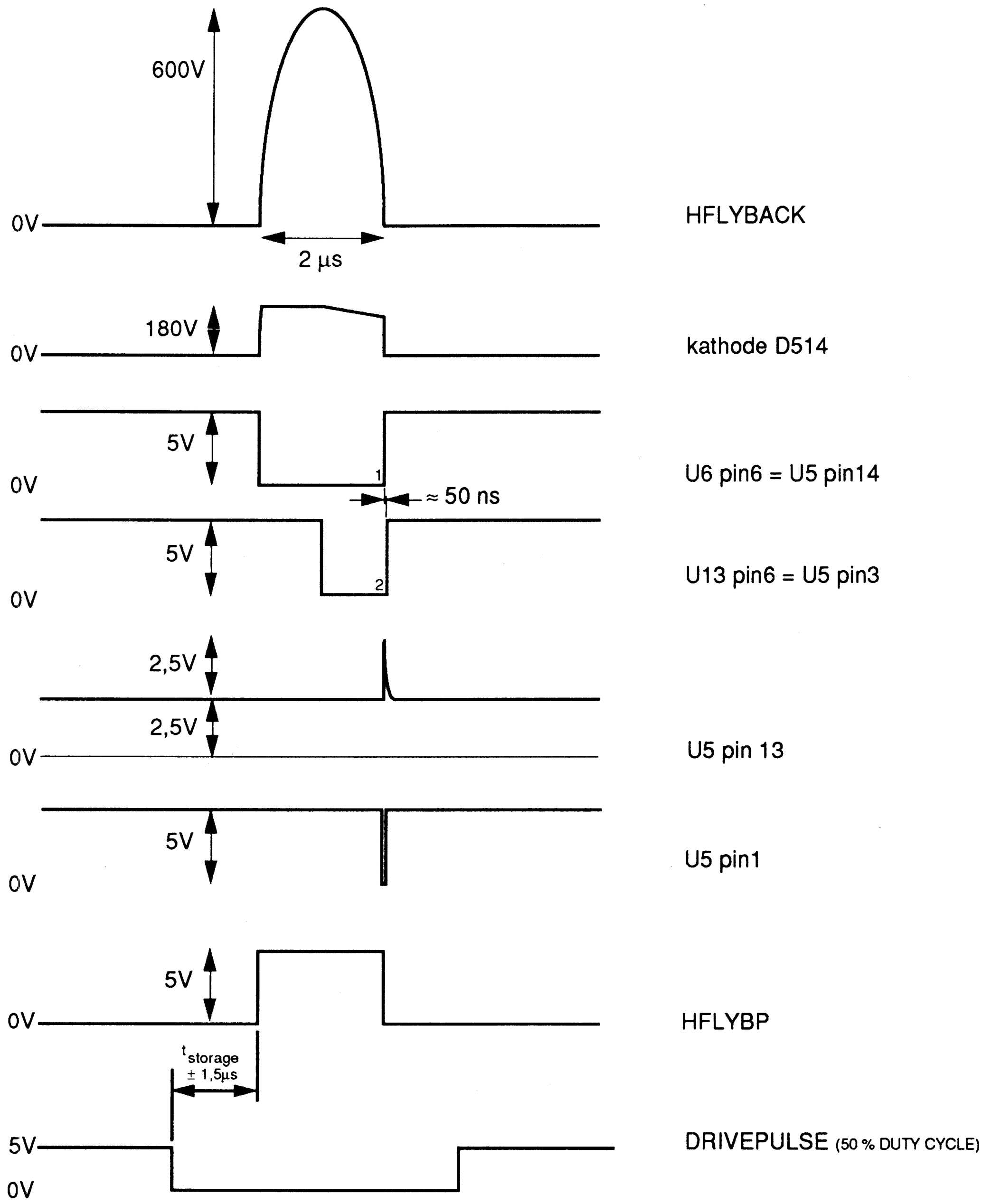


figure 2.15 : flyback waveforms

The ramp for the vertical deflection is generated by charging C542 with a constant current. The constant current is generated by U30,pin 8 and R252. C542 is discharged by U33 pin1,15 during the high level of VP.
Just before vertical retrace, the inverted VRAMP (U30,pin14) is sampled by U33; the difference between the sample and VAMPLADJ is integrated by C545 to obtain a symmetrical sawtooth with amplitude VAMPLADJ.

The signal NVSP, coming from the SYNC&SCALING module is processed by U34, resulting in a stable SAMPLEP, even with distorted or absent NVSP.

(sheet 3 of 7)
The falling edge of SAMPLEP triggers U13, Q goes high (=VP), Q* goes low (=NVP). Q13 goes off, C557 charges, as soon as the voltage across C557 exceeds the voltage on U22(pin7) (determined by AKBREMOVADJ) U13(pin 13) goes low. The duration of VP is determined by AKBREMADJ and used to start the retrace.

(sheet 6 of 7)
During retrace the signal VP will be high:
- switch U33 pin15,1 will be closed
- C542 will discharge immediately
- Q36 will be on and discharge the gate-source capacitor of Q516
- Q516 will be off.
- the current through the deflection coil will continue through the internal diode of Q517; the voltage on the drain of Q517,516 is now 150V
- the current through R521 turns on Q35, Q517 is closed by Q35
- the 150V power supply is used to achieve a fast vertical retrace.

After retrace the signal VP will be low:

- Q33 will be on, Q35 will be off
- Q517 will be off, Q36 will be off, charging the gate-source capacitor of Q516
- C542 will be charged again, the vertical ramp starts

RESONANT DEGAUSS (sheet 7 of 7)

The -148Vpp is added to the +148V by C539, D100 and D101. C536, C544, C554 and C553 are charged to approxima-tely 300V in a few seconds.
When the µP orders to degauss, NDEGENP goes low during 50ms typical, Q30 goes off. As soon as VMIDP gets positive (>0.7V) U28(pin2) goes high (this happens during the second half of the vertical scan) (positive feedback with R244 keeps U28(pin2) high until NDEGENP* goes high), Q40 turns on Q520 starting the degauss cycle.

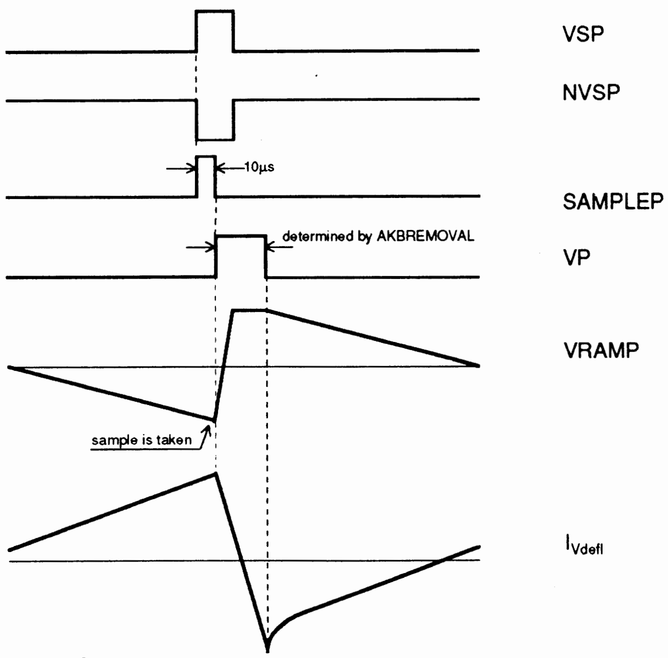


figure 2.16 : vertical deflection waveforms

Degaussing is obtained by driving a damped alternating current through the degauss coils. The degauss coils, together with R517//D516//D517, switch Q520//D519 and C536//C544 set up a resonant circuit.
As the degausscurrent increases (C536,544 discharge), the voltage across R517 gets more negative, U28(pin1) remains low. After being discharged completely, the two capacitors will be recharged (opposite polarity), forced by the energy in the magnetic field of the degauss coil. The current drops to 0 (max. voltage across C536,544) and becomes negative, resulting in a positive voltage across R517. U28(pin1) goes high, the rising edge forces U28 (pin14) to a low level for a short time. Q37 goes on, the current through the primary of T504 turns on Q521, C553 will deliver a supplementary charge for C536,544 stimulating the oscillation.
Half a period later, the current drops to 0 again (max. voltage across C536,544) and becomes positive again, resulting in a negative voltage across R517. U28(pin1) goes low, the falling edge forces U28 (pin13) to a low level for a short time. Q41 and Q522 go on, C554 will deliver a supplementary charge for C536,544 stimulating the oscillation.
The two chargepumps improve the quality factor of the oscillation.

VERTICAL WHITE UNIFORMITY ADJUST (VWHUNADJ)

The degauss coils are also used for VWHUNADJ. The current for VWHUNADJ is powered by the -6.3V power supply and sensed by R517. The difference between the voltage across R517 and VWHUNADJ is integrated, U31(pin1) drives Q515.
During degauss, the emitter of Q40 will be at +10V, via D69, R261,255 the inverting input of U31(pin2) will be high, U31(pin1) will go low and Q515 will be off, disabling VWHUNADJ and protecting Q515 against overdissipation.

AXIAL WHITE UNIFORMITY ADJUST (AXWHUNADJ*)

The AXWHUNADJ is obtained by sending a current through the AXWHUCL. AXWHUNADJ* drives the non-inverting input of U31(pin6). The current through AXWHUCL is sensed by R522 and fed to the inverting input U31(pin6) via R270. The difference is integrated and buffered by Q518,519.
During degauss AXWHUNADJ is disabled to obtain a complete demagnetization of the CRT. During degauss the emitter of Q40 will be at +10V, Q39 will be on, fet Q38 will be on and the non-inverting input of U31(pin5) is at OV, the current through the AXWHUCL drops to 0.

MICROCONTROLLER (sheet 2 of 7)

The microcontroller (8031 - 8 bit) only executes minor tasks, the major work is done by the microprocessor (68000 - 16 bit) on the processorboard.
The microcontroller controls several functions:

- DAC refresh, demultiplexer
- frequency (hor. & vertical) measurement
- checking hor. & vert. deflection
- degauss
- S-correction switching
- trimdac driving
- generate an interrupt when frequency changes

The µcontroller and µprocessor are linked by a serial line (SCL, SDA), the µprocessor is the master.
D82,83 and R237,231 protect the serial line against possible peakvoltages.
The watchdog (U32) controls if MUXA 0 (U32,pin3) is addressed regularly, if not, U32,pin2 will go high resetting the µcontroller.

The EPROM (U511) containing the program is addressed by the µcontroller via a latch (U23). This is necessary because the databits 0-7 are multiplexed with the addressbits 0-7. When addressing the EPROM, the lower byte of the address is latched in U23, the higher byte of the address is connected directly to the EPROM. When U511,pin22 is set high by the µcontroller, the data will be present on the databus.

DAC refresh, demultiplexer (sample and hold)

Sending data to the DAC is done by putting the data on the databus and latching it with U24. This latch is activated by addressing 8001H, addressbits 0,15 must be '1', WR* (U510,pin16) must be '0'; U29,pin6 goes low. The data is transferred to U512, the DAC generates a current according to the data on the input (U512,pins 5-7). The current is converted in a DC voltage by U27,pin1 and enters the demultiplexer U16. The outputchannel of the demultiplexer is selected by MUXA0-MUXA3 (16 outputs, 12 used), MUXEN enables the demultiplexer. As the multiplexer is fed by +15V (U16,pin24), these signallevels must be converted to +15V, this is done by U509, R201,214,219,207,197. The demultiplexer scans the sample and hold circuits, the RC-networks are buffered by an opamp with high impedance.
For HAMPLADJ, two signals are used, one devided by 100 and added to the other. This gives a "slow" (fine) and a "fast" (coarse) HAMPLADJ.
HORAMPLADJ, AKBREMOVADJ, VLINADJ*, HDFTILTADJ*, VAMPLADJ, VSHIFTADJ* and AXWHUNADJ* are rescaled after buffering.

Frequency (hor. & vertical) measurement

The frequency measurement is triggered by NVSP and HFLYBP, generating an interrupt (U510, pin12 U510,pin15) The frequency is calculated by the µcontroller; when requested, the calculated data is sent to the µprocessor for further processing. If scanparameters change during frequency measurement, HDEFLLOCKED (U510,pin13) will go low, cancelling the frequency measurement.

Checking hor. & vert. deflection

In the fault indicator on the front panel lights up, the operator can check the diagnosis on the keypad. The µprocessor will ask the µcontroller to check the signals HDEFLOK (U510,pin7) and NVDEFLOK (U510,pin8) and report their status.
Degauss

A degauss request is sent to the µcontroller (via the serial link), NDEGENP (U510,pin14) goes low (50 ms).

S-correction switching

The µprocessor orders the µcontroller to activate HSCORRSEL0-3 for optimal horizontal S-correction. The calculations to determine optimal S-correction are done by the µprocessor. During start-up U26,pin1 goes low, all S-correction capacitors are active to protect the fets Q504-507.

MULTIPLIERS (sheet 5 of 7)

For horizontal and vertical dynamic focus, parabolic waveforms, synchronised with horizontal and vertical deflection are required.
For vertical linearity adjust, east-west correction and bowing, a parabolic waveform synchronised with the vertical deflection is required, for vertical S-correction a third order waveform is required.
These second and third order waveforms are generated by multiplier circuits.

U503, U504 and U507 are four-quadrant multipliers, they are followed by an opamp for good operation (U3, U4).
U503 squares the inputsignal VRAMP, connected to the inputs (U503, pin8,12). The complementary outputsignals (U503,pin2,pin14) are connected to an opamp (U4,pin3,2).
U507 multiplies the difference between HFEEDB2 (U507,pin4) and HFEEDB1 (U507,pin12) (HFEEDB2 - HFEEDB1 = ramp). An additional signal HDTILTADJ* is connected to U507,pin9; it allows tilting of HPARAB. The complementary outputsignals (U507,pin2,pin14) are connected to an opamp (U3,pin3,2).
U504 multiplies (VRAMP*) by (VPARAB - VPARABMAX), VLINADJ* allows vertical linearity adjust; the complementary outputsignals (U504,pin2,pin14) are connected to an opamp (U4,pin5,6).

During flyback or retrace, it is undesired to let the parabolic waveform pass to other circuitry, this would result in unnecessary transients causing distortion.
The output of U4,pin1 is connected to switch U8,pin2; as long as SAMPLEP is low, U4,pin1 is connected to U7,pin3

and VPARAB equals $VRAMP^2$. SAMPLEP, going high just before vertical retrace, will charge C47 via D16,R105, U8,pin10,11 go high, U8,pin15 is floating, VPARAB remains on the same level, driven C43 (track and hold circuit); C510 is charged by U7,pin 1 via U8 pin13,14. 10µs later, SAMPLEP goes low again, C47 will discharge via R95 and after approximately 15µsec (time for VRAMP to end retrace) the switches are in the original position again. The sample and hold circuit U8,C510,U7 holds VPARABMAX, this signal is required to compose VSCORR. (VSCORR must not affect vertical amplitude).

The output of U3,pin1 is connected to switch U8,pin5; as long as HFLYBP is low, U3,pin1 is connected to U9,pin3, HPARAB equals a tilted parabola. HFLYBP, high during flyback, will connect U9,pin3 with C512 via U8,pin4,3.C512 is charged by U9,pin7 via D8 (peak detector). The peakdetector is triggered by HFEEDB2; only during the first half of the scan HFEEDB2 will be negative, Q5 will be off for a short time and C512 will be charged to the peak level of U3,pin1 (during the second half of the scan HFEEDB2 is 0V, Q5 is on and the peakdetector is disabled), this means that when HFLYBP goes high, U9,pin1 will be preset to the startlevel of the next parabolic waveform (equal to the startlevel of the previous parabolic waveform).

Dynamic Focus disable during vertical retrace for stable AKB

NMBLP goes low during horizontal and vertical blanking.
C59 will not discharge sufficiently during horizontal blanking, however, during the vertical blanking Q7 will be off during a longer time, U8,pin9 will go high. HPARAB will be preset to the maximum value of the previous parabolic waveform, during vertical retrace HPARAB is kept constant to ensure stable AKB measurements.

Trimdac

All signals used for geometry correction are keypad controllable, a software controlled trimdac (U508) trims the signallevels. The serial communication between the trimdac and the µcontroller is controlled by SDI (U508,pin20), CLK (U508,pin17) and LD (U508,pin16). These pins are connected to the databus of the µcontroller via a latch (U26,pin12,13,14 see sheet 2 of 7). NPR (U508,pin7) resets the trimdac after start-up until µcontroller takes over control. The trimmed levels are buffered by U19, HDFPARAB (U19,pin1) is the AC coupled rescaled HPARAB; VDFPARAB (U19,pin7) is the summation of the rescaled VPARAB with the rescaled VRAMP; HDYNAMPL (U19,pin8) is the summation of the rescaled VPARAB with the rescaled VRAMP; HDYNDLY (U19,pin14) is the summation of the rescaled VPARAB with the rescaled VRAMP and HPASEADJ.

2.2.4 PCB LAYOUT

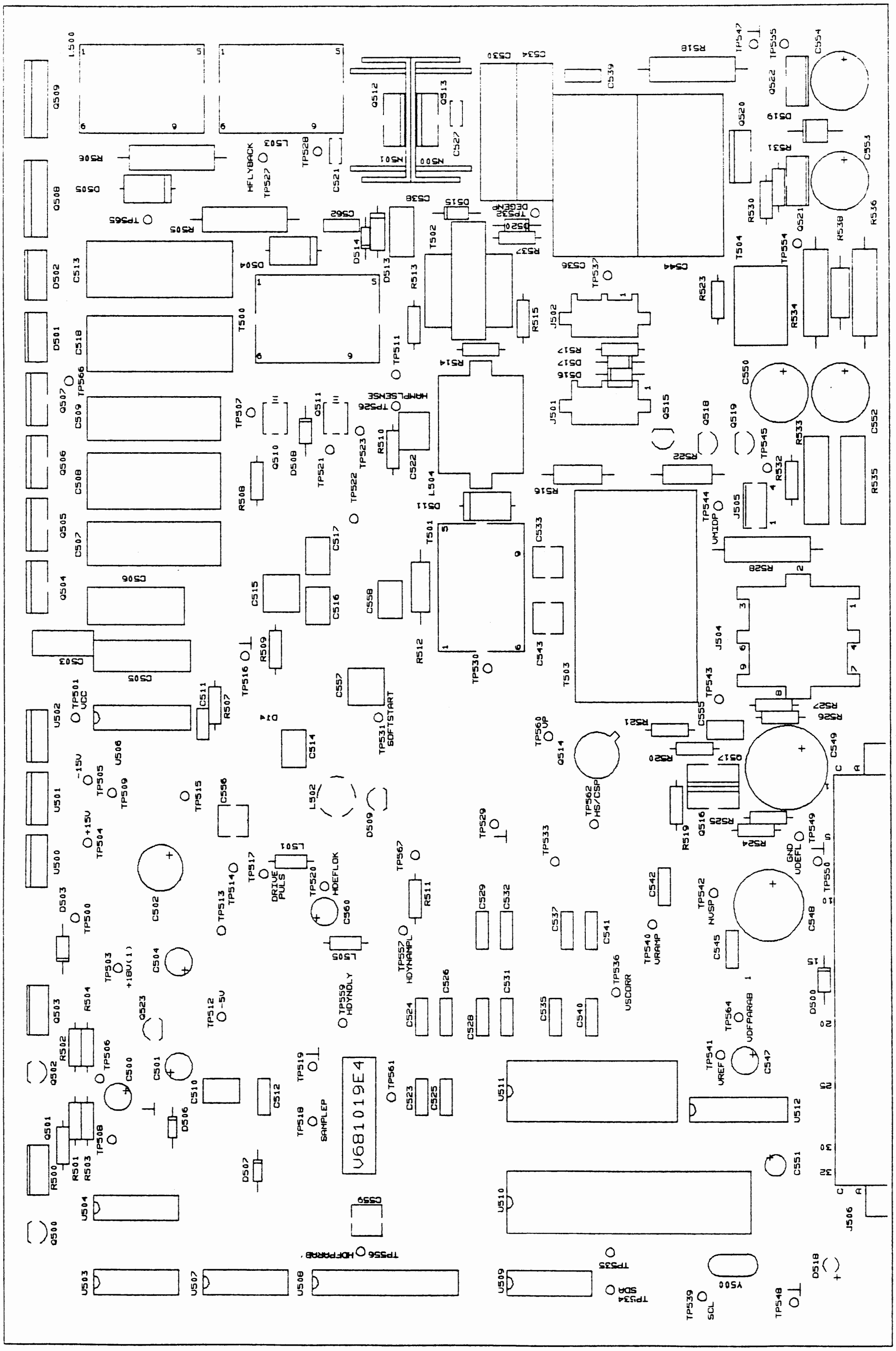


figure 2.17 : DEFLECTION BOARD component side

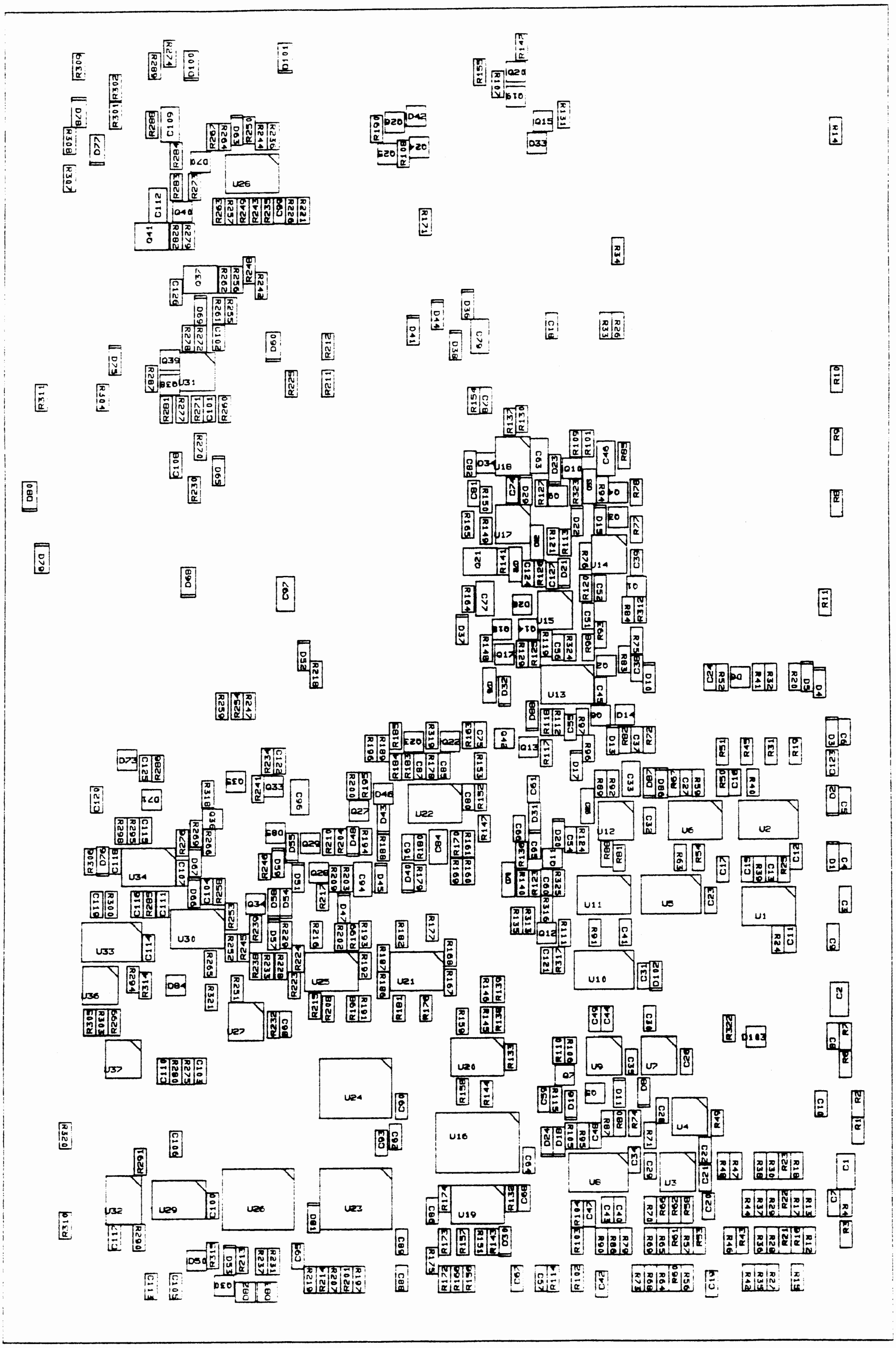


figure 2.18 : DEFLECTION board solder side

2.2.5 PARTSLIST

17" VERSION

Order number of a DEFLECTION BOARD 32/64 KC MPRD9643: V5631235 20 Date : 01/12/92

Order number	Description	Item
V1011369	R CFFH 1K J 0W25	R526
V101200	R MF H 1E J 0W5	R501,R502,R503,R504
V101207	R MF H 3E9 J 0W5	R508
V101208	R MF H 4E7 J 0W5	R531
V101212	R MF H 10E J 0W5	R500,R517
V1012129	R CFFH 10E J 0W5	R533,R535
V101214	R MF H 15E J 0W5	R530
V101216	R MF H 22E J 0W5	R523
V101223	R MF H 82E J 0W5	R539
V101228	R MF H220E J 0W5	R527
V101248	R MF H 10K J 0W5	R520
V101252	R MF H 22K J 0W5	R509
V101256	R MF H 47K J 0W5	R519,R537
V101260	R MF H100K J 0W5	R507,R521
V101262	R MF H150K J 0W5	R532
V101504	R MF H 2E2 F 0W4 E2	R524,R525
V101513	R MF H 12E F 0W4 E2	R513
V101517	R MF H 27E F 0W4 E2	R514,R515
V101539	R MF H 1K8 F 0W4 E2	R510
V101548	R MF H 10K F 0W4 E2	R539
V101568	R MF H470K F 0W4 E2	R511
V102300	R MF H 1E J 2W5	R505,R506
V102312	R MF H 10E J 2W5	R534,R536
V102330	R MF H330E J 2W5	R528
V102349	R MF H 27K J 2W5	R518
V102915	R MF H 18E J 1W6	R512
V102924	R MF H100E J 1W6	R516,R522
V1114005	C EL RA 47M M200E3 105	C549
V1114169	C EL RA 10M M350E2 105	C550,C552
V1114689	C EL RA 470M M 16E2 105	C502
V111476	C EL RA 4M7M400E2 105	C553,C554
V111489	C EL RA 470M M 35E2 105	C548
V1114932	C EL RA 4M7M 50E1 105	C551
V1114972	C EL RA 100M M 10E1 105	C560
V1115109	C EL RA 22M M 25E2 105	C500,C501,C504,C547
V111681	C EL BRA 22M M 25E2 85	C559
V111725	C COG MU 1N5K200E2 125	C521,C527
V112090	C CE DI 47P K102E3 HV	C538
V1120901	C CE DI 100P K102E3 HV	C503
V112683	C N750MI 22P G500E2	C511
V1127020	C X7R MU 10N K200E2 125	C562
V1127040	C X7R MU 4N7K200E2 125	C555
C112825	C CE DI 1N S400E2	C539
V114051	C POMERA 560N K250E9 85	C530,C534
V1140584	C POMERA 2M2K400E11 85	C536,C544
V114082	C POMERA 22N K 63E2 85	C542
V114088	C POMERA 100N K 50E2 85	C512,C523,C524,C525,C526,C528, C529,C531,C532,C535,C537,C540, C541,C545
V114092	C POMERA 470N K 50E2 85	C510
V114099	C POMERA 3M3M 50E2 85	C533,C543,C556

Order number	Description	Item
V115006	C PPMERA 12N J102E9 HV	C513,C518
V1150652	C PPMERA 120N K250E6	C505
V1150692	C PPMERA 270N K250E9	C506
V1150712	C PPMERA 390N K250E9	C509
V1150722	C PPMERA 470N K250E9	C507
V1150762	C PPMERA 1M K250E11	C508
V115159	C PP RA 680P J100E2 85	C516
V115161	C PP RA 1N J100E2 85	C514,C517
V115162	C PP RA 1N5J100E2 85	C558
V115167	C PP RA 4N7J 63E2 85	C515,C522
V116304	C PP RA 6N8H 63E2 85	C557
V1314182	Q BC559C P SS TO92	Q523
V131426	Q BC337 N SS TO92	Q518
V131432	Q BC161-10 P P TO39	Q514
C131646	D 1N4007 R DO41	D516,D517
V131662	D LED D3 T RED	D518
V131688	U 521-4 TLP DIP16 P	U506
V131729	D ZEN 4V7 0W5 C DO35	D506,D507
V131776	D ZEN 180V 0W5 C DO7	D515,D520
V131827	D BB212 VAR TO92	D509
C131907	D BY584 R SOD61A	D513,D514
V131914	D BYW96E AFSR SOD64	D519
V131930	D SB130 SCH F126	D500,D503,D508
V131954	D BYV27-200 R SOD57	D510,D512
V131956	D MUR10120E UF R TO220	D501,D502
V132024	D VSK340 SCH	D504,D505,D511
V132209	Q TYN1004 TH P TO220	Q520
V132500	Q MPSA44 N SS TO92	Q515
V132501	Q BC327-25 P SS TO92	Q519
V132554	Q BC546B N SS TO92	Q500
V132555	Q BC556B P SS TO92	Q502
V132568	Q MJW16010A N P TO247	Q508,Q509
V1325791	Q BD651F DN P SOT186	Q503
V1325841	Q BD652F DP P SOT186	Q501
V132592	Q BUT12A N P TO220	Q521,Q522
V132602	Q IRF510 FN P TO220	Q504
V132603	Q IRF520 FN P TO220	Q505,Q506
V132614	Q IRF620 FN P TO220	Q513,Q516
V132615	Q IRF9620 FP P TO220	Q512,Q517
V132620	Q IRF530 FN P TO220	Q507
V132625	Q IRFD9110 FP P DIP4	Q510
V132630	Q IRFD110 FN P DIP4	Q511
V1327680	U 08 DAC DIP16 M	U512
V133005	Q ACC INSUL SIL TO220	0070
V133012	Q ACC HTSNK TO5	0100
V133076	Q ACC WSHR TO5	0101
V133082	Q ACC INSUL BUSH TO220	0094
V133084	Q ACC HTSNK TO92	0060
V133086	Q ACC HTSNK TO220	N500,N501
V1340100	U 7815 TO220 P	U500
V1340131	U 2990-15 LM TO220 P	U501
V134044	U 2940-5 LM TO220 P	U502
V1341070	U 1595 MC DIP14 M	U503,U504,U507
V1342060	U 5407 DIP14 M	U509
V134259	U 8840 DAC DIP24 I	U508
V1372322	U 80C31BH 12MDIP40 I	U510
C302108	CORE 3.7X 1.2X 3.5	0170

Order number	Description	Item
V3061564	CHOKE AX NS 1 MH	L501,L505
V306410	COIL DYN LIN 6630A 00	T503
V306701	TRF DRIV AT4043/ 89	T504
V306726	TRF CURR AT4043/ 47	T502
V306800	X ACC INSUL HC49	0120
V306860	X 12.000000 MHZ	Y500
V311061	D ACC HLDR D3 P1 TS H 6.5	0160
C3132531	J U0.6 FBT P28 E1AU TLP	0080
V3133042	J MNL R MBT P 2 AU	J501,J502
V3133047	J MNL R MBT P 9 AU	J504
V313525	J EUR3C MBS P64 E1C2 S1.6	J506
V3139133	J DUBX1 MBT P 4 E1AU	J505
V315332	SLDRLUG SCR 1TAG D4.2 L26	0130
V342168	WIRE AWG24 UL1007 WHI Y	0036
V3481064	W JUMP 0.6 17.78	R538
V3620146	SMP-I M2.5X10 D 84	0140
V3620206	SMP-I AM3 X 5 D 84	0037
V3620216	SMP-I AM3 X 6 D 84	0038,0090
V3620226	SMP-I AM3 X 8 D 84	0091
V3620246	SMP-I AM 3X12 D84	0092
V3661026	NUT DIN934 I M3	0095,0150
V3661106	NUT DIN934 I M2.5	0142
V3673896	WASHER INOX M2.5DIN137 Y	0141
V3673906	WASHER CRINKLE I M3	0039,0093,0151
V367650	MOUNTING BRACKET	0031
V5681931	SOFT DEFL.32/64KC 9600 00	U511
V6030963	CAPTIVE SCREW SPRING 01	0033
V6030964	CAPTIVE SCREW M3 X10 00	0032
V603569	KLEM TRANSISTOR 3L 00	0040
V6035692	KLEMTRANSISTOR 2L 00	0050
V6036112	HEATSINK DEFL 20H 03	0030
V603695	ISOLATION DEFLECTION 01	0035
V603731	PCB CLAMP MPRD9000 01	0152
C671005	CH 9.2 MH 00	L504
V681019	SMD DEFLECT. MPRD 9600 10	0010
V716543	PCB TESTPOINT 05	0020
V775039	COIL WH-YEL-BLA-BLA	L502
V775332	T DRIVER DEFL 9000 00	T500
V775333	T SHIFT DEFL 9000 00	T501
V775335	CHOKE POWER DEFL. 9000 00	L500,L503

20" VERSION

Order number of a DEFLECTION BOARD 47/94 KC MPRD9651 : V5631230 19 Date : 01/12/92

Order number	Description	Item
V1011369	R CFFH 1K J 0W25	R526
V101200	R MF H 1E J 0W5	R501,R502,R503,R504
V101207	R MF H 3E9 J 0W5	R508
V101208	R MF H 4E7 J 0W5	R531
V101212	R MF H 10E J 0W5	R500,R517
V1012129	R CFFH 10E J 0W5	R533,R535
V101214	R MF H 15E J 0W5	R530
V101216	R MF H 22E J 0W5	R523
V101228	R MF H220E J 0W5	R527
V101248	R MF H 10K J 0W5	R520
V101252	R MF H 22K J 0W5	R509
V101256	R MF H 47K J 0W5	R519,R537
V101260	R MF H100K J 0W5	R507,R521
V101262	R MF H150K J 0W5	R532
V101504	R MF H 2E2 F 0W4 E2	R524,R525
V101513	R MF H 12E F 0W4 E2	R513
V101517	R MF H 27E F 0W4 E2	R514,R515
V101539	R MF H 1K8 F 0W4 E2	R510
V101548	R MF H 10K F 0W4 E2	R539
V101570	R MF H680K F 0W4 E2	R511
V102300	R MF H 1E J 2W5	R505,R506
V102312	R MF H 10E J 2W5	R534,R536
V102330	R MF H330E J 2W5	R528
V102349	R MF H 27K J 2W5	R518
V102915	R MF H 18E J 1W6	R512
V102924	R MF H100E J 1W6	R516,R522
V1114005	C EL RA 47M M200E3 105	C549
V1114169	C EL RA 10M M350E2 105	C550,C552
V1114689	C EL RA 470M M 16E2 105	C502
V111476	C EL RA 4M7M400E2 105	C553,C554
V111489	C EL RA 470M M 35E2 105	C548
V1114932	C EL RA 4M7M 50E1 105	C551
V1114972	C EL RA 100M M 10E1 105	C560
V1115109	C EL RA 22M M 25E2 105	C500,C501,C504,C547
V111681	C EL BRA 22M M 25E2 85	C559
V111725	C COG MU 1N5K200E2 125	C521,C527
V112090	C CE DI 47P K102E3 HV	C538
V1120901	C CE DI 100P K102E3 HV	C503
V112683	C N750MI 22P G500E2	C511
V1127030	C X7R MU 100N K200E2 125	C562
V1127040	C X7R MU 4N7K200E2 125	C555
C112825	C CE DI 1N S400E2	C539
V114040	C POMERA 68N K250E4 85	C505
V114051	C POMERA 560N K250E9 85	C530,C534
V1140584	C POMERA 2M2K400E11 85	C536,C544
V114082	C POMERA 22N K 63E2 85	C542
V114088	C POMERA 100N K 50E2 85	C512,C523,C524,C525,C526,C528, C529,C531,C532,C535,C537,C540, C541,C545
V114092	C POMERA 470N K 50E2 85	C510
V114099	C POMERA 3M3M 50E2 85	C533,C543,C556
V115006	C PPMERA 12N J102E9 HV	C513,C518
V1150662	C PPMERA 150N K250E6	C506
V1150692	C PPMERA 270N K250E9	C507,C509

Order number	Description	Item
V1150732	C PPMERA 560N K250E9	C508
V115159	C PP RA 680P J100E2 85	C516
V115161	C PP RA 1N J100E2 85	C514,C517
V115162	C PP RA 1N5J100E2 85	C558
V115167	C PP RA 4N7J 63E2 85	C515,C522
V116304	C PP RA 6N8H 63E2 85	C557
V1314182	Q BC559C P SS TO92	Q523
V131426	Q BC337 N SS TO92	Q518
V131432	Q BC161-10 P P TO39	Q514
C131646	D 1N4007 R DO41	D516,D517
V131662	D LED D3 T RED	D518
V131688	U 521-4 TLP DIP16 P	U506
V131729	D ZEN 4V7 0W5 C DO35	D506,D507
V131776	D ZEN 180V 0W5 C DO7	D515,D520
V131827	D BB212 VAR TO92	D509
C131907	D BY584 R SOD61A	D513,D514
V131914	D BYW96E AFSR SOD64	D519
V131930	D SB130 SCH F126	D500,D503,D508
V131954	D BYV27-200 R SOD57	D510,D512
V131956	D MUR10120E UF R TO220	D501,D502
V132024	D VSK340 SCH	D504,D505,D511
V132209	Q TYN1004 TH P TO220	Q520
V132500	Q MPSA44 N SS TO92	Q515
V132501	Q BC327-25 P SS TO92	Q519
V132554	Q BC546B N SS TO92	Q500
V132555	Q BC556B P SS TO92	Q502
V132568	Q MJW16010A N P TO247	Q508,Q509
V1325791	Q BD651F DN P SOT186	Q503
V1325841	Q BD652F DP P SOT186	Q501
V132592	Q BUT12A N P TO220	Q521,Q522
V132602	Q IRF510 FN P TO220	Q504
V132603	Q IRF520 FN P TO220	Q505,Q506
V132614	Q IRF620 FN P TO220	Q513,Q516
V132615	Q IRF9620 FP P TO220	Q512,Q517
V132620	Q IRF530 FN P TO220	Q507
V132625	Q IRFD9110 FP P DIP4	Q510
V132630	Q IRFD110 FN P DIP4	Q511
V1327680	U 08 DAC DIP16 M	U512
V133005	Q ACC INSUL SIL TO220	0070
V133012	Q ACC HTSNK TO5	0100
V133076	Q ACC WSHR TO5	0101
V133082	Q ACC INSUL BUSH TO220	0094
V133084	Q ACC HTSNK TO92	0060
V133086	Q ACC HTSNK TO220	N500,N501
V1340100	U 7815 TO220 P	U500
V1340131	U 2990-15 LM TO220 P	U501
V134044	U 2940-5 LM TO220 P	U502
V1341070	U 1595 MC DIP14 M	U503,U504,U507
V1342060	U 5407 DIP14 M	U509
V134259	U 8840 DAC DIP24 I	U508
V1372322	U 80C31BH 12MDIP40 I	U510
C302108	CORE 3.7X 1.2X 3.5	0170
V3061564	CHOKE AX NS 1 MH	L501,L505
V306410	COIL DYN LIN 6630A 00	T503
V306701	TRF DRIV AT4043/ 89	T504
V306726	TRF CURR AT4043/ 47	T502
V306800	X ACC INSUL HC49	0120

Order number	Description	Item
V306860	X 12.000000 MHZ	Y500
V311061	D ACC HLDR D3 P1 TS H 6.5	0160
C3132531	J U0.6 FBT P28 E1AU TLP	0080
V3133042	J MNL R MBT P 2 AU	J501,J502
V3133047	J MNL R MBT P 9 AU	J504
V313525	J EUR3C MBS P64 E1C2 S1.6	J506
V3139133	J DUBX1 MBT P 4 E1AU	J505
V315332	SLDRLUG SCR 1TAG D4.2 L26	0130
V342168	WIRE AWG24 UL1007 WHI Y	0036
V3481064	W JUMP 0.6 17.78	R538
V3620146	SMP-I M2.5X10 D 84	0140
V3620196	SMP-I AM3 X 4 D 84	0150
V3620206	SMP-I AM3 X 5 D 84	0037
V3620216	SMP-I AM3 X 6 D 84	0038,0090
V3620226	SMP-I AM3 X 8 D 84	0091
V3620246	SMP-I AM 3X12 D84	0092
V3661026	NUT DIN934 I M3	0095
V3661106	NUT DIN934 I M2.5	0142
V3673896	WASHER INOX M2.5DIN137 Y	0141
V3673906	WASHER CRINKLE I M3	0039,0093,0151
V367650	MOUNTING BRACKET	0031
V5681921	SOFT DEFL.47/93KC 9600 00	U511
V6030963	CAPTIVE SCREW SPRING 01	0033
V6030964	CAPTIVE SCREW M3 X10 00	0032
V603569	KLEM TRANSISTOR 3L 00	0040
V6035692	KLEMTRANSISTOR 2L 00	0050
V6036112	HEATSINK DEFL 20H 03	0030
V603695	ISOLATION DEFLECTION 01	0035
V603731	PCB CLAMP MPRD9000 01	0152
C671005	CH 9.2 MH 00	L504
V681019	SMD DEFLECT. MPRD 9600 10	0010
V716543	PCB TESTPOINT 05	0020
V775040	COIL WH-RED-BLA-BLA **	L502
V775332	T DRIVER DEFL 9000 00	T500
V775333	T SHIFT DEFL 9000 00	T501
V775335	CHOKE POWER DEFL. 9000 00	L500,L503

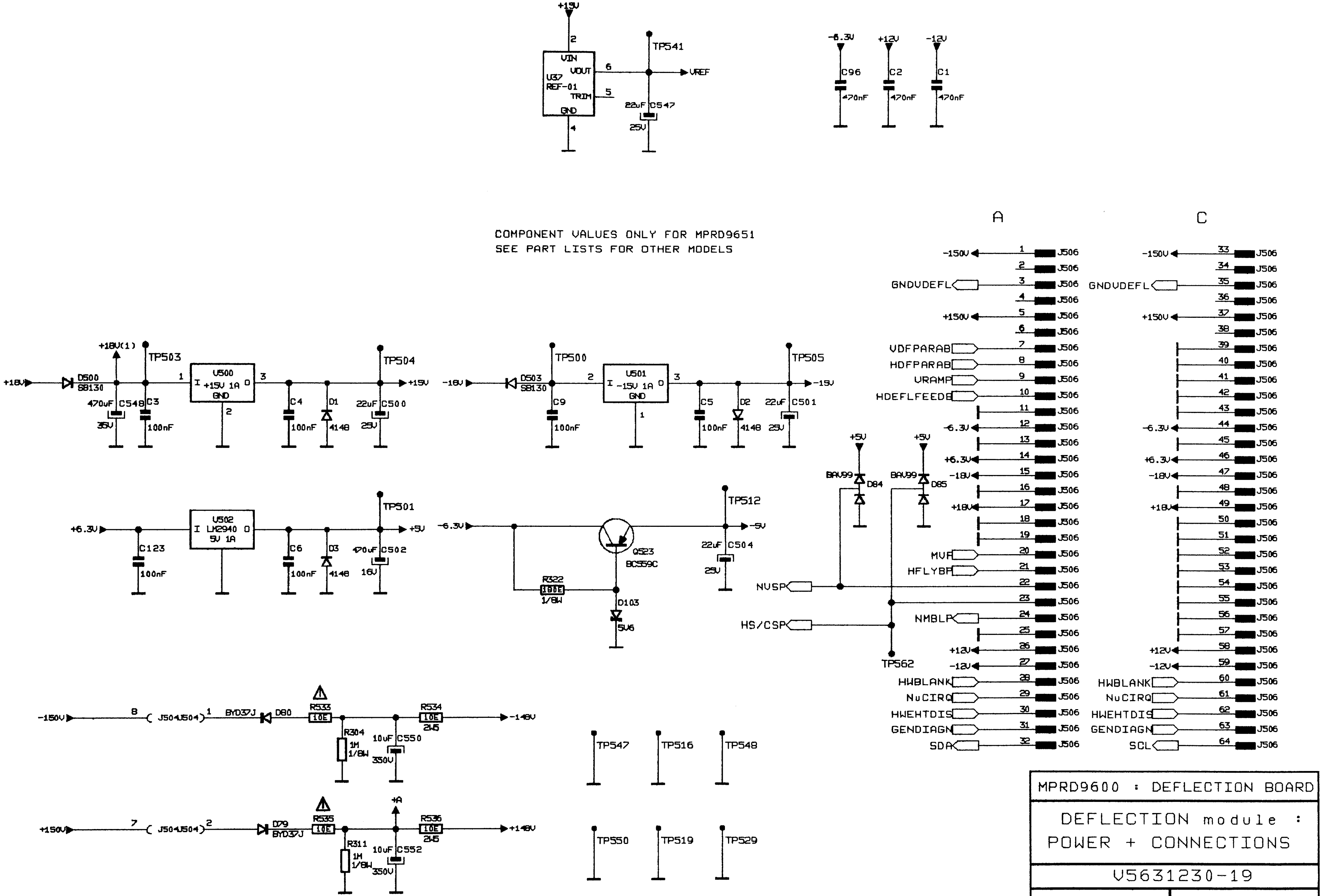
Order number of a complete SMD DEFL : V681019 Date : 01/12/92

Order number	Description	Item
P200001	R# CE H 1E J 0W12 1206	R321
P200005	R# CE H 1E5 J 0W12 1206	R25
P200043	R# CE H 56E J 0W12 1206	R14 ,R309,R34
P200045	R# CE H 68E J 0W12 1206	R26 ,R283,R284,R33
P200049	R# CE H100E J 0W12 1206	R154,R163,R231,R237,R299,R318
P200053	R# CE H150E J 0W12 1206	R316
P200055	R# CE H180E J 0W12 1206	R322
P200057	R# CE H220E J 0W12 1206	R109,R288,R85
P200059	R# CE H270E J 0W12 1206	R3 ,R6
P200061	R# CE H330E J 0W12 1206	R141,R306,R310
P200065	R# CE H470E J 0W12 1206	R1 ,R2 ,R218,R271,R72 ,R75
P200069	R# CE H680E J 0W12 1206	R314,R315
P200073	R# CE H 1K J 0W12 1206	R105,R113,R121,R138,R144,R145, R158,R159,R176,R177,R181,R182, R184,R198,R202,R208,R213,R216, R239,R256,R266,R282,R294,R305, R312,R323,R81 ,R82 ,R83 ,R88 , R97 ,R98
P200075	R# CE H 1K2 J 0W12 1206	R117,R125
P200077	R# CE H 1K5 J 0W12 1206	R129,R164,R225
P200079	R# CE H 1K8 J 0W12 1206	R107,R108,R180,R262,R279,R286, R303
P200081	R# CE H 2K2 J 0W12 1206	R101,R118,R123,R130,R19 ,R24 , R241,R25 ,R31 ,R324,R39 ,R45 , R51 ,R84
P200085	R# CE H 3K3 J 0W12 1206	R106,R126,R143,R179,R194,R217, R269,R285,R78 ,R91
P200087	R# CE H 3K9 J 0W12 1206	R142,R195
P200089	R# CE H 4K7 J 0W12 1206	R161,R221,R258,R273,R28 ,R30 , R325,R35 ,R37 ,R47 ,R48 ,R63 , R65 ,R68
P200091	R# CE H 5K6 J 0W12 1206	R260,R4 ,R7 ,R87
P200093	R# CE H 6K8 J 0W12 1206	R148,R38 ,R44
P200095	R# CE H 8K2 J 0W12 1206	R131,R190,R36 ,R42 ,R69 ,R73
P200097	R# CE H 10K J 0W12 1206	R104,R110,R112,R114,R119,R127, R132,R155,R171,R173,R174,R178, R185,R188,R189,R196,R197,R200, R201,R207,R214,R219,R270,R278, R290,R291,R298,R320,R71 ,R77 , R93 ,R94
P200099	R# CE H 12K J 0W12 1206	R111,R15 ,R17 ,R56
P200101	R# CE H 15K J 0W12 1206	R255,R261,R95
P200103	R# CE H 18K J 0W12 1206	R76 ,R96
P200105	R# CE H 22K J 0W12 1206	R115,R204,R210
P200107	R# CE H 27K J 0W12 1206	R226
P200109	R# CE H 33K J 0W12 1206	R135,R156,R20 ,R209,R21 ,R23 , R234,R27 ,R272,R277,R287,R29 , R317,R32 ,R41 ,R52 ,R61 ,R64
P200113	R# CE H 47K J 0W12 1206	R120,R136,R238,R244,R254
P200117	R# CE H 68K J 0W12 1206	R137,R170,R281,R80
P200121	R# CE H100K J 0W12 1206	R10 ,R133,R140,R147,R151,R203, R229,R246,R250,R319,R40, R86
P200123	R# CE H120K J 0W12 1206	R152
P200125	R# CE H150K J 0W12 1206	R183,R295
P200127	R# CE H180K J 0W12 1206	R252,R9

Order number	Description	Item
P200133	R# CE H330K J 0W12 1206	R276,R54 ,R79 ,R8
P200139	R# CE H560K J 0W12 1206	R11 ,R211,R212,R274,R289,R301, R302,R307,R308
P200145	R# CE H 1M J 0W12 1206	R124,R153,R165,R247,R304,R311, R74
P200157	R# CE H 3M3 J 0W12 1206	R236,R300
P200411	R# CE H 1K F 0W12 1206	R160,R233,R59
P200413	R# CE H 1K2 F 0W12 1206	R50
P200415	R# CE H 1K5 F 0W12 1206	R67
P200417	R# CE H 1K8 F 0W12 1206	R245
P200423	R# CE H 3K3 F 0W12 1206	R13 ,R16 ,R175,R22 ,R43 ,R53 , R60
P200427	R# CE H 4K7 F 0W12 1206	R232,R242,R249,R251,R257,R263, R267,R275,R280
P200435	R# CE H 10K F 0W12 1206	R102,R103,R12 ,R157,R172,R18 , R253,R265,R46 ,R49 ,R57 ,R58 , R62 ,R66 ,R70 ,R90
P200437	R# CE H 12K F 0W12 1206	R313
P200439	R# CE H 15K F 0W12 1206	R166
P200443	R# CE H 22K F 0W12 1206	R193,R89 ,R92
P200445	R# CE H 27K F 0W12 1206	R169
P200449	R# CE H 39K F 0W12 1206	R264
P200451	R# CE H 47K F 0W12 1206	R167,R168,R186,R187,R191,R215, R223,R224,R235,R243,R248
P200459	R# CE H100K F 0W12 1206	R150,R228
P200463	R# CE H150K F 0W12 1206	R192,R199
P200469	R# CE H270K F 0W12 1206	R149
P200475	R# CE H470K F 0W12 1206	R139
P200477	R# CE H560K F 0W12 1206	R146
P210002	C(S)CEC2CH1812X7R474M 50	C1 ,C109,C112,C2 ,C33 ,C46 , C63 ,C77 ,C84 ,C94 ,C96 ,C97
P210013	C(S)CEC1CH1206COG102J 50	C115,C121,C125,C34 ,C39 ,C47 , C82
P210028	C(S)CEC1CH1206COG152J 50	C116,C126,C99
P210045	C(S)CEC2CH1206X7R473K 50	C91
P210049	C(S)CEC2CH1808X7R224K 50	C36 ,C53 ,C62 ,C70 ,C72 ,C76
P210068	C(S)CEC2CH1206X7R223K 50	C27
P210076	C(S)CEC1CH1206COG221J 50	C122,C13 ,C15 ,C16 ,C37 ,C55 , C7 ,C8
P210092	C(S)CEC2CH1206X7R103K 50	C10 ,C101,C102,C103,C120,C43 , C54 ,C56 ,C60 ,C65 ,C66 ,C80
P210095	C(S)CEC2CH1812X7R334M 50	C79
P210100	C(S)CEC1CH1206COG470J 50	C105,C113,C74
P210102	C(S)CEC1CH1206COG471J 50	C44 ,C98
P210122	C(S)CEC2CH1206X7R104K 50	C100,C104,C106,C107,C108,C11 , C110,C111,C114,C117,C118,C119, C12 ,C123,C127,C17 ,C19 ,C20 , C21 ,C22 ,C23 ,C24 ,C26 ,C28 , C29 ,C3 ,C30 ,C31 ,C32 ,C35 , C4 ,C40 ,C41 ,C42 ,C45 ,C48 , C49 ,C5 ,C51 ,C52 ,C565,C57 , C6 ,C64 ,C67 ,C68 ,C75 ,C78 , C81 ,C85 ,C86 ,C87 ,C88 ,C89 , C9 ,C90 ,C92 ,C93 ,C95
P210137	C(S)CEC1CH1206COG101J 50	R230
P210150	C(S)CEC2CH1206X7R332K 50	C59
P210156	C(S)CEC2CH1206X7R682J 50	C18

Order number	Description	Item
P210161	C(S)CEC1CH1206COG121J 50	C38
P210238	C# N750MU 15P J 63 1206	C61
P230030	SMC(S)ICCMOS 4053	U33 ,U8
P230049	SMC(S)ICCMOS 74HC10	U29
P230052	SMC(S)ICCMOS 74HC74	U13
P230054	SMC(S)ICLOPA TL072I	U12 ,U14 ,U17 ,U27 ,U3 ,U31 , U36 ,U4 ,U7 ,U9
P230058	SMC(S)ICLCOM LM239	U22 ,U28
P230094	SMC(S)ICCMOS 4067	U16
P230139	SMC(S)ICDMOS 74HC4016	U11
P230163	SMC(S)ICDMOS 74HC132	U34
P230173	SMC(S)ICDMOS 74HC14	U6
P230328	SMC(S)ICLQUA TL064I	U19 ,U20 ,U21 ,U25 ,U30
P230378	SMC(S)ICTIM MB3773 SOF8	U32
P230450	SMC(S)ICHC 74HC4020 SO16	U10
P230464	SMC(S)ICHCT74HCT574 SOL20	U24 ,U26
P230515	SMC(S)ICHCT74HCT373 SOL20	U23
P230568	SMC(S)ICHC 74HC4002 SO14	U1
P230569	SMC(S)ICHC 74HC4046 SO16	U5
P230570	SMC(S)ICHC 74HC4518 SO16	U2
P230583	SMC(S)ICCOM LM293 SO8	U15 ,U18
P230641	SMC(S)ICREF REF01 SO8	U37
P232004	SMC(S)TRA BC849C	Q10 ,Q11 ,Q15 ,Q22 ,Q23 ,Q27 , Q28 ,Q29 ,Q30 ,Q33 ,Q34 ,Q36 , Q4 ,Q40 ,Q5 ,Q7
P232019	SMC(S)TRAFET 4416	Q38
P232069	SMC(S)TRA BT2369	Q1 ,Q12 ,Q13 ,Q14 ,Q2 ,Q6 , Q9
P232101	SMC(S)TRPNP BC859C SOT23	Q17 ,Q18 ,Q26 ,Q3 ,Q39 ,Q42
P232126	SMC(S)TRNPN PMBTA42 SOT23	Q20 ,Q24 ,Q35
P232127	SMC(S)TRPNP PMBTA92 SOT23	Q19 ,Q25
P232129	SMC(S)TRPNP BC869 SOT89	Q21 ,Q37 ,Q41
P234036	SMC(S)DIOZEN BZX84B5V6	D103,D34
P234047	SMC(S)DIO BAV99	D82 ,D83 ,D84 ,D85
P234048	SMC(S)DIOZEN BZX84C15	D33 ,D42
P234074	SMC(S)DIOZEN BZX84C10	D46 ,D6 ,D71 ,D73
P234094	SMC(S)DIOZEN BZX84C6V8	D14
P234099	SMC(S)DIO 4148	D1 ,D10 ,D13 ,D15 ,D16 ,D17 , D18 ,D2 ,D20 ,D21 ,D23 ,D24 , D3 ,D30 ,D31 ,D32 ,D36 ,D37 , D38 ,D4 ,D40 ,D41 ,D44 ,D45 , D48 ,D5 ,D51 ,D52 ,D54 ,D55 , D57 ,D58 ,D59 ,D63 ,D65 ,D66 , D69 ,D75 ,D76 ,D86 ,D87 ,D88
P234140	SMC(S)DIOSCH LL101A	D102,D11 ,D22 ,D29 ,D43 ,D47 , D53 ,D67 ,D8 ,D81, D104
P234172	SMC(S)DIZENBZX84B5V1SOT23	D28 ,D50 ,D70
P234196	SMC(S)DIAVA BYD37J SOD87	D100,D101,D60 ,D68 ,D77 ,D78 , D79 ,D80
P900809	PRINT - P1286809	S

2.2.6 SCHEMATIC DIAGRAM



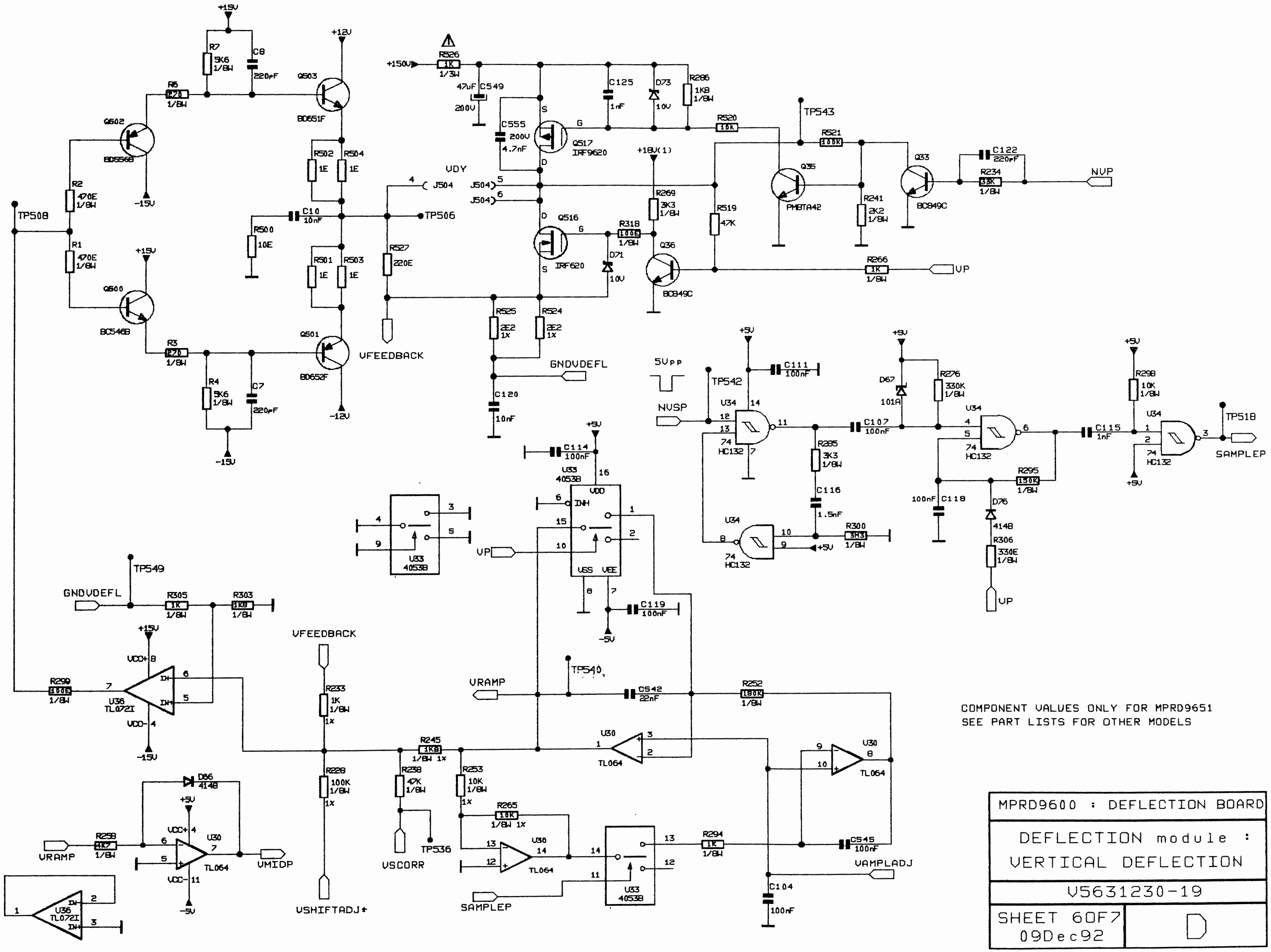
MPRD9600 : DEFLECTION BOARD

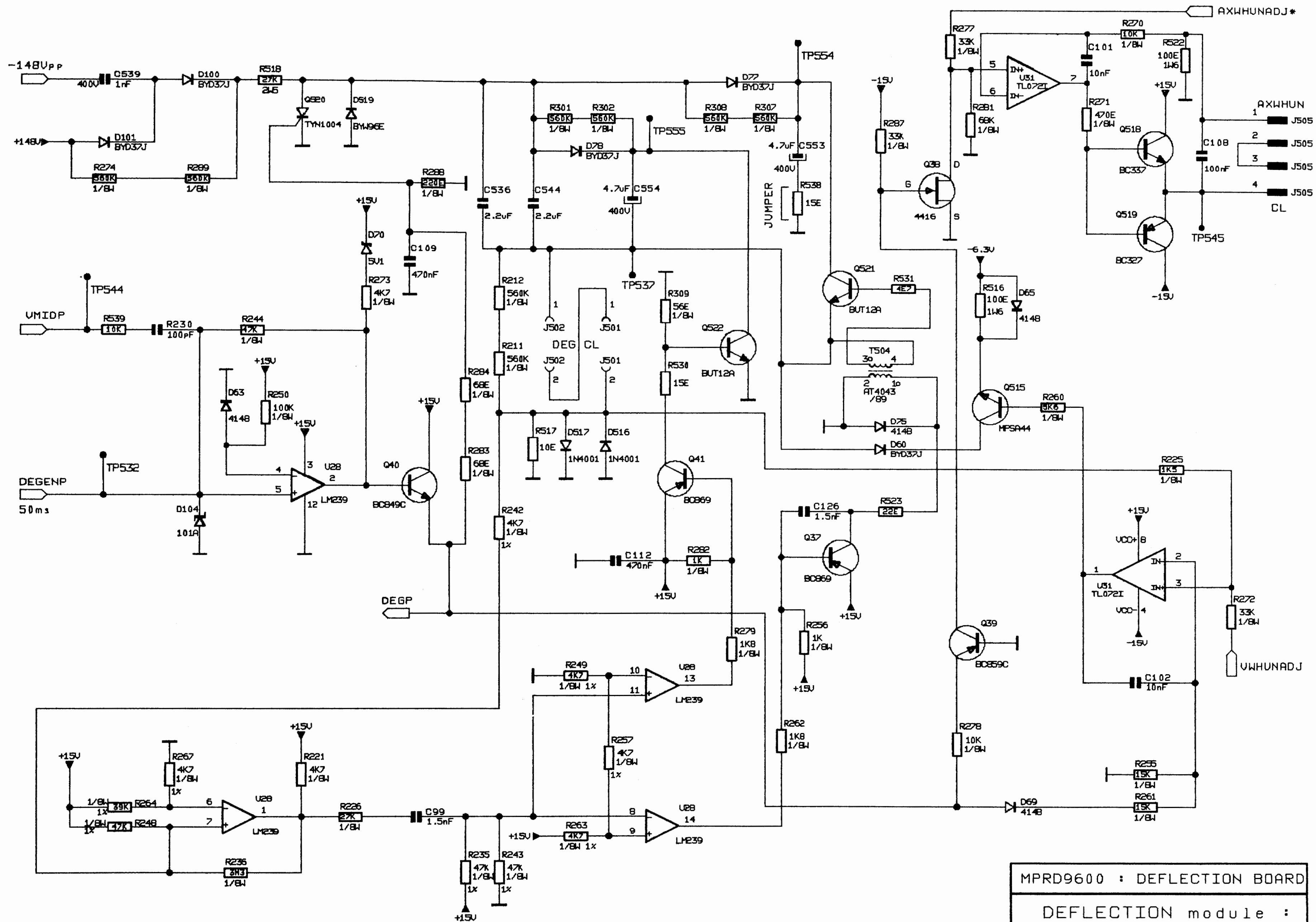
DEFLECTION module :
POWER + CONNECTIONS

V5631230-19

SHEET 1OF7
09Dec92

D


COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS
MPRD9600 : DEFLECTION BOARD
DEFLECTION module :
VERTICAL DEFLECTION
V5631230-19
SHEET 6OF7
09Dec92
D
VFEEDBACK
GNDVDEFL
NVSP
NVP
VP
SAMPLEP
VRAMP
VMIDP
VSHIFTADJ+
VSCORR
VAMPLADJ
TP508
TP506
TP543
TP542
TP518
TP549
TP540
TP536
VDY
5Vpp



COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS

MPRD9600 : DEFLECTION BOARD	
DEFLECTION module : DEGAUSS+SH COMP+ WuA	
V5631230-19	
SHEET 7OF7 09Dec92	D

2.2.7 BACKBOARD CONNECTIONS

DEFLECTION Board Connector J506 is connected with BACKBOARD Connector J12.

a-side pin nr	signal name	to	from	(CAD)	c-side pin nr	signal name	to	from
1	**-150 V**		P	33	1	**-150 V**		P
2	nc/ntbu			34	2	nc/ntbu		
3	**GNDVDEFL**		P	35	3	**GNDVDEFL**		P
4	nc/ntbu			36	4	nc/ntbu		
5	**+150 V**		P	37	5	**+150 V**		P
6	nc/ntbu			38	6	nc/ntbu		
7	VDFPARAB	E		39	7	**GND**		P
8	HDFPARAB	E		40	8	**GND**		P
9	VRAMP	M		41	9	**GND**		P
10	HDEFLFEEDB	M		42	10	**GND**		P
11	**GND**		P	43	11	**GND**		P
12	**-6.3 V**		P	44	12	**-6.3 V**		P
13	**GND**		P	45	13	**GND**		P
14	**+6.3 V**		P	46	14	**+6.3 V**		P
15	**-18 V**		P	47	15	**-18 V**		P
16	**GND**		P	48	16	**GND**		P
17	**+18 V**		P	49	17	**+18 V**		P
18	**GND**		P	50	18	**GND**		P
19	**GND**		P	51	19	**GND**		P
20	MVP	ACM		52	20	**GND**		P
21	HFLYBP	ACM		53	21	**GND**		P
22	NVSP		A	54	22	**GND**		P
23	HS/CSP		A	55	23	**GND**		P
24	NMBLP		C	56	24	**GND**		P
25	**GND**		P	57	25	**GND**		P
26	**+12 V**		P	58	26	**+12 V**		P
27	**-12 V**		P	59	27	**-12 V**		P
28	HWBLANK	C		60	28	HWBLANK	C	
29	NuCIRQ int	C		61	29	NuCIRQ int	C	
30	HWEHTDIS	C		62	30	HWEHTDIS	C	
31	GENDIAGN oc/int	C	AEILMO	63	31	GENDIAGN oc/int	C	AEILMO
32	SDA	CILMO	CILMO	64	32	SCL		C

2.2.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

DEFL. BOARD WATERCOOLED MPRD9651 V5631231

Order number of a complete DEFL. BOARD WATECOOLED MPRD9651 : V5631231 19 Date : 12/01/93
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFL. BOARD WATERCOOLED MPRD9651 V5631231 19

SUBSTITUTES

Order Number	Description	Item	
V6036112	HEATSINK DEFL 20H 03	0030	replaced by
V6036111	HEATSINK DEFL. FLAT 02		

DEFLECTION BOARD 32/64 KC MPRD9651 V5631232

Order number of a complete DEFLEC. BOARD 32/64 KC MPRD9651 : V5631232 14 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFLEC. BOARD 32/64 KC MPRD9651 V5631232 14

SUBSTITUTES

Order Number	Description	Item	
V114040	C POMERA 68N K250E4	C505	replaced by
V1150682	C PPMERA 220N K250E6		
V1150662	C PPMERA 150N K250E6	C506	replaced by
V1150712	C PPMERA 390N K250E9		
V1150692	C PPMERA 270N K250E9	C507	replaced by
V1150742	C PPMERA 680N K250E9		
V1150732	C PPMERA 560N K250E9	C508	replaced by
V1150782	C PPMERA 1M5K250E11		
V1150692	C PPMERA 270N K250E9	C509	replaced by
V1150742	C PPMERA 680N K250E9		
V115162	C PP RA 1N5J100E2	C558	replaced by
V115163	C PP RA 2N2J100E2		
V1127030	C X7R MU 100N K200E2	C562	replaced by
V1127020	C X7R MU 10N K200E2		
V775040	COIL WH-RED-BLA-BLA	L502	replaced by
V775039	COIL WH-YEL-BLA-BLA		
V5681921	SOFT DEFL.47/93KC 9600 00	U511	replaced by
V5681931	SOFT DEFL.32/64KC 9600 00		

ADDED

Order Number	Description	Item
V101223	R MF H 82E J 0W5	R540

DEFLECTION BOARD 40/80 KC MPRD9643 V5631237

Order number of a complete DEFLEC. BOARD 40/80 KC MPRD9643 : V5631237 00 Date : 01/12/92
Differences between DEFLEC. BOARD 32/64 KC MPRD9643 V5631235 and
DEFLEC. BOARD 40/80 KC MPRD9643 : V5631237 00

SUBSTITUTES

Order Number	Description	Item	
V1150652	C PPMERA 120N K250E6	C505	replaced by
V1150642	C PPMERA 100N K250E6		
V1150692	C PPMERA 270N K250E9	C506	replaced by
V1150682	C PPMERA 220N K250E6		
V1150722	C PPMERA 470N K250E9	C507	replaced by
V1150712	C PPMERA 390N K250E9		
V1150762	C PPMERA 1M K250E11	C508	replaced by
V1150752	C PPMERA 820N K250E11		
V1150712	C PPMERA 390N K250E9	C509	replaced by
V1150702	C PPMERA 330N K250E9		
V1127020	C X7R MU 10N K200E2	C562	replaced by
V1127030	C X7R MU 100N K200E2		
V775039	COIL WH-YEL-BLA-BLA	L502	replaced by
V775040	COIL WH-RED-BLA-BLA		
V5681921	SOFT DEFL.47/93KC 9600 00	U511	replaced by
V5681931	SOFT DEFL.32/64KC 9600 00		

ADDED

Order Number	Description	Item
V2000007	R# CE H 1E8 J 0W12	R259

REMOVED

Item
R540

DEFLECTION BOARD 47/94 KC MPRD9651 V5631238

Order number of a complete DEFLEC. BOARD 47/94 KC HEATS. MPRD9651 : V5631238 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFLEC. BOARD 47/94 KC HEATS. MPRD9651 : V5631238 00

SUBSTITUTES

Order Number	Description	Item	
V6036112	HEATSINK DEFL 20 H 03	0030	replaced by
V6036114	HEATSINK DEFL 20-10X45H 03		

DEFLECTION BOARD 47/94 KC SHRT FLB 9651 V5631239

Order number of a complete DEFLEC. BOARD 47/94 KC SHRT FLB. 9651 : V5631238 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFLEC. BOARD 47/94 KC SHRT FLB. 9651 V5631239 00

SUBSTITUTES

Order Number	Description	Item	
V115006	C PPMERA 12N J102 E9 HV	C513, C518	replaced by
V115003	C PPMERA 10N J102 E9 HV		

DEFLECTION BOARD 47/94 KC FC722 MPRD9651 V5631930

Order number of a complete DEFL. BOARD 47/94 KC FC722 MPRD9651 : V5631930 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFL. BOARD 47/94 KC FC722 MPRD9651 V5631930 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

DEFLECTION BOARD 47/94 KC H.SEAL MPRD9651 V5631931

Order number of a complete DEFL. BOARD 47/94 KC H.SEAL MPRD9651 : V5631931 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFL. BOARD 47/94 KC H.SEAL MPRD9651 V5631931 00

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0200

DEFLECTION BOARD 32/64 KC FC722 MPRD9651 V5631932

Order number of a complete DEFLEC. BOARD 32/64 FC722 MPRD9651 : V5631932 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFLEC. BOARD 32/64 FC722 MPRD9651 V5631932 00

SUBSTITUTES

Order Number	Description	Item	
V114040	C POMERA 68N K250E4	C505	replaced by
V1150682	C PPMERA 220N K250E6		
V1150662	C PPMERA 150N K250E6	C506	replaced by
V1150712	C PPMERA 390N K250E9		
V1150692	C PPMERA 270N K250E9	C507	replaced by
V1150742	C PPMERA 680N K250E9		
V1150732	C PPMERA 560N K250E9	C508	replaced by
V1150782	C PPMERA 1M5K250E11		
V1150692	C PPMERA 270N K250E9	C509	replaced by
V1150742	C PPMERA 680N K250E9		
V115162	C PP RA 1N5J100E2	C558	replaced by
V115163	C PP RA 2N2J100E2		
V1127030	C X7R MU 100N K200E2	C562	replaced by
V1127020	C X7R MU 10N K200E2		
V775040	COIL WH-RED-BLA-BLA	L502	replaced by
V775039	COIL WH-YEL-BLA-BLA		
V5681921	SOFT DEFL.47/93KC 9600 00	U511	replaced by
V5681931	SOFT DEFL.32/64KC 9600 00		

ADDED

Order Number	Description	Item
V101223	R MF H 82E J 0W5	R540
V395154	FLUORAD FC - 722	0200

DEFLECTION BOARD CER FC722 MPRD9651 V5631933

Order number of a complete DEFLEC. BOARD CER FC722 MPRD9651 : V5631933 00 Date : 01/12/92
Differences between DEFLEC. BOARD 47/94 KC MPRD9651 V5631230 and
DEFLEC. BOARD CER FC722 MPRD9651 V5631933 00

SUBSTITUTES

Order Number	Description	Item	
V134259	U 8840 DAC DIP24 I	U508	replaced by
V1342591	U 8840 DAC DIP24 C		
V1372322	U 80C31BH 12MDIP40 I	U510	replaced by
V1372323	U 80C31BH TD 12MDIP40 C		
V5681921	SOFT DEFL.47/93KC 9600 00	U511	replaced by
V5681911	SOFT DEFLECT.MPRD 9600 00	U511	

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

2.3 EHT BOARD

General

The EHT board generates the EHT, VG2 and the FOCUS voltage for horizontal & vertical dynamic focus and static focus. It contains a high efficiency pulse-width modulated power oscillator.
Static and dynamic horizontal & vertical FOCUS are DC adjustable, no high voltage trimmers are required.
All necessary circuits for diagnose and protection are implemented.

Optional EHT board versions are described in section 2.3.8 Customized Versions (Options)

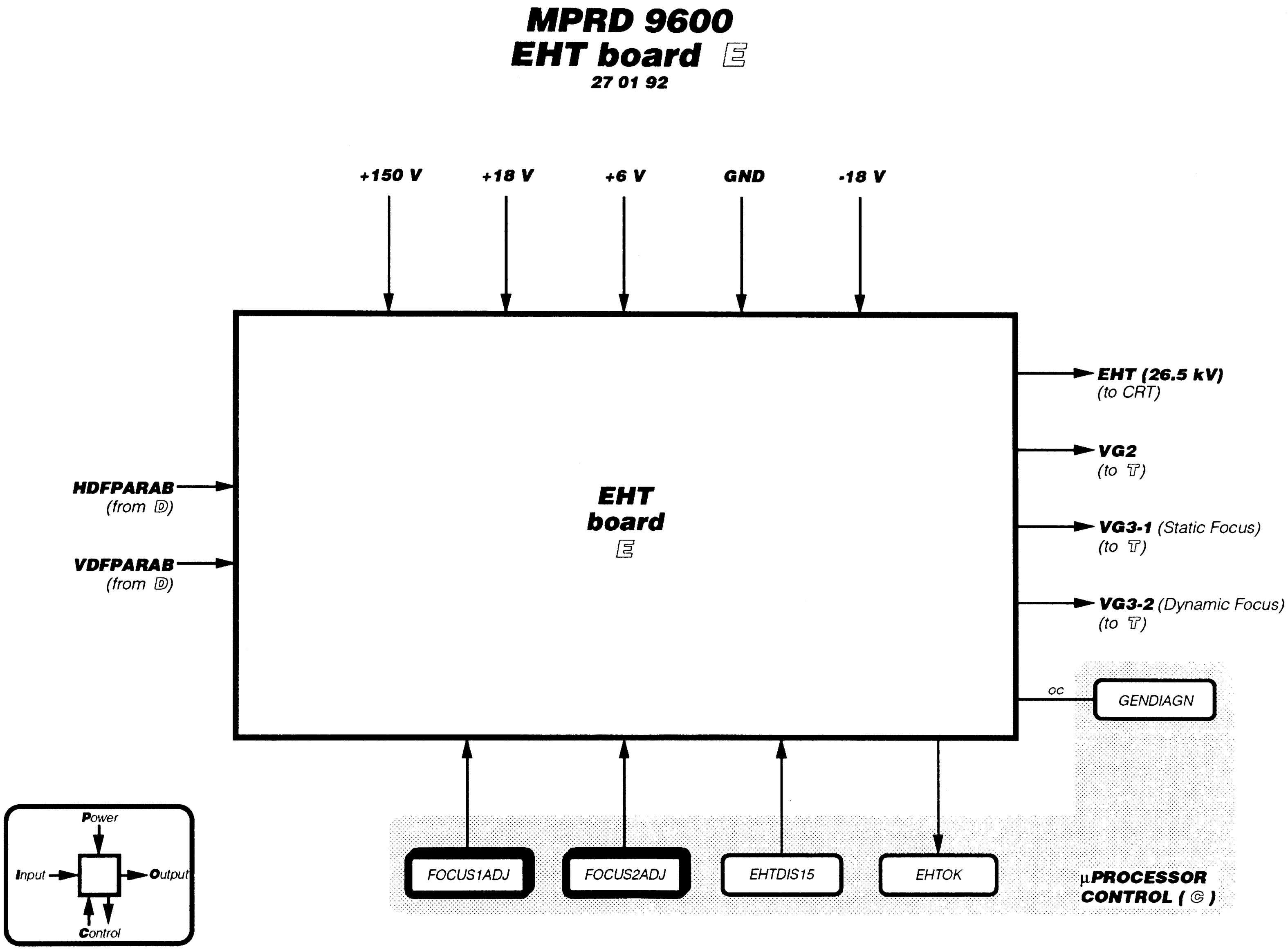


figure 2.19 : EHT board IOPC diagram

2.3.2 BLOCK DIAGRAM

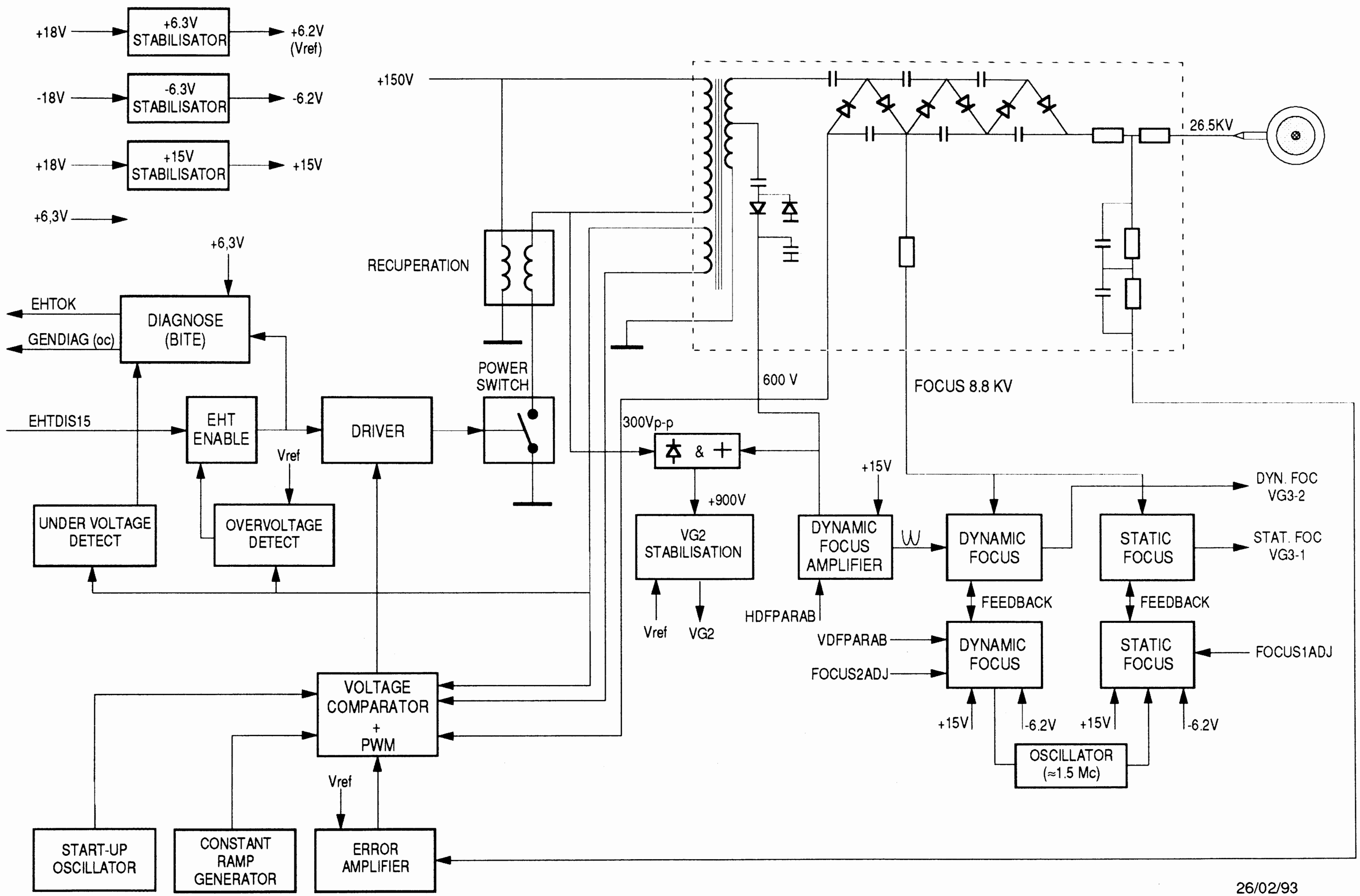


figure 2.20 : EHT board block diagram

2.3.3 CIRCUIT DESCRIPTION

EHT GENERATOR

The primary (EHT module, pin10,11) of the EHT transformer is part of an oscillator, and acts as a tuned circuit (fres. approx. 60 Kc). The oscillator is powered by the +150 V, the EHT feedback signal (EHT module, pin5,7) is pulse width modulated to regulate the amplitude of the EHT.

Start-up

Shortly after power up, no EHT will be present. A built-in sine wave oscillator U6,pin1,2,3, C14, RA5,6 with a frequency close to the self resonance frequency of the EHT module will start the EHT generator. The sine wave is connected to the inverting input U4,pin4 of a comparator via R8, the non-inverting input is connected to VREF (6,3Vdc). The sine wave is converted into a square wave and leaves at U4,pin2. A constant current source Q5,D1,2,R1,15 charges C9. When U4,pin2 goes low, C9 will be discharged via R9,D3.
Once the EHT generation has started, the oscillator voltage (coupled via R8 = 220KΩ) will be overruled by the voltage at pin5,7 (coupled via R13,14 = 470Ω) of the EHT module; the discharging of C9 is now locked with the oscillatorfrequency.

EHT Feedback & Stabilisation

The overcompensated EHT feedback signal leaves the EHT module at pin2, assuming that Q6 is on, a small part of it will be found across R17, smoothed by C17. Via R19 it is connected to the inverting input U6,pin6 of an integrator (U6,R24,C12,13), the non-inverting input receives part of VREF (P1,R31). At the output of the inverter U6,pin7 leaves a varying positive DC-signal. It is compared with the ramp at U4,pin6; as soon as the level of the ramp exceeds the outputlevel of the integrator, U4,pin1 goes low. Q4 will be turned off via Q2 and R2. Little later, C9 will be discharged again; U4, pin 1 will go high, the gate-source capacitor of Q4 will be charged by Q3 via R11,2, D34 limits the gate voltage.
D5 ensures that Q4 can only conduct during the negative half cycle of the sine wave on pin10 of the EHT module.

If EHT increases, the EHT feedbacklevel will increase, the voltage over R17 will increase, the DC-level at U6,pin7 will decrease, it will be exceeded faster by the ramp, turning of Q4 earlier, reducing the pulse width and the EHT; if the EHT feedbacklevel decreases, the opposite will happen.

Power Circuit

Q4 is the power switch, pulse-width modulated driven by U4,pin1 via Q2,3 .
When Q4 switches on, a rising current flows through the primary winding of the EHT module (pin10,11) and the primary of L2. The secondary of L2 blocks, D6 is biased in reverse direction.
The insertion of L2 in the primary circuit allows to have a sinusoidal voltage on pin10 and a near zero voltage on the drain of Q4 (Q4 saturated) simultaneously. When Q4 is switched off, the induction voltage in the secondary of L2 will bias D6 in forward direction. As a result the energy stored in L2 at the end of the conduction time of Q4 will be recycled into the positive power supply. This circuit allows nearly lossless operation in the primary power circuits of the EHT generator (only conduction losses in the saturated Q4, its switching losses at +/- 60 Kc are very small).
R4,3, C2,6 damp voltage spikes on Q4 and D6.

EHT Overcurrent Protection

Under normal conditions the current through R10, connected to the +18V, is sufficient to saturate Q6. If the EHT-current exceeds [18V - 0,7V]/7.86KΩ, Q6 will not be saturated any more and Vce of Q6 will increase. This will result in a higher EHT feedbackvoltage (sum of U_{R17} and Vce Q6); the EHT will decrease and so will the EHT current.

Overvoltage detect

The sinusoidal signal leaving at pin5,7 is also used to check for over- or undervoltage.
It is peak to peak rectified D9,10 and connected to the non inverting input U4,pin9,10 of the comparator.
If the level is higher than VREF, U4,pin14 goes high, via RA7,8 Q1 will conduct, shortening the drivesignal for Q2,3,4 to ground disabling the EHT module, Q8 will be on and led D24 will lighten, via D23 GENDIAGN goes low.
D14, RA8 is positive feedback to keep the EHT disabled after overvoltage.

Undervoltage detect

If the level on U4,pin10 is lower than on pin11 the output of the comparator U4,pin13 will go high, Q8 will conduct and led D24 will lighten, via D23 GENDIAGN goes low. As U4,pin14 is low, Q1 will not conduct and the EHT module is not disabled.

Flash protection
R69, C42, D40,41 protect U4 against flash,
D7,8, R19 protect U6 against flash

VG2 STABILISATION

Approximately 750Vdc is required for VG2. The signal at pin10 of the EHT module is peak to peak rectified (C39,41 D36,37) and added to the 600V present at pin15 of the EHT-module.
The 900Vdc is stabilised by a series regulator Q11.
VG2 OUT is sensed over the voltage reducer R50,45 P2 and connected to U9,pin2. The non inverting input receives VREF via R49, the difference between the inputsignals is integrated by U9 and connected to Q9. If VG2 OUT is too low, the voltage at U9,pin1 will increase, the current through Q9 will decrease, the base current of Q11 will increase and VG2 OUT will rise; if VG2 OUT is too high, vice versa. C33 smooths the base drive of Q11, C36 reduces the output impedance, D23,39 protect against flash, R52, C39 determine the loop gain.

HORIZONTAL DYNAMIC FOCUS

The horizontal dynamic focus is powered by the +600Vdc at pin15 of the EHT module. HDFPARAB, coming from the deflection board is coupled capacitively (C559 on the deflection board) to the hor. dyn. focus circuit.
The transistorarray U7,pin1,2,3,4,5,12,13,14 is a differential amplifier; input U7,pin2 receives the signal HDFPARAB, the other input, U7,pin4, receives the attenuated (R57,59,R60,R36//R37) and by an emitterfollower (U7,pin9,10,11) buffered outputsignal.
The current going through the collector of U7,pin14 is determined by the voltage over D19 and R35.
The current through the base of Q10, connected to the +15V via D25, is determined by the voltage across R44, via the emitter of U7 current is injected in R44, driving the outputstage Q10,12.
The outputstage is a bootstrapped active load amplifier to reduce powerdisspation. The quiescent current is determined by R55,56. Via C34,R58 the outputsignal is driving the base of Q12, D30 allows to drive Q12 exceeding the 600V power supply.
When a high outputlevel is required, Q12 will be driven additionally via C34,R58 as soon as the outputlevel starts to rise; via feedback the voltage across R44 will increase and Q10 will hardly conduct. The capacitive load can now be charged via the low-impedance emitter path of Q12.
Discharging the capacitive load goes via 42,Q10 (common base reduces influence of Miller capacitor),R44, due to feedback very short output signal fall times are obtained.

The outputsignal of the horizontal dynamic focus is capacitively coupled to VG3-2. To ensure a good flash protection, SG1, R25 and D31,32 were added. D22 protects the b-e junction U7,pin6,7, D18 protects the b-e junction U7,pin2,3.

2.3.4 PCB LAYOUT

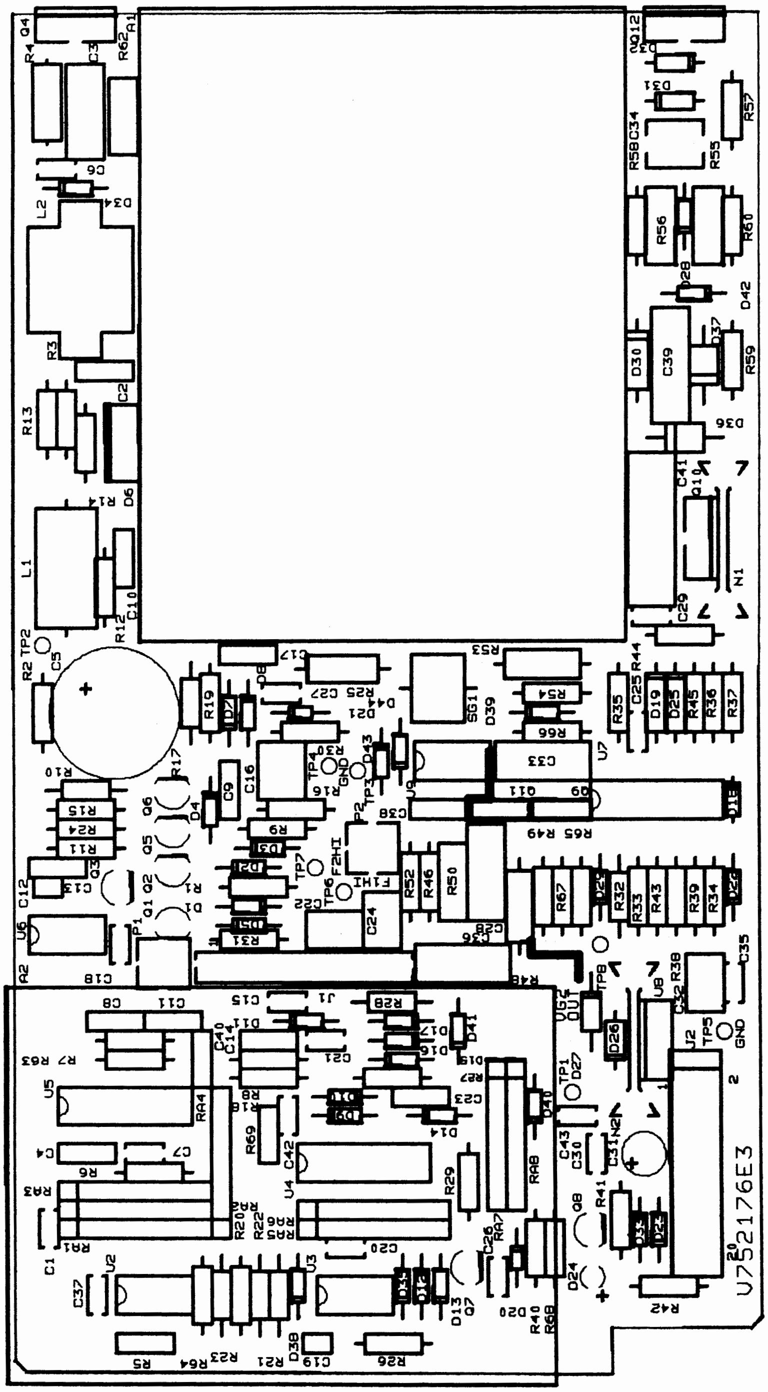


figure 2.21 : EHT board component side

2.3.5 PARTSLIST

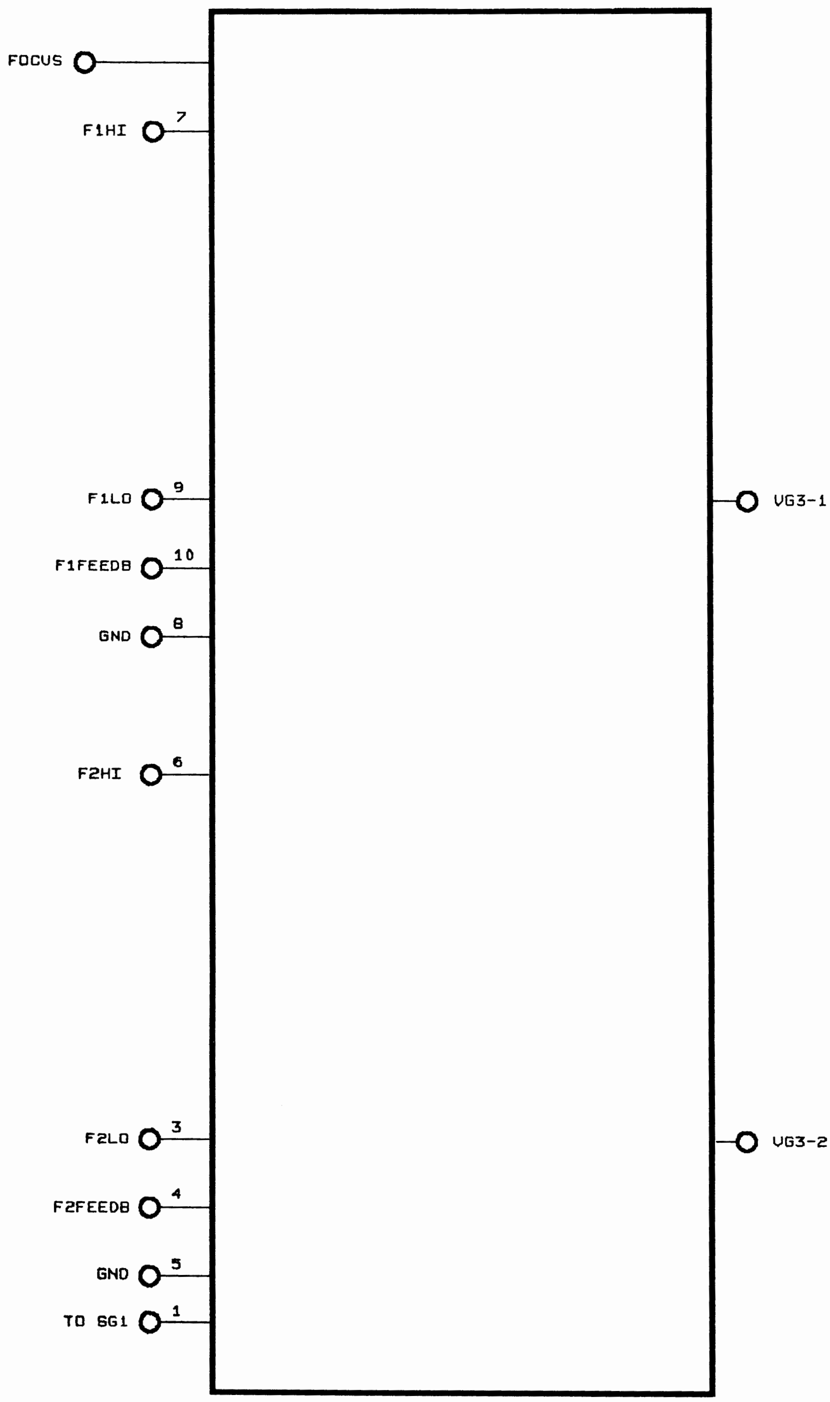
Order number of a complete EHT: V5636240 00 Date : 11/05/93

Order number	Description	Item
V101212	R MF H 10E J 0W5	R2
V101220	R MF H 47E J 0W5	R33 ,R38
V101224	R MF H100E J 0W5	R69
V101231	R MF H390E J 0W5	R35
V101232	R MF H470E J 0W5	R13 ,R14 ,R26 ,R63 ,R64 ,R9
V101233	R MF H560E J 0W5	R44
V101234	R MF H680E J 0W5	R15
V101236	R MF H 1K J 0W5	R16 ,R45 ,R49 ,R6 ,R65 ,R67 , R7
V101238	R MF H 1K5 J 0W5	R40 ,R52
V101239	R MF H 1K8 J 0W5	R24
V101240	R MF H 2K2 J 0W5	R30
V101242	R MF H 3K3 J 0W5	R27 ,R37
V101244	R MF H 4K7 J 0W5	R42
V101245	R MF H 5K6 J 0W5	R11
V101246	R MF H 6K8 J 0W5	R19 ,R36 ,R39
V101248	R MF H 10K J 0W5	R54 ,R58
V101253	R MF H 27K J 0W5	R46
V101256	R MF H 47K J 0W5	R41 ,R68
V101257	R MF H 56K J 0W5	R31
V101260	R MF H100K J 0W5	R1 ,R18 ,R66
V101264	R MF H220K J 0W5	R8
V101268	R MF H470K J 0W5	R20
V101271	R MF H820K J 0W5	R29
V101520	R MF H 47E F 0W4 E2	R70
V101536	R MF H 1K F 0W4 E2	R34
V102036	R CC H 1K K 0W5	R25
V102048	R CC H 10K K 0W5	R48
V1026007	R MF H 10K F 0W6	R23 ,R5
V1026047	R MF H 11K F 0W6	R57
V1026146	R MF H 1K4 F 0W6	R21
V1026298	R MF H200K F 0W6	R17
V1026338	R MF H221K F 0W6	R28
V1026506	R MF H 3K32F 0W6	R22
V1026726	R MF H 5K62F 0W6	R43
V1026756	R MF H 6K04F 0W6	R32
V1026807	R MF H 68K1 F 0W6	R59 ,R60
V1026856	R MF H 7K68F 0W6	R10
V1026925	R MF H909E F 0W6	R12
V102916	R MF H 22E J 1W6	R4
V102960	R MF H100K J 1W2	R55 ,R56
V104651	R HV H680K J 0W5 3500	R53
K104668	R HV H 3M9 J 0W5 3500	R50
V104671	R HV H 4M7 J 0W5 3500	R62
V107009	R TCE H 10K M 0W5 S7 TS	P1
V107012	R TCE H 50K M 0W5 S7 TS	P2
V1114005	C EL RA 47M M200E3 105	C5
V1114762	C EL RA 47M M 25E1 105	C31
V1117581	C CE DI 10N M102E3 HV	C28 ,C3 ,C33 ,C36
V1120902	C CE DI 100P K202E3 HV	C34
V1122360	C COG MU 560P J100E2 125	C6
V1124300	C COG MU 10P J100E1 125	C12

Order number	Description	Item
V1124410	C COG MU 82P J100E1 125	C19
V1127410	C X7R MU 1N5K 50E2 125	C44
V1127830	C X7R MU 100N K 50E2 125	C1 ,C15 ,C18 ,C20 ,C21 ,C25 , C26 ,C27 ,C29 ,C30 ,C35 ,C37 , C42 ,C7
V1140304	C POMERA 10N K400E4 85	C39
V1140424	C POMERA 100N K400E6 85	C41
V114080	C POMERA 10N K 63E2 85	C11 ,C17 ,C23 ,C4
V114083	C POMERA 33N K 63E2 85	C40
V114091	C POMERA 330N K 63E2 85	C32
V114092	C POMERA 470N K 63E2 85	C22 ,C24
V114096	C POMERA 1M K 50E2 85	C16
V114481	C PO RA 1N5M100E2 100	C14 ,C38
V114482	C PO RA 2N2M100E2 100	C8
V114486	C PO RA 6N8M100E2 100	C13
V115183	C PC RA 560P K100E2 100	C10 ,C9
V1312621	TUBE SURGE PROTECT 1000V	SG1
V131411	Q BC549C N SS TO92	Q1 ,Q6 ,Q8
V1314133	Q BC557C P SS TO92	Q7
V1314182	Q BC559C P SS TO92	Q5
V131426	Q BC337 N SS TO92	Q3
V1315046	D BAT86 SCH DO34	D10 ,D9
V1316211	D 1N4148 SW DO35	D1 ,D11 ,D12 ,D13 ,D14 ,D15 , D16 ,D17 ,D18 ,D2 ,D22 ,D28 , D29 ,D3 ,D33 ,D35 ,D38 ,D39 , D4 ,D40 ,D41 ,D42 ,D43 ,D44 , D5
V131627	D BAV21 SW DO35	D7 ,D8
V131645	D 1N4448 SW DO35	D23
C131646	D 1N4007 R DO41	D26 ,D27
V131662	D LED D3 T RED	D24
C131714	D STB 1V4 0W4 C DO7	D19 ,D25
V1317205	D REF 6V2 0.01 % DO34	D20 ,D21
V131758	D ZEN 15V 0W5 C DO35	D34
V1319035	D BYD33M FSR SOD81	D31 ,D32
C131907	D BY584 R SOD61A	D30
V131912	D BYV95C FSR SOD57	D36 ,D37
V1319531	D BYR29-800F UFSR SOT186	D6
V132088	HVPS 27.5 KV 04	A1
V132089	HVFS 9000 00	A2
V132134	U 3046 CA DIP14 P	U7
V1321942	U 072 TL DIP8 I	U6 ,U9
V132501	Q BC327-25 P SS TO92	Q2
V132535	Q BUX87 N P TO126	Q11 ,Q9
V132588	Q 2SC3675 P P TO220	Q10 ,Q12
V132606	Q IRF843 FN P TO220	Q4
V133005	Q ACC ISO SIL TO220	0060
V133039	SPR L 8 D 4 D 1.2 K	0080
V133082	Q ACC ISO BUSH TO220	0064
V133089	Q ACC HTSNK TO220	N1 ,N2
V1340051	U 239 LM DIP14 I	U4
V1340100	U 7815 TO220 P	U8
V1341091	U 555 TLC DIP8 P	U3
V1341171	U 074 TL DIP14 I	U5
V1341431	U 062I TL DIP8 I	U2
V1508101	R AI 4 100E G 0W3 SIP8	RA2
V1508103	R AI 4 10K G 0W3 SIP8	RA1 ,RA3 ,RA6 ,RA8

Order number	Description	Item
V1508184	R AI 4 180K G 0W3 SIP8	RA4
V1508473	R AI 4 47K G 0W3 SIP8	RA5 ,RA7
V311061	D ACC HLDR D3 P1 TS H 6.5	0030
V346991	SLV SHR D19 /9.5 BLK	0192
V346993	SLV SHR D 9.5/4.8 BLK	0073,0120
V347035	SLV SHR D12.7/6 HV BLU	0072
V347037	SLV SLDR CWT 5	0070
C347053	SLV SHR D 6 /2 BLK	0071
V348000	CBL ACC TIE B L 98 W2.5	0130
C348041	SLV FLX D 6 WHT	0150
V348099	SLV WTR_H D 9/ 7 CLR	0191
V3492726	CORD FLAT P20 100MM 00	J2
V3620216	SCR D84 M 3 X 6 I	0090,0100
V3620226	SCR D84 M 3 X 8 I	0023,0061
V3661026	NUT D934 M 3 I	0050,0063
V3673906	WSHR WAVE 3.2 I	0024,0051,0062,0091,0101
V582054	MAKROFOL N 0.1 X 34X 55	0110
V602950	TESTPIN 00	TP1 ,TP2 ,TP3 ,TP4 ,TP5 ,TP6 , TP7 ,TP8
V6035694	KLEMTRANSISTOR 1L SHORT01	0093
V6036132	HEATSINK EHT 20H $$$ 03	0020
V603737	ISOLATION 15/40 9000 00	0092
V603841	EHT CONNECTOR 40KV 00	0190
V752176	PCB EHT MODULE 9000 02	0010
V775164	CHOKE AX 0.5 51.0UH 01	L1
V7752821	TRF EHT MPRD9000 00	L2

2.3.6 SCHEMATIC DIAGRAM



MPRD 9600:EHT BOARD	
EHT submodule(U1): FOCUS MODULE	
V5636240-00	
SHEET 2OF2 10May93	E

2.3.7 BACKBOARD CONNECTIONS

EHT Board Connector J2 is connected with BACKBOARD Connector J5.

pin nr	signal name	to	from
1	**GND**		P
2	**GND**		P
3	nc/ntbu		
4	nc/ntbu		
5	**+150 V**		P
6	**+150 V**		P
7	nc/ntbu		
8	nc/ntbu		
9	**-18 V**		P
10	**-18 V**		P
11	**+18 V**		P
12	**+18 V**		P
13	GENDIAGN oc/int	G	ADILMO
14	**+6.3 V**		P
15	EHTDIS15		G
16	FOCUS2ADJ		G
17	EHTOK	G	
18	FOCUS1ADJ		G
19	HDFPARAB		D
20	VDFPARAB		D

2.3.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

EHT BOARD WATERCOOLED 9600 V5636241

Order number of a complete EHT BOARD WATERCOOLED 9600 : V5636241 00 Date : 10/05/93
Differences between EHT BOARD 9600 V5636240 and
EHT BOARD WATERCOOLED 9600 : V5636241 00

SUBSTITUTES

Order Number	Description	Item	
V6036132	HEATSINK EHT 20H $$$ 03	0020	replaced by
V6036131	HEATSINK EHT 20H FLAT 02		

EHT BOARD FC722 9600 V5636940

Order number of a complete EHT BOARD FC722 9600 : V5636940 00 Date : 10/05/93
Differences between EHT BOARD 9600 V5636240 and
EHT BOARD FC722 9600 : V5636940 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0200

EHT BOARD H. SEAL 9600 V5636941

Order number of a complete EHT BOARD H. SEAL 9600 : V5636941 00 Date : 10/05/93
Differences between EHT BOARD 9600 V5636240 and
EHT BOARD H. SEAL 9600 : V5636941 00

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0200

EHT BOARD CER. FC722 9600 V5636943

Order number of a complete EHT BOARD CER. FC722 9600 : V5636943 00 Date : 10/05/93
Differences between EHT BOARD 9600 V5636240 and
EHT BOARD CER. FC722 9600 : V5636943 00

SUBSTITUTES

Order Number	Description	Item	
V131411	Q BC549C N SS TO92	Q1, Q6, Q8	replaced by
V131414	Q BC109C N SS TO18		
V1314182	Q BC559C P SS TO92	Q5	replaced by
V131420	Q BC177C N SS TO18		
V1341431	U 062 TL DIP8 I	U2	replaced by
V1321940	U 072 TL DIP8 M		
V1341091	U 555 TLC DIP8 I	U3	replaced by
V1341090	U 555 TLC DIP8 M		
V1340051	U 239 LM DIP14 I	U4	replaced by
V1340050	U 139 LM DIP14 M		
V1341171	U 074 TL DIP14 I	U5	replaced by
V1341170	U 074 TL DIP14 M		
V1321942	U 072 TL DIP8 I	U6, U9	replaced by
V1321940	U 072 TL DIP8 M		
V132134	U 3046 CA DIP14 P	U7	replaced by
V1321340	U 3821 SG DIP14 M		

ADDED

Order Number	Description	Item
C347053	SLE SHR 6.0 3:1 BLA	Q'5, Q'6
V395154	FLUORAD FC - 722	0200

2.4 PROCESSOR BOARD

General

The processor board is built around the 16 bit 68000 processor, clock frequency is 8 MHz.

On board circuitry:

- Interrupt Interface:	- priority encoder (8 to 3 lines) - 8 interrupts -> 3 lines (IPL0-2) - 7 NMI with highest priority
- Address Decoder:	- 2 GALs convert adressbus into chip select signals for memory, PIA, ACIAs and latches
- Adjust Voltage Generator:	- controlled by 2 latches (2 x 8bit) - 20 analog adjust voltages, 10 bit DAC, 0 - 10.23V/10 mV resolution
- Memory and Parallel I/O Interface:	- SRAM 2 x 32, 2 x128 or 2 x 512 Kbyte - E^2PROM 2 x 2, 2 x 8 or 2 x 32 Kbyte - EPROM 2 x 128, 2 x 256, 2 x 512, 2 x 1024 Kbyte - 1 PIA + 7 latches, 62 bit out / 15 bit in
- Remote Control Interface:	- 2 ACIAs - remote interface for PC RS232 (REMOTE IN), RS422-423 (REM AUX) - InterMonitorBus RS485 (REMOTE IN & OUT) - OPTISENSE DATA RS232, 4800 Baud (CONTROL)
- H & V Blanking Generator:	controlled by Mixed Vertical Pulse and Hor. Flyback Pulse outputsignals: - VBLP (vertical blanking pulse, 10 bit resolution) - HBLP (start/stop circuit, independently adjustable 10 bit resolution) - soft blank - hard blank - Not Mixed Blanking Pulse
- BIT Generator:	clock generator (48MHz / 3) 16MHz testpattern - STDBIT - CROSSHATCH (RGB switchable) - WHITE BOX (RGB switchable) - WHITE FIELD (RGB switchable) - REF WHITE ADJUSTABLE (650-750mV), not for STDBIT

Optional PROCESSOR board versions are described in section 2.4.8 Customized Versions (Options)

2.4.1 IOPC DIAGRAM

MPRD 9600
PROCESSOR board

28 01 92

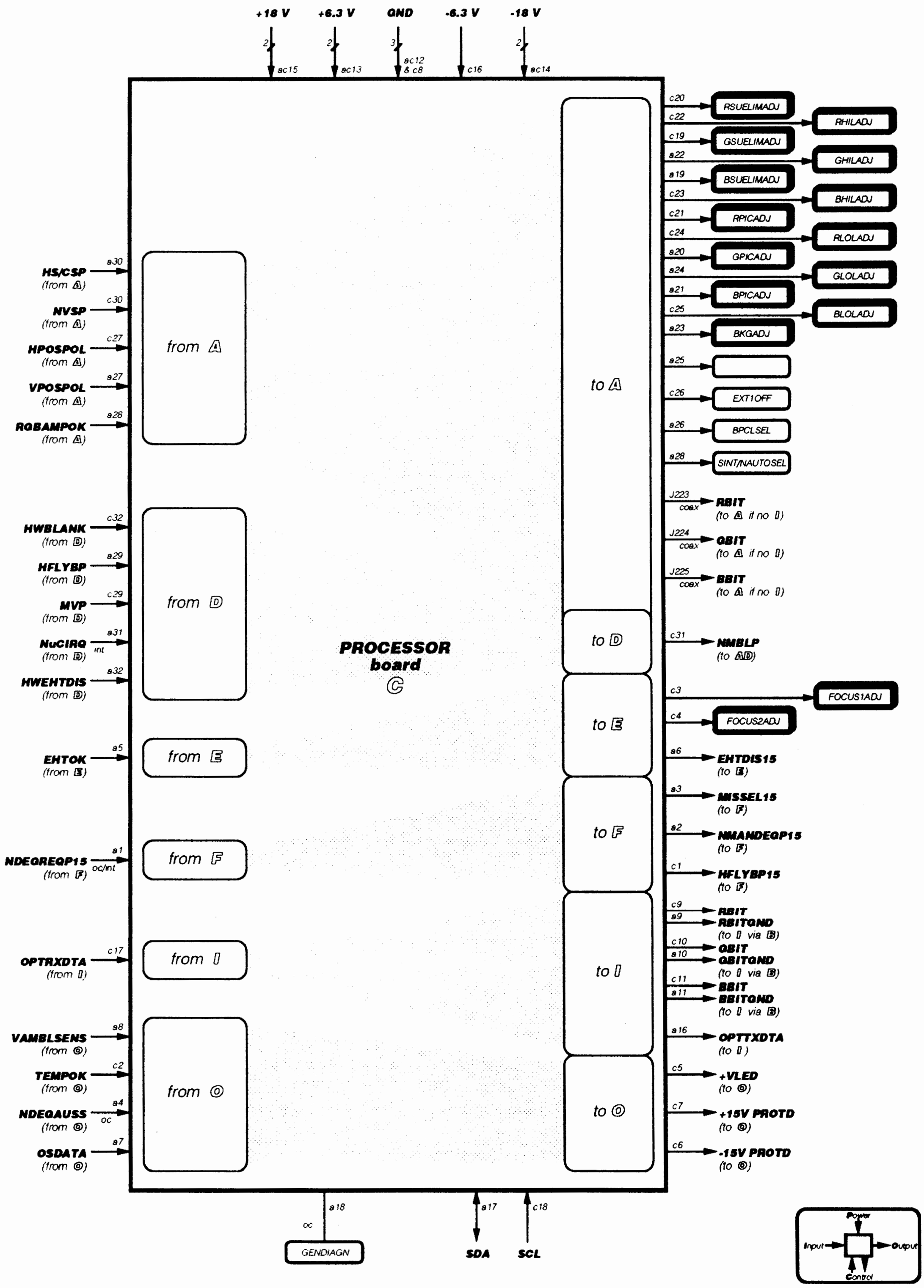


figure 2.22 : PROCESSOR board IOPC diagram

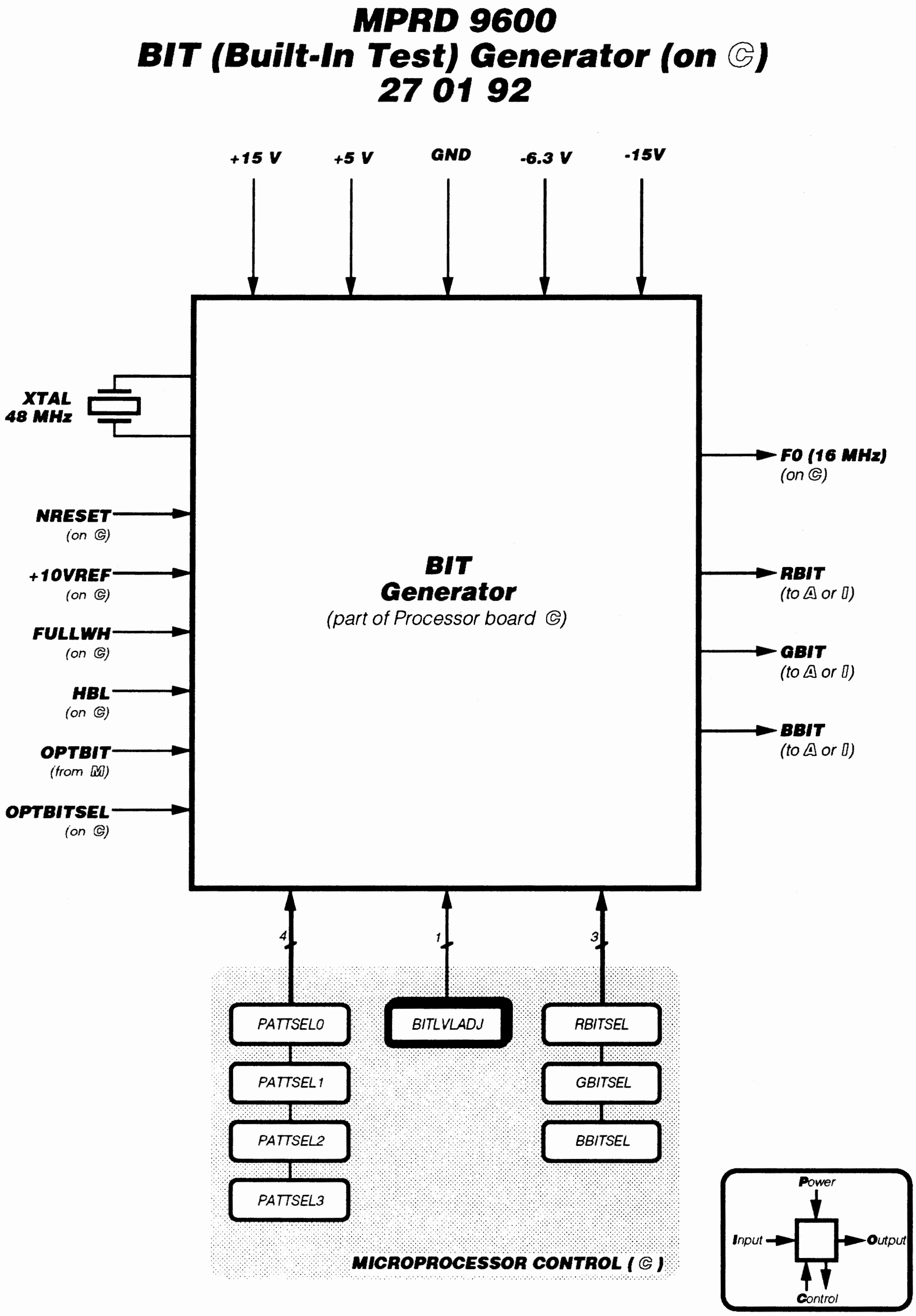


figure 2.23 : BIT (Built-In Test) generator IOPC diagram

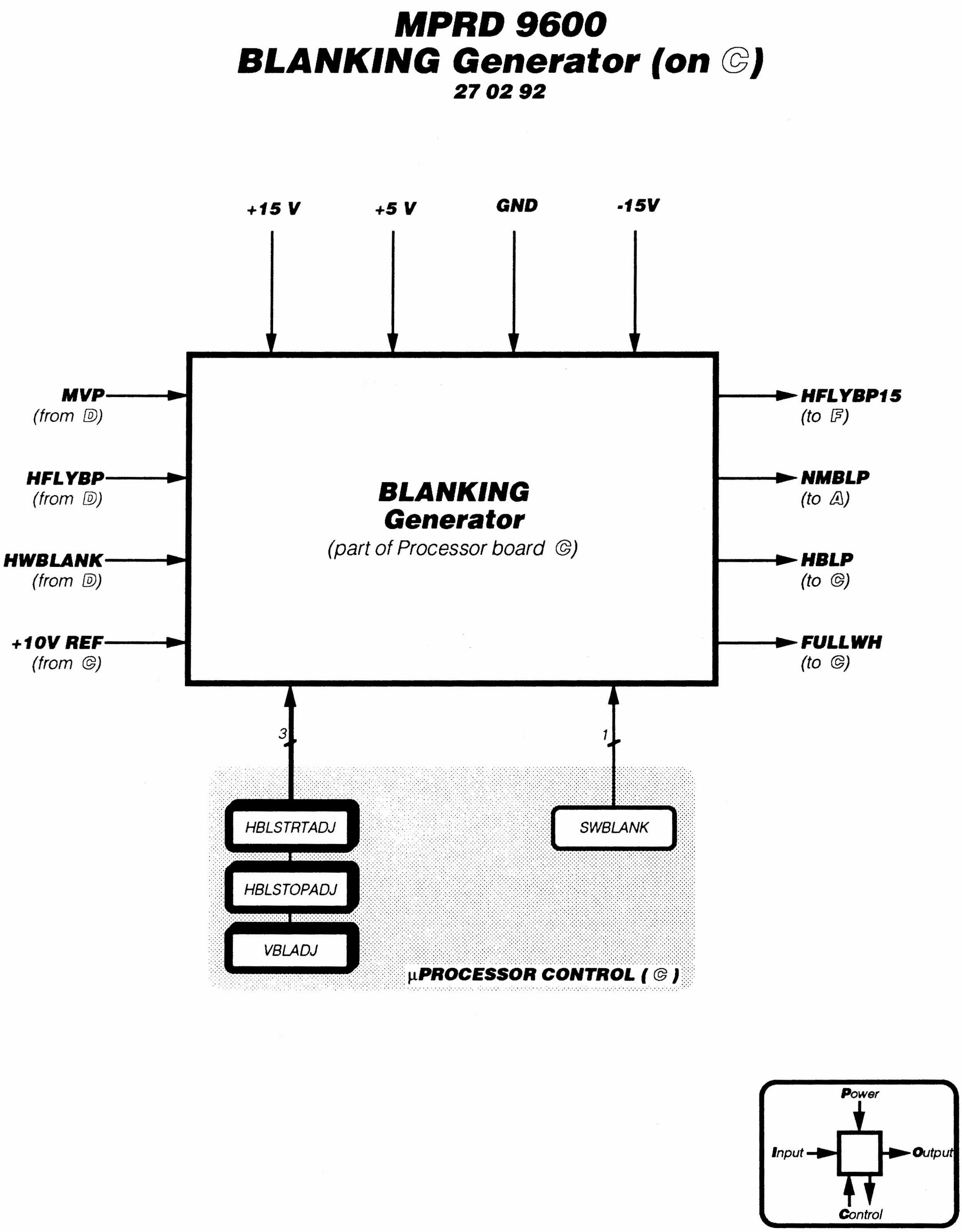


figure 2.24 : blanking generator IOPC diagram

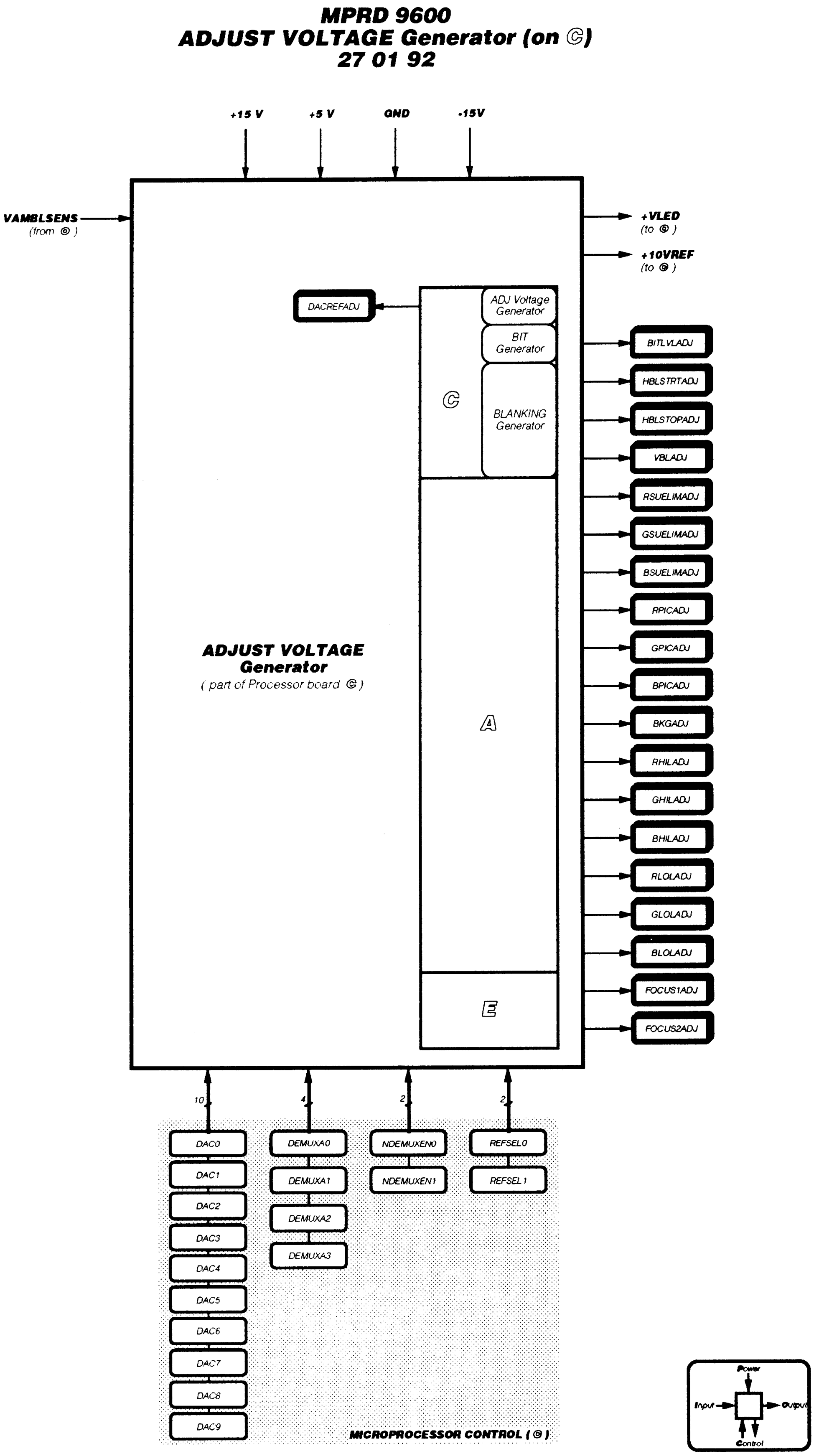


figure 2.25 : adjust voltage generator IOPC diagram

MPRD 9600
CTRL & INFO LINES Interface (on Ⓒ)
15 12 92

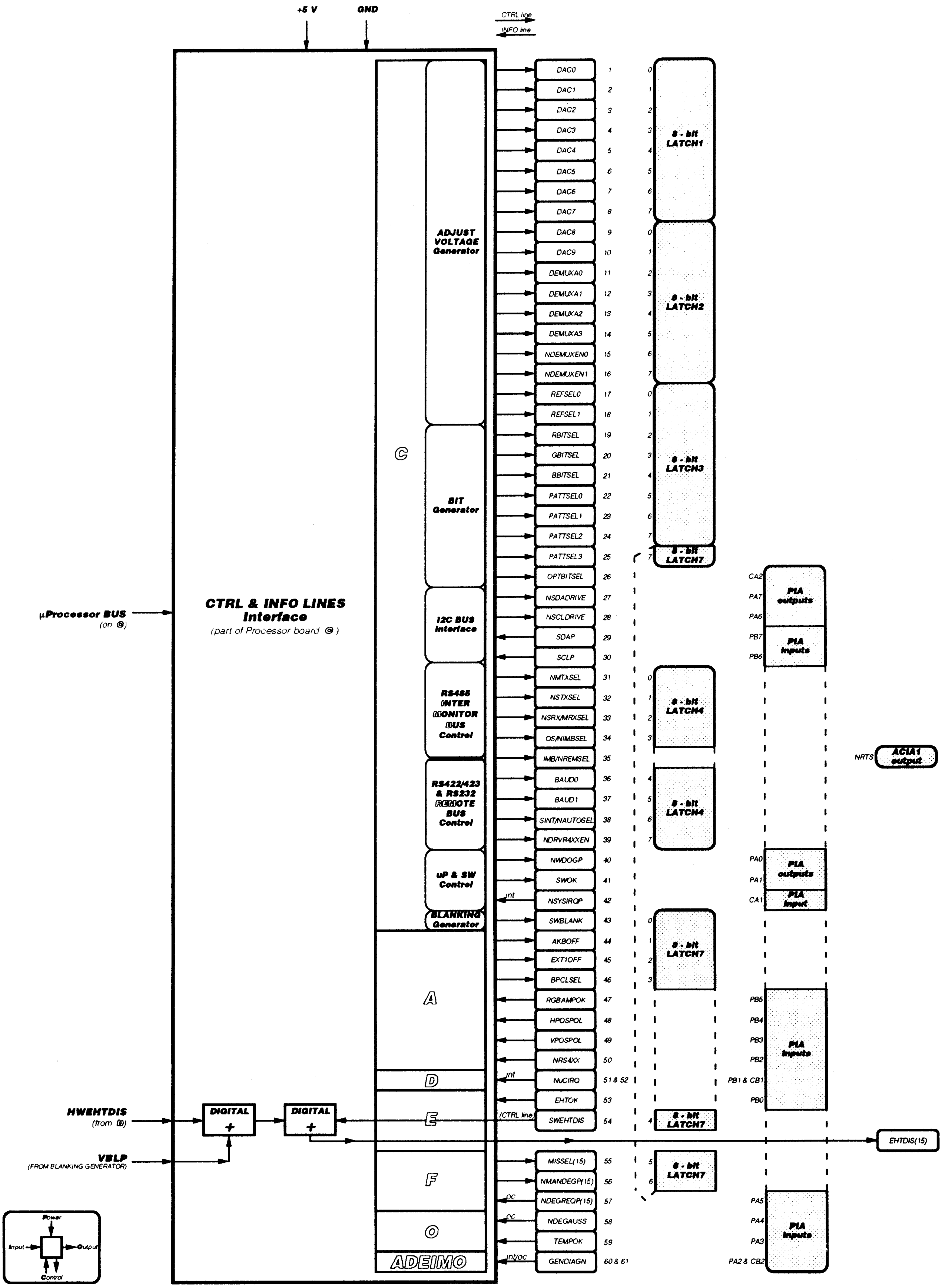


figure 2.26 : CTRL & INFO lines interface IOPC diagram

MPRD 9600
68K MICROPROCESSOR (on ©)
(part of Processor board)
28 01 92

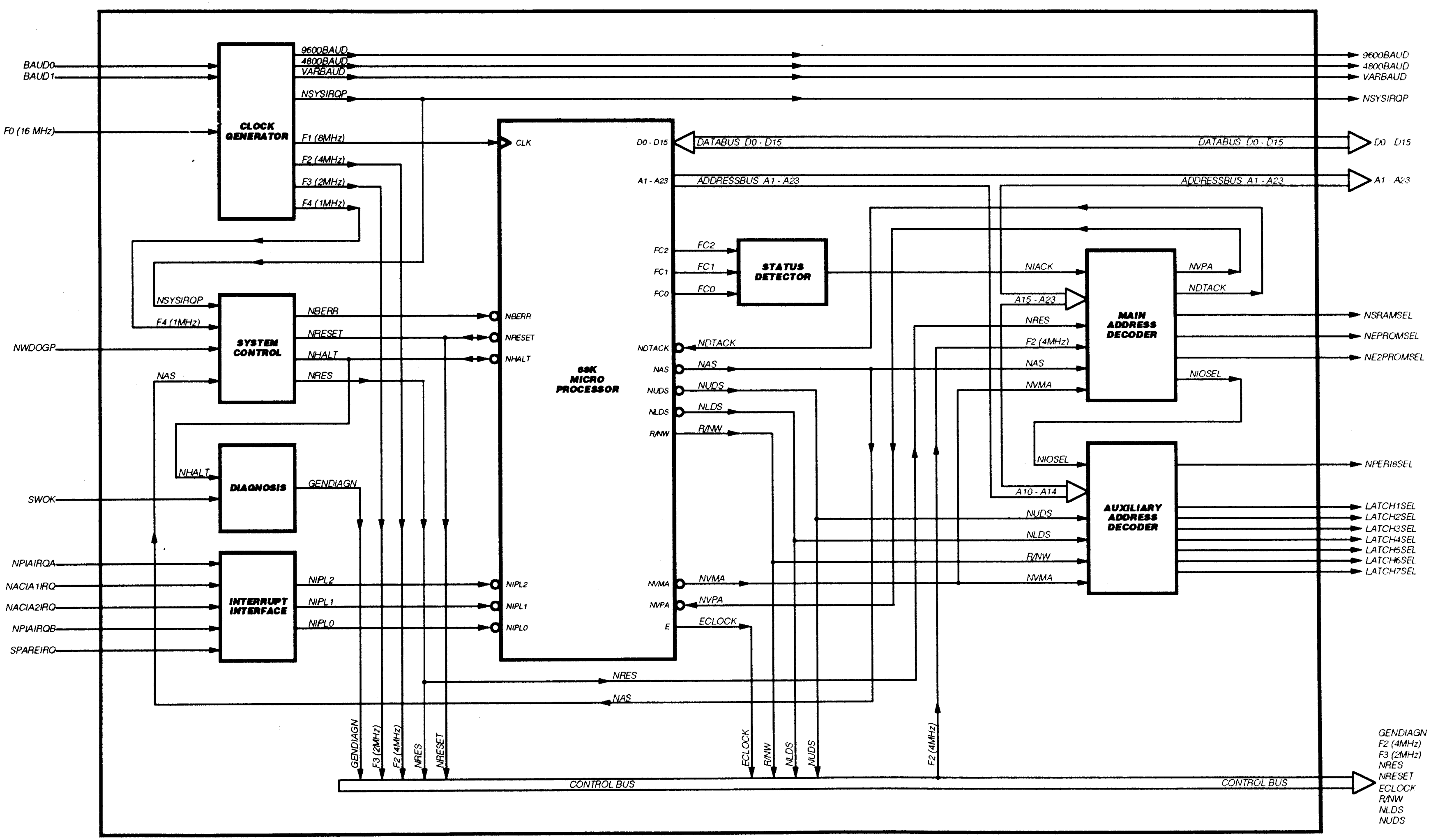


figure 2.27 : microprocessor block diagram

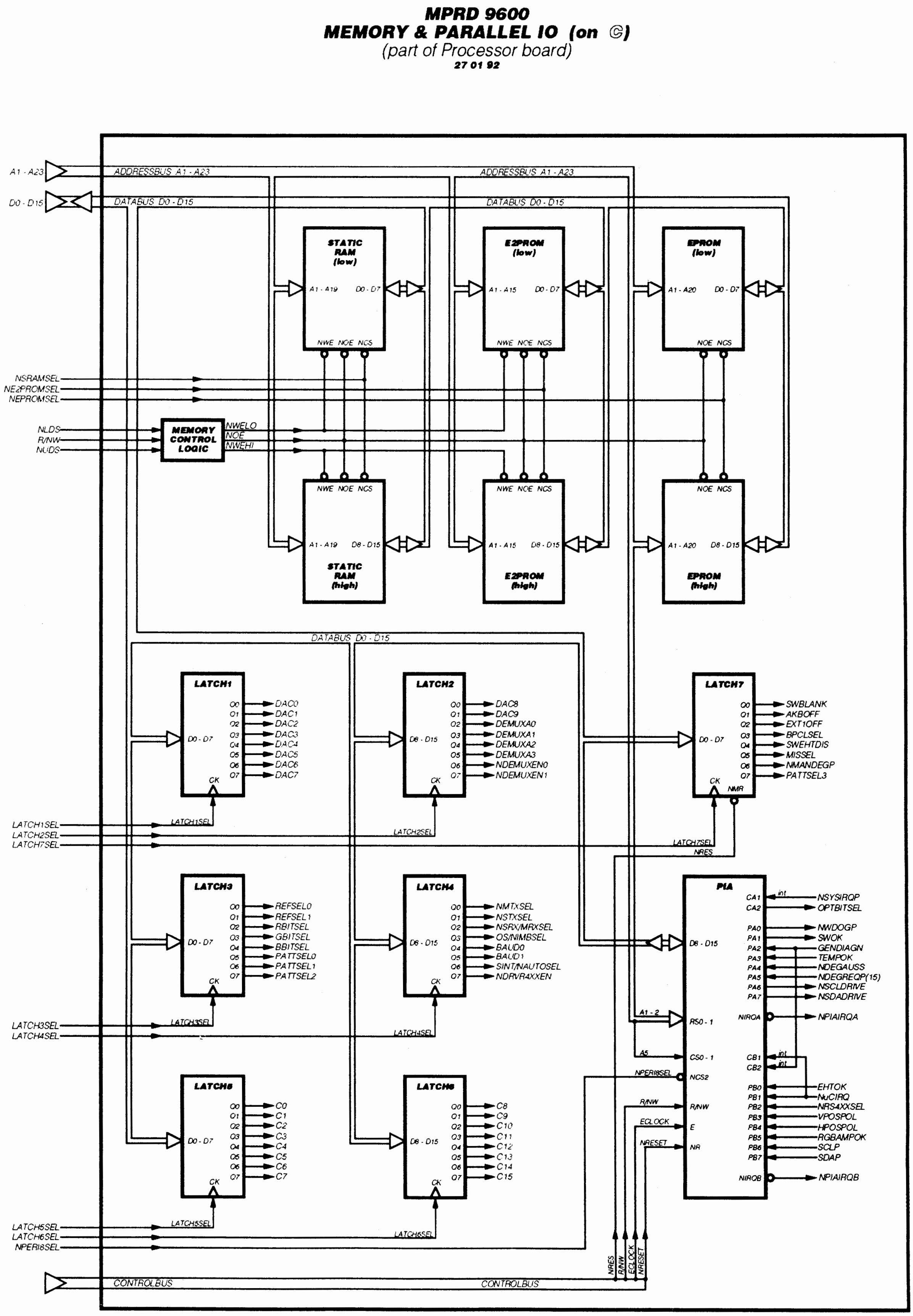
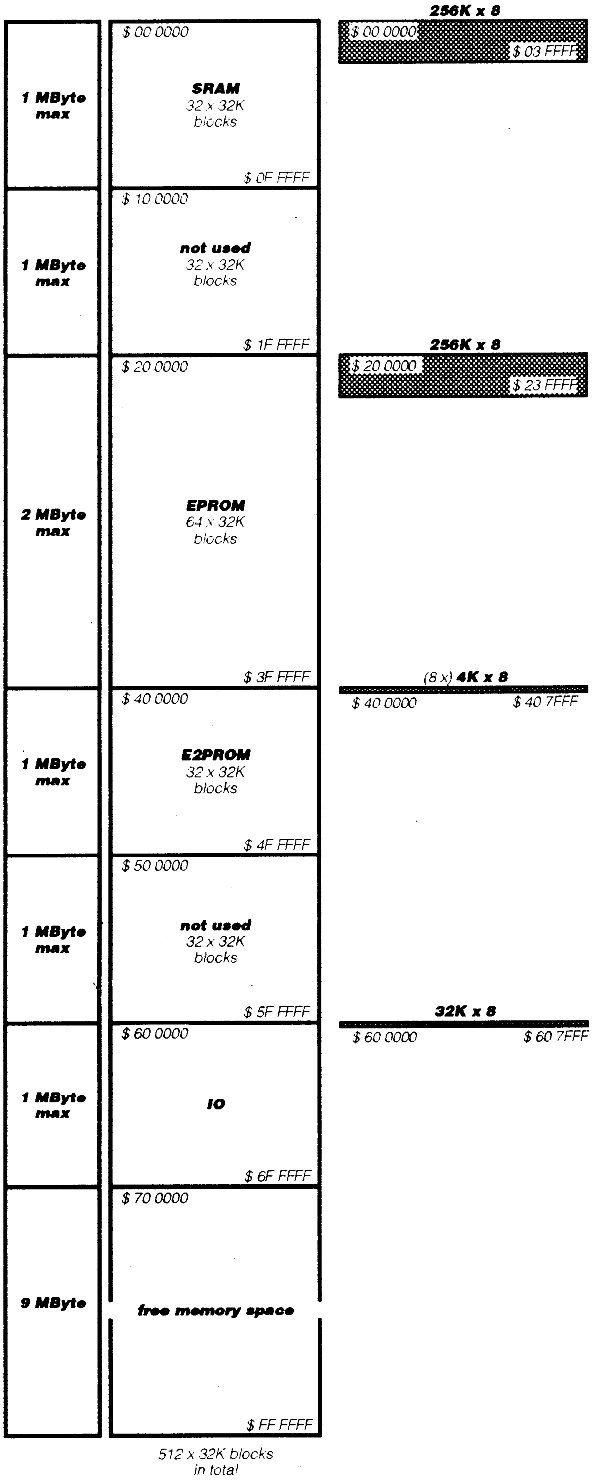
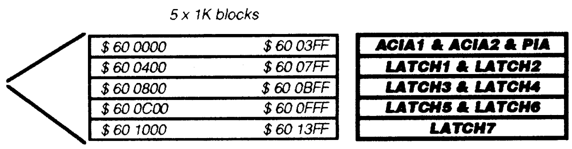


figure 2.28 : memory & parallel IO block diagram

MPRD 9600
MICROPROCESSOR Module (©)
28 0792





IO ADDRESSES

IO Chip	DataBus Connection	Address(es)	Function
ACIA1	L	$ 60 0009 $ 60 000B	CtrlReg DataReg
ACIA2	U	$ 60 0010 $ 60 0012	CtrlReg DataReg
PIA	U	$ 60 0020 $ 60 0022 $ 60 0024 $ 60 0026	DataRegA CtrlRegA DataRegB CtrlRegB
LATCH1	L	$ 60 0401	DataReg
LATCH2	U	$ 60 0400	DataReg
LATCH3	L	$ 60 0801	DataReg
LATCH4	U	$ 60 0800	DataReg
LATCH5	L	$ 60 0C01	DataReg
LATCH6	U	$ 60 0C00	DataReg
LATCH7	L	$ 60 1001	DataReg

figure 2.29 : microprocessor memory map

MPRD 9600
SERIAL REMOTE CONTROL (on ©)
27 01 92

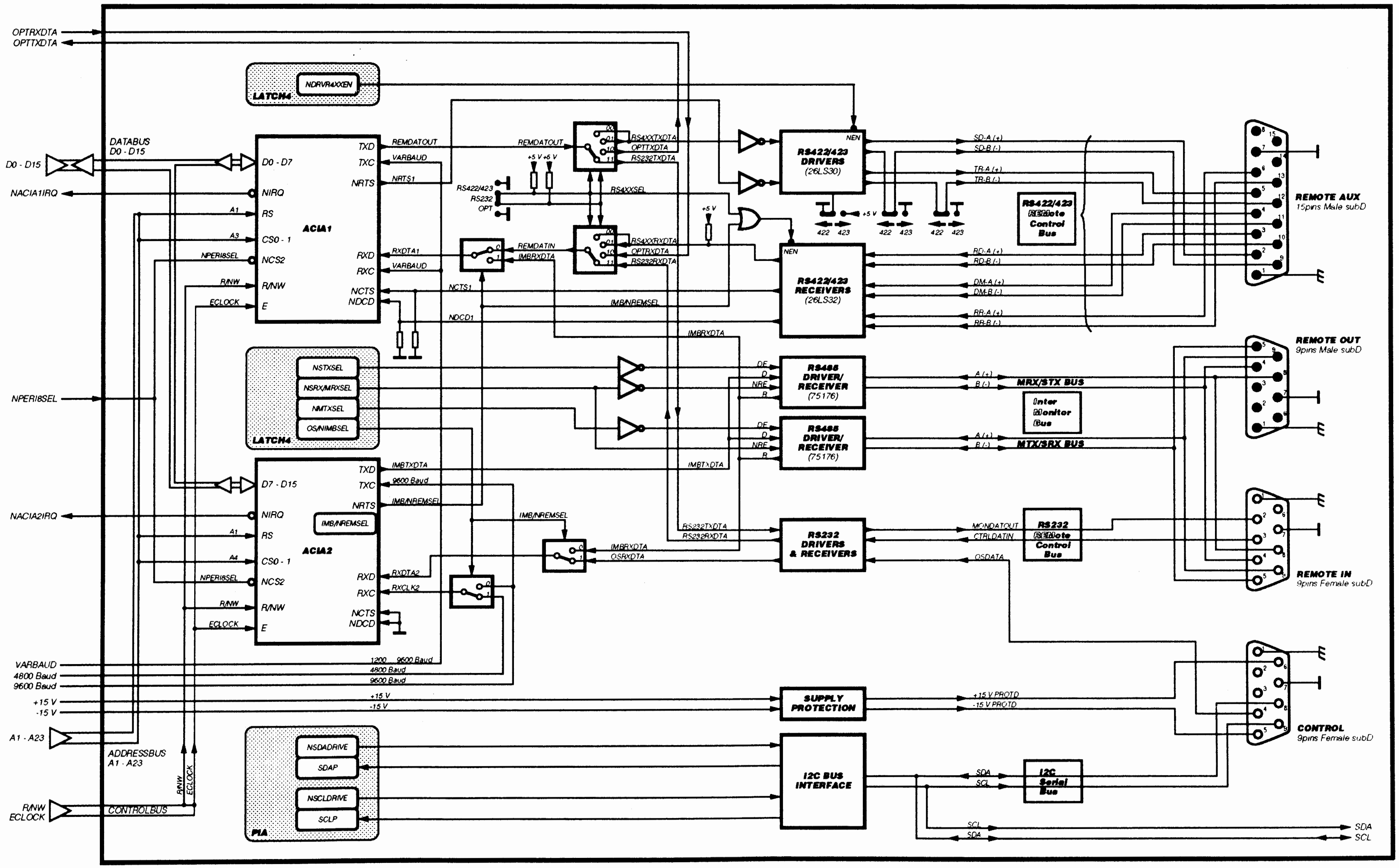


figure 2.30 : serial remote control block diagram

MPRD 9600
BIT (Built-In Test) GENERATOR (on ©)
(part of Processor board)
28 01 92

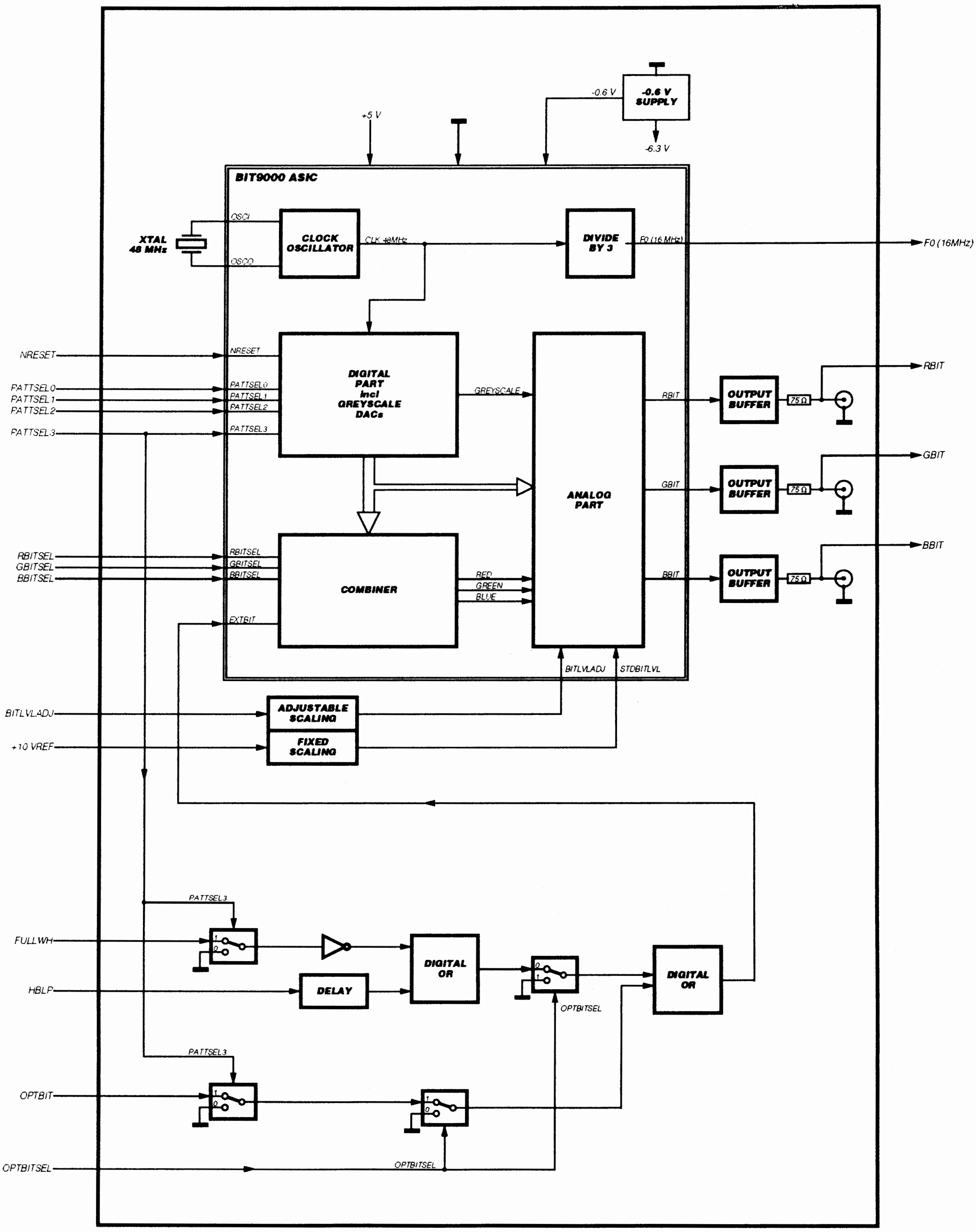


figure 2.31 : BIT (Built-In Test) generator block diagram

MPRD 9600
BLANKING Generator (on ©)
(part of Processor board)
28 01 92

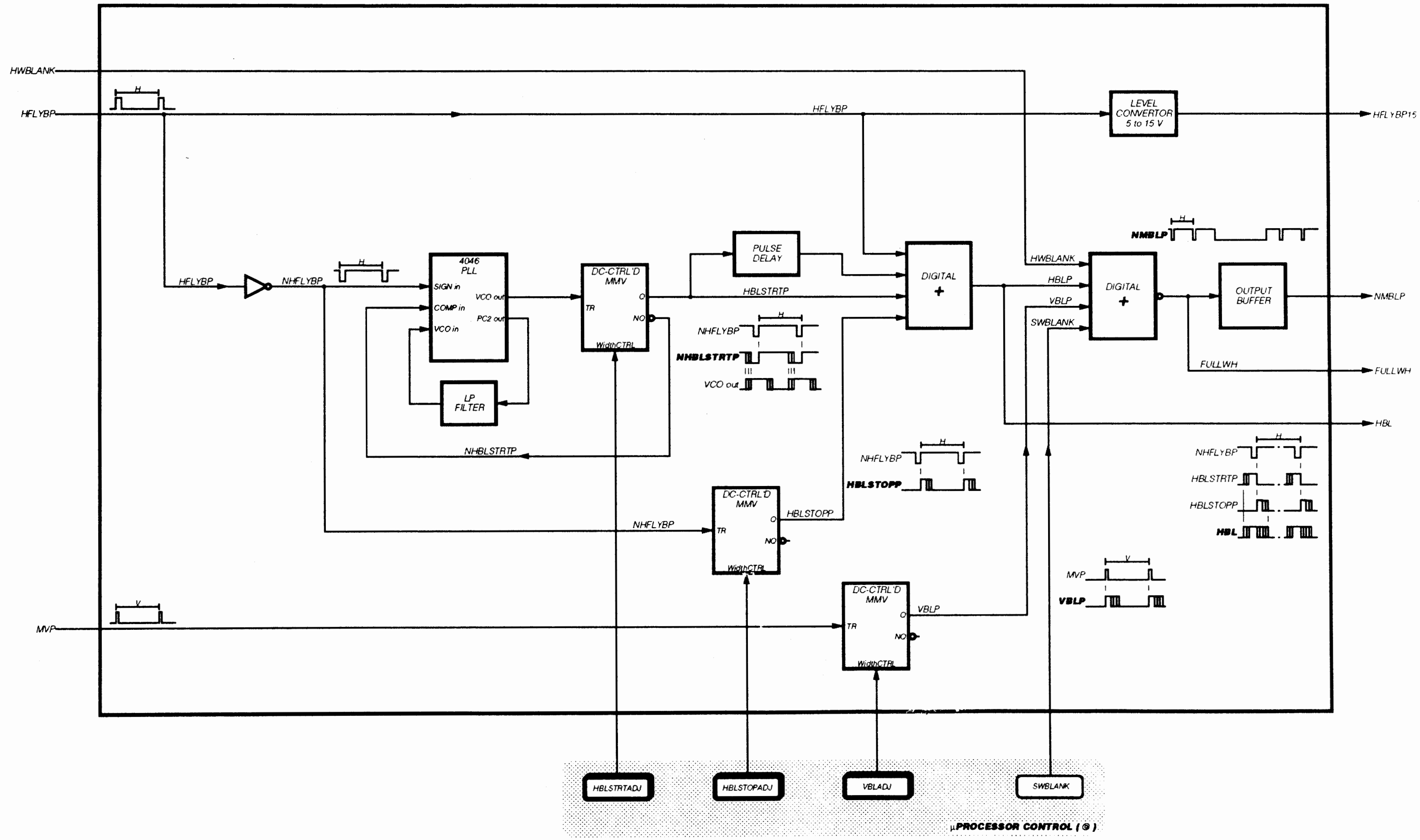


figure 2.32 : blanking generator block diagram

MPRD 9600
ADJUST VOLTAGE GENERATOR (on ©)
(part of Processor board)
28 01 92

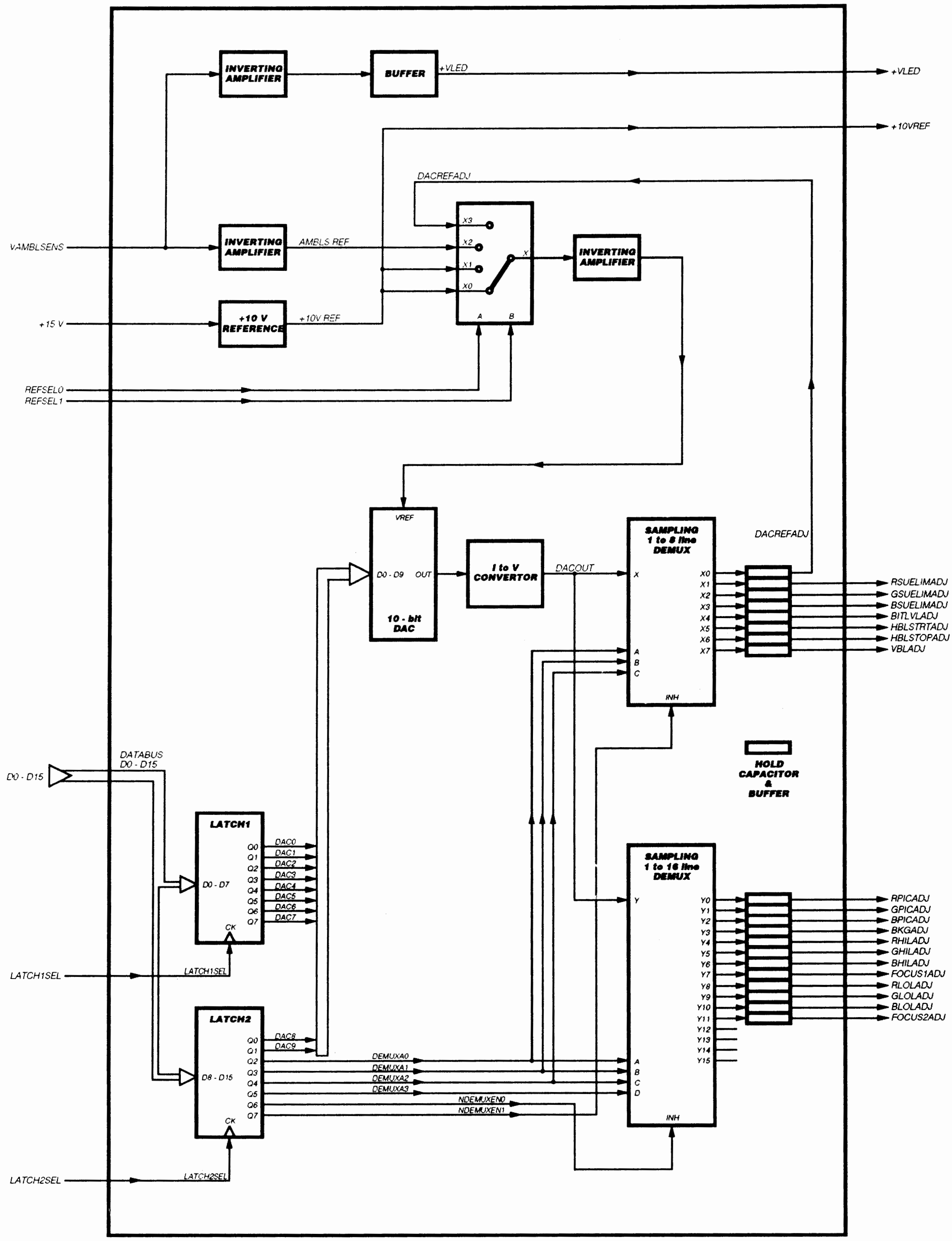


figure 2.33 : adjust voltage generator block diagram

2.4.3 CIRCUIT DESCRIPTION

CLOCK GENERATOR (sheet 6 of 7)

The clockgenerator is integrated in U220 (ASIC = Application Specific Integrated Circuit). The frequency is determined by Y200 (48MHz), U220 divides by 3, the 16MHz (=F0) leaves at pin43.

Derived Clocksignals (sheet 1 of 7)

F0 clocks U4,pin2, a 4 bit counter; the output signals are :

- F1 (8MHz) the processorclock,
- F2 (4MHz) driving the baudrategenerator,
- F3 (2MHz),
- F4 (1MHz) clocking the bus error generator.

RESET GENERATOR & WATCHDOG (sheet 1 of 7)

During power-on, after the +5V power supply has exceeded a certain level (adjustable with P200), U13,pin8 remains low during 150ms.

The signal is buffered by:

- U14,pin10,11, pulled up by R16 and connected to the active-low HALT input of the µprocessor,
- U14,pin13,12, pulled up via D201,R15,R49 and connected to the active-low RESET input of the µprocessor.

As a result, the µprocessor will start under normal power conditions after 150 ms.
During "power-on reset" led200,201 will light.
In TEST mode, J222 is connects U23,pin1 to the +5V. U27 is always clocked, NSYSIRQP is connected to U13,pin3, U13,pin8 remains high and the watchdog is disabled.
In RUN mode, J222 connects U23,pin1 to NWDOGP (U218,pin2). NWDOGP is set low is software watchdog detects a software error. If U23,pin1 goes low U27 will not be clocked any more, (NSYSIRQ level does not change). After 250 ms U13,pin8 goes low. The reset and halt line of the µprocessor go low. Yellow led D201 lights during RESET, after 1 s the µprocessor will restart. The keypad shows : `ERROR PROCESSORBOARD, REBOOT SYSTEM.`

ADDRESS DECODING

2 GALs (Generic Array Logic) U215,216 support the address decoding.
Addressbits A(23) - A(10) are decoded and select 11 memorybanks or I/O devices.
U215 activates NSRAMSEL, NEPROMSEL and NE²PROMSEL; U216 activates NPERI8SEL (PIA and 2 ACIAs) and 7 latches (8bit each) LATCH1(->7)SEL.

BUS ERROR GENERATOR

2 Counters in U5 divide the 1MHz clocksignal by 256; if the counters are not reset by NAS (every 127µs maximum), U5,pin8 will go high, via inverter U20,pin3,4,5,6 the NBERR input of the µprocessor will be activated; the processor is reset (no message on keypad).

INTERRUPT INTERFACE

The µprocessor has 3 interrupt lines IPL0-2 allowing to decode 8 interrupts, the interrupts are encoded by U25.
NPIAIRQA, NACIA1IRQ, NACIA2IRQ and NPIAIRQB are connected to the encoder.

ADJUST VOLTAGE GENERATOR (sheet 2 of 7)

20 Adjustable voltages are generated by the Adjust Voltage Generator.
Databits D0-D7 are latched by U28, databits D8-D9 are latched by U24, the latched databits are connected to the 10 bit DAC (U221).
VREF, required by the DAC, depends on the status of U34,pin9,10. Under normal conditions X0 (pin12) or X1 (pin13) will be connected to COMMON X (pin13). The +10V REF goes through U34, is inverted by U39,pin12,13,14, and the DAC receives -10V at U221,pin15. +10V REF can be adjusted by P210.
The DAC gain is adjustable with P204, (outputspan covers 0-10.23V - 10bit); via a compensated I-V converter (U35,pin1,2,3) the DAC outputsignal (pin1) is connected to the demultiplexers U30,32.

Databits D10-15 are latched by U24 (DEMUXA0-3, NDEMUXEN0-1) and level adapted (DEMUXA0-3/15, NDEMUXEN0-1/15) by U29. The DEMUX-signals select which inputpin of U30,32 will receive DACOUT and also define the time during which one of the outputs od U30,32 (selected by the DEMUX address lines) will be connected to that inputpin; the outputs of U30,32 are connected to hold circuits, sampling action is defined by DEMUX enable lines.

iHILADJ, iPICADJ (i = R,G or B)

One of the demultiplexer outputs, DACREFADJ (U32,pin13), can be used as reference voltage (after sample and hold with U32, C212, U33,pin12,13,14) for the DAC .
U15 adapts the level of REFSEL0-1, U34,pin11 will be selected as active input by REFSEL0-1/15. DACREFADJ is now connected to U221,pin15 via U34,pin11,13.

iHILADJ sets the maximum for iPICADJ, iPICADJ can vary from 0 to iHILADJ (10 bit resolution).
iHILADJ is generated with the 10V REF signal connected to the DAC (normal condition). When changing iPICADJ, the iHILADJ is sent to DACREFADJ as current voltage reference, the outputspan of the DAC is now limited to iHILADJ but the 10 bit resolution is maintained.

AMBIENT LIGHT CONTROLLER (ALC)

VAMBLSENS coming from the lightsensor is buffered, inverted and rescaled by U39,pin5,6,7. The outputsignal U39,pin7 is used as reference voltage for the DAC (ALC on, 4000 LUX on bezel ≈10V) for iPICADJ.

FRONT PANEL LED INTENSITY DRIVER

VAMBLSENS is also used to control the intensity of the leds on the front panel. The signal is buffered, inverted and rescaled by U39,pin8,9,10. Q204 drives the anodes of the leds on the control panel, if the ambient light intensity increases, +VLED will increase as well.

MEMORY & PARALLEL I/O INTERFACE (sheet 3 of 7, 4 of 7)

The SRAM sockets U201,206 accept 32,128 or 512 Kbyte chips, J219 selects the memory range and is set default on 32 & 128 Kbyte (J219 not mounted, connection made by copper trace).
The E^2PROM sockets U202,207 accept 2,8 or 32 Kbyte chips, J211,213,220 select the memory range and is set default on 2 Kbyte (J211,213,220 not mounted, connection made by copper trace).
The EPROM sockets U203,208 accept 128,256,512 or 1024 Kbyte chips, J211,213,220 select the memory range and is set default on 128 & 256 Kbyte (J211,213,220 not mounted, connection made by copper trace).

Memory Control Logic (Output Enable, Low/High Byte Select, Read/Write)

NWELO is the control signal for the low byte (SRAM, E^2PROM) and is the OR function (U21,pin1,2,3) of NLDS and R/NW.

NWELO will be low when NLDS and R/NW are low, both low banks receive the same signal but only one of both will be selected by the seperated chip select control line (NSRAMSEL or NE2PROMSEL).
NWEHI is the controlsignal of the high byte (SRAM,E^2PROM) and 1is the OR function (U21,pin4,5,6) of NUDS and R/NM.
NWEHI will be low when NUDS and R/NW are low, both high banks receive the same signal but only one of both will be selected by the seperated chipselect controlline (NSRAMSEL or NE2PROMSEL).

NOE is common for low/high bank and for all memory, NOE is the NAND function (U16,pin4,5,6) of the NAND function (U16,pin1,2,3) of NLDS and NUDS with R/NW; NOE will be low if at least one of both datastrobes is low and R/NW is high.

PIA U218 is selected by NPERI8SEL and addressbit A(5), the latches 3,4,5,6,7 (and also the latches 1,2 on sheet 2 of 7) are selected by LATCHxSEL coming from GAL (U216).

ACIA1 is selected by NPERI8SEL and addressbit A(3), ACIA2 is selected by NPERI8SEL and addressbit A(4).

J200,201 is a future extension bus.

REMOTE CONTROL INTERFACE (SHEET 4 OF 7)

I²C Serial Interface Bus

The I2C Serial Interface Bus is implemented in software and uses four PIA-pins:
* two outputs: NSCLDRIVE and NSDADRIVE, and
* two inputs: SCLP and SDAP.

The DRIVE signals are inverted by Q10 and Q11 (sheet 4 of 7) to create the I2C bus lines SDA and SCL which are routed to the BACKBOARD and to pins 8 & 9 of the "CONTROL" connector to interface the I2C peripherals (Control Panel, Keypad, MicroController on the Deflection Board, ...) to the main MicroProcessor. The I2C lines are monitored by this MicroProcessor via the SDAP and SCLP lines which are fed back to the PIA inputs.

RS232 **REMOTE** CONTROL BUS

MONDATOUT & CTRLDATIN

The main MicroProcessor controls the RS232 REMote Control Bus via ACIA1 which is connected to the lower data bus (D0...D7). Selection of the internal ACIA registers is done by the lowest address line A1, the ACIA chip is selected by NPERI8SEL (which is a common select line for all 8-bit peripheral chips) and address line A3.
The Transmit and Receive Clocks are both connected to the VARBAUD clock line which is the output of selector U26 (sheet 1 of 7). Depending on software selection (BAUD0 & BAUD1), this clock signal can be either 16 x 9600, 16 x 4800, 16 x 2400 or 16 x 1200 Hz. These frequencies are derived from the main 16 MHz clock via counter U4 (÷ 4), divide-by-13 counter U23 and binary counter U27.
The TXD line (pin 6 / U204) is routed to pin 13 of the double 4-position selector U40. This selector is controlled by hardware jumper J227 (3 positions) and selects between three different drivers for the TXD line:
* the RS422/423 (RS4XX) driver U210 (jumper position "4"),
signal name "RS4XXTXDTA",
* a driver on the Optional board (jumper position "O"),
    signal name "OPTTXDTA",
* and the RS232 driver/receiver U219 (jumper position "2"),
    signal name "RS232TXDTA", which is discussed here.

The driver output (pin 3) is called "MONDATOUT" (the RS232-version of TXD/ACIA1 or "REMDATOUT") and is connected to pin 2 of the "REMOTE IN" connector.
The RS232 line from the host (entering via pin 3 of "REMOTE IN") is called "CTRLDATIN" and is converted to TTL levels by U219. The output of the receiver (pin 13) is called "RS232RXDTA" and is presented to one of the inputs (pin 4) of selector U40. Similar to the lower part (X) this Y-selector is again controlled by hardware jumper J227. This means that either RS4XXRXDTA or OPTRXDTA or RS232RXDTA can be selected for the RXD input

of ACIA1. The output of this Y-selector U40 is called "REMDATIN" and is normally routed to the RXD input of ACIA1 via the A-part of the triple 2-positions selector U12. The function of this selector will be described in paragraph 2.5.
The RS232 (and OPT) REMote interface does not use hardware handshake. This means that the handshake inputs of ACIA1 (NDCD, pin 23 and NCTS, pin 24) must be "low" if jumper J227 is put in the position "2" (and "O"). On the other hand, for RS4XX communication, these ACIA1 handshake inputs must be connected to the corresponding RS4XX receiver outputs (pins 3 & 11 / U211) for the "RR" and "DM" handshake lines.

OSDATA

To interface the **BARCO** Optisense® or the Thoma Colour Analyser to the monitor, a second RS232 receiver-only channel is provided. The RS232/4800 Baud Optical Sensor signal line is entering at pin 4 of the "CONTROL" connector (Processor board or Frontal Control Panel): "OSDATA". This RS232 signal is converted to TTL levels by receiver(/driver) U219: "OSRXDTA" (pin 11). OSRXDTA is connected to the RXD input of the second ACIA via B-selector of U12 which is controlled by the "OS/NIMBSEL" line (see also paragraph Serving three ports with two ACIAs: switching logic). This select line also controls the C-part of selector U12 to make sure that the Receiver Clock input of ACIA2 (RXC, pin 3 / U209) is connected to the fixed 4800BAUD clock line (16 x 4800 Hz) if Optical Sensor data must be read by the software.
No hardware handshake is required for ACIA2: pins 23 & 24 are grounded (see also RS485 InterMonitorBus).

*RS4XX **REM**OTE CONTROL BUS*

Similar to the RS232 (and OPT) REMote control bus, the RS4XX bus is supported by ACIA1 via selectors U40 and the A-part of U12. In this way, TXD/ACIA1 (REMDATOUT) becomes "RS4XXTXDTA" which is connected to driver U210 via invertor U17,pins 11&10. Output D (pin 13) of receiver U211 is "RS4XXRXDTA" and becomes "REMDATIN" which is connected to the RXD input of ACIA1 via the A-part of selector U12.

DRIVER

The 26LS30 driver for RS4XX can be put in the RS422 or the RS423 mode by applying the appropriate level to Mode pin 4. The 26LS30 is a dual RS422 line driver with mode pin low or a quad RS423 line driver with mode pin high. In the RS422 mode, input A (pin 2) and input D (pin 7) are the two driver inputs. The outputs are labeled Ao (pin 15 / non-inverting) & Bo (pin 14 / inverting) for the A input, and Co (pin 11 / inverting) & Do (pin 10 / non-inverting) for the D input. The B and C inputs are active-high disable inputs for the first (A input) and the second (D input) driver. These disable lines are controlled by the "NDRVR422EN" line under software control.
In the RS423 mode, there are four (non-inverting) drivers A...D. Outputs B and C are not used: their corresponding lines (SD-B and TR-B) are grounded by jumpers J205 and J204. In this mode, it is not possible to put the driver outputs in the TRI-STATE mode.

RECEIVER

The 26LS32 is a quad differential line receiver designed to meet the RS422 and RS423 Standards for balanced and unbalanced digital data transmission. It has an enable (pin 4) and disable (pin 12) function, common to all four receivers. This feature is used to switch between two kinds of operation: with or without hardware handshake.
As already explained earlier, only RS4XX communication needs hardware handshake. This means that in all other cases where ACIA1 is used for serial communication, inputs 23 & 24 of this ACIA1 must be "low". This is implemented as follows: the two ACIA handshake inputs are pulled low by resistors R93 & R94, IF the 26LS32 receiver outputs are disabled by pulling the disable input (NE, pin 12) "high". This is true in three situations:
* jumper J227 in position "2" (RS232) or "O" (OPTional)
* the InterMonitorBus (see also next paragraph) is served by ACIA1, irrespective of the position of hardware jumper J227 (in this particular case, the line "IMB/NREMSEL" is put "high" by software).

RS485 **I**NTER **M**ONITOR **B**US

This bus is normally (see also next paragraph) driven by ACIA2. Two 75175 Multipoint RS485 Transceivers are used. Each transceiver consists of a driver (input "D", pin 4) and a receiver (output "R", pin 1). The non-inverting output of the driver and the corresponding input of the receiver are connected together: input/output "A", pin 6. In the same way the inverting driver output and receiver input are connected to input/output "B", pin 7. Driver and receiver outputs can be enabled or disabled independently: active-low receiver enable (pin 2) and active-high driver enable (pin 3).
As the InterMonitorBus is full-duplex, two transceivers are used: one for transmit and the other one for receive. Depending on the Remote Status of the monitor (Master or Slave), transceiver U212 acts as a Master Receiver or a Slave Transmitter. Similarly, U217 is either a Master Transmitter or a Slave Receiver.
The transceiver enable/disable lines are controlled by software: either the upper receiver (in U212) or the lower receiver (in U217) is enabled by "NSRX/MRXSEL", the Slave Transmitter is enabled by "NSTXSEL" and the Master Transmitter by "NMTXSEL".
The driver inputs of the two transceivers are unconditionally connected to the TXD output of ACIA2 ("IMBDATOUT"). The receiver outputs however are connected to the RXD input of ACIA2 ("IMBDATIN") via the B-selector of U12, which is controlled by the "OS/NIMBSEL" line (see also next paragraph). This select line also controls the C-part of selector U12 to make sure that the Receiver Clock input of ACIA2 (RXC, pin 3/U209) is connected to the fixed 9600BAUD clock line (16 x 9600 Hz) if the IMB is activated (OS/NIMBSEL "low").
The InterMonitorBus does not require any hardware handshake for ACIA2: pins 23 & 24 are grounded.

Serving three ports with two ACIAs: switching logic

As already described in the previous paragraphs, the two ACIAs are serving three ports:
* the **REM**ote Control Bus (either RS232, RS4XX or OPT),
* the **I**nter**M**onitor**B**us (RS485)
* and the **O**ptical **S**ensor receive-only port (RS232).

The general rule for the switching logic is:
ACIA1 is serving the REMote Control Bus,
ACIA2 is serving the InterMonitorBus.
The "driving force" behind the switching logic is the possibility to interconnect monitors in different configurations:
* Single Monitor Configuration:
  - without Optical Sensor (either Optisense® or Thoma Colour Analyser)
  - with Optical Sensor.
* Multiple Monitor Configurations:
  - without Optical Sensor
  - with Optical Sensor connected to the Master
  - with Optical Sensor connected to one of the Slaves.

The following table gives an overview of the different possibilities. The upper part of the table is an analysis of the needs and the lower part gives a summary of the implementation of the switching logic: the status of five different control or select lines is defined for the different configurations:

"**IMB/NREMSEL**" is connected to the hardware handshake line "NRTS" of ACIA2 and is programmed by the software as a general purpose output line (similar to a PIA output).
It controls the A-selector of U12 and switches between REMDATIN (IMB/NREMSEL "low") and IMBDATIN (IMB/NREMSEL "high"). Case [5] in the table is the situation where ACIA1 is used to read IMBDATIN in stead of REMDATIN. To make sure that ACIA1 will function properly, the hardware handshake inputs pin 23 & 24 must be low, irrespective of the position of jumper J227, the Communication Standard Selector. This is accomplished by having IMB/NREMSEL=high force high the disable input of receiver U211 (26LS32) via OR-gate U21, pins 12,13,11 (see also paragraph RS4XX RECEIVER).

"**OS/NIMBSEL**" is output Q3 of LATCH4, controlled by the software.
It controls the B- and C-selectors of U12. The B-selector switches between IMBDATIN (OS/NIMBSEL "low") and OSRXDTA (OS/NIMBSEL "high"). The C-selector switches in a similar manner between 9600BAUD for IMBDATIN and 4800BAUD for OSRXDTA. The normal situation is that ACIA2 is reading the Optical Sensor data. The only exception is case [3], where no sensor is connected at all and where the Master has the full control over the Slaves.

"**BAUD0**" & "**BAUD1**" are outputs Q4 & Q5 of LATCH4, controlled by software.
These lines control the Baud rate for the REMote Control Bus (either RS232, RS4XX or OPT). The four possibilities for VARBAUD are listed in the table. There is one special case [5], where both lines must be forced low by software to read IMBDATIN via ACIA1 at the predefined 9600 Baud rate.

"**NHWHANDSH**" is the output of OR-gate U21, pins 12,13,11, partially controlled by the hardware jumper J227 and partially controlled by software (IMB/NREMSEL).
As already explained earlier in this paragraph and in paragraph 2.3, this line is "high" if NO hardware handshake is required. The only special case is [5], where this line must be forced high by IMB/NREMSEL=high, even if jumper J227 is put in the position "4".

MPRD 9000
REMOTE CONTROL CONFIGURATIONS

TX / ACIA1 = REMDATOUT
TX / ACIA2 = IMBDATOUT

RXC / ACIA1 = TXC / ACIA1 = VARBAUD

BAUD1	BAUD0	VARBAUD
0	0	9600
0	1	4800
1	0	2400
1	1	1200

IMB/NCTRLSEL	OS/NIMBSEL	RX / ACIA1	RXC / ACIA1	RX / ACIA#2	RX / ACIA2
0	0	REMDATIN	VarBaud	IMBDATIN	9600
0	1	REMDATIN	VarBaud	OSRXDTA	4800
1	0	IMBDATIN	VarBaud	IMBDATIN	9600
1	1	IMBDATIN	VarBaud	OSRXDTA	4800

		ACIA1							ACIA2						
		ComStd	RXD pin 2	RXC pin 3 (= VARBAUD)	ComStd	TXD pin 6 (=MONDATOUT)	TXC pin 4 (= VARBAUD)	Handshake pins 5, 23 & 24	ComStd	RXD pin 2	RXC pin 3	ComStd	TXD pin 6 (= IMBDATOUT)	TXC pin 4 (= 9600)	Handshake pins 5, 23 & 24 (= N)
Single Monitor Configurations															
[1]	without OPTISENSE®	RS232 RS422/423 OPT (fiber)	REMDATIN REMDATIN REMDATIN	VARBAUD VARBAUD VARBAUD	RS232 RS422/423 OPT (fiber)	REMDATOUT REMDATOUT REMDATOUT	VARBAUD VARBAUD VARBAUD	N Y N		not used	don't care		IMBDATOUT	9600	N
[2]	OPTISENSE® connected	RS232 RS422/423 OPT (fiber)	REMDATIN REMDATIN REMDATIN	VARBAUD VARBAUD VARBAUD	RS232 RS422/423 OPT (fiber)	REMDATOUT REMDATOUT REMDATOUT	VARBAUD VARBAUD VARBAUD	N Y N	RS232	OSRXDTA	4800		IMBDATOUT	9600	N
Multiple Monitor Configurations															
[3]	without OPTISENSE®	RS232 RS422/423 OPT (fiber)	REMDATIN REMDATIN REMDATIN	VARBAUD VARBAUD VARBAUD	RS232 RS422/423 OPT (fiber)	REMDATOUT REMDATOUT REMDATOUT	VARBAUD VARBAUD VARBAUD	N Y N	RS485	IMBDATIN	9600	RS485	IMBDATOUT	9600	N
[4]	OPTISENSE® connected to MASTER	RS232 RS422/423 OPT (fiber)	REMDATIN REMDATIN REMDATIN	VARBAUD VARBAUD VARBAUD	RS232 RS422/423 OPT (fiber)	REMDATOUT REMDATOUT REMDATOUT	VARBAUD VARBAUD VARBAUD	N Y N	RS232	OSRXDTA	4800		IMBDATOUT	9600	N
[5]	OPTISENSE® connected to one of the SLAVEs	RS485	IMBDATIN	VARBAUD (= 9600)		REMDATOUT	VARBAUD (= 9600)	N	RS232	OSRXDTA	4800	RS485	IMBDATOUT	9600	N

N : no
Y : yes
X : don't care

shaded areas : don't care situations

SUMMARY

		ComStd	IMB/NREMSEL	OS/NIMBSEL	BAUD1	BAUD0	NHWHANDSH	Case	
Single Monitor Configurations	without OPTISENSE®	RS232 RS422/423 OPT (fiber)	0	X (1) (b)	(a)	(a)	1 0 1	[1]	(a) : 9600, 4800, 2400 or 1200 baud - software programmable, depending on application. (b) : if don't care is programmed as "1", then case [1] is identical to case [2] and no special action is needed when OPTISENSE® data must be read.
	OPTISENSE® connected	RS232 RS422/423 OPT (fiber)	0	1	(a)	(a)	1 0 1	[2]	The monitor can be controlled by a host via ACIA1 and read data from an OPTISENSE® via ACIA2.
Multiple Monitor Configurations	Master or Slave without OPTISENSE®	RS232 RS422/423 OPT (fiber)	0 (c)	0	(a)	(a)	1 0 1	[3]	A Master can be controlled by a host (ACIA1), while communicating with a Slave via the IMB-bus (ACIA2). A Slave in this case [3] only has to communicate with the Master via the IMB-bus (ACIA2), hence ACIA1 is not used: don't care in position (c) for SLAVEs only, to be programmed "0" as if the Slave is a Master; so no difference exists between Master and Slave if both without OPTISENSE®.
	OPTISENSE® connected to MASTER	RS232 RS422/423 OPT (fiber)	0	1	(a)	(a)	1 0 1	[4]	If the monitor is a Master that wants to read OPTISENSE® data (via ACIA2), software must switch from case [3] to case [4]: OS/NIMBSEL line must change state. ACIA1 is then used for communication between host and Master monitor.
	OPTISENSE® connected to one of the SLAVEs	RS232 RS422/423 OPT (fiber)	1	1	0	0	1 **1 (d)** 1	[5]	If the monitor is a Slave that wants to read OPTISENSE® data (via ACIA2), software must switch from case [3] to case [5]: both IMB/NREMSEL and OS/NIMBSEL must change state. This Slave communicates with the Master via the IMB-bus: ACIA1 instead of ACIA2 is used for SRX (IMBDATIN) and ACIA2 is used for STX (IMBDATOUT). [ACIA2 is always used for IMBDATOUT (STX or MTX)]. Remark (d): Case [5] is the only case that does not allow REMote control by a host. To make sure that ACIA1 can process IMBDATIN (no handshake needed nor allowed), a "NO" must be forced in position (d) so that ACIA1 will work without Handshake, even if RS422/423 is selected as the Communication Std.

Remark:

Signal:	ComStd:	RS232	RS422/423	OPT
REMDATIN		RS232RXDTA	RS4XXRXDTA	OPTRXDTA
REMDATOUT		RS232TXDTA	RS4XXTXDTA	OPTTXDTA

H & V BLANKING GENERATOR (SHEET 5 OF 7)

Horizontal Blanking Start Pulse Generator

VCO & Phase Comparator

The PLL (Phase Locked Loop) will regulate the VCO frequency and phase in such a way that the rising edges of NHFLYBP (SIGN in) and NHBLSTRTP (COMP in) are coincidental.

HFLYBP is inverted by U2,pin1,2,3 and connected to the PLL, U3,pin14 (SIGNin).
VCO out (pin4) is connected to a DC controlled (HBLSTRTADJ) monostable (Q2,Q5,U10,U18). The inverted output of the monostable is connected to the other PLL input (COMP in).
These inputs are triggered by a rising edge. If VCO out would be connected straight to COMP in, VCO out would have the same frequency as SIGN in (but 50 % duty cycle). As VCO out is delayed and inverted (=NHBLSTRP), COMP in will be triggered by the delayed (but inverted !) falling edge of VCO out. As a result, VCO out will go high BEFORE (time adjustable with HBLSTRTADJ) NHFLYBP goes high.
HBLSTRTP (has to blank before flyback) goes high before flyback has started (delay DC adjustable).
J228 selects the LOw or HIgh frequency range for the PLL, to match the processor board with the deflection board hor. freq. range.

DC controlled monostable

The rising edge of VCO out (50% duty cycle) clocks the D-FF U18,pin3. U18,pin5 goes high (= start of HBLSTRTP), U18,pin6 goes low, Q5 goes off and C203 is charged by Q2 (constant current source). If the voltage across C203 exceeds the voltage on U10,pin4 (= rescaled HBLSTRTADJ) U10,pin12 will go low and reset U18; U18,pin5 goes low (= end of HBLSTRTP), U18,pin6 goes high and triggers the PLL; Q5 goes on and discharges C203, the level of U10,pin5 does not any longer exceed the level of U10,pin4 and U10,pin12 goes high again.

Horizontal Blanking Stop Pulse Generator

DC controlled monostable

The rising edge of NHFLYBP clocks the D-FF U18,pin11. U18,pin9 goes high (= start of HBLSTOPP), U18,pin8 goes low, Q7 goes off and C204 is charged by Q4 (constant current source). If the voltage across C204 exceeds the voltage on U10,pin9 (= rescaled HBLSTOPADJ) U10,pin7 will go low and reset U18; U18,pin9 goes low (= end of HBLSTOPP), U18,pin8 goes high; Q7 goes on and discharges C204, the level of U10,pin10 does not any longer exceed the level of U10,pin9 and U10,pin7 goes high again.

Vertical Blanking Pulse Generator

DC controlled monostable

The rising edge of MVP sets the RS-FF U2,pin8,9,10,11,12,13. U2,pin13 goes high (= start of VBLP), U2,pin10 goes low, Q1 goes off and C205 is charged by Q3 (constant current source). If the voltage across C205 exceeds the voltage on U17,pin2 (= rescaled HBLSTOPADJ) U7,pin1 will go high and reset the RS-FF; U2,pin13 goes low (= end of VBLP), U2,pin10 goes high; Q1 goes on and discharges C205, the level of U7,pin3 does not any longer exceed the level of U7,pin2 and U2,pin1 goes low again.

Mixing Stage and Output Buffer

HBLSTRTP, the delayed (R34,C48) HBLSTRTP, HBLSTOPP and HFLYBP are NORed by U1,pin9,10,11,12 and inverted by U2,pin4,5,6; the result is HBLP.
HBLP, VBLP, HWBLANK and SWBLANK are NORed by U1,1,2,3,4,5; the output is buffered by Q8,9.

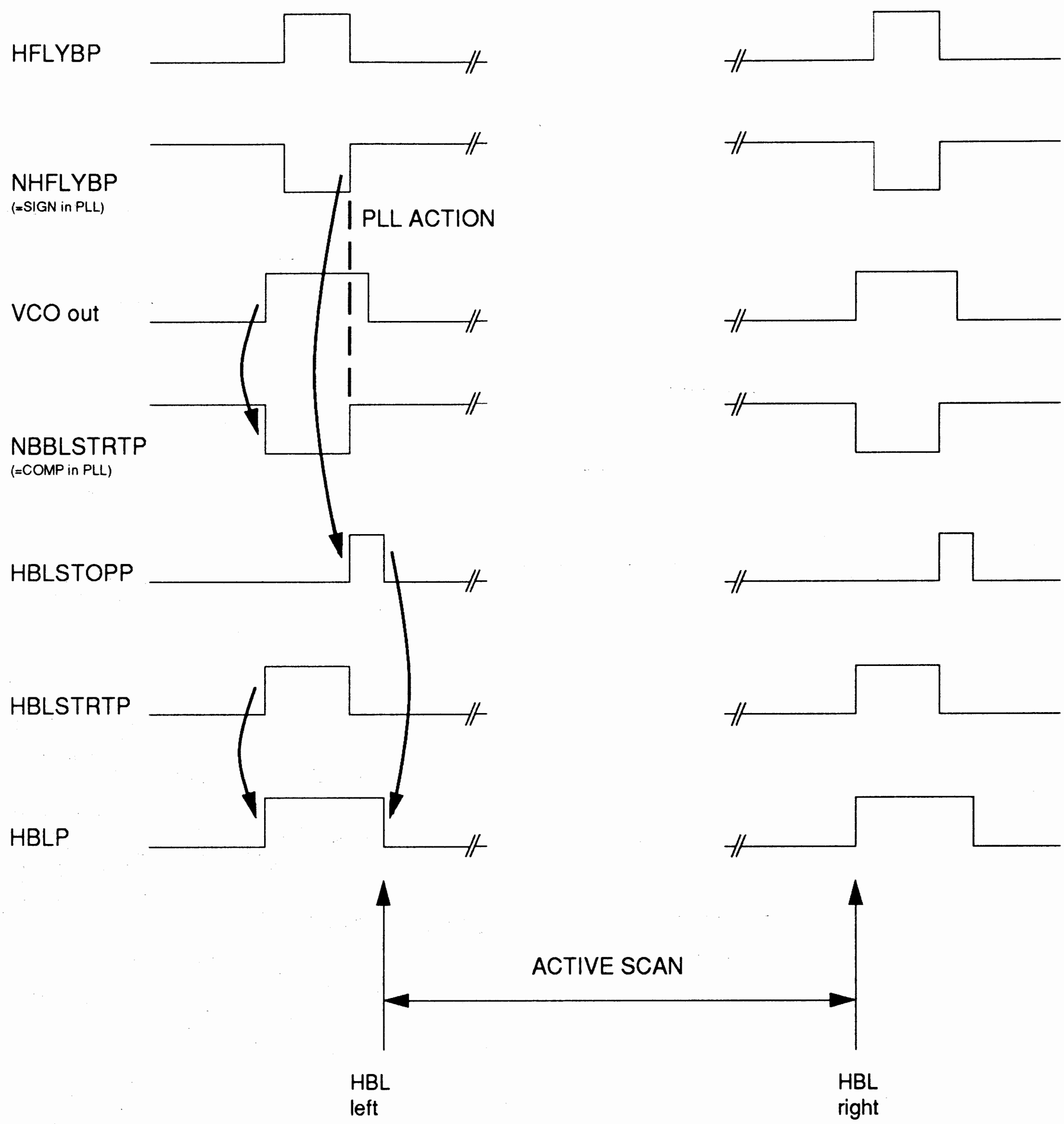


figure 2.34: horizontal blanking generator timing diagram

BIT GENERATOR (sheet 6 of 7)

The MPRD/CCID 9000 monitor is equipped with a built-in test ("BIT") generator, implemented in ASIC technology: BIT9000 (U220).

The timing of BIT9000 is controlled by a 48 MHz XTAL (Y200) which oscillates at its 3rd overtone. Oscillation at its ground frequency is prevented by L1 and C101.

The 48 MHz clock is divided by 3 to generate the basic 16 MHz clock (F0, pin 42) for the MicroProcessor part of this board.

The patterns generated in BIT9000 using the 48 MHz dot clock are defined by 769 active dots in a line and 769 active lines in a field in case of a 4:3 aspect ratio. For a 5:4 aspect ratio, the first 48 active dots of "crosshatch" and "field" are dropped, leaving 721 active dots by 769 active lines; the other pattern elements (colour bars, grey scales & box) are shifted 24 dots to the right. In this way, the horizontal and vertical scan frequencies remain constant, only the backporch of the BIT signal is increased by 1 μs.

The complete scan parameters for the BIT patterns are as follows:

* Horizontal:	- Active =	16 µs (AR = 4:3) or 15 µs (AR = 5:4)
	- Blanking =	4 µs or 5 µs
	- Front Porch =	1 µs
	- Sync Width =	1 µs
	- Backporch =	2 µs or 3 µs
	- Total =	20 µs (Hor. Freq. = 50 kHz)
*Vertical:	- Active =	769 lines
	- Blanking =	31 lines
	- Front Porch =	2 lines
	- Sync Width =	2 lines
	- Backporch =	27 lines
	- Total =	800 lines (Vert. Freq. = 62.5 Hz)

The different patterns are selected by PATTSEL0...3 under software control, according to the following rules:
* PATTSEL0 & 1 (pins 6 & 5) select between STanDard BIT, CROSSHatch, BOX and Field:

Pattern	PATTSEL1	PATTSEL0
STDBIT	0	0
CROSSH	0	1
BOX	1	0
FIELD	1	1

* PATTSEL2 selects between AspectRatio = 4:3 ("low") and AR = 5:4 ("high")
* PATTSEL3 selects between the internally generated patterns ("low") and the possibility to accept externally generated patterns ("EXTBIT") for subsequent processing inside BIT9000.

The Red, Green and Blue BIT outputs (pins 11, 10 & 9) can be switched on or off under software control by putting R-, G- and/or BBITSEL (pins 2, 1 & 44) "high" (on) or "low" (off).

The output levels of the three channels is defined by two DC voltages:
* STDBITLVL is a fixed voltage (approx. 1.4 Vdc) derived from the +10VREF voltage and is used only if STDBIT is selected.
As the STDBIT pattern is selected to check proper operation of the monitor at a glance (by selecting "BIT" on the Control Panel), it is impossible to modify this pattern (e.g. switching off all channels) by software; this is prevented by the hardware design.

* BITLVLADJ is a variable dc voltage, controlled by software (approx. 0...1.4 Vdc) and is used to define the video output levels of all three channels simultaneously for the three other patterns: CROSSH, BOX and FIELD. The nominal level of 700 mVpp (corresponding to 1.4 Vpp unterminated) is adjustable by the GAIN control adjustment P205.

Power supply for the digital part of BIT9000 is between -0.6V and +5V. Black level is defined by the GND potential, White level is defined by BITLVLADJ or STDBITLVL (referenced to GND) and Sync Tip level (on GBIT only) is defined by the -0.6V supply (generated by D203 & Q203).

The video outputs are buffered by 75Ω drivers (Q200, Q201 & Q202). In case no Optional board is installed, de three BIT signals are routed to the RGB Amplifier board by three coax cables connected to J223, J224 & J225. If an Optional board is inserted, the three coax cables must be inserted in the corresponding coax connectors on that Optional board. The three BIT signals are then routed to that board via the Backboard (J208, pins c9, c10 & c11) and processed together with the outputs of that Optional board (switching between BIT signals and the corresponding OPT outputs) under control of the software.

EXTBIT is connected to the output of switching logic (part of U16, part of U20 and U19) that switches between FULLWH (derived from the Blanking Generator) and OPTBIT (J200, pin 10) under control of the OPTBIT(/NFULLWH)SELect line and the PATTSEL3 line. This possibility can be used for future expansion.

2.4.4 PCB LAYOUT

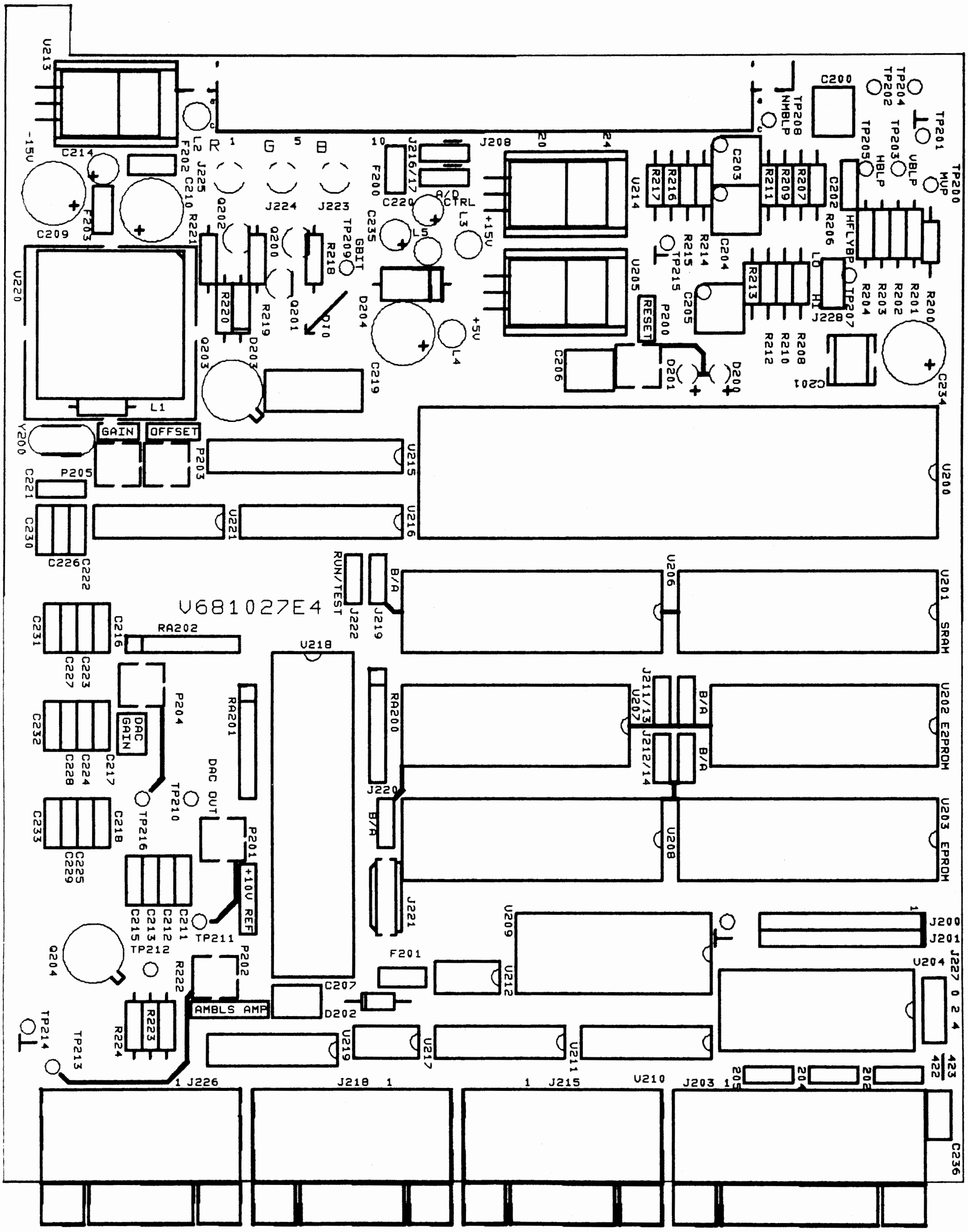


figure 2.35 : PROCESSOR board component side

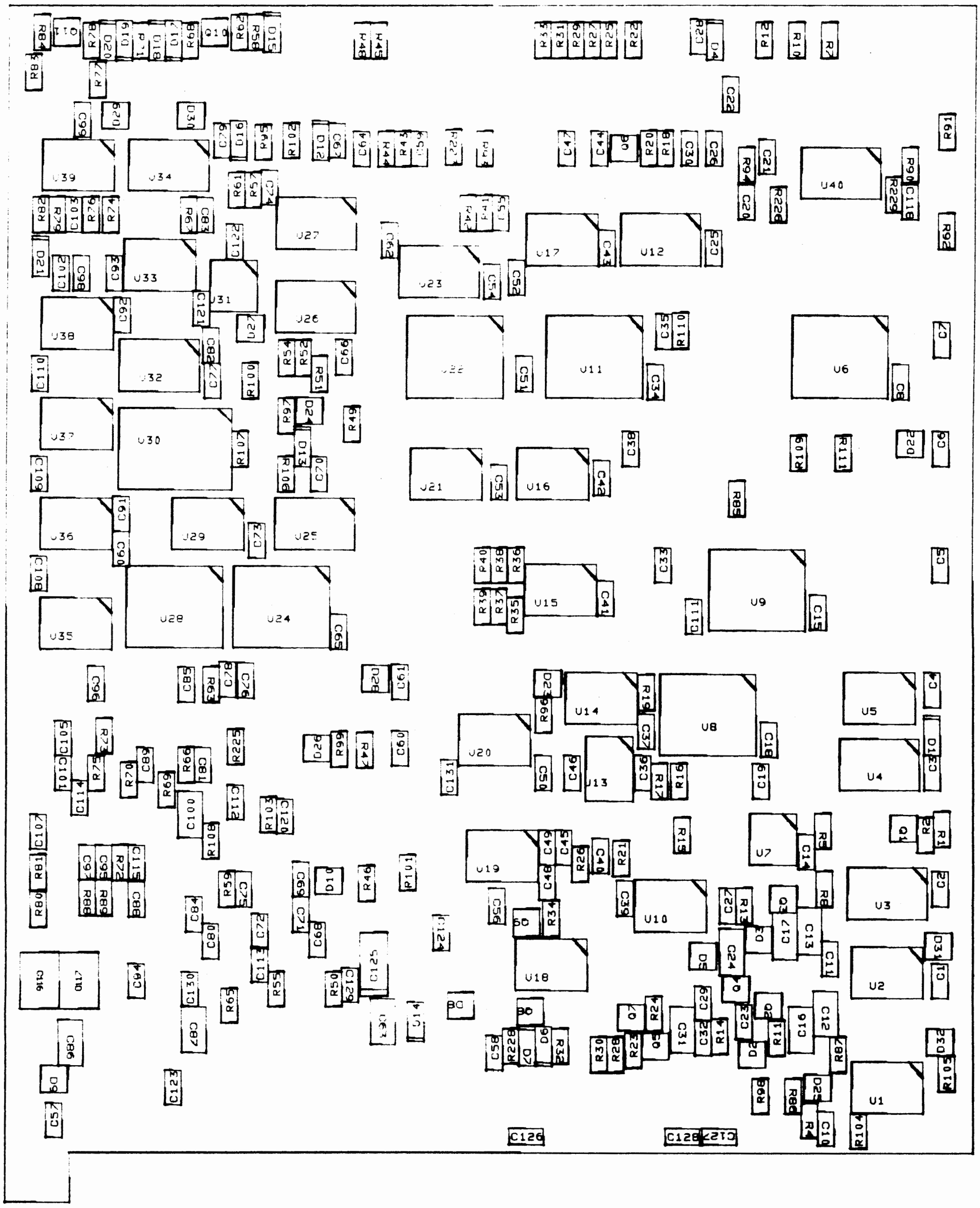


figure 2.36 : PROCESSOR board solder side

2.4.5 PARTSLIST

Order number of a complete PROCESSOR BOARD : V5631220 09 Date : 01/12/92

Order number	Description	Item
V101223	R MF H 82E J 0W5	R220
V101224	R MF H100E J 0W5	R203
V101231	R MF H390E J 0W5	R218,R219,R221
V101232	R MF H470E J 0W5	R204
V101247	R MF H 8K2 J 0W5	R222
V101248	R MF H 10K J 0W5	R224
V101252	R MF H 22K J 0W5	R233
V101260	R MF H100K J 0W5	R223
V101261	R MF H120K J 0W5	R201
C1026008	R MF H100K F 0W6	R212
V1026048	R MF H110K F 0W6	R213
V1026087	R MF H 12K1 F 0W6	R207,R215
C1026247	R MF H 17K8 F 0W6	R217
V1026297	R MF H 20K F 0W6	R206
V1026406	R MF H 2K4 F 0W6	R211
V1026417	R MF H 26K7 F 0W6	R200
V1026496	R MF H 3K24F 0W6	R214
V1026687	R MF H 51K1 F 0W6	R202
V1026747	R MF H 59K F 0W6	R210
V1026807	R MF H 68K1 F 0W6	R209
V1026828	R MF H715K F 0W6	R216
V1026906	R MF H 8K66F 0W6	R208
V107004	R TCE H200E M 0W5 S7 TS	P205
V107005	R TCE H500E M 0W5 S7 TS	P204
V107009	R TCE H 10K M 0W5 S7 TS	P201,P202
V107013	R TCE H100K M 0W5 S7 TS	P200
V1114879	C EL RA 100M M 35E2 105	C209,C210,C219,C234
V1114942	C EL RA 10M M 50E1 105	C214,C220,C235
V112829	C CE DI 2N2S400E3	C236
V114088	C POMERA 100N K 50E2 85	C202,C211,C212,C213,C215,C216, C217,C218,C221,C222,C223,C224, C225,C226,C227,C228,C229,C230, C231,C232,C233
V114096	C POMERA 1M K 50E2 85	C200,C206
V115162	C PP RA 1N5J100E2 85	C207
V1158138	C PS RA 2N74F63E3 85	C203,C204
V1158191	C PS RA 10N F 63E3 85	C205
V1163054	C PP RA 560P F630E2 85	C201
V131411	Q BC549C N SS TO92	Q200,Q201,Q202
V131425	Q BC141-10 N P TO39	Q204
V131432	Q BC161-10 P P TO39	Q203
V1316211	D 1N4148 SW DO35	D33 ,D34
C131646	D 1N4007 R DO41	D202
V131658	D LED D3 T YEL	D201
V131662	D LED D3 T RED	D200
C131714	D ZEN 1V4 0W4 C DO7	D203
V131787	D TVS 5V 1500W U CB429	D204
V1330769	Q ACC WSHR TO5-4	0070
V133091	Q ACC HTSNK 40 K TO220	N200,N201,N202
V1340100	U 7815 TO220 P	U214
V1340131	U 2990-15 LM TO220 P	U213
V134044	U 2940-5 LM TO220 P	U205
V1342561	U 7533 AD DIP16 I	U221
V134257	U 145406 MC DIP16 P	U219
V1372010	U 26LS32 DIP16 M	U211

Order number	Description	Item
V1372020	U 26LS30 DIP16 M	U210
V1372051	U 65176 SN DIP8 I	U212,U217
V1372131	U 28C16 DIP24 I	U202,U207
V1372352	U 68A50 DIP24 C	U204,U209
V1372361	U 68A21 DIP40 I	U218
V1372821	U SRAM 128KX8 -15DIP32 I	U201,U206
V1372991	U 68HC000 DIP64 I	U200
V1376001	U#9000 BIT PLCC44 I	U220
V1407103	R AB 6 10K G 0W2 SIP7	A202
V1407332	R AB 6 3K3 G 0W2 SIP7	A200,A201
V301102	COIL CAN 7.5X7.5X12 606	0210
V306100	CH AX NS 9 UH	L2 ,L3 ,L4 ,L5
V3061164	CH AX NS 470 NH	L1
V306800	X ACC INSUL HC49	0060
V306852	X 48.000000 MHZ HC49 S30	Y200
V311061	D ACC HLDR D3 P1 TS H 6.5	0050
V313202	J SMB MBT P 1 50E	J223,J224,J225
V3132069	J MD2 MBT P20 E1AU	J200
C3132431	J U0.6 FBT P24 E1SN SPG	0105
C3132441	J U0.6 FBT P40 E1AU TLP	0150
V3132504	J UPLCC FBT P44 E1SN SPG	0160
V3132509	J U0.3 FBT P24 E1AU TLP	0130
C3132531	J U0.6 FBT P28 E1AU TLP	0100
V313388	J MD1 MBT P 4 E1AU	J227
V313392	J MD JMP P 1 E1AU	0020
V313393	J MD1 MBT P 3 E1AU	J202,J204,J205,J222,J228
V3134911	J U0.3 FBT P 8 E1AU TLP	0120
V3134951	J U0.3 FBT P16 E1AU TLP	0110
V3134971	J U0.6 FBT P32 E1AU TLP	0090
V3134981	J U0.9 FBT P64 E1AU TLP	0080
V3135035	J D ACC SCR_L U/U L 8	0180
V3135059	J DA S8 MBS P15 FU M BLE	J203
V3135169	J DE S5 FBS P 9 FU M BLE	J218,J226
V3135179	J DE S5 MBS P 9 FU M BLE	J215
V313525	J EUR3C MBS P64 E1C2 S1.6	J208
V3135511	J U0.3 FBT P20 E1AU TLP	0140
V313913	J DUBX1 MBT P 5 E1AU	J221
V3141981	F 0A2 PTC MULTI	F201
V3141985	F 0A5 PTC MULTI	F202,F203
V3141989	F 1A1 PTC MULTI	F200
V341000	WIRE AWG28 W-WRAP YEL Y	0240
V347001	SLE OIL 0.5 RED N	0230
V3480602	WIRE SADDLE 11X10MM Y	0220
V3620146	SMP-I M2.5X10 D 84	0200
V3620226	SMP-I AM3 X 8 D 84	0190
V3661106	NUT DIN934 I M2.5	0198
V366940	NUT M3 PC BOARDS	0193
V3673896	WASHER INOX M2.5DIN137 Y	0199
V3673906	WASHER CRINKLE I M3	0191
V5681841	SOFT LOW STD MPRD9600 06	U203
V5681842	SOFT HIGH STD MPRD9600 06	U208
V5681851	MAIN ADRESS DECODER 00	U215
V5681861	AUX. ADRESS DECODER 00	U216
V6030961	CAPTIVE SCREW M3 X 8 00	0201
V6030963	CAPTIVE SCREW SPRING 01	0202
V603591	U-PROC. PLATE 01	0203
V681027	SMD MICROPR. MPRD 9600 05	0010
V716543	PCB TESTPOINT 05	0170

Order number of a complete SMD PROCESSOR : V681027 Date : 01/12/92

Order number	Description	Item
P200013	R# CE H 3E3 J 0W12 1206	R102
P200037	R# CE H 33E J 0W12 1206	R88 ,R89
P200049	R# CE H100E J 0W12 1206	R100,R101,R104,R105,R108,R225, R32 ,R45 ,R46 ,R48 ,R69 ,R95 , R96 ,R97 ,R98 ,R99
P200051	R# CE H120E J 0W12 1206	R62
P200057	R# CE H220E J 0W12 1206	R10 ,R12 ,R20 ,R7 ,R71 ,R83
P200065	R# CE H470E J 0W12 1206	R72
P200067	R# CE H560E J 0W12 1206	R63
P200069	R# CE H680E J 0W12 1206	R15 ,R19 ,R77
P200071	R# CE H820E J 0W12 1206	R23 ,R28
P200073	R# CE H 1K J 0W12 1206	R103,R21 ,R22 ,R25 ,R26 ,R27 , R29 ,R31 ,R33 ,R34 ,R59 ,R82
P200075	R# CE H 1K2 J 0W12 1206	R24 ,R30 ,R68 ,R78
P200081	R# CE H 2K2 J 0W12 1206	R109,R110,R111,R4 ,R47
P200083	R# CE H 2K7 J 0W12 1206	R16 ,R49
P200085	R# CE H 3K3 J 0W12 1206	R106,R36 ,R39 ,R85
P200089	R# CE H 4K7 J 0W12 1206	R2 ,R5 ,R58
P200095	R# CE H 8K2 J 0W12 1206	R1 ,R84
P200097	R# CE H 10K J 0W12 1206	R107,R11 ,R13 ,R14 ,R18 ,R226, R227,R228,R229,R35 ,R37 ,R38 , R40 ,R52 ,R54 ,R79 ,R90 ,R91 , R92 ,R93 ,R94
P200101	R# CE H 15K J 0W12 1206	R41 ,R42 ,R43 ,R44
P200109	R# CE H 33K J 0W12 1206	R57 ,R61
P200113	R# CE H 47K J 0W12 1206	R51
P200121	R# CE H100K J 0W12 1206	R8 ,R87
P200125	R# CE H150K J 0W12 1206	R66
P200129	R# CE H220K J 0W12 1206	R17
P200137	R# CE H470K J 0W12 1206	R86
P200384	R# CE H 75E F 0W12 1206	R50 ,R55 ,R65
P200435	R# CE H 10K F 0W12 1206	R76
P200442	R# CE H 20K F 0W12 1206	R67 ,R73 ,R74 ,R80
P200672	R# CE H 6M8 K 0W12 1206	R75
P206339	R# CE H 3K4 F 0W12 1206	R81
P206341	R# CE H 3K57F 0W12 1206	R70
P210002	C(S)CEC2CH1812X7R474M 50	C100,C12 ,C13 ,C16 ,C17 ,C24 , C31 ,C63 ,C86 ,C87
P210013	C(S)CEC1CH1206COG102J 50	C21 ,C22 ,C28 ,C30
P210064	C(S)CEC1CH1206COG220J 50	C101,C105
P210067	C(S)CEC2CH2321X7R105M 50	C116,C117
P210092	C(S)CEC2CH1206X7R103K 50	C114,C115,C126,C127,C128
P210100	C(S)CEC1CH1206COG470J 50	C10 ,C113,C129,C130,C48
P210122	C(S)CEC2CH1206X7R104K 50	C1 ,C102,C103,C107,C108,C109, C11 ,C110,C111,C112,C118,C120, C121,C122,C123,C124,C14 ,C15 , C18 ,C19 ,C2 ,C20 ,C23 ,C25 , C26 ,C27 ,C29 ,C3 ,C32 ,C33 , C34 ,C35 ,C36 ,C37 ,C38 ,C39 , C4 ,C40 ,C41 ,C42 ,C43 ,C44 , C45 ,C46 ,C47 ,C49 ,C5 ,C50 , C51 ,C52 ,C53 ,C54 ,C55 ,C56 , C57 ,C58 ,C59 ,C6 ,C60 ,C61 , C62 ,C64 ,C65 ,C66 ,C67 ,C68 , C69 ,C7 ,C70 ,C71 ,C72 ,C73 ,

Order number	Description	Item
		C74 ,C75 ,C77 ,C78 ,C79 ,C8 , C80 ,C81 ,C82 ,C83 ,C84 ,C85 , C88 ,C89 ,C90 ,C91 ,C92 ,C93 , C94 ,C95 ,C96 ,C97 ,C98 ,C99
P210139	C(S)CEC1CH1206C0G330J 50	C76
P210170	C(S)CEC1CH1206COG560J 50	C131
P212018	C(S) TACH6032 106M 16	C125
P230052	SMC(S)ICCMOS 74HC74	U18
P230063	SMC(S)ICCMOS 4051	U32
P230064	SMC(S)ICCMOS 4052	U34 ,U40
P230094	SMC(S)ICCMOS 4067	U30
P230096	SMC(S)ICCMOS 74HCT02	U2
P230102	SMC(S)ICCMOS 74HCT00	U16
P230103	SMC(S)ICCMOS 74HCT04	U17
P230328	SMC(S)ICLQUA TL064I	U33 ,U35 ,U36 ,U37 ,U38 ,U39
P230378	SMC(S)ICTIM MB3773 SOF8	U13
P230388	SMC(S)ICHCT 74HCT393 SO14	U5
P230423	SMC(S)ICHCT 74HCT10 SO14	U20
P230424	SMC(S)ICHCT 74HCT32 SO14	U21
P230464	SMC(S)ICHCT74HCT574 SOL20	U11 ,U22 ,U24 ,U28 ,U6 ,U8
P230465	SMC(S)ICHCT74HCT4053 SO16	U12
P230488	SMC(S)ICCOM LM219 SO14	U10
P230568	SMC(S)ICHC 74HC4002 SO14	U1
P230569	SMC(S)ICHC 74HC4046 SO16	U3
P230575	SMC(S)ICHCT74HCT273 SOL20	U9
P230583	SMC(S)ICCOM LM293 SO8	U7
P230596	SMC(S)ICHCT 74HCT27 SO14	U19
P230597	SMC(S)ICHCT 74HCT147 SO16	U25
P230598	SMC(S)ICHCT 74HCT151 SO16	U26
P230599	SMC(S)ICHCT 74HCT161 SO16	U23 ,U4
P230601	SMC(S)ICHCT74HCT4040 SO16	U27
P230603	SMC(S)IC74C 74C906 SO14	U15 ,U29
P230604	SMC(S)ICALS74ALS1035 SO14	U14
P230641	SMC(S)ICREF REF01 SO8	U31
P232004	SMC(S)TRA BC849C	Q9
P232069	SMC(S)TRA BT2369	Q1 ,Q10 ,Q11 ,Q5 ,Q7
P232101	SMC(S)TRPNP BC859C SOT23	Q2 ,Q3 ,Q4 ,Q6 ,Q8
P234047	SMC(S)DIO BAV99	D10 ,D22 ,D23 ,D24 ,D25 ,D26 , D27 ,D28 ,D29 ,D30 ,D31 ,D32 , D8 ,D9
P234099	SMC(S)DIO 4148	D15 ,D17 ,D18 ,D19 ,D20
P234140	SMC(S)DIOSCH LL101A	D1 ,D13 ,D14 ,D6 ,D7
P234164	SMC(S)DIZEN BZV55C5V6 DMM	D12 ,D16 ,D4
P234172	SMC(S)DIZENBZX84B5V1SOT23	D2 ,D3 ,D5
P234184	SMC(S)DIZEN BZV55C7V5 DMM	D21
P900959	PRINT - P1340959	S

2.4.6 SCHEMATIC DIAGRAM

2.4.7 BACKBOARD CONNECTIONS

PROCESSOR Board Connector J208 is connected with BACKBOARD Connector J1.

a-side pin nr	signal name	to	from	(CAD)	c-side pin nr	signal name	to	from
1	NDEGREQP15 oc		F	33	1	HFLYBP15	F	
2	NMANDEGP15	F		34	2	TEMPOK		O
3	MISSEL15	F		35	3	FOCUS1ADJ	E	
4	NDEGAUSS oc		O	36	4	FOCUS2ADJ	E	
5	EHTOK		E	37	5	+VLED	O	
6	EHTDIS15	E		38	6	-15 V PROTD	OL	
7	OSDATA		LO	39	7	+15 V PROTD	OL	
8	VAMBLSENS		O	40	8	**GND**		P
9	(RBIT)GND	I		41	9	RBIT	I	
10	(GBIT)GND	I		42	10	GBIT	I	
11	(BBIT)GND	I		43	11	BBIT	I	
12	**GND**		P	44	12	**GND**		P
13	**+6.3 V**		P	45	13	**+6.3 V**		P
14	**-18 V**		P	46	14	**-18 V**		P
15	**+18 V**		P	47	15	**+18 V**		P
16	OPTTXDTA	I		48	16	**-6.3 V**		P
17	SDA	DILMO	DILMO	49	17	OPTRXDTA		I
18	GENDIAGN oc/int		ADEILMO	50	18	SCL	DILMO	
19	BSUELIMADJ	A		51	19	GSUELIMADJ	A	
20	GPICADJ	A	(O)	52	20	RSUELIMADJ	A	
21	BPICADJ	A		53	21	RPICADJ	A	
22	GHILADJ	A		54	22	RHILADJ	A	
23	BKGADJ	A	(O)	55	23	BHILADJ	A	
24	GLOLADJ	A		56	24	RLOLADJ	A	
25	AKBOFF	A		57	25	BLOLADJ	A	
26	BPCLSEL	A		58	26	EXT1OFF	A	
27	VPOSPOL		A	59	27	HPOSPOL		A
28	SINT/NAUTOSEL	A		60	28	RGBAMPOK		A
29	HFLYBP		D	61	29	MVP		D
30	HS/CSP		A	62	30	NVSP		A
31	NuCIRQ int		D	63	31	NMBLP	AD	
32	HWEHTDIS		D	64	32	HWBLANK		D

2.4.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

PROC. BOARD FC722 9600 V5631920

Order number of a complete PROC. BOARD FC722 9600 : V5631920 01 Date : 01/12/92
Differences between PROC. BOARD 9600 V5631220 and
PROC. BOARD FC722 9600 V5631920 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0250

PROC. BOARD H.SEAL 9600 V5631921

Order number of a complete PROC. BOARD H.SEAL 9600 : V5631921 00 Date : 01/12/92
Differences between PROC. BOARD 9600 V5631220 and
PROC. BOARD H.SEAL 9600 V5631921 00

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0250

PROC. BOARD CER. FC722 9600 V5631922

Order number of a complete PROC. BOARD CER FC722 9600 : V5631922 00 Date : 01/12/92
Differences between PROC. BOARD 9600 V5631220 and
PROC. BOARD CER. FC722 9600 V5631922 00

SUBSTITUTES

Order Number	Description	Item	
V5681851	MAIN ADRESS DECODER 00	U215	replaced by
V5681951	MAIN ADRESS DECODER REA00		
V5681861	AUX. ADRESS DECODER 00	U216	replaced by
V5681961	AUX. ADRESS DECODER REA00		
V134257	U 145406 MC DIP16 P	U219	replaced by
V1342571	U 145406 MC DIP16 C		

ADDED

Order Number	Description	Item
V395154	FLUORAD FC722	0250

2.5 POWER SUPPLY BOARD

110/220VAC VERSION

General

This power supply is a half bridge series-resonant converter that generates 5 positive and 5 negative output voltages.
It features a very high overall power efficiency.
A jumper selects 115 or 220 VAC mains voltage.

CAUTION

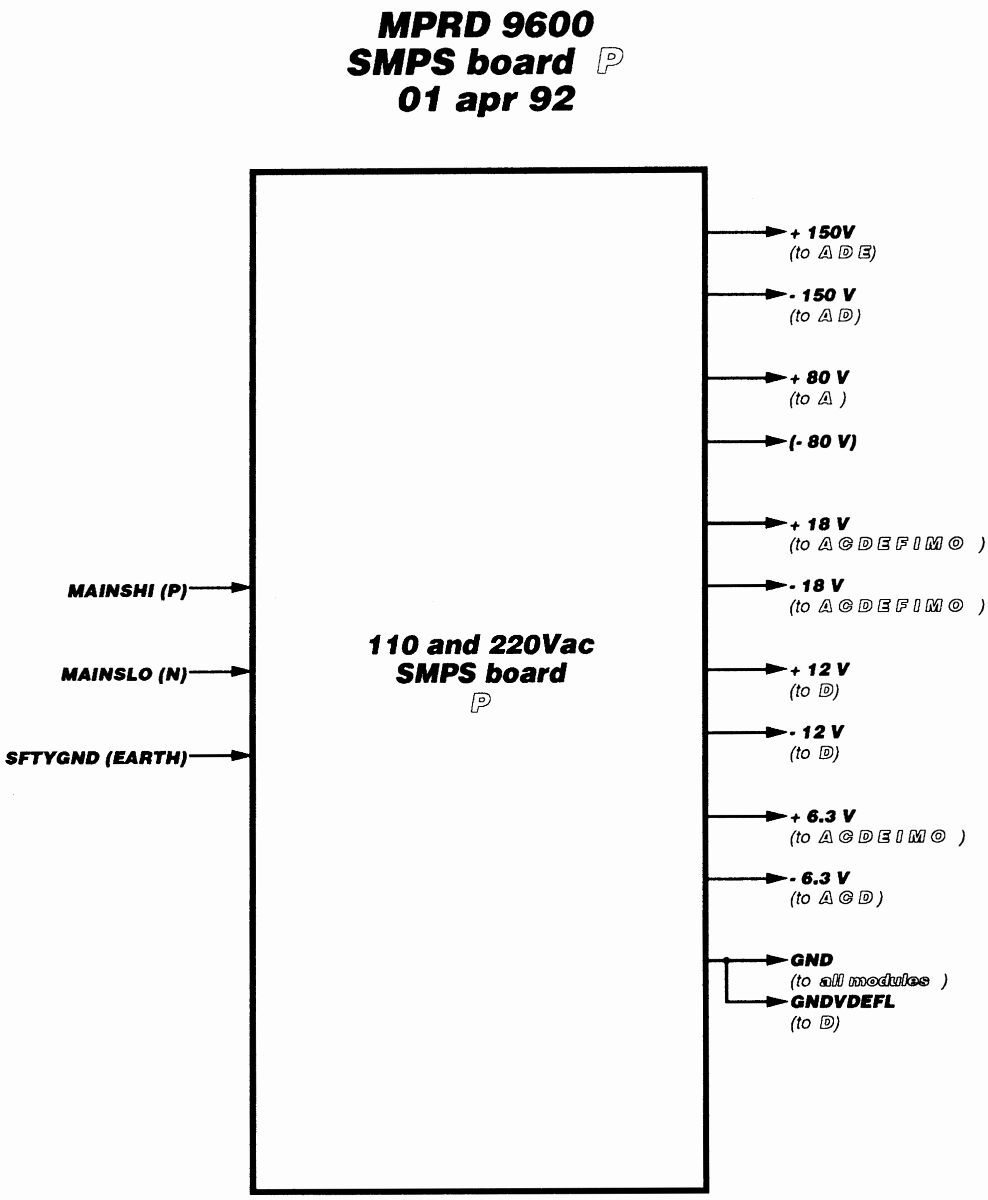
The +6.3 V and -6.3 V outputs are adjusted for +6.0 V and -6.0 V

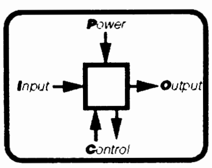
A sticker on the switch mode indicates the factory set power suppply input voltage.

The identification plate at the rear of the monitor also indicates the factory set power supply input voltage.

Optional Power Supply board versions are described in section 2.5.14 Customized Versions (Options)

2.5.1 IOPC DIAGRAM





BOARD NAMES & ABBREVIATIONS	
A	RGB AMPLIFIER
B	BACKBOARD
C	PROCESSOR
D	DEFLECTION
E	EHT
F	MIS (optional)
H	TEMPERATURE SENSOR
I	EXTRA INPUT (optional)
K	KEYPAD
L	Ambient Light Controller (optional)
M	MODULATOR (optional)
O	CONTROL PANEL
P	Switched Mode Power Supply
S	OPTICAL SENSOR (Optisense®)
T	CRT SOCKET

figure 2.37 : 110/220VAC POWER SUPPLY IOPC diagram

2.5.2 BLOCK DIAGRAM

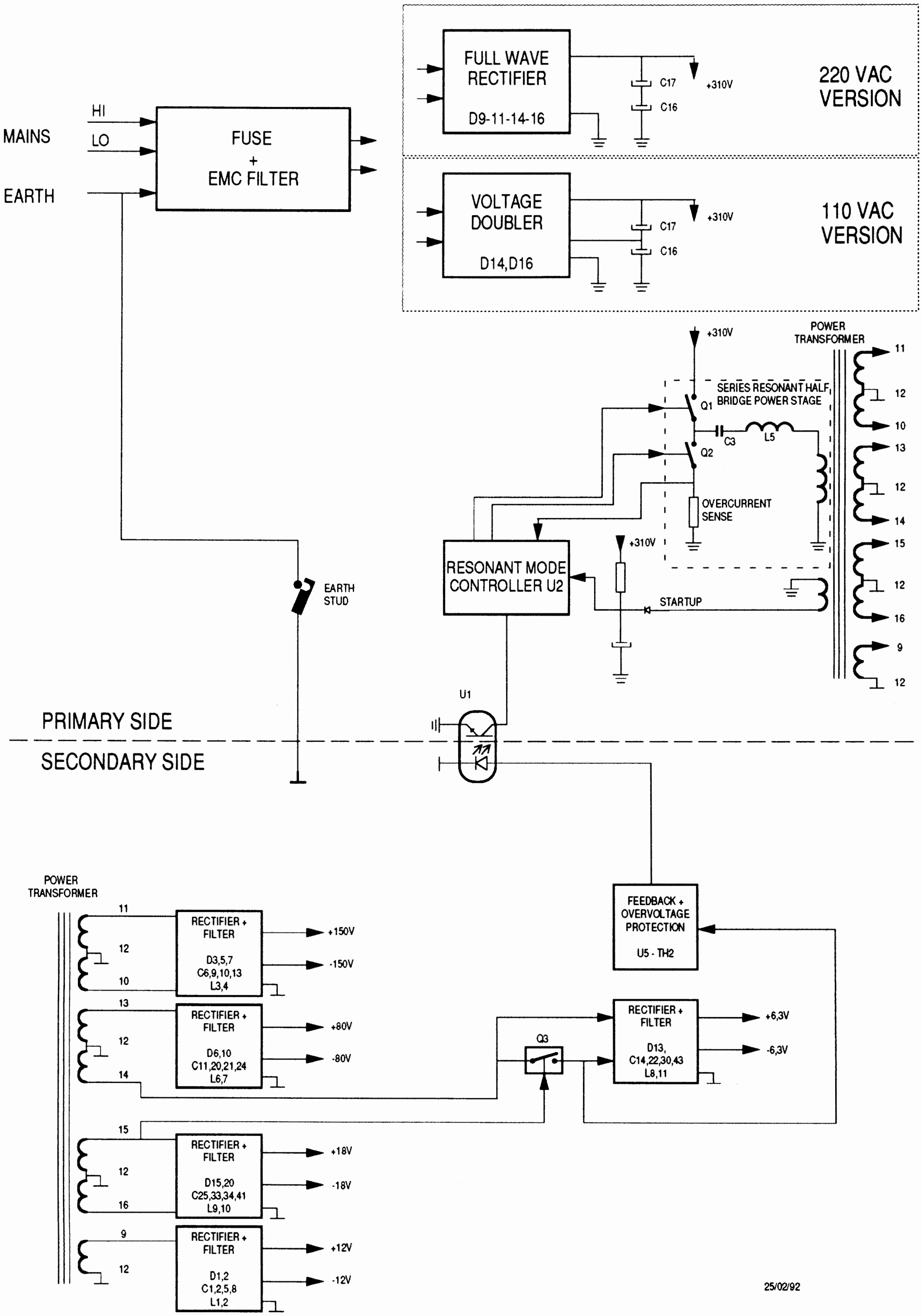


figure 2.38 : 110/220VAC POWER SUPPLY board block diagram

2.5.3 CIRCUIT DESCRIPTION

MAINS INPUT - EMC FILTER

T4, C50, C45 and T3 form a two-section filter to suppress differential mode noise. The same two coils with C49, C44 and C48 have the same function for common-mode noise.
The earth-stud in parallel with C46 connects the internal electrical ground (secondary side) with the mains earth. If opened C46 forms a low impedance path for high frequencies. The shunt R30 forms a discharge path in parallel with C46.

MAINS RECTIFICATION

Low Range (90Vac to 135Vac)

Diodes D14 and D16 together with C16 and C17 form a voltage doubler rectification circuit for the input voltage (110Vac nominally). The output voltage will be 310Vdc.

High Range (176Vac to 264Vac)

The four diodes form a double phase rectification bridge for the input voltage (220Vac nominally). Again, the output voltage will be 310Vdc.

PRIMARY SECTION

This section is built around resonant mode controller U2 and the half bridge power stage with Q1,2 that drive transformer T1.

Start-up Circuitry

After switch on C15 will be charged via R7 and R9 from the 310Vdc. As long as the voltage over C15 (Vcc) is less then 16V, the controller is not operating and draws only a minor current from Vcc. At 16V U2 turns on and is powered by the voltage on C15. This voltage on C15 will ramp down whilst energy is taken from it.
The power stage starts operating and all the secondary voltages start rising. Also via the auxiliary winding at pin 3 of power transformer T1 a voltage is generated. This voltage is rectified by D8 and charges C15 back to approx. 13V. Now the supply is at its normal operating level with all secondaries generating their nominal voltage.

Feedback

The feedback signal comes from optocoupler U1 and drives the operational amplifier internal in U2 at its inverting pin nr 7. R26 and C36 between output (pin6) and inverting input (pin7) form a compensation network to stabilise the feedback loop. The RA1 3K3 resistor at output pin6 drives the voltage controlled oscillator input pin3. A rising voltage at pin6 increases the switching frequency.

Overcurrent Protection

Only the positive alternations of the primary current that flow through Q2 are sensed over sense resistors R3 and R4. It is not necessary to sense the other alternations of this current because the series connection of L4 with the load prevents a very rapid build up of the current in case of overload or short circuits. After peak detection and a low pass filtering, the remaining signal is connected to the fault input at pin 10. A level of 1.0 volts switches of the controller. After switch-off the voltage on C15 has to rise again to 16V to start the supply again. So the R9-C15 time constant prevents hiccupping of the supply in case of permanent overload.

SECONDARY SECTION

Seven secondary windings generate the ten different output voltages.
As the transformer T1 is magnetized in both directions, it is possible to generate voltages in several ways:
- two-way rectification with two diodes on a double winding:
    - +150V with D3 (double diode)
    - +18V with D15 (double diode)
    - -150V with D5 and D7
- single winding, for positive and/or negative output voltages, with single wave rectification:
    - +80V with D10
    - -80V with D6
    - -18V with D20
    - +12V with D2
    - -12V with D1
    - -6.0 V with schottky diode D13
    - +6.0V with Q3 as synchronous rectifier driven by the 18V winding.

Each output has its own LC lowpass filter, to reduce the high frequency output ripple to acceptable values.
The +6.3V output is used for feedback via the R12, P1, R36 divider.
D21 is a temperature compensated reference diode.
A fraction of the 6.3V output is compared with the reference voltage for overvoltage protection. When this output reaches approx. 6.85V thyristor Th2 is fired and the shorted 80 V secondary shuts off the supply.

2.5.4 PCB LAYOUT

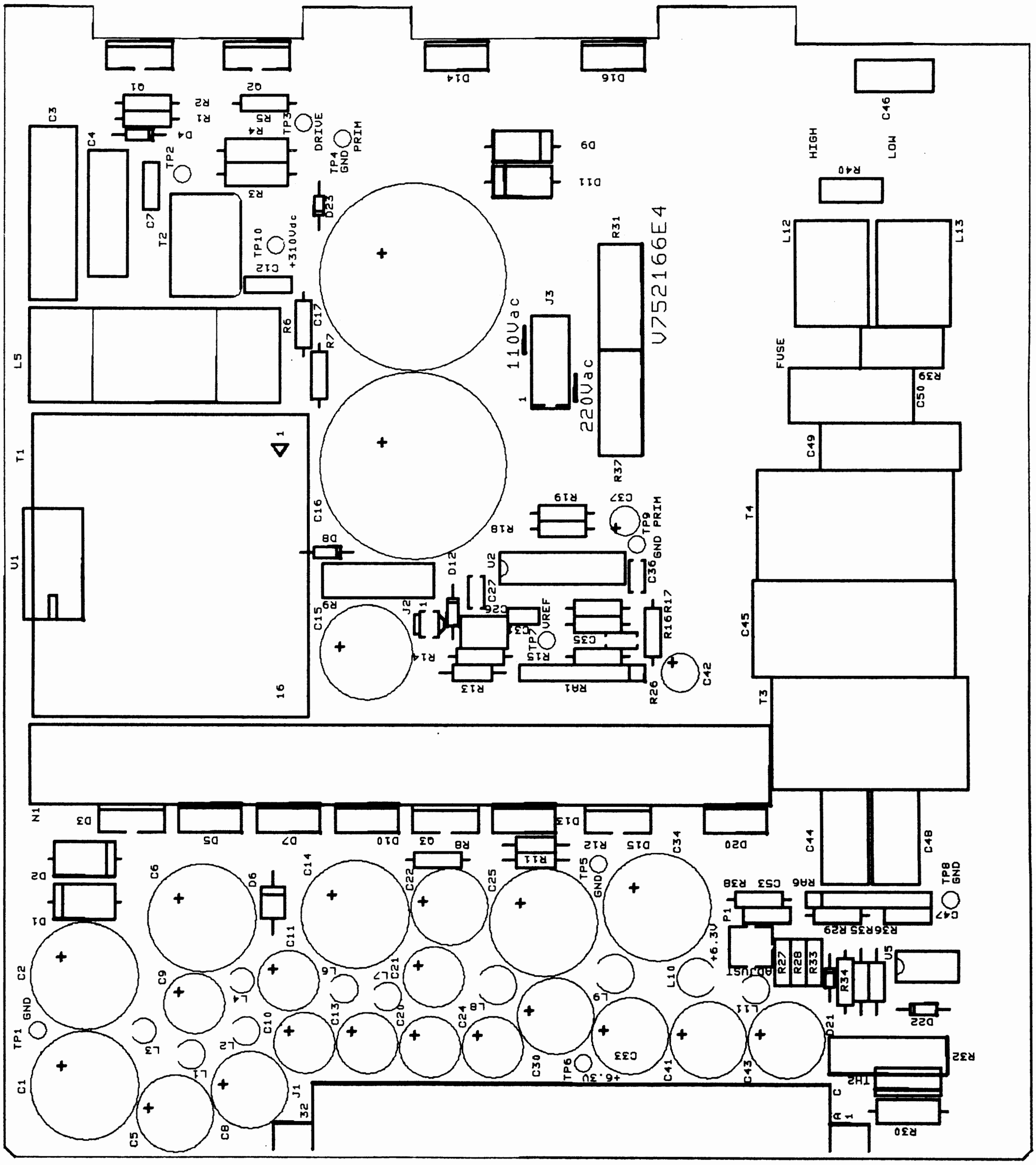


figure 2.39 : 110/220VAC POWER SUPPLY board component side

2.5.5 PARTS LIST

Order number of a complete PS 115 V FIX. CORD MPRD9600 : V5631275 11 Date : 30/03/93

Order number	Description	Item
C1011339	R CFFH560E J 0W25	R7
V101213	R MF H 12E J 0W5	R2
V101214	R MF H 15E J 0W5	R5
V101216	R MF H 22E J 0W5	R8
V101227	R MF H180E J 0W5	R6
V101229	R MF H270E J 0W5	R14
V101234	R MF H680E J 0W5	R1
V101236	R MF H 1K J 0W5	R38
V101245	R MF H 5K6 J 0W5	R17
V101248	R MF H 10K J 0W5	R28
V101249	R MF H 12K J 0W5	R19 ,R34
V101252	R MF H 22K J 0W5	R18
V101253	R MF H 27K J 0W5	R26
V101259	R MF H 82K J 0W5	R29
V101260	R MF H100K J 0W5	R15
V101264	R MF H220K J 0W5	R16
V102360	R MF H100K J 2W	R9
V1026007	R MF H 10K F 0W6	R27
C1026008	R MF H100K F 0W6	R35
V1026296	R MF H 2K F 0W6	R36
V1026377	R MF H 24K3 F 0W6	R13
V1026506	R MF H 3K32F 0W6	R33
V1026655	R MF H475E F 0W6	R12
V1026657	R MF H 47K5 F 0W6	R11
V102900	R MF H 1E J 1W6	R3 ,R4
V1035993	R WW R 4E7 K 2W E4	R32
V104665	R HV H 3M3 J 0W5 3500	R30
V105011	R NTC 10E M 1W5	R31
V105016	R NTC 4E7 M 1W5	R37
V107005	R TCE H500E M 0W5 S7 TS	P1
V1113855	C EL RA 15M M160E2 105	C20 ,C21
V1113875	C EL RA 33M M250E3 105	C6
V1114165	C EL RA 10M M200E2 105	C10 ,C13 ,C9
V1114709	C EL RA1000M M 16E2 105	C15 ,C22 ,C30 ,C43
V1114805	C EL RA1500M M 25E3 105	C25 ,C34
V1114825	C EL RA3300M M 25E3 105	C1 ,C2
V1114835	C EL RA3300M M 10E3 105	C14
V111489	C EL RA 470M M 35E2 105	C33 ,C41 ,C5 ,C8
V1114922	C EL RA 2M2M 50E1 105	C37
V1114952	C EL RA 22M M 50E1 105	C42
V1116435	C EL RA 470M M200E4 105	C16 ,C17
V1117581	C CE DI 10N M102E3 HV	C46
V1122510	C COG MU 1N J100E2 125	C27
V1127410	C X7R MU 1N5K 50E2 125	C36
V1127510	C X7R MU 10N K 50E2 125	C35
V1127810	C X7R MU 47N K 50E2 125	C54
V1127890	C X7R MU 470N K 50E2 125	C12 ,C7
V1127990	C X7R MU 100N K100E1 125	C31
V1140424	C POMERA 100N K400E6 85	C4
V114089	C POMERA 150N K 63E2 85	C47 ,C53
C1147009	C CE DI 4N7M400E5 Y	C49 ,R40
C1147105	C PO RA 100N M250 X	C50
C1147169	C PO RA 1M M250 X	C45

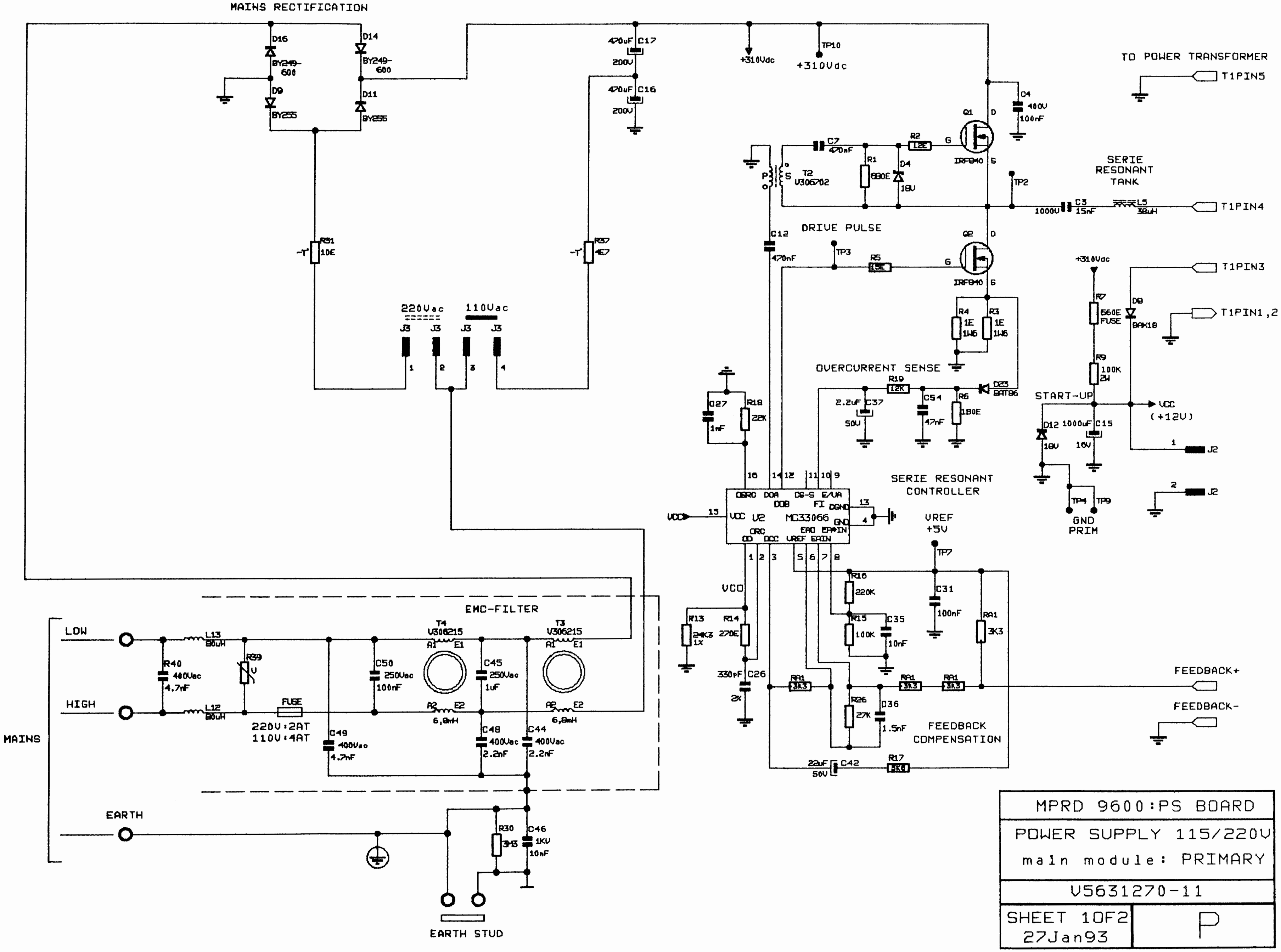
Order number	Description	Item
C114722	C CE DI 2N2M400E5 Y	C44 ,C48
V115014	C PPMERA 33N J102E9 HV	C3
V1151552	C PP RA 330P H100E2 85	C26
V1315046	D BAT86 SCH DO34	D23
V131624	D BAX18 SW DO35	D8
V131697	U 65B CNY DIP16 P	U1
V1317205	D 1N823/6V2 REF DO34	D21
V131743	D ZEN 8V2 0W5 C DO35	D22
V131749	D ZEN 18V 0W5 C DO35	D12 ,D4
C131902	D BY255 R DO13	D11 ,D9
V131909	D PBYR1045 SCH TO220	D13
V131915	D BY249-600 R TO220	D14 ,D16
V1319496	D BYV29-400 UFSR TO220	D10 ,D5 ,D7
V131951	D BYV34-400 UFSR TO220	D3
V131952	D BYV32-200 UFSR TO220	D15
V131955	D BYV79-200 UFSR TO220	D20
V132024	D VSK340 SCH	D1 ,D2
V1321942	U 072 TL DIP8 I	U5
V132211	Q SO402BH TH P TO220	TH2
V132612	Q IRF840 FN P TO220	Q1 ,Q2
V132620	Q IRF530 FN P TO220	Q3
V133028	U ACC HTSNK DIP16	0220
V133039	SPR L 8 D 4 D 1.2 K	0040
V1330431	Q ACC ISO ALOX 1.6 TO220	0128
V1377661	U 33066 MC DIP16 I	U2
V1508332	R AI 4 3K3 G 0W3 SIP8	RA1 ,RA6
C302108	CORE TUBE 3.5/ 1.3 X 3	Q'1 ,Q'2
V302126	CORE TUBE 6 / 3 X18	L10 ,L8 ,L9
C302127	CORE TUBE 8 / 4 X18	0148
V306101	CH RA NS 9 UH	L7
V3061363	CH AX S 22 UH	L1 ,L11 ,L2
V3061402	CH AX NS 47 UH	L3 ,L4
V306215	CH MNS 6.8 MH 2X 2A2	T3 ,T4
V306222	CH TOR V 80 UH 2A	L12 ,L13
V306702	T DVR 2227X	T2
V3133004	J MD1 MBT P 4 S1SN	J3
V3133021	J MD JMP P 1 S1SN	J'3
V313525	J EUR3C MBS P64 E1C2 S1.6	J1
V3139132	J DUBX1 MBT P 2 E1AU	J2
C3141041	F T 4A L 5X20 RU/VDE	0131
V314512	F ACC HLDR 5X20 FRM	0130
V315302	J EYE TEST LG	TP1 ,TP10,TP2 ,TP3 ,TP4 ,TP5 , TP6 ,TP7 ,TP8 ,TP9
V315331	SLDRLUG SCR 1TAG D3.2 L12	0147
V315332	SLDRLUG SCR 1TAG D4.2 L26	0156
V326112	CBL (AWG18) 3 UL/CSA	0141
V342150	WIRE AWG22 UL1672 BLA #Y	0132,0133
V346991	SLV SHR D19 /9.5 BLK	L'12,L'13
V347001	SLV OIL D 0.5 RED	0290
V3480141	SLV SHR D 3.2/1.6 L10 BLK	0134
V348016	SLV SHR D 3.2/1.6 L20 GRN	0146
V348045	CBL ACC TIE B L280 W3.4	0060
V348060	CBL ACC CLP FLT	0140
V3620206	SCR D84 M 3 X 5 I	0104,0231
V3620216	SCR D84 M 3 X 6 I	0102,0121,0126,0212
V3620226	SCR D84 M 3 X 8 I	0214
C366964	SCR D933 M 4 X 16 B	0150

Order number	Description		Item
C366965	NUT D934 M 4	B	0151
C367384	BSHG SCR M 4		0152
V3673906	WSHR WAVE 3.2	I	0103,0122,0127,0213,0217,0232
V367401	RVT D2.4 L 9.1 P	A	0020
V3675036	WSHR D6798 A 4.3	I	0155
V367650	FIX BRKT UNIVERSAL M3		0101
V3685408	NUT I KSS2 M 3		0233
V395124	GLUE LOCTITE 384		0250
V395322	EMC SEAL D3.2		0280
C600145	MASSA SUPPORT	01	0154
V6030961	CAPTIVE SCREW M3 X 8	00	0105
V6030963	CAPTIVE SCREW SPRING	01	0106
V6030964	CAPTIVE SCREW M3 X10	00	0108
V603569	KLEM TRANSISTOR 3L	00	0107,0210
V6035692	KLEMTRANSISTOR 2L	00	0125,0211
V6036126	HEATSINK SM HE308P3 20H	03	0100
V603614	HEATSINK SMPS REC. $$$	01	0200
V603696	ISOLATION SMPS REC.	00	0215
V6036971	BACK ISOLATION 220V	02	0123
V6036991	SMPS SHIELD 220V	03	0230
V603731	PCB CLAMP MPRD9000	01	0216
V752166	PCB SMPS 115/220V 9000	02	0010
V775328	CH TOR V 38 UH		L5
V775336	TRF SMPS 115/220V 9000	00	T1

NOTE FOR 220V AC VERSION ONLY

FUSE must be a 2 A T type.

2.5.6 SCHEMATIC DIAGRAM



MPRD 9600:PS BOARD

POWER SUPPLY 115/220V

main module: PRIMARY

V5631270-11

SHEET 1OF2

27Jan93

P

28VDC VERSION

General

This power supply consists of two converters in cascade. The first converter is a step-up (boost) converter, with duty cycle modulation at approximately 100Kc, that converts any input voltage between 18Vdc and 40Vdc to a fixed output voltage of 67Vdc. This stabilised voltage forms the input to the second converter which is a resonant mode converter switching around 250Kc.

The advantages of this cascade of two converters are:

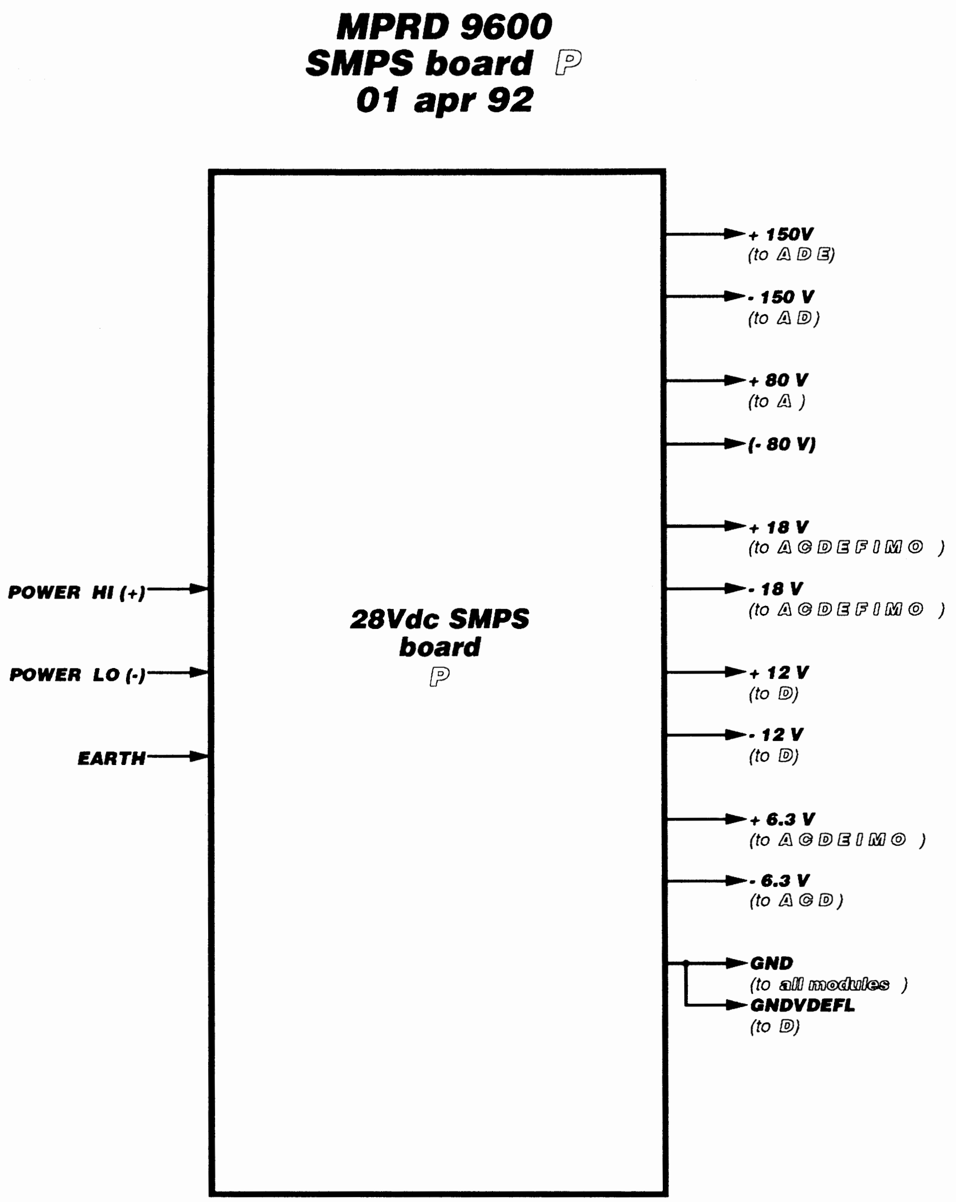
- a very wide range of input voltages, the supply is able to accept any voltage between 18Vdc and 60Vdc (for the complete monitor the operating range is 20Vdc to 40Vdc)
- a high efficiency over the complete range of input voltages.

CAUTION

The +6.3 V and -6.3 V outputs are adjusted for +6.0 V and -6.0 V

Optional Power Supply board versions are described in section 2.5.14 Customized Versions (Options)

2.5.7 IOPC Diagram



BOARD NAMES & ABBREVIATIONS	
A	RGB AMPLIFIER
B	BACKBOARD
C	PROCESSOR
D	DEFLECTION
E	EHT
F	MIS (optional)
H	TEMPERATURE SENSOR
I	EXTRA INPUT (optional)
K	KEYPAD
L	Ambient Light Controller (optional)
M	MODULATOR (optional)
O	CONTROL PANEL
P	Switched Mode Power Supply
S	OPTICAL SENSOR (Optisense®)
T	CRT SOCKET

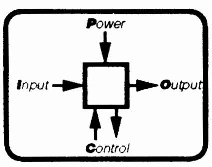


figure 2.40 : 28VDC POWER SUPPLY board IOPC diagram

2.5.8 BLOCK DIAGRAM

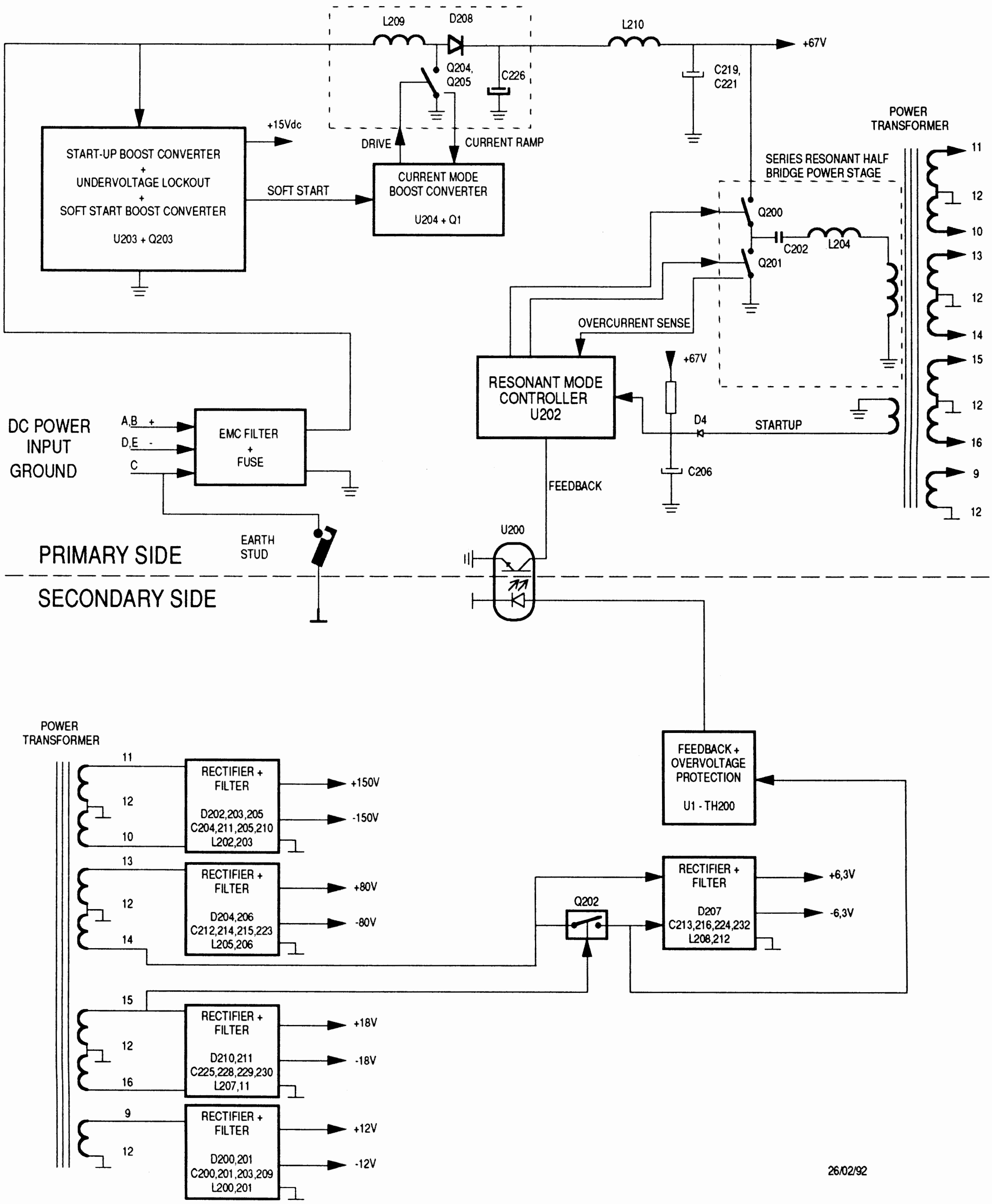


figure 2.41 : 28VDC POWER SUPPLY board block diagram

2.5.9 CIRCUIT DESCRIPTION

POWER INPUT - EMC FILTER

L213,214 together with C234,238 form a filter to suppress differential mode noise. The same coils with C236,237, 239,240 have the same function for common-mode noise.
The earth-stud in parallel with C235 connects the internal electrical ground (secondary side) to earth. If opened C235 forms a low impedance path for high frequencies. The shunt R203 forms a discharge path in parallel with C235.

BOOST CONVERTER

Power Stage
The power switch consist of the parallel combination of two sense-powerfets Q204,205. These form together with L209,D208 and C226 a basic boost converter.

Control Circuitry
The power switch is duty cycle modulated at approximately 100 Kc by controller U204. This is a current mode controller. The current ramp is sensed at the sense contacts of Q205 and Q204 in parallel, and via a low pass filter R41-C16 connected to the current sense input of U204. Via emitter follower Q1 a fraction of the oscillator ramp voltage on C13 is added to the current sense wave form. This is called slope compensation and is needed for feedback stabilisation in any boost converter that operates at duty cycles over 50%. The output voltage is divided by R28,21 and via low pass R22-C11 connected to the inverting input at pin2 for feedback stabilisation. R40 and C14 stabilise the closed loop.

Undervoltage Lockout and Start-up
One half of U203 senses the value of the input voltage. At values above 18V pin7 goes high and the +15V at the emitter of Q203 powers the boost controller U204. As soon as the voltage goes below 17,5V the emitter of Q203 returns to zero and the boost converter stops (undervoltage lockout).
At each switch-on, the second part of U203 generates a soft start pulse that is injected in the feedback loop via R24 and D9. The pulse duration is determined by charging C231 via R39.

SERIES RESONANT HALF BRIDGE CONVERTER

This section is built around resonant mode controller U202 and the half bridge power stage with Q200,201 that drive transformer T1.

Start-up Circuitry
After switch on C206 will be charged via R8 and R200 from the 67Vdc. As long as the voltage over C206 (Vcc) is less then 16V, the controller is not operating and draws only a minor current from Vcc. At 16V U202 turns on and is powered by the voltage on C206. This voltage on C206 will ramp down whilst energy is taken from it.
The power stage starts operating and all the secondary voltages start rising. Also via the auxiliary winding at pin3 of power transformer T200 a voltage is generated. This voltage is rectified by D4 and charges C206 back to approx. 13V. Now the supply is at its normal operating level with all secondaries generating their nominal voltage.

Feedback
The feedback signal comes from optocoupler U200 and drives the operational amplifier internal in U202 at its inverting pin7. R15 and C8 between output (pin6) and inverting input (pin7) form a compensation network to stabilise the feedback loop. The R16 resistor at output pin6 drives the voltage controlled oscillator input pin3. A rising voltage at pin6 increases the switching frequency.

Overcurrent Protection
Only the positive alternations of the primary current that flow through Q4 are sensed over sense resistors R8 and R9. It is not necessary to sense the other alternations of this current because the series connection of L4 with the load prevent a very rapid build up of the current in case of overload or short circuits.
The low sense voltage between current-sense and kelvin source pins of Q201 is differentially amplified by U201. After peak detection a low pass filter R9,C9 extracts the average value, and connects this average voltage to the fault

input at pin10. A level of 1.0 volts switches of the controller. After switch-off the voltage on C206 has to rise again to 16V to start the supply again. So the R8-C206 time constant prevents hiccupping of the supply in case of permanent overload.

SECONDARY SECTION

Seven secondary windings generate the ten different output voltages.
As the transformer T1 is magnetized in both directions, it is possible to generate voltages in several ways:
- two-way rectification with two diodes on a double winding:
    +150V with D202 (double diode).
    +18V with D210 (double diode).
    -150V with D203 and D205.
-single winding, for positive and/or negative output voltages, with single wave rectification:
    +80V with D206.
    - 80V with D204.
    -18V with D211.
    +12V with D201.
    - 12V with D200.
    - 6.0V with schottky diode D207.
    +6.0V with Q202 as synchronous rectifier driven by the 18V winding.

Each output has its own LC lowpass filter, to reduce the high frequency output ripple to acceptable values.
The +6.3V output is used for feedback via the R25, P200, R58 divider.
D209 is a temperature compensated reference diode.
A fraction of the 6.3V output is compared with the reference voltage for overvoltage protection. When this output reaches approx. 6.85V thyristor Th200 is fired and the shorted 18V secondary shuts off the supply.

2.5.10 PCB LAYOUT

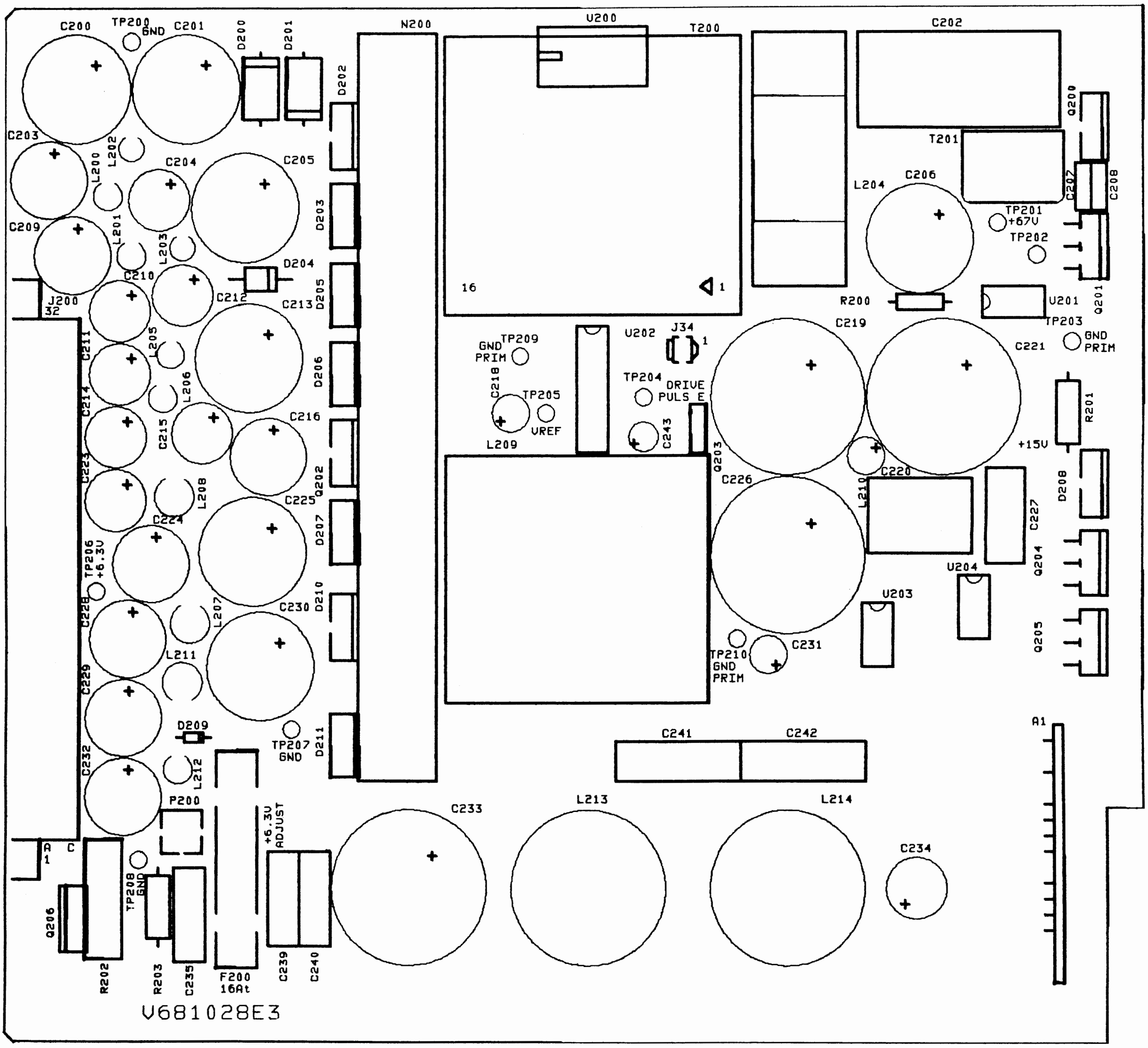


figure 2.42 : 28VDC POWER SUPPLY board component side

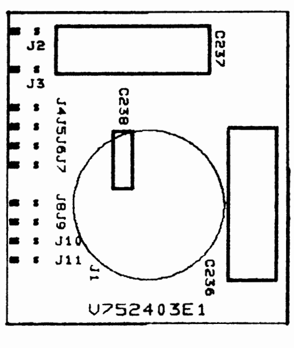


figure 2.43 : 28VDC POWER SUPPLY submodule FILTER component side

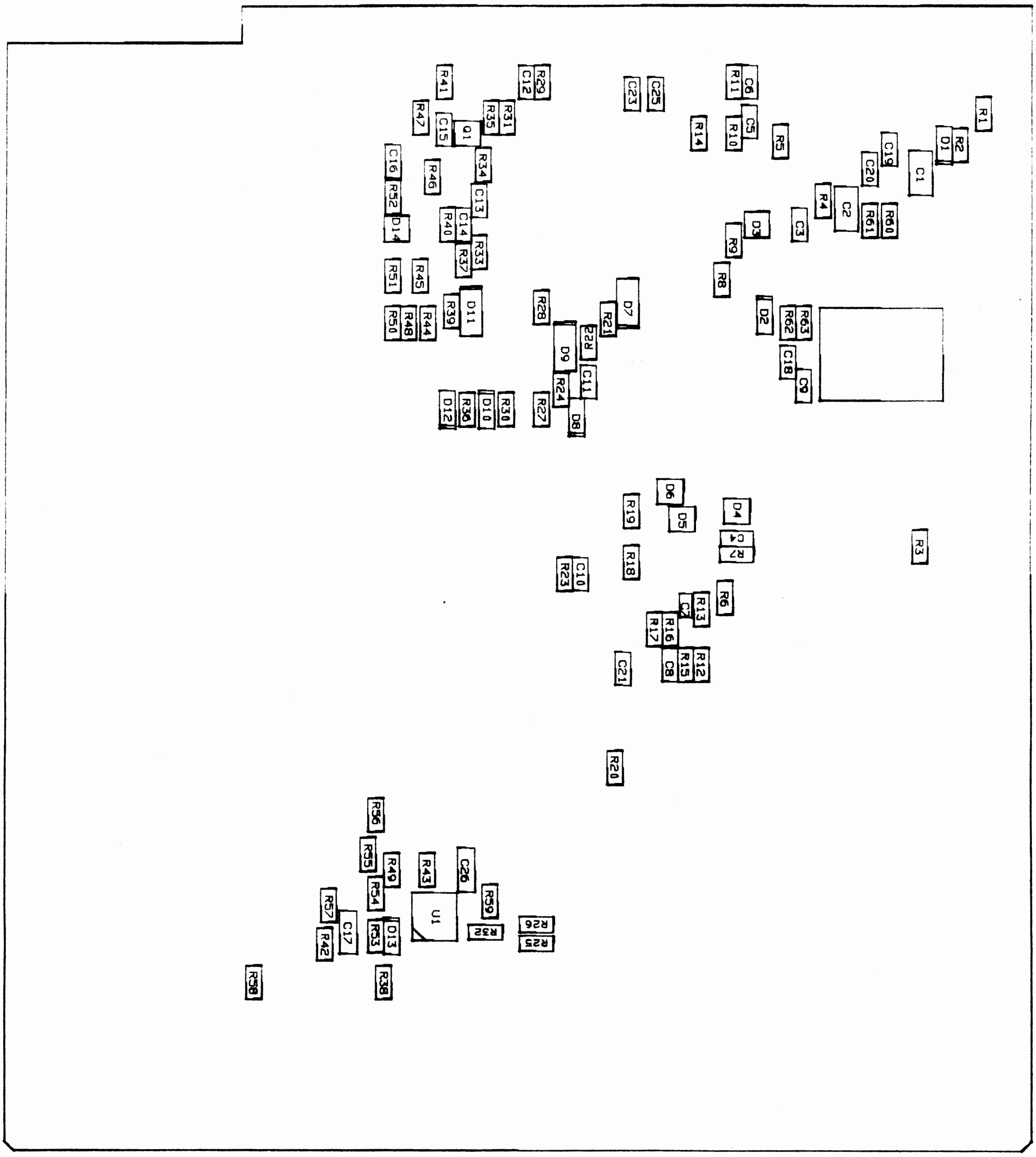


figure 2.44: 28VDC POWER SUPPLY board solder side

2.5.11 PARTSLIST

Order number of a complete 28 V DC POWER SUPPLY BOARD : V5631271 12 Date : 26/01/93

Order number	Description	Item
C1011339	R CFFH560E J 0W25	R200
V102909	R MF H 5E6 J 1W6	R201
V1035993	R WW R 4E7 K 2W E4	R202
V104654	R HV H 1M J 0W5 3500	R203
V107005	R TCE H500E M 0W5 S7 TS	P200
V1113855	C EL RA 15M M160E2 105	C214,C215
V1113875	C EL RA 33M M250E3 105	C205
V1114165	C EL RA 10M M200E2 105	C204,C210,C211
V1114709	C EL RA1000M M 16E2 105	C216,C224,C232
V111471	C EL RA1000M M 25E3 105	C206
V1114762	C EL RA 47M M 25E1 105	C220,C231
V1114805	C EL RA1500M M 25E3 105	C225,C230
V1114825	C EL RA3300M M 25E3 105	C200,C201
V1114835	C EL RA3300M M 10E3 105	C213
V111489	C EL RA 470M M 35E2 105	C203,C209,C228,C229
V1114942	C EL RA 10M M 50E1 105	C243
V1114952	C EL RA 22M M 50E1 105	C218
V1114985	C EL RA 470M M 63E3 105	C234
V111600	C EL RA1500M M100E4 105	C219,C221,C226,C233
V1127030	C X7R MU 100N K200E2 125	C207,C208
V1127930	C X7R MU 1M K 50E2 125	C238
V1140309	C POMERA 10N K630E4 85	C235
V1140409	C POMERA 68N K630E6 85	C236,C237,C241,C242
V1140462	C POMERA 220N K100E4 85	C227
V115019	C PPMERA 150N K400E11 HV	C202
V1314361	Q BD139 N P TO126	Q203
V131697	U 65B CNY DIP16 P	U200
V1317205	D 1N823/6V2 REF DO34	D209
V131909	D PBYR1045 SCH TO220	D207
V1319496	D BYV29-400 UFSR TO220	D203,D205,D206
V131951	D BYV34-400 UFSR TO220	D202
V131952	D BYV32-200 UFSR TO220	D208,D210
V131955	D BYV79-200 UFSR TO220	D211
V132024	D VSK340 SCH	D200,D201
V132211	Q SO402BH TH P TO220	Q206
V132611	Q IRF540 FN P TO220	Q200
V132620	Q IRF530 FN P TO220	Q202
V132633	Q MTP10N10M FN P TO220	Q201,Q204,Q205
V133028	U ACC HTSNK DIP16	0220
V133039	SPR L 8 D 4 D 1.2 K	0250
V1330431	Q ACC INSUL ALOX TO220	0123
V134120	U 3140 CA DIP8 P	U201
V1341431	U 062I TL DIP8 I	U203
V1377661	U 33066 MC DIP16 I	U202
V1377691	U 2843 UC DIP8 I	U204
V302109	CORE TUBE 2.6/ 1.2 X 1.6	L217
V302126	CORE TUBE 6 / 3 X18	L207,L208,L211
V306101	CH AX NS 9 UH	L206,L215,L216
V3061363	CH AX S 22 UH	L200,L201,L212
V3061402	CH AX NS 47 UH	L202,L203
V306222	CH TOR V 80 UH 2A	L210
V306702	T DVR 2227X	T201
V3132841	J CIS MBS P20 R1SN	J11
V313525	J EUR3C MBS P64 E1C2 S1.6	J200
V3136740	J RND_M FBT P 5 15/05 HSG	J1
V3139132	J DUBX1 MBT P 2 E1AU	J34

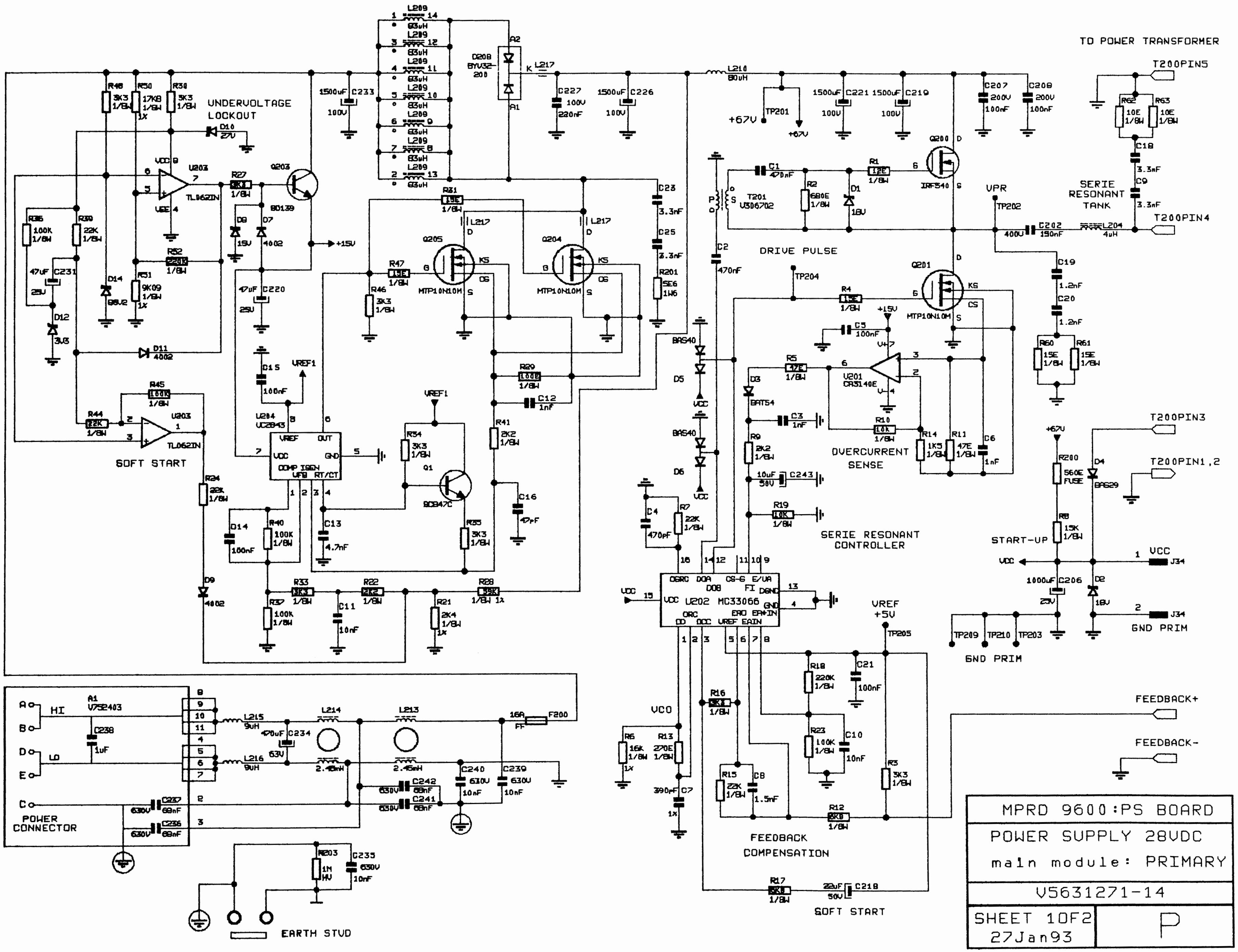
Order number	Description	Item
V314155	F FF16A H 6X32	0030
V314504	F ACC HLDR T UNIV PC/CPL	F200
V315302	J EYE TEST LG	TP
V315332	SLDRLUG SCR 1TAG D4.2 L26	0156
V347001	SLE OIL 0.5 RED N	0290
C347053	SLE SHR 6.0 3:1 BLA	L200,L202
V348006	CABLE TIE B2.5L140 Y	0240
V3620146	SCR D84 M 2.5X 10 I	0020
V3620206	SCR D84 M 3 X 5 I	0104,0231
V3620216	SCR D84 M 3 X 6 I	0102,0121,0141,0212
V3620226	SCR D84 M 3 X 8 I	0214
V3620236	SCR D84 M 3 X 10 I	0143
V3620276	SCR D84 M 3 X 20 I	0272
V3620316	SCR D84 M 3 X 35 I	0260
V3661026	NUT D934 M 3 I	0262
V3661106	NUT D934 M 2.5 I	0022
V366940	SPR I L 1.5 M 3 T1.5 S T	0273
C366964	SCR D933 M 4 X 16 B	0150
C366965	NUT D934 M 4 B	0157
C367384	BSHG SCR M 4	0152
V3673896	WSHR D137A 2.7 I	0021
V3673906	WSHR WAVE 3.2 I	0103,0122,0142,0213,0217,0232, 0261,0271
V3673916	WSHR WAVE 4.3 I	0158
V3675036	WSHR D6798 A 4.3 I	0155
V367650	FIX BRKT UNIVERSAL M3	0101
V3685408	NUT I KSS2 M 3	0233
V3685496	SPR RVT L12 M3 I	0144
V395124	GLUE LOCTITE 384	0221
V395322	EMC SEAL D3.2	0280
C600145	MASSA SUPPORT 01	0154
V6030961	CAPTIVE SCREW M3 X 8 00	0110
V6030963	CAPTIVE SCREW SPRING 01	0111
V6030964	CAPTIVE SCREW M3 X10 00	0112
V603154	PLASTIC WASHER 00	0270
V603569	KLEM TRANSISTOR 3L 00	0120,0210
V6035692	KLEMTRANSISTOR 2L 00	0124,0211
V6036125	HEATSINK SM HE308P5 20H02	0100
V603614	HEATSINK SMPS REC. $$$ 01	0200
V603696	ISOLATION SMPS REC. 00	0215
V603699	SMPS SHIELD 28V 03	0230
V603731	PCB CLAMP MPRD9000 01	0216
V681028	SMD SMPS 28V MPRD9600 06	0010
V752403	PCB FILTER MODULE 9000 02	A1
V7753281	CH TO V 4.6 UH 01	L204
V775334	CORE SMPS 80 UH 9000 00	L209
V775337	TRF SMPS 28V DC 9000 00	T200
V775353	COIL TOROID 2.45MH 02	L213,L214

Order number of a complete SMD 28 V DC : V681028 Date : 27/01/93

Order number	Description	Item
P200025	R# CE H 10E J 0W12 1206	R62 ,R63
P200027	R# CE H 12E J 0W12 1206	R1
P200029	R# CE H 15E J 0W12 1206	R31 ,R47 ,R60 ,R61 ,R4
P200033	R# CE H 22E J 0W12 1206	R20
P200041	R# CE H 47E J 0W12 1206	R11 ,R5

Order number	Description	Item
P200049	R# CE H100E J 0W12 1206	R29
P200059	R# CE H270E J 0W12 1206	R13
P200069	R# CE H680E J 0W12 1206	R2
P200073	R# CE H 1K J 0W12 1206	R59
P200077	R# CE H 1K5 J 0W12 1206	R14
P200081	R# CE H 2K2 J 0W12 1206	R22 ,R41 ,R9
P200085	R# CE H 3K3 J 0W12 1206	R16 ,R27 ,R3 ,R30 ,R33 ,R34 , R35 ,R38 ,R46 ,R48 ,R53 ,R56 , R57
P200093	R# CE H 6K8 J 0W12 1206	R12 ,R17
P200097	R# CE H 10K J 0W12 1206	R10 ,R19 ,R49
P200099	R# CE H 12K J 0W12 1206	R55
P200101	R# CE H 15K J 0W12 1206	R8
P200105	R# CE H 22K J 0W12 1206	R15 ,R24 ,R39 ,R44 ,R7
P200119	R# CE H 82K J 0W12 1206	R43
P200121	R# CE H100K J 0W12 1206	R23 ,R36 ,R37 ,R40 ,R45
P200129	R# CE H220K J 0W12 1206	R18 ,R52
P200418	R# CE H 2K F 0W12 1206	R58
P200420	R# CE H 2K4 F 0W12 1206	R21
P200435	R# CE H 10K F 0W12 1206	R54
P200440	R# CE H 16K F 0W12 1206	R6
P200459	R# CE H100K F 0W12 1206	R32
P206257	R# CE H475E F 0W12 1206	R25
P206338	R# CE H 3K32F 0W12 1206	R42
P206380	R# CE H 9K09F 0W12 1206	R51
P206408	R# CE H 17K8 F 0W12 1206	R50
P206449	R# CE H 47K5 F 0W12 1206	R26
P206458	R# CE H 59K F 0W12 1206	R28
P210002	C(S)CEC2CH1812X7R474M 50	C1 ,C2
P210013	C(S)CEC1CH1206COG102J 50	C12 ,C3 ,C6
P210028	C(S)CEC1CH1206COG152J 50	C8
P210048	C(S)CEC2CH1808X7R154K 50	C17 ,C26
P210055	C(S)CEC1CH0805COG391F 50	C7
P210092	C(S)CEC2CH1206X7R103K 50	C10 ,C11
P210100	C(S)CEC1CH1206COG470J 50	C16
P210102	C(S)CEC1CH1206COG471J 50	C4
P210112	C(S)CEC1CH1206COG122J 50	C19 ,C20
P210122	C(S)CEC2CH1206X7R104K 50	C14 ,C15 ,C21 ,C5
P210140	C(S)CEC2CH1206X7R472K 50	C13
P210150	C(S)CEC2CH1206X7R332K 50	C18 ,C23 ,C25 ,C9
P230054	SMC(S)ICLOPA TL072I	U1
P232104	SMC(S)TRNPN BC847C SOT23	Q1
P234003	SMC(S)DIO BAS40-04	D5 ,D6
P234021	SMC(S)DIOZEN BZV55C18	D1 ,D2
P234034	SMC(S)DIO BAS29	D4
P234037	SMC(S)DIOZEN BZX84B6V2	D14
P234051	SMC(S)DIOZEN BZV55C15	D8
P234055	SMC(S)DIO BAT54	D3
P234056	SMC(S)DIOREC 4002	D11 ,D7 ,D9
P234057	SMC(S)DIOZEN BZV55C8V2	D13
P234185	SMC(S)DIZEN BZV55C27 DMM	D10
P234213	SMC(S)DIZEN BZV55C3V3 DMM	D12
P905042	PRINT - P1386042	S

2.5.12 SCHEMATIC DIAGRAM



MPRD 9600:PS BOARD
POWER SUPPLY 28VDC
main module: PRIMARY
V5631271-14
SHEET 1OF2 27Jan93	P

2.5.13 BACKBOARD CONNECTIONS

110/220 V AC POWER SUPPLY Board Connector J1 or 28 V DC POWER SUPPLY Board Connector J200 is connected with BACKBOARD Connector J4.

c-side pin nr	signal name	to	from
32	-12 V	D	
31	nc/ntbu		
30	+12 V	D	
29	nc/ntbu		
28	+150 V	ADE	
27	nc/ntbu		
26	-150 V	AD	
25	nc/ntbu		
24	GNDVDEFL	D	
23	GNDVDEFL	D	
22	GNDVDEFL	D	
21	nc/ntbu		
20	+80 V	A	
19	+80 V	A	
18	nc/ntbu		
17	-80 V	nu	
16	nc/ntbu		
15	GND	all	
14	GND	all	
13	GND	all	
12	GND	all	
11	+6.3 V / A	A	
10	+6.3 V	CDEILMO	
9	-18 V	ACDEFIM	
8	-18 V	ACDEFIM	
7	GND	all	
6	GND	all	
5	+18 V	ACDEFIM	
4	+18 V	ACDEFIM	
3	-6.3 V	ADI	
2	-6.3 V	ADI	
1	SFTYGND		

a-side pin nr	signal name	to	from
32	-12 V	D	
31	nc/ntbu		
30	+12 V	D	
29	nc/ntbu		
28	+150 V	ADE	
27	nc/ntbu		
26	-150 V	AD	
25	nc/ntbu		
24	GNDVDEFL	D	
23	GNDVDEFL	D	
22	GNDVDEFL	D	
21	nc/ntbu		
20	+80 V	A	
19	+80 V	A	
18	nc/ntbu		
17	-80 V	nu	
16	nc/ntbu		
15	GND	all	
14	GND	all	
13	GND	all	
12	GND	all	
11	+6.3 V / A	A	
10	+6.3 V	CDEILMO	
9	-18 V	ACDEFIM	
8	-18 V	ACDEFIM	
7	GND	all	
6	GND	all	
5	+18 V	ACDEFIM	
4	+18 V	ACDEFIM	
3	-6.3 V	ADI	
2	-6.3 V	ADI	
1	SFTYGND		

2.5.14 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

115 V AC CUSTOMER VERSIONS

PS 115V P3 RGD V5631270

Order number of a complete PS 115 V P3 RGD : V5631270 08 Date : 30/03/93
Differences between PS 115V F.CORD RGD V5631275 and
PS 115V P3 RGD V5631270

SUBSTITUTES

Order Number	Description	Item	
V348060	CBL ACC CLP FLT	0140	replaced by
V313670	J RND_M FWT P 3 09/98 HSG		
V326112	CBL (AWG18) 3 UL/CSA	0141	replaced by
V3620216	SCR D84 M3 X 6 D I		

ADDED

Order Number	Description	Item
V3673906	WSHR WAVE 3.2	0142
V342150	WIRE AWG22 UL1672 BLA	0143
V342159	WIRE AWG22 UL1672 WHI	0144
V342049	WIRE AWG22 UL1672 Y/G	0145

PS 115V P3 FC722 9600 V5631970

Order number of a complete PS 115V P3 FC722 9600 : V5631970 01 Date : 01/12/92
Differences between PS 115V P3 9600 V5631270 and
PS 115V P3 FC722 9600 V5631970 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

PS 115V P12-3 MPRD9600 V5631972 (READ IMPORTANT NOTICE !!)

Order number of a complete PS 115V P12-3 MPRD9600 : V5631972 00 Date : 01/12/92
Differences between PS 115V P3 9600 V5631270 and
PS 115V P12-3 MPRD9600 V5631972 00

SUBSTITUTES

Order Number	Description		Item	
V6036126	HEATSINK SM HE308P3 20H	03	0100	replaced by
V6036129	HEATSINK SM HE301P3/20	00		
V313670	J RND_M FWT P 3 09/98 HSG		0140	replaced by
V313952	J RND_M FCT P 3 12-03 HSG			
V6036991	SMPS SHIELD 220V	03	0230	replaced by
V6036992	SMPS SHIELD HE301/20	00		

ADDED

Order Number	Description	Item
V6037184	SMPS 220V ISOLATION	0235
V367434	RIV.P AL D2.4 L 3.2	0300

PS 115V P12-3 H.SEAL V5631973 (READ IMPORTANT NOTICE !!)

Order number of a complete PS 115V P12-3 H.SEAL 9600 : V5631973 00 Date : 01/12/92
Differences between PS 115V P3 MPRD9600 V5631270 and
PS 115V P12-3 H.SEAL 9600 V5631973 00

SUBSTITUTES

Order Number	Description		Item	
V6036126	HEATSINK SM HE308P3 20H	03	0100	replaced by
V6036129	HEATSINK SM HE301P3/20	00		
V313670	J RND_M FWT P 3 09/98 HSG		0140	replaced by
V313952	J RND_M FCT P 3 12-03 HSG			
V6036991	SMPS SHIELD 220V	03	0230	replaced by
V6036992	SMPS SHIELD HE301/20	00		

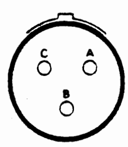
ADDED

Order Number	Description	Item
V6037184	SMPS 220V ISOLATION	0235
V367434	RIV.P AL D2.4 L 3.2	0236
V395166	HUMISEAL 1B31	0300

IMPORTANT NOTICE

The power supplies with order number V5631972 and V5631972 have another type of power connector, this connector is wired in a different way. Refer to drawing below for correct connection.

pin A : 115/220 V AC LIVE (fused)
pin B : GROUND
pin C : 115/220 V AC NEUTRAL



PS 115/SW FC722 9600 V5631974

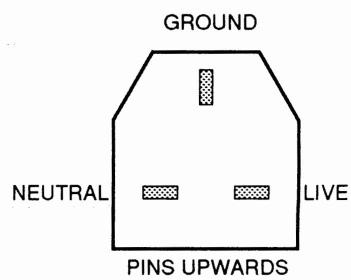
Order number of a complete PS 115/SW FC722 9600 : V5631974 00 Date : 01/12/92
Differences between PS 115 F.CORD MPRD9600 V5631275 and
PS 115V/SW F.CORD FC722 9600 V5631974 00

SUBSTITUTES

Order Number	Description		Item	
V6036126	HEATSINK SM HE308P3	03	0100	replaced by
V6036120	HEATSINK HE308/SWITCH	00		
V326112	CBL (AWG18) 3 UL/CSA		0141	replaced by
V326123	CD MNS BS/IEC 2.0M 5A			
V6036991	SMPS SHIELD 220V	03	0230	replaced by
V603829	SMPS SHIELD POW.SWITCH	00		

ADDED

Order Number	Description	Item
V603828	HOLDER POWER SWITCH	0240
V324701	SW MNS JPZ 2M TV5 WS	0241
K721990	KNOB PUSH D BLA FS	0242
V3620216	SMP-I AM3 X 6 D 84	0243
V3673906	WASHER CRINCKLE I M3	0244
V395154	FLUORAD FC - 722	0300



PS 115V F.CORD FC722 9600 V5631975

Order number of a complete PS 115V F.CORD FC722 9600 : V5631975 00 Date : 01/12/92
Differences between PS 115V F.CORD MPRD9600 V5631275 and
PS 115V F.CORD MPRD9600 V5631975 00

SUBSTITUTES

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

PS 115 P3 T.SENSOR V5631279

Order number of a complete PS 115 P3 T.SENSOR : V5631279 02 Date : 08/01/93
Differences between PS 115V P3 MPRD9600 V5631270 and
PS 115 P3 T.SENSOR V5631279 02

SUBSTITUTES

Order Number	Description	Item	
V6036126	HEATSINK SM HE308P3 20H03	0100	replaced by
V6036128	HEATSINK SM HE308/20 01		
V314512	F ACC HLDR 5X20 FRM	0130	replaced by
C348101	W JUMP 0.6 5		
V603614	HEATSINK SMPS REC.§§§ 01	0200	replaced by
V6036141	HEATS SMPS REC.TS §§§ 00		

ADDED

Order Number	Description	Item
V311097	F 10A 90C THERMO	0260
V3620226	SCR D84 M 3 X 8 I	0261
V3673906	WSHR WAVE 3.2 I	0262
V3661026	NUT D934 M3 I	0263
V3480141	SLE SHR 3.2 L10 BLA	0264
V326112	CBL (AWG18) 3 UL/CSA	0266
V348060	CABLE CLAMP LFT	0270
C348003	GROMMET T1.5 D 9.5	0271

REMOVED

Item
0130, 0131, 0132, 0133, 0134

28 V DC CUSTOMER VERSIONS

PS 28V P5 FC722 9600 V5631971

Order number of a complete PS 28V P5 FC722 9600 : V5631971 01 Date : 01/12/92
Differences between PS 28V P5 9600 V5631271 and
PS 28V P5 FC722 9600 V5631971 01

SUBSTITUTES

Order Number	Description	Item	
V6036125	HEATSINK SM HE308P5 20H02	0100	replaced by
V6036124	HEATSINK SM HE308P5 FL 04		

PS 28V P5 FC722 9600 V5631971

Order number of a complete PS 28V P5 FC722 9600 : V5631971 01 Date : 01/12/92
Differences between PS 28V P5 9600 V5631271 and
PS 28V P5 FC722 9600 V5631971 01

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0300

2.6 CONTROL PANEL BOARD

General

I^2C circuitry scans the keys and drives the leds.
Two leds OVERTEMP and FAULT are driven by parallel control lines.

Optional Control Panel board versions are described in section 2.6.8 Customized Versions (Options)

2.6.1 IOPC DIAGRAM

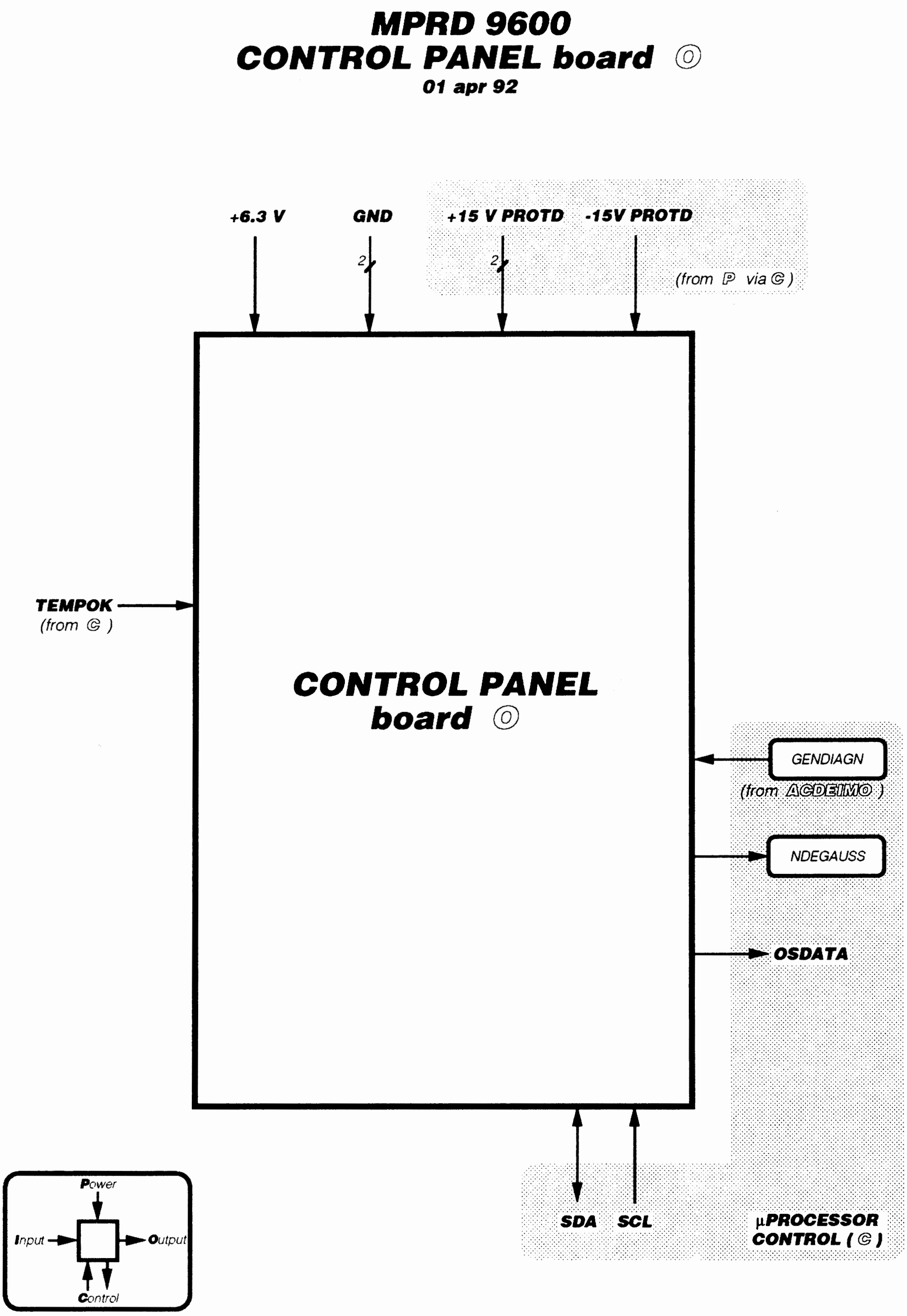


figure 2.45 : CONTROL PANEL board IOPC diagram

2.6.2 BLOCK DIAGRAM

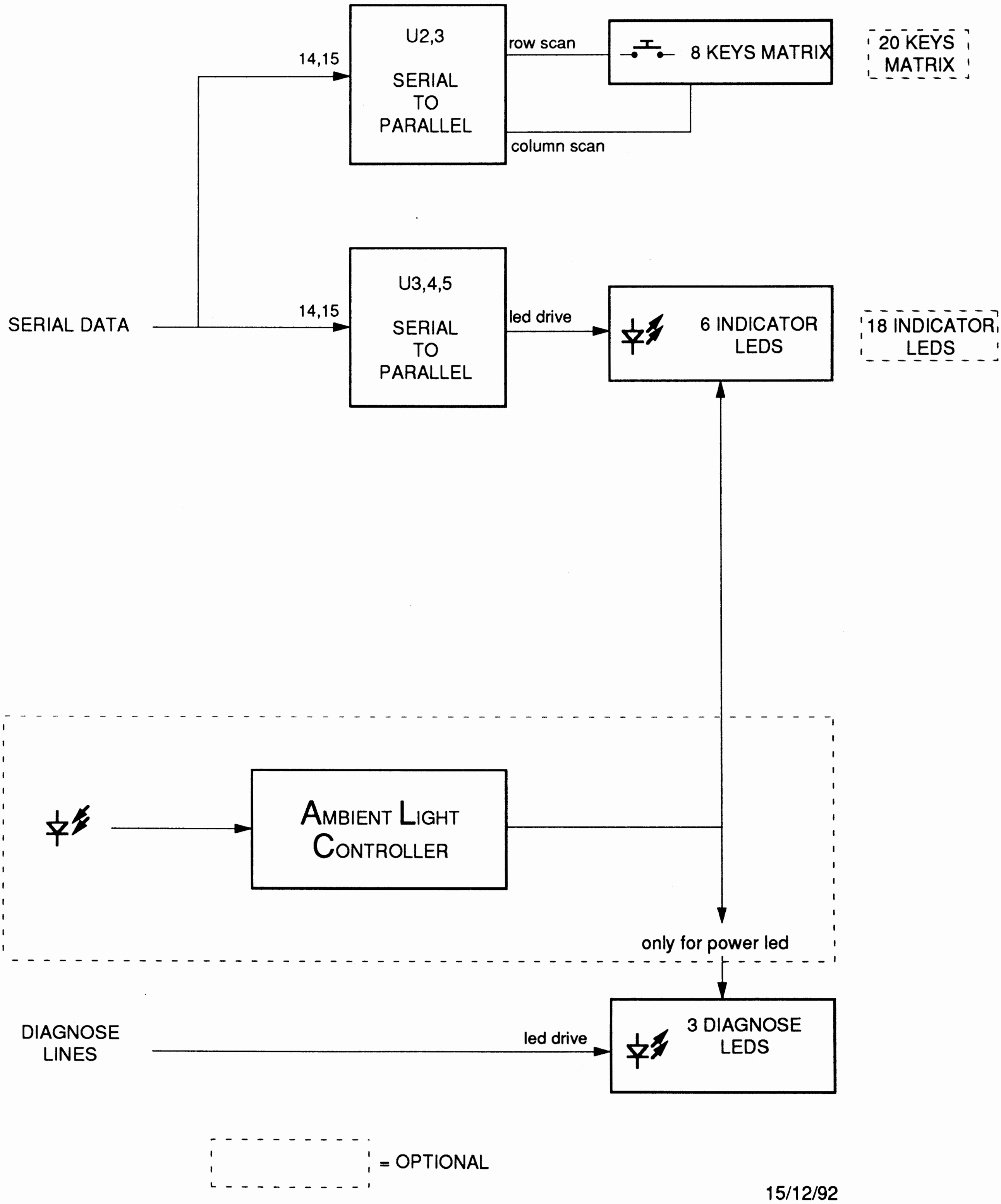


figure 2.46 : CONTROL PANEL board block diagram

2.6.3 CIRCUIT DESCRIPTION

The left hand side of the circuit diagram shows the internal connections between the control board and the MPRD 9600 (plug J1), the right hand side shows the external connections to the OPTISENSE© HEAD (plug J2).

The I²C lines, SCL and SDA, are protected by D10,11,12,13 and R4,5. U2 and U3 receive both lines but they have different addresses, determined by pins1,2,3.

U2 scans the keyboard (8 push buttons, 4colums x 2 rows); U3 drives 6 indicator leds D4-9.

The circuits are powered by U1, this is a low drop voltage regulator stabilizing the +6.3V.

The POWERLED D1 lights if +6.3V is present, the OVERTEMP LED D2 and FAULT LED are driven by two parallel control lines.

2.6.3.1 Optional version with function keys and ambient light controller

J1, pin1,3,5,7,15,16 (on the left hand side of the circuit diagram) and J2 pin1,4,5,6,7,8,9 (at the right hand side) shows the connections from the MPRD 9651 control board to the OPTISENSE© HEAD.

The I²C lines, SCL and SDA, are protected by D32,33,34,35 and R20,21. U2,3,4,5 receive both lines but they have different addresses, determined by pin1,2,3 of each of them.

Part of U2 and U3 scan the keyboard (20 push buttons, 5 columns x 4 rows). Part of U2 and U3 also drive indicator leds D4,5,14,15,16,17.
Part of U2, part of U3, U4 and U5 drive indicator leds D4 - 25.

The circuits are powered by U1, this is a low drop voltage regulator stabilizing the +6.3V.

The POWERLED D1 lights if +6.3V is present, the OVERTEMP LED D2 and FAULT LED are driven by two parallel control lines.

AMBIENT LIGHT CONTROLLER

The ambient light is sensed by the light sensors D26,27. The more light falling on the sensors, the higher the output voltage at U6,pin6 will be. U7 adapts the regulation curve to the eye sensitivity curve by changing the amplification according to the input voltage. This is realized through the zener diodes D28,29,30. At pin 6 leaves a lowering voltage for increasing ambient light.
Low to high voltage transients are smoothed by the RC network R14-C10. From high to low faster switching is realised by D31 and the RC network R15-C10. The result is a fast increase of the contrast for a dark-to-light ambient light transition and a delayed decrease of the contrast for a light-to-dark ambient light transition.
Buffered by U8, UAMBLSENS leaves the board at J1,pin4.

If the ALC is switched on, UAMBLSENS is used to modulate +VLED, +VLED supplies power to all indicator leds, except for the OVERTEMPLED and the FAULTLED.

2.6.5 PARTS LIST

Order number of a complete CONTROL PANEL STD : V5631260 01 Date : 01/12/92

Order number	Description	Item
V101224	R MF H100E J 0W5	R4 ,R5
V101234	R MF H680E J 0W5	R1 ,R2 ,R3
V1127830	C X7R MU 100N K 50E2 125	C2 ,C3
V1127890	C X7R MU 470N K 50E2 125	C1
V131627	D BAV21 SW DO35	D10 ,D11 ,D12 ,D13
V131667	D LED D3 T GRE	D1
V131670	D LED D3 T YEL HLMP	D4 ,D5 ,D6 ,D7 ,D8 ,D9
V131671	D LED D3 T RED HLMP	D2 ,D3
V1330145	Q ACC MOUNTING PAD TO18	0040
V134044	U 2940-5 LM TO220 P	U1
V1372951	U 8574A PCF DIP16 P	U2 ,U3
V1405472	R AB 4 4K7 G 0W2 SIP5	AR1 ,AR4
V1508561	R AI 4 560E G 0W3 SIP8	AR2 ,AR3
V3110631	D ACC HLDR D3 P1 T H 4.8	0030
V3132068	J MD2 MBT P16 E1AU	J1
V3135017	J DE T8 FPT P 9 FT M	J2
V324198	SW PUSH 1M BT	0020
V3571031	KNOB PUSH D7.8/1.4 TR. #Y	0021
V3620226	SMP-I AM3 X 8 D 84	0060
V3661026	NUT DIN934 I M3	0062
V3673906	WASHER CRINKLE I M3	0061
V3685466	STANDOFF M3- 8 INOX	0070
V752178	PCB CONTR.STD MPRD9651 01	0010

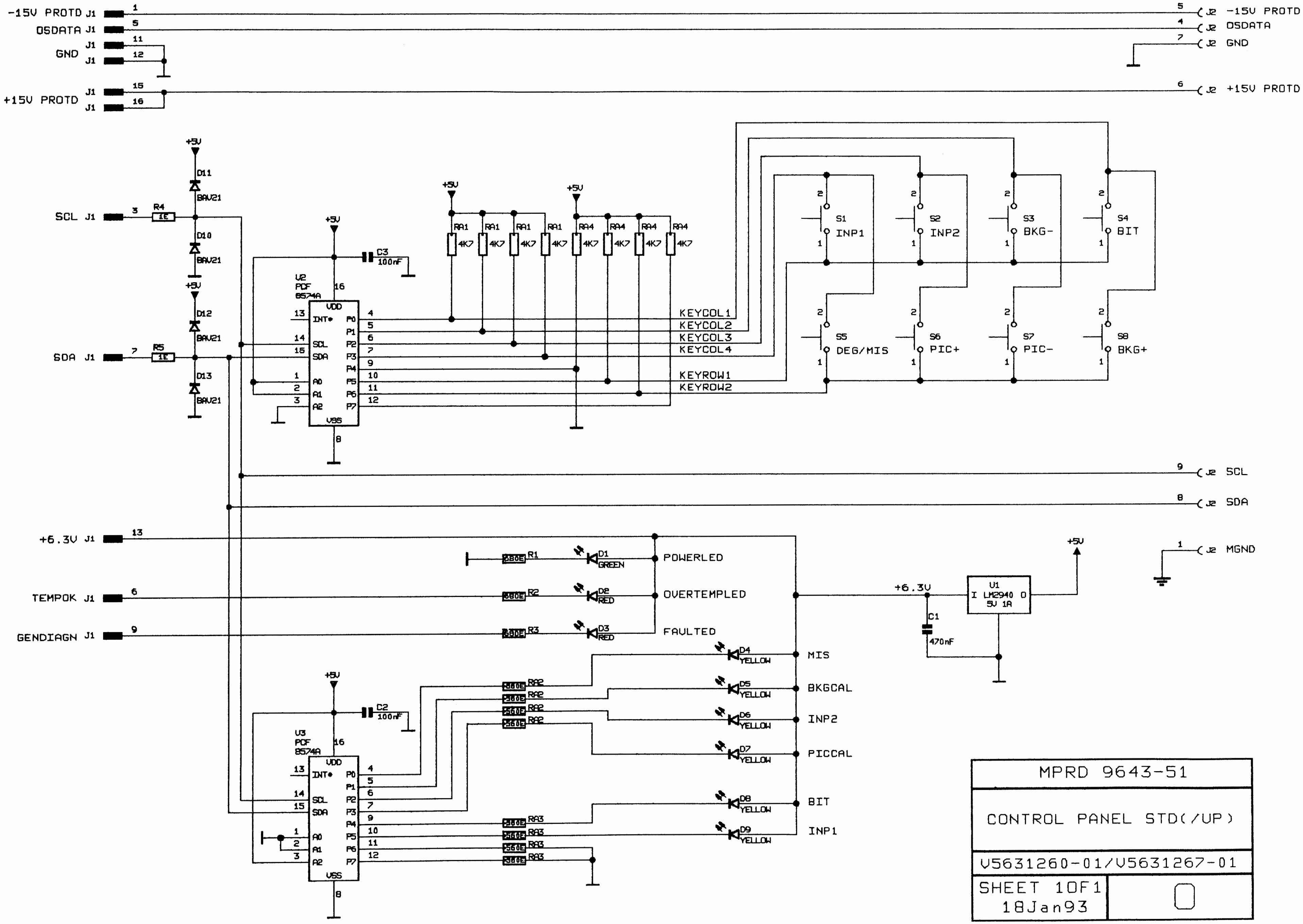
OPTIONAL VERSION WITH FUNCTION KEYS

Order number of a complete CON. PAN. FKEYS 51L : V5631261 00 Date : 01/12/92

Order number	Description	Item
V101224	R MF H100E J 0W5	R20 ,R21
V101233	R MF H560E J 0W5	R18 ,R19
V101234	R MF H680E J 0W5	R1 ,R2 ,R3
V101239	R MF H 1K8 J 0W5	R10
V101244	R MF H 4K7 J 0W5	R16 ,R17 ,R8 ,R9
V101248	R MF H 10K J 0W5	R6 ,R7
V101250	R MF H 15K J 0W5	R15
V101252	R MF H 22K J 0W5	R12
V101253	R MF H 27K J 0W5	R4 ,R5
V101260	R MF H100K J 0W5	R14
V101275	R MF H 1M8 J 0W5	R13
V1026680	R MF H 5K11F 0W6	R11
V111197	C EL AX 4M7M100E7 105	C10
V1114942	C EL RA 10M M 50E1 105	C4
V1127830	C X7R MU 100N K 50E2 125	C1 ,C2 ,C3 ,C5 ,C6 ,C7 , C8 ,C9
V1127890	C X7R MU 470N K 50E2 125	C11
V1316211	D 1N4148 SW DO35	D31
V131627	D BAV21 SW DO35	D032,D033,D034,D035
V131667	D LED D3 T GRE	D1

Order number	Description	Item
V131670	D LED D3 T YEL HLMP	D10 ,D11 ,D12 ,D13 ,D14 ,D15 , D16 ,D17 ,D18 ,D19 ,D20 ,D21 , D22 ,D23 ,D24 ,D25 ,D4 ,D5 , D6 ,D7 ,D8 ,D9
V131671	D LED D3 T RED HLMP	D2 ,D3
V131694	D BPW21 PHO TO56 I	D26 ,D27
C131720	D ZEN 6V2 0W5 C DO35	D29
V131729	D ZEN 4V7 0W5 C DO35	D30
V131743	D ZEN 8V2 0W5 C DO35	D28
V1321942	U 072 TL DIP8 I	U8
V1330136	Q ACC MOUNTING PAD TO5	0050
V1330145	Q ACC MOUNTING PAD TO18	0040
V134044	U 2940-5 LM TO220 P	U1
V1341220	U 07 OP DIP8 I	U6 ,U7
V1372951	U 8574A PCF DIP16 P	U2 ,U3 ,U4 ,U5
V1405472	R AB 4 4K7 G 0W2 SIP5	RA1 ,RA2
V1508561	R AI 4 560E G 0W3 SIP8	RA3 ,RA4 ,RA5 ,RA6 ,RA7
V3110631	D ACC HLDR D3 P1 T H 4.8	0030
V3132068	J MD2 MBT P16 E1AU	J1
V3135017	J DE T8 FPT P 9 FT M	J2
V324198	SW PUSH 1M BT	0020
V3571031	KNOB PUSH D7.8/1.4 TR. #Y	0021
V3620226	SMP-I AM3 X 8 D 84	0060
V3661026	NUT DIN934 I M3	0062
V3673906	WASHER CRINKLE I M3	0063
V3685466	STANDOFF M3- 8 INOX	0070
V752179	PCB CONTR.F.K.MPRD9651L00	0010

2.6.6 SCHEMATIC DIAGRAM


-15V PROTD
OSDATA
GND
+15V PROTD
SCL
SDA
+6.3V
TEMPOK
GENDIAGN
J1
J2
MGND
+5V
R4 1E
R5 1E
D10 BAV21
D11 BAV21
D12 BAV21
D13 BAV21
U2 PCF 8574A
U3 PCF 8574A
VDD
VSS
INT*
SCL
SDA
A0 A1 A2
P0 P1 P2 P3 P4 P5 P6 P7
C3 100nF
C2 100nF
RA1 4K7
RA4 4K7
KEYCOL1
KEYCOL2
KEYCOL3
KEYCOL4
KEYROW1
KEYROW2
S1 INP1
S2 INP2
S3 BKG-
S4 BIT
S5 DEG/MIS
S6 PIC+
S7 PIC-
S8 BKG+
R1 680E
R2 680E
R3 680E
D1 GREEN
D2 RED
D3 RED
POWERLED
OVERTEMPLED
FAULTED
RA2 560E
RA3 560E
D4 YELLOW
D5 YELLOW
D6 YELLOW
D7 YELLOW
D8 YELLOW
D9 YELLOW
MIS
BKGCAL
INP2
PICCAL
BIT
INP1
U1 LM2940 5V 1A
C1 470nF
MPRD 9643-51
CONTROL PANEL STD(/UP)
V5631260-01/V5631267-01
SHEET 1OF1
18Jan93
0

2.6.7 BACKBOARD CONNECTIONS

CONTROL PANEL Board Connector J1 is connected with BACKBOARD Connector J7 by a 16 pins flatcable.

pin nr	signal name	to	from
1	**-15V PROTD**		C
2	**+VLED**		C
3	*SCL*		C
4	*VAMBLSENS*	C	
5	*OSDATA*	CL	
6	*TEMPOK*	CH	
7	*SDA*	CDILM	CDILM
8	*ABKGADJ*	A (C)	
9	*GENDIAGN oc/int*	C	ADEILM
10	*APICADJ*	A (C)	
11	**GND**		P
12	**GND**		P
13	**+6.3 V**		P
14	*NDEGAUSS oc*	C	
15	**+15V PROTD**		C
16	**+15V PROTD**		C

note1 : pin10 = APICADJ (= GPICADJ from Microprocessor Module C)

note1 : pin8 = ABKGADJ (= BKGADJ from Microprocessor Module C)

2.6.8 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

CON. PAN. UP MPRD 9600 V5631267

Order number of a complete CON. PAN. UP 9600 : V5631267 01 Date : 12/01/93
Differences between CONTROL PANEL STD V5631260 and
CON. PAN. UP 9600 V5631267 01

SUBSTITUTES

Order Number	Description	Item
V752178	PCB CONTR.STD MPRD9651 01	0010 replaced by
V752181	PCB CONTR.UP MPRD9651 00	

CON. PAN. F.KEYS 9643L V5631265

Order number of a complete CON. PAN. F.KEYS 9643L : V5631265 00 Date : 01/12/92
Differences between CON. PAN. F.KEYS 9651L V5631261 and
CON. PAN. F.KEYS 9643L V5631265 00

SUBSTITUTES

Order Number	Description	Item
V752179	PCB CONTR.F.K.MPRD9651L00	0010 replaced by
V752181	PCB CONTR.F.K.MPRD9643L01	

CONTROL STD FC722 9600 V5631960

Order number of a complete CONTROL STD FC722 9600 : V5631960 00 Date : 01/12/92
Differences between CONTROL STD 9600 V5631260 and
CONTROL STD FC722 9600 V5631960 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

CONTROL FK.FC722 9651L V5631961

Order number of a complete CONTROL FK. FC722 9651L: V5631961 00 Date : 01/12/92
Differences between CON. PAN. F.KEYS 9651L V5631261 and
CONTROL FK. FC722 9651L V5631961 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

CONTROL STD HSEAL 9600 V5631962

Order number of a complete CONTROL STD HSEAL : V5631962 00 Date : 01/12/92
Differences between CONTROL STD 9600 V5631260 and
CONTROL STD HSEAL 9600 V5631962 00

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	0100

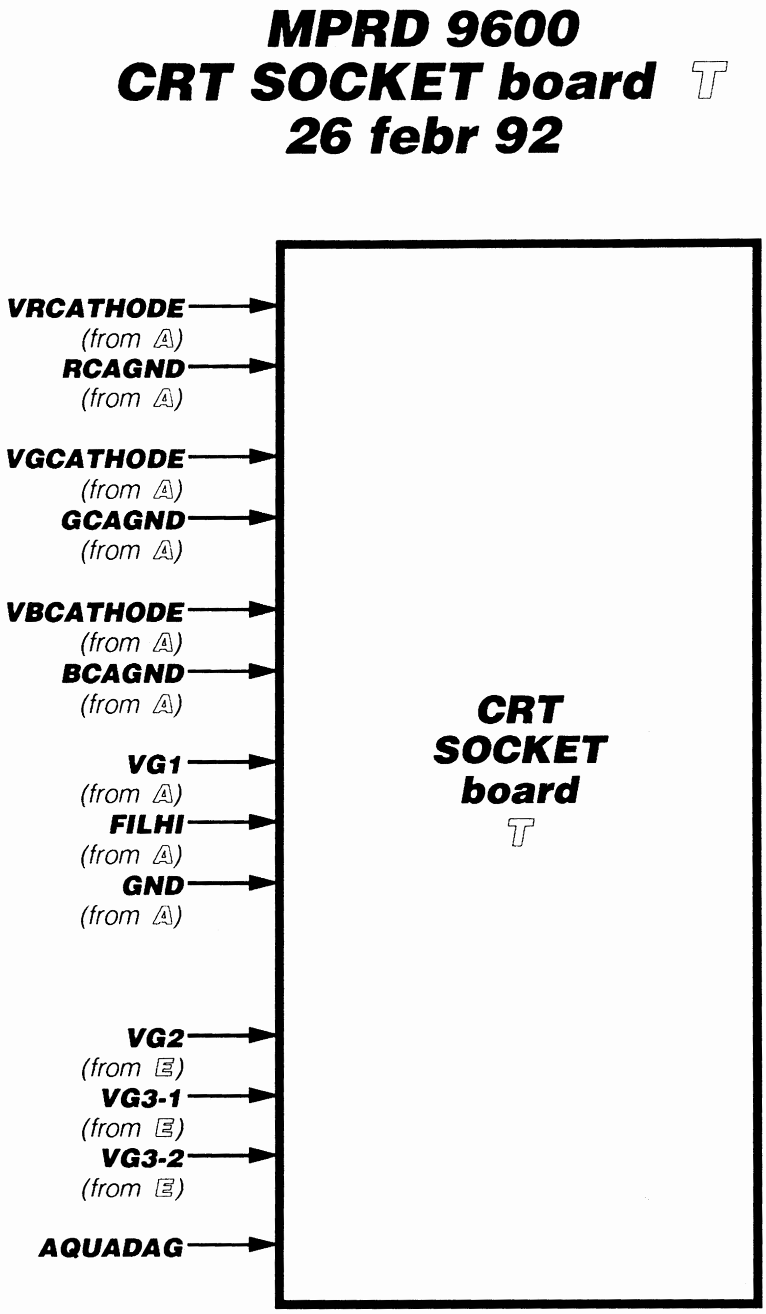
2.7 CRT SOCKET

General

The CRT socket connects RGB and FOCUS signals, filament power, ground and AQUADAG to the CRT.

Optional CRT Socket versions are described in section 2.7.5 Customized Versions (Options)

2.7.1 IOPC DIAGRAM



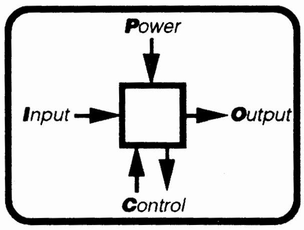
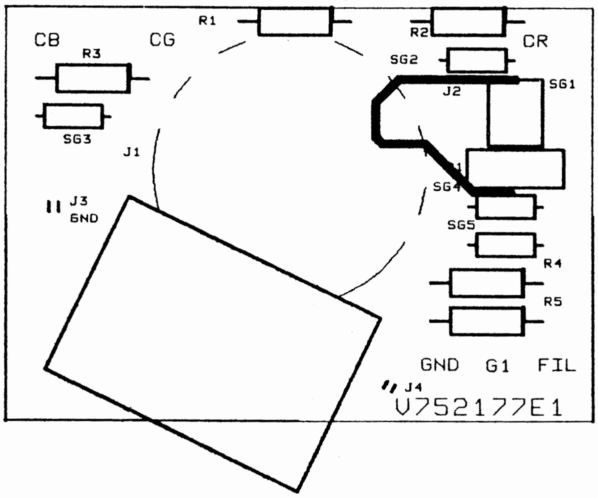
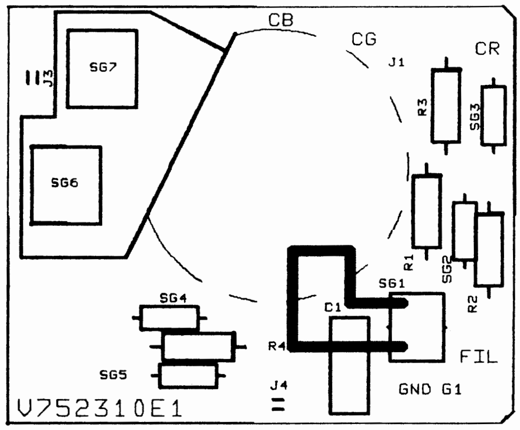


figure 2.48 : CRT SOCKET board IOPC diagram

2.7.2 PCB LAYOUT



LANDSCAPE



PORTRAIT

figure 2.49 : CRT SOCKET board component side

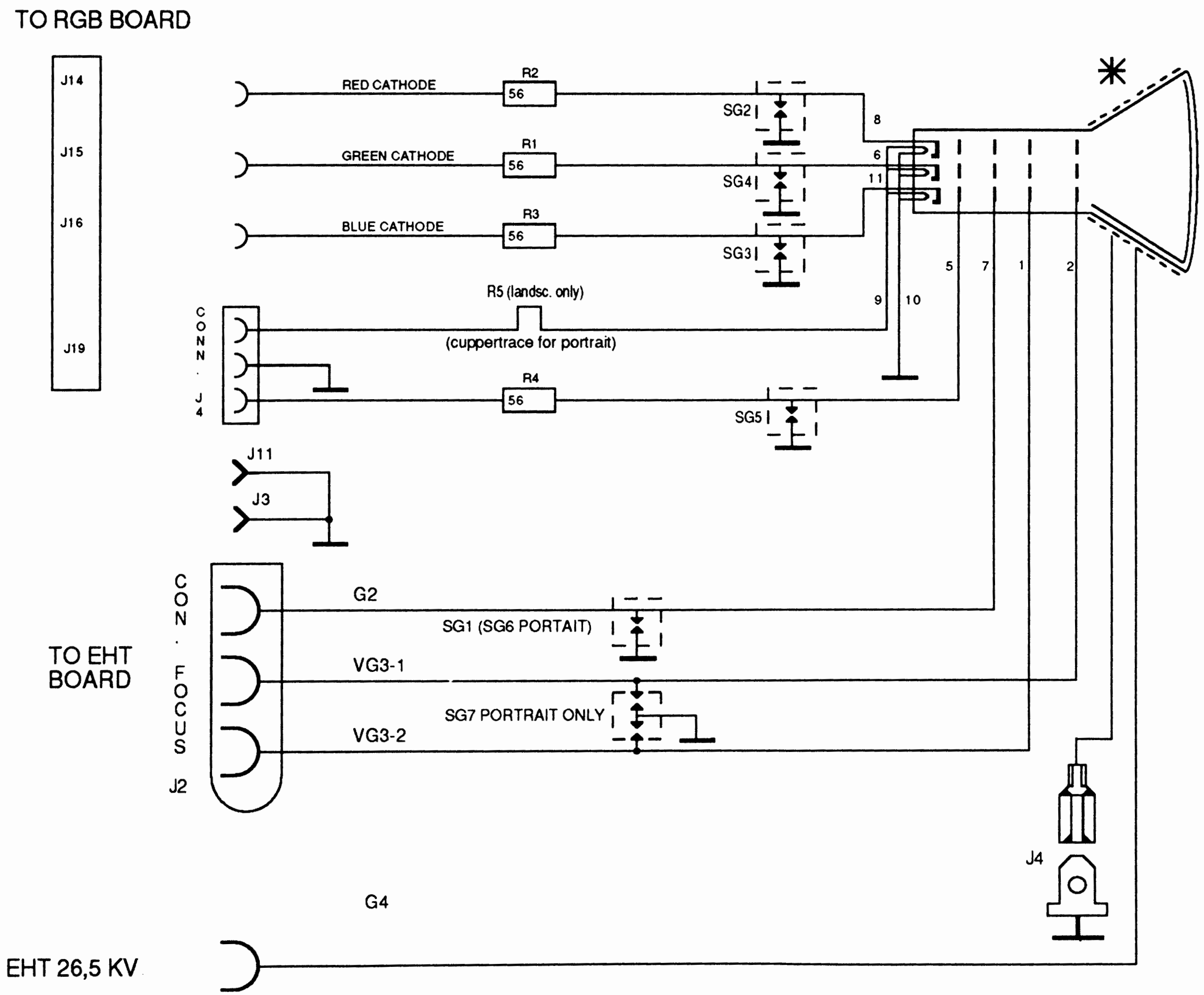
2.7.3 PARTS LIST

Order number of a complete CRT SOCKET : V5631280 02 Date : 01/12/92

Order number	Description	Item
V102021	R CC H 56E K 0W5	R1 ,R2 ,R3 ,R4
V1117581	C CE DI 10N M102E3 HV	C1
V1312621	TUBE SURGE PROTECT 1000V	SG1
V131265	TUBE SURGE PROTECT 200V	SG2 ,SG3 ,SG4 ,SG5
V311037	J CRT FBT B10-301 SKT	J1
V3139142	J DUBX1 FWT P 2 E1 HSG	0020
V3139144	J DUBX1 FWT P 3 E1 HSG	0030
V313931	J DUBX FWT P 1 30/22	0024,0034
V315314	J RVT FBT P 1	J10 ,J5 ,J6 ,J7 ,J8 ,J9
V315319	J TAB1 MBT H 6.3S0.8	J4
V315353	J TAB1 MBS H 2.8S0.5	J11 ,J3
V326306	CD HV ALDEN_1X FWT P 3	0040
V342168	WIRE AWG24 UL1007 WHI Y	0021,0022,0023,0031,0032,0033
V3481064	W JUMP 0.6 17.78	R5
V752177	PCB CRT SOCKET 9000 01	0010

2.7.4 SCHEMATIC DIAGRAM

MPRD9600 CRT SOCKET 15/12/92



2.7.5 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

CRT SOCKET P MPRD 9600 V5631282

Order number of a complete CRT SOCKET P MPRD9600 : V5631282 01 Date : 01/12/92
Differences between CRT SOCKET MPRD9600 V5631280 and
CRT SOCKET P MPRD9600 V5631282 01

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. $$$ 00		
V752177	PCB CRT SOCKET 9000 01	0010	replaced by
V752310	PCB CRT SOCKET P 9000 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

REMOVED

Item
R5

CRT SKT EXT ALT9600 V5631285

Order number of a complete CRT SKT EXT ALT9600 : V5631285 00 Date : 01/12/92
Differences between CRT SOCKET MPRD9600 V5631280 and
CRT SKT EXT ALT9600 V5631285 00

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. $$$ 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

CRT SOCKET P MPRD 9600 V5631282

Order number of a complete CRT SOCKET FC722 9600 : V5631980 00 Date : 01/12/92
Differences between CRT SOCKET MPRD9600 V5631280 and
CRT SOCKET FC722 9600 V5631980 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

CRT SKT P HSEAL 9600 V5631981

Order number of a complete CRT SKT P HSEAL9600 : V5631981 00 Date : 01/12/92
Differences between CRT SOCKET MPRD9600 V5631280 and
CRT SKT P HSEAL9600 V5631981 00

SUBSTITUTES

Order Number	Description	Item	
V311037	J CRT FBT B10-301 SKT	J1	replaced by
V6037861	MODIFIED TUBE SOC. $$$ 00		
V752177	PCB CRT SOCKET 9000 01	0010	replaced by
V752310	PCB CRT SOCKET P 9000 00		

ADDED

Order Number	Description	Item
V131263	TUBE SURGE PROTECT 10000V	SG6, SG7
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060
V395166	HUMISEAL 1B31	100

REMOVED

Item
R5

2.8 TEMPERATURE SENSOR

General

The MPRD9600 is thermally protected by a temperature sensor.
If the internal monitor temperature exceeds 90°C the contact in the sensor will close, the OVERTEMP LED on the front panel will light; the microprocesor board will disable the EHT. The AKB module will detect zero beamcurrent, the FAULT LED on the front panel will also light.
A warning appears on the keypad :

```
WARNING:

OVERTEMP
```

2.8.1 IOPC DIAGRAM

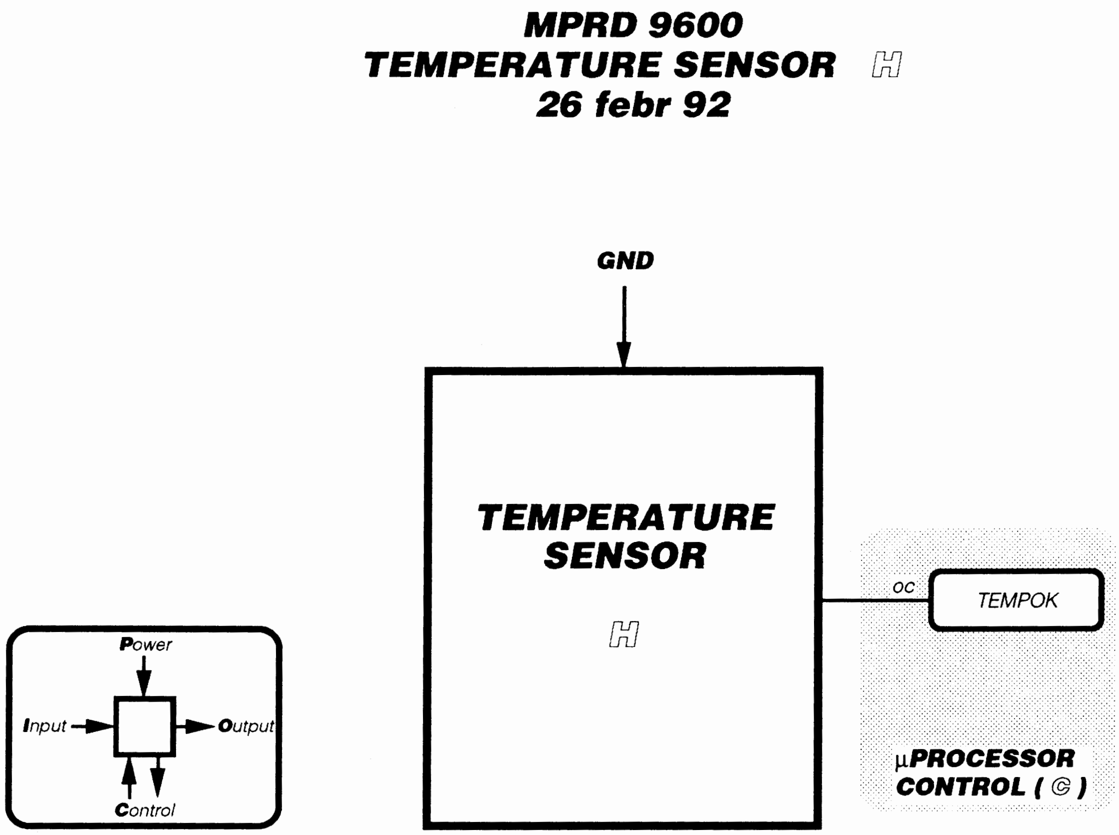


figure 2.50: TEMPERATURE SENSOR IOPC diagram

2.8.2 TEMPERATURE SENSOR CONNECTIONS

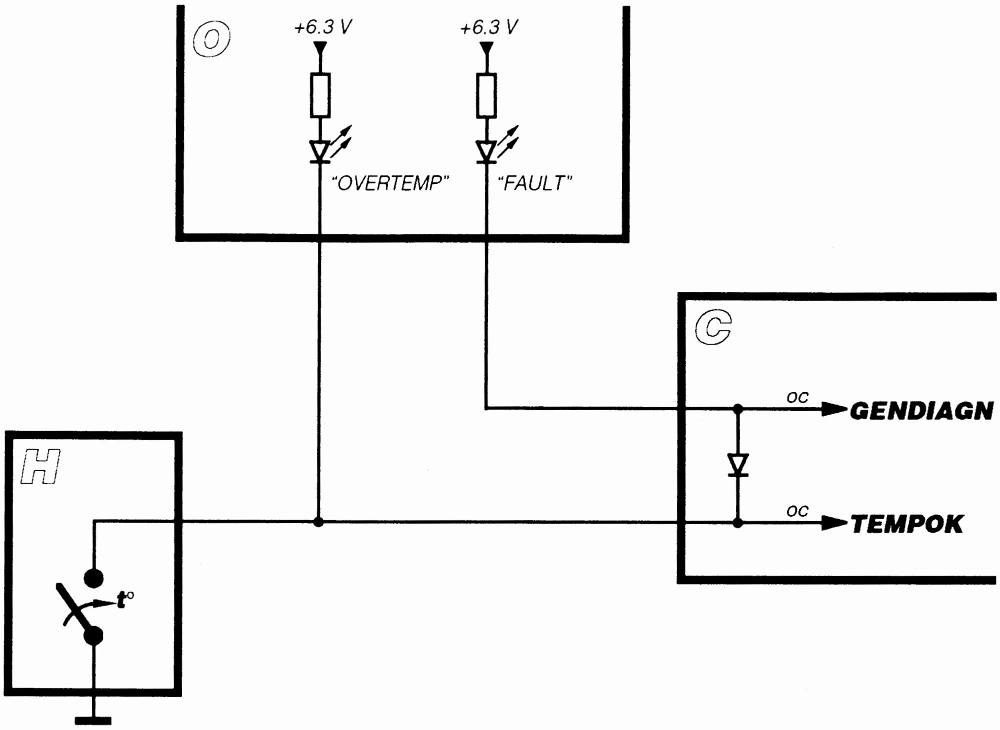


figure 2.51 : TEMPERATURE SENSOR connections

2.8.3 PARTS LIST

The temperature sensor, wiring, plugs, etc. can be found in the parts list of the FRAME V5631180; this parts list can be found in paragraph 2.11 OTHER PARTS LISTS.

2.8.4 BACKBOARD CONNECTIONS

TEMPEATURE SENSOR wires are connected to BACKBOARD Connector J9.

pin nr	signal name	to	from
1	TEMPOK	G	
2	**GND**		P

2.9 BACKBOARD

General

Most of the wirings between plug-in units go via the backboard.

All other wirings are described in chapter 3 Interconnections.

Optional Backboard versions are described in section 2.9.4 Customized Versions (Options)

2.9.1 PCB LAYOUT

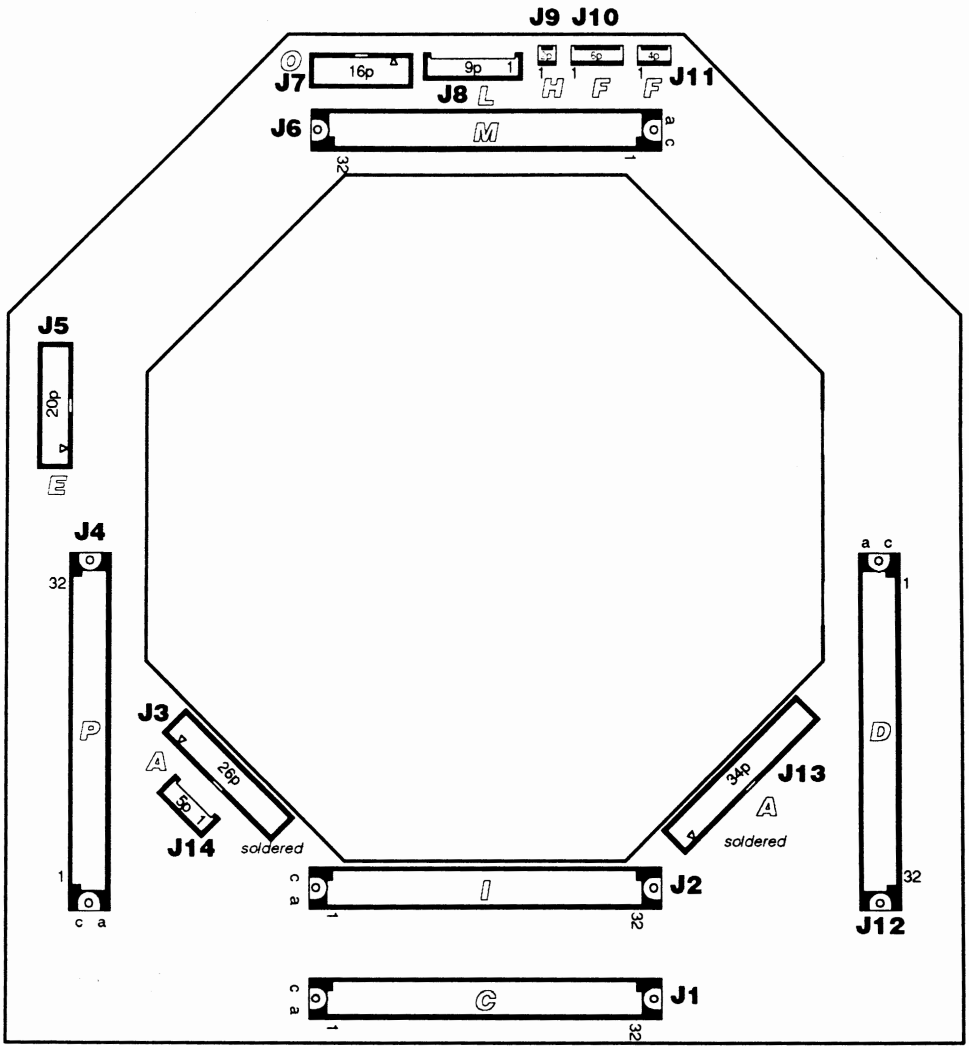


figure 2.52 : BACKBOARD component side

2.9.2 PARTS LIST

Order number of a complete BACKBOARD : V5631200 00   Date : 01/12/92

Order number	Description	Item
V313480	J FLT2 MBT P20 E1AU	J5
V313484	J FLT2 MBT P16 E1AU	J7
V313526	J EUR3C FBT P64 E1C2 S1.6	J1 ,J12 ,J2 ,J4 ,J6
V3139132	J DUBX1 MBT P 2 E1AU	J9
V3139133	J DUBX1 MBT P 4 E1AU	J11
V3139135	J DUBX1 MBT P 6 E1AU	J10
V3492531	CORD FLAT P26 230MM 00	J3
V3493339	CORD FLAT P34 230MM 00	J13
V367400	RIV. AL D2.4 L 5.9	0030
V3685466	STANDOFF M3- 8 INOX	0020
V752157	BACKBOARD (PCB) 9000 00	0010

2.9.3 CONNECTIONS OVERVIEW

2.9.4 CUSTOMIZED VERSIONS (OPTIONS)

The parts lists in this paragraph only show the differences between the standard RGB board and the customized versions.

Components that are not mounted in the customized version are only referred to by the their item number (appearing in the standard parts list); additional components in the customized version are referred to by their order number, description and item number; for substituded components both the originals and substitutes are referred to by their order number, description and item number.

BACKBOARD FC722 9600 V5631900

Order number of a complete BACKBOARD FC722 9600 : V5631900 00 Date : 01/12/92
Differences between BACKBOARD MPRD9600 V5631200 and
BACKBOARD FC722 9600 V5631900 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

BACKBOARD H.SEAL 9600 V5631901

Order number of a complete BACKBOARD H.SEAL 9600 : V5631901 00 Date : 01/12/92
Differences between BACKBOARD MPRD9600 V5631200 and
BACKBOARD H.SEAL 9600 V5631901 00

ADDED

Order Number	Description	Item
V395166	HUMISEAL 1B31	100

2.10 SOFTWARE

The real-time software on the processor board is split up in different parts.

* KEYSCAN	: Scans the keys (of keypad and control panel)
*Dacrefresh	: Refreshes the DACs on the processor board
* E^2PROM	: Supports reading in and writing to E^2PROM Sends parameters to the deflection board
* LTC	: Life Time Counter Automatic Degauss Orbitting Secondary watchdog
* Treescan	: Processes all data Kernal
* RScom	: Supports communication Automatic colour calibration
* Watchdog	: Controls all processes Controls events
* Scanset	: Selects scan set parameters
* Gend	: General diagnostic (active if FAULT led lights)
* Mid	: Interrupt controller

The software on the deflection board sets the deflection parameters, receives parameters from the processor board, measures the horizontal and vertical deflection frequency and triggers the degauss circuit if requested by the processor board.

2.11 OTHER PARTSLISTS

Order number of a complete FRONT 20" L STD : V5631130 00 Date : 01/12/92

Order number	Description	Item
V3120056	SPG CMP 8 X24.5/0.63 I	0031
K3135033	J D ACC SCR_L U/M L 8	0050
V3620106	SMP-I AM2.5X 5 D 84	0011
V3620676	SMP-I AM 5X12 D84	0041
V3622126	SMC-MI 3X 6 D963	0027
V3673926	WASHER CRINKLE I M5	0042
V395326	NEOPRENE SPONSRUBBER D6	0100
V600478	HANDLE TRIM RGCD $$$ 00	0040
V6005273	FLTR ND50% EMI-EMC 03	0025
V603260	CUP CAPT M6	0030
V603594	SEAL CHASSIS 00	0050
V6035953	SEAL FILTERFRAME 20 00	0026
V603678	STANDARD LABEL L&P 01	0010
V6036922	CAPT.BOLTM6 X 45 SW8 00	0033
V603782	BEZEL SET 9651L 00	0020

Order number of a complete FRONT 17" L STD : V5631135 00 Date : 01/12/92

Order number	Description	Item
V3120056	SPG CMP 8 X24.5/0.63 I	0031
K3135033	J D ACC SCR_L U/M L 8	0050
V3620106	SMP-I AM2.5X 5 D 84	0011
V3620676	SMP-I AM 5X12 D84	0041
V3622126	SMC-MI 3X 6 D963	0027
V3673926	WASHER CRINKLE I M5	0042
V395326	NEOPRENE SPONSRUBBER D6	0100
V600478	HANDLE TRIM RGCD $$$ 00	0040
V603260	CUP CAPT M6	0030
V603594	SEAL CHASSIS 00	0050
V6035954	SEAL FILTERFRAME 17 00	0026
V603598	FLTR AR 60% EMC 9643 00	0025
V603678	STANDARD LABEL L&P 01	0010
V6036922	CAPT.BOLTM6 X 45 SW8 00	0033
V6037831	BEZEL SET 9643L 00	0020

Order number of a complete FRAME UN. STD : V5631180 00 Date : 01/12/92

Order number	Description	Item
V311099	F 2A 90C THERMO	0010
V3139142	J DUBX1 FWT P 2 E1 HSG	0015
V342168	WIRE AWG24 UL1007 WHI Y	0014
V348014	SLE SHR 3.2 L20 BLA Y	0013
V3480211	W ACC CLIP 3.2	0080
V348029	GROMMET PANEL 2MM Y	0082
V348073	KABELCLIPS TWIST #Y	0081
V3495417	WIRE UNIT RG179 400 00	0090
V358137	PCB GUIDE L 162 #Y	0021
V3581372	PCB GUIDE L 76 #Y	0022
V3581381	PCB GUIDE L 56 #Y	0023

Order number	Description		Item
V3620196	SMP-I AM3 X 4 D 84		0011
V3620216	SMP-I AM3 X 6 D 84		0100,0120
V3620236	SCR DIN84 M 3 X 10 I		0101
V3620516	SMP-I AM 4X 8 D 84		0130
V3620526	SMP-I AM 4X10 D84		0230
V3673766	WASHER PA I 3.2 D125		0111
V3673906	WASHER CRINKLE I M3		0012,0102,0121
V3673916	WASHER CRINKLE I M4		0131,0231
V367434	RIV.P AL D2.4 L 3.2		0150,0151
V3674566	RIV.P IN D3.2 L 6.4		0036
V591034	LABEL DANGER 37X18		0140
V6030961	CAPTIVE SCREW M3 X 8	00	0041,0061,0071
V6030963	CAPTIVE SCREW SPRING	01	0032,0042,0062,0072
V6030964	CAPTIVE SCREW M3 X10	00	0033,0043
V6030965	CAPTIVE SCREW M3 X13	00	0031,0044
V603588	FRAME	05	0020
V603589	TOPCOVER	01	0040
V6035923	SEC. INPUT BLANC	00	0060
V603641	EHT CON PLATE	00	0070
V603642	BACKCOVER	03	0030
V6036421	HEATSINK BACKCOVER	02	0035
V6036422	HEATSINK POW.BACKCOVER	00	0035
V603731	PCB CLAMP MPRD9000	01	0110
V7502827	IDENT PLAAT NSN 6551A	00	0150

Order number of a complete PICT. TUBE UN. STD 20 " : V5636190 00 Date : 11/05/93

Order number	Description		Item
V131178	CRT HT51-669-ITC		0100
V3133062	J MNL FWT P 1 AU24/18		0102,0132
V3133072	J MNL P NWT P 2 HSG		0131
V3133077	J MNL P NWT P 9 HSG		0101
V342199	WIRE AWG18 UL1007 GRY Y		0103,0104
V348000	CBL ACC TIE B L 98 W2.5		0025,0133
V348001	CBL ACC TIE B L172 W4.6		0122
V348027	GROMMET CONTINUOUS #Y		0024
V348072	CBL ACC TIE FIX TM2S6		0011
V3494613	CORD FLAT P16 700MM	00	0160
V3496361	WIRE UN HV 40KV UL3239	00	0110
V3622136	SCR D963 M 3 X 8 I		0021,0090
V3622266	SCR D963 M 4 X 12 I		0032
V3623332	SCR D933 M 5 X 16 S B		0105
V3661026	NUT D934 M 3 I		0022
V3673766	WSHR D125 A 3.2 I		0013
V3673816	WSHR D440R 5.5 I		0107
V3673906	WSHR WAVE 3.2 I		0023
V3674546	RVT POP D3.2 L 6.7 P II		0012
V3675046	WSHR D6798 A 5.3 I		0106
V367529	WSHR D 5.1 X17.9 T0.8 D		0108
V395156	SILICONE RTV 3140		0112
V395467	TAPE GLASS UL 1" UL		0121
V5900101	LABEL BVC FCC PART15		0191
V590225	LAB CAUTION HIGH		0190
V603605	SHIELD 20"	02	0010
V603607	SHIELD TRIM 20"	01	0020

Order number	Description	Item
V6036884	CRT FIX.(MILLING)LEFT 01	0070
V6036885	CRT FIX.(MILLING)RIGHT 01	0071
V603824	SHIELD STIF.CRT SIDE 00	0091
V6038241	SHIELD STIF.CRT TOP 00	0092
V603825	SHIELD STIF.BEZEL SIDE 00	0030
V6038251	SHIELD STIF.BEZEL TOP 00	0031
C660193	UN AKWADAG CD 351 01	0120
V670024	SPO DEGAUSS 6551A/1 02	0130

Order number of a complete PICT. TUBE UN. STD 17" : V5636195 00 Date : 11/05/93

Order number	Descritpion	Item
V131179	CRT M41KXH900X 02	0100
V3133062	J MNL FWT P 1 AU24/18	0102,0132
V3133072	J MNL P NWT P 2 HSG	0131
V3133077	J MNL P NWT P 9 HSG	0101
V342199	WIRE AWG18 UL1007 GRY Y	0103,0104
V348000	CBL ACC TIE B L 98 W2.5	0025,0133
V348001	CBL ACC TIE B L172 W4.6	0122
V348072	CBL ACC TIE FIX TM2S6	0011
V3494613	CORD FLAT P16 700MM 00	0160
V3496361	WIRE UN HV 40KV UL3239 00	0110
V3622136	SCR D963 M 3 X 8 I	0021,0090
V3622266	SCR D963 M 4 X 12 I	0032
V3623332	SCR D933 M 5 X 16 S B	0105
V3661026	NUT D934 M 3 I	0022
V3673766	WSHR D125 A 3.2 I	0013
V3673816	WSHR D440R 5.5 I	0107
V3673906	WSHR WAVE 3.2 I	0023
V3674546	RVT POP D3.2 L 6.7 P II	0012
V3675046	WSHR D6798 A 5.3 I	0106
V367529	WSHR D 5.1 X17.9 T0.8 D	0108
V395156	SILICONE RTV 3140	0112
V395467	TAPE GLASS UL 1" UL	0121
V4121015	UN W AQUADAG 3/37 02	0120
V5900101	LABEL BVC FCC PART15	0191
V590225	LAB CAUTION HIGH	0190
V603604	SHIELD 17" 01	0010
V603606	SHIELD TRIM 17" 01	0020
V6036884	CRT FIX.(MILLING)LEFT 01	0070
V6036885	CRT FIX.(MILLING)RIGHT 01	0080
V6038241	SHIELD STIF.CRT TOP 00	0092
V603825	SHIELD STIF.BEZEL SIDE 00	0030
V6038252	SHIELD STIF.BEZEL TOP 01	0031
V670025	SPO DEGAUSS 6537A/1 01	0130

Order number of a complete RACKMOUNT KIT 20" : V5631290 00 Date : 01/12/92

Order number	Description		Item
V3620516	SMP-I AM 4X 8 D 84		0031
V3620526	SMP-I AM 4X10 D84		0034
V3622236	SMC-I M 4X 8 D 963		0011
V3622448	SMCHI M 6X16 D7991		0061
V3673776	WASHER PA I 4.3 D9021		0033
V3673906	WASHER CRINKLE I M3		0042,0052
V3673916	WASHER CRINKLE I M4		0032
V3674736	RIV.C CUNI D3.2 L 3.8		0041,0051
V3675058	WASHER I 6.4 D6798		0062
V6004631	LOCATION BLOCK OUT SRD	01	0060
V603622	SLIDE ADAPTER LEFT	03	0040
V6036221	SLIDE ADAPTER RIGHT	03	0050
V603623	LOC BLOCK BRIDGE 20L$$$	01	0010
V603624	SLIDESUPP LEFT 20L	01	0020
V6036241	SLIDESUPPORTRIGHT20L	01	0030

Order number of a complete RACKMOUNT KIT 17" : V5631295 00 Date : 01/12/92

Order number	Description		Item
V3620516	SMP-I AM 4X 8 D 84		0031
V3622236	SMC-I M 4X 8 D 963		0011
V3622278	SMC-I M 4X16 D7991		0061
V3673916	WASHER CRINKLE I M4		0032
V3674736	RIV.C CUNI D3.2 L 3.8		0041,0051
V6004632	LOCATION BLOCK 9643	01	0060
V603620	LOC BLOCK BRIDGE 17L	00	0010
V603621	SLIDESUPPORTLEFT 17L	00	0020
V6036211	SLIDESUPPORTRIGHT17L	00	0030
V603622	SLIDE ADAPTER LEFT	03	0040
V6036221	SLIDE ADAPTER RIGHT	03	0050

3. INTERCONNECTIONS

3.1 GENERAL INFORMATION

This chapter describes all the interconnections (from one unit to another) that are not integrated on the backboard.

These interconnections are :

- BIT RGB connection between RGB Board and Processor Board,
- EHT connection from EHT board to CRT,
- VG2, VG3-1, VG3-2 from EHT board to CRT Socket,
- Cathode R, Cathode G, Cathode B, RGB ground, G1, filament power and ground from RGB Board to CRT socket,
- connection between Temperature Sensor and Backboard,
- connection between Deflection Board and deflection coils,
- connection between Deflection Board and degauss coils,
- connection between RGB Board and Backboard,
- connection between Control Board and Backboard,
- connection between EHT Board and Backboard,
- AQUADAG from CRT socket to CRT.

IMPORTANT NOTICE

The RGB Board has 8 external connectors, accessible at the rear of the MPRD9600. These connectors are numbered J01, J02, ..., J08 on the rear plate but have another number on the PCB and in the schematic diagrams.

Signal Name	External Connector Number	Number on PCB mask and schematic diagram
R EXT1 (in)	J01	J1
R EXT1 (out)	J02	J2
G EXT1 (in)	J03	J5
G EXT1 (out)	J04	J6
B EXT1 (in)	J05	J8
B EXT1 (out)	J06	J9
HS/CS	J07	J11
VS	J08	J12

The RGB signals from the BIT are connected to 3 (internal) connectors that are not accessible at the rear of the MPRD9600; their numbers are in accordance with the PCB mask and schematic diagrams.

A connector will be referred to by the number on the schematic diagram.

3.2 INTERCONNECTION SPECIFICATIONS

BIT RGB connection between RGB Board and Processor Board

3 coaxial cables connect the BIT RGB signals from the Processor to the RGB Board

Processor Board	Signal Name	RGB Board
J225	RBIT	J4
J224	GBIT	J7
J223	BBIT	J10

EHT connection from EHT Board to CRT

The EHT wire leaves the EHT Board and goes to an on-wire EHT connector, the other side of the EHT connector receives the EHT wire coming from the CRT EHT connection.

VG2, VG3-1, VG3-2 from EHT Board to CRT Socket

The VG2 wire (green) leaves the EHT board at solder point VG2 OUT (soldered) and goes to the FOCUS connector.
The VG3-1 and VG3-2 leave the focus module and go to the same focus connector.
The plug that fits into the focus connector is drawn on the MPRD9600 CRT Socket (CON FOCUS J2).

Cathode R, Cathode G, Cathode B, RGB ground, G1, filament power and ground from RGB Board to CRT socket

Signal Name	RGB BOARD	Identification on CRT Socket
VG1	J19 pin nr 2	soldered
FILHI	J19 pin nr 1	soldered
GND	J19 pin nr 3	soldered
VRCATHODE	J14	CR
VGCATODE	J15	CG
VBCATHODE	J16	CB
RGB GROUND	solderlug on case U15	J3
	solderlug on case U13	J11

Connection between Temperature Sensor and Backboard

Temperature Sensor	Backboard J9
Ground	J10 pin 2
N.O. Contact	J10 pin 1

Connection between Deflection Board and deflection coils

The deflection coils are connected with J504, two jumpers on the plug that fits J504 open the deflection board power connections if it is plugged out.

Signal name	J504 pin nr	
-150 V (power supply out)	1	grey
+150 V (power supply out)	2	grey
Horizontal deflection coil (high)	3	red
Vertical deflection coil (low)	4	green or black
Vertical deflection coil (high)	5	not used
Vertical deflection coil (high)	6	yellow
+150 V (power supply in)	7	grey
-150 V (power supply in)	8	grey
Horizontal deflection coil (low)	9	blue

Connection between Deflection Board and degauss coils

The degauss coils (2 coils in series) are connected with J501,502; these coils are also used for the vertical white uniformity adjust. Interchanging J501 with J502 will not cause troubles.

Signal name	J501	J502
Degauss coil 1 high	1	
Deguass coil 1 low	2	
Degauss coil 2 high		1
Deguass coil 2 low		2

Connection between RGB Board and Backboard

Two flatcables connect the RGB Board with the Backboard; RGB board connector J3 (26 pins) is connected to J3 on the Backboard and RGB board connector J13 (34 pins) is connected to J13 on the Backboard

Connection between Control Board and Backboard

Control panel Board connector J1 (16 pins) is connected to Backboard connector J7 by a flatcable.

Connection between EHT Board and Backboard

EHT Board connector J2 (20 pins) is connected to Backboard connector J5 by a flatcable.

AQUADAG from CRT socket to CRT

The AQUADAG leaves the CRT socket at plug J4, the other side is connected to the concuctive coating on the bulb.

4. MAINTENANCE KIT

4.1 MAINTENANCE KIT CONTENTS

- OPTISENSE head (V5627412)
- OPTISENSE amplifier (V5627422)
- keypad (V5627431)
- 2 extension boards (left = V5630905, right = V5630906)
- technical manual
- screwdriver (W380027)
- double socket wrench (W3803081)
- trimmer adjust tool (W381006)
- spare captive screws M3 X 8 (V6030961), M3 X 10 (V6030964), M3 X 13 (V6030965)
- spare captive spring (V6030963)
- spare fuse 2 A T (C314116, to be used with 220 V AC / 270 V DCversion only !)
- spare fuse 4 A T (C3141041, to be used with 110 V AC / 170 V DC version only !)
- spare fuse 16 A FF (V314155, to be used with 28 V DC version only !)
- deflection coils extension cable V349639
- degauss coils extension cable V349640 (2x)

Both extension boards can be used for the processor board (plug the RGB cables in the coax receptacles on the extension board) or the optional input module, V5630905 (= left) is to be used when servicing the switch mode power supply, V5630906 (= right) is to be used when servicing the deflection board, during repair deflectioncoils wires and degausscoils wires are to be connected to the deflection board using the extension cables V349639 and V349640.

Double socket wrench key is required to (un-)screw the rackmount screws in bezel.
Screwdriver can be used to (un-)screw MPRD9600 external screws.
Trimmer adjust tool is only to adjust R-trimmers, do not use this tool to adjust the PLL-coil.

Be careful when selecting a spare captive screw, only use screws of correct length.

4.1.1 REQUIRED TEST EQUIPMENT

Maintenance on component level requires following test equipment

- oscilloscope	bandwidth > 150 MHz,
- sweep generator	freq. range DC - 300MHz,
- RGB generator	line rate 100KHz, clock rate 150 MHz,
- colour analyser	Thoma TMF3 or better,
- digital multimeter	3 1/2 digit min.

4.2 HOW TO USE KEYPAD

4.2.1 GENERAL INFORMATION ON THE KEYPAD CONTROLS

This text describes the MPRD 9xxx software features. As software required for basic monitor operation/service and software for optional module support were integrated in the same firmware, some of the explained below might not be applicable for your model.
Refer to chapter 9 "OPTIONAL MODULES" to find out which options have been mounted.

USER MODES.

If the monitor is fitted with a softkey control board, the operator can choose between two modes: LOCAL and ALT. If the monitor is fitted with a standard keyboard (or analog controls) only the LOCAL mode will be active.

LOCAL mode.

This mode can be selected for any input source. All keys on the keypad or the control panel will control monitor related functions: contrast, brightness, colour temperature, white uniformity, etc ...

ALT mode.

When selecting the ALT mode, which is only possible when not in BIT, a message on the keypad will appear. Now the only possible selections are: brightness control, contrast control, degauss operation and ALT (= CTRLx on keypad).

All keys on the monitor control panel - the ALT and DEG key excepted - react as softkeys. This means that the keys perform another function. When a key is pressed, its led will start flashing until the monitor has been polled by a host computer, after which the led will be lit constantly. When pressing several softkeys simultaneously, only the last one pressed will be sent and indicated by the led.

The monitor will always start as it was prior to switch-off, bringing back all the selections (EXCEPT FOR THE BATTLE SHORT OVERRIDE) that then were stored in E^2PROM.

Each mode has two operation levels: a user level and a test level.
The test level is access protected via a special key sequence, only "qualified personnel" can reach sensitive adjustments. In the test level, some selections and adjustments that only make sense to repair/test personnel can be made. The current mode is shown on the keypad, after start-up or when the keypad is disconnected the software automatically reverts to the user level.

SOFTWARE INPUT SOURCES.

By one or more of the following entry devices, selections can be made:

- **keyboard.** The software detects the presence and the type of the keyboard. So far, 5 different types of keyboard have been defined, i.e. MPRD short digital (standard), MPRD analog, MPRD long landscape, MPRD long portrait and a custom keyboard. If no keyboard is present, the software will select the MPRD short digital as default.

- **keypad.** This little "terminal" can be connected on either side of the monitor on the control bus. The presence of the device is sensed and a start-up screen is displayed to inform the user that the device is ready for input. With the keypad, the monitor can be completely adjusted to the user likings.

- **remote interface.** Through this way, a serial source such as a host computer can communicate with the monitor to obtain information from it or to readjust it. The communication can be done in 3 standards, being RS232, RS422/423 and an optional mode connecting directly on the board (Optional Module, Backboard Connector J2, pins 51,52,53). The format (8 databits, no parity, 1 stopbit) is always the same, the baudrate can be selected via the keypad.

- **inter monitor bus.** This is an extension of the remote interface, it is used to communicate between monitors. In this way a monitor sends/receives information to/from another monitor on the daisy chain (RS485).

- **optisense.** Although this is not an input device for the user, this sensor passes its data via a serial link to the monitor, allowing the software to adjust the colour temperature of the monitor automatically.

GENERAL OPERATION.

All parameters (EXCEPT FOR THE BATTLE SHORT OVERRIDE) inside the monitor are stored in non-volatile memory (E^2PROM), so that this data is preserved in time. However, an E^2PROM can only be changed a limited number of times (min. 10.000 times) so that after that time, certain parameters will no longer change. When the software detects such an event, a warning message will be displayed on the keypad and be sent via the remote interface. Operation of the monitor is still possible, the warning will disappear automatically, the E^2PROMs should be replaced.

When selecting an input source, the SCAN SET linked with the selected input will be copied from E^2PROM into RAM. Figure 4.1 shows a part of the E^2PROM and the RAM. After power-up, the static parameters are also copied from E^2PROM into RAM. Adjusting MPRD9600 parameters is executed in RAM.
All parameters in the active scan set are compared with those in E^2PROM, IF NOT IN TEST MODE , the altered RAM paramerters will be copied into E^2PROM 7 seconds after making the last alteration. (when changing parameters in test mode, they will only be stored when returning to user mode; changes are lost when selecting an other inputsource in test mode because a new scan set is copied into the RAM, overwriting the previous data). The detection of a difference between RAM and E^2PROM is displayed by an asterisk in the upper right corner of the keypad display. When the asterisk disappears, the data is preserved and the monitor can be switched off.

When pressing a key on either the keyboard or the keypad, the key will be processed. When a key is pressed for a longer period of time, the increment (decrement) speed will increase.

Not all keys will remain active when selecting a menu on the keypad. When the keypad is disconnected without quitting the menu (= returning to the Main Menu), the menu will be closed by the software and the control panel will be fully enabled again.

2 Data entering modes are available on the keypad: inc/dec or direct entry.
The first mode only uses the [+] and/or [−] keys, increasing or decreasing the selected value.
The second mode uses the numeric keys on the keypad followed by the [ENTER] key. Any overflow will be limited automatically to the maximum allowed value for the selected parameter.
If in doubt about the maximum range, enter a too large value to have the maximum value displayed; [ENTER] will validate this maximum value, pressing [QUIT] or [↑] or [↓] will restore the previous validated value.

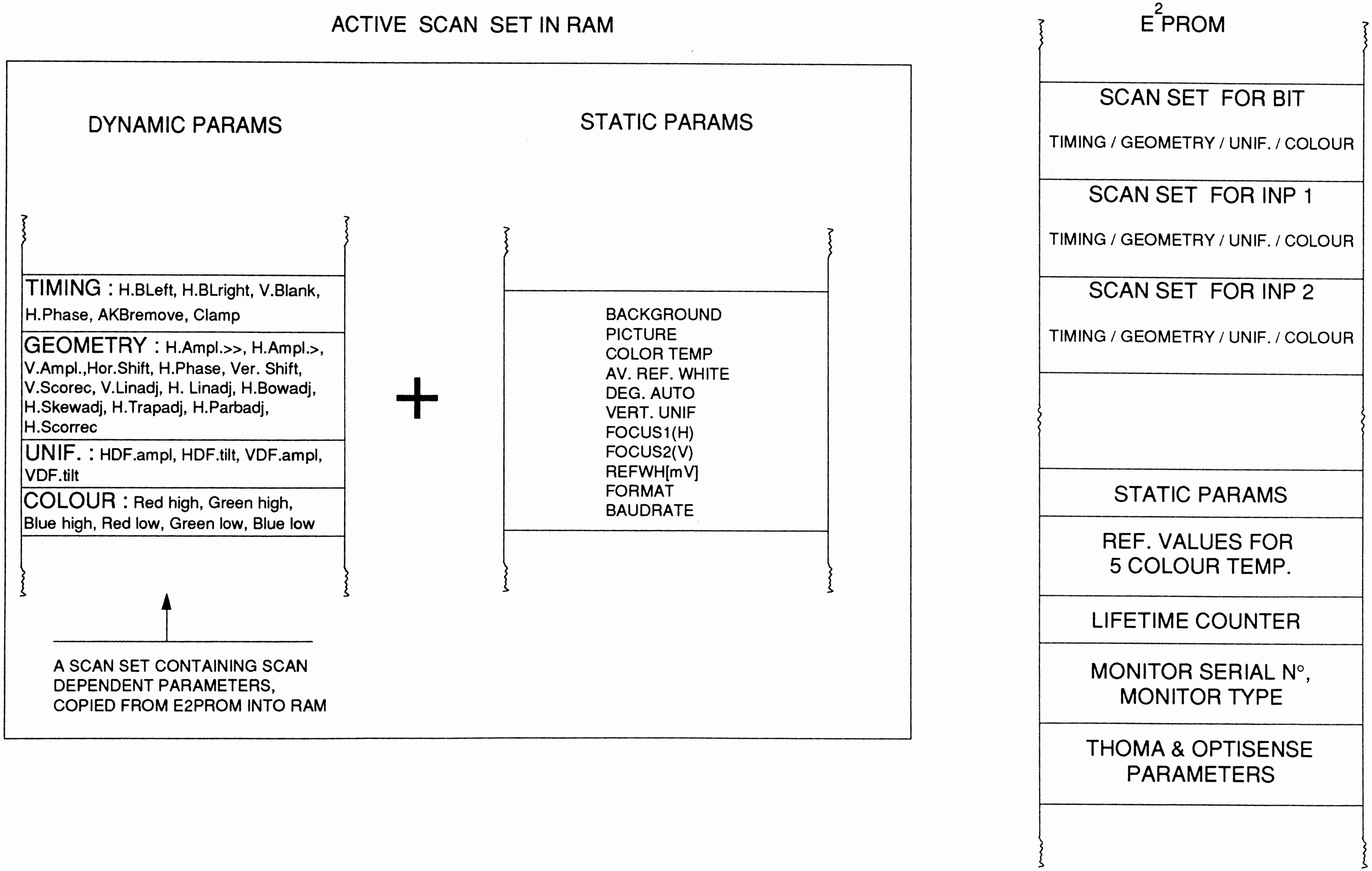


figure 4.1 : scan set structure

All parameters are grouped in menus, which can be selected using the menu keys. In such a menu, a "▲" indicates that there are lines higher up, a "▼" indicates there are more lines further down. You can scroll up and down the menus with the [↑] and [↓] keys. To scroll 4 lines at a time (or less if start or end of menu are reached), use the [←] or [→] keys. The only way to exit a menu is by pressing the [QUIT] key. Quitting a menu brings you back to the main menu, where the general status of the monitor is shown.
Pressing the menu key from within that menu, will reset the screen to the first 4 lines of that specific menu. Exceptions on these general rules are clarified in the Detailed Keypad Menu Overview.

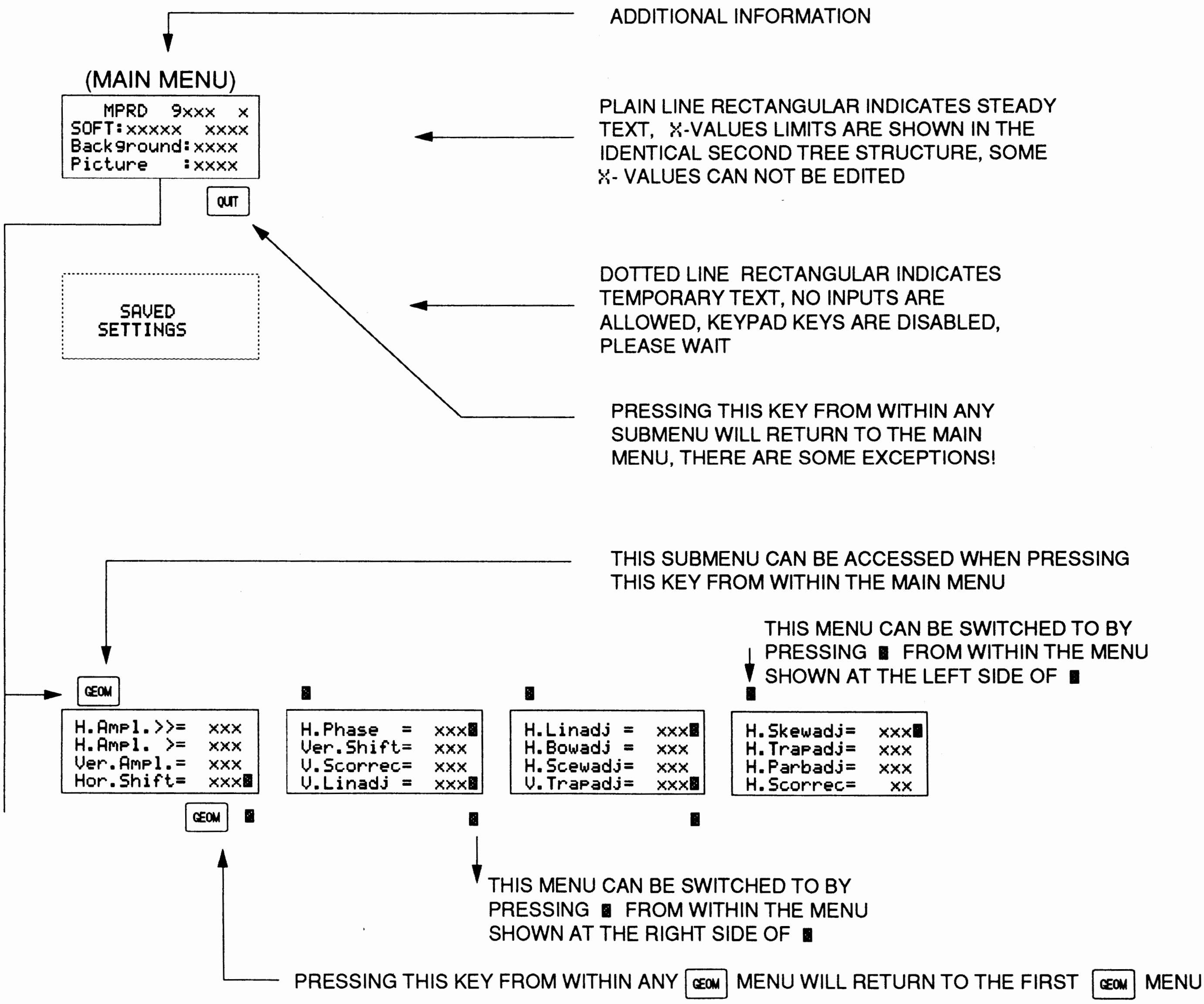
The degauss button has a double function. When pressing it for 5 seconds, the MIS (if installed) will be switched on if it was off, or the other way round. When the MIS is installed and active, the led on the degauss button is lit.

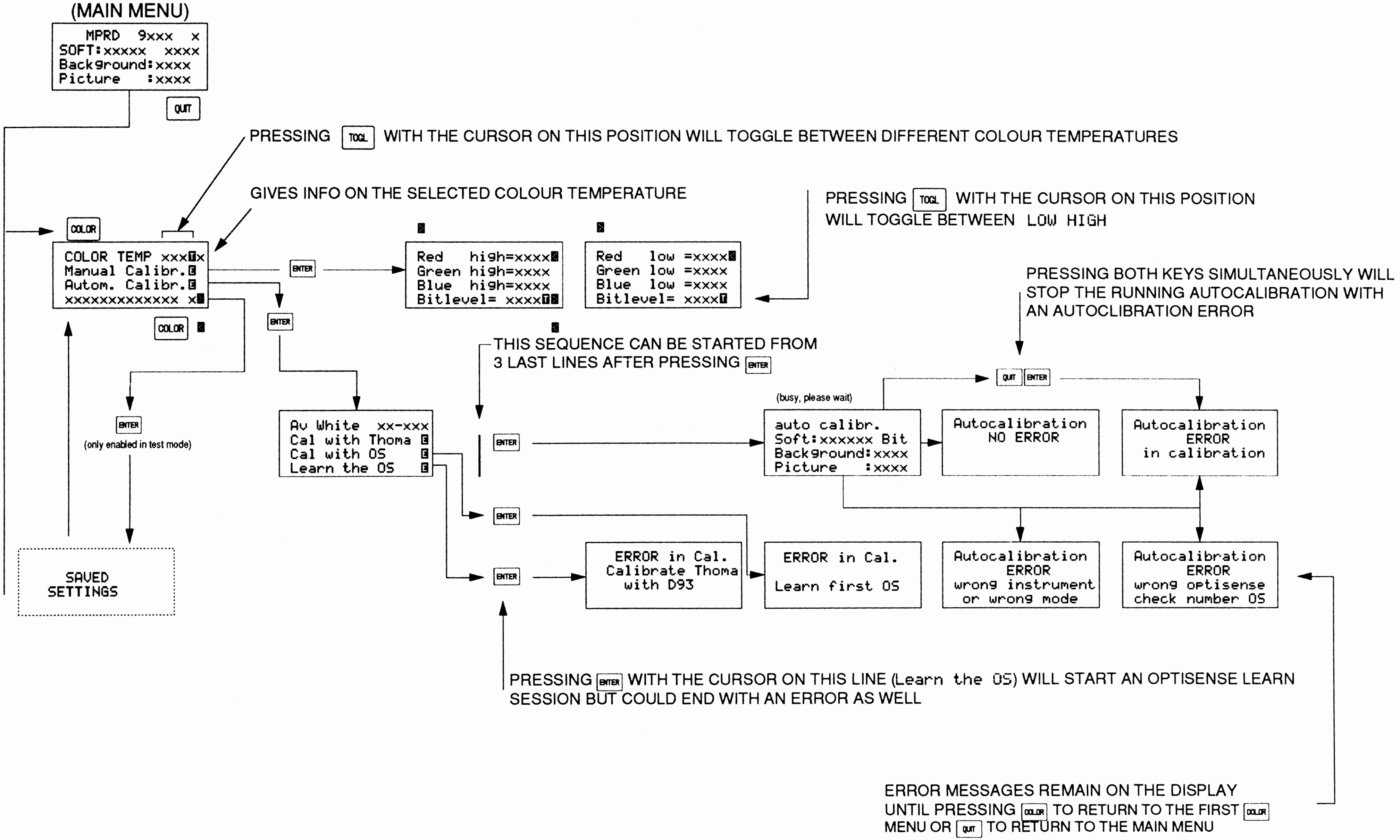
4.2.2. DETAILED KEYPAD MENU OVERVIEW

EXEMPLIFICATION OF THE KEYPAD MENUS

All texts that can appear on the keypad display are shown in a tree-structure; every branch is described in a paragraph. All conditions required to access the branch, the explanation of the parameters, min./max. values etc. will be described.

Tree structure symbolic.





(MAIN MENU)
MPRD 9xxx x
SOFT:xxxxx xxxx
Background:xxxx
Picture :xxxx
QUIT
PRESSING TOGL WITH THE CURSOR ON THIS POSITION WILL TOGGLE BETWEEN DIFFERENT COLOUR TEMPERATURES
GIVES INFO ON THE SELECTED COLOUR TEMPERATURE
COLOR
COLOR TEMP xxx x
Manual Calibr.
Autom. Calibr.
xxxxxxxxxxxxx x
COLOR
ENTER
ENTER
Red high=xxxx
Green high=xxxx
Blue high=xxxx
Bitlevel= xxxx
Red low =xxxx
Green low =xxxx
Blue low =xxxx
Bitlevel= xxxx
PRESSING TOGL WITH THE CURSOR ON THIS POSITION
WILL TOGGLE BETWEEN LOW HIGH
PRESSING BOTH KEYS SIMULTANEOUSLY WILL
STOP THE RUNNING AUTOCALIBRATION WITH
AN AUTOCLIBRATION ERROR
THIS SEQUENCE CAN BE STARTED FROM
3 LAST LINES AFTER PRESSING ENTER
QUIT ENTER
ENTER
(only enabled in test mode)
Av White xx-xxx
Cal with Thoma
Cal with OS
Learn the OS
ENTER
(busy, please wait)
auto calibr.
Soft:xxxxxx Bit
Background:xxxx
Picture :xxxx
Autocalibration
NO ERROR
Autocalibration
ERROR
in calibration
ENTER
ENTER
SAVED
SETTINGS
ERROR in Cal.
Calibrate Thoma
with D93
ERROR in Cal.
Learn first OS
Autocalibration
ERROR
wrong instrument
or wrong mode
Autocalibration
ERROR
wrong optisense
check number OS
PRESSING ENTER WITH THE CURSOR ON THIS LINE (Learn the OS) WILL START AN OPTISENSE LEARN
SESSION BUT COULD END WITH AN ERROR AS WELL
ERROR MESSAGES REMAIN ON THE DISPLAY
UNTIL PRESSING COLOR TO RETURN TO THE FIRST COLOR
MENU OR QUIT TO RETURN TO THE MAIN MENU

DESCRIPTION OF KEYPAD KEYS AND RELATED FUNCTIONS

[−◑][◑+] (Picture adjust) and [−☼][☼+] (Background adjust).

Picture (contrast) and background (brightness) are normally set in CAL position, being 750 for the first and 523 for the second. The range is 0 to 1023. The value is increased/decreased by pressing the corresponding keys on the control board or keypad. On the keypad the increment/decrement step is 1, on the control board 5.
There is no need to validate the edited parameter with the [ENTER] key, [−◑], [◑+], [−☼] and [☼+] are immediately processed by the microprocessor. When pressing the [−☼] and [☼+] or [−◑] and [◑+] key simultaneously, the calibrated value for background or picture is recalled. Picture or background (depending on the position of the cursor in the main menu) can also be increased/decreased by the [−]/[+] keys.
Picture adjust and background adjust are only enabled in the MAIN MENU and every first SUB MENU; in the [REM] and [COLOR] menu they are always disabled.
There is an optional control panel with potentiometers for contrast and brightness. Connecting such a keyboard will be sensed automatically by the software, contrast and brightness will not be indicated on the keypad.

[◑+] and [−☼] = BATTLE OVERRIDE (WHEN PRESSED SIMULTANEOUSLY)

This function allows to bypass the internal temperature sensor inside the monitor. This function is activated by pressing the [◑+] and [−☼] simultaneously, the CAL leds on the front panel and on the keypad will flash at a frequency of approximately 0,2 Hz, indicating the "Battle Override" active (and NOT calibrated background and picture settings). It is a toggle function so pressing both keys again switches "Battle Override" off/on again (wait 4 seconds before switching "Battle Override" on/off again.
"Battle Override" can be switched on in case of overtemp (to obtain picture in a too hot environment) or under normal environmental conditions as a preventive action to ensure picture will not be lost in case of overtemperature.
In case of overtemp and "Battle Override" activated, the keypad display shows :

```
   WARNING:
   OVERTEMP

BATTLE OVERRIDE
```

The keypad main menu shows `Battle Mode` on the second line if `BATTLE OVERRIDE` is switched on.

[DEG] Degauss.

Degauss is activated by pressing either the [DEG] key (keypad), degauss key (control panel), by connecting a push button to the NDEGAUS line or by the MIS module (option). Between two degauss operations, a wait time of 5 seconds is introduced (except for MIS), so there will be no reaction. The wait time is necessary for the degauss circuit to get fully charged again.
Degauss is only enabled in the MAIN MENU and every first sub menu, in the [REM] menu it is always disabled.

[PRE1], [PRE2] and [CAL].

Two user programmable settings [PRE1] and [PRE2], can store preferred background and picture settings. If the light sensors (option) are switched on, the contrast and brightness of the picture is the result of the multiplication of the measured light level with the contrast setting and the highlights. If the light sensors are switched off, a fixed voltage is taken instead of the measured light level.
Presetting the values for background and picture is done by pressing either of these keys. When pressing the [CAL] key on the keypad, both background and picture are calibrated. This key is only enabled in the MAIN MENU. To program the [PRE1] or [PRE2] key, one must adjust the contrast and brightness to his liking and then press the [SHIFT] and [ENTER] key on the keypad. This action is only possible in the main menu and will ask the user in which preset key the settings have to be stored.
When the monitor has a long digital keyboard with light sensors, pressing [PRE1] will always switch on the light sensors, [PRE2] will switch them off; [CAL] will not vary the lightsensors on-off selection but the values for contrast and brightness will be calibrated.

[−], [+]

These keys are used to increase or decrease parameters, there is no need to validate the edited parameter with the [ENTER] key, [−] and [+] are immediately processed by the microprocessor.

[↑] [↓] [←] [→]

These keys are used to scroll the cursor through the different lines of a menu.
[←] / [→] are used to scroll the cursor 4 lines forward/backward (or less if start or end of menu is reached).
Pressing [↑] on the first or [↓] on the last line of a menu does nothing, pressing [↑] or [↓] on a line without ■ or ■ will position the cursor 1 position up or down.
Pressing [↑] on a line with ■ or pressing [↓] on a line with ■ will scroll the menu up/down.
None of these keys allow to select a sub menu.

[TOGL]

This key can only be used if the cursor is on a menu line showing ■.
Each time [TOGL] is pressed, another value for the parameter will be displayed, the displayed value is immediately processed.

[CTRLx] (=ALT on control panel, optional)

This selection is only possible when not in BIT!, this key is only enabled in the MAIN MENU and in the database.

[CTRLa] (INP1), [CTRLb] INP2 and [CTRLc] BIT

These keys are present on all control panels and on the keypad as [CTRLa] for INP1, [CTRLb] for INP2 and [CTRLc] for BIT.
The selection for INP2 can only be made if a second input board has been installed. The BIT selection will always generate a standard combined pattern with fixed frequency. When changing between inputs, all frequency dependent parameters are recalled from E^2PROM to restore the picture as it was set before. If no parameters are available for the input source, parameters are copied from the BIT settings, with the exception for the blanking, which is set to minimum. Frequency dependent parameters are stored in a "SCAN SET" in E^2PROM.
These keys are only enabled in the MAIN MENU and in the database sub menu.

[TIM]

In this menu, horizontal and vertical blanking parameters can be adjusted. Together with the blanking, the horizontal phase can be set. The AKB removal shifts the AKB line out of the visible area on top of the screen, while the clamp select can be toggled between backporch and synctip for signalS with no or very short horizontal backporch.

H.BLeft	: increasing value = larger zone blanked on the left side
H.BRight	: increasing value = larger zone blanked on the right side
V.Blank	: increasing value = larger zone blanked on top
H.Phase	: increasing value = active video in picture moves to the right side
AKBremove	: increasing value = AKB-lines move upwards
Clamp	: can be toggled between backporch and synctip

(see also figure 4.12)

[GEOM]

Here all parameters influencing geometry are gathered. The horizontal amplitude is split in a coarse (>>) and a fine (>) adjustment to increase the precision of the alignment. All parameters have a range of 0 to 255, with the exception of the Horizontal S-correction, which only has 0 to 15 range (4 bits).

H.Ampl.>>	: increasing value = larger horizontal scan zone (coarse)
H.Ampl. >	: increasing value = larger horizontal scan zone (fine)

Ver.Ampl.	: increasing value = larger vertical scan zone
Hor.Shift	: increasing value = scanning moves to the right
H.Phase	: increasing value = active video in picture moves to the right side
Ver.Shift	: increasing value = scanning moves towards the top
V.Scorrec	: increasing value = top and bottom zone expand, center is squeezed
V.Linadj	: increasing value = top expands, bottom is squeezed
H.Linadj	: increasing value = left side expands, right side is squeezed
H.Bowadj	: increasing value = upper and lower zone bow to the left
H.Scewadj	: increasing value = top corners skew right, bottom corners skew left
H.Trapadj	: increasing value = top corners are stretched, bottom corners are squeezed
H.Parbadj	: increasing value = top corners bow to each other, bottom corners bow towards each other
H.Scorrec	: increasing value = left and right zone expand, centre is squeezed

(see also figure 4.12)

COLOR

The MPRD 9600 can be aligned for several colour temperatures. In the non-volatile memory there is a section in which the reference values (3 low lights and 3 high lights settings) for each of the five different colour temperatures are stored. These reference values were aligned on the BIT white box pattern and stored using a service password. Another section in the non-volatile memory is used to store the SCAN SETs, one for each input (INP1, INP2 (option) and BIT). Each SCAN SET stores all the parameters defined in the TIM, GEOM, UNIF and COLOR menu. When selecting an input source, the specific SCAN SET parameters for this input are copied into the ACTIVE SCAN in RAM and are used to align the monitor.

When changing the color temperature by pressing TOGL, the reference values for the displayed colour temperature will be copied into the ACTIVE SCAN. Selecting a reference value is indicated by a character "r" (for reference) on the end of the first line of the COLOR menus. Note that toggling the color temperature will overwrite the previous color setting in the ACTIVE SCAN.

Normally, the use of the reference values will result in correct colour temperatures, although the intensity may not be 100 % correct. Correcting this error is possible by realigning the desired scan set and storing the values in the scan set (E^2PROM). This way, other than the standard five color temperatures can be set and stored in the memory.

When pressing ENTER with the cursor on the second line of the menu (= `Manual Calibr.`) the color settings for the active input source can be (re)calibrated (display shows a COLOR sub menu). Now the low lights and high lights can be readjusted, the new values being saved in the ACTIVE SCAN.
If BIT is the active input, the pattern will change to white box, `Bit.level` will be `high` (100%). The high lights can now be adjusted. When `Bit.level` is toggled to `low` (10%), the low lights can be adjusted.
If INP1 (or INP2 = option) is the active input, the external pattern must be levelled to 100% as `RED high`, `GREEN high` and `BLUE high` are displayed (100%). The high lights can now be adjusted. Pressing → changes the display to `RED low`, `GREEN low` and `BLUE low` (10%), the external pattern must be levelled to 10% and the low lights can be adjusted. Note that `Bit.level` can not be toggled when INP1 (or INP2) is the active input.

When returning to the main COLOR menu (press COLOR) the upper right corner will display "c" (for calibrated).
When pressing QUIT (return to Main Menu) within 7 seconds after last changing ACTIVE SCAN parameters, the upper right corner will display "*" indicating a difference between the ACTIVE SCAN (RAM) and the SCAN SET (E^2PROM) for the active input. If no ACTIVE SCAN parameters were changed within the 7 seconds (but they differ from the SCAN SET of the active input) they will be copied into the SCAN SET for the active input.

When selecting a colour temperature (first line of the COLOR menu), a character "n" (for new) could appear. This indicates that the currently selected colour temperature for the active input is being selected for the very first time (factory programmed default low light and high light values are still present in the SCAN SET for the selected input).

If required, these parameters, manually (re)calibrated for a certain colour temperature and stored in a SCAN SET, can be copied into the reference values. This can only be done in test mode, requiring a service password (see MISC2 menu). In user mode the text "user settings" will be displayed on the last line of the COLOR main menu, in test mode it will be "save changes ◘". Pressing ENTER with the cursor on this line in test mode will save the colour parameters as reference values.

NOTE : these new values are now present as potential reference values for all SCAN SETs

BUT THEY'RE NOT AUTOMATICALLY COPIED INTO OTHER SCAN SETS !!!

EXAMPLE :
- INP1 and colour temperature D93 are selected,
- now BIT and colour temperature D93 are selected, colours are calibrated manually and parameters are saved in test mode,
- when selecting INP1 and colour temperature D93, the SCAN SET (E^2PROM) for INP 1 is copied into ACTIVE SCAN (RAM) BUT the SCAN SET for INP1 still has the old D93 colour references, the COLOR main menu will show a "c" in the upper right corner because the colour termperature differs from the reference values in E^2PROM,
- to copy the new colour references into the INP1 SCAN SET (E^2PROM) the cursor must be positioned on the first line of the COLOR main menu, press TOGL until D93 reappears
- pressing TOGL will copy the colour temperature reference values into the ACTIVE SCAN; 7 seconds after having made the last change, these settings will be copied from the ACTIVE SCAN into the INP1 SCAN SET.

Pressing ENTER with the cursor on the third line of the main COLOR menu selects a second COLOR sub menu. On the first line of this sub menu the Average White level (30-99 Nit) and the current colour temperature are displayed. The Average White level can be edited in the MISC2 menu but the service password will be required (see below). The very first auto calibration must be done with a Thoma (was already done in the factory).

Pressing ENTER with the cursor on the second line will start an auto calibration with a Thoma. The monitor switches to BIT (white box) and aligns itself on the color temperature specified in the first line from the sub menu.
During auto calibration the display shows another menu, no inputs are required, please wait.
When the auto calibration has ended, the monitor remains in BIT, the display shows:

```
Autocalibration
    NO ERROR.
```

During auto calibration, the low and high lights in the active scan are processed and adapted, if ended succesfully, the new calibrated values for the specified colour temperature are stored as reference values and in the SCAN SET for BIT; if autocalibration is stopped, the low and high lights in the active scan could be inaccurate, please re-copy the desired SCAN SET into the ACTIVE SCAN by changing inputsource.

Pressing COLOR returns to the COLOR main menu, pressing QUIT returns to the Main Menu.

Note : if the monitor was not in BIT when auto calibration was requested, the INP1 SCAN SET (or INP2) still contains the previous colour temperature settings (refer to manual calibration procedure above).

The first condition for Automatic calibration with an OS is that, at least once, the monitor has been calibrated for D93 with a Thoma, the second condition is that "Learn the OS" was executed at least once before, USING THE CURRENT OPTISENSE HEAD AND AMPLIFIER !!!
For best results, the "LEARN OPTISENSE" should be executed only on a monitor that was recently calibrated.
"Learn the Optisense" measures and stores the Optisense characteristics, as well as its serial number. If another Optisense® (having another serial number than the one used for the learn sequence) is connected it will be detected, indicating that a new Optisense learn sequence is required.
Apart from these conditions, the autocalibration sequence for Thoma or OS correspond completely.
Autocalibration is always executed on BIT (monitor switches to BIT), manual calibration can be also executed on INP1 (or INP2 = option).

Auto calibration can be stopped by pressing QUIT and ENTER simultaneously, the keypad will display an error message. Other error messages will be displayed if, as yet, D93 was not calibrated yet with Thoma, if the OS learn sequence hadn't been executed, if calibration with OS was requested but Thoma was connected (or vice versa) or if an OS was detected with a different serial number than the one read during the last OS learn sequence.

CAUTION : During calibration it is advisable to cover the front of the monitor with a dark coloured cloth to prevent ambient light interfering with the CRT light output.

MISC1

A variety of functions are grouped in this menu.

Parameters that can only be edited if already in BIT before selecting MISC1 are: Format, Pattern and Color(s).

Pressing TOGL with the cursor on the first line of the MISC1 menu to switch between either the 5/4 or 4/3 aspect ratio for BIT.

Pressing TOGL with the cursor on the second line of the MISC1 menu selects the current BIT pattern.

- STDBIT. A combined test pattern that includes monochrome and colour bars together with a convergence grid.
- CROSSHATCH To check the convergence of the picture and the geometry.
- BOX To align the colour temperature of the monitor with a colour analyser or an optisense.
- FIELD To check the screen for purity, missing dots and other screen related problems.

In case of the last three patterns one or more colours can be switched off. This is not possible for the STDBIT because the design is deliberately made that way. Other patterns than the first are meant for service purposes only, and are therefore selected via the keypad menus. Note that when BIT is again selected by pressing BIT on the control panel or CTRLc on the keypad the bitpattern will change to STDBIT, as a precaution the STDBIT is always shown at 100% in order to guarantee a picture whenever BIT is selected, no matter what picture or colours were on, even if the bitlevel indicates "low".
In test mode two more patterns can be selected : SYNCWH and OPTBIT; these are for future development.
If one of these is selected and mode is reverted to user mode, the bit pattern selection will not be affected.

Pressing TOGL with the cursor on the third line of the MISC1 menu allows to switch on/off the BIT RGB-signals. Note that when BIT will be selected again - by pressing BIT on the control panel or CTRLc on the keypad - the three BIT RGB-signals will be switched on.

On the fourth line REFWH(mV) can be adjusted.
The default value is 700 mV (monitor was factory calibrated for this value). This means that RGB input signals of 700 mV (+ 300 mV sync) will give a calibrated picture (colour and lightoutput). If the signals connected to INP1 (or INP2 = option) have a different maximum value, they will not generate a calibrated picture.
Setting REFWH(mV) to the max. inputlevel of the RGB input signals and auto calibrating the monitor again will result in calibrated pictures for the applied RGB signals. Note that adjusting REFWH(mV) directly affects the light output for the BIT-patterns CROSSH, BOX and field.

The second menu (press [→]) groups the ALC (option), MIS (option) and ORBITING functions.

ALC can be switched on/off by pressing [TOGL] with the cursor on the second line of this menu. Note that ALC is always switched on when pressing [PRE1] and switched off when pressing [PRE2]. ALC can also be switched on by pressing ALC on the control panel.

MIS can be switched on/off by pressing [TOGL] with the cursor on the third line if the MIS (option) is installed (hardware) and enabled in the [MISC2] menu.

Orbiting will slightly shift the picture both horizontally and vertically in order to reduce screen burn, especially for low picture contents with high peak brightness. It can be enabled/disabled by pressing [TOGL] with the cursor on the fourth line.

The third menu (press [→]) groups data on the applied scanning.

The horizontal/vertical frequency is measured and calculated, the horizontal/vertical sync polarity are measured; all data is displayed.

When pressing [→] in this menu, all parameters will be refreshed.

If the processor is unable to show correct values for Hor. freq, one of the following texts will appear :

- LOCK?	: PLL out of lock,
- VS?	: no vertical sync present,
- HFLB?	: no (faulty) hor. flyback signal,
- VRNG?	: vert. freq. out of range,
- I2C?	: no (faulty) communication with deflection board.

If the processor is unable to show correct values for Vert. freq, one of the following text will appear :

- VRNG?	: vert. freq. out of range.
blank zone	: no specific info available

With this information one can discriminate different generator timings, each of them can be fine-tuned in another scan set and recalled automatically by the software as it recognizes the timing. A "data base" of different scan sets co-ordinates this process.

[MISC2]

This menu contains "sensitive" adjustments and factory settings, all of them protected by a service password. In this menu the software mode (test/user) is selected, the OPTISENSE is aligned, the lifetime is shown, ...

The first line shows the number of hours that the monitor has been operational.

When first entering this menu, the second line will show "Password no" which means that the service password must be entered if one or more of the settings in this menu have to be changed; the last line will show "User ==> Test" which means that current software mode is user mode.

The default service password is set to [ENTER] before shipment

Pressing [ENTER] with the cursor on the second line will show another menu.

Pressing [ENTER] with the cursor on the first line of this new menu will switch to another menu asking to enter the current service password. The SHIFT-function on the keypad is automatically activated; the password must only be made up of letters (A-Z) and/or numbers (0-9) and/or spaces (=[CTRLd]) with a total of maximum 6 characters. The last displayed character can be deleted by pressing [SHIFT][←].

After pressing ENTER, the password will be checked; if it was correct, a text "Password correct" is displayed, after one second the MISC2 main menu will reappear. The second line now shows "Password Acc". If the password wasn't correct, "Password False" is displayed, pressing QUIT returns to the Main Menu, pressing MISC2 returns to the MISC2 main menu.

If the service password was entered successfully, all functions (but one) will be enabled in this menu.

Pressing ENTER with the cursor on the second line of this menu allows to alter the user password. Note that if the current password was not entered yet, pressing ENTER will return to the MISC2 main menu. If the current password was entered before, a new menu will appear allowing to enter the new service password. The password must only have letters (A-Z) and/or numbers (0-9) and/or space (= CTRLd) with a total of maximum 6 characters. The last displayed character can be deleted by pressing SHIFT ←. After pressing ENTER, the new password will overwrite the old one, the display shows the MISC2 main menu.

Note that disconnecting the keypad resets to "Password no".

Pressing ENTER with the cursor on the third line (Settings) will show another menu.

The first line allows to install or remove the database by pressing the TOGL key. Data is not lost after switch-off/switch-on sequence.

The second line is used to inform the software if a MIS module (option) is installed, press the TOGL key to make a selection (this does not switch on/off the MIS module).

The third and fourth line allow to enter a colour temperature for USR1 and USR2. Note that an autocalibration in the COLOR menu for the altered colour temperature must be executed to obtain calibrated colour temperature !!!

Pressing → shows the last part of the settings menu.

Pressing ENTER with the cursor on the "Life time" line switches to the life time sub menu allowing to alter the current lifetime. When replacing the processor board, the life time must be copied into the E²PROM of the new board.

Pressing ENTER with the cursor on the "Type number" line allows to enter the monitor's type number, this number is displayed on the first line of the main menu.

Pressing ENTER with the cursor on the "Serial number" line allows to enter the monitor's type number, this number must be in accordance with the number on the identification plate of the monitor.

Pressing ENTER with the cursor on the "AV Ref White" line allows to edit the lightoutput. Note that an autocalibration in the COLOR menu for the all colour temperature must be executed to obtain calibrated lighoutput for all colour temperatures !!!

If the last character of the "AV Ref White" line equals ■ it indicates that the factory password has been entered instead of the service password. An additional menu can now be seen by pressing →.

The fourth line in the MISC2 main menu will end with ■ if the password was entered correctly. This allows to toggle between user mode and test mode. If test mode is selected, some additional functions are enabled : in the MISC1 menu "REFW[mV]" will have an extended range and "Pattern" gets two additional choices; in the COLOR menu the changes can be saved as reference values.

Note that disconnecting the keypad will reset to user mode.

UNIF

Two UNIF main menus are shown. The first one gives access to all parameters, the second one is shown if the MIS option is installed (in the MISC2 menu), it has a limited set of parameters.

The first parameters (accessible by pressing 1, only if MIS is not installed) allow to adjust the vertical uniformity, and the "Deg. auto" function.

When edited, vertical uniformity is stored in the SCAN SET of the active input as it is a scan dependent value.

IF the "Deg. auto" displays 0, automatic degauss is disabled; all entered values less than 10 are converted to 0, the working range is 10 - 999. The value shows the time interval between two Degauss cycles in seconds.

The second menu groups all focus parameters.

Focus1(H) allows to align the static focus for horizontal lines, Focus2(V) allows to align the static focus for vertical lines. Note that these two alignments might influence each other. Both alignments are static and frequency independent, so they will not change when selecting another scan set.

Apart from the static hor. and vert. focus , there is also dynamic focus. Both amplitude and tilt of the hor. and vert. dyn. focus can be edited at the end of the second menu. Dynamic focus amplitude and dynamic focus tilt are adjusted for a single scanning, the values are stored in the SCAN SET of the active input, they may have to be altered if another scanning is applied to the same input source.

REM

This key selects the remote menu. The MPRD is capable of communicating with a host computer via a serial link. The type of the link is set by hardware jumpers on the microprocessor board, the baudrate is software selected. Apart from this serial link, a serial inter monitor bus provided, enabling the user to put several monitors in a daisy chain, reducing the number and length of the interconnections. Via software, the first monitor on the IMB is given the MASTER status, the others are given the SLAVE status (2 - 9). Any communication between the host computer and a SLAVE monitor is passed on through the MASTER. Via the keypad, all monitors can be controlled from the master in broadcast mode, addressing all monitors on the chain simultaneously, or in slave mode, addressing one specific monitor as if the keypad were plugged into that monitor. The selecting and programming of all related parameters are done in this REMOTE menu. If a keypad is connected on a SLAVE during a BROADCAST session, it will display the addressed menus and the new data values.

The IMB will only function properly if one and only one monitor was assigned the Master status and if all slaves were assigned a different number.

As all monitors leave the factory with MASTER status all but one must be switched to slave before starting a remote session on the IMB.

A remote session can only be opened on the keypad connected to the MASTER, for this reason, the first line of the REM main menu is used to display whether the monitor is the master or a slave.

Pressing ENTER with the cursor on the second line of the REM main menu displays a sub menu allowing to select between master or slave. Only the master/slave setting of the monitor to which the keypad is connected can be changed.

Pressing ENTER with the cursor on the third line of the REM main menu will open a session (this selection is blanked if the monitor to which the keypad is connected is a SLAVE). A new menu appears: pressing the 0 will enter the broadcast mode, all monitors on the chain, including the master, will react to subsequent key presses, the MASTER does not listen to any slave, there is **no feedback**. Another value (2-9) will pass the key presses to the SLAVE monitor with the corresponding number, the data that normally appears on the keypad of the SLAVE monitor is also sent back via the bus and displayed on the MASTER keypad. The slave answers to the commands of the MASTER via the IMB, with the MASTER checking the data received. Any of these sessions can be terminated by pressing the QUIT key, returning keypad control to the MASTER monitor only (without returning to the Main Menu).

Only a reduced number of commands can be executed in Slave control or Broadcast mode.

Pressing 0 starts the Broadcast mode, a new menu appears, with all monitors on the IMB then receiving the same data/commands.

NOTE : **The data displayed on the MASTER keypad is only valid for the Master monitor.**

e.g. Pressing the [−◘] will decrease the contrast for all monitors connected on the IMB.
This is done by sending the command "decrease background" to all monitors on the IMB; if not all monitors had the same contrast setting when the session was opened, they won't have it either after pressing [−◘] or any other increase/decrease command.

If all monitors need to have the same background settings, the setting on the MASTER must be executed using direct entry; put the cursor on background, enter the correct value using the numeric keys followed by [ENTER].
Now this **value** (and not an increase/decrease commando) is sent to all monitors and they will have identical brightness settings.

Pressing [COLOR] from within the BROADCAST main menu shows a sub menu allowing to change the colour temperature. Pressing ◘ changes the selected colour temperature but again it does not guarantee that all monitors did select the same colour temperature.

Pressing [QUIT] from within this menu returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing [MISC2] from within the BROADCAST main menu shows a sub menu with the lifetime. Pressing [QUIT] from within this menu returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing [UNIF] from within the BROADCAST main menu shows a sub menu allowing to edit the "Deg. auto" parameter. Pressing [QUIT] from within this menu returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing [MISC1] from within the BROADCAST main menu shows a sub menu allowing to toggle the "ALC", "MIS" and "ORBITING" settings. Once again, note that it does not guarantee that all monitors do have the same settings for "ALC", "MIS" and "ORBITING". Pressing [QUIT] from within this menu returns to the BROADCAST MODE menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Opening a session (pressing [ENTER] with the cursor on the third line of the [REM] main menu) and entering a value between 2 and 9 starts a SLAVE CONTROL session for the SLAVE monitor assigned to that number.

Pressing [COLOR] from within the SLAVE CONTROL main menu shows a sub menu allowing to change the colour temperature. Pressing ◘ changes the selected colour temperature.

Pressing [QUIT] from within this menu returns to the SLAVE CONTROL main menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing [MISC2] from within the SLAVE CONTROL main menu shows a sub menu, the lifetime of the SLAVE monitor is displayed. Pressing [QUIT] from within this menu returns to the SLAVE CONTROL main menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing [UNIF] from within the SLAVE CONTROL main menu shows a sub menu allowing to edit the "Deg. auto" parameter, the displayed value is the setting of the SLAVE monitor. Pressing [QUIT] from within this menu returns to the SLAVE CONTROL main menu, this is an exception to the general rule that pressing [QUIT] would return to the Main Menu.

Pressing MISCl from within the SLAVE CONTROL main menu shows a sub menu allowing to toggle the "ALC", "MIS" and "ORBITING" settings, the displayed settings are those of the SLAVE monitor. Note that in this case pressing the TOGL will unambiguously display the correct SLAVE monitor settings for "ALC", "MIS" and "ORBITING". Pressing QUIT from within this menu returns to the SLAVE CONTROL main menu, this is an exception to the general rule that pressing QUIT would return to the Main Menu.

Pressing ENTER with the cursor on the fourth of the REM main menu displays a sub menu that allows to toggle between the different Baudrates. Only the Baudrate of the monitor to which the keypad is connected can be changed. This is the Baudrate for the Remote (RS232 or RS422) and the IMB; default is 9600 Baud, other Baudrates are 1200, 2400 and 4800.

CTRLd

DO NOT TRY TO OPERATE THE DATABASE BEFORE GROWING ACCUSTOMED TO THE BASIC KEYPAD OPERATIONS

The CTRLd key selects the database.

The database allows to save and recall scan sets.

If a scanning is applied, the horizontal & vertical frequency and sync. polarity will be measured each second. If the scan frequency and sync polarity have not changed, the same scan set is used. If at least one of these has changed, the new input frequency and sync polarity will be looked up in the database, starting with scan set 00. If these values are found in one of the scan sets stored in the database, the monitor will automatically use all the settings that are defined in that particular scan set, it becomes the default setting for the selected input. If they cannot be found, the database will create a new scan set, it becomes the default settings for the selected input.
46 Different scan sets can be stored in the database, if all scan sets are used and an unknown scanning is applied, the database will overwrite scan set 45. Not that the above mentioned functions are disabled upon entering the database menu.

Scan set 00 is reserved for BIT but INP1 and/or INP2 (optional) can also use this scan set.

When pressing CTRLd from within the Main Menu, the display will show the first (00 used for BIT) and the second (01) scan set. Each scan set uses 2 lines, the first line shows the number (left side, 2 characters) and the name (in the middle, max. 8 characters) of the scan set. The second line indicates for which input source(s) this scan set is used, followed by 1, 2, B or a blank, the last character is an →. 1 Means that this particular scan set has been assigned to INP1 since entering the database, 2 means that this particular scan set has been assigned to INP2 since entering the database, B means that this particular scan set has been assigned to BIT since entering the database. This allows the operator to look at a certain input with a scan set that differs from the default one. It is done by pressing the CTRLa (input1), CTRLb (input2) or CTRLc (BIT) key, pressing CTRLx returns to the default scan set.
The database can store 46 different scan sets, in this menu the operator can scroll through them, the scan set with the cursor at the end of its first line is selected to be edited.
Do **not** use the ← or → keys to scroll 4 lines at a time, in this menu these keys have a different function (see further), only use the ↑ and ↓ keys to select a scan set.

Database Organisation

3 Pointers BIT, INP1 and INP2 are used to link an input source with a scan set. By default the BIT pointer is linked with scan set 00, INP1 to scan set 1, INP2 to scan set 2 (these are the 3 scan sets described earlier). The hor. & vert. frequency and sync. polarity of a scanning are used to automatically select a scan set in the database (see fig. 4.2).

e.g. - Pointers are on their default position, the scanning on INP1 is changed, the frequency does not match with scan set 01.
- The INP1 pointer is reset (it points to scan set 00) and checks if the frequency and sync. data of this scan set is in accordance with the applied scanning. If so, the pointer remains on this position, if not the pointer is set one scan set further, the same checks are then repeated. This sequence continues until a scan set with corresponding freq. and sync. data is found. If such a scan set cannot be found, a new one will be created.
- This new scan set is a copy of 00 (for BIT) but the freq. and sync. data is replaced by the current measured data; note that if all 46 scan sets were already used, scan set 45 will be overwritten !

Pressing [→] in the [CTRLd] main menu (2 scan sets displayed) shows the hor. & vert. frequency and sync. polarity for the 2 scan sets. The last character on the first and third line are a copy of those in the [CTRLd] main menu. Pressing [←] returns to the [CTRLd] main menu.
In either of these two menus [MISC1], [REM], [QUIT], [TOGL] and [ENTER] can be used to execute several functions.

Pressing [CTRLd] from within the [CTRLd] main menu will measure and show the freq. and sync. for the selected input source, the selected scan set is of no import. Pressing [CTRLd] again will refresh the data; pressing [QUIT] returns to the [CTRLd] main menu.

Pressing [REM] from within the [CTRLd] main menu allows to copy or remove a scan set.
Before entering this menu the scan set that has to be copied or removed must be selected by scrolling the cursor.

copy: Pressing [ENTER] with the cursor on the third line (`Copy scan set`) shows a new display. The first line shows the number of the selected scan set and the number of the new scan set to which the data will be copied. The number of the new scan set is filled in automatically, it is the first free scan set found when searching from 00. When pressing [ENTER] with the cursor on the third line (`Copy freq.`) all parameters for the new scan set are copied from the selected scan set. When pressing [ENTER] with the cursor on the fourth line (`Copy freq.`) the frequency and sync. polarity of the selected input will first be measured and then stored in the new scan set. The other parameters for the new scan set are copied from the selected scan set.
After pressing [ENTER], a time bar on the second line will indicate the copy progress, please wait until the [CTRLd] main menu is shown to press any key.

delete: A deleted scan set cannot be restored automatically, THINK TWICE !
Pressing [ENTER] with the cursor on the fourth line (`Del scan set`) shows a new display. The second line shows the number of the selected scan set that will be deleted. Pressing [ENTER] with the cursor on the third line (`NO`) will return to the [CTRLd] main menu without deleting the selected scan set; pressing [ENTER] with the cursor on the fourth line (`YES`) will switch to a new menu displaying a time bar, please wait until the [CTRLd] main menu is shown to press any key.

NOTE: - if scan set 00 is selected, the cursor cannot be placed on the `Del scan set` line,
- if the scan set assigned to the current selected input is deleted, BIT will become the active input,
- if a new scan set was assigned to the selected input and then deleted, the scan set that was assigned to the same input before entering the database will be reassigned again automatically.
- remaining scan sets will not be renumbered upon deleting an intermediate scan set

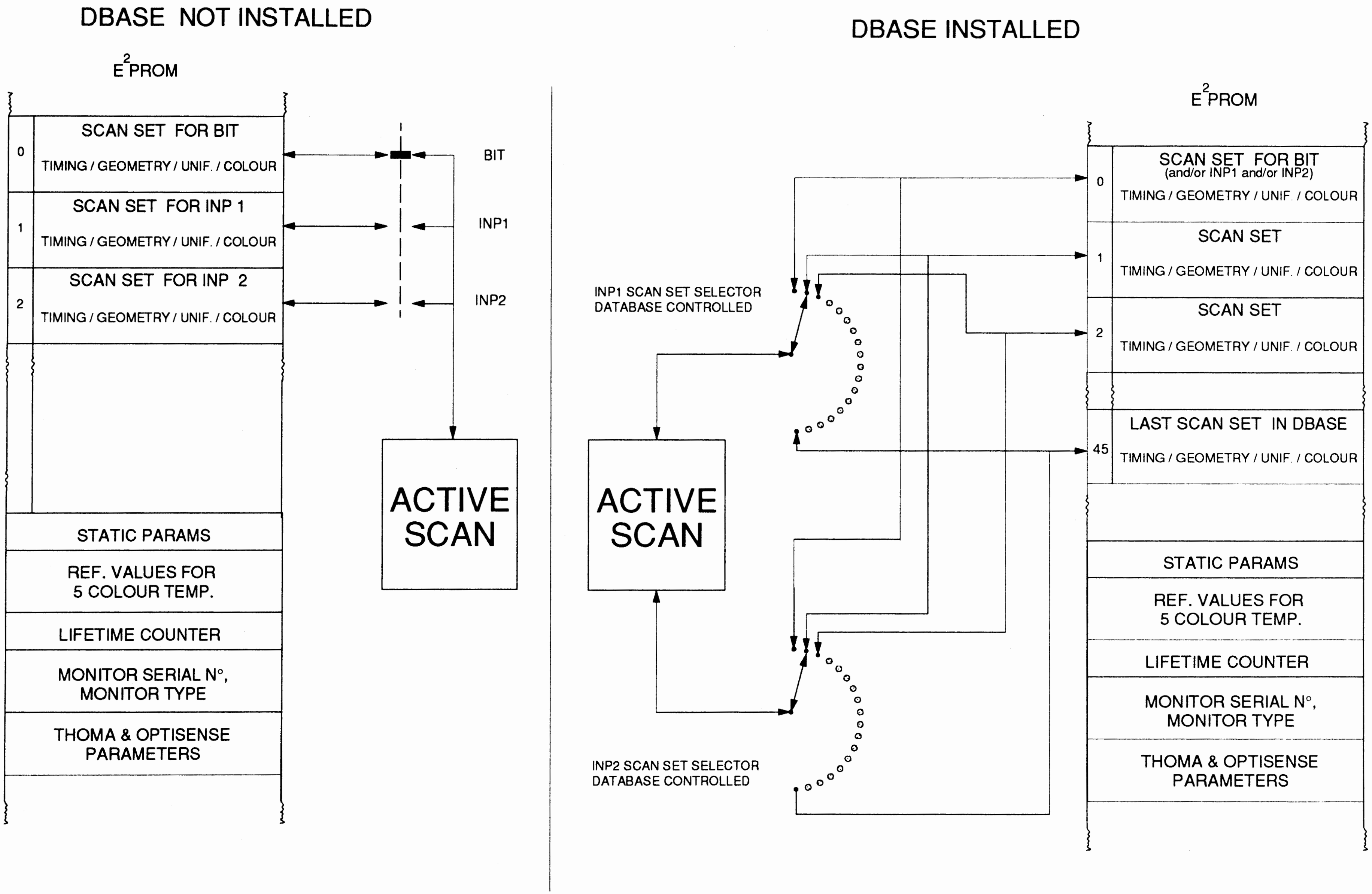


figure 4.2 : comparison of the scan set structure with and without database

Pressing QUIT from within the CTRLd main menu will check if an input has been assigned to a new default scan set. If so, a new menu will appear asking if the new default is to be saved. Press 1 to save the old scan set as default, press 3 to save the new scan set as default
If no new default was assigned, the Main Menu will appear on the keypad.
Note that only the LAST input assigned to a new default scan set can be stored.

Pressing TOGL from within the CTRLd main menu allows to jump to a specified scan set. If ENTER is pressed with the cursor on the second line the CTRLd main menu with the INP1 default scan set will be displayed. If ENTER is pressed with the cursor on the third line the CTRLd main menu with the INP2 default scan set will be displayed. On the last line the number of a scan set can be entered. When ENTER is pressed with the cursor on the fourth line after entering the desired scan set umber, the CTRLd main menu with that scan set will be displayed.
If a number of a non existing scan set is entered, the data base will jump to the scan set with the number closest to the desired one.
Pressing ENTER from within the CTRLd main menu allows to edit all parameters of the selected scan set, the parameters of the selected scan set are copied in the active scan (not frequency and sync.), now the active input is shown on the screen with the parameters of the selected scan set (first display shows `Loading value`, then a new menu appears).
If parameters are edited, the new values will be stored in E^2PROM (on the address of the selected scan set) and in RAM (= active scan set). When pressing QUIT in this menu, the parameters in the active scan will be restored with initial values that existed prior to entering the Edit menu.
In the Edit menu the scan set label can be edited by pressing ENTER with the cursor on the first line. Letters (keyboard shift is activated automatically), numbers and space can be entered with a maximum of 8 characters. The last displayed character can be erased by pressing SHIFT ←.
All selections, (apart from `Edit label`, described above and a **disabled** `Autom. Calibr.` in the COLOR menu) that can be made in the Edit menu, are identical copies of previous described menus. They are now activated by pressing ENTER. They were explained earlier when discussing the TIM, GEOM, COLOR and UNIF menus selected from within the Main menu.

4.2.3 WARNING AND ERROR MESSAGES

During monitor operation, the text on the keypad can be overwritten by a warning or an error.
If a warning or error is displayed, only the picture, contrast, PRE1, PRE2, CAL, DEG, CTRLx, CTRLa, CTRLb and CTRLc keys are enabled.
The warning or error can be removed by pressing QUIT on the keypad, the Main Menu will then be displayed.

The software starts searching for warnings and ends with the errors; all of them are scanned in a fixed sequence, only the first one encountered is displayed.

After connecting a keypad a warning or error may be displayed, which had been saved by the processor board. Only the first one will be displayed, e.g. if EHT goes down, the AKB on the RGB board will also fail. As the EHT board went down first, only the EHT error will be displayed.

Extra info on Warnings and Errors.

Warning Overview

OVERTEMP:	indicates over temperature inside the monitor, EHT goes down
REPLACE E2PROM:	faulty write cycles, data can no longer be saved in the device
MEMORY:	static RAM corrupted, will not be copied to E^2PROM

Error Overview

PROCESSOR BOARD: REBOOT SYSTEM	an error occurred on the processor board, auto reboot after 15 seconds, keypad is temporarily disabled
HARD- & SOFTWARE: DEFLECTION	communication between processor board and controller on deflection board stopped
VERTICAL DEFLECTION:	vertical deflection malfunction
HORIZONTAL DEFLECTION:	horizontal deflection malfunction
EHT:	EHT malfunction
RGB:	RGB malfunction

WARNING/ERROR	PRIORITY
WARNING: OVERTEMP	1
ERROR: PROCESSOR BOARD REBOOT SYSTEM	2
ERROR: HARD- & SOTFWARE DEFLECTION	3
ERROR: VERTICAL DEFLECTION	4
ERROR: HORIZONTAL DEFLECTION	5
ERROR: EHT	6
ERROR: RGB	7
WARNING: REPLACE E2PROM	8
WARNING: MEMORY	9

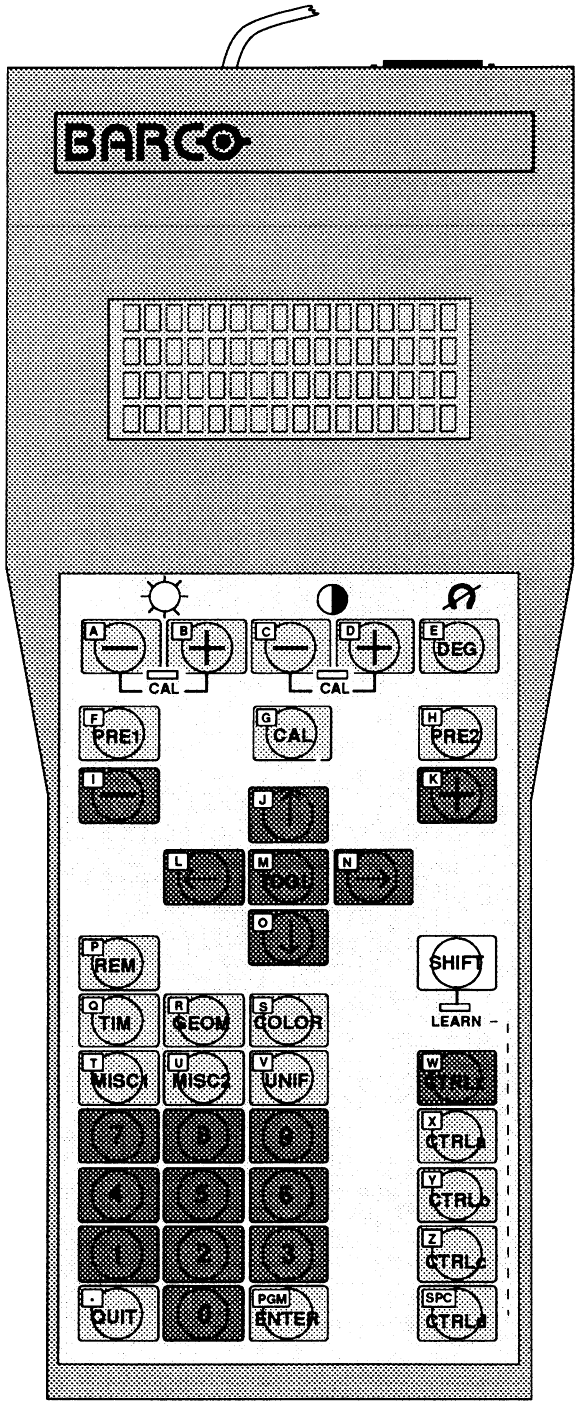


figure 4.3 : keypad

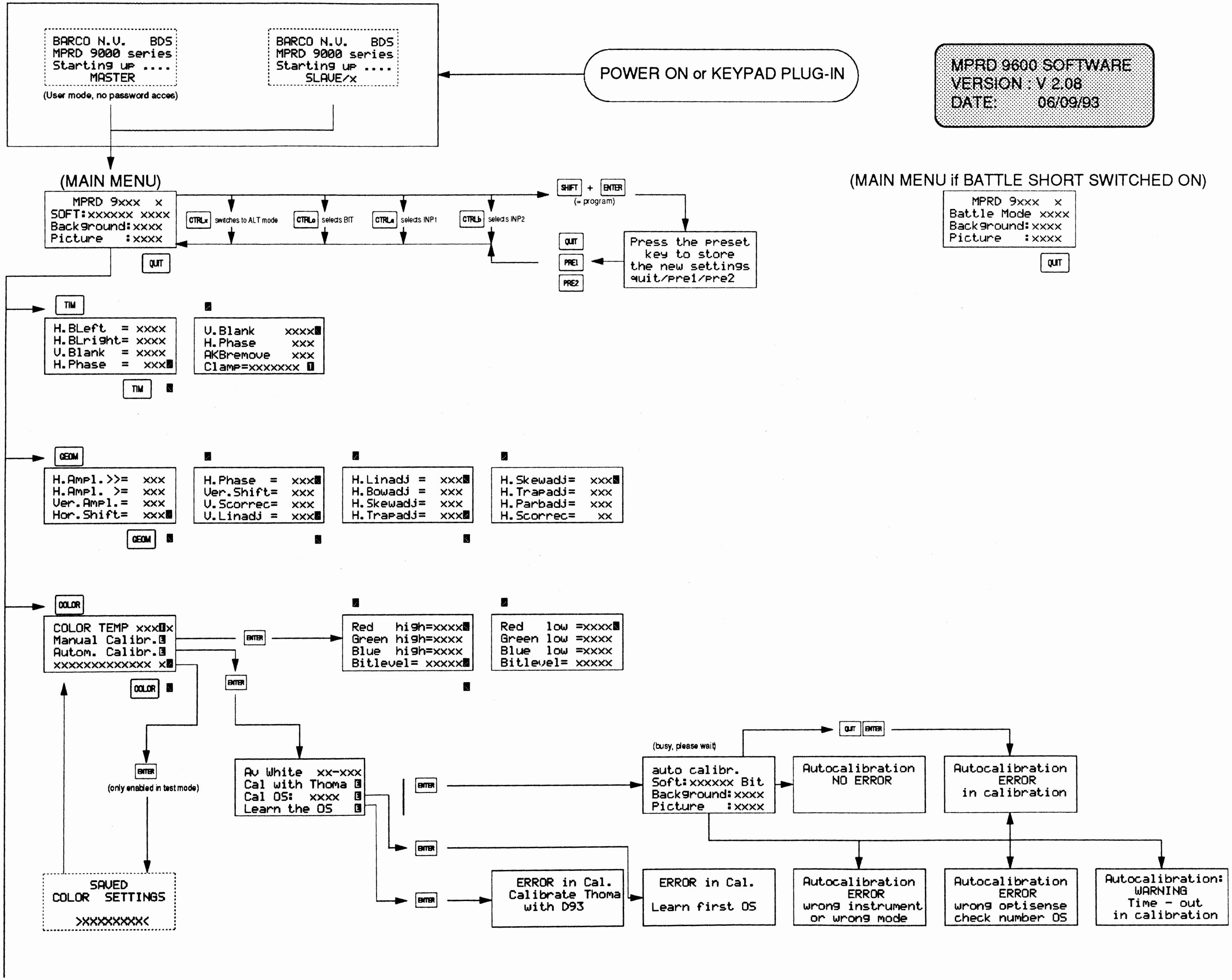


figure 4.4 : keypad menu fixed text part 1

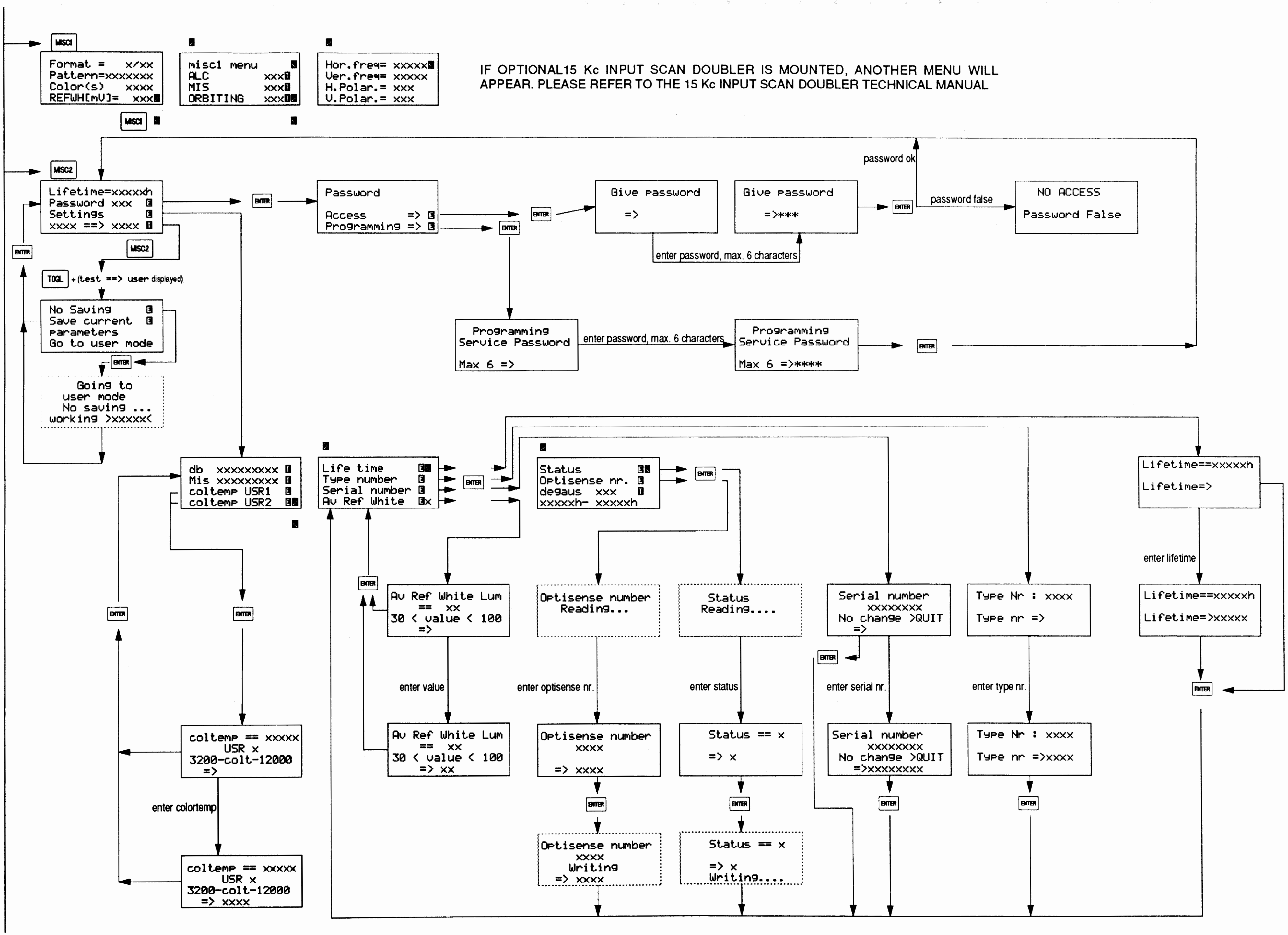


figure 4.5 : keypad menu fixed text part 2

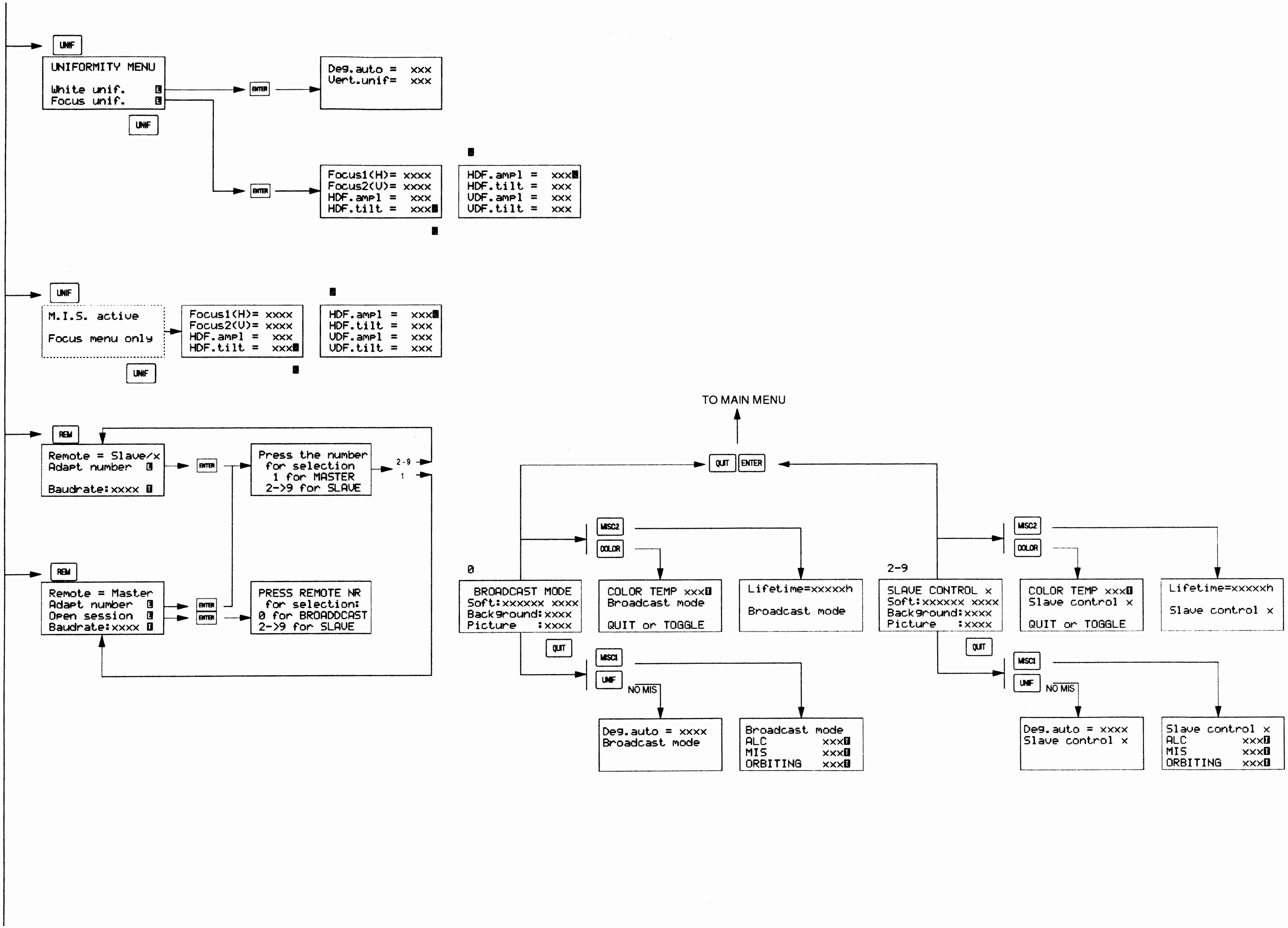


figure 4.6 : keypad menu fixed text part 3

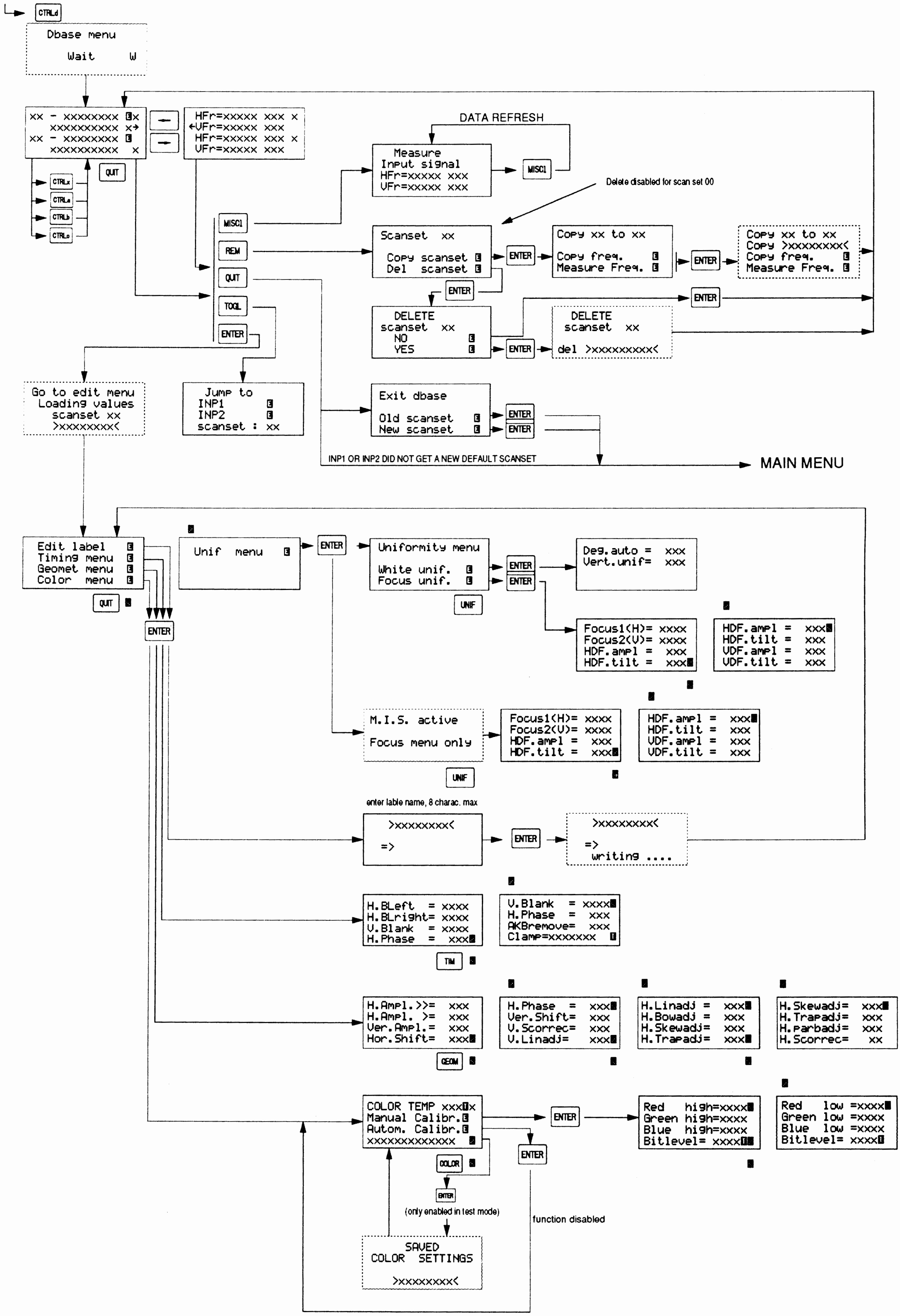


figure 4.7 : keypad menu fixed text part 4

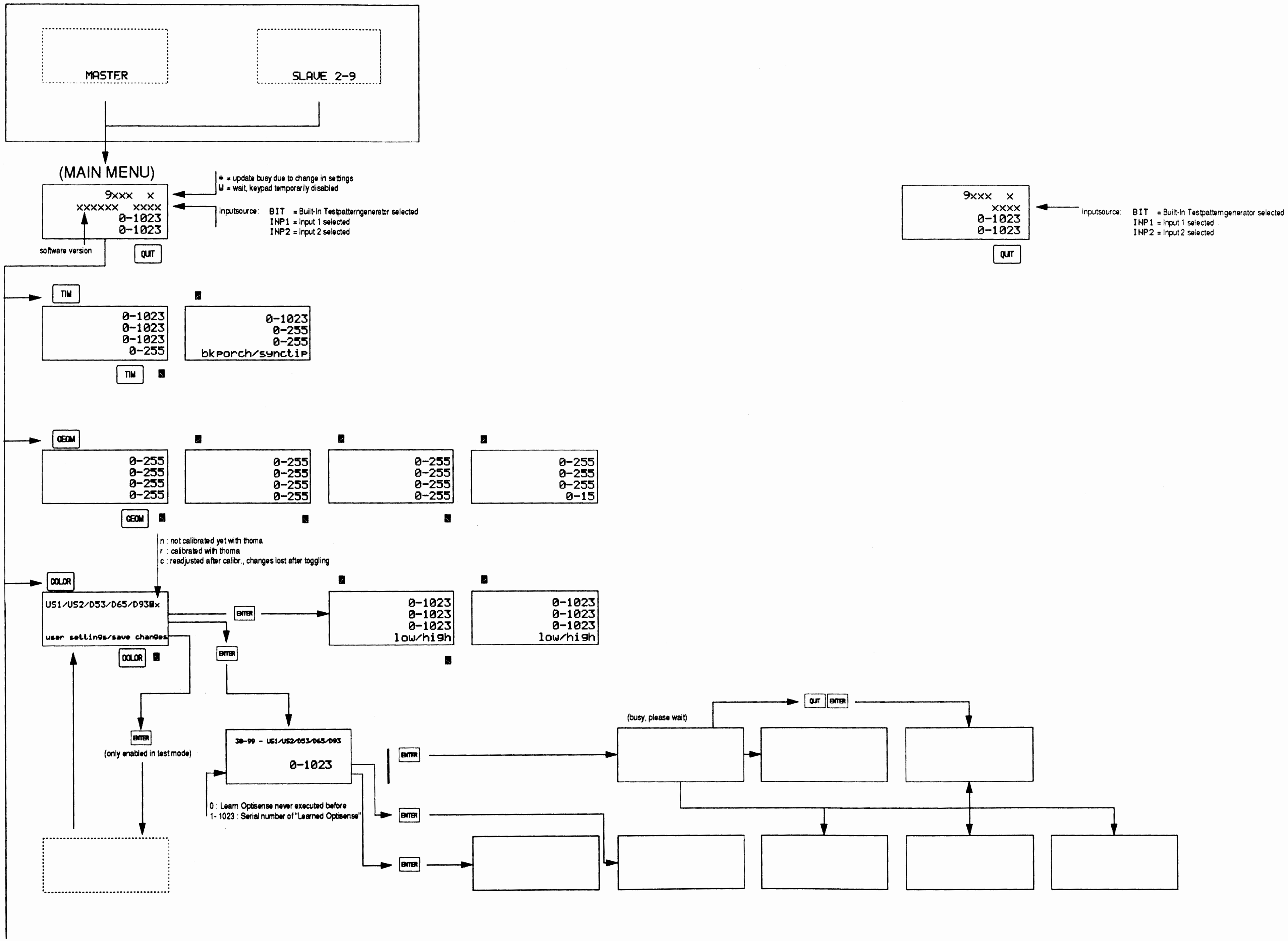


figure 4.8 : keypad parameter limits part 1

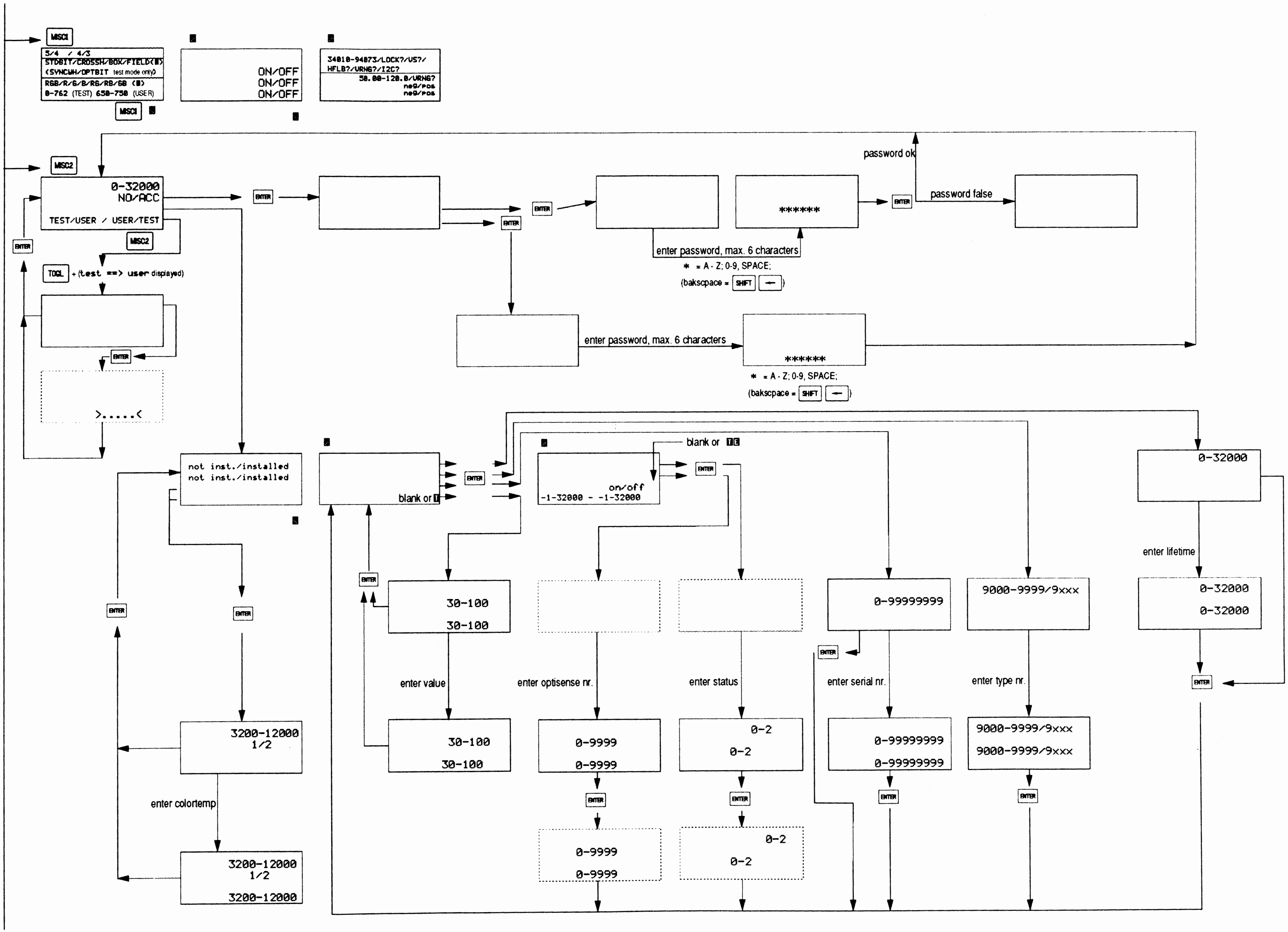


figure 4.9 : keypad parameter limits part 2

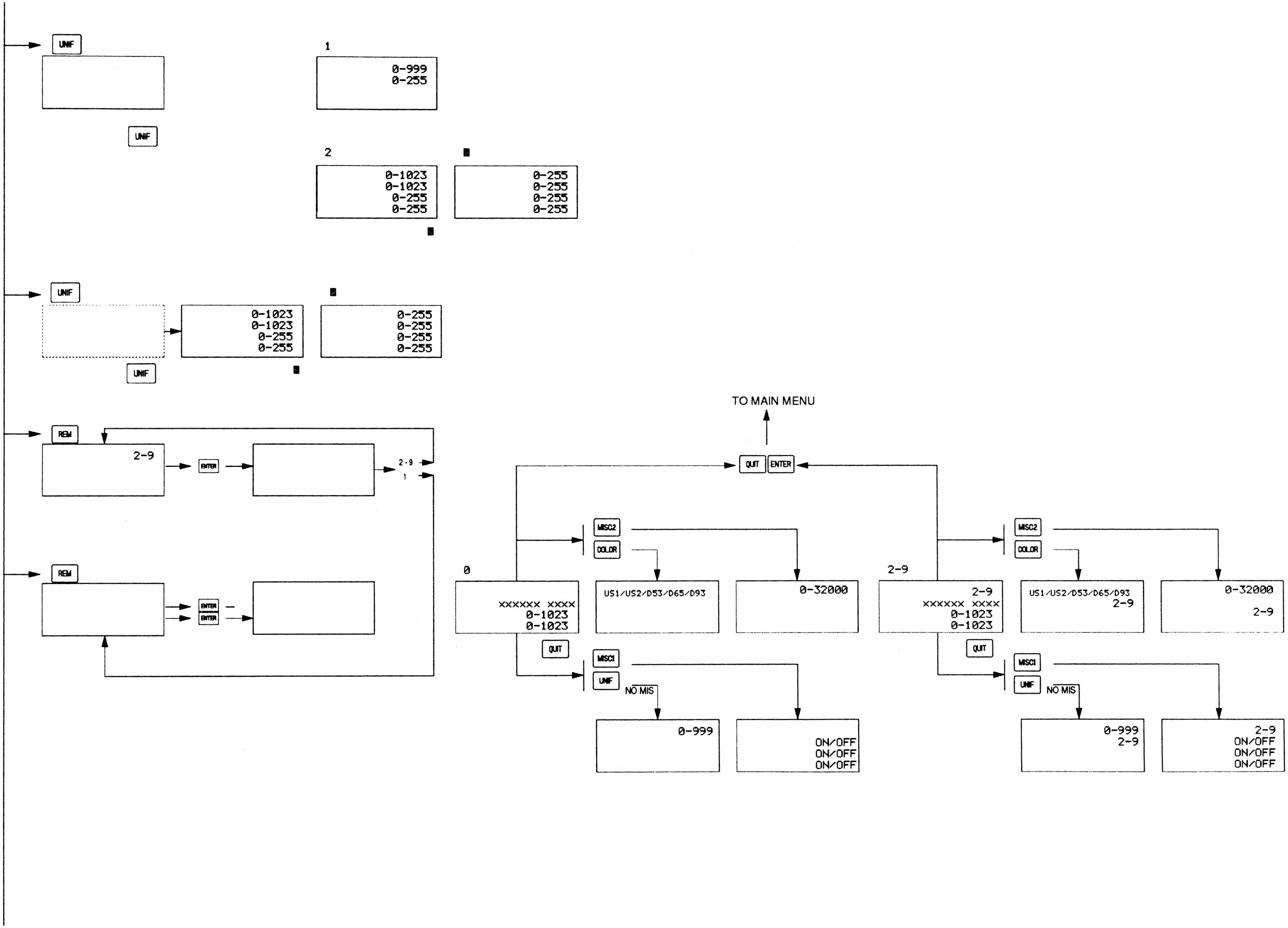


figure 4.10 : keypad parameter limits part 3

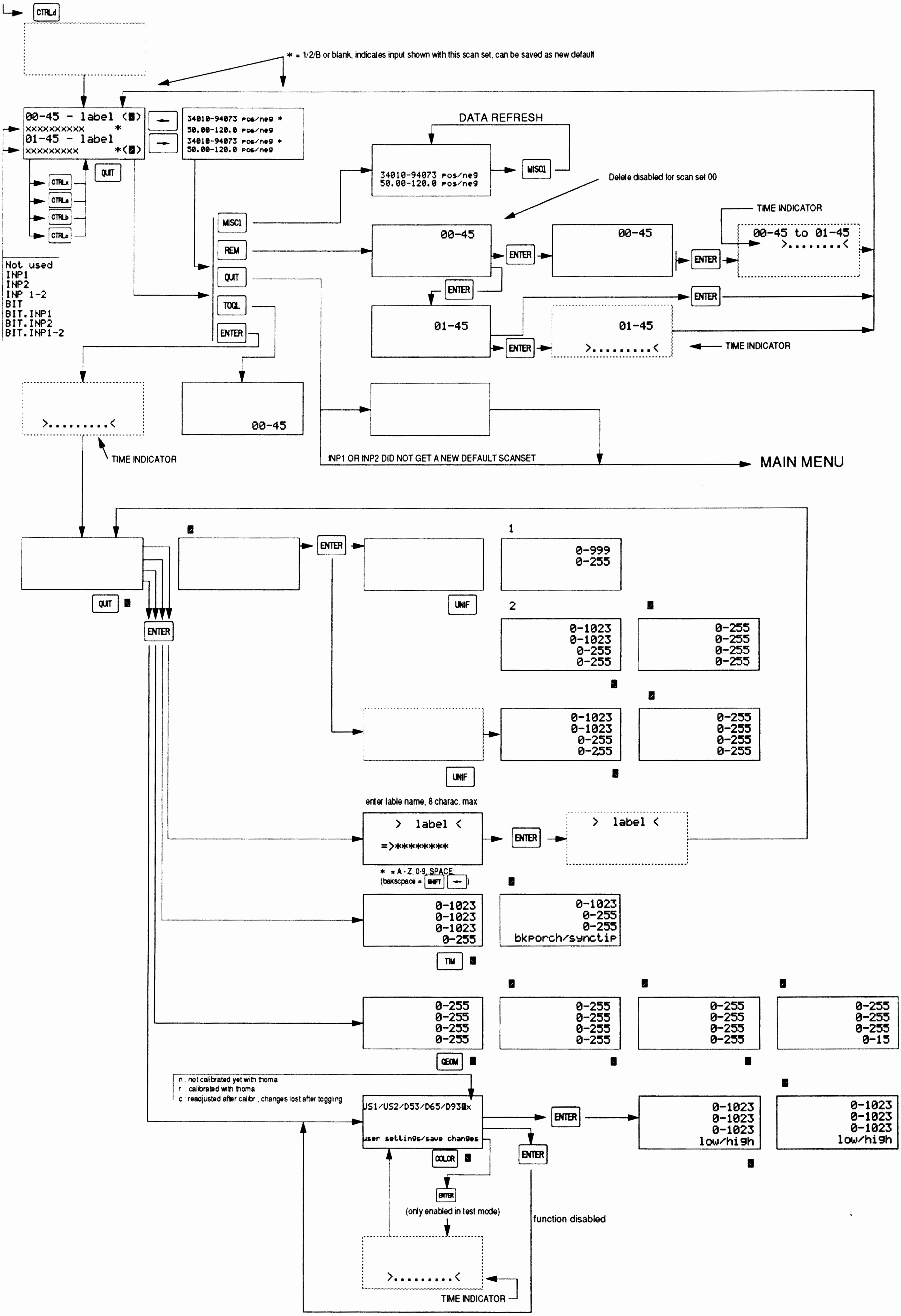


figure 4.11 : keypad parameter limits part 4

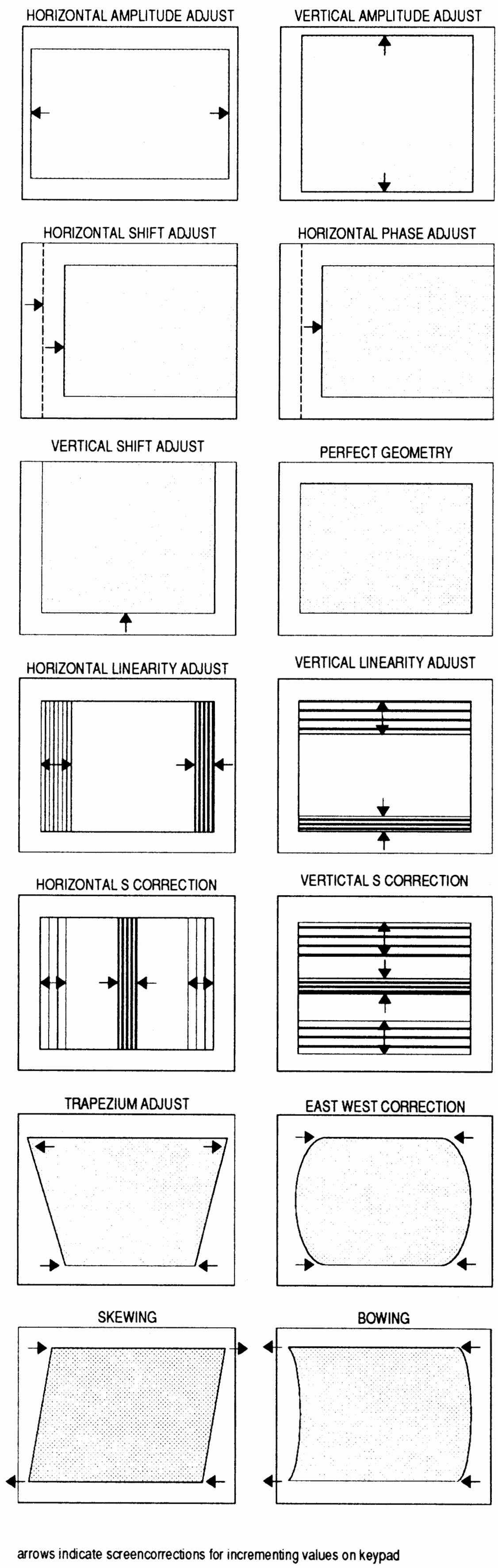


figure 4.12 : geometry

4.3 HOW TO USE THE OPTISENSE®

The Optisense is a maintenance tool specially designed for use with 9000 series monitors. Each Optisense has its own serial number, which is checked for by the software during an alignment. With the optisense, it is possible to reproduce a previously set condition of the monitor, which needs to be done if the picture tube or the RGB boards are swapped from a monitor. The Optisense is part of the "color loop", translating light output to electrical values. Therefore, the Optisense has been aligned with a monitor to determine the translation factors. It is possible to use the same Optisense for a number of monitors, but later the monitor must be re-aligned with the same Optisense used in the "Learn Optisense" sequence. Once the "Learn Optisense" was executed, the Optisense serial number will appear in the third line of the second COLOR submenu (`Automat. Calib.`); `0` indicates "not executed yet". The serial number is marked on top of the Optisense Head and on the bottom of the Optisense Head Amplifier.
If a different Optisense is used, the software will show an error on the keypad display.

Calibration of the monitor is done in three steps.

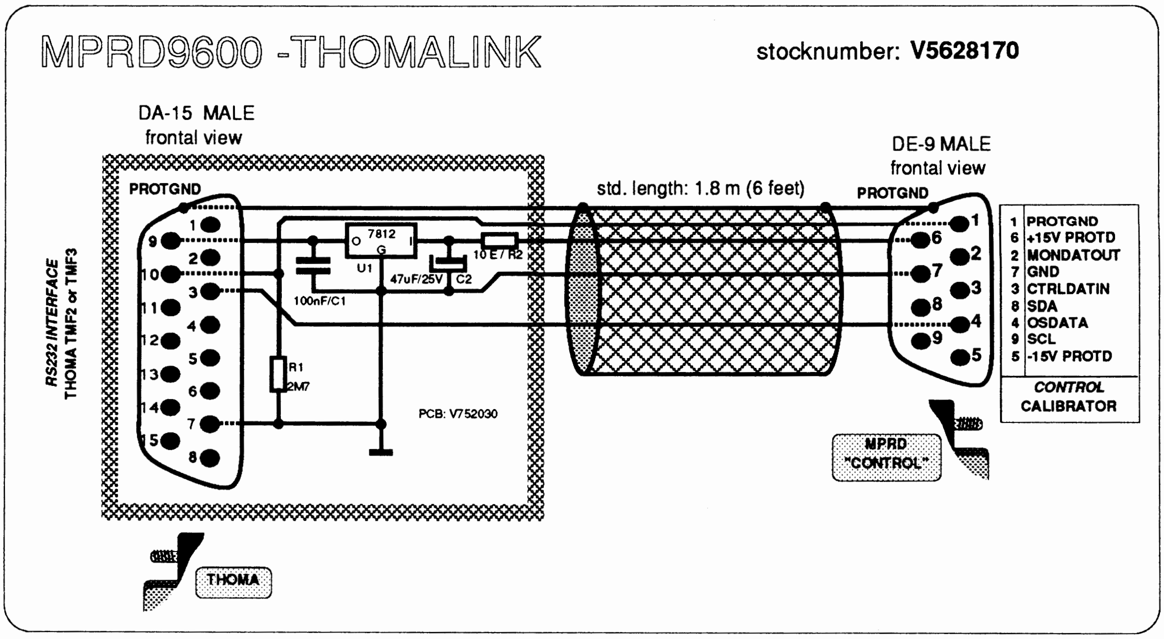
At first, the monitor needs to be aligned with an exact measuring color analyser such as the THOMA TMF 3. In that way, the color temperature of 9300 K is adjusted on the monitor and stored in the E^2PROM from the monitor (Cal with Thoma). If an Optisense is connected during this phase, an error will be shown on the display.

The second calibration run is with an Optisense connected to the monitor (Learn the OS). In this second run, the serial number of the Optisense and its scale factors are stored in E^2PROM.

FOR BEST RESULTS, THE "LEARN OPTISENSE" SEQUENCE SHOULD ONLY BE EXECUTED ON A RECENTLY CALIBRATED MONITOR.

The third and every run thereafter (Cal with OS) is recalibrating the monitor at a desired color temperature with an Optisense or a Thoma.

If in doubt about the use of the Optisense, contact the factory for additional information, prior to any experiments.



PURPOSE: to connect a Thoma TMF2 or TMF3 Colour Analyser to the MPRD9600.

DESCRIPTION: 15 pins MALE D-connector with built-in interface *(Thoma)* to 9 pinsMALE D-connector *(to frontal CONTROL-connector orCONTROL-connector at the rear of the MPRD9600, or the 9 pins D-connector on the Keypad connected to the MPRD9600).*

figure 4.13 : Thoma connection cable

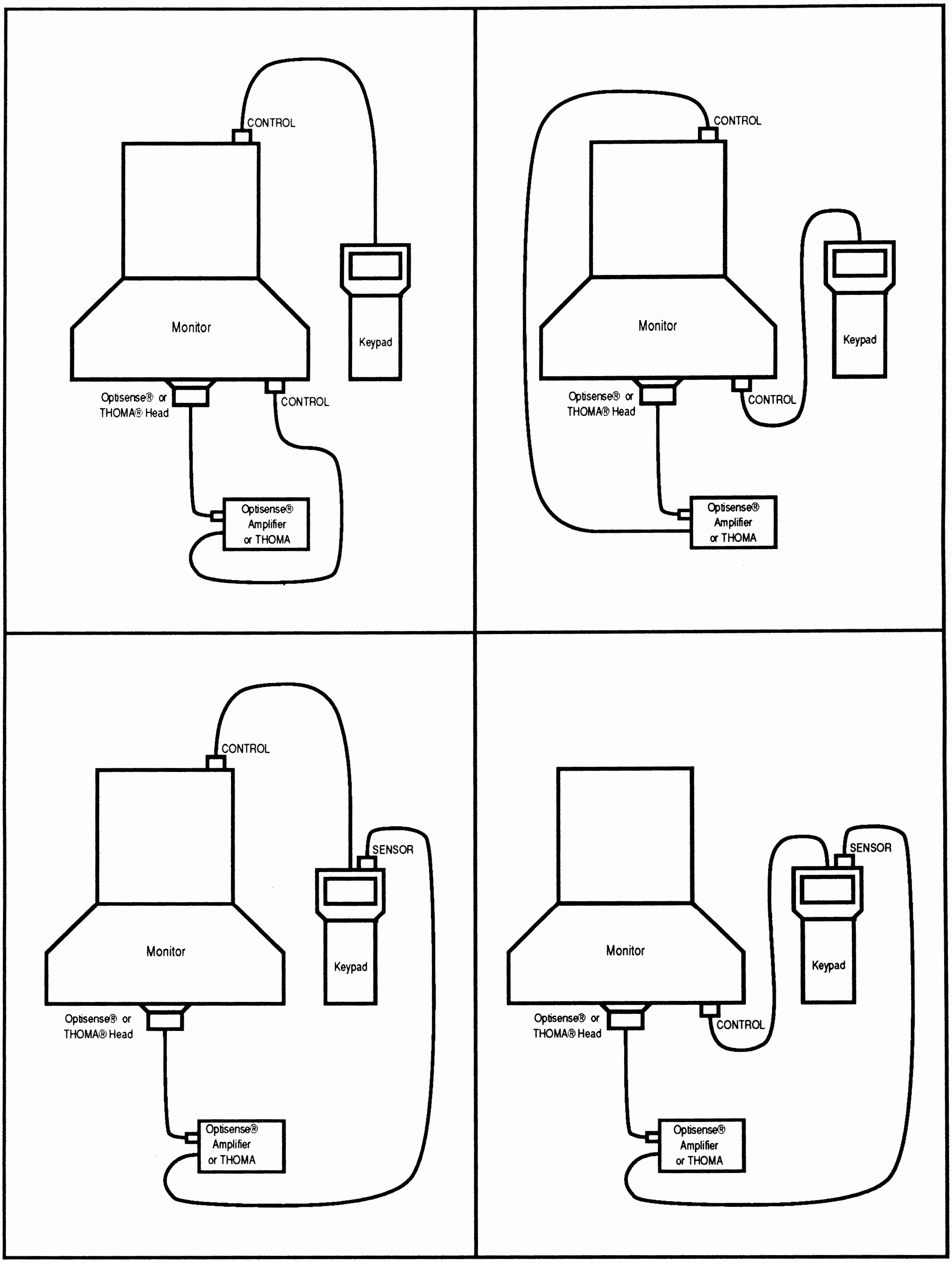


figure 4.14 : Optisense® or Thoma® connections

NORMAL FLOW FOR COLOUR CALIBRATION WITH AN OPTISENSE OR A THOMA

FACTORY

D93 IS ALIGNED WITH THOMA

(ANOTHER COLOUR TEMPERATURE COULD ALSO BE ALIGNED)

FIELD

FIRST "LEARN OPTISENSE" IF COLOUR TEMPERATURE WILL BE CALIBRATED USING AN OPTISENSE HEAD AND AMPLIFIER

	USER MODE	TEST MODE
AUTO CALIB.	RESULT OF CALIBRATION IS STORED IN REF. VALUES , ACTIVE SCAN AND SCAN SET FOR BIT	
MAN CALIB.	RESULT OF CALIBRATION IS STORED IN ACTIVE SCAN SET, 7 SECONDS LATER IT IS STORED IN THE SCAN SET OF THE ACTIVE INPUT, MANUALLY CALIBRATED PARAMETERS CAN NOT BE STORED AS REFERENCE VALUES, TOGGLING THE COLORTEMPERATURE FOR THE SELECTED INPUT WILL DELETE COLOUR SETTING OF MANUAL CALIBRATION	RESULT OF CALIBRATION IS STORED IN ACTIVE SCAN SET, 7 SECONDS LATER IT IS STORED IN THE SCAN SET OF THE ACTIVE INPUT, MANUALLY CALIBRATED PARAMETERS CAN BE STORED AS REFERENCE VALUES USING "SAVE SETTINGS"

figure 4.15 : Normal flow for colour calibration with an Optisense or a Thoma

Operation:
The Optisense is used with the keypad, it is connected to the control bus of the monitor. You can use both control bus connectors from the monitor or you can loop the Optisense on the keypad extension connector on top of the keypad. Either way, the software will detect its presence.

If a Thoma color analyser is used, the connection should be made at the control bus as well, and not on the Remote IN !!! To connect a Thoma to the MPRD9600, only use a cable as shown in figure 4.13.
The Thoma is powered via the keypad, switch on the Thoma by pressing the ON key, press the ADJ key twice. Cover the light sensor (sensor must be dark !) and press the X,Y,Z button. The LCD screen on the color analyser shows the values for X,Y and Z; all values should display zero.

Now, place the Thoma lightsensor or the Optisense Head on the CRT and cover the bezel/screen with a dark coloured cloth. Select the color menu on the keypad and proceed with the Autom. Calibr. An alternative is to press the CAL key on the keyboard, which is selected by pressing the +/o and the −/◑ key simultaneously. As soon as this selection is made, the monitor will switch to BIT input and select the white box pattern. Make sure the Optisense or the color analyser head are well aligned with the box pattern on screen.

4.4 KEYPAD CIRCUIT DIAGRAM

The optional keypad can be connected at the front control panel or at the rear of the display via the 9 pins SUBD connector. Connection with the board is obtained via the 10 pin Mini Mate plug (J2). The 9 pin SUBD (J1) connector on the rear of the keypad is used to connect the OPTISENSE box for automatic plug adjustment. The keypad is driven by the protected (with D1...D4) serial I2C bus (SCL, SDA). This feeds the whole display and is available at pin 8 of the LIGHT SENSOR connector on the keypad and the CONTROL connector on the Control panel. The supply voltage +/-15 V is supplied by connector J1. The +15 V is used to obtain the necessary +5 V via a voltage regulator 7805 U1. A 'soft start up' is also provided with R17 and C1 when plugging in the keypad.

Keyboard :

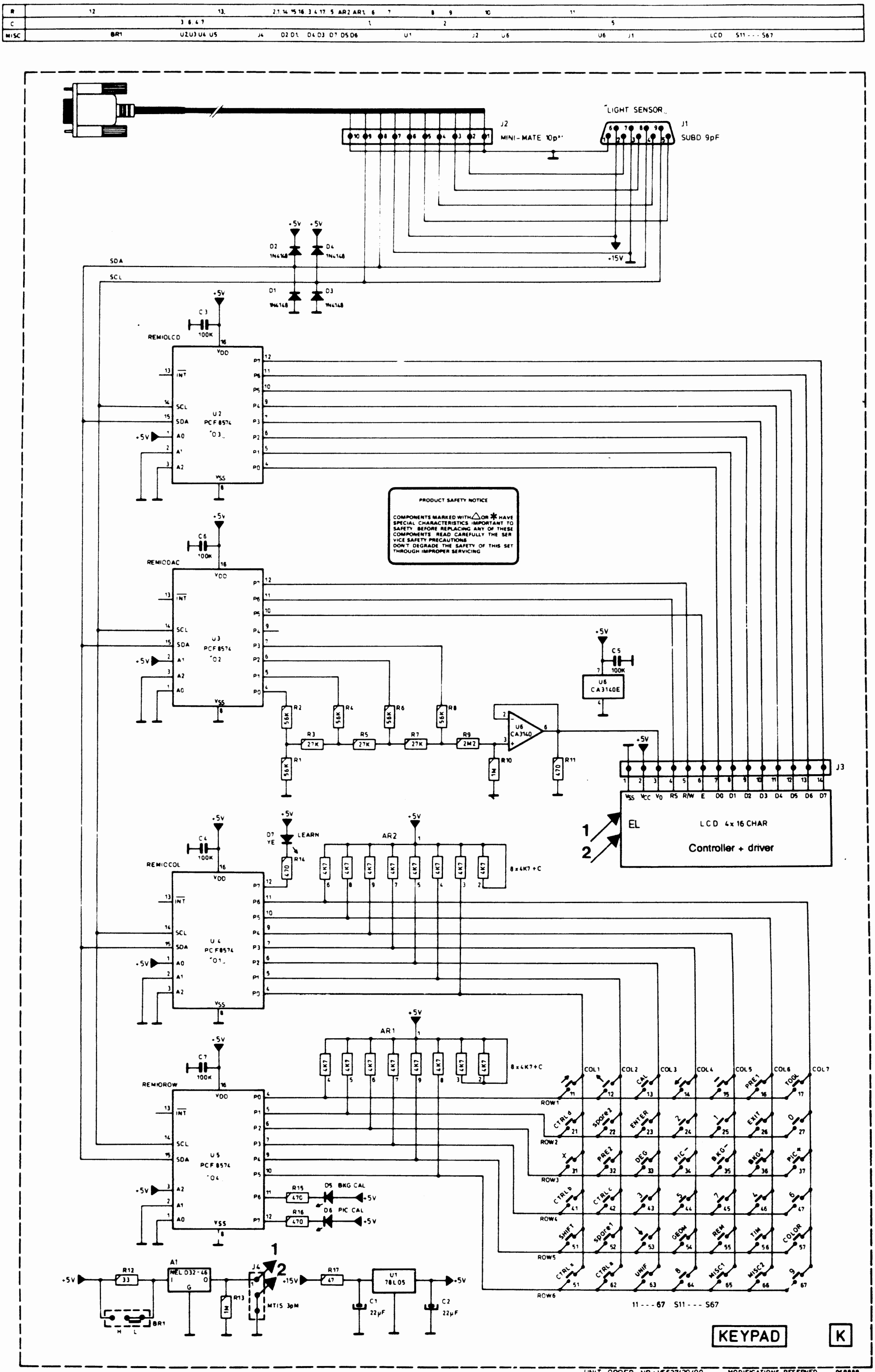
Characters and functions can be inserted via the keyboard. The keyboard has 42 buttons (S11-S67) of which 40 are used. The 7 columns and 6 rows form the keyboard matrix which is scanned by the µP via U4 (P0...P6) and U5 (P0...P5).

Display :

The LCD display receives data via U2 P0...P7 and is driven via the control lines E (P5: Select), RS (P6: Control/Data) and R/W (P7: Read/Write) via U3. The LCD intensity is software controlled with a D/A convertor built around U6, R1...R11. The LCD back lighting is performed by the inverter A1. It is switched off via J4. The resistor R13 protects the inverter if the connector to the LCD display J4 is disconnected. R12 and BR1 compensate aging of the back lighting after about 100 Hours. BR1 starts in 'L' position, after backlight aging the 'H' position can be selected.
LEDS :

Learn/Shift Led (D7): This Led is driven via U4 P7 and will light up when:
The MPRD is set in the Learn Mode during the programming of the CTRL keys.
- The keyboard is set in Shift Mode which allows two functions per key.
BKG cal Led (D5) and PICT cal Led (D6) which are driven via U5 (P6..7) light up when the Picture and Background adjustment is set in the calibrated position.

4.4.1 SCHEMATIC DIAGRAM



UNIT ORDER NR: V5627430/00 MODIFICATIONS RESERVED 060989
PCB: V751417-01

5. DIAGNOSE

5.1 HARDWARE & FAULT FINDING TREE

CAUTION

ALWAYS DISCONNECT MONITOR FROM MAINS
OR POWER SUPPLY BEFORE REMOVING COVER

ALWAYS DISCONNECT MONITOR FROM MAINS
OR POWER SUPPLY BEFORE REPLACING BOARDS

Four boards (RGB, Deflection, EHT and Processor) have a fault led; if one of these leds lights, the front panel indicator FAULT will light too (wired or function).

As a malfunction on one board can influence the behaviour of other boards, following procedure must be used to find the faulty board:

check if POWER indicator lights:	- replace power fuse if blown - replace Power Supply board (P), power up again and check for picture on screen (problem could be solved)
check if OVERTEMP indicator lights:	- monitor should function again if internal temperature goes below 70 °C - try to ensure better cooling

power up, select bit and check if testpattern appears on the screen; if it does there is something wrong with the video source or the connections between the video source and the monitor (problem is situated outside the monitor)

fault indicator on Processor board lights:	- check if switching monitor off and on again solves the problem - power down and replace Processor board (C), power up again and check for picture on screen (problem could be solved)
fault indicator on Deflection board lights: (1)	- power down and replace Deflection board (D), power up again and check for picture on screen (problem could be solved)
fault indicator on EHT board lights: (2)	- power down and replace EHT board (E), power up again and check for picture on screen (problem could be solved)
fault indicator on RGB board: (3)	- power down and replace RGB board (A), power up again and check for picture on screen (problem could be solved)

If replacing boards C, D, E and/or A did not solve the problem, replace Power Supply board (P) even if Power indication front panel lights, start again from "fault indicator on Processor board lights".

Power Supply board hicking will probably be caused by faulty Deflection board or a power circuit overload.

(1) can be caused by Power Supply board malfunction or on-board failure
(2) can be caused by Power Supply board, Processor board malfunction, Deflection board malfunction, overtemperature or on-board failure
(3) can be caused by Power Supply board, Processor board malfunction, Deflection board malfunction, EHT board malfunction, overtemperature or on-board failure

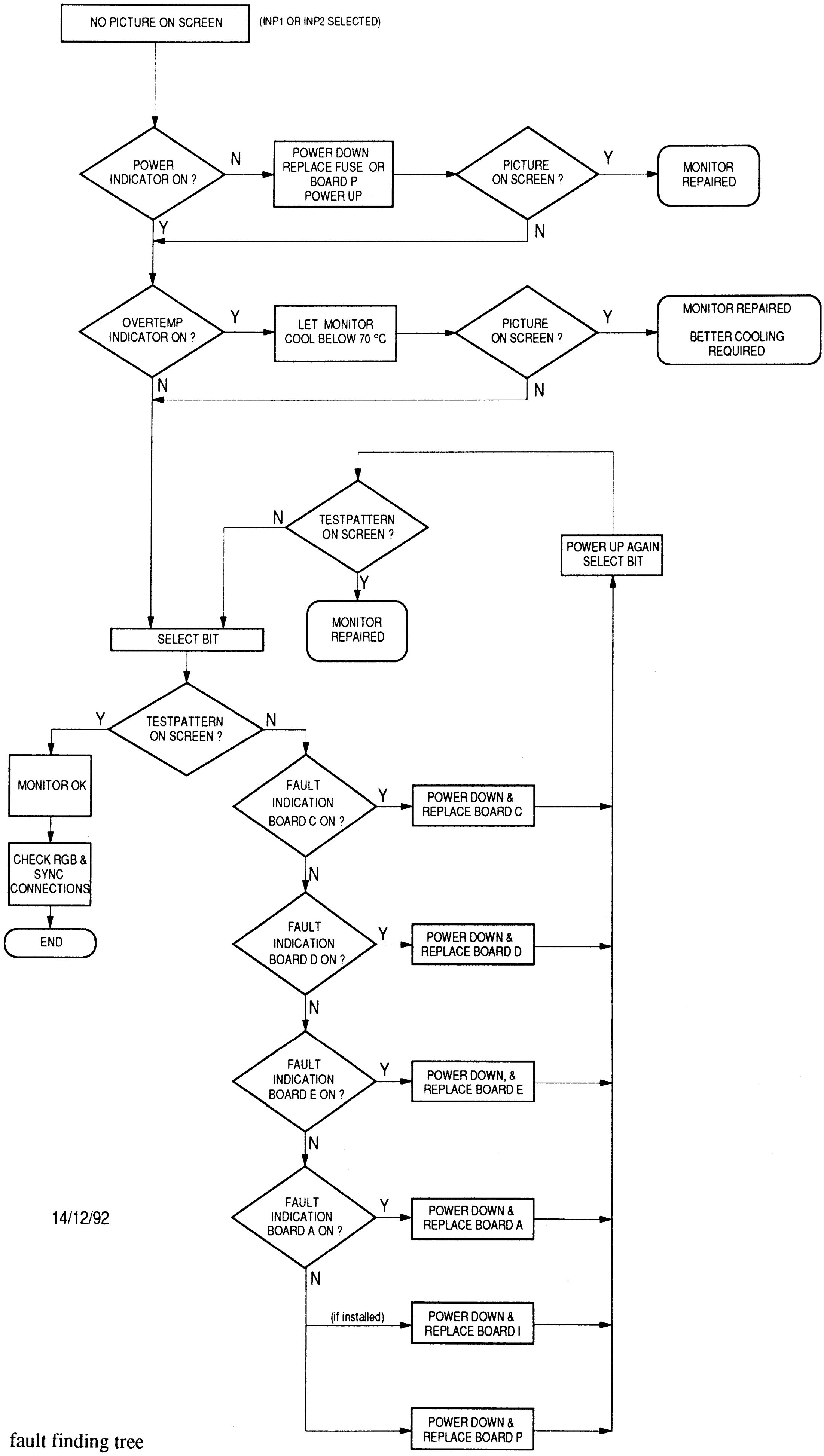


figure 5.1 : fault finding tree

5.2 SOFTWARE

For software diagnose, a keypad has to be connected to the monitor.
In part 4.2.3 of this manual all warning and error messages are described in detail.

6. ADJUSTMENTS

REQUIRED TEST EQUIPMENT

- oscilloscope	bandwidth > 150 MHz,
- RGB generator	line rate 100 KHz, clock rate 150 MHz,
- colour analyser	Thoma TMF3 or better,
- digital multimeter	3 1/2 digit min.

6.1 DEFLECTION BOARD

The only component that can be adjusted is L502. This coil is factory adjusted and only has to be readjusted after replacing C61, D509, R50, R59 or U12.

L502 also has to be readjusted if the PLL is unable to lock over the complete frequency range (exceptional).

Procedure:

- Switch off the display.
- Select BIT.
- Connect the + lead of a digital voltmeter to TP515, connect the common to TP529
- For a 32 - 64KHz deflection board, adjust L502 for a meter reading of 7,5V.
- For a 40 - 80KHz deflection board, adjust L502 for a meter reading of 3,9V.
- For a 47 - 94KHz deflection board, adjust L502 for a meter reading of 3,9V.
- If available, connect the lowest and highest specified scan to monitor and check if it locks.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

6.2 EHT BOARD

Be sure of a good earth connection to prevent electrical shocks

DO NOT TOUCH THE SEALED POTENTIOMETER,
IT IS FACTORY SET AND NEEDS NO ADJUSTMENT

Vg2 adjustment

After 10 minutes warm-up, measure the voltages (against electrical ground, 0V) with a DC-voltmeter on TP1, TP2 and TP3 of the AKB-module (see section 2, figure 2.4).
Connect the DC-voltmeter to the testpoint with the highest voltage and adjust P2 (on the EHT board) for 110 Vdc reading on the DC-voltmeter.

6.3 PROCESSOR BOARD

See chapter 2, figure 2.35 for PCB component side layout.

RESET

Board inserted in monitor (on extender board)
- Put P200 in its mid position.

+10VREF

Measure with DMM on TP 211 and adjust with P201 for (10.000 ± 0.002)V.

DAC GAIN

Make sure the "HBLSTOP (HBL LEFT)" parameter is set to the value 1000 using the Keypad ("TIM" menu).
Measure with DMM on TP 216 and adjust with P204 for (10.000 ± 0.002)V.

AMBLS AMP

Board inserted in monitor (equiped with ALC control panel version only)
Put the Processor board on an extender board so that P202 (near the "Remote" subD connectors) is accessible during normal operation of the monitor. Don't forget to reconnect the three coax cables for the BIT generator.
- Make sure the front face of the monitor is illuminated with 4000 lux.
- Measure with DMM on TP 213 and adjust with P202 for (10.000 ± 0.050)V.

The adjustment of "AMBLSENS AMP" makes possible that the light output of the monitor **with ALC off** is equal to the light output of that same monitor **with ALC on and illuminated with 4000 lux** in case the PICTURE (Contrast) and BACKGROUND (Brightness) controls are calibrated in both cases.

BIT GENERATOR GAIN

Measurement conditions:

Put the Processor board on an extender card so that P203 and P205 (near the 10-bit DAC, U221) are accessible during normal operation of the monitor. Don't forget to reconnect the three coax cables for the BIT generator as they terminate the three BIT output drivers.

- Select "BIT" as an (internal) input source (instead of INP1 or (INP2)] with the Keypad.
- Select the BIT Generator control menu on the Keypad (MISC1).
- Select "BOX" signal.
- Set "REFWH" parameter in the control menu to 700 mV.
- Measure with oscilloscope (100 mV/DIV, DC-coupling, 2µs/DIV) on TP209.

Adjustment:

* Adjust with P203 for a black-to-white box signal level of (1400 ± 10)mVpp.

6.4 POWER SUPPLY BOARD

Mains Voltage Adjustment.

To set the AC mains voltage, disconnect the display from the mains, remove the top cover (34 screws), unscrew the two screws fixing the switch mode power supply (left top and center bottom).
Locate the jumper (selecting the mains voltage) on the switch mode power supply PCB (see figure 2.39).

Replace the fuse in the fuseholder, 2 A SLOW for 220V AC, 4A SLOW for 115V AC.
Fuses are supplied with the MPRD 9600 Monitor and Maintenance Kit.

Adjustment of the power supply output voltages.

All voltages are adjusted simultaneously with one trimmer.

110/220 V AC VERSION

- Switch off the display.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Switch on the display.
- Connect a DVM between testpoint TP8 (GND) and TP6 (+6.3V). Adjust P1 for a meter reading of 6.0 VDC.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

28 V DC VERSION

- Switch off the display.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Switch on the display.
- Remove top cover and locate the power supply board.
- Connect a DVM between testpoint TP208 (GND) and TP206 (+6.3V). Adjust P200 for a meter reading of 6.0 VDC.
- Switch off the display.
- Reinstall cover, tighten 34 screws.

Replacing a blown fuse.

110/220 V AC VERSION

Fuseholder is mounted on heatsink of power supply module.
Switch off display before replacing fuse.

USE A 2A SLOW FUSE ONLY FOR 220 V AC
USE A 4A SLOW FUSE ONLY FOR 110 V AC

28 V DC VERSION

Fuseholder is mounted on board P.

- Switch off the display before replacing fuse.
- Unscrew the 34 screws fixing the top cover; remove cover.
- Replace fuse.
- Reinstall cover, tighten 34 screws.

USE A 16A FAST FUSE ONLY !!!

7. OPTICAL FILTER REPLACEMENT

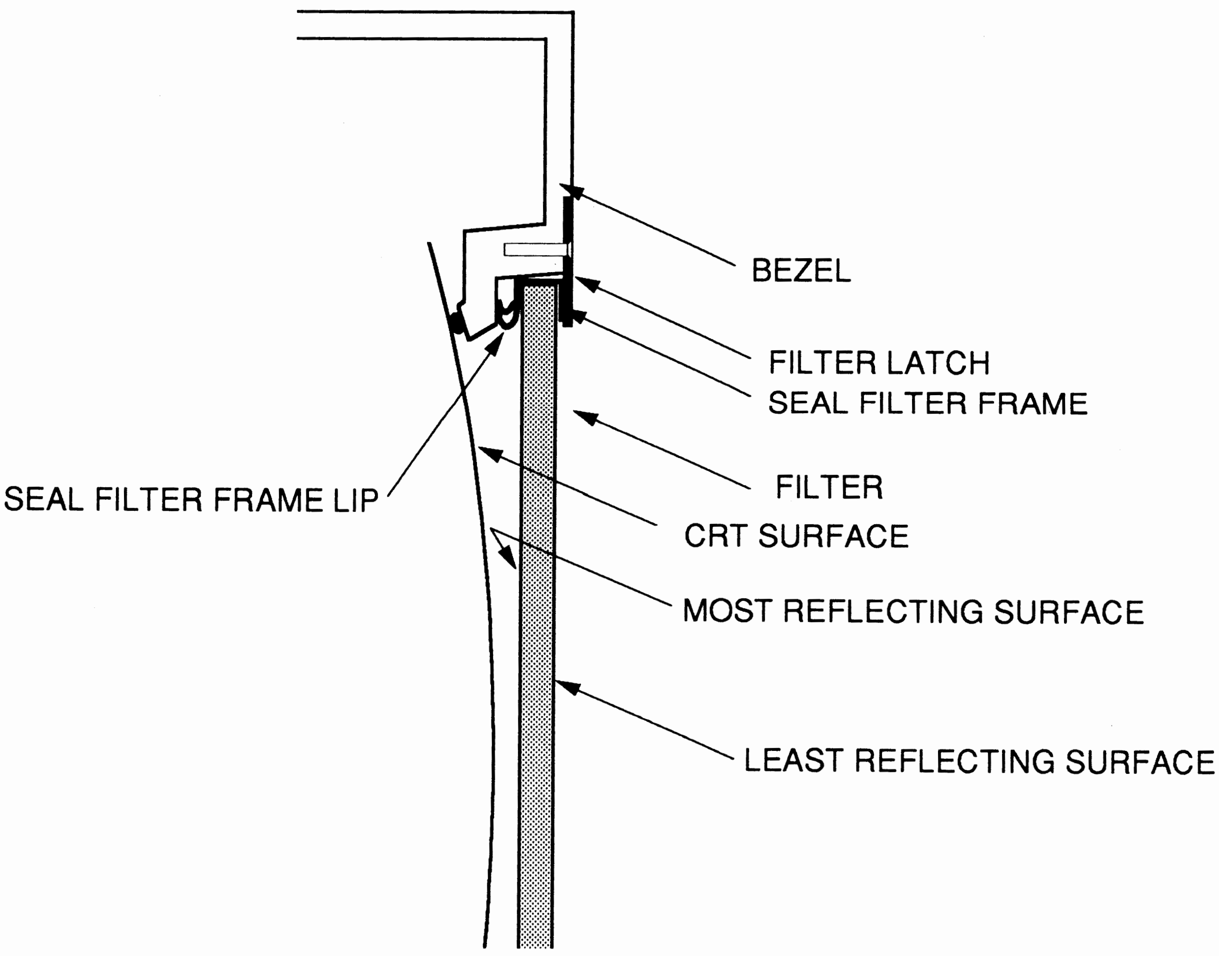
When replacing the filter, it is advisable to replace the seal filter frame as well.

Remove the upper filter latch and unscrew the screws holding the lower filter latch and remove the filter. If filter was smashed, also remove lower filter latch and carefully remove all the remaining filter parts.
Position the lower filter latch, reinsert the screws but don't tighten.

Clean the CRT and inner filtersurface with a soft cloth and isopropyl alcohol.

Carefully position the seal filter frame over the filter edges. Avoid touching the filter surface.
Make sure that the lip of the seal filter frame is placed at the most reflecting surface of the filter.
Hold the filter vertically with the most reflective surface to the CRT; position the underside of the filter beyond the lower filter latch. Sustain the filter while mounting the upper filter latch, tighten the screws crosswise.

	OPTICAL FILTER	SEAL FILTER FRAME	FILTER LATCH
17"	V603598	V6035954	V603690
20"	V6005273	V6035953	V603691



8. LIST OF ABBREVIATIONS

SINGULAR

...A...	...Analog...
...ACK...	...ACKnowledge
...AD...	...multiplexed Address & Data...
...ADD...	...ADDress...
...ADJ...	...ADJust (voltage)...
...AKB...	...Automatic Kinescope Biasing...
...AMB...	...AMBient...
...AMP...	...AMPlifier...
...AMPL...	...AMPLitude...
...AN...	...ANode...
...AUX...	...AUXiliary...
...AX...	...AXial...
...B...	...Blue...
...BKG...	...BacKGround...
...BL...	...BLanking...
...BOW...	...BOWing...
...BP...	...BackPorch
...C...	...Current... or ...Composite...
...CA...	...CAthode...
...CHAS...	...CHASsis...
...CL...	...CLamp... or ...CoiL...
...CLK...	...CLocK...
...COL...	...COLumn...
...CON...	...CONnector...
...CONV...	...CONVergence...
...CORR...	...CORRection...
...CTRL...	...ConTRoL
...D...	...Digital...
...DEFL...	...DEFLection...
...DEG...	...DEGauss...
...DF...	...Dynamic Focus...
...DLYD...	...DElaYeD
...DEMUX...	...DEMUltipleXer...
...DET...	...DETector...
...DIAGN...	...DIAGNose...
...DIS...	...DISable...
...DLY...	...DeLaY...
...DRVR...	...DRiVeR...
...DTA...	...DaTA...
...DYN...	...DYNamic...
...EHT...	...Extra High Voltage...
...EN...	...ENable...
...EXT...	...EXTernal...
...F...	...Focus... or ...Frequency...
...FDB...	...FeeDBack...
...FEEDB...	...FEEDBack...
...FIL...	...FILament...
...FIFF...	...DIFFerential...
...FLYB...	...FLYBack...
...FP...	...FrontPorch
...G...	...Green...
...GEN...	...GENeral...

...GND...	...GrouND...
...H...	...Horizontal...
...HI...	...HIgh...
...HW...	...HardWare...
...IC...	...Integrated Circuit...
...ICON...	...InterCONnect(ion)
...IN...	...INput...
...INH...	...INHibit...
...INIT...	...INITial(isation)...
...INT...	...INTernal...
...L...	...Light...
...LIN...	...LINearity...
...LO...	...LOw...
...LVL...	...LeVeL...
...M...	...Mixed... or ...Measure(ment)...
...MAN...	...MANual...
...MAX...	...MAXimum...
...MIN...	...MINimum...
...MOD...	...MODulator...
...MUX...	...MUltipleXer...
...N...	...Not-... (inverted or active low)
...NEG...	...NEGative...
...OPT...	...OPTional...
...OUT...	...OUTput...
...P...	...Pulse...(0-5 V)
...P15...	...Pulse...(0-15 V)
...PARAB...	...PARABola
...PATT...	...PATTern...
...PIC...	...PICture...
...POL...	...POLarity...
...POS...	...POSitive...
...PRES...	...PRESent...
...PRIM...	...PRIMary...
...PROT...	...PROTection...
...PROTD...	...PROTecteD...
...PWM...	...Pulse Width Modulator...
...R...	...Red...
...RCVR or RX...	...ReCeiVeR
...RDY...	...ReaDY...
...REF...	...REFerence...
...REM...	...REMote...
...REQ...	...REQuest...
...RET...	...RETurn...
...RETR...	...RETRace...
...RX...	...Receive(r)...
...S...	...Sync...
...SCORR	...SCORRection...
...SEC...	...SECundary...
...SEL...	...SELect...
...SENS...	...SENSor...
...SEP...	...SEParated...
...SFTY...	...SaFeTY...
...ST...	...SyncTip
...STRT...	...STaRT...
...SW...	...SoftWare...
...SYS...	...SYStem...
...T...	...Transformer...
...TEMP...	...TEMPerature...
...TR...	...TRigger...

...TX...	...Transmit(ter)...
...V...	...Vertical... or ...Voltage...
...VAL...	...VALue...
...VAR...	...VARiable...
...VID...	...VIDeo...
...WH...	...WHite...
...WHUN...	...WHite Uniformity...
...XTND...	...EXTeNDed...
...XMTR or TX...	...TransMiTteR...
...Y...	...Yoke...

*	scaled adjust voltage (ex.: GLOLADJ*, VLINADJ*, ...) or variant version of a particular signal
/	or
oc	**o**pen **c**ollector line
int	**int**errupt line
uC or µC	microController
uP or µP	microProcessor
J.. / ..	connector or Jack / pin ..
name1 P - name2 P	ex.: NMBLP-AKBBLP (name1 = NMBL, name2 = AKBBL) active low Mixed BLanking Pulse, except during AKB BLanking time

Note1: all **digital** signals (control lines, info lines, timing pulses, ...) are 0-5 V signals, except otherwise noticed by a suffix indicating the voltage level (f.e.: ...P15 is a timing pulse with levels between 0 and 15 V).

Note2: all **ADJust voltages** are 0...+10 V analog control signals, except otherwise noticed by an asterisk (*).

COMPOUND

A1-15	Address line 1...15
ACIA	Asynchronous Communication Interface Adaptor
ADJ	ADJust voltage
AKBBLP	AKB BLanking Pulse
AKBCLP	AKB CLaMPing Pulse
AKBMP	AKB Measuring Pulse
AKBOFF	Automatic Kinescope Biasing OFF
AKBREMOVADJ	AKB REMOVal ADJust voltage
AMBLSENS	AMBient Light SENSor
AMV	Astable MultiVibrator
AXWHUNADJ	AXial WHite UNiformity ADJust voltage
AXWHUNCL	AXial WHite UNiformity CoiL
BAKBBLP	Blue AKB BLanking Pulse
BAKBM	Blue AKB Measurement (signal)
BAUD0-1	BAUD rate 0-1 selection lines
BBIT	Blue BIT (signal)
BBITSEL	Blue BIT (signal) SELect
BCAGND	Blue CAthode GrouND

BCL	Beam Current Limit
BERR	Bus ERRor
BHILADJ	Blue HIghLight ADJust voltage
BIASP	BIAS Pulse
BICONHI	Blue InterCONnection HIgh
BICONLO	Blue InterCONnection LOw
BIT	Built-In Test
BITLVLADJ	BIT LeVeL ADJust voltage
BKG	BacKGround (brightness) control
BLOLADJ	Blue LOw Light ADJust voltage
BOPT	Blue OPTional module signal
BP	Back Porch
BPCLSEL	Not-Back Porch (/sync tip) Clamp SELect
BPICADJ	Blue PICture ADJust voltage
BSUELIMADJ	Blue Set Up ELIMination ADJust voltage
CAL	CALibrated
CCID	Colour Calibrated Imaging Display
CHASGND	CHASsis GrouND
CLK	CLocK
CLP	CLamping Pulse
CLPPRES	CLamping Pulse PRESent
CPU	Central Processing Unit
CS	Composite (H & V) Sync
CTRLDATIN	ConTRoL DATa INput
CY	CYan or Convergence Yoke
D0-15	Data line 0...15
DAC	Digital-to-Analog Convertor
DAC0-9	DAC line 0...9
DACREFADJ	DAC REFerence ADJust voltage
DEGCL	DEGauss CoiL
DEGENP	DEGauss ENable Pulse
DEMUX	DeMUltipleXing (-er)
DEMUXA0-3	DEMUltipleXer Address line 0...3
DIFFINP	DIFFerential INPut (submodule)
DM	Data Mode
DYNFOCUS	DYNamic FOCUS
E	E clock
E2PROM (EEPROM)	Electricaly Eraseable Programmable ROM
ECLOCK	Enable CLOCK
EHT	Extreme High Tension
EPROM	Eraseable Programmable ROM
FF	Flip-Flop
FILHI	FILament HIgh
FILLO	FILament Low
FOCUS1	FOCUS 1 voltage (VG3-1)
FOCUS1ADJ	FOCUS 1 ADJust voltage
FOCUS2	FOCUS 2 voltage (VG3-2)
FOCUS2ADJ	FOCUS 2 ADJust voltage
FP	Front Porch
G	Green
GAKBBLP	Green AKB BLanking Pulse
GAKBM	Green AKB Measurement (signal)
GBIT	Green BIT (signal)
GBITSEL	Green BIT (signal) SELect
GCAGND	Green CAthode GrouND
GENDIAGN	GENeral DIAGNostic (line)
GHILADJ	Green HIghLight ADJust voltage
GICONHI	Green InterCONnection HIgh

GICONLO	Green InterCONnection LOw
GLOLADJ	Green LOw Light ADJust voltage
GOPT	Green OPTional module signal
GPICADJ	Green PICture ADJust voltage
GSUELIMADJ	Green Set Up ELIMination ADJust voltage
HAMPLADJ	Horizontal AMPLitude ADJust voltage
HBLADJ	Horizontal BLanking ADJust voltage
HBLSTOPADJ	Horizontal BLanking STOP ADJust voltage
HBLSTRTADJ	Horizontal BLanking STaRT ADJust voltage
HBOWADJ	Horizontal BOWing ADJust voltage
HDEFLFEEDB	Horizontal DEFLection FEEDBack signal
HDEFLHI	Horizontal DEFLection HIgh
HDEFLLO	Horizontal DEFLection Low
HDEFLOK	Horizontal DEFLection OK!
HDFAMPLADJ	Horizontal Dynamic Focus AMPLitude ADJust voltage
HDFTILTADJ	Horizontal Dynamic Focus TILT ADJust voltage
HDY	Horizontal Deflection Yoke
HFLYBINFO	Horizontal FLYBack INFOrmation
HFLYBP	Horizontal FLYBack Pulse
HLINADJ	Horizontal LINearity ADJust voltage
HPARABADJ	Horizontal PARABola ADJust voltage
HPHASEADJ	Horizontal PHASE ADJust voltage
HPOSPOL	Horizontal Positive Polarity
HS/CS	Horizontal Sync or Composite Sync (input)
HS/CSICON	Horizontal Sync or Composite Sync InterCONnection
HS/CSP	Horizontal Sync or Composite Sync Pulse
HSCORRSEL0-3	Horizontal S-CORRection SELect 0...3
HSHIFTADJ	Horizontal SHIFT ADJust voltage
HSKEWADJ	Horizontal SKEWing ADJust voltage
HSP	Horizontal Sync Pulse
HTRAPADJ	Horizontal TRAPezium ADJust voltage
HVDFPARAB	Horizontal & Vertical Dynamic Focus Parabola
HWBLANK	HardWare BLANK
HWEHTDIS	HardWare EHT DISable
I2C or IIC	Inter Integrated Circuit bus
IMB	Inter Monitor Bus
IRQ	Interrupt ReQuest
LCD	Liquid Crystal Display
LD	Load Data
LPF	Low Pass Filter
MA	MAgenta
MBLP	Mixed BLanking Pulse
MIS	Magnetic Immune System
MISCL1	MIS CoiL 1
MISCL2	MIS CoiL 2
MISSEL	MIS SELect
MMV	Monostable MultiVibrator
MONDATOUT	MONitor DATa OUTput
MPRD	Multi Purpose Rugged Display
MRX/STX-A (+)	Master Receive or Slave Transmit positive
MRX/STX-B (-)	Master Receive or Slave Transmit negative
MTX/SRX-A (+)	Master Transmit or Slave Receive positive
MTX/SRX-B (-)	Master Transmit or Slave Receive negative
MVPEAKP	Mixed Vertical PEAK Pulse
N...	Not-... (active low signal or inverted pulse)
NAKBBLP	Not-AKB BLanking Pulse
NAKBMP	Not-AKB Measuring Pulse
NAS	Not-Address Strobe

NC	Not Connected
NC/NTBU	Not Connected and Not To Be Used
NCTS	Not-Clear To Send
NDCD	Not-Data Carrier Detect
NDEGREQP	Not-DEGauss REQuest Pulse
NDEMUXEN0-1	Not-DEMUltipleXer ENable line 0...1
NDRVR422EN	Not-Driver (RS) 422 ENable
NDTACK	Not-Data Transfer ACKnowledge
NE2PROMSEL	Not-E2PROM SELect
NEPROMSEL	Not-EPROM SELect
NIACK	Not-Interrupt ACKnowledge
NIOSEL	Not-Input/Output SELect
NIPL0-2	Not-InterruPt Line 0...2
NIRQ	Not-Interrupt ReQuest
NLDS	Not-Lower Data Strobe
NMANDEGP	Not-MANual DEGauss Pulse
NMBLP	Not-Mixed BLanking Pulse
NMTXSEL	Not-Master Transmit SELect
NPERI8SEL	Not-Peripheral 8 (bit) SELect
NPIAIRQA	Not-PIA IRQ A(side)
NPIAIRQB	Not-PIA IRQ B(side)
NR/W	Not-Read / Write
NRES	active low RESet
NRTS	Not-Request To Send
NSCLDRIVE	Not-Serial CLock DRIVEr
NSDADRIVE	Not-Serial DAta DRIVEr
NSRAMSEL	Not-Static RAM SELect
NSRX/MRXSEL	Not-Slave Receive / Master Receive SELect
NSTXSEL	Not-Slave Transmit SELect
NSYSIRQP	Not-SYStem Interrupt ReQuest Pulse
NTBU	Not To Be Used
NUDS	Not-Upper Data Strobe
NVDEFLOK	Not-Vertical DEFLection OK
NVMA	Not-Valid Memory Address
NVPA	Not-Valid Peripheral Address
NWE	Not-Write Enable
OPTBIT	OPTional BIT (signal)
OPTBITSEL	OPTional BIT SELect
OPTRXDTA	OPTional module Receive DaTA line
OPTSEL	OPTional module SELect
OPTTXDTA	OPTional module Transmit DaTA line
OS	Optical Sensor (OPTISENSE®)
OSC	OSCillator
OSDATA	Optical Sensor DATA
PATTSEL0-2	PATTern SELect 0...2
PIA	Peripheral Interface Adaptor
PIC	PICture (contrast) control
PLL	Phase Locked Loop
PR1 or PRE1	PREset 1
PR2 or PRE2	PREset 2
PROTD	PROTecteD
PROTGND	PROTective GrouND
PWMTRP	Pulse Width Modulator TRigger Pulse
R/NW	Read / Not-Write
RAKBBLP	Red AKB BLanking Pulse
RAKBM	Red AKB Measurement (signal)
RAM	Random Access Memory
RBIT	Red BIT (signal)

RBITSEL	Red BIT (signal) SELect
RCAGND	Red CAthode GrouND
RD	Receive Data
REFSEL0-1	REFerence SELect line 0...1
REMIO	REMote Input/Output I2C interface IC
REMRXTXCLK	REMote Receive Transmit CLocK
RHILADJ	Red HIghLight ADJust voltage
RICONHI	Red InterCONnection HIgh
RICONLO	Red InterCONnection LOw
RLOLADJ	Red LOw Light ADJust voltage
ROM	Read Only Memory
ROPT	Red OPTional module signal
RPICADJ	Red PICture ADJust voltage
RR	Receiver Ready
RSUELIMADJ	Red Set Up ELIMination ADJust voltage
SCL	Serial CLock (I2C)
SD	Send Data
SDA	Serial DAta (I2C)
SDI	Serial Data Input
SOG	Sync On Green
SRAMP	S corrected RAMP
ST	Sync Tip
STRTUP	STaRT-UP
STX/MRX	Slave Transmit / Master Receive
SWBLANK	SoftWare BLANK
SWEHTDIS	SoftWare EHT DISable
SYN&SCA	SYNc & SCAling (submodule)
TBD	To Be Defined
TR	Terminal Ready
VAMBLSENS	Voltage from AMBient Light SENSors
VAMPLADJ	Vertical AMPLitude ADJust voltage
VBCATHODE	Voltage on Blue CATHODE
VBLADJ	Vertical BLanking ADJust voltage
VBLP	Vertical BLanking Pulse
VDEFLHI	Vertical DEFLection HIgh
VDEFLLO	Vertical DEFLection LOw
VDFAMPLADJ	Vertical Dynamic Focus AMPLitude ADJust voltage
VDFTILTADJ	Vertical Dynamic Focus TILT ADJust voltage
VDY	Vertical Deflection Yoke
VG1	Voltage Grid 1
VG2	Voltage Grid 2
VG3-1	Voltage Grid 3-1 (Static Focus)
VG3-2	Voltage Grid 3-2 (Dynamic Focus)
VGCATHODE	Voltage on Green CATHODE
VMA	Valid Memory Address
VMIDP	Vertical MID Pulse
VPA	Valid Peripheral Address
VPOSPOL	Vertical POSitive POLarity
VRAMP	Vertical RAMP signal
VRCATHODE	Voltage on Red CATHODE
VS	Vertical Sync (input)
VSCORRADJ	Vertical S-CORRection ADJust voltage
VSHIFTADJ	Vertical SHIFT ADJust voltage
VSHIFTCORRADJ	Vertical SHIFT CORRection ADJust voltage
VSICON	Vertical Sync InterCONnection
VSP	Vertical Sync Pulse
VWHUNADJ	Vertical WHite UNiformity ADJust voltage
VWHUNCL	Vertical WHite UNiformity CoiL
WDOG	Watch DOG
WH	WHite
WHUNCL	WHite UNiformity CoiL
YE	YEllow

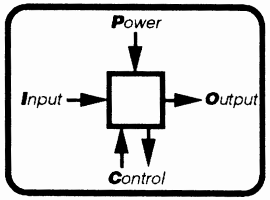
9. OPTIONAL MODULES

9.1 MIS BOARD

General

The Magnetic Immune System compensates magnetic fields up to 5 Gauss with a maximum frequency of 0,5 Hz.

MPRD 9600
MIS (Magnetic Immune System) board
22sep91



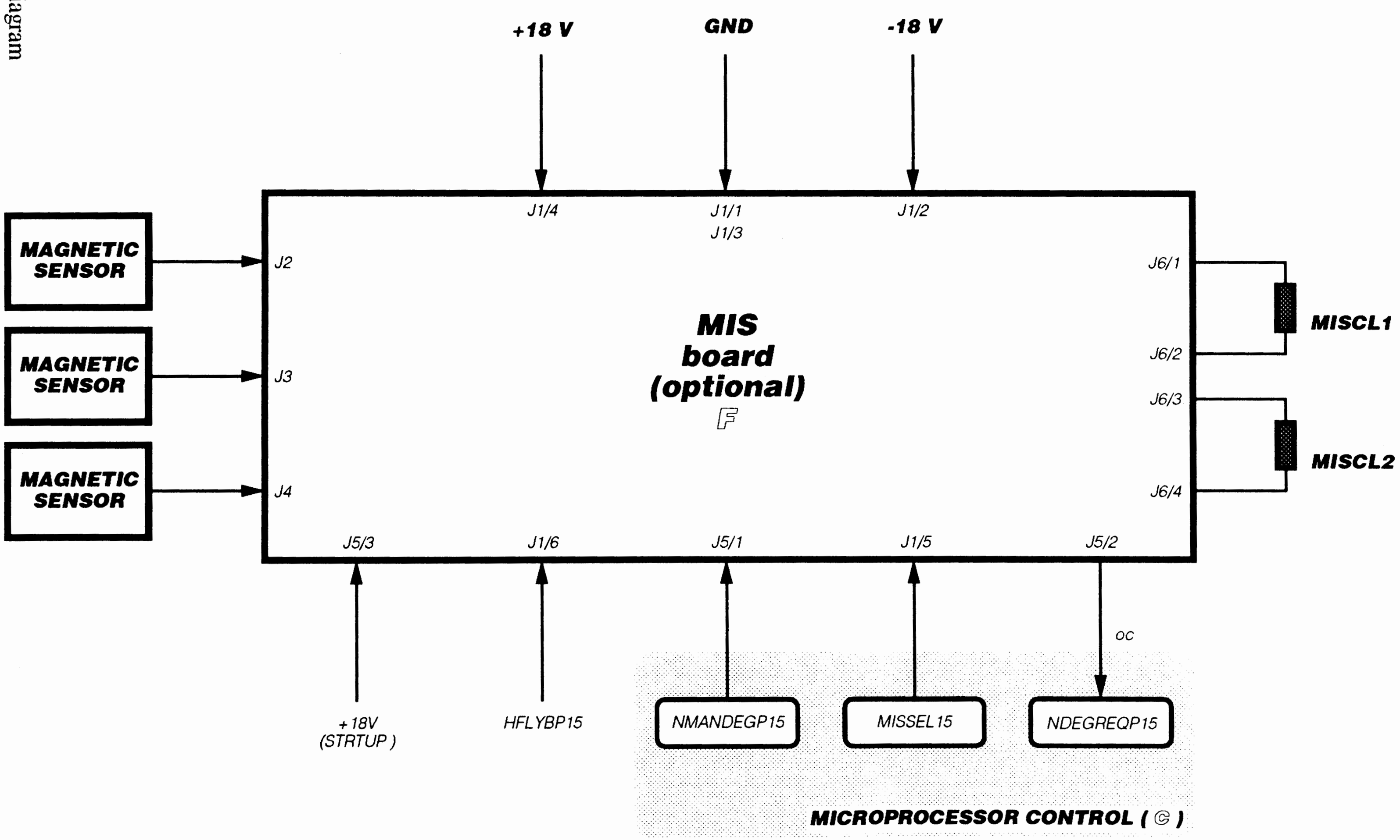


figure 9.1 : MIS board IOPC diagram

9.1.2 PCB LAYOUT

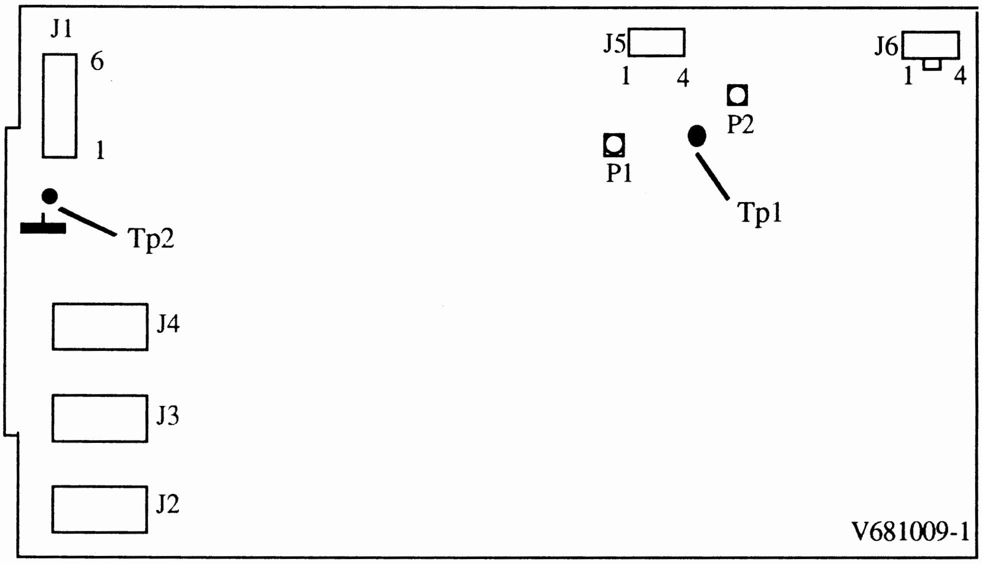


figure 9.2 : MIS board component side

9.1.3 BACKBOARD CONNECTIONS

MIS Connector J1 is connected with BACKBOARD Connector J10.

J10 pin nr	signal name	to	from
1	**GND**		P
2	**-18 V**		P
3	**GND**		P
4	**+18 V**		P
5	*MISSEL15*		G
6	*HFLYBP15*		G

MIS Connector J5 is connected with BACKBOARD Connector J11.

J11 pin nr	signal name	to	from
1	*NMANDEGP15*		G
2	*NDEGREQP15 oc*	G	
3	*+18 V (STRTUP)*		J10/4
4	*nc*		

9.1.4 MIS BOARD INTERCONNECTION SPECIFICATIONS

Connection between MIS Board and Backboard

MIS Board connector J1 (6 pins) is connected to Backboard connector J10.
MIS Board connector J5 (4 pins) is connected to Backboard connector J11.

Connection between MIS Sensors and MIS Board

The 3 MIS sensors are connected to J2, J3 and J4 on the MIS board.

Connection between MIS Board and WUA coils 1 & 2

WUA coil 1 is connected to pin 1 & 2 of J6, WUA coil 2 is connected to pin 3 & 4 of J6.

9.1.5 MIS BOARD ADJUSTMENT

Place the display in a varying magnetic field, connect an oscilloscope to Tp1 (Tp2 = ground).
Position the display such that the coils are in lateral direction against the display, send an LF current through the coils.
Adjust P1 for minimun variation reading on the oscilloscope .
Position the display such that the coils are in axial direction (same centerline of CRT and coils) and send an LF current through the coils.
Adjust P2 for minimum rotation and shift of the displayed picture.
Disconnect the oscilloscope and apply a magnetic field in three directions, degauss the display and check if the MIS board functions correctly.

9.2 OPTIONAL INPUT BOARD

General

The optional input board allows to connect a second RGB source to the MPRD9643/51.

Loopthrough Version

This board has R, G, B and composite sync inputs with loopthrough.

The ROPT, GOPT, BOPT outputsignals of this board always have sync on green.

Terminated Version

This board has R, G, B and composite sync inputs erminated in 75Ω.

The ROPT, GOPT, BOPT outputsignals of this board always have sync on green.

9.2.1 IOPC DIAGRAM

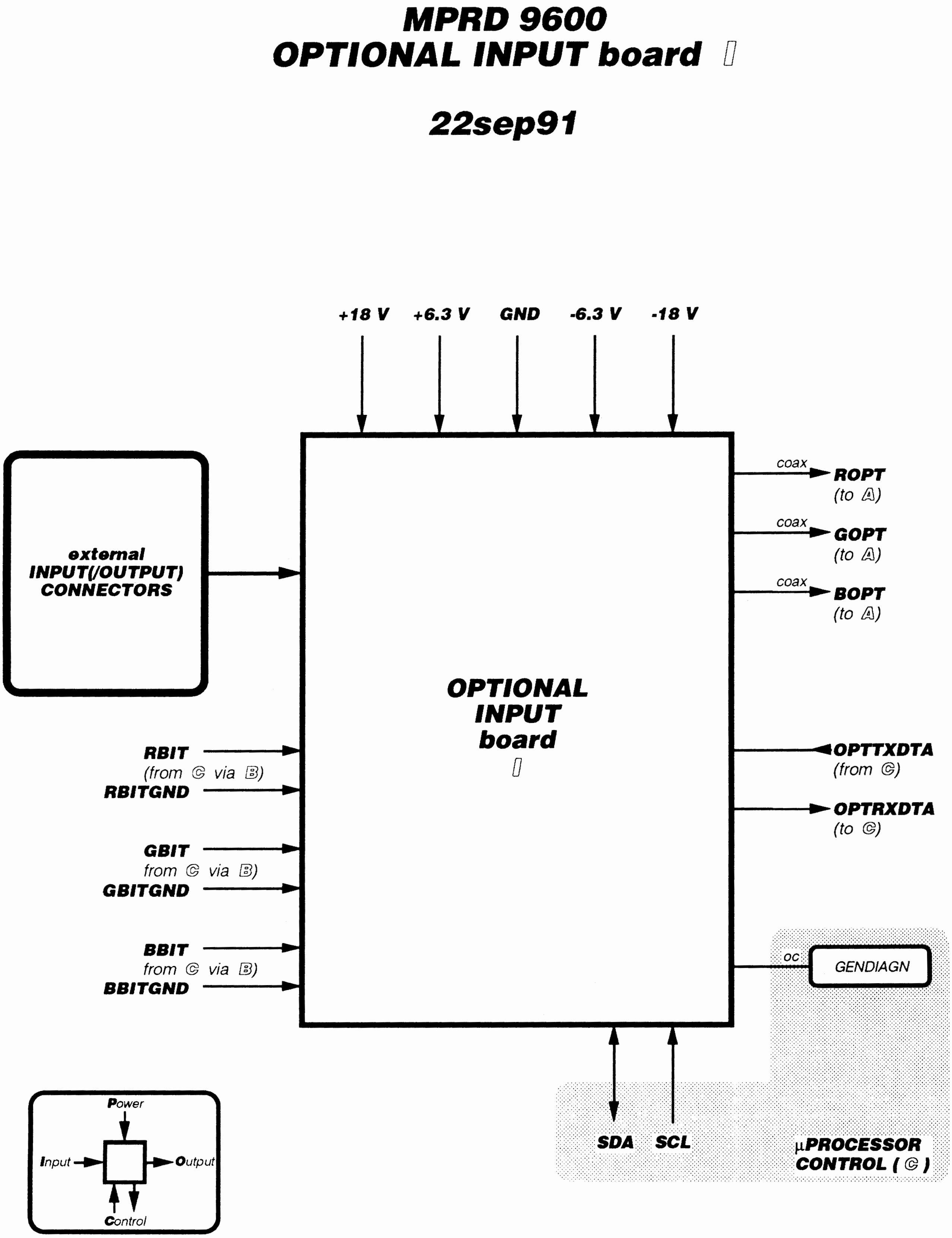
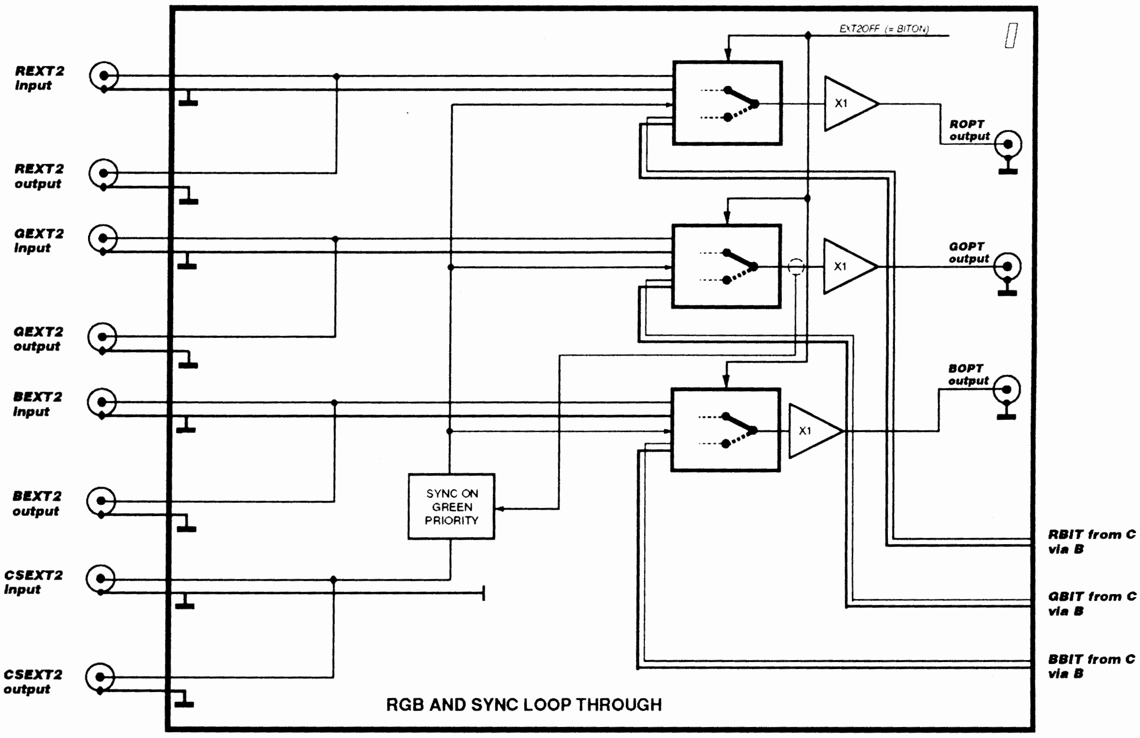


figure 9.3 : OPTIONAL INPUT board IOPC diagram

9.2.2 BLOCK DIAGRAM

MPRD 9643/51
OPTIONAL INPUT
17dec 92



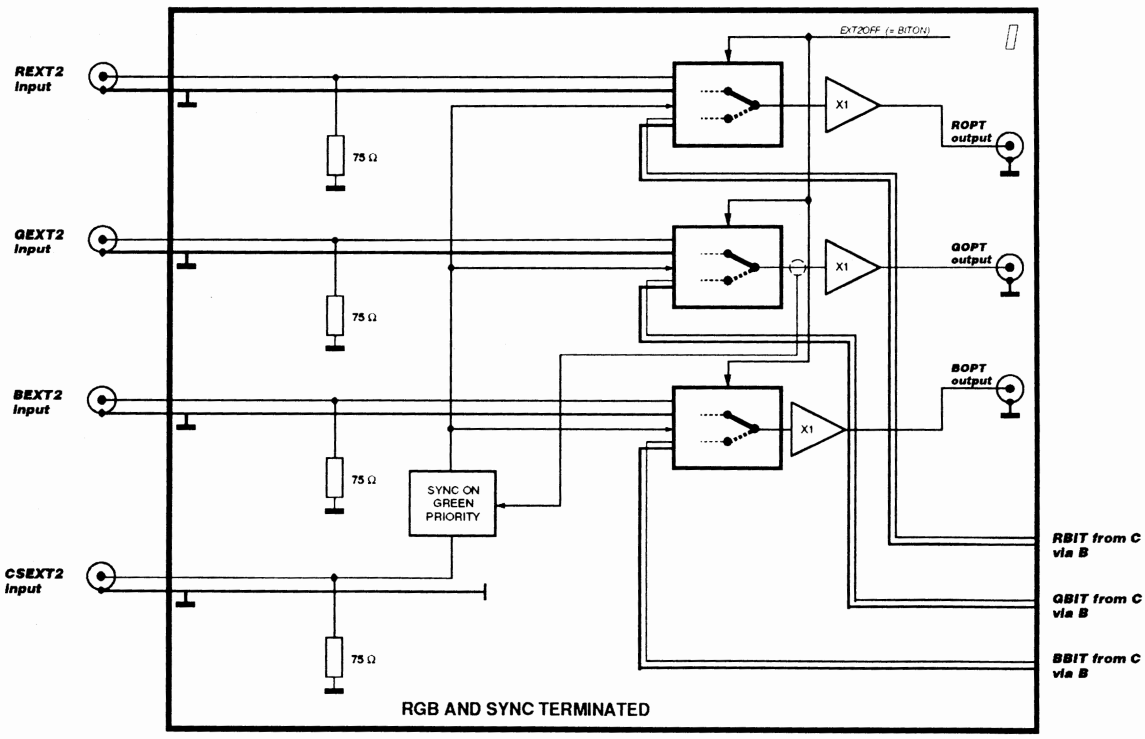


figure 9.4 : OPTIONAL INPUT board block diagram

9.2.3 CIRCUIT DESCRIPTION

As the R,G and B channel are identical, only the G channel will be described.

Jumper W1,2,3,4 and 5 are not mounted.

RGB and Sync Loop through version

sheet 1 of 3

The signal enters via J17, via a loop through filter (printed coils) the signal arrives at J16 and must be terminated (externally) in 75Ω.

RGB and Sync Terminated

sheet 1 of 3

The signal enters via J17, via a loop through filter (printed coils) the signal arrives at J16 (J16 is replaced by a 75Ω resistor).

Via C46,R97 the G signal is connected to the differential amplifier Q18,17 (C104,105 are not mounted !).
R85,95 bias for the bases of Q17,18.
The temperature compensated constant current source Q10,D56 is connected to Q12,13. Only one of both (Q12,13) can be on, depending on the level of EXT2OFF.
When EXT2OFF is high, Q37 will be saturated, the collectorcurrent goes through D54, R179,180, the cathode of D54 will be at -7,3V and the b-e junction of Q12 will conduct. As Q37 is saturated there will be 0,7V on the collector, the base of Q38 will be at 0,4V, Q38 is off, the voltage drop over R177 is 0V and the b-e junction of Q13 is biased in reverse direction, Q13 is off and so are Q17,18.
The current source is connected to R72,71 via Q12; GBIT,GBIT GND is selected. As the base of Q12 is on a fixed potential, the emittervoltage of Q12 and the collectorvoltage of Q10 will not change; Q10 will not be modulated when Q15,14 are driven with a common mode signal, increasing the common mode rejection. The amplification is determined by R72,71; R61,C48 increase the amplification in the low frequency range; R78,82 increase the stability.
Only part of the current through R60 goes through Q14, the other part goes through Q16. The base of Q16 is forced to a fixed potential by R74,73, D24,27, and so is the emitter; the current through R60 will be constant as well. Only part of the current through R59 goes through Q15, the other part goes through Q11. The base of Q11 is forced to a fixed potential by R74,73,D24,27, and so is the emitter; the current through R59 will be constant as well. This means that the differential amplifier Q14,15 is fed by a constant current and voltage, eliminating feedback, increasing high frequency stability by lowering the influence of the Miller capacitor.
The voltage differences at the input of the differential amplifier are converted into a current difference through Q11. The collectorcurrent of Q16 is converted into a voltage by R93, and buffered by Q19, an emitterfollower with low outputimpedance (not very sensitive to capacitive loads); D26 ensures temperature stabilisation for Q19. The outputsignal present across R92 is connected to U12 via R96,C54. U12 is a 75 Ω driver, the signal leaves at pin 8 and is available at J3.

Protection circuits
D28,29,30,31 limit the inputvoltages on the bases of Q14,15,17,18; R89,91,94,97 limit the current through the diodes during flash.
C59,60, connected to the low inputs, short undesired high frequency components.

Sync on green

sheet 1 of 3
The collectorcurrent of Q11 is converted into a voltage by R70, and inverted by Q20 because the other side of the differential amplifier was taken as signalsource; D25 ensures temperature stabilisation for Q20. The outputsignal SOG is present across R87.

sheet 2 of 3

The SOG signal coming from Q20 via C58 is buffered by Q32 and DC-restored (R136,138,C6) and clamped (C13,D41). Q31 amplifies approximately 3 times to increase noise immunity; the collectorsignal is clamped by C85,D42, R148 stabilizes the current through D42 to reduce phase jitter. The input of comparator U4,pin4 is only driven by the sync pulses.

RGB and Sync Loop through version

sheet 2 of 3

The signal enters via J21, via a loop through filter (printed coils) the signal arrives at J20 and must be terminated (externally) in 75Ω.

RGB and Sync Terminated

sheet 2 of 3

The signal enters via J21, via a loop through filter (printed coils) the signal arrives at J20 (J20 is replaced by a 75Ω resistor).

Composite sync

Via C5,R154 the CS signal is connected to the differential amplifier Q33,34
The temperature compensated constant current source Q30,D40 is connected to Q33,34.
Via C87 the signal is connected to a pulseshaper U16,pin7,9,10 to reduce the risetime of the CS signal, followed by an autopolarizing circuit U5,pin11,12,13,R8,151,C15. Independent from the sync polarity, U5,pin11 will deliver positive sync output. Negative sync polarity will charge C15, U5 will invert the signal on pin12, positive sync will not charge C15, U5 will buffer the signal on pin12.

Sync priority system.

If internal sync is present on this second G input , it will be used, external sync has no priority on the second input board.
If sync on green is present, U5,pin6 will be low, U3,pin14 will be low and U3,pin4 remains on +5V.
IF no sync on green is present, U5,pin6 will be high, U3,pin14 is connected to autopolarised CS signal (U5,pin11).
U3, pin3,4,5,9 now acts as an invertor. The signal at U3,pin4 is used to modulate the current through Q16 superposing the sync signal on the G channel.

A signal with external sync connected to the optional input board, is sent to the RGB board with sync on green.

Composite sync Inhibit

When selecting BIT, INH will go high, disabling U3. This function is required because the CS signal of the second video inputs is not synchronised with the BIT generator. This would lead to a failing sync on green detection for BIT and the CS-signal would be superposed on the sync-signal of BIT.

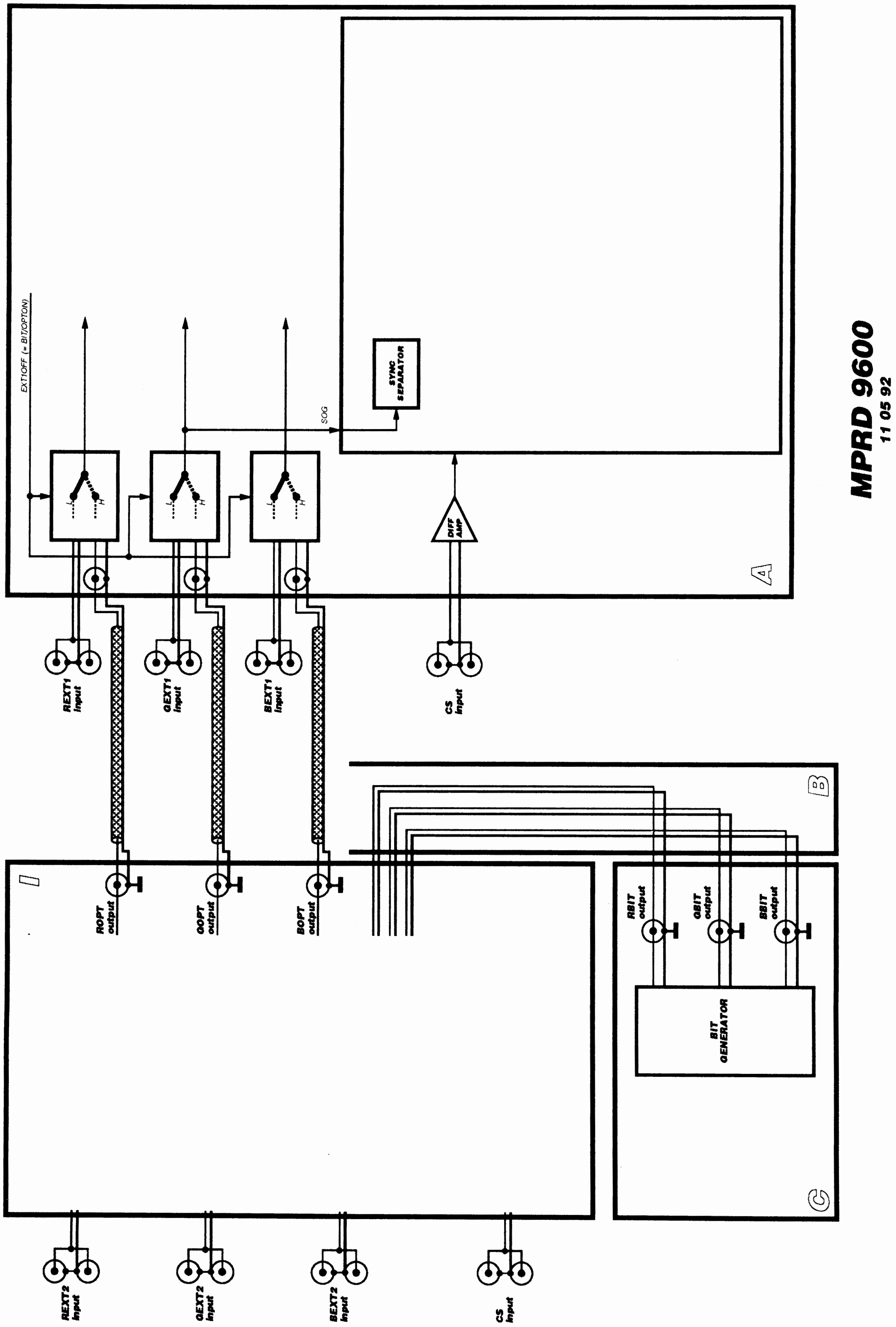


figure 9.5 : INPUT SWITCHING with OPTIONAL INPUT BOARD

9.2.4 PCB LAYOUT

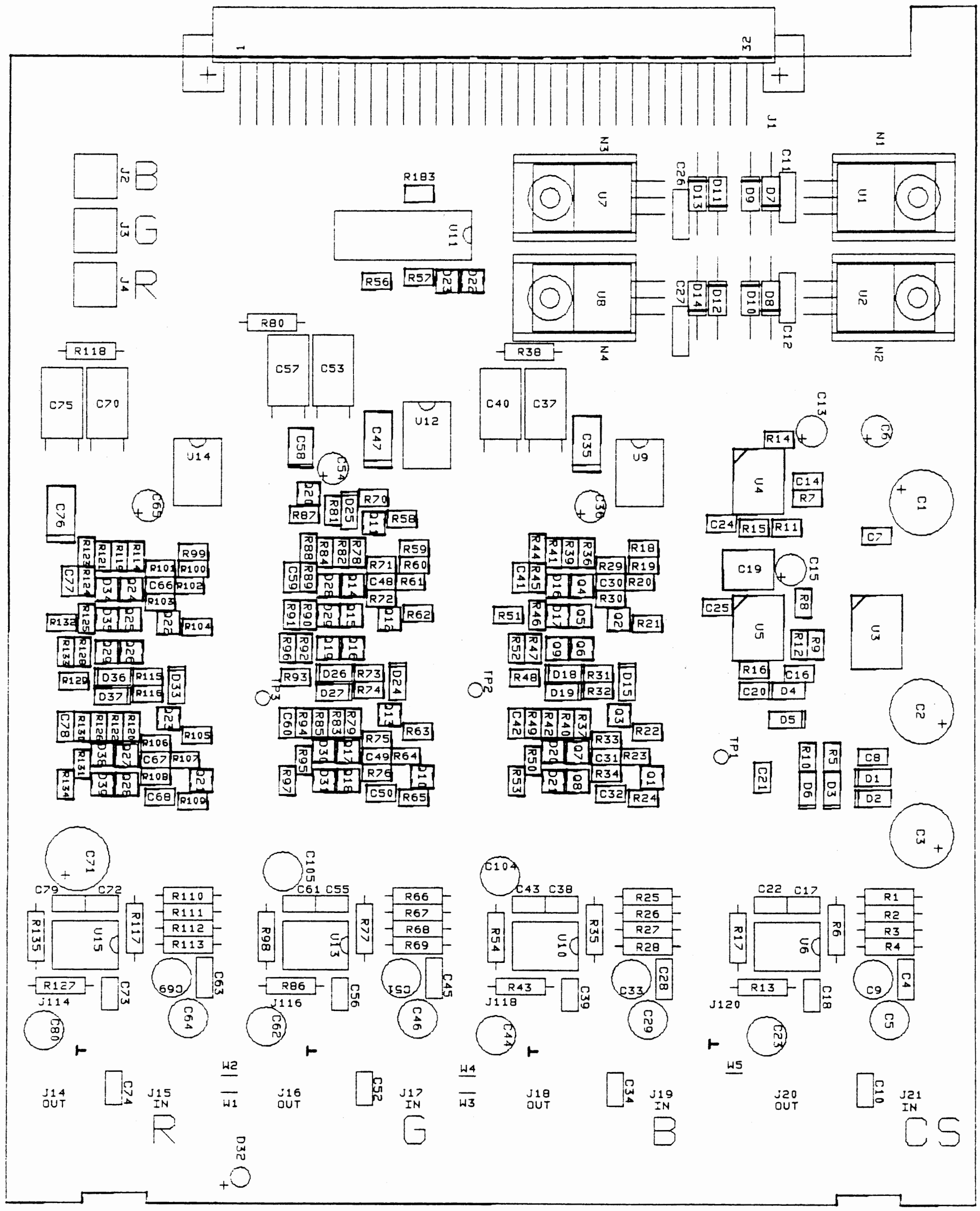


figure 9.6 : OPTIONAL INPUT board component side

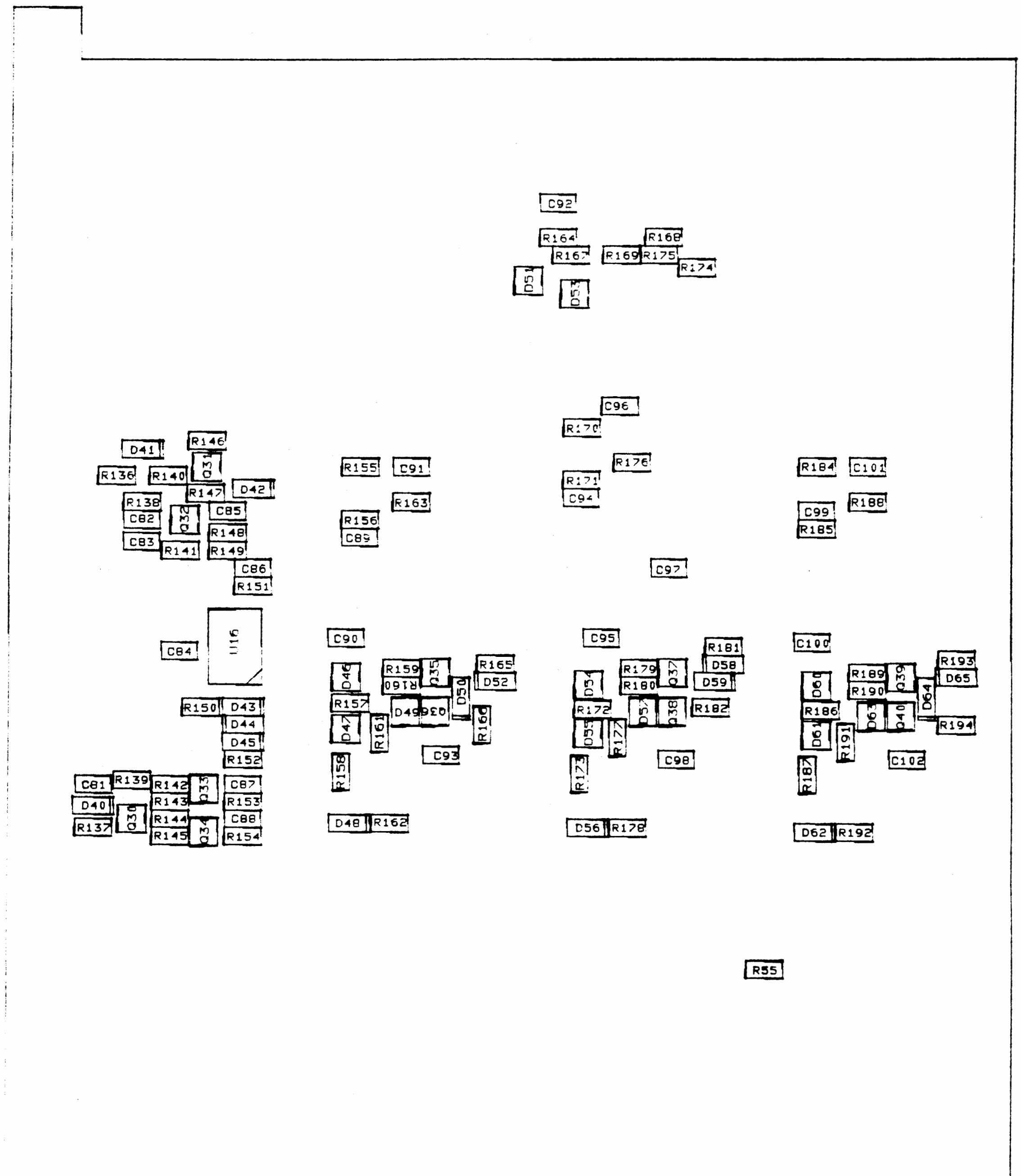


figure 9.7 : OPTIONAL INPUT board solder side

9.2.5 PARTS LIST

Order number of a complete OPTION INP BNC : V5631165 Date : 01/12/92

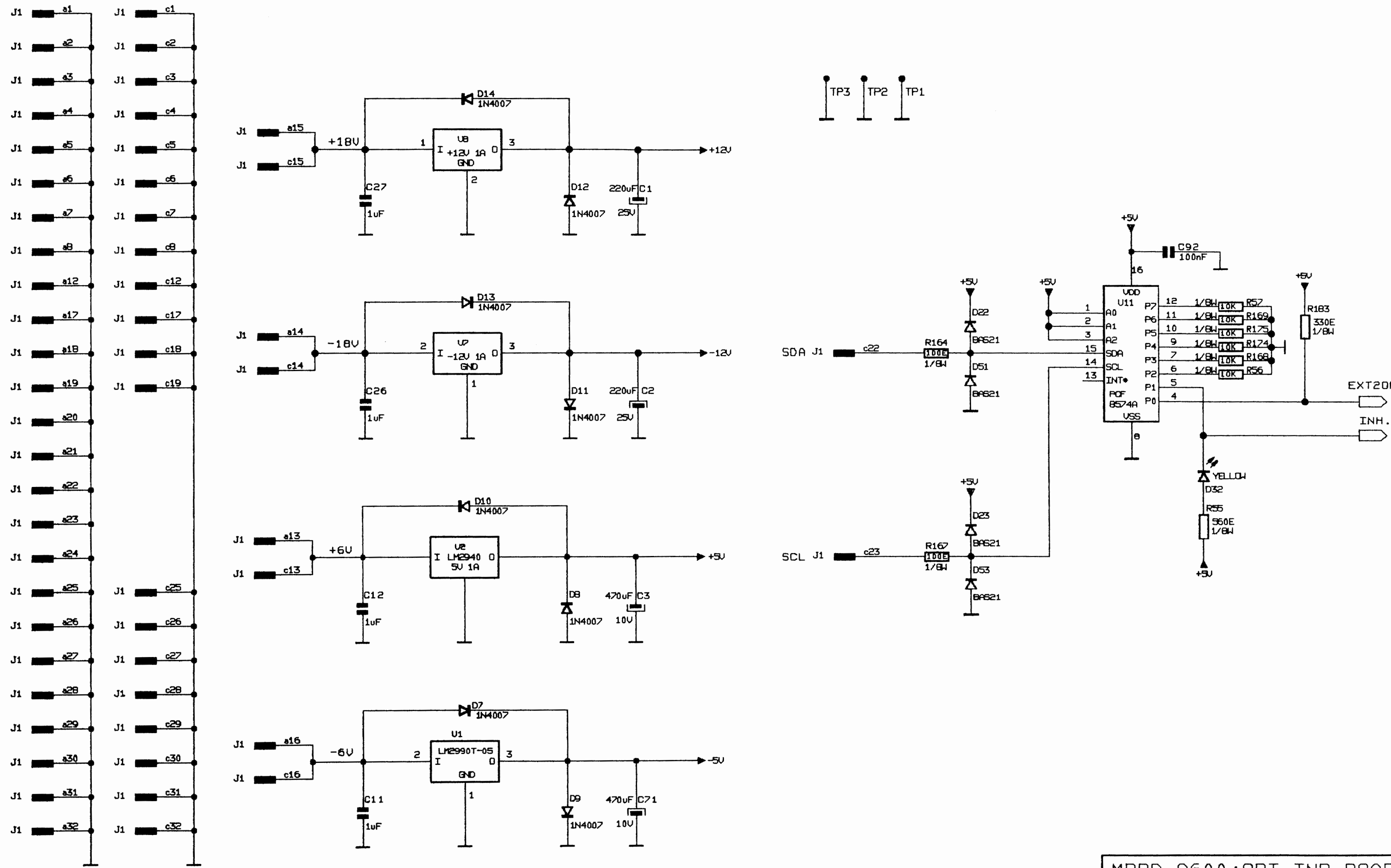
Order number	Description	Item
V1012231	R MF H 75E J 0W5	R118,R38 ,R80
V1114529	C EL RA 470M M 10E2 105	C3 ,C71
V1114750	C EL RA 15M M 25E1 125	C36 ,C54 ,C65
V111478	C EL RA 220M M 25E2 105	C1 ,C2
V1114932	C EL RA 4M7M 50E1 105	C15
V1114942	C EL RA 10M M 50E1 105	C13 ,C6
V111681	C EL BRA 22M M 25E2 85	C23 ,C29 ,C37 ,C40 ,C44 ,C46 , C5 ,C53 ,C57 ,C62 ,C64 ,C70 , C75 ,C80
V112232	C NP0 MI 15P G 63E2	C28 ,C4 ,C45 ,C63
V1127930	C X7R MU 1M K 50E2 125	C11 ,C12 ,C26 ,C27
V1137160	C COG MU 220P J500E2 125	C10 ,C34 ,C52 ,C74
C131646	D 1N4007 R DO41	D10 ,D11 ,D12 ,D13 ,D14 ,D7 , D8 ,D9
V131670	D LED D3 T YEL HLMP	D32
V1330911	Q ACC HTSNK 55 K TO220	N1 ,N2 ,N3 ,N4
V1340022	U 7812 TO220 P	U8
V1340162	U 2990-12 LM TO220 M	U7
V1340281	U 2990-5 LM TO220 M	U1
V134044	U 2940-5 LM TO220 P	U2
V1342221	U 581D SI DIP8 I	U12 ,U14 ,U9
V1372951	U 8574A PCF DIP16 P	U11
V311061	D ACC HLDR D3 P1 TS H 6.5	0060
V3131400	J BNC FCT P 1 50E S	0030
V313202	J SMB MBT P 1 50E	J2 ,J3 ,J4
V3133691	J BNC ACC WHSR	0032
V3134951	J U0.3 FBT P16 E1AU TLP	0070
V313525	J EUR3C MBS P64 E1C2 S1.6	J1
V315317	SLDRLUG SCR 1TAG D9.7 L24	0031
V342168	WIRE AWG24 UL1007 WHI Y	0033
V3620146	SMP-I M2.5X10 D 84	0050
V3620216	SMP-I AM3 X 6 D 84	0026,0041
V3661106	NUT DIN934 I M2.5	0052
V366940	NUT M3 PC BOARDS	0040
V3673896	WASHER INOX M2.5DIN137 Y	0051
V3673906	WASHER CRINKLE I M3	0027,0042
V367650	MOUNTING BRACKET	0025
V6030961	CAPTIVE SCREW M3 X 8 00	0021
V6030963	CAPTIVE SCREW SPRING 01	0022
V603592	SEC. INPUTPANEL BNC 01	0020
V681033	SMD OPT.INPUT MPRD9000 00	0010
V716543	PCB TESTPOINT 05	TP1 ,TP2 ,TP3

Order number of a complete SMD OPTION INP : V681033 Date : 01/12/92

Order number	Description	Item
P200025	R# CE H 10E J 0W12 1206	R155,R156,R170,R171,R184,R185
P200033	R# CE H 22E J 0W12 1206	R104,R105,R21 ,R22 ,R62 ,R63
P200043	R# CE H 56E J 0W12 1206	R133,R165,R181,R193,R52 ,R96
P200049	R# CE H100E J 0W12 1206	R115,R124,R130,R132,R134,R149, R158,R164,R167,R173,R187,R31 , R45 ,R49 ,R51 ,R53 ,R73 ,R89 , R91 ,R94 ,R97
P200053	R# CE H150E J 0W12 1206	R140,R58
P200055	R# CE H180E J 0W12 1206	R142,R144
P200057	R# CE H220E J 0W12 1206	R128,R129,R47 ,R48 ,R70 ,R92 , R93
P200061	R# CE H330E J 0W12 1206	R183
P200065	R# CE H470E J 0W12 1206	R147,R153,R154,R81 ,R87
P200067	R# CE H560E J 0W12 1206	R55
P200071	R# CE H820E J 0W12 1206	R137
P200073	R# CE H 1K J 0W12 1206	R116,R12 ,R14 ,R15 ,R151,R162, R178,R192,R32 ,R74
P200075	R# CE H 1K2 J 0W12 1206	R143,R145,R7
P200077	R# CE H 1K5 J 0W12 1206	R136
P200079	R# CE H 1K8 J 0W12 1206	R139
P200081	R# CE H 2K2 J 0W12 1206	R146
P200085	R# CE H 3K3 J 0W12 1206	R123,R44 ,R88
P200089	R# CE H 4K7 J 0W12 1206	R8
P200093	R# CE H 6K8 J 0W12 1206	R109,R160,R166,R180,R182,R190, R194,R24 ,R65
P200095	R# CE H 8K2 J 0W12 1206	R102,R107,R20 ,R23 ,R61 ,R64
P200097	R# CE H 10K J 0W12 1206	R11 ,R138,R150,R168,R169,R174, R175,R56 ,R57
P200105	R# CE H 22K J 0W12 1206	R10 ,R121,R125,R126,R131,R41 , R42 ,R46 ,R5 ,R50 ,R84 ,R85 , R90 ,R95
P200111	R# CE H 39K J 0W12 1206	R141,R9
P200113	R# CE H 47K J 0W12 1206	R163,R176,R188
P200121	R# CE H100K J 0W12 1206	R157,R172,R186
P200129	R# CE H220K J 0W12 1206	R159,R161,R177,R179,R189,R191
P200131	R# CE H270K J 0W12 1206	R152
P200143	R# CE H820K J 0W12 1206	R16
P200145	R# CE H 1M J 0W12 1206	R148
P200381	R# CE H 56E F 0W12 1206	R114,R119,R120,R122,R36 ,R37 , R39 ,R40 ,R78 ,R79 ,R82 ,R83
P200387	R# CE H100E F 0W12 1206	R101,R103,R106,R108,R29 ,R30 , R33 ,R34 ,R71 ,R72 ,R75 ,R76
P200399	R# CE H330E F 0W12 1206	R100,R18 ,R19 ,R59 ,R60 ,R99
P210013	C(S)CEC1CH1206COG102J 50	C30 ,C31 ,C48 ,C49 ,C66 ,C67
P210067	C(S)CEC2CH2321X7R105M 50	C19
P210092	C(S)CEC2CH1206X7R103K 50	C16 ,C20
P210122	C(S)CEC2CH1206X7R104K 50	C100,C101,C102,C14 ,C21 ,C24 , C25 ,C32 ,C50 ,C68 ,C7 ,C8 , C81 ,C82 ,C83 ,C84 ,C85 ,C86 , C87 ,C89 ,C90 ,C91 ,C92 ,C93 , C94 ,C95 ,C96 ,C97 ,C98 ,C99
P210152	C(S)CEC2CH1206X7R153K 50	C41 ,C42 ,C59 ,C60 ,C77 ,C78 , C88
P212006	C(S) TACH3528 475M 16	C58
P212018	C(S) TACH6032 106M 16	C35 ,C47 ,C76

Order number	Description	Item
P230465	SMC(S)ICHCT74HCT4053 SO16	U3
P230478	SMC(S)ICHCT 74HCT86 SO14	U5
P230488	SMC(S)ICCOM LM219 SO14	U16 ,U4
P232004	SMC(S)TRA BC849C	Q1 ,Q10 ,Q12 ,Q13 ,Q2 ,Q21 , Q22 ,Q23 ,Q3
P232051	SMC(S)TRA BC847B	Q30
P232067	SMC(S)TRA BC857C	Q32
P232069	SMC(S)TRA BT2369	Q31 ,Q33 ,Q34
P232090	SMC(S)TRBB BFR92A SOT23	Q14 ,Q15 ,Q17 ,Q18 ,Q19 ,Q20 , Q24 ,Q25 ,Q27 ,Q28 ,Q29 ,Q4 , Q5 ,Q7 ,Q8 ,Q9
P232091	SMC(S)TRBB BFT92 SOT23	Q11 ,Q16 ,Q26 ,Q6
P232101	SMC(S)TRPNP BC859C SOT23	Q35 ,Q36 ,Q37 ,Q38 ,Q39 ,Q40
P234013	SMC(S)DIOZEN BZX84C4V7	D46 ,D47 ,D54 ,D55 ,D60 ,D61
P234018	SMC(S)DIOZEN BZV55C6V2	D19 ,D27 ,D37
P234047	SMC(S)DIO BAV99	D16 ,D17 ,D20 ,D21 ,D28 ,D29 , D30 ,D31 ,D34 ,D35 ,D38 ,D39
P234055	SMC(S)DIO BAT54	D49 ,D57 ,D63
P234099	SMC(S)DIO 4148	D1 ,D15 ,D18 ,D2 ,D24 ,D25 , D26 ,D3 ,D33 ,D36 ,D4 ,D41 , D42 ,D43 ,D44 ,D45 ,D48 ,D5 , D50 ,D52 ,D56 ,D58 ,D59 ,D6 , D62 ,D64 ,D65
P234127	SMC(S)DIZEN BZV55C5V1 DMM	D40
P234195	SMC(S)DI BAS21 SOT23	D22 ,D23 ,D51 ,D53
P905185	PRINT - P1455185	S

9.2.6 SCHEMATIC DIAGRAM



MPRD 9600:OPT.INP.BOARD	
LV-POWER	
V5631165	
SHEET 3OF3 17Dec92	I

2.9.7 BACKBOARD CONNECTIONS

OPTIONAL INPUT BOARD Connector J1 is connected to BACKBOARD Connector J2.

a-side pin nr	signal name	to	from	(CAD)	c-side pin nr	signal name	to	from
1	**GND**		P	33	1	**GND**		P
2	**GND**		P	34	2	**GND**		P
3	**GND**		P	35	3	**GND**		P
4	**GND**		P	36	4	**GND**		P
5	**GND**		P	37	5	**GND**		P
6	**GND**		P	38	6	**GND**		P
7	**GND**		P	39	7	**GND**		P
8	**GND**		P	40	8	**GND**		P
9	*(RBIT)GND*		C	41	9	*RBIT*		C
10	*(GBIT)GND*		C	42	10	*GBIT*		C
11	*(BBIT)GND*		C	43	11	*BBIT*		C
12	**GND**		P	44	12	**GND**		P
13	**+6.3 V**		P	45	13	**+6.3 V**		P
14	**-18 V**		P	46	14	**-18 V**		P
15	**+18 V**		P	47	15	**+18 V**		P
16	**-6.3 V**		P	48	16	**-6.3 V**		P
17	**GND**		P	49	17	**GND**		P
18	**GND**		P	50	18	**GND**		P
19	**GND**		P	51	19	**GND**		P
20	*GND*		P	52	20	*OPTTXDTA*		C
21	*GND*		P	53	21	*OPTRXDTA*	C	
22	*GND*		P	54	22	*SDA*	CDLMO	CDLMO
23	*GND*		P	55	23	*SCL*		C
24	*GND*		P	56	24	*GENDIAGN oc/int*	C	ADELMO
25	**GND**		P	57	25	**GND**		P
26	**GND**		P	58	26	**GND**		P
27	**GND**		P	59	27	**GND**		P
28	**GND**		P	60	28	**GND**		P
29	**GND**		P	61	29	**GND**		P
30	**GND**		P	62	30	**GND**		P
31	**GND**		P	63	31	**GND**		P
32	**GND**		P	64	32	**GND**		P

9.2.8 CUSTOMIZED VERSIONS

OPT. INP. BOARD BNT MPRD 9600 V5631161

Order number of a complete OPT. INP. BOARD BNT MPRD9600 : V5631161 00 Date : 06/01/93
Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and
OPT. INP. BOARD BNT MPRD9600 V5631161 00

SUBSTITUTES

Order Number	Description	Item	
V603592	SEC. INPUTPANEL BNC 01	0020	replaced by
V6035921	SEC. INPUTPANEL TRIAX 01		
V3131400	J BNC FCT P 1 50E S	0030	replaced by
V313150	J BNT FCT P 1 50E		

REMOVED

Item
0031
0032

OPT. INP. BOARD TNC TERM 9600 V5631166

Order number of a complete OPT. INP. BOARD TNC TERM 9600 : V5631166 00 Date : 06/01/93
Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and
OPT. INP. BOARD TNC TERM 9600 V5631166 00

SUBSTITUTES

Order Number	Description	Item	
V603592	SEC. INPUTPANEL BNC 01	0020	replaced by
V6035926	SEC.INPUTPANEL BNC NLT 00		
V3131400	J BNC FCT P 1 50E S	0030	replaced by
V313150	J TNC FCT P 1 50E		

ADDED

Order Number	Description	Item
V1015231	R MF H 75E F 0W4 E2	R119, R120, R121, R122
V348000	CABLE TIE B2,5L 98	0041
V603786	SPARE CAP HOUSE 9600P 00	0060

OPT. INP. BOARD TRIAX MPRD 9600 V5631161

Order number of a complete OPT. INP. BOARD FC722 MPRD9600 : V5631965 00 Date : 06/01/93
Differences between OPT. INP. BOARD BNC MPRD9600 V5631165 and
OPT. INP. BOARD FC722 MPRD9600 V5631965 00

ADDED

Order Number	Description	Item
V395154	FLUORAD FC - 722	0100

10. PREVENTIVE MAINTENANCE

At least every 2 years, all boards containing electrolytical capacitors need to be powered on during 24 hours minimum.

Make units free of dust whenever necessary.

Cleaning of optical filter : clean the outer filtersurface with a soft cloth and isopropyl alcohol or a mild detergent.

11. REMOVAL AND REINSTALLATION OF ELECTRONIC BOARDS

Refer to figure 1.1 and 1.2 for the board location.
In the text below, right hand side of the display means the right hand side of the display for someone looking towards the front face of the display.
In the text below, left hand side of the display means the left hand side of the display for someone looking towards the front face of the display.

IMPORTANT

Make sure that the display is disconnected from mains power before removing any sub-assemblies.

RGB board

Removal :
- remove the cover from the display by unscrewing 34 captive screws.
- remove the metallic plate, on which the display's identification plate is attached, from the rear of the display by unscrewing the 12 captive screws fixing it to the chassis.
- gently pull the CRT socket board away from the CRT.
- unplug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- unplug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- disconnect the 2 ground wires coming from the RGB board.
- unplug the 3 coax cables coming from the μprocessor unit (top rear of RGB) .
- loosen the 2 screws (M3) on the lower part of the RGB module with which the RGB board is fixed to the chassis.
- unplug the 2 flatcables (one connected on the left hand bottom side of the RGB, the other connected on the right hand bottom side of the RGB)
- remove the RGB board from the display by pulling it towards the top of the display.

Reinstallation :
- place the RGB board into the PCB guides and slide into position.
- plug the 2 flatcables (one connected on the left hand bottom side of the RGB, the other connected on the right hand bottom side of the RGB)
- fasten the 2 screws (M3) on the lower part of the RGB module with which the RGB board is fixed to the chassis.
- plug the 3 coax cables coming from the μprocessor unit (top rear of RGB, each cable has a colour code)
- reconnect the 2 ground wires coming from the RGB board.
- plug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- plug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- gently reposition the Crt socket board.
- reinstall the metallic plate, on which the display's identification plate is attached, on the rear of the display, tighten the 12 captive screws.
- install the cover on the display by way of the 34 captive screws.

Deflection board

Removal :
- remove the cover from the display by unscrewing 34 captive screws.
- unscrew the remaining captive screw at the bottom of the deflection board heatsink.
- disconnect the 9-pin connector (deflection coils) from the deflection board.
- disconnect the two 2-pin connectors (degauss coils) from the deflection board.
- pull out the board.

Reinstallation :

- place the deflection board into the PCB guides and slide into position.
- reconnect the two 2-pin connectors (degauss coils) to the deflection board (it is not important how the connection is made;one may choose to which male connector each female connector is connected)
- reconnect the 9-pin connector (deflection coils) from the deflection board.
- tighten the captive screw at the bottom of the deflection board heatsink.
- install the cover on the display by way of the 34 captive screws.

EHT board

Removal :

- remove the SM Power Supply board.
- remove the MIS board (see further).
- disconnect the EHT connection (silicone connector, refer to sticker on connector to know which sid opens); if impossible to pull EHT wire out of connector, cut the silicone connector but be carefull not to damage the EHT wires
- discharge the Eht connection towards the chassis.
- the focus connection towards the CRT socket is made by way of a large connector fixed onto the chassis with a metallic clips; remove the clips by unscrewing 1 captive screw. The focus connector is secured in closed position by 2 small metal clipses. Open the clipses and pull the 2 parts of the focus connector in opposite direction using the FOC CON PINCHER (V603840).
- pull the Eht module towards the rear of the unit over a distance of approximately 1 cm. Now it is possible to disconnect the flatcable that connects the Eht module to the backboard.
- gently pull out the Eht board while guiding the focus connector.

Reinstallation :

- position the wires for the focus connection and Eht connection; before pushing the Eht board completely into its normal position, reconnect the flatcable on the backboard. Push the Eht board in its normal position.
- plug the focus connector, secure the connection by way of the 2 clipses, positon the connector onto the chassis, position the metallic clips and fasten with a captive screw.
- reconnect the EHT connector (clean EHT wire with iso propyl alcohol or equivalent and put some silicone compound (order number V3951801) over the end of the EHT wire (approx. 4 cm length); slide the wire into the EHT connector, make sure the tinned end of the EHT wire enters the black conductive part in the center of the connector.
- USE ONLY SILICONE GREASE COMPOUND TO SLIDE EHT WIRE INTO CONNECTOR.
- reinstall the MIS board.
- reinstall the SMPS board.

Microprocessor board

Removal :

- unscrew the 2 captive screws fixing the processorboard to the rear of the display.
- pull out the processor board using the maintenance key (V603790).
- unplug the 3 coax cables, one for each colour R, G, B of the BIT signal (only if the Optional Input board is NOT installed).
- Reinstallation :
- plug the 3 coax cables (a colour code is present on each of the 3 wires).
- push the board back into position.
- fix the board onto the chassis by way of the 2 captive screws at the rear.

SM Power Supply board

Removal :

- remove the cover from the display by unscrewing 34 captive screws.
- unscrew the 2 captive screws at the rear of the Power Supply board.
- pull out the SMPS board.

Reinstallation :
- place the SMPS board into the PCB guides and slide into position.
- fix the SMPS board onto the chassis by way of 2 captive screws.
- install the cover on the display by way of the 34 captive screws.

CRT socket board

Removal :
- remove the display top cover by unscrewing 34 captive screws.
- remove the metallic plate, on which the display's identification plate is attached, from the rear of the display by unscrewing the 12 captive screws fixing it to the chassis.
- gently pull the CRT socket board away from the CRT.
- unplug the cathode wires coming from the CRT socket board (3 x 2-pin connector).
- unplug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- disconnect the 2 ground wires coming from the RGB board.
- disconnect the aquadag from the CRT socket board.
- remove the MIS board.
- the focus connection towards the CRT socket is made by way of a large connector fixed onto the chassis with a metallic clips; remove the clips by unscrewing 1 captive screw. The focus connector is secured in closed position by 2 small metal clipses. Open the clipses and pull the 2 parts of the focus connector in opposite direction using the FOC CON PINCHER (V603840).
- remove the top half of the shielding situated around the neck of the CRT; to do so, unscrew 2 captive screws on top of this shielding and pull the shielding towards the top of the display. Now there is space enough for the focus connector to be slid out of the display when removing the CRT socket board.

Reinstallation :
- gently slide the focus connector through the opening between the CRT neck and the chassis; reinstall the top half of the shielding situated around the neck of the CRT; to do so, reposition this shielding and fix it by way of the 2 captive screws on top.
- plug the focus connector, secure the connection by way of the 2 clipses, positon the connector onto the chassis, position the metallic clips and fasten with a captive screw.
- reinstall the MIS board.
- reconnect the aquadag.
- reconnect the 2 ground wires coming from the RGB board.
- plug the cathode wires coming from the CRT socket board (3 x 2-pin connector)
- plug the wires (with first grid and heater voltage) coming from the socket board (1x 3-pin connector).
- gently reposition the Crt socket board.
- reinstall the metallic plate, on which the display's identification plate is attached, on the rear of the display, tighten the 12 captive screws.
- install the cover on the display by way of the 34 captive screws.

Control board

Removal :
- unscrew 12 screws M4 with which the bezel is fixed on the µ-metal shielding and carefully withdraw the bezel from the front of the CRT. Disconnect the flatcable on the right bottom side on the inner side of the bezel. Be careful not to damage the front face filter.
- unscrew the control panel from the bezel

Reinstallation :
- install the control panel in the bezel by using the M2,5 screws; use loctite 242E to fix the screws properly.
- reconnect the flatcable to the connector on the control board.
- reinstall the front face bezel.

CRT assembly

Removal :
- remove the display top cover by unscrewing 34 captive screws.
- remove the front face bezel (12 screws M4) and disconnect the flatcable from the control panel board.
- remove the MIS board.
- remove the RGB board.
- disconnect the aquadag from the CRT socket board.
- unscrew 4 screws M3x6 with which the µ-metal shielding, situated around the neck of the Crt, is fixed onto the chassis.
- remove the deflection board.
- remove the Eht and SM Power Supply board.
- the rackmounting is fixed onto the CRT µ-metal shield on left and right hand side by way of 3 screws M4 on each side. Unscrew these screws.
- the wires which leave from the 2 MIS-sensors, mounted on the left hand side and right hand side of the µ-metal screen, are fixed on the chassis by way of a cable clamp. Remove these cable clamps (1 screw M3 for each sensor)
- the µ-metal shield and the CRT are fixed onto the chassis; by unscrewing 4 captive screws M4 and 4 other screws M4, the complete CRT assembly is detached from the chassis.

Reinstallation :
- install the CRT assembly on the chassis (4 captive screws M4 and 4 standard screws M4).
- fix the wires of the 2 Mis-sensors with their cable clamps onto the chassis.
- reinstall the rackmounting on the µ-metal screen.
- reinstall the Eht and SM Power Supply board.
- reinstall the deflection board.
- fix the rear side of the µ-metal shielding on the chassis by way of 4 screws M3x6.
- reconnnect the aquadag to the CRT socket board.
- reinstall the RGB board.
- reinstall the MIS board.
- reinstall the front face bezel; connect the flatcable to the control panel board.
- install the cover on the display by way of the 34 captive screws.

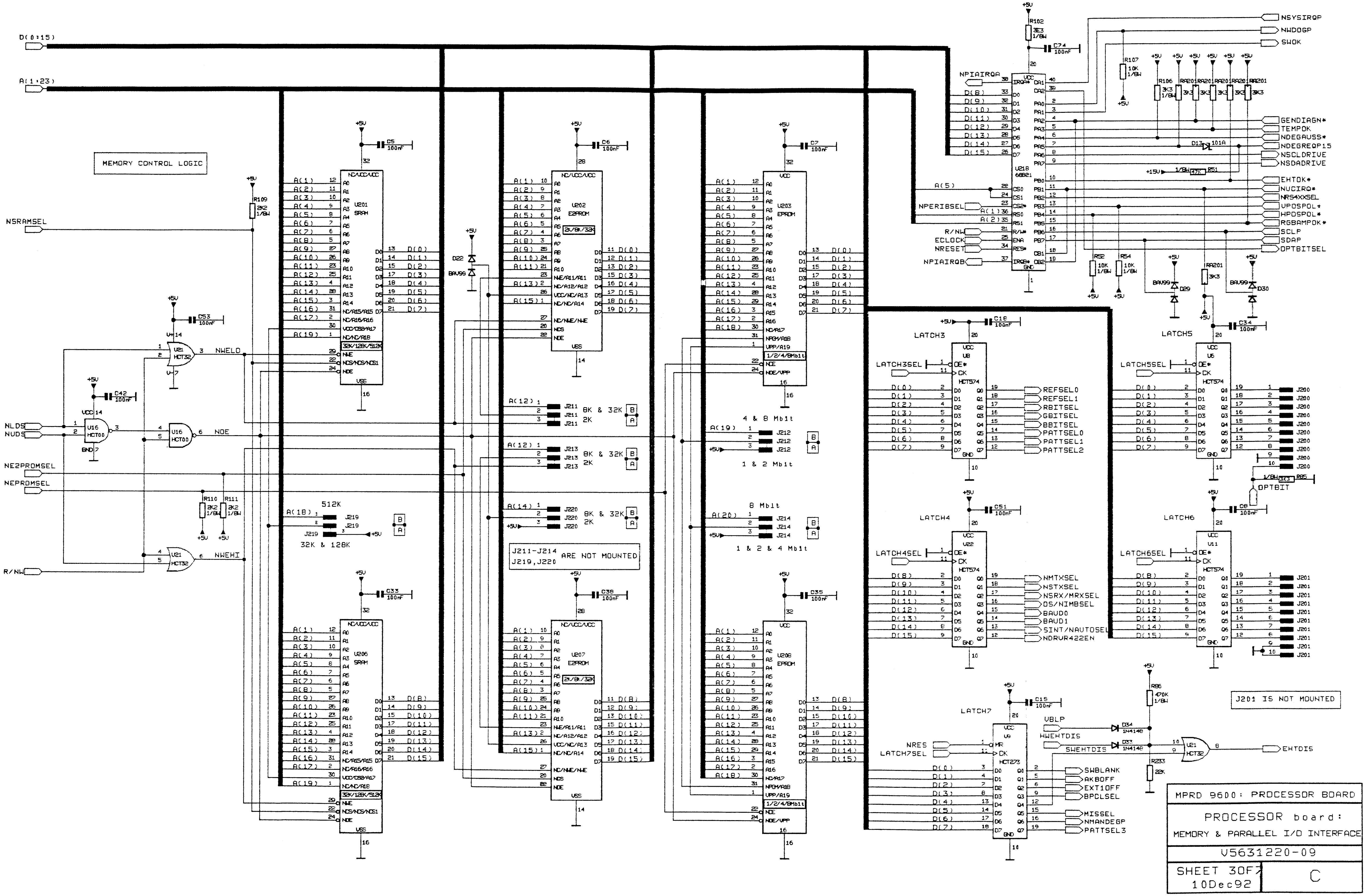
MIS board

Removal :
- remove the display top cover by unscrewing 34 captive screws.
- remove from the chassis the metallic part on which the MIS board is mounted by unscrewing 4 captive screws.
- disconnect the connectors from the MIS module.
- remove the board from its metallic mounting (2 screws M3)

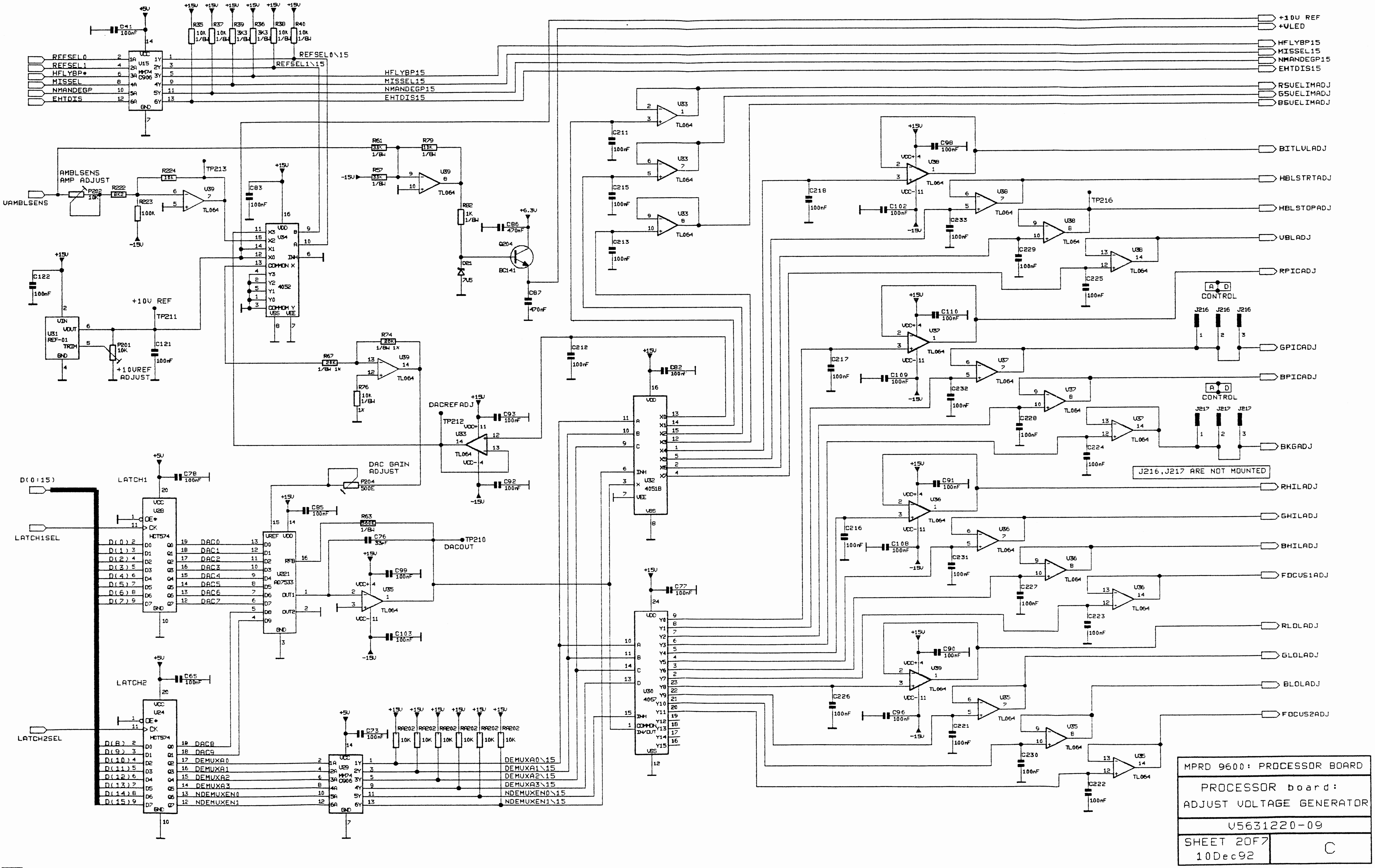
Reinstallation :
- install the MIS board on its metallic mounting.
- reconnect the connectors on the MIS module.
- reinstall the metal plate on which the MIS board is mounted.
- install the cover on the display by way of the 34 captive screws.

Optional Input board

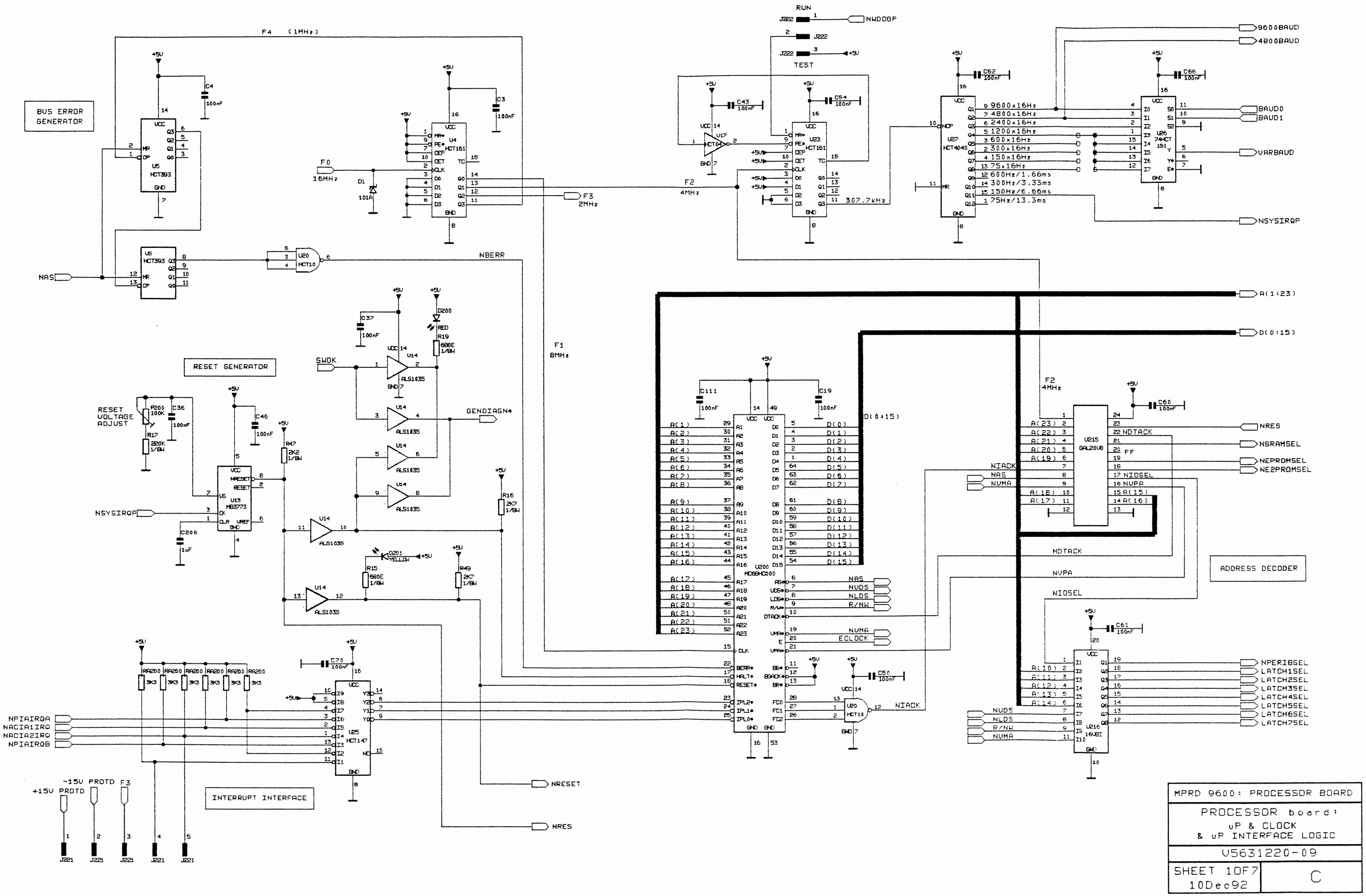
Removal :
- unscrew the 2 captive screws fixing the optional input board to the rear of the display.
- pull out the optional input board using the maintenance key (V603790).
- unplug the 3 coax cables, one for each colour R, G, B of the BIT signal
- Reinstallation :
- plug the 3 coax cables (a colour code is present on each of the 3 wires).
- push the board back into position.
- fix the board onto the chassis by way of the 2 captive screws at the rear.

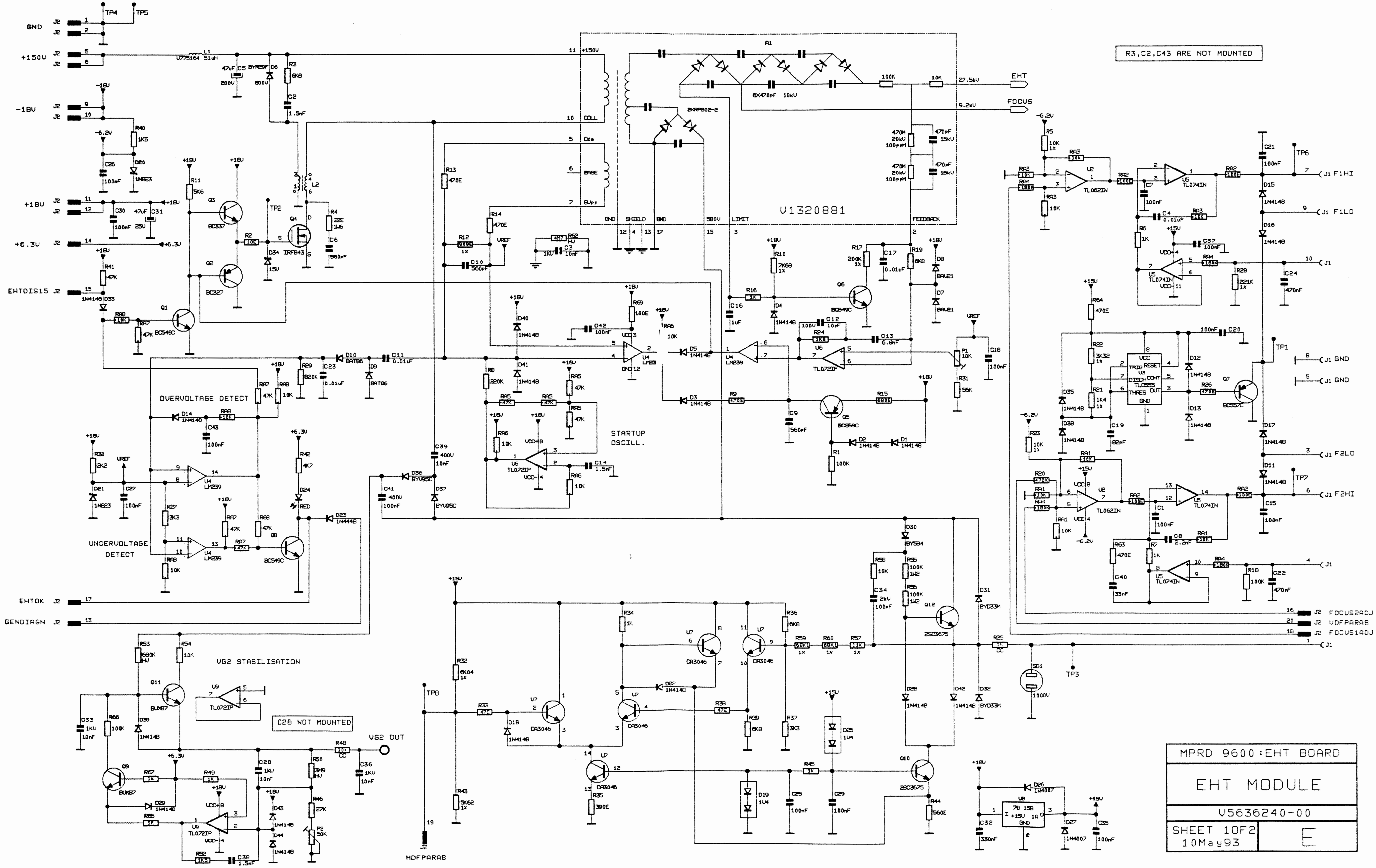


MEMORY CONTROL LOGIC
D(0:15)
A(1:23)
NSRAMSEL
NLDS
NUDS
NE2PROMSEL
NEPROMSEL
R/NW
NWELO
NOE
NWEHI
U201 SRAM
U202 E2PROM
U203 EPROM
U206 SRAM
U207 E2PROM
U208 EPROM
512K
32K & 128K
8K & 32K
2K
4 & 8 Mbit
1 & 2 Mbit
8 Mbit
1 & 2 & 4 Mbit
J211-J214
J219,J220
ARE NOT MOUNTED
U218 68B21
NPIAIRQA
NPERIBSEL
R/NW
ECLOCK
NRESET
NPIAIRQB
NSYSIRQP
NWDOGP
SWOK
GENDIAGN*
TEMPOK
NDEGAUSS*
NDEGREQP15
NSCLDRIVE
NSDADRIVE
EHTOK*
NUCIRQ*
NRS4XXSEL
VPOSPOL*
HPOSPOL*
RGBAMPOK*
SCLP
SDAP
OPTBITSEL
LATCH3
LATCH3SEL
REFSEL0
REFSEL1
RBITSEL
GBITSEL
BBITSEL
PATTSEL0
PATTSEL1
PATTSEL2
LATCH4
LATCH4SEL
NMTXSEL
NSTXSEL
NSRX/MRXSEL
DS/NIMBSEL
BAUD0
BAUD1
SINT/NAUTOSEL
NDRVR422EN
LATCH5
LATCH5SEL
LATCH6
LATCH6SEL
OPTBIT
LATCH7
NRES
LATCH7SEL
SWBLANK
AKBOFF
EXT1OFF
BPCLSEL
MISSEL
NMANDEGP
PATTSEL3
VBLP
HWEHTDIS
SWEHTDIS
EHTDIS
J201 IS NOT MOUNTED
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
MEMORY & PARALLEL I/O INTERFACE
V5631220-09
SHEET 3OF7
10Dec92
C

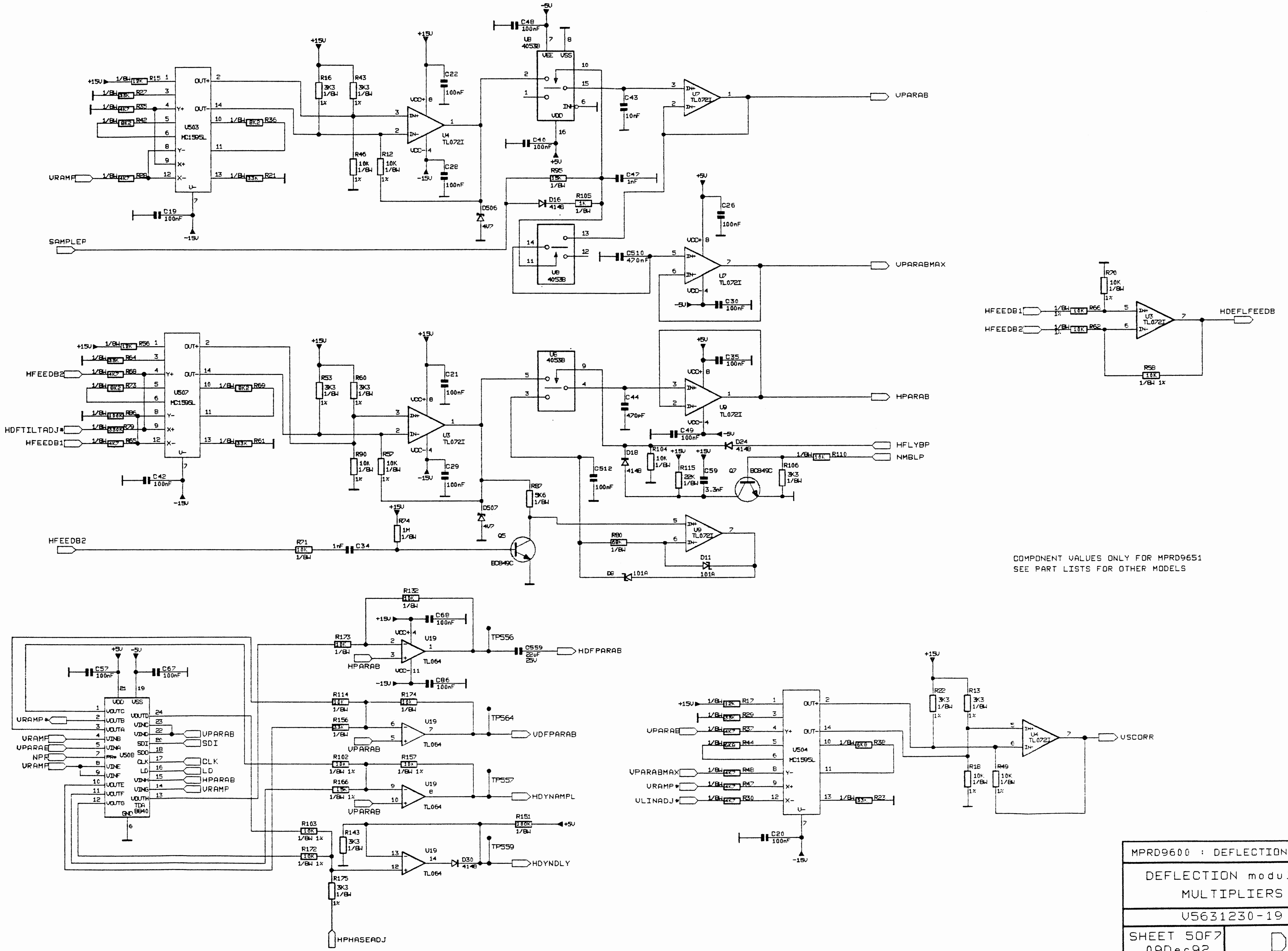


+10V REF
+VLED
HFLYBP15
MISSEL15
NMANDEGP15
EHTDIS15
RSVELIMADJ
GSVELIMADJ
BSVELIMADJ
BITLVLADJ
HBLSTRTADJ
HBLSTOPADJ
VBLADJ
RPICADJ
GPICADJ
BPICADJ
BKGADJ
RHILADJ
GHILADJ
BHILADJ
FOCUS1ADJ
RLOLADJ
GLOLADJ
BLOLADJ
FOCUS2ADJ
REFSEL0
REFSEL1
HFLYBP*
MISSEL
NMANDEGP
EHTDIS
REFSEL0\15
REFSEL1\15
VAMBLSENS
AMBLSENS
AMP ADJUST
+10V REF
+10VREF
ADJUST
DACREFADJ
DAC GAIN
ADJUST
D(0:15)
LATCH1
LATCH1SEL
LATCH2
LATCH2SEL
DACOUT
DEMUXA0\15
DEMUXA1\15
DEMUXA2\15
DEMUXA3\15
NDEMUXEN0\15
NDEMUXEN1\15
CONTROL
J216,J217 ARE NOT MOUNTED
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
ADJUST VOLTAGE GENERATOR
V5631220-09
SHEET 2OF7
10Dec92
C


BUS ERROR GENERATOR
RESET GENERATOR
INTERRUPT INTERFACE
ADDRESS DECODER
F4 (1MHz)
F0 16MHz
F1 8MHz
F2 4MHz
F3 2MHz
307.7kHz
RUN
TEST
NWDOGP
9600BAUD
4800BAUD
BAUD0
BAUD1
VARBAUD
NSYSIRQP
NAS
NBERR
SWOK
GENDIAGN*
RESET VOLTAGE ADJUST
A(1:23)
D(0:15)
NRES
NSRAMSEL
NEPROMSEL
NE2PROMSEL
NDTACK
NVPA
NIOSEL
NIACK
NUMA
NUDS
NLDS
R/NW
ECLOCK
NPERIBSEL
LATCH1SEL
LATCH2SEL
LATCH3SEL
LATCH4SEL
LATCH5SEL
LATCH6SEL
LATCH7SEL
NPIAIRQA
NACIA1IRQ
NACIA2IRQ
NPIAIRQB
NRESET
+15V PROTD
-15V PROTD
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
uP & CLOCK
& uP INTERFACE LOGIC
V5631220-09
SHEET 1OF7
10Dec92
C



R3,C2,C43 ARE NOT MOUNTED
GND
+150V
-18V
+18V
+6.3V
EHTDIS15
EHTOK
GENDIAGN
EHT
FOCUS
V1320881
OVERVOLTAGE DETECT
UNDERVOLTAGE DETECT
STARTUP OSCILL.
VG2 STABILISATION
C26 NOT MOUNTED
VG2 OUT
HDFPARAB
J1 F1HI
J1 F1LO
J1 GND
J1 F2LO
J1 F2HI
FOCUS2ADJ
VDFPARAB
FOCUS1ADJ
MPRD 9600:EHT BOARD
EHT MODULE
V5636240-00
SHEET 1OF2
10May93
E



COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS

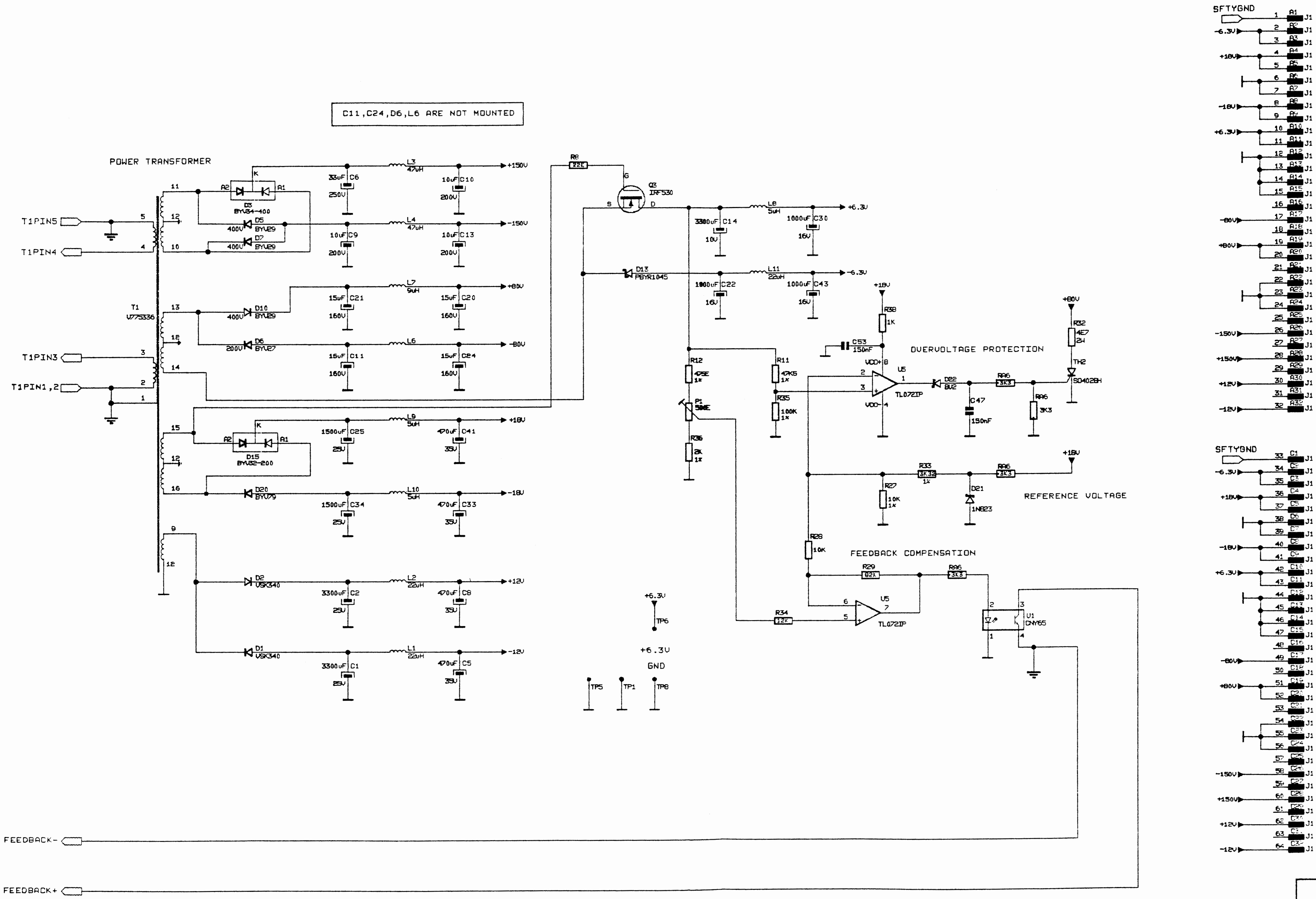
MPRD9600 : DEFLECTION BOARD

DEFLECTION module : MULTIPLIERS

V5631230-19

SHEET 5OF7
09Dec92

D



MPRD 9600:PS BOARD

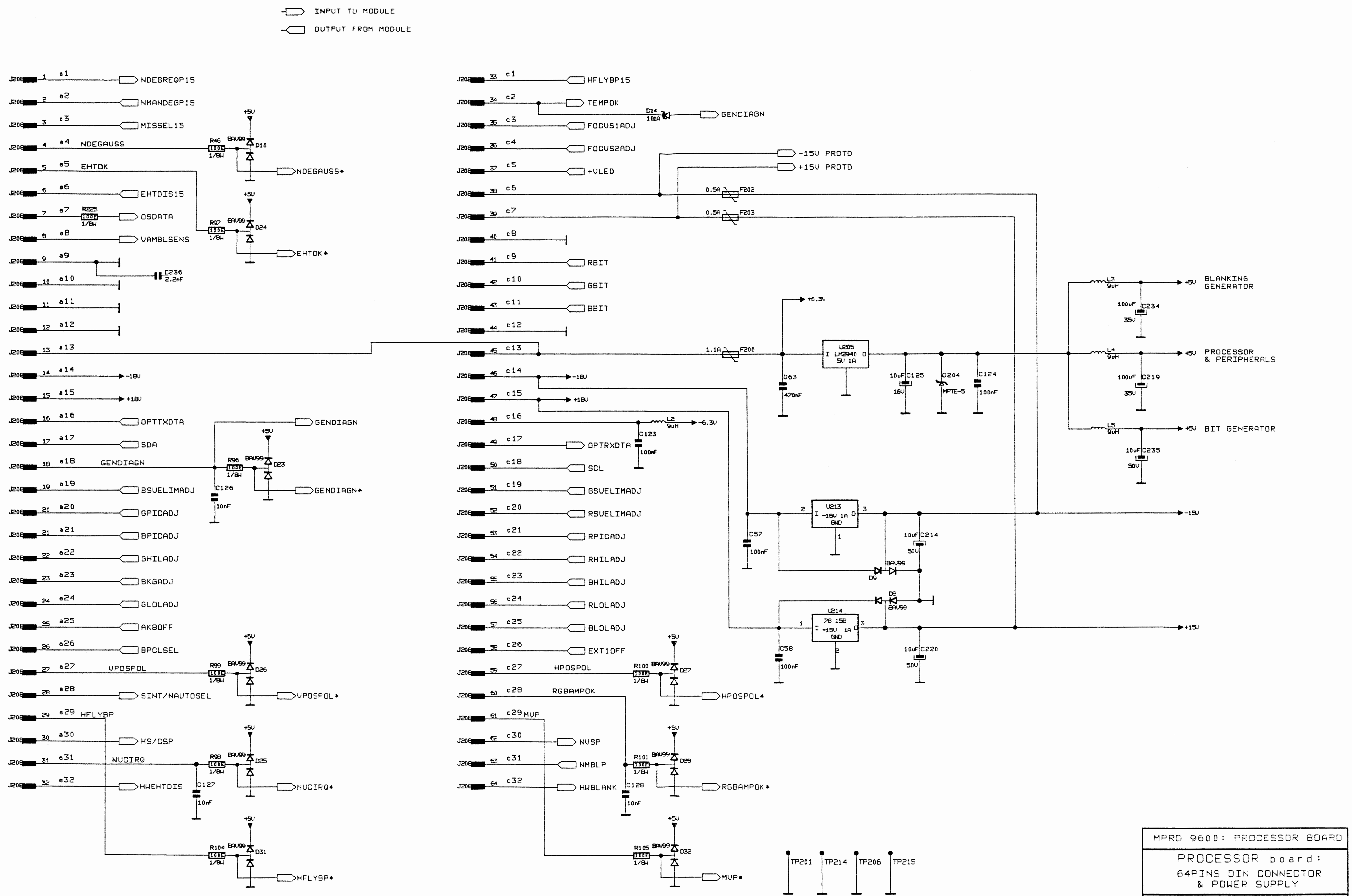
POWER SUPPLY 115/220V

main module:SECUNDARY

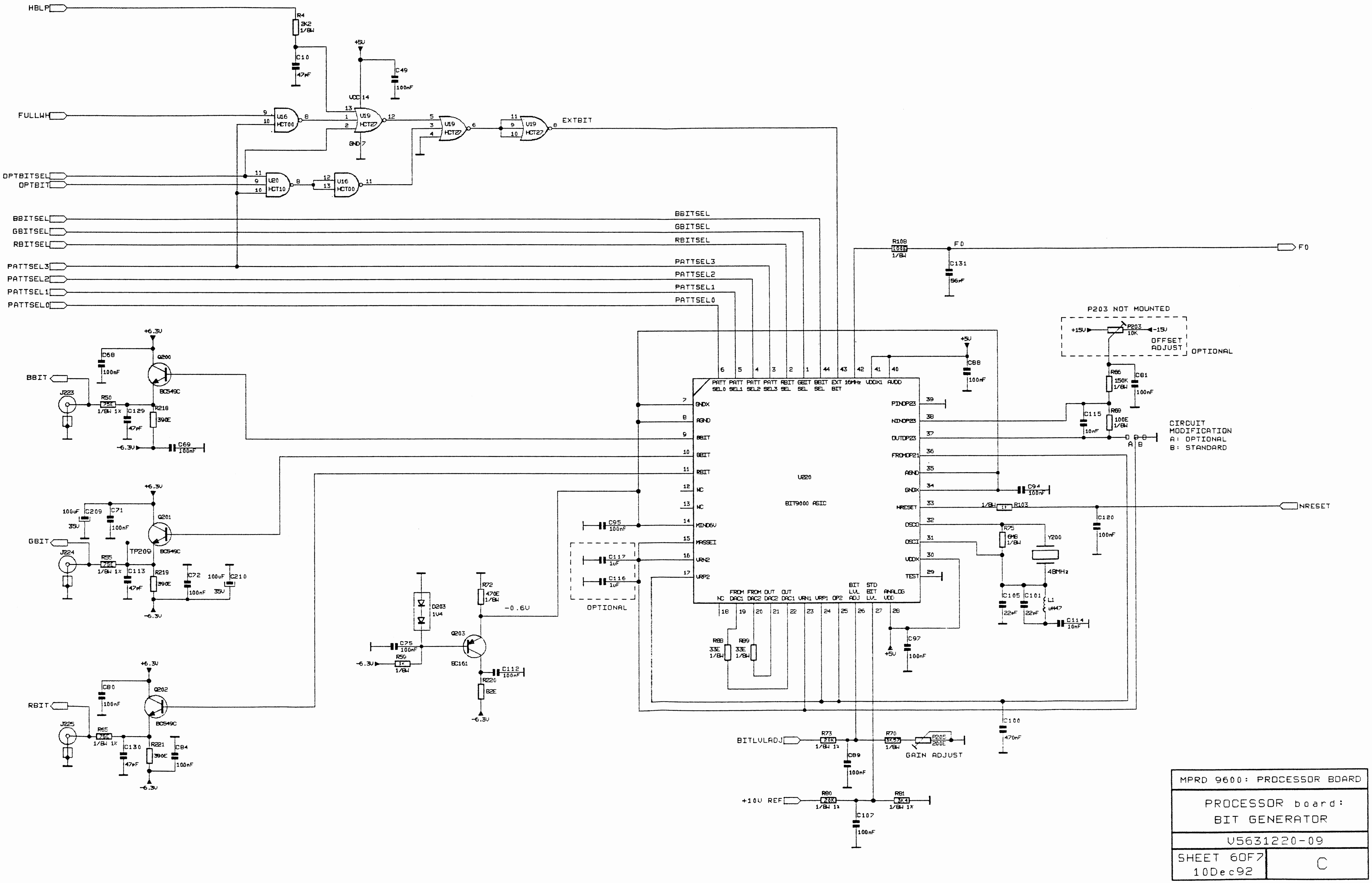
V5631270-11

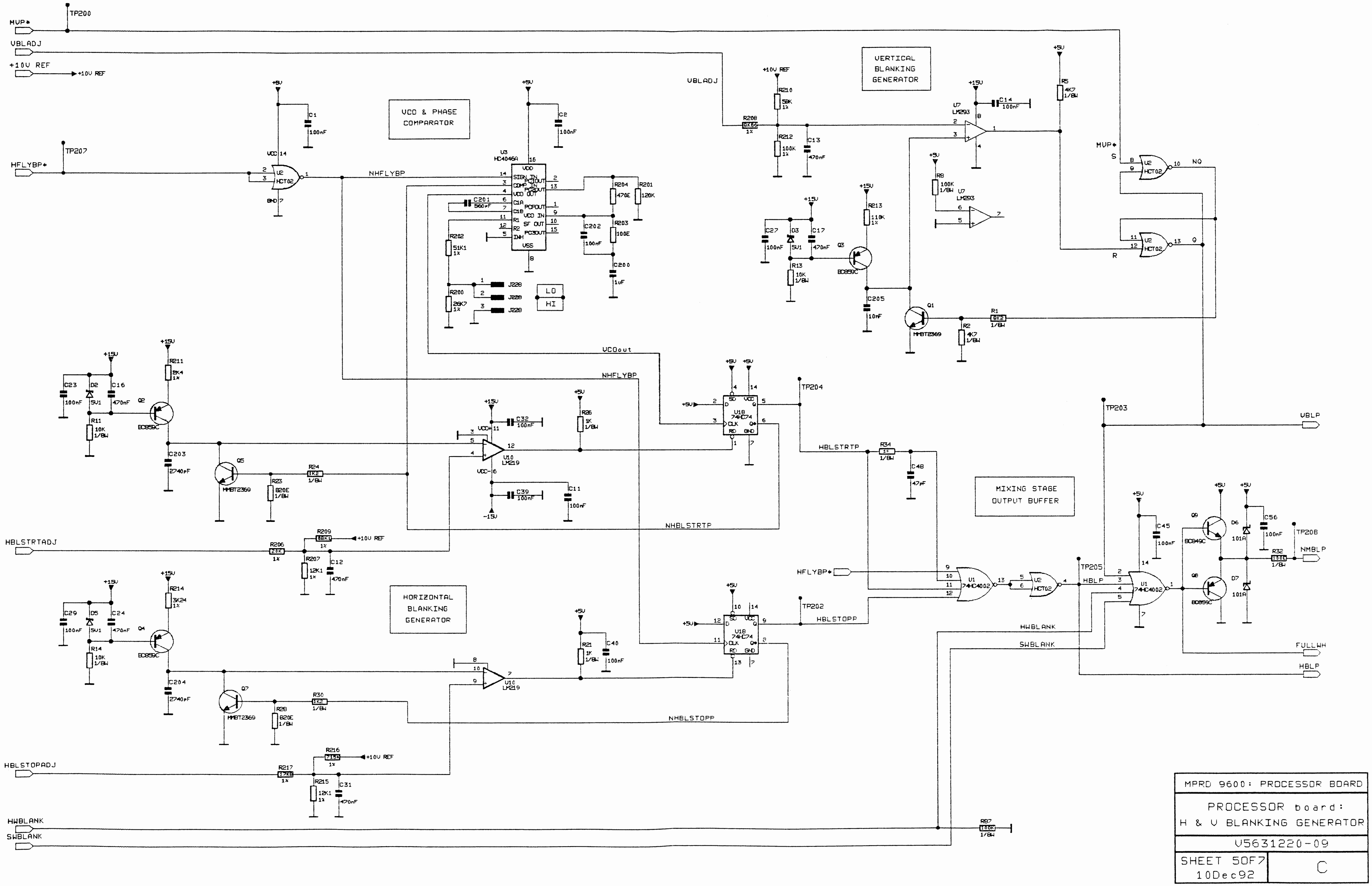
SHEET 2OF2
27Jan93

P

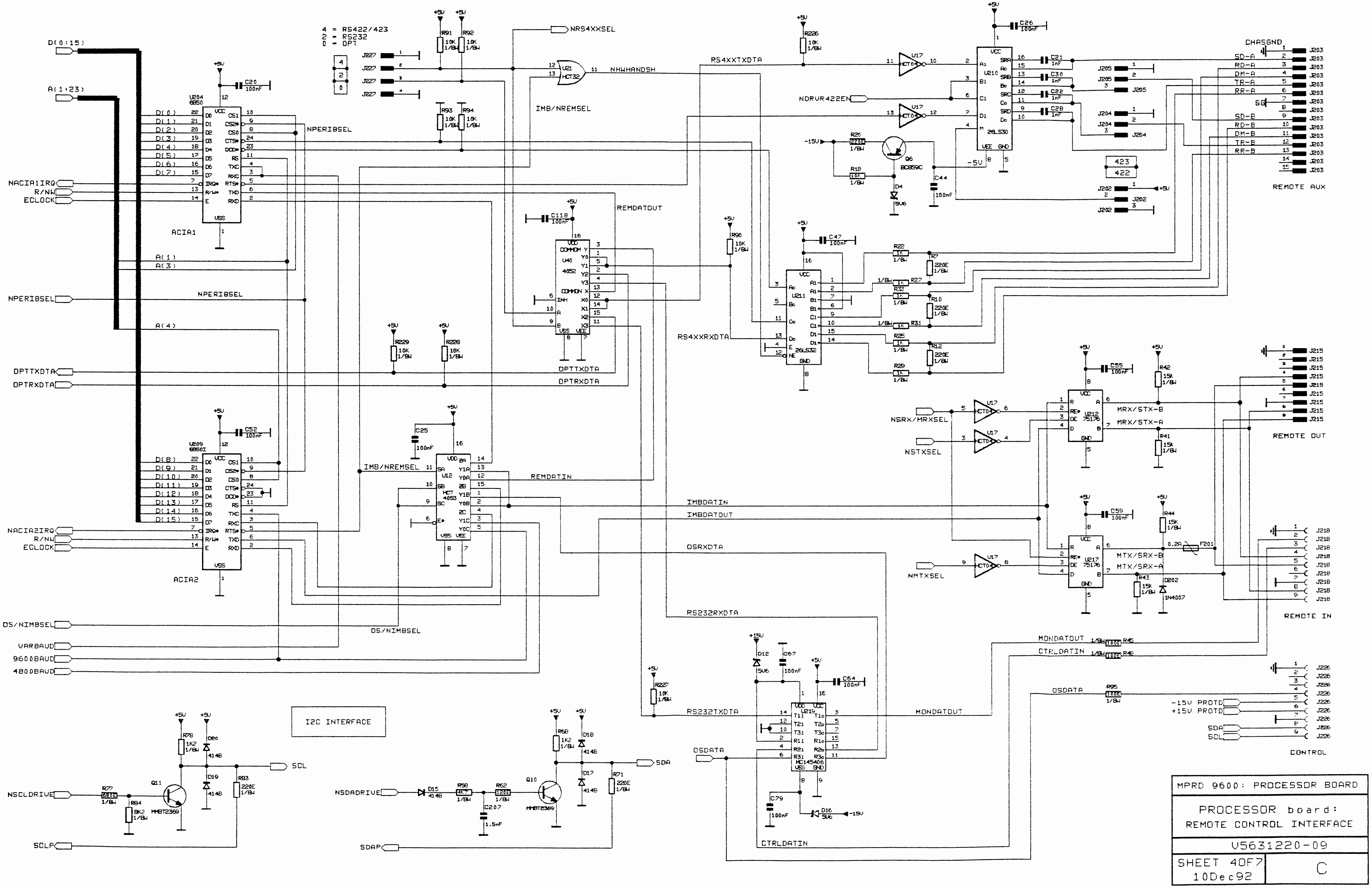


MPRD 9600: PROCESSOR BOARD	
PROCESSOR board: 64PINS DIN CONNECTOR & POWER SUPPLY	
V5631220-09	
SHEET 7OF7 10Dec92	C

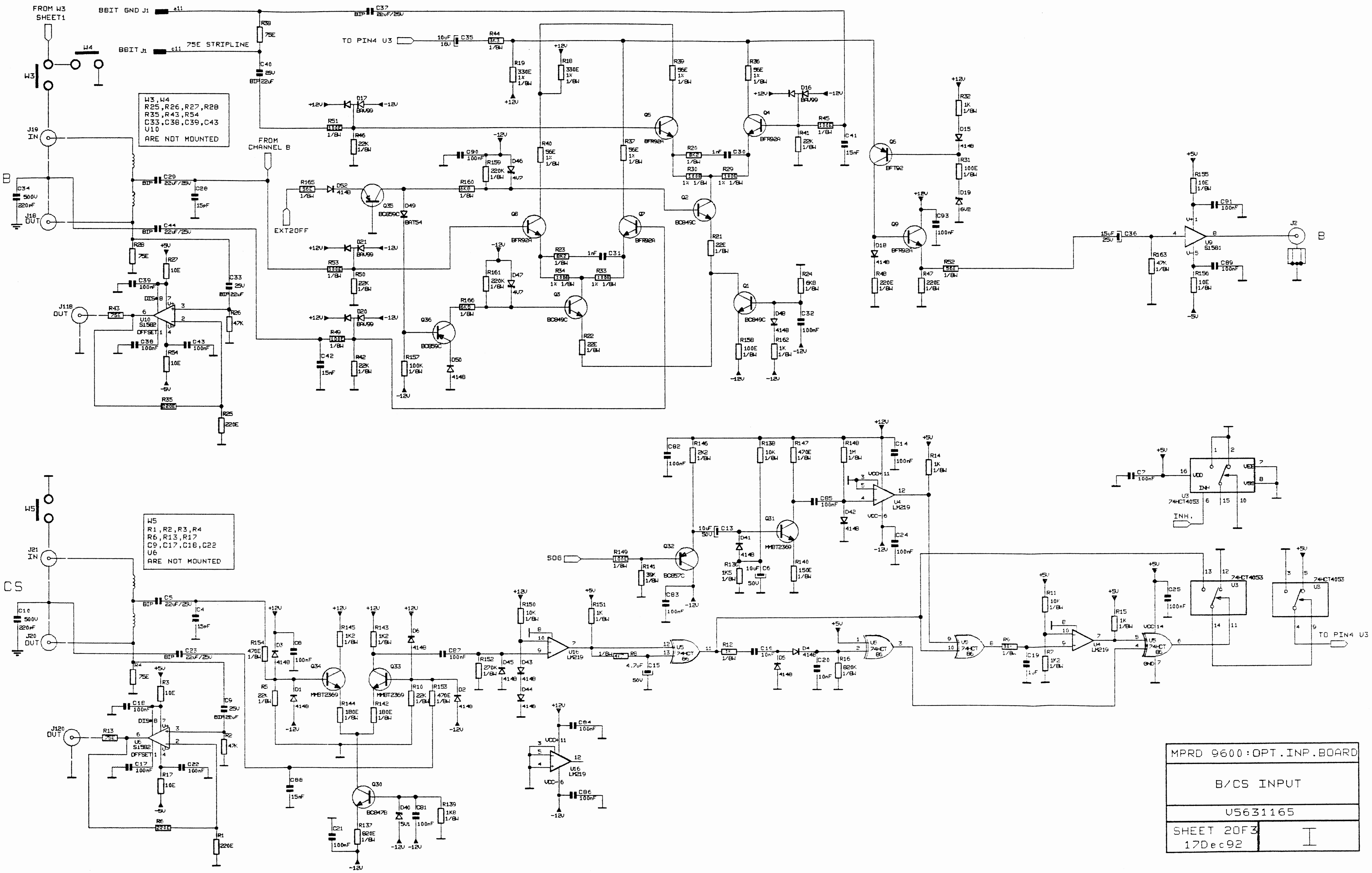

HBLP
FULLWH
OPTBITSEL
OPTBIT
BBITSEL
GBITSEL
RBITSEL
PATTSEL3
PATTSEL2
PATTSEL1
PATTSEL0
EXTBIT
BBIT
GBIT
RBIT
F0
NRESET
U220
BIT9000 ASIC
P203 NOT MOUNTED
OFFSET ADJUST
OPTIONAL
CIRCUIT MODIFICATION
A: OPTIONAL
B: STANDARD
BITLVLADJ
+10V REF
GAIN ADJUST
48MHz
-0.6V
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
BIT GENERATOR
V5631220-09
SHEET 6OF7
10Dec92
C



MVP*
VBLADJ
+10V REF
HFLYBP*
HBLSTRTADJ
HBLSTOPADJ
HWBLANK
SWBLANK
VCO & PHASE COMPARATOR
VERTICAL BLANKING GENERATOR
HORIZONTAL BLANKING GENERATOR
MIXING STAGE OUTPUT BUFFER
NHFLYBP
VCOout
NHBLSTRTP
NHBLSTOPP
HBLSTRTP
HBLSTOPP
HBLP
LO
HI
VBLP
NMBLP
FULLWH
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
H & V BLANKING GENERATOR
V5631220-09
SHEET 5OF7
10Dec92
C



D(0:15)
A(1:23)
NACIA1IRQ
R/NW
ECLOCK
ACIA1
NPERI8SEL
OPTTXDTA
OPTRXDTA
NACIA2IRQ
ECLOCK
ACIA2
OS/NIMBSEL
VARBAUD
9600BAUD
4800BAUD
NSCLDRIVE
SCLP
SCL
I2C INTERFACE
NSDADRIVE
SDAP
SDA
4 = RS422/423
2 = RS232
0 = OPT
NRS4XXSEL
NHWHANDSH
IMB/NREMSEL
REMDATOUT
REMDATIN
IMBDATIN
IMBDATOUT
OSRXDTA
RS232RXDTA
RS232TXDTA
OSDATA
CTRLDATIN
RS4XXTXDTA
RS4XXRXDTA
NDRVR422EN
MONDATOUT
CTRL_DATIN
CHASGND
SD-A
RD-A
DM-A
TR-A
RR-A
SG
SD-B
RD-B
DM-B
TR-B
RR-B
REMOTE AUX
REMOTE OUT
REMOTE IN
NSRX/MRXSEL
NSTXSEL
NMTXSEL
MRX/STX-B
MRX/STX-A
MTX/SRX-B
MTX/SRX-A
-15V PROTD
+15V PROTD
CONTROL
MPRD 9600: PROCESSOR BOARD
PROCESSOR board:
REMOTE CONTROL INTERFACE
V5631220-09
SHEET 4OF7
10Dec92
C



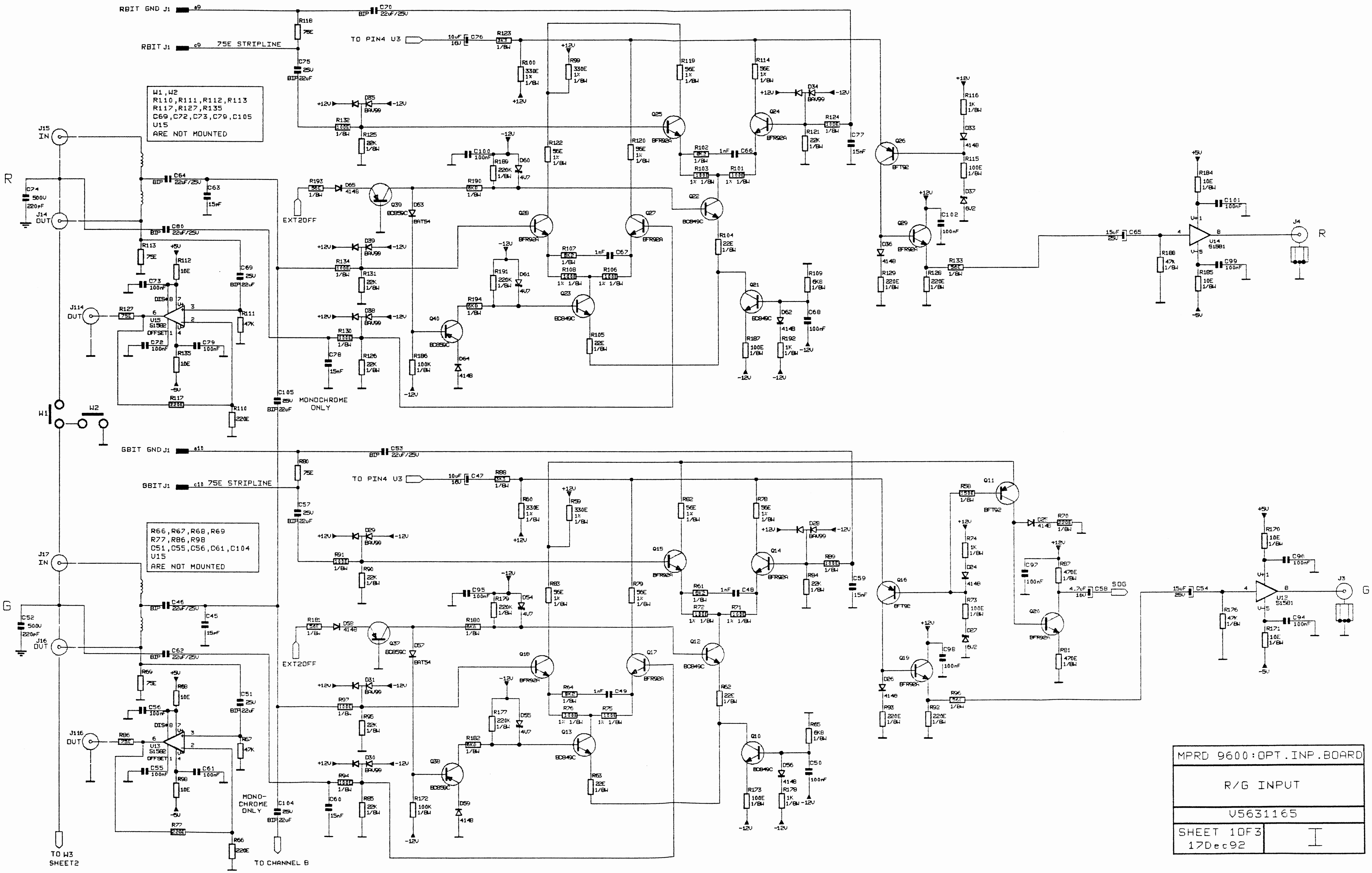
MPRD 9600:OPT.INP.BOARD

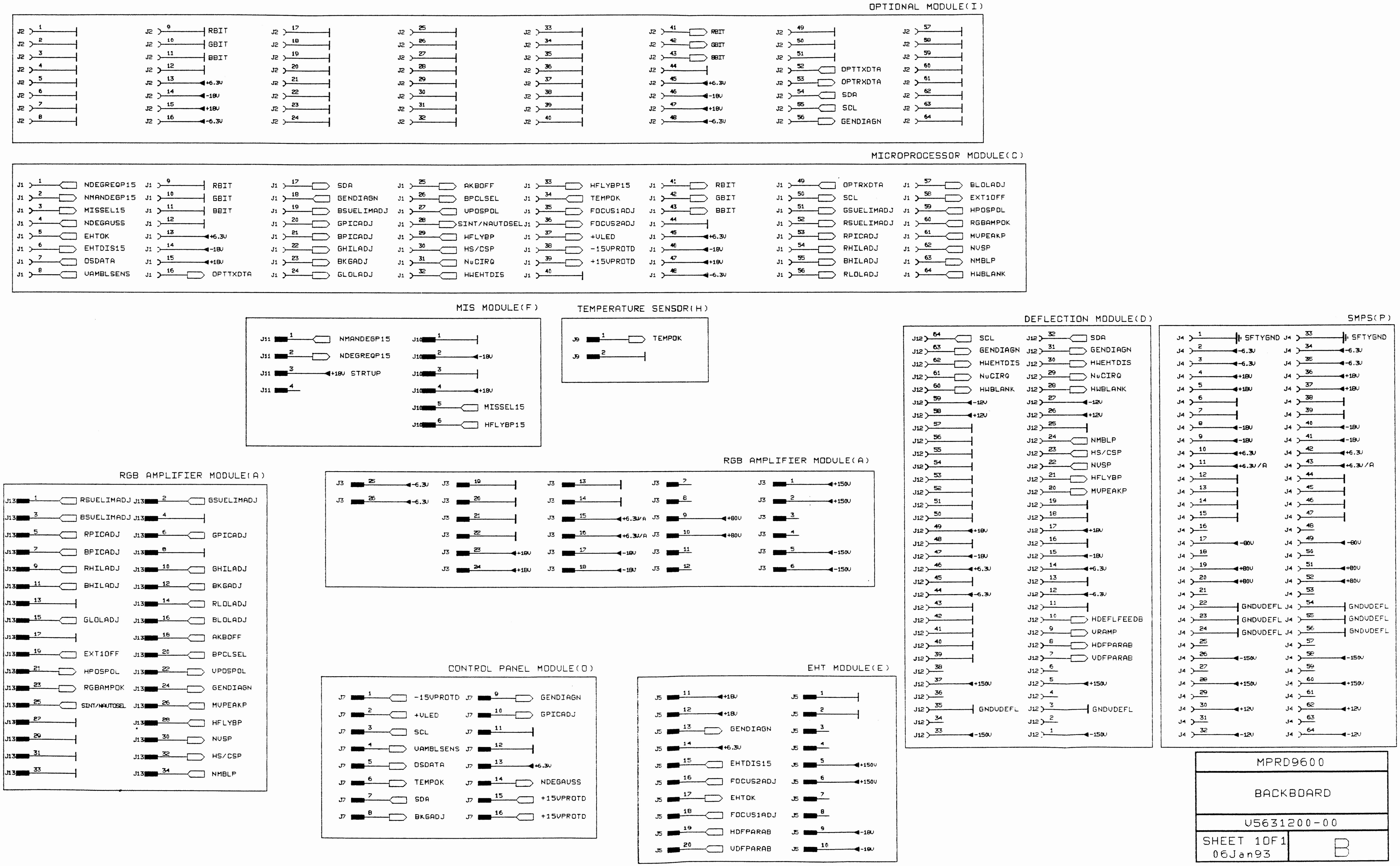
B/CS INPUT

U5631165

SHEET 2OF3
17Dec92

I


RBIT GND J1
RBIT J1
75E STRIPLINE
TO PIN4 U3
W1,W2
R110,R111,R112,R113
R117,R127,R135
C69,C72,C73,C79,C105
U15
ARE NOT MOUNTED
J15 IN
R
J14 OUT
J114 OUT
EXT2OFF
MONOCHROME ONLY
W1
W2
GBIT GND J1
GBIT J1
75E STRIPLINE
TO PIN4 U3
R66,R67,R68,R69
R77,R86,R98
C51,C55,C56,C61,C104
U15
ARE NOT MOUNTED
J17 IN
G
J16 OUT
J116 OUT
EXT2OFF
MONO-CHROME ONLY
TO W3 SHEET2
TO CHANNEL B
SOG
R
G
MPRD 9600:OPT.INP.BOARD
R/G INPUT
V5631165
SHEET 1OF3
17Dec92
I



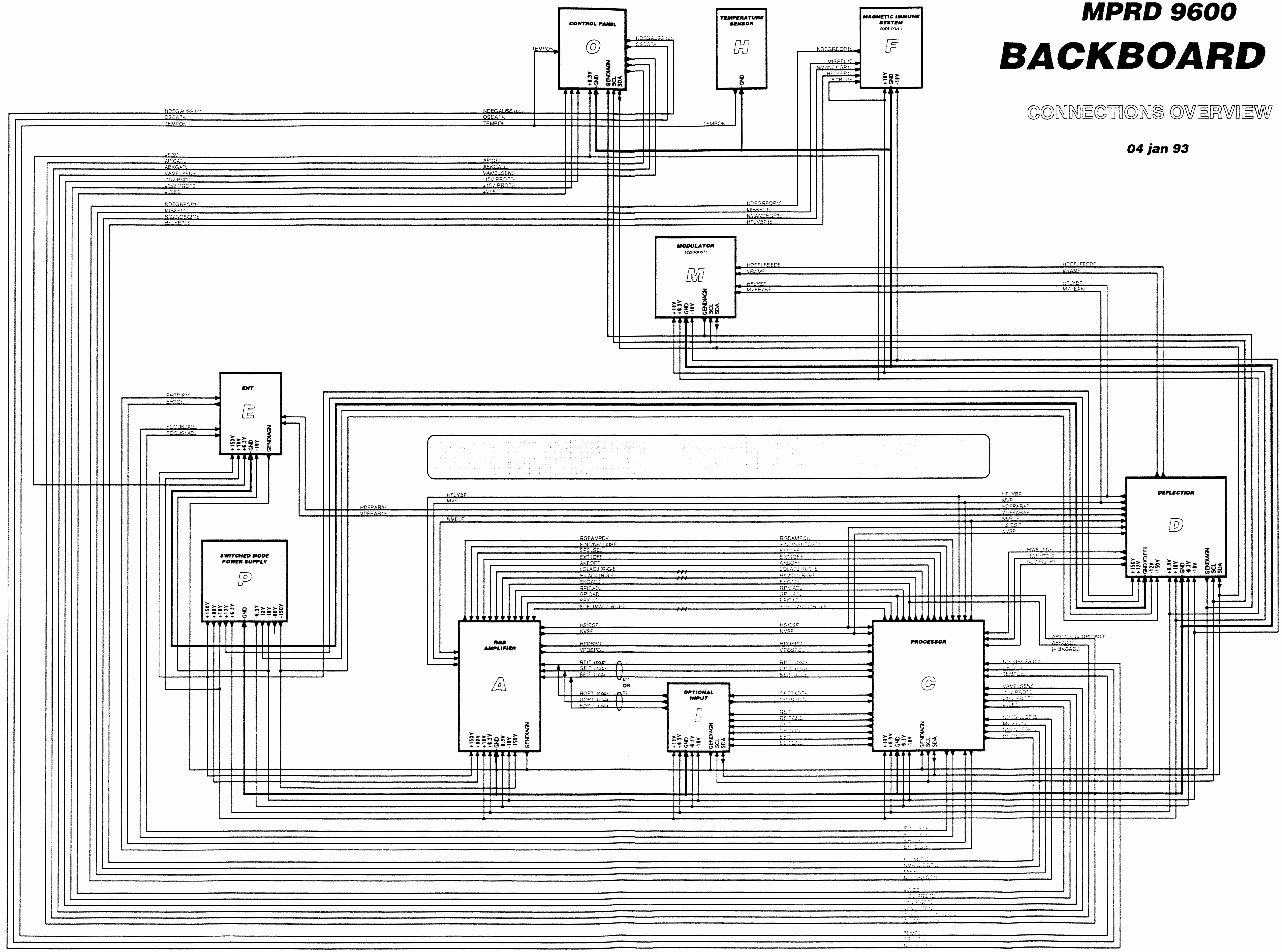
OPTIONAL MODULE(I)
RBIT GBIT BBIT OPTTXDTA OPTRXDTA SDA SCL GENDIAGN
MICROPROCESSOR MODULE(C)
NDEGREQP15 NMANDEGP15 MISSEL15 NDEGAUSS EHTOK EHTDIS15 OSDATA VAMBLSENS
RBIT GBIT BBIT OPTTXDTA
SDA GENDIAGN BSUELIMADJ GPICADJ BPICADJ GHILADJ BKGADJ GLOLADJ
AKBOFF BPCLSEL VPOSPOL SINT/NAUTOSEL HFLYBP HS/CSP NvCIRQ HWEHTDIS
HFLYBP15 TEMPOK FOCUS1ADJ FOCUS2ADJ +VLED -15VPROTD +15VPROTD
OPTRXDTA SCL GSUELIMADJ RSUELIMADJ RPICADJ RHILADJ BHILADJ RLOLADJ
BLOLADJ EXT1OFF HPOSPOL RGBAMPOK MVPEAKP NVSP NMBLP HWBLANK
MIS MODULE(F)
NMANDEGP15 NDEGREQP15 STRTUP MISSEL15 HFLYBP15
TEMPERATURE SENSOR(H)
TEMPOK
DEFLECTION MODULE(D)
SCL GENDIAGN HWEHTDIS NvCIRQ HWBLANK GNDVDEFL
SDA GENDIAGN HWEHTDIS NvCIRQ HWBLANK NMBLP HS/CSP NVSP HFLYBP MVPEAKP HDEFLFEEDB VRAMP HDFPARAB VDFPARAB GNDVDEFL
SMPS(P)
SFTYGND GNDVDEFL
RGB AMPLIFIER MODULE(A)
RSUELIMADJ GSUELIMADJ BSUELIMADJ RPICADJ GPICADJ BPICADJ RHILADJ GHILADJ BHILADJ BKGADJ RLOLADJ GLOLADJ BLOLADJ AKBOFF EXT1OFF BPCLSEL HPOSPOL VPOSPOL RGBAMPOK GENDIAGN SINT/NAUTOSEL MVPEAKP HFLYBP NVSP HS/CSP NMBLP
CONTROL PANEL MODULE(O)
-15VPROTD +VLED SCL VAMBLSENS OSDATA TEMPOK SDA BKGADJ GENDIAGN GPICADJ NDEGAUSS +15VPROTD +15VPROTD
EHT MODULE(E)
GENDIAGN EHTDIS15 FOCUS2ADJ EHTOK FOCUS1ADJ HDFPARAB VDFPARAB
MPRD9600
BACKBOARD
V5631200-00
SHEET 1OF1
06Jan93
B

MPRD 9600

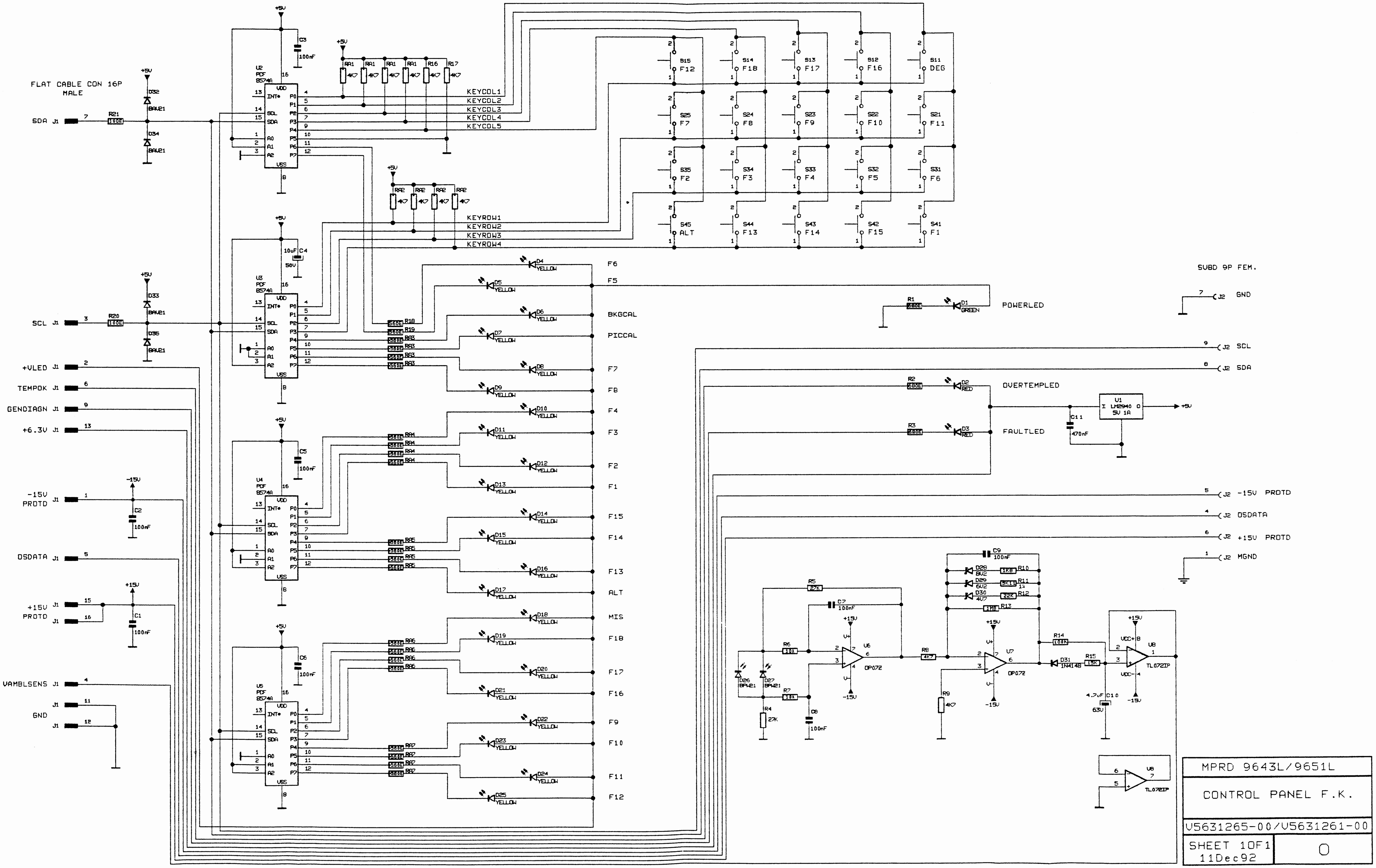
BACKBOARD B

CONNECTIONS OVERVIEW

04 jan 93



B


FLAT CABLE CON 16P MALE
SDA J1
SCL J1
+VLED J1
TEMPOK J1
GENDIAGN J1
+6.3V J1
-15V PROTD J1
OSDATA J1
+15V PROTD J1
VAMBLSENS J1
GND J1
KEYCOL1
KEYCOL2
KEYCOL3
KEYCOL4
KEYCOL5
KEYROW1
KEYROW2
KEYROW3
KEYROW4
PCF 8574A
F6
F5
BKGCAL
PICCAL
F7
F8
F4
F3
F2
F1
F15
F14
F13
ALT
MIS
F18
F17
F16
F9
F10
F11
F12
S15 F12
S14 F18
S13 F17
S12 F16
S11 DEG
S25 F7
S24 F8
S23 F9
S22 F10
S21 F11
S35 F2
S34 F3
S33 F4
S32 F5
S31 F6
S45 ALT
S44 F13
S43 F14
S42 F15
S41 F1
SUBD 9P FEM.
GND
POWERLED
SCL
SDA
OVERTEMPLED
FAULTLED
LM2940 5V 1A
-15V PROTD
OSDATA
+15V PROTD
MGND
OP072
TL072IP
MPRD 9643L/9651L
CONTROL PANEL F.K.
V5631265-00/V5631261-00
SHEET 1OF1
11Dec92
0

2.6.4 PCB LAYOUT

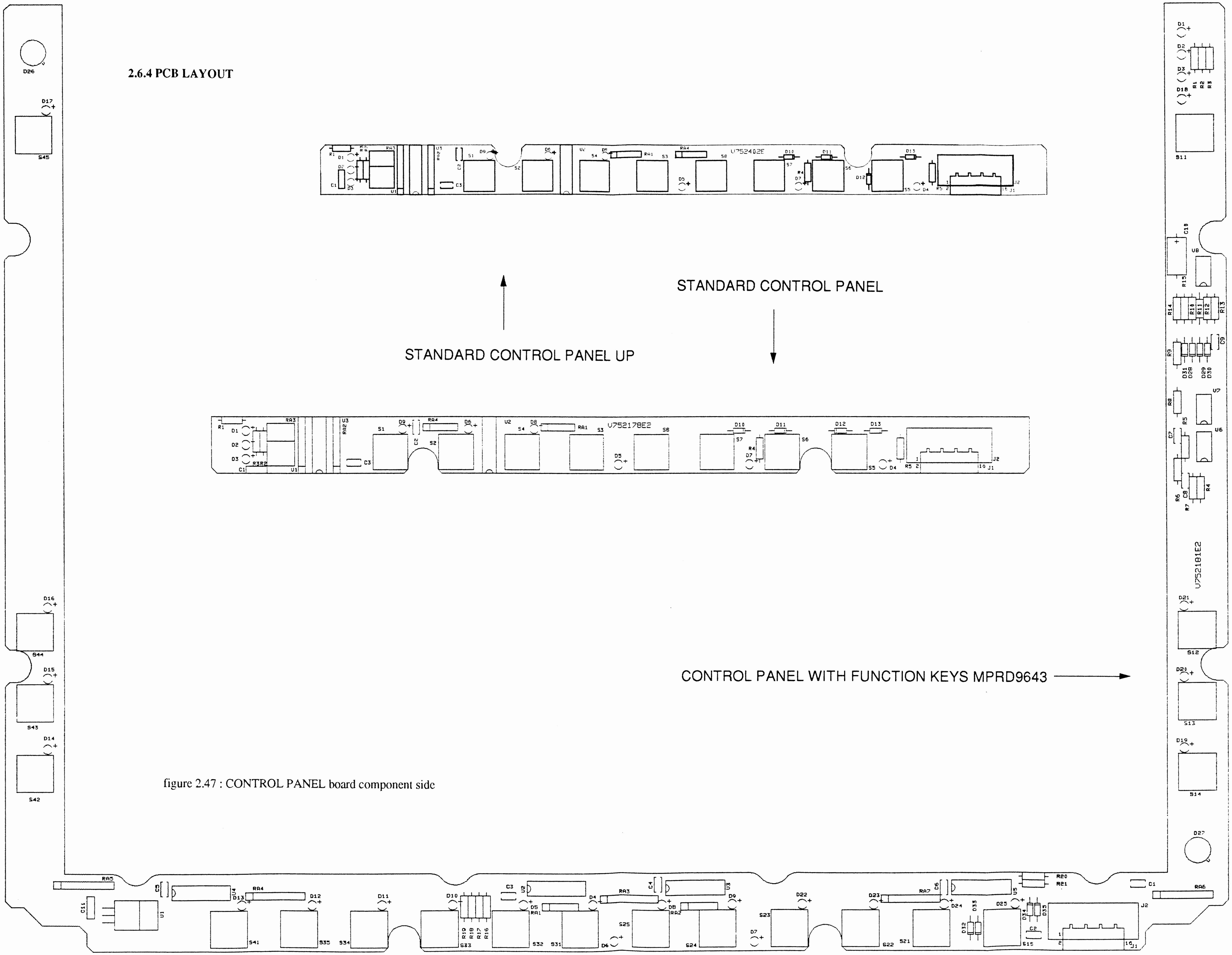
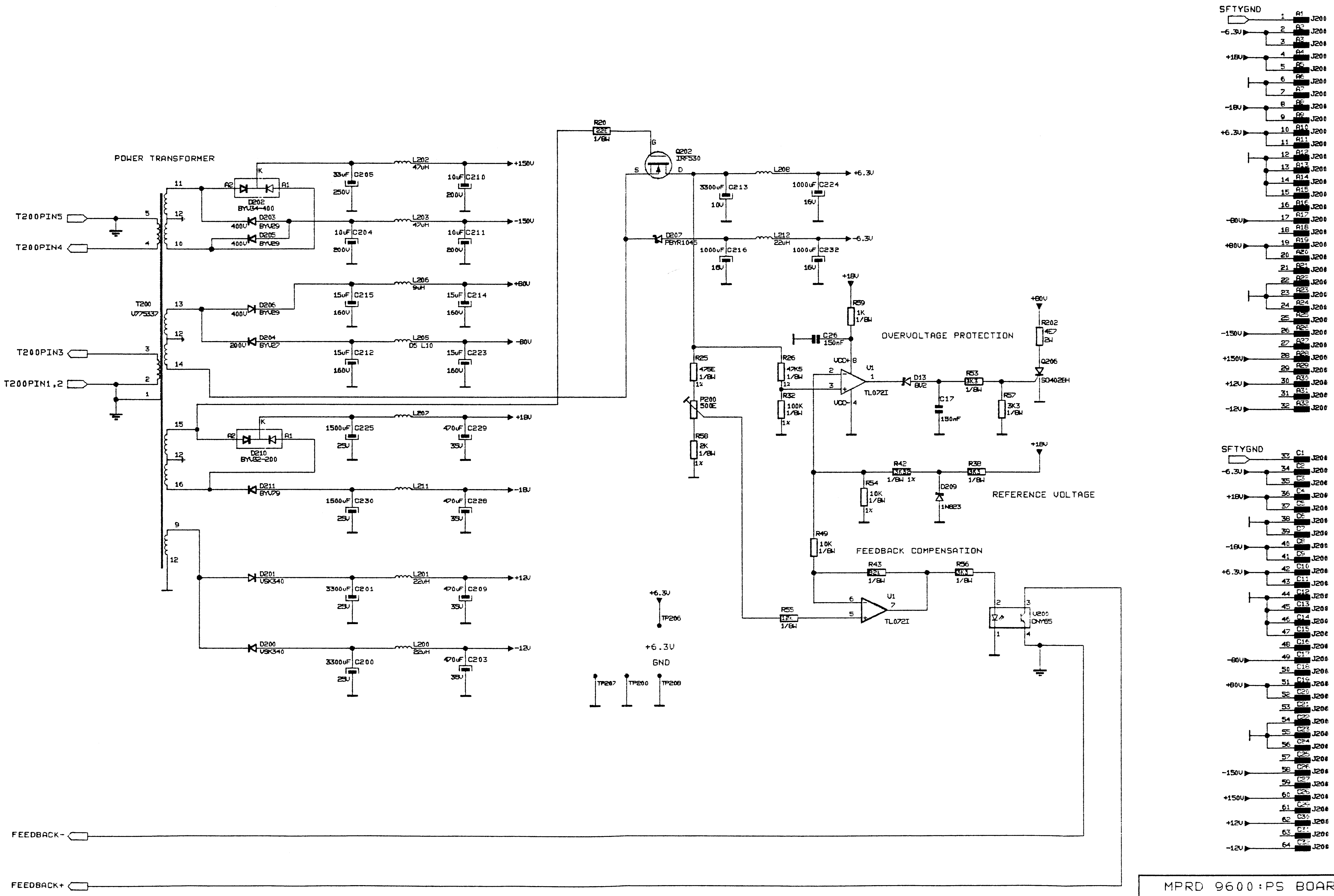


figure 2.47 : CONTROL PANEL board component side



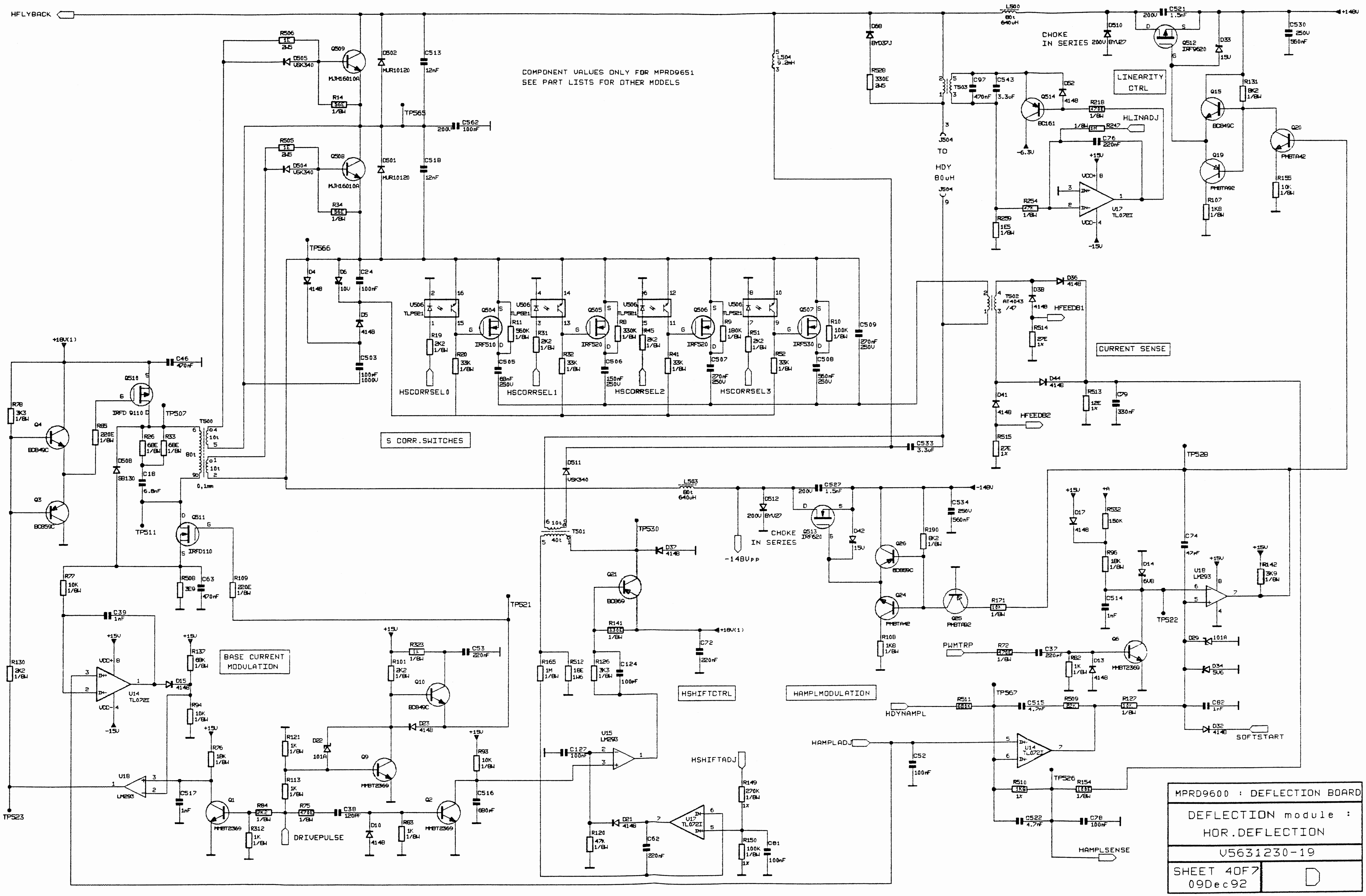
MPRD 9600:PS BOARD

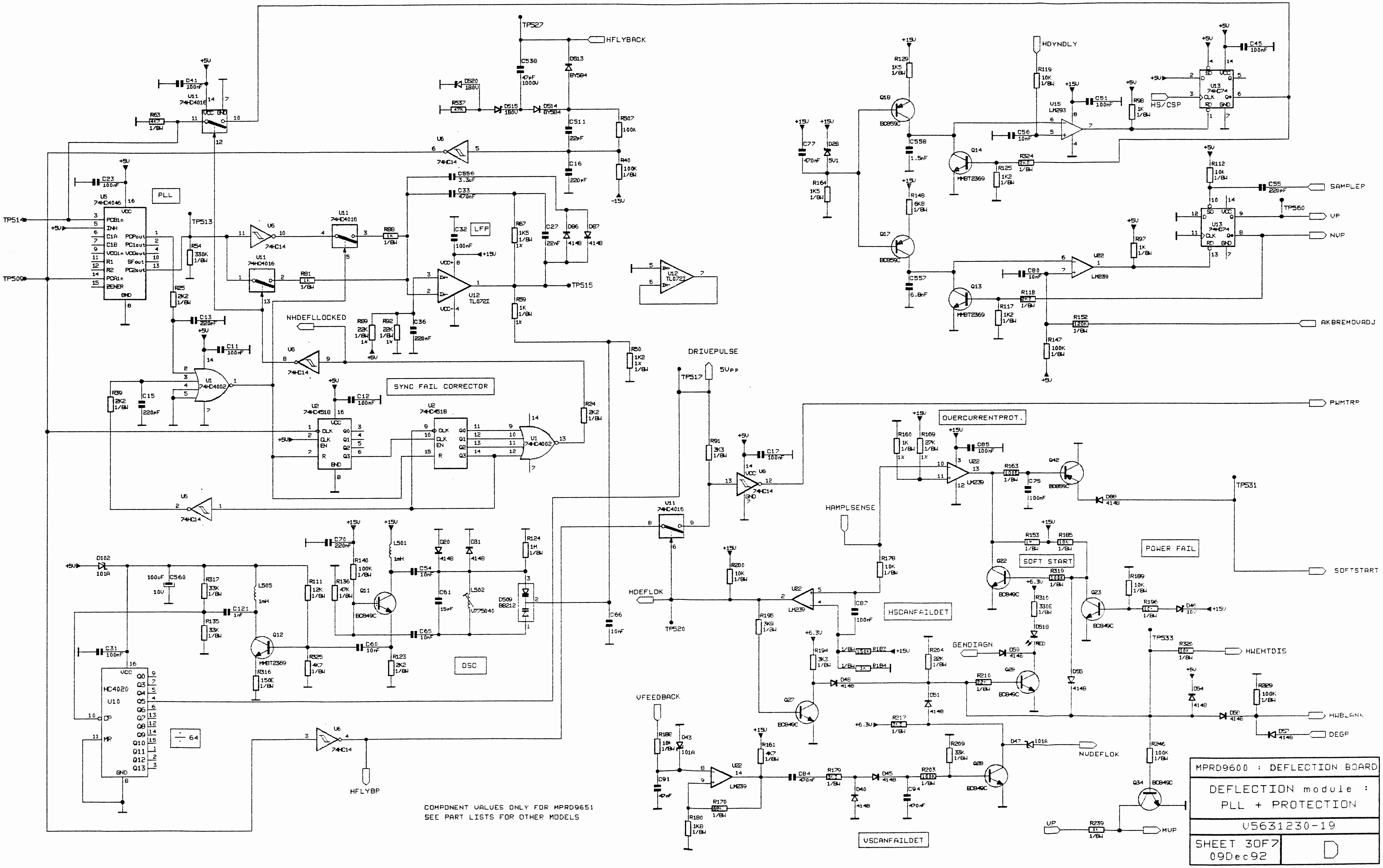
POWER SUPPLY 28VDC
main module:SECUNDARY

V5631271-14

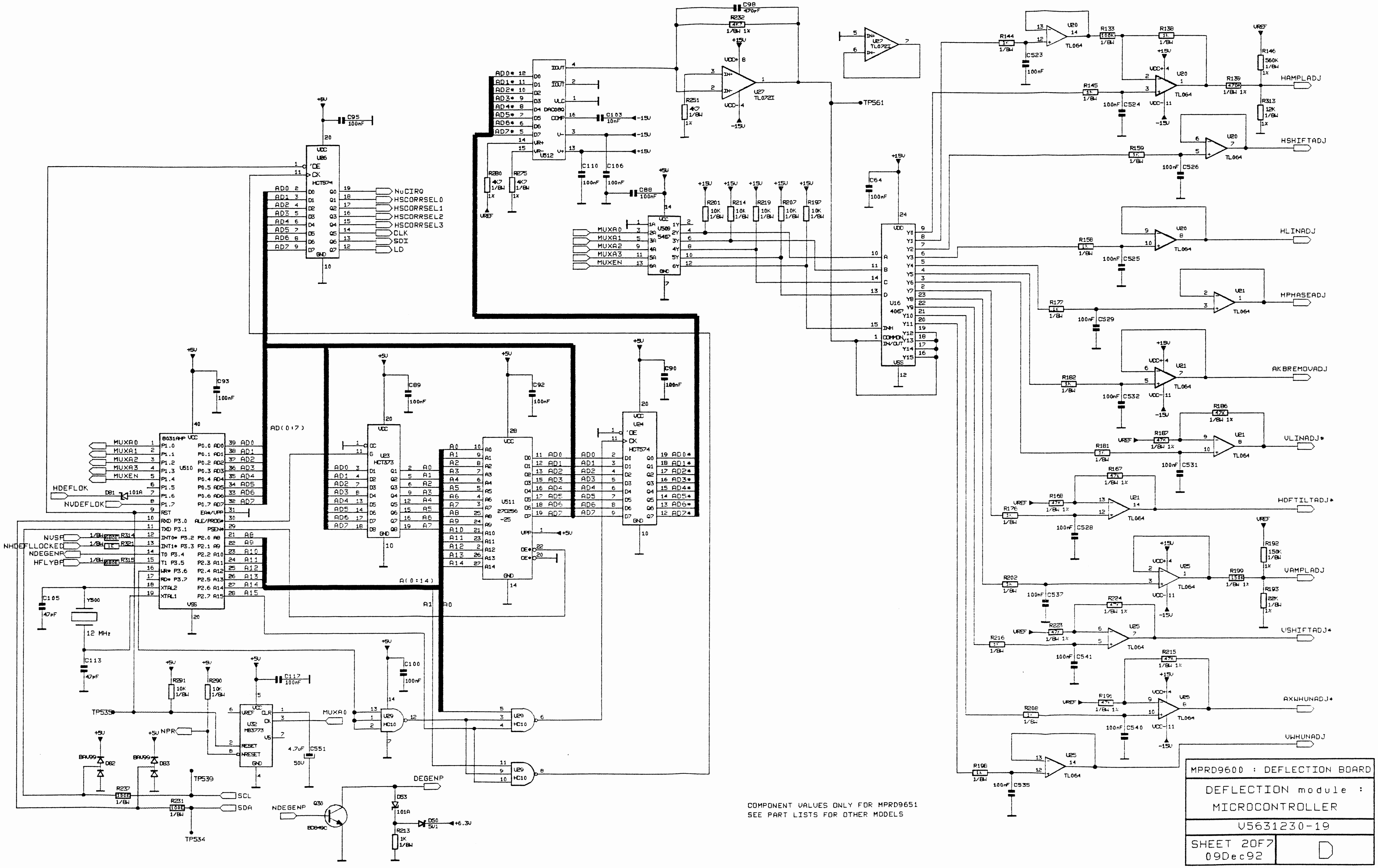
SHEET 2OF2
27Jan93

P


COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS
HFLYBACK
S CORR.SWITCHES
HSCORRSEL0
HSCORRSEL1
HSCORRSEL2
HSCORRSEL3
CHOKE IN SERIES
LINEARITY CTRL
HLINADJ
CURRENT SENSE
HFEEDB1
HFEEDB2
BASE CURRENT MODULATION
DRIVEPULSE
HSHIFTCTRL
HSHIFTADJ
HAMPLMODULATION
PWMTRP
HDYNAMPL
HAMPLADJ
HAMPLSENSE
SOFTSTART
-148Vpp
HDY 80uH
MPRD9600 : DEFLECTION BOARD
DEFLECTION module :
HOR.DEFLECTION
V5631230-19
SHEET 4OF7
09Dec92
D

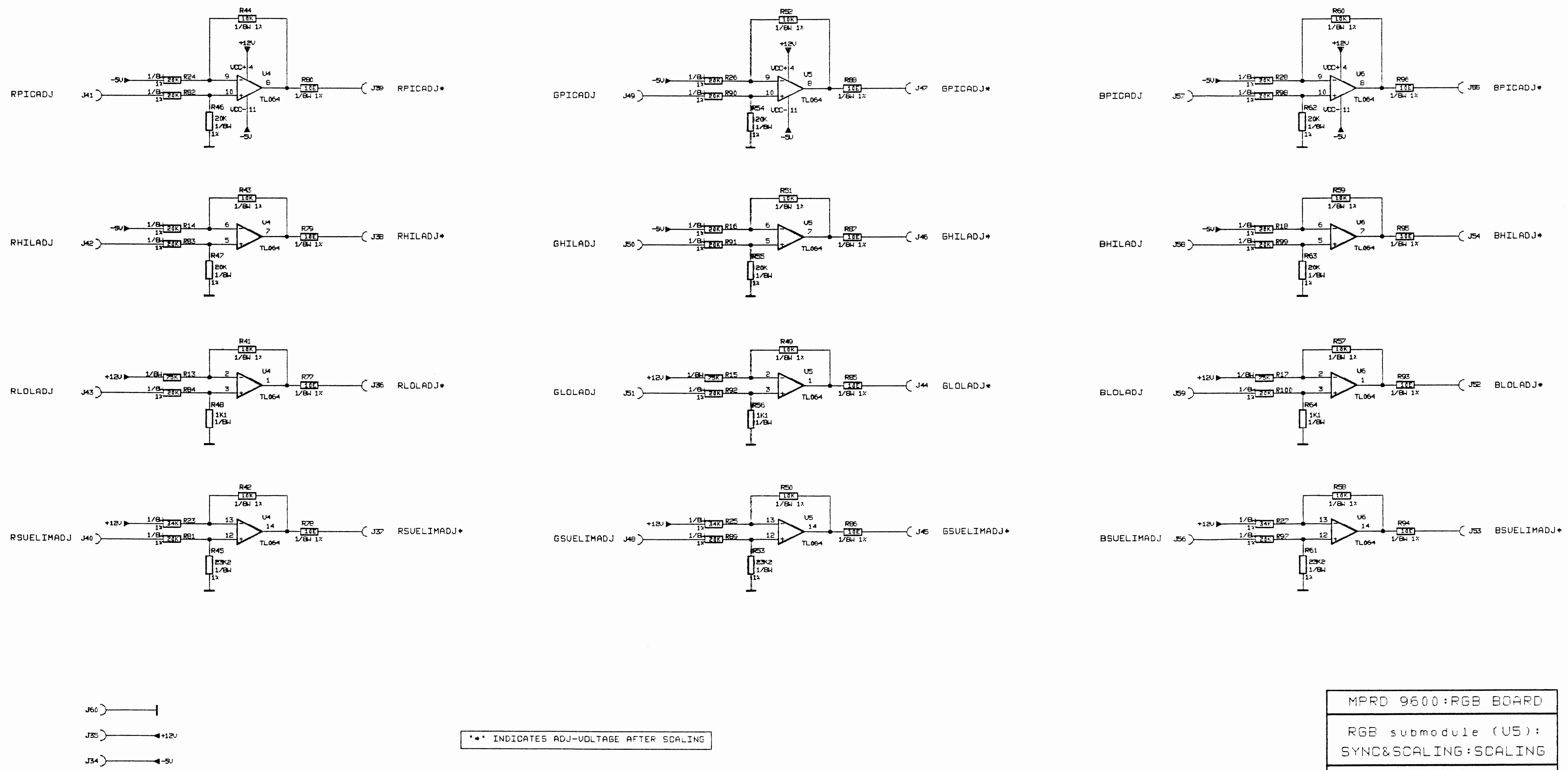


PLL
LFP
SYNC FAIL CORRECTOR
OSC
OVERCURRENTPROT.
SOFT START
POWER FAIL
HSCANFAILDET
VSCANFAILDET
HFLYBACK
HDYNDLY
HS/CSP
SAMPLEP
VP
NVP
AKBREMOVADJ
PWMTRP
SOFTSTART
HWEHTDIS
HWBLANK
DEGP
MVP
NUDEFLOK
HDEFLOK
VFEEDBACK
HAMPLSENSE
GENDIAGN
DRIVEPULSE
NHDEFLLOCKED
HFLYBP
COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS
MPRD9600 : DEFLECTION BOARD
DEFLECTION module :
PLL + PROTECTION
V5631230-19
SHEET 3OF7
09Dec92
D



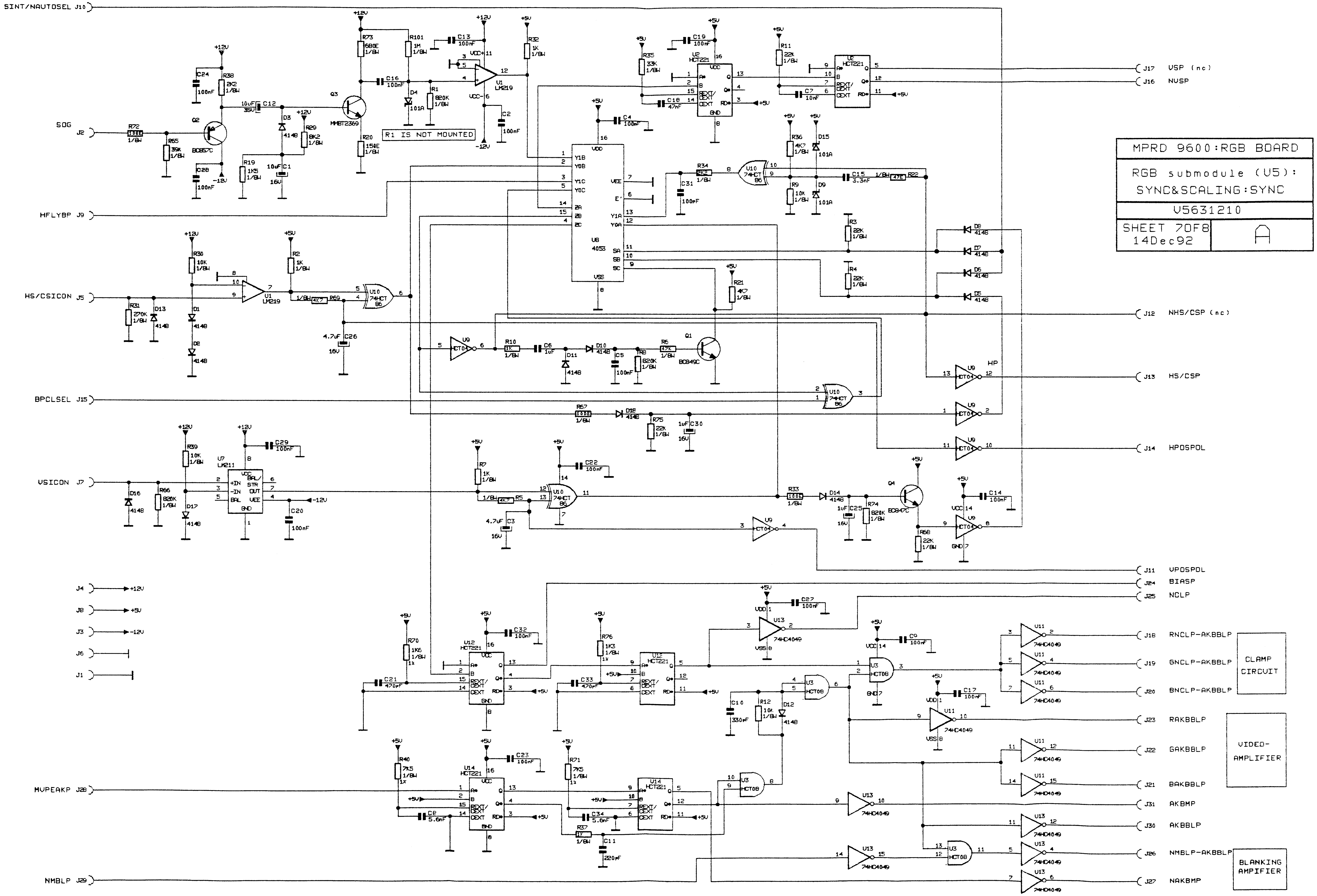
COMPONENT VALUES ONLY FOR MPRD9651
SEE PART LISTS FOR OTHER MODELS

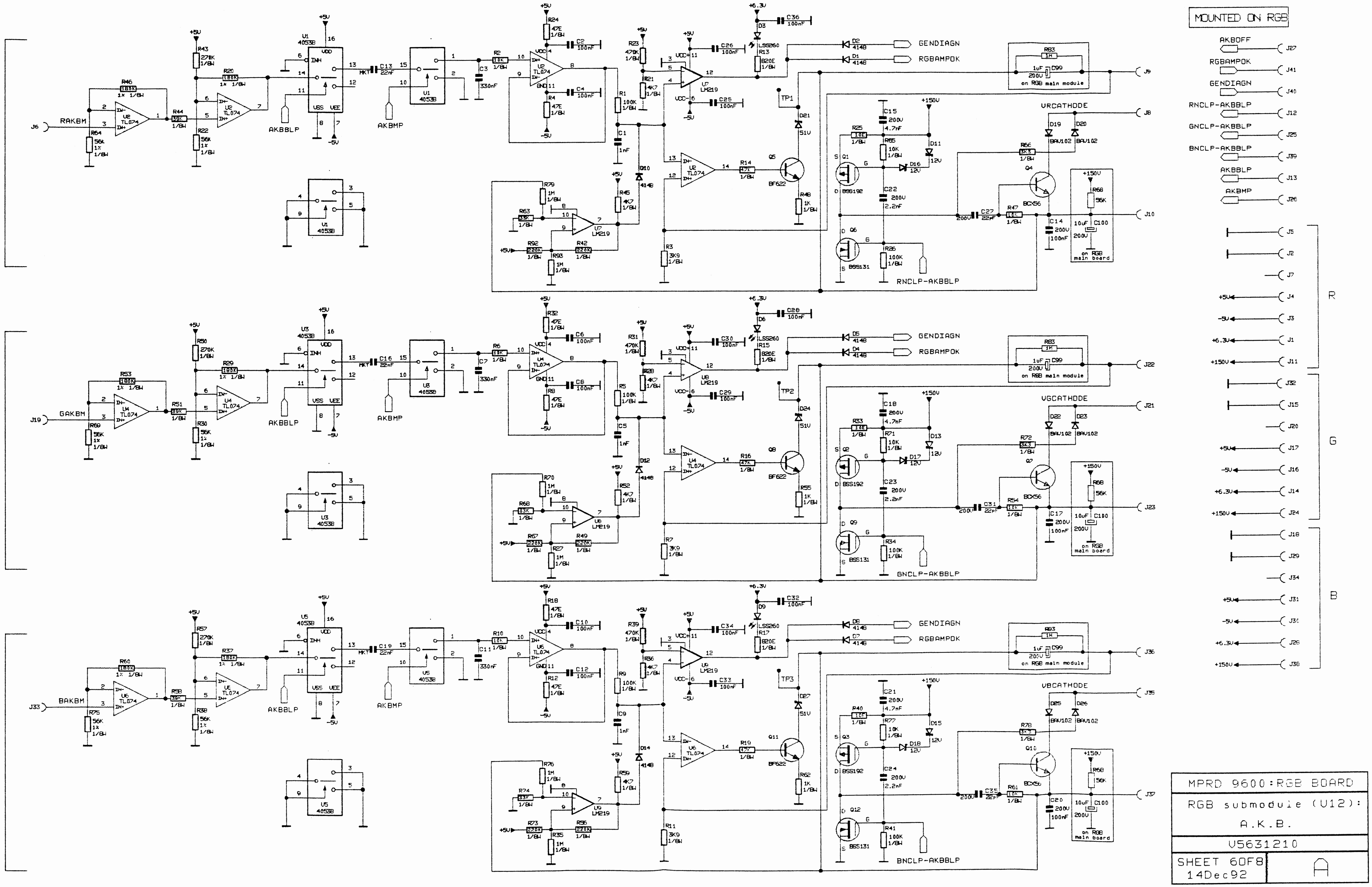
MPRD9600 : DEFLECTION BOARD	
DEFLECTION module : MICROCONTROLLER	
V5631230-19	
SHEET 2OF7 09Dec92	D



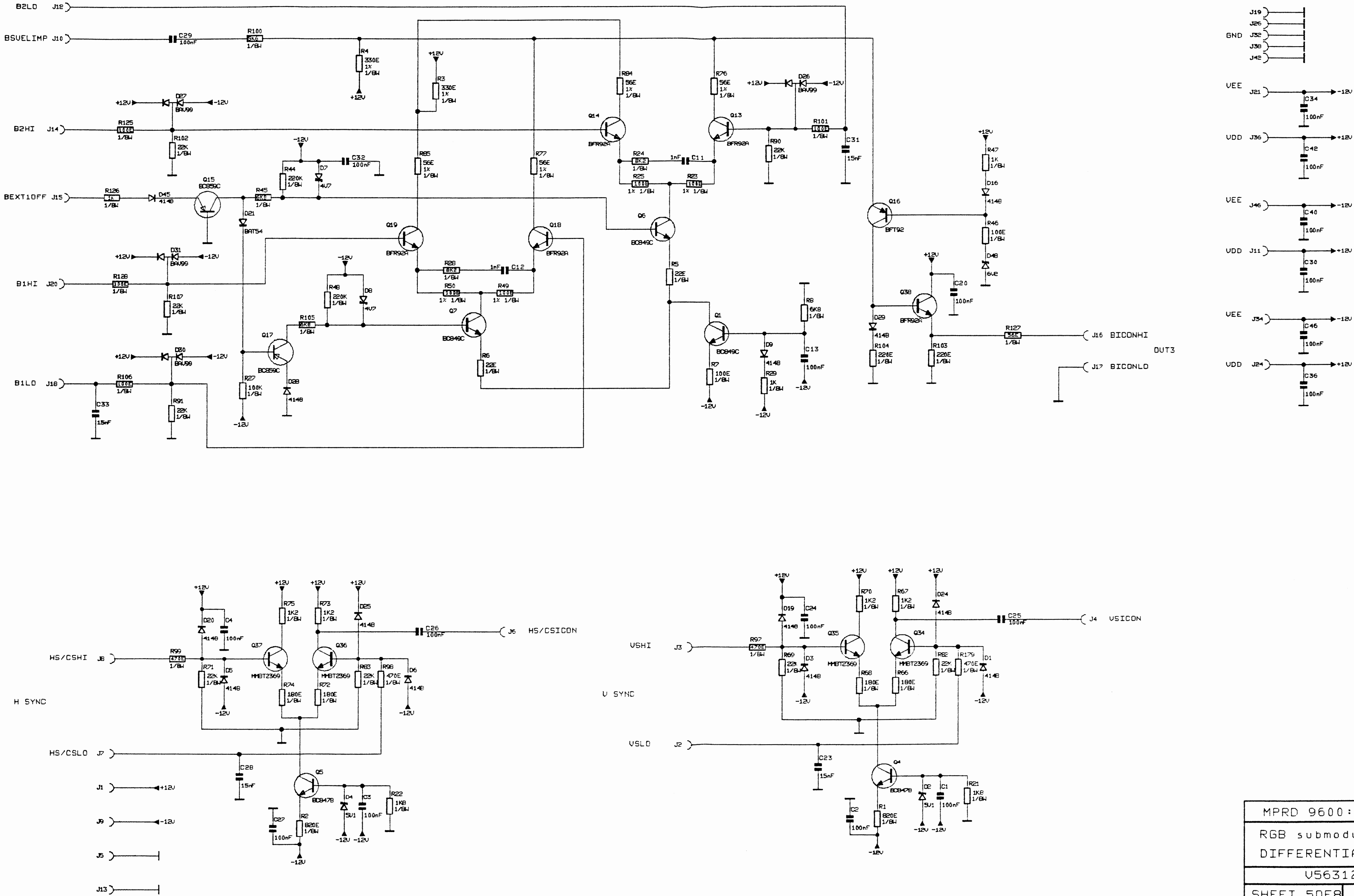
"*" INDICATES ADJ-VOLTAGE AFTER SCALING

MPRD 9600:RGB BOARD
RGB submodule (U5): SYNC&SCALING:SCALING
V5631210
SHEET 8OF8 14Dec92 — A

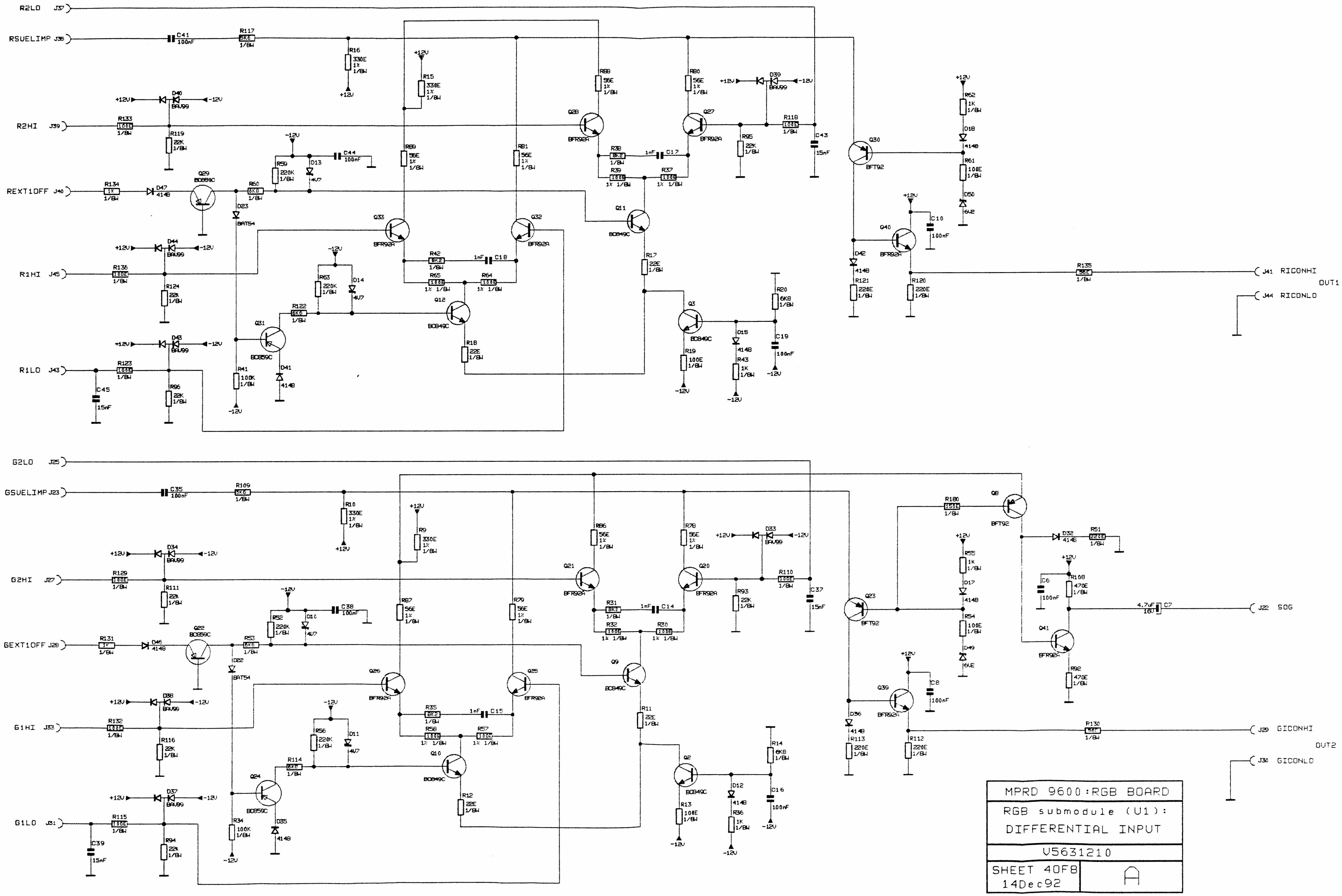

MPRD 9600:RGB BOARD
RGB submodule (U5):
SYNC&SCALING:SYNC
V5631210
SHEET 7OF8
14Dec92
A
SINT/NAUTOSEL J10
SOG J2
HFLYBP J9
HS/CSICON J5
BPCLSEL J15
VSICON J7
MVPEAKP J28
NMBLP J29
J17 VSP (nc)
J16 NVSP
J12 NHS/CSP (nc)
J13 HS/CSP
J14 HPOSPOL
J11 VPOSPOL
J24 BIASP
J25 NCLP
J18 RNCLP-AKBBLP
J19 GNCLP-AKBBLP
J20 BNCLP-AKBBLP
J23 RAKBBLP
J22 GAKBBLP
J21 BAKBBLP
J31 AKBMP
J30 AKBBLP
J26 NMBLP-AKBBLP
J27 NAKBMP
CLAMP CIRCUIT
VIDEO-AMPLIFIER
BLANKING AMPIFIER
R1 IS NOT MOUNTED



MOUNTED ON RGB
R
G
B
RAKBM
GAKBM
BAKBM
AKBBLP
AKBMP
GENDIAGN
RGBAMPOK
VRCATHODE
VGCATHODE
VBCATHODE
RNCLP-AKBBLP
GNCLP-AKBBLP
BNCLP-AKBBLP
on RGB main module
on RGB main board
AKBOFF
RGBAMPOK
GENDIAGN
RNCLP-AKBBLP
GNCLP-AKBBLP
BNCLP-AKBBLP
AKBBLP
AKBMP
MPRD 9600:RGB BOARD
RGB submodule (U12):
A.K.B.
V5631210
SHEET 6OF8
14Dec92
A



MPRD 9600:RGB BOARD	
RGB submodule (U1): DIFFERENTIAL INPUT	
V5631210	
SHEET 5OF8 14Dec92	A



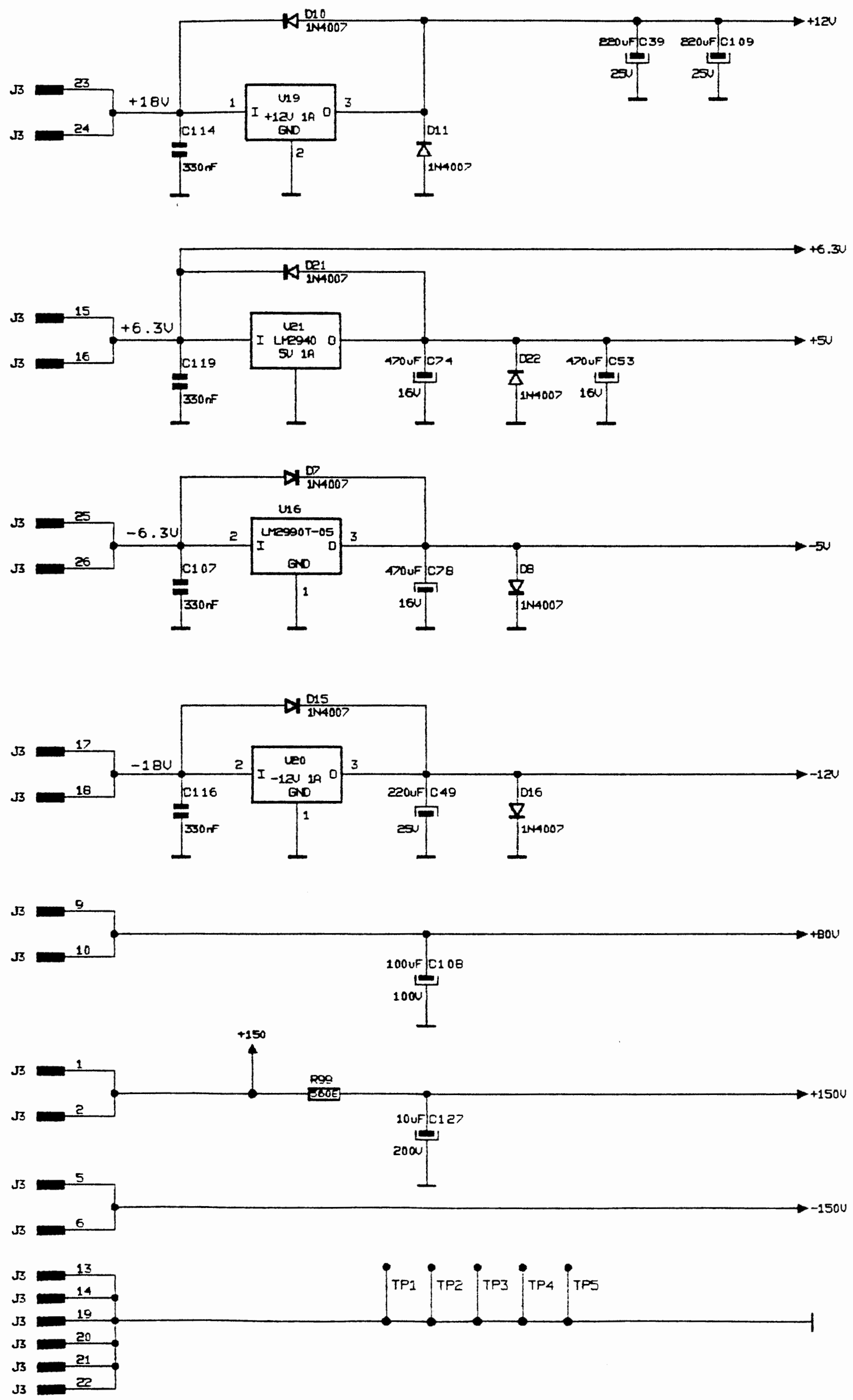
MPRD 9600:RGB BOARD

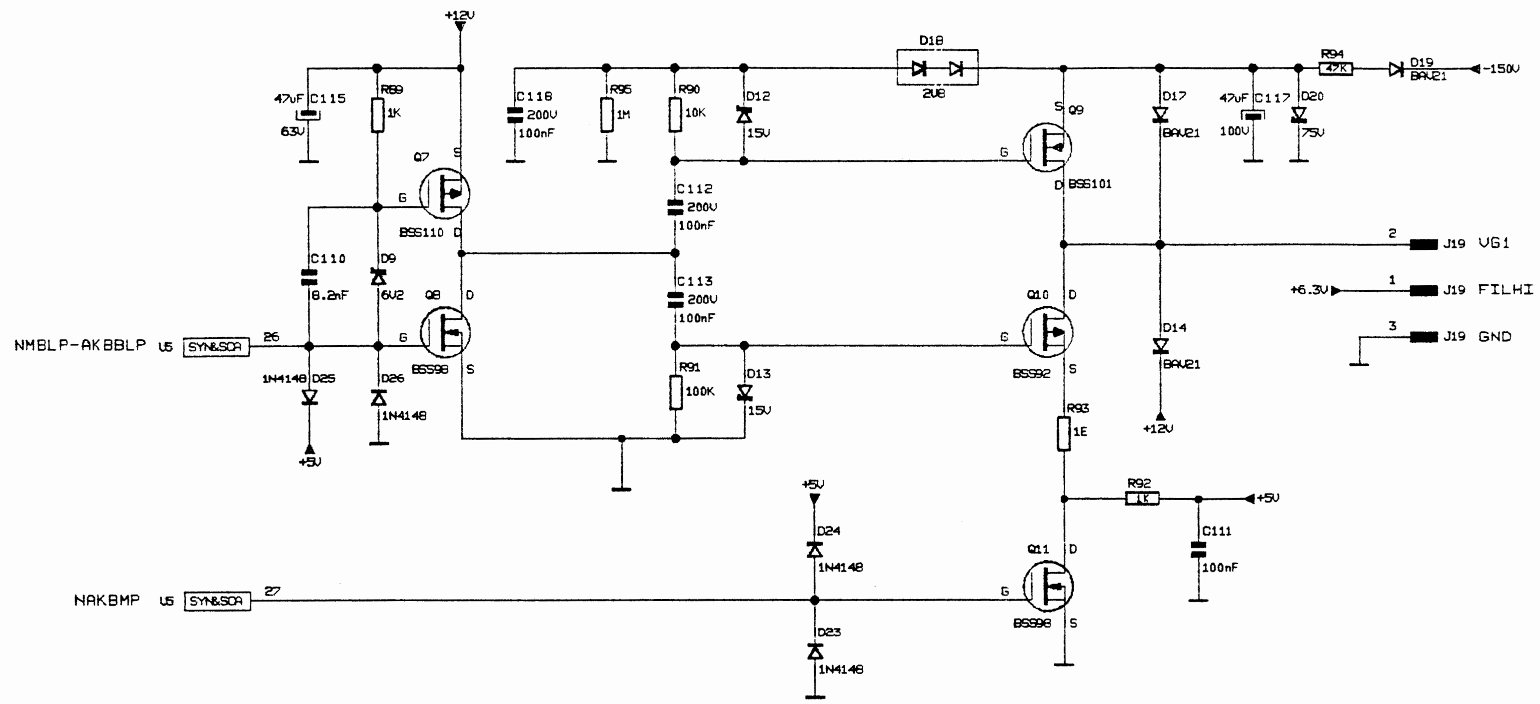
RGB submodule (U1):
DIFFERENTIAL INPUT

V5631210

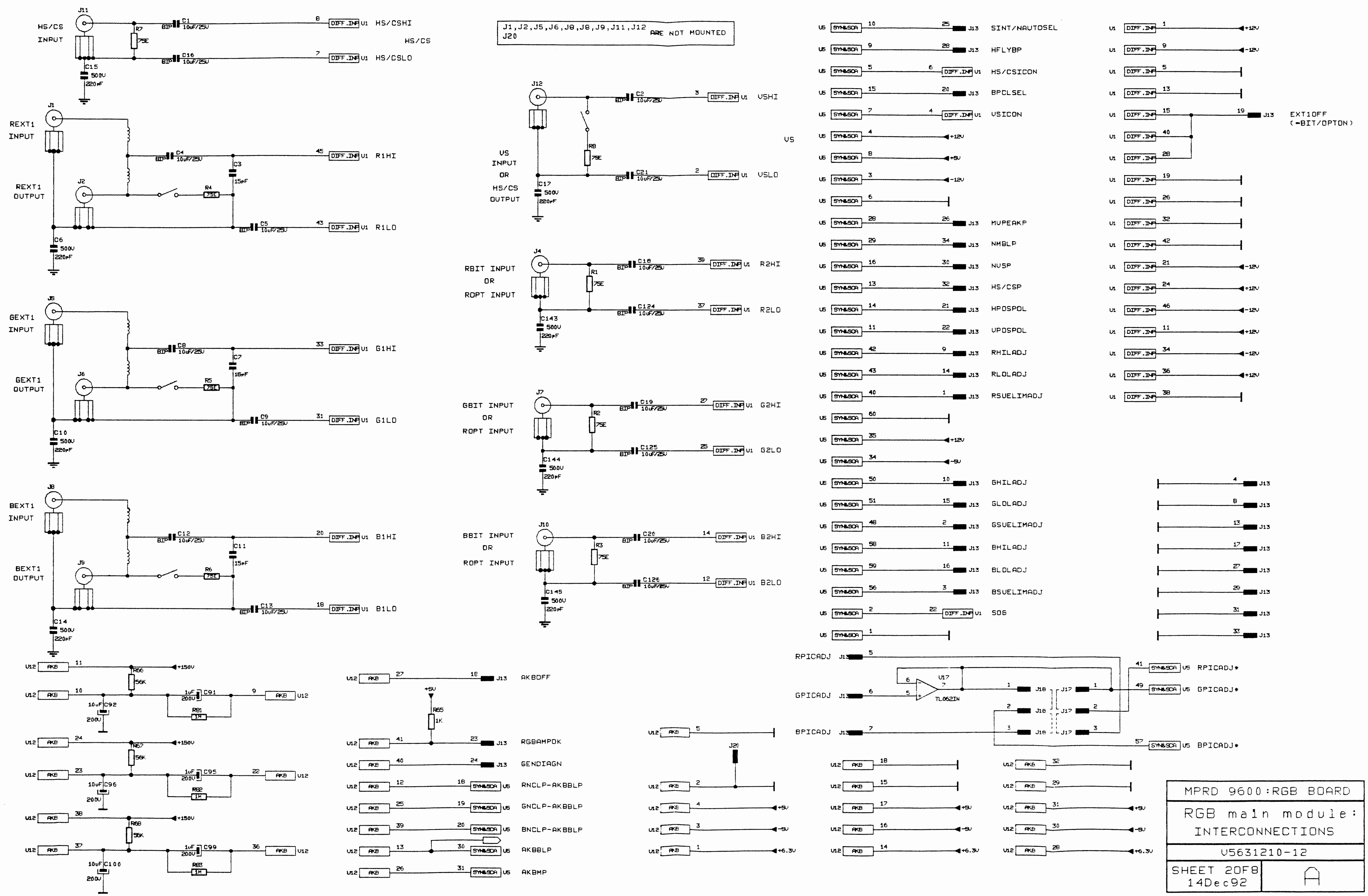
SHEET 40F8
14Dec92

A





MPRD 9600:RGB BOARD	
RGB main module: POWER&BLANKING	
V5631210-12	
SHEET 3OF8 14Dec92	A



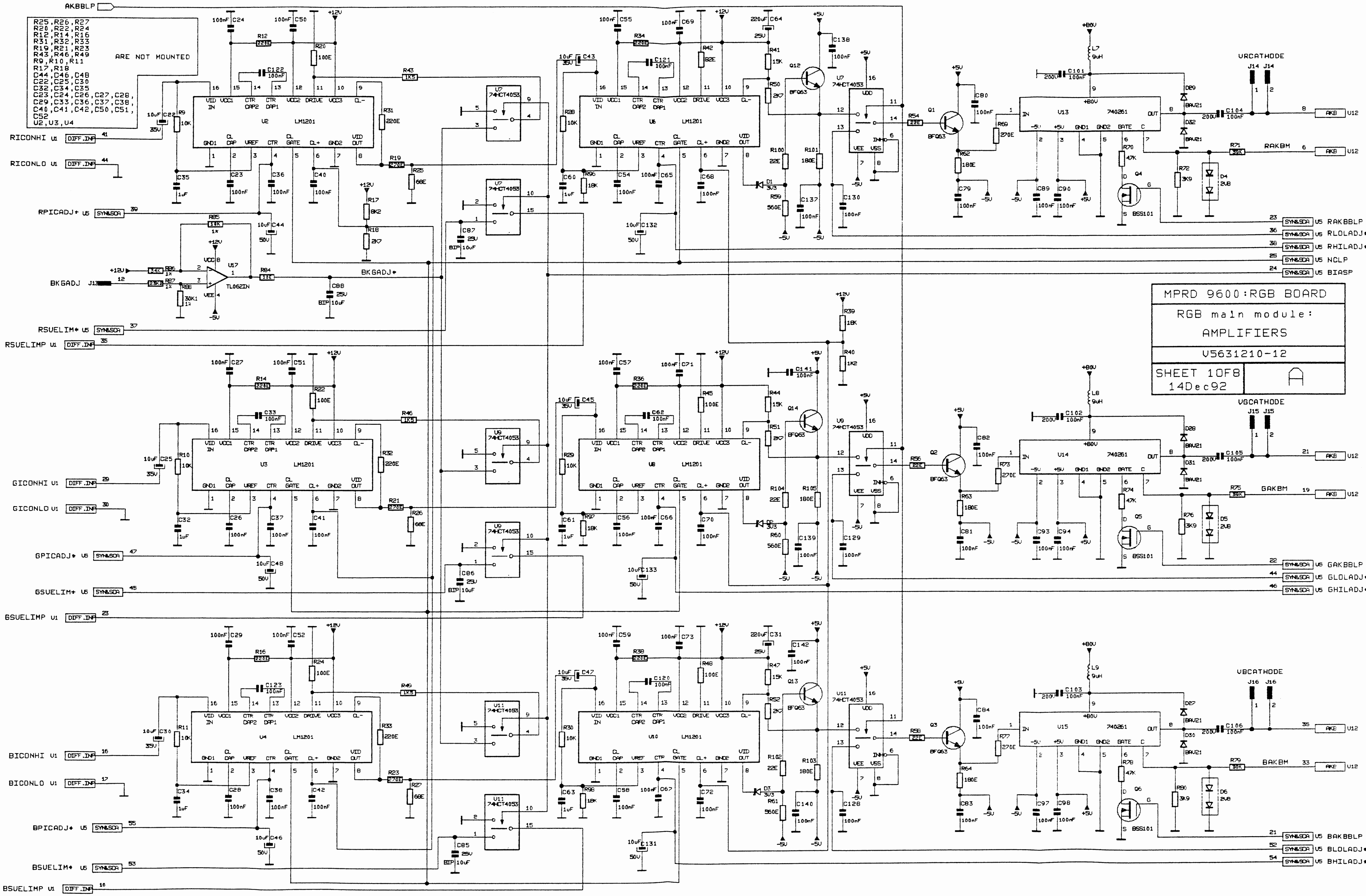
MPRD 9600:RGB BOARD

RGB main module:
INTERCONNECTIONS

V5631210-12

SHEET 2OF8
14Dec92

A



MPRD 9600:RGB BOARD
RGB main module:
AMPLIFIERS
V5631210-12
SHEET 1OF8
14Dec92
A
R25,R26,R27
R20,R22,R24
R12,R14,R16
R31,R32,R33
R19,R21,R23
R43,R46,R49
R9,R10,R11
R17,R18
C44,C46,C48
C22,C25,C30
C32,C34,C35
C23,C24,C26,C27,C28,
C29,C33,C36,C37,C38,
C40,C41,C42,C50,C51,
C52
U2,U3,U4
ARE NOT MOUNTED
AKBBLP
RICONHI
RICONLO
RPICADJ*
BKGADJ
BKGADJ*
RSUELIM*
RSUELIMP
GICONHI
GICONLO
GPICADJ*
GSUELIM*
GSUELIMP
BICONHI
BICONLO
BPICADJ*
BSUELIM*
BSUELIMP
VRCATHODE
VGCATHODE
VBCATHODE
RAKBM
GAKBM
BAKBM
RAKBBLP
RLOLADJ*
RHILADJ*
NCLP
BIASP
GAKBBLP
GLOLADJ*
GHILADJ*
BAKBBLP
BLOLADJ*
BHILADJ*
LM1201
74HCT4053
740261
TL062IN
BFQ63
BSS101
BAV21