CONTENTS

Page

6. PARTS LIST

6.1. PM 2528

6.1.1. Capacitors

Pos. nr.	*Description*			*Ordering code*	
C1	2x2.5 nF			5322 121 44161	Mains filter
C201	33 µF	50 %	16 V	4822 124 20688	Display N2
C202	47 µF	50 %	10 V	4822 124 20678	Display N2
C203	47 µF	50 %	10 V	4822 124 20678	Display N2
C204	22 nF	80 %	63 V	4822 122 30103	Display N2
C205	22 nF	80 %	63 V	4822 122 30103	Display N2
C206	22 nF	80 %	63 V	4822 122 30103	Display N2
C207	22 nF	80 %	63 V	4822 122 30103	Display N2
C208	22 nF	80 %	63 V	4822 122 30103	Display N2
C209	22 nF	80 %	63 V	4822 122 30103	Display N2
C210	22 nF	80 %	63 V	4822 122 30103	Display N2
C211	22 nF	80 %	63 V	4822 122 30103	Display N2
C212	22 nF	80 %	63 V	4822 122 30103	Display N2
C213	22 nF	80 %	63 V	4822 122 30103	Display N2
C214	22 nF	80 %	63 V	4822 122 30103	Display N2
C1001	220 nF	10 %	100 V	4822 121 40232	Power supply
C1002	680 µF	50 %	40 V	4822 124 20794	Power supply
C1003	1.5 µF	20 %	35 V	5322 124 14078	Power supply
C1004	2.2 µF	20 %	35 V	5322 124 14014	Power supply
C1005	680 µF	50 %	40 V	4822 124 20794	Power supply
C1006	1.5 µF	20 %	35 V	5322 124 14078	Power supply
C1007	2.2 µF	20 %	35 V	5322 124 14014	Power supply
C1008	6800 µF	−10 +30 %	16 V	5322 124 14187	Power supply
C1009	2.2 µF	20 %	35 V	5322 124 14014	Power supply
C1010	2.2 µF	20 %	35 V	5322 124 14014	Power supply
C1011	33 µF	40 %	10 V	4822 124 20945	Power supply
C1012	22 nF	80 %	63 V	4822 122 30103	Power supply
C1013	22 nF	80 %	63 V	4822 122 30103	Power supply
C1014	22 nF	80 %	63 V	4822 122 30103	Power supply
C1015	22 nF	80 %	63 V	4822 122 30103	Power supply
C1016	22 nF	80 %	63 V	4822 122 30103	Power supply
C1018	22 nF	80 %	63 V	4822 122 30103	Power supply
C1101	1 µF	10 %	100 V	5322 121 40197	ADC input switch
C1201	100 pF	10 %	2 kV	5322 122 54018	Voltage attenuator
C1202	15 pF	2 %	100 V	4822 122 31058	Voltage attenuator
C1401	220 nF	10 %	630 V	5322 121 40282	Voltage attenuator
C1402	22 pF	2 %	500 V	4822 122 31199	Voltage attenuator
C1403	22 pF	2 %	500 V	4822 122 31199	Voltage attenuator
C1404	47 pF	2 %	100 V	4822 122 31072	Voltage attenuator

Pos. nr.	*Description*			*Ordering code*	
C1405	18 pF	2 %	100 V	5322 122 34064	Voltage attenuator
C1407	39 pF	2 %	100 V	4822 122 31405	Voltage attenuator
C1408	12 pF	2 %	100 V	5322 122 34065	Voltage attenuator
C1409	27 pF	2 %	100 V	5322 122 34063	Voltage attenuator
C1410	68 pF	2 %	100 V	4822 122 31076	Voltage attenuator
C1411	15 pF	2 %	100 V	4822 122 31404	Voltage attenuator
C1412	5.5 pF	TRIM	300 V	5322 125 54045	Voltage attenuator
C1413	33 pF	2 %	100 V	4822 122 31067	Voltage attenuator
C1414	12 pF	2 %	100 V	5322 122 34065	AC voltage
C1415	22 pF	2 %	100 V	5322 122 34067	AC voltage
C1416	56 pF	2 %	100 V	4822 122 31074	AC voltage
C1417	8.2 pF - 0.25 pF		100 V	4822 122 31052	AC voltage
C1418	5.5 pF	TRIM	300 V	5322 125 54045	AC voltage
C1419	100 pF	2 %	100 V	4822 122 31081	AC voltage
C1420	5.6 pF - 0.25 pF		100 V	4822 122 31047	AC voltage
C1421	3.3 pF - 0.25 pF		100 V	4822 122 31041	AC voltage
C1422	1.8 pF - 0.25 pF		100 V	4822 122 31034	AC voltage
C1423	47 pF	2 %	100 V	4822 122 31072	AC voltage
C1424	27 pF	2 %	100 V	5322 122 34063	AC voltage
C1425	15 pF	2 %	100 V	4822 122 31404	AC voltage
C1426	15 pF	2 %	100 V	4822 122 31404	AC voltage
C1427	1 nF	1 %	250 V	4822 121 50566	AC voltage
C1428	18 pF		300 V	5322 125 54013	AC voltage
C1430	5.5 pF		300 V	5322 125 54045	AC voltage
C1431	120 pF	2 %	63 V	4822 122 31351	AC voltage
C1432	820 pF	10 %	100 V	4822 122 63821	AC voltage
C1601	47 pF	10 %	100 V	4822 122 31072	Current
C1701	6.8 µF	40 %	10 V	5322 124 24115	Analog control
C1702	6.8 µF	40 %	10 V	5322 124 24115	Analog control
C1703	33 µF	40 %	10 V	4822 124 20945	Analog control
C1704	33 µF	40 %	10 V	4822 124 20945	Analog control
C1705	33 µF	40 %	10 V	4822 124 20945	Analog control
C1706	10 nF	50 %	100 V	4822 122 31414	Analog control
C1707	10 nF	50 %	100 V	4822 122 31414	Analog control
C1708	10 nF	50 %	100 V	4822 122 31414	Analog control
C1709	10 nF	50 %	100 V	4822 122 31414	Analog control
C1710	6.8 µF	40 %	10 V	5322 124 24115	Analog control
C1711	6.8 µF	40 %	10 V	5322 124 24115	Analog control
C1712	22 nF	80 %	63 V	4822 122 30103	Analog control
C1801	1 nF	10 %	500 V	4822 122 31175	Digital section
C1802	270 pF	2 %	100 V	4822 122 31439	Digital section
C1803	4.7 nF	10 %	100 V	4822 122 30128	Digital section
C1804	22 µF	40 %	10 V	4822 124 20943	Digital section
C1805	1 µF	40 %	25 V	4822 124 20944	Digital section
C1806	22 pF	5 %	50 V	4822 122 31063	Digital section
C1807	22 pF	5 %	50 V	4822 122 31063	Digital section
C1808	33 µF	40 %	10 V	4822 124 20945	Digital section
C1809	33 µF	40 %	10 V	4822 124 20945	Digital section
C1901	3300 µF	50 %	16 V	4822 124 20781	Ext. start outguard
C1902	100 nF	10 %	100 V	5322 121 40323	Ext. start outguard
C1903	10 nF	10 %	630 V	5322 121 44201	Ext. start outguard
C1904	10 µF	50 %	16 V	5322 124 14066	Ext. start outguard
C2001	22 nF	80 %	63 V	4822 122 30103	ADC control N20
C2002	22 nF	80 %	63 V	4822 122 30103	ADC control N20

Pos. nr.	*Description*			*Ordering code*	
C2003	22 nF	80 %	63 V	4822 122 30103	ADC control N20
C2004	22 nF	80 %	63 V	4822 122 30103	ADC control N20
C2005	22 nF	80 %	63 V	4822 122 30103	ADC control N20
C2006	100 pF	2 %	100 V	4822 122 31081	ADC control N20
C2007	47 µF	50 %	10 V	4822 124 20678	ADC control N20
C2008	2.2 nF	10 %	100 V	4822 122 30114	ADC control N20
C2101	10 nF	50 %	100 V	4822 122 31414	ADC analog N21
C2102	10 nF	50 %	100 V	4822 122 31414	ADC analog N21
C2103	162 nF	TRIM	100 V	5322 121 54255	ADC analog N21
C2104	3.3 µF	10 %	100 V	5322 121 40283	ADC analog N21
C2106	33 pF	2 %	100 V	4822 122 31067	ADC analog N21
C2106	220 pF	10 %	500 V	4822 122 31173	ADC analog N21
C2107	22 nF	80 %	63 V	4822 122 30103	ADC analog N21
C2108	22 nF	80 %	63 V	4822 122 30103	ADC analog N21
C2109	22 nF	80 %	63 V	4822 122 30103	ADC analog N21
C2110	4.7 nF	10 %	100 V	4822 122 30128	ADC analog N21
C2111	4.22 nF	1 %	63 V	5322 121 54253	ADC analog N21
C2112	33 pF	2 %	100 V	4822 122 31067	ADC analog N21
C2113	33 pF	2 %	100 V	4822 122 31067	ADC analog N21
C2114	6.8 µF	20 %	25 V	5322 124 14081	ADC analog N21
C2115	22 µF	40 %	10 V	4822 124 20943	ADC analog N21
C2116	22 µF	40 %	10 V	4822 124 20943	ADC analog N21
C2117	6.8 µF	20 %	25 V	5322 124 14081	ADC analog N21
C2201	470 nF	10 %	100 V	5322 121 40175	DC amplifier N22
C2202	47 nF	10 %	250 V	5322 121 44138	DC amplifier N22
C2203	8.2 pF - 0.25 pF		100 V	4822 122 31052	DC amplifier N22
C2204	2.2 µF	20 %	16 V	4822 124 10204	DC amplifier N22
C2205	680 nF	10 %	100 V	5322 121 40233	DC amplifier N22
C2206	3.16 nF	1 %	63 V	5322 121 54252	DC amplifier N22
C2207	6.19 nF	1 %	63 V	4822 121 50633	DC amplifier N22
C2209	22 µF	40 %	10 V	4822 124 20943	DC amplifier N22
C2210	33 µF	40 %	10 V	4822 124 20945	DC amplifier N22
C2211	330 nF	10 %	100 V	4822 121 40257	DC amplifier N22
C2212	4.7 µF	−20 +20 %	25 V	5322 124 14064	DC amplifier N22
C2213	6.8 µF	20 %	25 V	5322 124 14081	DC amplifier N22
C2214	6.8 µF	20 %	25 V	5322 124 14081	DC amplifier N22
C2216	27 pF	2 %	100 V	4822 122 30045	DC amplifier N22
C2217	3.3 nF	10 %	100 V	4822 122 30099	DC amplifier N22
C2301	4.7 µF	20 %	25 V	5322 124 14064	Current source N23
C2302	4.7 µF	20 %	25 V	5322 124 14064	Current source N23
C2303	100 pF	2 %	100 V	4822 122 31081	Current source N23
C2304	33 pF	2 %	100 V	4822 122 31067	Current source N23
C2305	1.33 nF	1 %	250 V	5322 121 54254	Current source N23
C2401	22 nF	10 %	400 V	5322 121 44232	AC amplifier N24
C2402	8.2 pF - 0.25 pF		100 V	4822 122 31052	AC amplifier N24
C2403	33 nF	10 %	400 V	5322 121 44025	AC amplifier N24
C2404	220 pF	10 %	500 V	4822 122 31173	AC amplifier N24
C2405	3.9 pF		100 V	5322 122 34107	AC amplifier N24
C2406	220 nF	10 %	100 V	4822 121 40232	AC amplifier N24
C2407	22 µF	20 %	4 V	5322 124 14059	AC amplifier N24

Pos. nr.	*Description*			*Ordering code*	
C2408	13.3 nF	1 %	63 V	5322 121 54251	AC amplifier N24
C2409	6.8 µF	20 %	25 V	5322 124 14081	AC amplifier N24
C2410	6.8 µF	20 %	25 V	5322 124 14081	AC amplifier N24
C2411	330 nF	10 %	100 V	4822 121 40257	AC amplifier N24
C2412	150 pF	2 %	100 V	4822 122 31085	AC amplifier N24
C2413	10 nF	50 %	100 V	4822 122 31414	AC amplifier N24
C2414	1.8 nF	10 %	500 V	4822 122 31164	AC amplifier N24
C2415	15 pF	2 %	100 V	4822 122 31058	AC amplifier N24
C2416	12 pF	2 %	100 V	4822 122 31056	AC amplifier N24
C2417	10 nF	−20 +50 %	100 V	4822 122 31414	AC amplifier N24
C2418	560 pF	10 %	500 V	4822 122 31166	AC amplifier N24
C2419	6.8 nF	−20 +50 %	100 V	4822 122 31429	AC amplifier N24
C2420	6.8 nF	−20 +50 %	100 V	4822 122 31429	AC amplifier N24
C2421	22 nF	80 %	63 V	4822 122 30103	AC amplifier N24
C2422	22 nF	80 %	63 V	4822 122 30103	AC amplifier N24
C2423	22 nF	80 %	63 V	4822 122 30103	AC amplifier N24
C2424	22 nF	80 %	63 V	4822 122 30103	AC amplifier N24
C2425	39 pF	2 %	100 V	4822 122 31069	AC amplifier N24
C2501	22 pF	5 %	50 V	4822 122 31063	RMS convertor N25
C2502	470 pF	10 %	500 V	4822 122 31177	RMS convertor N25
C2503	100 pF	2 %	100 V	4822 122 31316	RMS convertor N25
C2504	10 nF	−20 +50 %	100 V	4822 122 31414	RMS convertor N25
C2505	10 nF	50 %	100 V	4822 122 31414	RMS convertor N25
C2506	3.3 µF	10 %	100 V	5322 121 40283	RMS convertor N25
C2507	330 nF	10 %	100 V	4822 121 40257	RMS convertor N25
C2508	10 pF	2 %	100 V	4822 122 31054	RMS convertor N25
C2509	100 pF	2 %	100 V	4822 122 31081	RMS convertor N25
C2510	470 pF	10 %	500 V	4822 122 31177	RMS convertor N25
C2511	6.8 µF	20 %	25 V	5322 124 14081	RMS convertor N25
C2512	6.8 µF	20 %	25 V	5322 124 14081	RMS convertor N25
C2513	22 nF	80 %	63 V	4822 122 30103	RMS convertor N25
C2514	22 nF	80 %	63 V	4822 122 30103	RMS convertor N25
C2515	6.8 µF	10 %	100 V	4822 121 40252	RMS convertor N25
C2516	2.2 µF	5 %	100 V	5322 121 44246	RMS convertor N25
C2517	100 nF	10 %	100 V	5322 121 40323	RMS convertor N25
C2518	10 nF	50 %	100 V	4822 122 31414	RMS convertor N25
C2519	2.2 nF	10 %	100 V	4822 122 30114	RMS convertor N25
C2520	18 pF	2 %	100 V	4822 122 31076	RMS convertor N25

6.1.2. Resistors

Pos. nr.	*Description*			*Ordering code*	
R201	10 K	0.5 %	0.4 W	4822 116 51253	Display N2
R202	10 K	0.5 %	0.4 W	4822 116 51253	Display N2
R203	10 K	0.5 %	0.4 W	4822 116 51253	Display N2
R204	10 K	0.5 %	0.4 W	4822 116 51253	Display N2
R205	10 K	0.5 %	0.4 W	4822 116 51253	Display N2
R206	249 E	1 %	0.4 W	5322 116 54499	Display N2
R207	249 E	1 %	0.4 W	5322 116 54499	Display N2
R208	249 E	1 %	0.4 W	5322 116 54499	Display N2
R209	249 E	1 %	0.4 W	5322 116 54499	Display N2
R210	274 E	1 %	0.4 W	5322 116 54504	Display N2
R211	274 E	1 %	0.4 W	5322 116 54504	Display N2
R212	274 E	1 %	0.4 W	5322 116 54504	Display N2
R213	274 E	1 %	0.4 W	5322 116 54504	Display N2
R214	300 E	1 %	0.33 W	4822 110 70093	Display N2
R215	300 E	1 %	0.33 W	4822 110 70093	Display N2
R216	300 E	1 %	0.33 W	4822 110 70093	Display N2
R218	300 E	1 %	0.33 W	4822 110 70093	Display N2
R218	300 E	1 %	0.33 W	4822 110 70093	Display N2
R219	300 E	1 %	0.33 W	4822 110 70093	Display N2
R220	300 E	1 %	0.33 W	4822 110 70093	Display N2
R221	300 E	1 %	0.33 W	4822 110 70093	Display N2
R222	300 E	1 %	0.33 W	4822 110 70093	Display N2
R223	300 E	1 %	0.33 W	4822 110 70093	Display N2
R224	300 E	1 %	0.33 W	4822 110 70093	Display N2
R225	300 E	1 %	0.33 W	4822 110 70093	Display N2
R226	300 E	1 %	0.33 W	4822 110 70093	Display N2
R227	300 E	1 %	0.33 W	4822 110 70093	Display N2
R228	300 E	1 %	0.33 W	4822 110 70093	Display N2
R229	300 E	1 %	0.33 W	4822 110 70093	Display N2
R230	300 E	1 %	0.33 W	4822 110 70093	Display N2
R231	300 E	1 %	0.33 W	4822 110 70093	Display N2
R232	300 E	1 %	0.33 W	4822 110 70093	Display N2
R233	300 E	1 %	0.33 W	4822 110 70093	Display N2
R234	300 E	1 %	0.33 W	4822 110 70093	Display N2
R235	300 E	1 %	0.33 W	4822 110 70093	Display N2
R236	300 E	1 %	0.33 W	4822 110 70093	Display N2
R237	300 E	1 %	0.33 W	4822 110 70093	Display N2
R238	300 E	1 %	0.33 W	4822 110 70093	Display N2
R239	300 E	1 %	0.33 W	4822 110 70093	Display N2
R240	300 E	1 %	0.33 W	4822 110 70093	Display N2
R241	300 E	1 %	0.33 W	4822 110 70093	Display N2
R242	300 E	1 %	0.33 W	4822 110 70093	Display N2
R243	300 E	1 %	0.33 W	4822 110 70093	Display N2
R244	300 E	1 %	0.33 W	4822 110 70093	Display N2
R245	300 E	1 %	0.33 W	4822 110 70093	Display N2
R246	300 E	1 %	0.33 W	4822 110 70093	Display N2
R247	300 E	1 %	0.33 W	4822 110 70093	Display N2
R248	300 E	1 %	0.33 W	4822 110 70093	Display N2
R249	300 E	1 %	0.33 W	4822 110 70093	Display N2
R250	300 E	1 %	0.33 W	4822 110 70093	Display N2

Pos. nr.	*Description*			*Ordering code*	
R251	300 E	1 %	0.33 W	4822 110 70093	Display N2
R252	300 E	1 %	0.33 W	4822 110 70093	Display N2
R253	300 E	1 %	0.33 W	4822 110 70093	Display N2
R254	300 E	1 %	0.33 W	4822 110 70093	Display N2
R255	300 E	1 %	0.33 W	4822 110 70093	Display N2
R256	249 E	1 %	0.4 W	5322 116 54499	Display N2
R1001	100 E	1 %	1/8 W	5322 116 54469	Power supply
R1002	1 K	1 %	0.4 W	5322 116 54549	Power supply
R1003	4K02	1 %	0.4 W	5322 116 55448	Power supply
R1004	14K7	1 %	0.4 W	5322 116 54632	Power supply
R1005	14K7	1 %	0.4 W	5322 116 54632	Power supply
R1101	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1102	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1103	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1104	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1105	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1106	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1107	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1108	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1109	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1110	11 K	1 %	0.4 W	5322 116 54623	ADC input switch
R1201	OM503 THIN FILM NETWORK			5322 111 94044	Voltage attenuator
R1202	10 K	Cerm. lin.	0.5 W	5322 100 10113	Voltage attenuator
R1203	1 K	Cerm. lin.	0.5 W	5322 100 10112	Voltage attenuator
R1204	100 E	Cerm. lin.	0.5 W	5322 101 14011	Voltage attenuator
R1205	180 K	5 %	2 W	4822 110 10167	Voltage attenuator
R1206	100 E	1 %	1/8 W	5322 116 54469	Voltage attenuator
R1207	100 K	Cerm. lin.	0.5 W	5322 103 14003	Voltage attenuator
R1208	1 M	1 %	0.4 W	5322 116 55535	Voltage attenuator
R1209	51E1	1 %	0.4 W	5322 116 54442	Voltage attenuator
R1210	10 M	5 %	0.5 W	4822 110 42214	Voltage attenuator
R1301	20K5	1 %	0.4 W	5322 116 54643	HF circuit
R1401	422 E	1 %	0.4 W	5322 116 50459	AC voltage
R1402	422 E	1 %	0.4 W	5322 116 50459	AC voltage
R1403	7K5	1 %	0.4 W	5322 116 54608	AC voltage
R1404	556 K	0.1 %	MR54E	5322 116 55583	AC voltage
R1405	556 K	0.1 %	MR54E	5322 116 55583	AC voltage
R1406	4K07	0.1 %	0.1 W	5322 116 54801	AC voltage
R1407	402 E	0.1 %	0.1 W	5322 116 54877	AC voltage
R1408	20K5	1 %	0.4 W	5322 116 54643	AC voltage
R1409	976 K	0.1 %	MR54E	5322 116 55584	AC voltage
R1410	10 K	Cerm. lin.	0.5 W	5322 100 10113	AC voltage
R1411	976 K	0.1 %	MR54E	5322 116 55584	AC voltage
R1412	255 K	1 %	0.4 W	5322 116 54735	AC voltage
R1413	10 K	Cerm. lin.	0.5 W	5322 100 10113	AC voltage
R1414	100 K	0.1 %	0.1 W	5322 116 54155	AC voltage
R1415	12K1	1 %	0.4 W	5322 116 50572	AC voltage
R1416	680 E	Cerm. lin.	0.5 W	5322 101 14096	AC voltage
R1417	11 K	0.1 %	0.1 W	5322 116 55328	AC voltage
R1418	90E9	Cerm. lin.	0.4 W	5322 116 54466	AC voltage

Pos. nr.	*Description*			*Ordering code*	
R1419	100E	Cerm.lin.	0.5 W	5322 101 14011	AC voltage
R1420	21K5	1 %	0.4 W	5322 116 50451	AC voltage
R1421	2K05	1 %	0.4 W	5322 116 50664	AC voltage
R1422	2K2	Cerm. lin.	0.5 W	5322 101 14008	AC voltage
R1423	110 K	0.1 %	MR34E	5322 116 55596	AC voltage
R1602	19E6	1 %	0.4 W	5322 116 50473	Current
R1603	15 E	NTC		5322 116 34035	Current
R1604		SHUNT ASSY		5322 115 84022	Current
R1605	12K1	1 %	0.4 W	5322 116 50572	Current
R1606	100 E	1 %	1/8 W	5322 116 54469	Current
R1607	20K5	1 %	0.4 W	5322 116 54643	Current
R1608	1 K	0.1 %	0.1 W	5322 116 50747	Current
R1609	8K98	0.1 %	0.1 W	5322 116 54987	Current
R1610	19E6	1 %	0.4 W	5322 116 50473	Current
R1611	89K8	0.1 %	0.1 W	5322 116 54977	Current
R1612	196 E	0.5 %	0.4 W	5322 116 55273	Current
R1613	493 K	0.1 %	MR34E	5322 116 55582	Current
R1614	407 K	0.1 %	MR34E	5322 116 55581	Current
R1615	5K9	1 %	0.4 W	5322 116 55581	Current
R1701	274 E	1 %	0.4 W	5322 116 54504	Analog control
R1702	274 E	1 %	0.4 W	5322 116 54504	Analog control
R1703	301 E	1 %	0.4 W	5322 116 54508	Analog control
R1704	301 E	1 %	0.4 W	5322 116 54508	Analog control
R1705	301 E	1 %	0.4 W	5322 116 54508	Analog control
R1706	33K2	0.5 %	0.4 W	4822 116 51259	Analog control
R1707	33K2	0.5 %	0.4 W	4822 116 51259	Analog control
R1708	274 E	1 %	0.4 W	5322 116 54504	Analog control
R1709	825 E	1 %	0.4 W	5322 116 54541	Analog control
R1801	154 K	1 %	0.4 W	5322 116 54714	Digital section
R1802	2K49	1 %	0.4 W	5322 116 50581	Digital section
R1803	10 K	0.5 %	0.4 W	4822 116 51253	Digital section
R1804	22K6	0.25 %	0.4 W	5322 116 50481	Digital section
R1805	51K1	1 %	0.4 W	5322 116 50672	Digital section
R1806	511 E	1 %	0.4 W	4822 116 51282	Digital section
R1807	22K6	0.25 %	0.4 W	5322 116 50481	Digital section
R1808	6K49	1 %	0.4 W	5322 116 54603	Digital section
R1809	620 K	1 %	0.4 W	4822 116 51169	Digital section
R1810	12K1	1 %	0.4 W	5322 116 50572	Digital section
R1811	12K1	1 %	0.4 W	5322 116 50572	Digital section
R1812	12K1	1 %	0.4 W	5322 116 50572	Digital section
R1813	12K1	1 %	0.4 W	5322 116 50572	Digital section
R1814	12K1	1 %	0.4 W	5322 116 50572	Digital section
R1815	2E05	1 %	0.4 W	5322 116 55477	Digital section
R1816	2E05	1 %	0.4 W	5322 116 55477	Digital section
R1817	51K1	1 %	0.4 W	5322 116 50672	Digital section
R1818	51K1	1 %	0.4 W	5322 116 50672	Digital section
R1819	90K9	1 %	0.4 W	5322 116 54694	Digital section
R1820	90K9	1 %	0.4 W	5322 116 54694	Digital section
R1821	301 K	1 %	0.4 W	5322 116 54743	Digital section
R1822	301 K	1 %	0.4 W	5322 116 54743	Digital section

Pos. nr.	*Description*			*Ordering code*	
R1823	46K4	1 %	0.4 W	5322 116 50557	Digital section
R1824	9K53	1 %	0.4 W	5322 117 54617	Digital section
R1825	51K1	1 %	0.4 W	5322 116 50672	Digital section
R1826	6K49	1 %	0.4 W	5322 116 54603	Digital section
R1827	5K11	1 %	0.4 W	5322 116 54595	Digital section
R1828	1 K	1 %	MR16	5322 116 55393	Digital section
R1829	1 K	1 %	MR16	5322 116 45393	Digital section
R1901	18K7	0.5 %	0.4 W	5322 116 55362	Ext. start outguard
R1902	100 K	0.5 %	0.4 W	4822 116 51268	Ext. start outguard
R1903	100 K	0.5 %	0.4 W	4822 116 51268	Ext. start outguard
R1904	402 E	1 %	0.4 W	5322 116 54519	Ext. start outguard
R1905	100 E	5 %	0.33 W	4822 111 30535	Ext. start outguard
R2001	15K4	1 %	0.4 W	5322 116 50479	ADC control N20
R2002	46K4	1 %	0.4 W	5322 116 50557	ADC control N20
R2003	1 K	1 %	0.4 W	5322 116 54549	ADC control N20
R2101	8K66	1 %	0.4 W	5322 116 54613	ADC control N20
R2102	140 K	1 %	0.4 W	5322 116 54259	ADC control N20
R2103	64K9	1 %	0.4 W	5322 116 50514	ADC control N20
R2104				5322 101 14294	ADC analog N21
R2105	82K5	1 %	0.4 W	5322 116 54689	ADC analog N21
R2106	82K5	1 %	0.4 W	5322 116 54689	ADC analog N21
R2107	24K9	1 %	0.4 W	5322 116 54648	ADC analog N21
R2108	40K2	1 %	0.4 W	5322 116 54665	ADC analog N21
R2109	5K9	1 %	0.4 W	5322 116 50583	ADC analog N21
R2110	121 K	1 %	0.4 W	5322 116 54704	ADC analog N21
R2111	5K9	1 %	0.4 W	5322 116 50583	ADC analog N21
R2112	442 E	1 %	0.4 W	5322 116 50592	ADC analog N21
R2113	442 E	1 %	0.4 W	5322 116 50592	ADC analog N21
R2114	442 K	1 %	0.4 W	5322 116 55458	ADC analog N21
R2115				5322 101 14293	ADC analog N21
R2116	1K05	1 %	0.4 W	5322 116 54552	ADC analog N21
R2117	8K25	1 %	0.4 W	5322 116 54558	ADC analog N21
R2118	33 K	20 %	0.5 W	5322 101 14295	ADC analog N21
R2119	0M528	THIN FILM NETWORK		5322 209 86482	ADC analog N21
R2121	100 E	Cerm. lin.	0.5 W	5322 101 14072	ADC analog N21

Pos. nr.	Description			Ordering code	
R2201	681 K	0.5 %	0.4 W	5322 116 55284	DC amplifier N22
R2202	48K7	1 %	0.4 W	5322 116 50442	DC amplifier N22
R2203	20K5	1 %	0.4 W	5322 116 54643	DC amplifier N22
R2204	100 K	0.5 %	0.4 W	4822 116 51268	DC amplifier N22
R2205	48K7	1 %	0.4 W	5322 116 50442	DC amplifier N22
R2206	20K5	1 %	0.4 W	5322 116 54643	DC amplifier N22
R2207	82E5	1 %	0.4 W	5322 116 54462	DC amplifier N22
R2208	20K5	1 %	0.4 W	5322 116 54643	DC amplifier N22
R2209	1 K	Cerm. lin.	0.5 W	4822 100 10255	DC amplifier N22
R2210	1K47	1 %	0.4 W	5322 116 50635	DC amplifier N22
R2211	1 K	1 %	0.4 W	5322 116 54549	DC amplifier N22
R2212	909 E	0.5 %	0.4 W	5322 116 53278	DC amplifier N22
R2213	2E05	1 %	0.4 W	5322 116 55477	DC amplifier N22
R2214	100 E	Cerm. lin.	0.5 W	5322 101 14072	DC amplifier N22
R2215	9K53	1 %	0.4 W	5322 116 54617	DC amplifier N22
R2216	Potm. 47 K	20 %	0.5 W	5322 101 14293	DC amplifier N22
R2217	220 K	Cerm. lin.	0.5 W	5322 101 14109	DC amplifier N22
R2219	82E5	1 %	0.4 W	5322 116 54462	DC amplifier N22
R2220	196 K	0.5 %	0.4 W	5322 116 55364	DC amplifier N22
R2221	48K7	1 %	0.4 W	5322 116 50442	DC amplifier N22
R2222	1M1	5 %	0.25 W	5322 111 44178	Current source N23
R2223	20K5	1 %	0.4 W	5322 116 54643	Current source N23
R2224	20K5	1 %	0.4 W	5322 116 54643	Current source N23
R2225	196 E	0.5 %	0.4 W	5322 116 55273	Current source N23
R2226	100 K	1 %	0.5 W	4822 116 51123	Current source N23
R2227	100 E	1 %	1/8 W	5322 116 54469	Current source N23
R2229	20K5	1 %	0.4 W	5322 116 54643	Current source N23
R2230	9K09	0.5 %	0.4 W	4822 116 51284	Current source N23
R2231	681 K	0.5 %	0.4 W	5322 116 55284	Current source N23
R2232	100 E	Cerm. lin.	0.5 W	5322 101 14072	Current source N23
R2233	14K7	0.1 %	MR24E	5322 116 55592	Current source N23
R2234	1K96	0.1 %	0.1 W	5322 116 55071	Current source N23
R2235	100 E	1 %	1/8 W	5322 116 54469	Current source N23
R2236	1K27	1 %	0.4 W	5322 116 50555	Current source N23
R2237	1K27	1 %	0.4 W	5322 116 50555	Current source N23
R2238	1 M	1 %	0.5 W	5322 116 54188	Current source N23
R2301	487 E	0.5 %	0.4 W	5322 116 55451	Current source N23
R2302	487 E	0.5 %	0.4 W	5322 116 55451	Current source N23
R2303	200 K	0.1 %	0.125 W	5322 116 54892	Current source N23
R2304	1K5	Cerm. lin.	0.5 W	5322 101 14214	Current source N23
R2305	200 K	0.1 %	0.125 W	5322 116 54892	Current source N23
R2306	402 K	1 %	0.125 W	5322 116 54744	Current source N23
R2307	38k3	0.5 %	0.4 W	5322 116 55369	Current source N23
R2308	2K15	1 %	0.4 W	5322 116 50767	Current source N23
R2309	22 K	Cerm. lin.	0.5 W	5322 100 10118	Current source N23
R2310	2K8	0.5 %	0.5 W	5322 116 55587	Current source N23
R2311	357 K	0.1 %	MR34E	5322 116 55579	Current source N23
R2312	215 E	0.5 %	0.4 W	5322 116 55274	Current source N23
R2313	2K2	Cerm. lin.	0.5 W	5322 100 10117	Current source N23
R2314	280 E	0.5 %	0.5 W	5322 116 55586	Current source N23

Pos. nr.	Description			Ordering code	
R2315	35K7	0.1 %	MR24E	5322 116 55594	Current source N23
R2316	21E5	1 %	0.4 W	5322 116 50677	Current source N23
R2317	220 E	Cerm. lin.	0.5 W	5322 101 14051	Current source N23
R2318	28 E	1 %	0.4 W	5322 116 55588	Current source N23
R2319	3K57	0.1 %	MR24E	5322 116 55593	Current source N23
R2320	2E15	1 %	MR25	5322 116 55536	Current source N23
R2321	33 E	20 %	0.5 W	5322 101 14295	Current source N23
R2322	200 E	0.1 %	0.125 W	5322 116 50267	Current source N23
R2323	200 E	0.1 %	0.125 W	5322 116 50267	Current source N23
R2324	330 E	5 %	4 W	4822 112 21094	Current source N23
R2325	100 E	20 %	265 V	4822 116 40006	Current source N23
R2326	898 E	0.1 %	MR24E	5322 116 55595	Current source N23
R2327	3E32	1 %	MR25E	5322 116 55566	Current source N23
R2328	100 K	Cerm. lin.	0.5 W	5322 100 10116	Current source N23
R2329	97K6	0.5 %	MR25	5322 116 55591	Current source N23
R2330	8M7	0.5 %	Spec.	5322 116 55585	Current source N23
R2331	4K7	20 %	0.5 W	5322 101 14292	Current source N23
R2332	499 K	0.1 %	0.125 W	5322 116 55126	Current source N23
R2333	499 K	0.1 %	0.125 W	5322 116 55126	Current source N23
R2401	1 M	1 %	0.4 W	5322 116 55535	AC amplifier N24
R2402	95K3	1 %	0.4 W	5322 116 50567	AC amplifier N24
R2403	9K53	1 %	0.4 W	5322 116 54617	AC amplifier N24
R2404	15E4	1 %	MR25	5322 116 55573	AC amplifier N24
R2405	681 K	0.5 %	0.4 W	5322 116 55284	AC amplifier N24
R2406	220 K	Cerm. lin.	0.5 W	5322 101 14109	AC amplifier N24
R2407	1 M	1 %	0.4 W	5322 116 55535	AC amplifier N24
R2408	681 K	0.5 %	0.4 W	5322 116 55284	AC amplifier N24
R2409	2K74	1 %	0.4 W	5322 116 50636	AC amplifier N24
R2410	15K4	1 %	0.4 W	5322 116 50479	AC amplifier N24
R2411	1 M	1 %	0.4 W	5322 116 55535	AC amplifier N24
R2412	1K05	1 %	0.4 W	5322 116 54552	AC amplifier N24
R2413	634 K	0.5 %	MR25	5322 116 55589	AC amplifier N24
R2414	17K8	1 %	0.4 W	5322 116 54637	AC amplifier N24
R2415	1 K	Cerm. lin.	0.5 W	4822 100 10255	AC amplifier N24
R2416	1K21	1 %	0.4 W	5322 116 54557	AC amplifier N24
R2417	10 M	10 %	CR25	4822 110 72214	AC amplifier N24
R2418	46K4	1 %	0.4 W	5322 116 50557	AC amplifier N24
R2419	46K4	1 %	0.4 W	5322 116 50557	AC amplifier N24
R2420	8K25	1 %	0.4 W	5322 116 54558	AC amplifier N24
R2421	8K25	1 %	0.4 W	5322 116 54558	AC amplifier N24
R2422	150	20 %	0.5 W	4822 100 10355	AC amplifier N24
R2423	46K4	1 %	0.4 W	5322 116 50557	AC amplifier N24
R2424	10 K	0.5 %	0.4 W	4822 116 51253	AC amplifier N24
R2425	2K74	1 %	0.4 W	5322 116 50636	AC amplifier N24
R2426	1K78	1 %	0.4 W	5322 116 50515	AC amplifier N24
R2427	140 E	1 %	0.4 W	5322 116 54484	AC amplifier N24
R2428	10 M	1 %	CR25	4822 110 72214	AC amplifier N24
R2429	301 K	1 %	0.4 W	5322 116 54743	AC amplifier N24
R2430	60K4	1 %	0.4 W	5322 116 54679	AC amplifier N24
R2431	2K15	1 %	0.4 W	5322 116 50767	AC amplifier N24
R2432	205 E	1 %	0.4 W	5322 116 50669	AC amplifier N24
R2433	2K61	1 %	0.4 W	5322 116 50671	AC amplifier N24
R2434	2K37	1 %	0.4 W	5322 116 54576	AC amplifier N24
R2435	7E5	1 %	0.4 W	5322 116 54417	AC amplifier N24
R2436	7E5	1 %	0.4 W	5322 116 54417	AC amplifier N24

Pos. nr.	*Description*			*Ordering code*	
R2437	2K15	1 %	0.4 W	5322 116 50767	AC amplifier N24
R2438	4K64	1 %	0.4 W	5322 116 50484	AC amplifier N24
R2439	215 E	0.5 %	0.4 W	5322 116 55274	AC amplifier N24
R2440	71E5	1 %	0.4 W	5322 116 54457	AC amplifier N24
R2441	71E5	1 %	0.4 W	5322 116 54457	AC amplifier N24
R2442	21E15	1 %	MR25	5322 116 55536	AC amplifier N24
R2443	71E5	1 %	0.4 W	5322 116 54457	AC amplifier N24
R2444	71E5	1 %	0.4 W	5322 116 54457	AC amplifier N24
R2445	1K05	1 %	0.4 W	5322 116 54552	AC amplifier N24
R2446	1K21	1 %	0.4 W	5322 116 54557	AC amplifier N24
R2447	15K4	1 %	0.4 W	5322 116 50479	AC amplifier N24
R2448	15K4	1 %	0.4 W	5322 116 50479	AC amplifier N24
R2449	46K4	1 %	0.4 W	5322 116 50557	AC amplifier N24
R2450	30K1	1 %	0.4 W	5322 116 54655	AC amplifier N24
R2451	1K05	1 %	0.4 W	5322 116 54552	AC amplifier N24
R2452	1K05	1 %	0.4 W	5322 116 54552	AC amplifier N24
R2453	30K1	1 %	0.4 W	5322 116 54655	AC amplifier N24
R2501	0M529	THIN FILM NETWORK		5322 209 86483	RMS convertor N25
R2502	19E6	1 %	0.4 W	5322 116 50473	RMS convertor N25
R2503	301 K	1 %	0.4 W	5322 116 54743	RMS convertor N25
R2504	47 K	20 %	0.5 W	5322 101 14293	RMS convertor N25
R2505	750 E	0.5 %	0.4 W	4822 116 51234	RMS convertor N25
R2506	590 E	1 %	0.4 W	5322 116 50561	RMS convertor N25
R2507	301 E	1 %	0.4 W	5322 116 54508	RMS convertor N25
R2508	7K87	1 %	0.4 W	5322 116 50458	RMS convertor N25
R2509	1K96	1 %	0.4 W	5322 116 54571	RMS convertor N25
R2510	1 K	Cerm. lin.	0.5 W	4822 100 10255	RMS convertor N25
R2511	8E25	1 %	0.4 W	5322 116 54099	RMS convertor N25
R2512	115 E	1 %	0.4 W	5322 116 54476	RMS convertor N25
R2513	301 K	1 %	0.4 W	5322 116 54743	RMS convertor N25
R2514	47 K	20 %	0.5 W	5322 101 14293	RMS convertor N25
R2515	10 K	0.5 %	0.4 W	4822 116 51253	RMS convertor N25
R2516	4K02	0.5 %	0.4 W	5322 116 55448	RMS convertor N25
R2517	330 E	Cerm. lin.	0.5 W	5322 101 14244	RMS convertor N25
R2518	2K05	1 %	0.4 W	5322 116 50664	RMS convertor N25
R2519	3K01	0.5 %	0.4 W	4822 116 51246	RMS convertor N25
R2520	5M6	5 %	CR25	4822 110 72207	RMS convertor N25
R2521	33 M	5 %	0.5 W	4822 110 42227	RMS convertor N25

6.1.3. Semi-conductors

Pos. nr.	*Description*	*Ordering code*	
V201	BAW62	4822 130 30613	Display N2
V202	BAW62	4822 130 30613	Display N2
V203	BAW62	4822 130 30613	Display N2
V204	BAW62	4822 130 30613	Display N2
V205	BAW62	4822 130 30613	Display N2
V206	BYW54	5322 130 34919	Display N2
V1001	BY164	4822 130 30414	Power supply
V1002	BYW29-150	5322 130 34711	Power supply
V1003	BYW29-150	5322 130 34711	Power supply
V1004	BZX79-B5V1	4822 130 34233	Power supply
V1005	BYW54	5322 130 34919	Power supply
V1006	BYW54	5322 130 34919	Power supply
V1007	BC557B	4822 130 44568	Power supply
V1008	BZX87-C5V1	5322 130 34425	Power supply
V1009	BZX79-B16	4822 130 34268	Power supply
V1401	BSV79	5322 130 44017	AC voltage
V1601	BC337	4822 130 40855	Current
V1602	BC337	4822 130 40855	Current
V1603	BT139-600	5322 130 24079	Current
V1701	BZX79-B10	4822 130 34297	Analog control
V1702	BAX12A	5322 130 34605	Analog control
V1703	BAX12A	5322 130 34605	Analog control
V1704	BAX12A	5322 130 34605	Analog control
V1705	BAX12A	5322 130 34605	Analog control
V1706	BAX12A	5322 130 34605	Analog control
V1707	BAX12A	5322 130 34605	Analog control
V1708	BZX79-B10	4822 130 34297	Analog control
V1709	BZX79-B10	4822 130 34297	Analog control
V1710	BZX79-B10	4822 130 34297	Analog control
V1711	BZX79-B10	4822 130 34297	Analog control
V1712	BAX12A	5322 130 34605	Analog control
V1713	BAX12A	5322 130 34605	Analog control
V1714	BAX12A	5322 130 34605	Analog control
V1715	BAX12A	5322 130 34605	Analog control
V1716	BAX12A	5322 130 34605	Analog control
V1717	BAX12A	5322 130 34605	Analog control
V1718	BAX12A	5322 130 34605	Analog control
V1719	BAX12A	5322 130 34605	Analog control
V1720	BZX79-B10	4822 130 34297	Analog control
V1721	BZX79-B10	4822 130 34297	Analog control
V1722	BAX12A	5322 130 34605	Analog control
V1723	BAX12A	5322 130 34605	Analog control
V1724	BAX12A	5322 130 34605	Analog control
V1725	BAX12A	5322 130 34605	Analog control
V1801	BAW62	4822 130 30613	Digital section

Pos. nr.	*Description*	*Ordering code*	
V1802	BAW62	4822 130 30613	Digital section
V1803	BAW62	4822 130 30613	Digital section
V1804	BC549C	4822 130 44246	Digital section
V1805	BF410A	5322 130 44905	Digital section
V1806	BC549C	4822 130 44246	Digital section
V1807	BZX79-B12	4822 130 34197	Digital section
V1808	BC557B	4822 130 44568	Digital section
V1901	BY225-100	4822 130 50312	Ext. start outguard
V1902	BAX12A	5322 130 34605	Ext. start outguard
V1903	BC559B	4822 130 44358	Ext. start outguard
V2001	BAW62	4822 130 30613	ADC control N20
V2101	ON528	5322 130 44405	ADC analog N21
V2102	BSV80	5322 130 34044	ADC analog N21
V2103	BAW62	4822 130 30613	ADC analog N21
V2104	BAW62	4822 130 30613	ADC analog N21
V2105	BAW62	4822 130 30613	ADC analog N21
V2106	BAW62	4822 130 30613	ADC analog N21
V2107	BZV14	5322 130 34568	ADC analog N21
V2201	BFQ10	5322 130 44355	DC amplifier N22
V2202	BZX79-B4V7	4822 130 34174	DC amplifier N22
V2203	BAV45	5322 130 34037	DC amplifier N22
V2204	BAV45	5322 130 34037	DC amplifier N22
V2205	BSV81	5322 130 44041	DC amplifier N22
V2206	BC547B	4822 130 40959	DC amplifier N22
V2207	BAW62	4822 130 30613	DC amplifier N22
V2208	BAW62	4822 130 30613	DC amplifier N22
V2209	BZX79-C3V6	5322 130 34834	DC amplifier N22
V2210	BZX79-C3V6	5322 130 34834	DC amplifier N22
V2211	BZX79-B5V6	4822 130 34173	DC amplifier N22
V2212	BFW13	5322 130 40516	DC amplifier N22
V2213	BZX87-C5V1	5322 130 34425	DC amplifier N22
V2214	BZX87-C5V1	5322 130 34425	DC amplifier N22
V2215	BAX12A	5322 130 34605	DC amplifier N22
V2301	BC557B	4822 130 44568	Current source N23
V2301	BZX12A	5322 130 34605	Current source N23
V2303	BAX12A	5322 130 34605	Current source N23
V2304	BAX12A	5322 130 34605	Current source N23
V2305	BAX12A	5322 130 34605	Current source N23
V2306	BAX12A	5322 130 34605	Current source N23
V2307	BAX12A	5322 130 34605	Current source N23
V2308	BAX12A	5322 130 34605	Current source N23
V2309	BC337	4822 130 40855	Current source N23
V2401	BSV81	5322 130 44041	AC amplifier N24
V2402	BFW13	5322 130 40516	AC amplifier N24
V2404	BFQ14	5322 130 44304	AC amplifier N24
V2405	BC547B	4822 130 40959	AC amplifier N24
V2406	BC547B	4822 130 40959	AC amplifier N24
V2407	BC557B	4822 130 44568	AC amplifier N24
V2408	BC557B	4822 130 44568	AC amplifier N24
V2409	BFW11	4822 130 40408	AC amplifier N24

Pos. nr.	*Description*	*Ordering code*	
V2410	BFW11	4822 130 40408	AC amplifier N24
V2411	BF199	4822 130 44154	AC amplifier N24
V2412	BF199	4822 130 44154	AC amplifier N24
V2413	BC547B	4822 130 40959	AC amplifier N24
V2415	BF199	4822 130 44154	AC amplifier N24
V2416	BF324	4822 130 41448	AC amplifier N24
V2417	BZX79-C3V0	4822 130 31251	AC amplifier N24
V2418	BZX46-C2V0	4822 130 31248	AC amplifier N24
V2419	BAV45	5322 130 34037	AC amplifier N24
V2420	BAV45	5322 130 34037	AC amplifier N24
V2421	BAW62	4822 130 30613	AC amplifier N24
V2422	BAW62	4822 130 30613	AC amplifier N24
V2423	BZX79-B8V2	4822 130 34382	AC amplifier N24
V2424	BZX79-B8V2	4822 130 34382	AC amplifier N24
V2501	BC547B	4822 130 40959	RMS convertor N25
V2502	BC547B	4822 130 40959	RMS convertor N25
V2503	BC559B	4822 130 44358	RMS convertor N25
V2504	MAT 01GH DUAL	5322 209 86481	RMS convertor N25
V2505	MAT 01GH DUAL	5322 209 86481	RMS convertor N25
V2508	BAW62	4822 130 30613	RMS convertor N25
V2509	BAW62	4822 130 30613	RMS convertor N25
V2510	BZX79-B4V7	4822 130 34174	RMS convertor N25
V2511	BAV45	5322 130 34037	RMS convertor N25
V2512	BAV45	5322 130 34037	RMS convertor N25
V2513	BAW62	4822 130 30613	RMS convertor N25
V2514	BAV45	5322 130 34037	RMS convertor N25
V2515	BAX12A	5322 130 34605	RMS convertor N25

6.1.4. Integrated circuits

Pos. nr.	*Description*	*Ordering code*	
D201	P8243	5322 209 54593	Display N2
D202	P8243	5322 209 54593	Display N2
D203	ULN2003N	5322 209 86296	Display N2
D204	SN74LS174N	5322 209 85002	Display N2
D205	SN74LS174N	5322 209 85002	Display N2
D206	SN74LS174N	5322 209 85002	Display N2
D207	SN74LS174N	5322 209 85002	Display N2
D208	SN74LS174N	5322 209 85002	Display N2
D209	SN74LS174N	5322 209 85002	Display N2
D210	SN74LS145N	5322 209 86276	Display N2
D211	SN74LS145N	5322 209 86276	Display N2
D212	HEF4556BP	4822 209 10004	Display N2
D213	N74LS32A	5322 209 85311	Display N2
D1101	HEF4051P (Selected)	5322 209 81248	ADC input switch
D1701	P8243	5322 209 54593	Analog control
D1702	P8243	5322 209 54593	Analog control
D1703	P8243	5322 209 54593	Analog control
D1704	ULN2003N	5322 209 86296	Analog control
D1705	HEF4104BP	5322 209 14443	Analog control
D1801	N74LS02A	5322 209 85312	Analog control
D1803	HEF4556BP	4822 209 10004	Analog control
D1804	HEF40175BP	5322 209 14406	Digital section
D1805	HEF40175BP	5322 209 14406	Digital section
D1806	HEF4737VP	5322 209 14511	Digital section
D1807	HEF4528BP	5322 209 14191	Digital section
D1808	N74LS04N	4822 209 80621	Digital section
D1809	P8035 μP	5322 209 86479	Digital section
* D1810	PROM 2716 loaded	5322 209 50026	Digital section
D1811	HEF4013BP	5322 209 10002	Digital section
D1812	SN74LS08N	5322 209 84995	Digital section
* D1813	PROM 2716 loaded	5322 209 50027	Digital section
D1814	HEF40098BP	5322 209 14304	Digital section
D1815	N74LS32A	5322 209 85311	Digital section
D1816	HEF4013BP	5322 209 10002	Digital section
D1817	HEF4081BP	5322 209 14054	Digital section
D2001	HEF4013BP	5322 209 10002	ADC control N20
D2002	HEF4518BP	5322 209 14064	ADC control N20
D2003	HEF4027BP	5322 209 14055	ADC control N20
D2004	HEF4071BP	5322 209 14053	ADC control N20
D2005	HEF4027BP	5322 209 14055	ADC control N20
D2006	HEF4070BP	5322 209 14073	ADC control N20
D2007	HEF4081BP	5322 209 14054	ADC control N20
D2008	HEF4081BP	5322 209 14054	ADC control N20
D2009	HEF4027BP	5322 209 14055	ADC control N20
D2010	HEF4081BP	5322 209 14054	ADC control N20
D2101	HEF4066BP	5322 209 14104	ADC analog N21
D2102	HEF4104BP	5322 209 14443	ADC analog N21
D2201	HEF4047BP	5322 209 14125	DC amplifier N22
D2401	HEF4047BP	5322 209 14125	AC amplifier N24

* Concern Service will always deliver the latest software release.

6.1.5. Analog IC's

Pos. nr.	*Description*	*Ordering code*	
A201	–VOLTREG 7905UC	5322 209 44843	Display N2
A1001	+VOLTREG 7815UC	5322 130 44698	Power supply
A1002	–VOLTREG 7915UC	5322 130 44844	Power supply
A1003	–VOLTREG 7905UC	5322 130 44843	Power supply
A1801	LM311N	5322 209 85503	Digital section
A1901	+VOLTREG 7805UC	5322 209 84841	Ext. start
A2101	LF356H	5322 209 80951	ADC analog N21
A2102	LM201AN	5322 209 14748	ADC analog N21
A2103	LF355H	5322 209 86338	ADC analog N21
A2104	LM311N	5322 209 85503	ADC analog N21
A2105	LM208AH	5322 209 85762	ADC analog N21
A2106	LM201AN	5322 209 14748	ADC analog N21
A2201	LF355H	5322 209 86338	DC amplifier N22
A2202	LF355H	5322 209 86338	DC amplifier N22
A2301	LM208AH	5322 209 85762	Current source N23
A2401	LM308AN	5322 209 86056	AC amplifier N24
A2402	LM393N	4822 209 80797	AC amplifier N24
A2502	LF356BN	5322 209 80953	RMS convertor N25

6.1.6. Miscellaneous

Pos. nr.	*Description*	*Ordering code*	
	Testpin red	5322 264 24013	Cables
	Testpin black	5322 264 24014	Cables
	Mains cable	5322 321 24376	Cables
	Measuring cable 4 W	5322 321 20506	Cables
	Topcover assy	5322 447 94234	Cabinet
	Bottom cover assy	5322 447 94235	Cabinet
	Front rim	5322 459 24056	Cabinet
	Textplate	5322 456 10012	Cabinet
	Handle profile	5322 498 54048	Cabinet/handle .
	Handle arm (2x)	5322 498 54048	Cabinet/handle
	Bearing bush (2x)	5322 520 34164	Cabinet/handle
	Knob	5322 414 64053	Cabinet/handle
	Stop plate	5322 528 34101	Cabinet/handle
	Spring	5322 530 84075	Cabinet/handle
	Foot (4x)	5322 462 44179	Cabinet
	Foot plug (4x)	5322 462 44431	Cabinet
	Rear foot (4x)	5322 462 44181	Cabinet
	Interconn. strip (guard-0)	5322 290 30001	Cabinet
	Window red	5322 381 10565	Cabinet
B1801	CNY57A	5322 131 94049	Opto couplers
B1802	6 MHz X-tal	5322 242 74364	Crystal
F1	125 MAT fuse	4822 253 30007	Fuses/Mains 220V
F1	Fuse 250 MAT	4822 253 30013	Fuses/Mains 110V
F2	2.5 A fuse	4822 253 20024	Fuses/A function
F2	Fuseholder assy	5322 256 40017	Fuses/A function
H201	HP5082-7750	5322 130 34579	Display N2
H202	HP5082-7750	5322 130 34579	Display N2
H203	HP5082-7750	5322 130 34579	Display N2
H204	HP5082-7750	5322 130 34579	Display N2
H205	HP5082-7750	5322 130 34579	Display N2
H206	HP5072-7750	5322 130 34579	Display N2
H207	HP5082-7750	5322 130 34579	Display N2
H208	5 V - 21 mA	5322 134 44225	Display N2
H209	5 V - 21 mA	5322 134 44225	Display N2
H210	5 V - 21 mA	5322 134 44225	Display N2
H211	5 V - 21 mA	5322 134 44225	Display N2
H212	5 V - 21 mA	5322 134 44225	Display N2
H213	5 V - 21 mA	5322 134 44225	Display N2
H214	5 V - 21 mA	5322 134 44225	Display N2
H215	5 V - 21 mA	5322 134 44225	Display N2
H216	5 V - 21 mA	5322 134 44225	Display N2
H217	5 V - 21 mA	5322 134 44225	Display N2
H218	5 V - 21 mA	5322 134 44225	Display N2
H219	5 V - 21 mA	5322 134 44225	Display N2
K1201	Reed Relay assy HV spec.	5322 280 20105	Relays
K1202	Reed relay assy	5322 280 80459	Relays
K1203	Reed relay assy	5322 280 80459	Relays
K1204	Reed relay assy	5322 280 80459	Relays
K1301	Reed Relay assy HV spec.	5322 280 20105	Relays

Pos. nr.	*Description*	*Ordering code*	
K1301	Reed relay assy	5322 280 80459	Relays
K1302	Reed relay assy	5322 280 80459	Relays
K1303	Reed relay assy	5322 280 80459	Relays
K1304	Reed relay assy	5322 280 80459	Relays
K1305	Reed relay assy	5322 280 80459	Relays
K1306	Reed relay assy	5322 280 80459	Relays
K1307	Reed relay assy	5322 280 80459	Relays
K1401	Reed Relay assy HV spec.	5322 280 20105	Relays
K1402	Relay assy	5322 280 24147	Relays
K1403	Reed relay assy	5322 280 80459	Relays
K1404	Reed relay assy	5322 280 80459	Relays
K1405	Reed relay assy	5322 280 80459	Relays
K1406	Reed relay assy	5322 280 80459	Relays
K1601	Relay assy	5322 280 74114	Relays
K1602	Relay assy	5322 280 74114	Relays
K1603	Relay assy	5322 280 74114	Relays
K1604	Reed relay assy	5322 280 80459	Relays
K1605	Reed relay assy	5322 280 80459	Relays
K1606	Reed relay assy	5322 280 80459	Relays
K1607	Reed relay assy	5322 280 80459	Relays
K1608	Reed relay assy	5322 280 80459	Relays
K1609	Reed relay assy	5322 280 80459	Relays
K2201	Reed relay assy	5322 280 80459	Relays
K2202	Reed relay assy	5322 280 80459	Relays
K2301	Reed relay assy	5322 280 80459	Relays
K2302	Reed relay assy	5322 280 80459	Relays
K2303	Reed relay assy	5322 280 80459	Relays
K2304	Reed relay assy	5322 280 80459	Relays
K2305	Reed relay assy	5322 280 80459	Relays
K2306	Reed relay assy	5322 280 80459	Relays
K2307	Reed relay assy	5322 280 80459	Relays
K2501	Reed relay assy	5322 280 80459	Relays
L2201	Coil	5322 158 10277	Coil
N2	Display unit	5322 216 94264	Units
N20	ADC control	5322 216 94257	Units
N21	ADC analog	5322 216 94258	Units
N22	DC amplifier	5322 216 94259	Units
N23	Current source	5322 216 94261	Units
N24	AC amplifier	5322 216 94262	Units
N25	RMS convertor	5322 216 94263	Units
S1	Power switch	4822 276 10554	Switches
S201	Keyboard switch	5322 276 14418	Switches
S202	Keyboard switch	5322 276 14418	Switches
S203	Keyboard switch	5322 276 14418	Switches
S204	Keyboard switch	5322 276 14418	Switches

Pos. nr.	*Description*	*Ordering code*	
S205	Keyboard switch	5322 276 14418	Switches
S206	Keyboard switch	5322 276 14418	Switches
S207	Keyboard switch	5322 276 14418	Switches
S208	Keyboard switch	5322 276 14418	Switches
S209	Keyboard switch	5322 276 14418	Switches
S210	Keyboard switch	5322 276 14418	Switches
S211	Keyboard switch	5322 276 14418	Switches
S212	Keyboard switch	5322 276 14418	Switches
S213	Keyboard switch	5322 276 14418	Switches
S214	Keyboard switch	5322 276 14418	Switches
S215	Keyboard switch	5322 276 14418	Switches
S216	Keyboard switch (no LED)	5322 276 14338	Switches
S217	Keyboard switch (no LED)	5322 276 14338	Switches
S218	Keyboard switch	5322 276 14418	Switches/Miniature
S1801	Slide switch	5322 277 24045	Switches/Miniature
S2501	Slide switch	5322 277 24045	Switches/Miniature
T1	Mains transformer	5322 146 44058	Transformer
T1	Thermal fuse	5322 252 20088	Transformer
X1	8p DIN socket (probe)	5322 267 54072	Plugs, terminals, knobs
X2	Guard terminal (blue)	5322 267 34058	Plugs, terminals, knobs
X3	Zero terminal (black)	5322 267 34059	Plugs, terminals, knobs
X4	V-Ω terminal (red)	5322 267 34057	Plugs, terminals, knobs
X5	A terminal (black)	5322 267 34059	Plugs, terminals, knobs
X6	HF conn. BNC bush	4822 267 10062	Plugs, terminals, knobs
X7	Terminal ANAL-output (black)	5322 267 34059	Plugs, terminals, knobs
X8	Terminal ANAL-output (black)	5322 267 34059	Plugs, terminals, knobs
X7/X8	Distance piece	5322 325 24004	Plugs, terminals, knobs
X7/X8	Ring	5322 532 64081	Plugs, terminals, knobs
X9	Mains connector	5322 267 44135	Plugs, terminals, knobs
X1901	Interface connector	5322 264 54062	Plugs, terminals, knobs
	Ext. spindle (power switch)	5322 535 91226	Plugs, terminals, knobs
	Power knob	5322 414 24872	Plugs, terminals, knobs
	Knob LED keyboard switch	5322 414 20005	Switches
	Knob keyboard switch (no LED)	5322 214 20007	Switches
	Al. insert TO 220	4822 466 90901	Mounting A1901
	Filling pl. 56360A	4822 255 40173	Mounting A1901
	Micaplate 56359B	4822 255 40161	Mounting A1901
	Washer TO 220	4822 255 40174	Mounting A1901
	Heatsink compound	5322 390 20019	Mounting A1901
	Connector 19p (10x)	4822 267 50234	Plugs, terminals, knobs
	IC foot 40p	5322 255 44217	Plugs, terminals, knobs
	IC foot 24p	5322 255 44109	Plugs, terminals, knobs
	IC foot 14p	5322 255 44122	Plugs, terminals, knobs
	IC foot 16p	5322 255 44218	Plugs, terminals, knobs
	TESTROM	5322 694 54015	Test facilities

6.2. OPTIONS

6.2.1. PM9254/01 analog output and galvanic separation on (N30, N31)

POSNR	DESCRIPTION			ORDERING CODE
A 3101	OQ051			5322 209 84444
B 3001	SELECTED CNX35			5322 130 31718
B 3002	SELECTED CNX35			5322 130 31718
B 3003	SELECTED CNX35			5322 130 31718
B 3004	SELECTED CNX35			5322 130 31718
B 3005	SELECTED CNX35			5322 130 31718
C 3002	22NF	30	16	4822 122 10166
C 3003	22NF	30	16	4822 122 10166
C 3004	22NF	30	16	4822 122 10166
C 3006	2,2NF	10	50	4822 122 10175
C 3007	22NF	30	16	4822 122 10166
C 3008	22NF	30	16	4822 122 10166
C 3009	47UF-10+50		10	4822 124 20678
C 3010	470PF	10	50	4822 122 31435
C 3101	10NF-20+50		100	4822 122 31414
C 3102	10NF-20+50		100	4822 122 31414
C 3103	2,2UF 20%		16V	4822 124 10204
C 3104	680PF	10	100	4822 122 30053
C 3105	1,5NF	10	100	4822 122 31221
C 3106	22NF-20+80		40	4822 122 30103
C 3107	MYLAR CAP 68N			4822 121 41156
C 3108	22NF 10%		400V	5322 121 40308
C 3109	10UF 50%		16V	5322 124 14066
C 3110	22NF-20+80		40	4822 122 30103
C 3111	22NF-20+80		40	4822 122 30103
C 3112	22NF-20+80		40	4822 122 30103
C 3113	22NF-20+80		40	4822 122 30103
C 3114	120PF	2	100	5322 122 34201
C 3115	10NF-20+50		100	4822 122 31414
C 3116	22NF-20+80		40	4822 122 30103
C 3117	33UF 40%		10V	4822 124 20945
D 3001	HEF4049BP	PH		5322 209 14049
D 3002	HEF4011BP	PH		5322 209 14046
D 3003	HEF4013BP	PH		5322 209 10002
D 3004	HEF4013BP	PH		5322 209 10002
D 3005	HEF40097BP	PH		5322 209 14433
D 3006	HEF4049BP	PH		5322 209 14049
D 3007	HEF4555BP	PH		5322 209 14188
D 3101	HEF4094BP	PH		5322 209 14485
D 3102	HEF4094BP	PH		5322 209 14485
D 3103	HEF4040BP	PH		5322 209 14269
D 3104	HEF4040BP	PH		5322 209 14269
D 3105	HEF4008BP	PH		5322 209 14214
D 3106	HEF4522BP	PH		5322 209 10165
D 3107	HEF4522BP	PH		5322 209 10165
D 3108	HEF4522BP	PH		5322 209 10165
D 3109	HEF4522BP	PH		5322 209 10165
D 3110	HEF4085BP	PH		5322 209 14058
D 3111	HEF4011BP	PH		5322 209 14046
D 3112	HEF4049BP	PH		5322 209 14049
D 3113	HEF4073BP	PH		5322 209 14066
D 3114	HEF4081BP	PH		5322 209 14054
D 3115	HEF4066BP	PH		5322 209 14104
R 3001	9,09K	1	MR25	4822 116 51284
R 3002	464	1	MR25	5322 116 50536
R 3003	464	1	MR25	5322 116 50536

POSNR	DESCRIPTION			ORDERING CODE
R 3004	464 1		MR25	5322 116 50536
R 3005	464 1		MR25	5322 116 50536
R 3006	2,05K	1	MR25	5322 116 50664
R 3007	154K	1	MR25	5322 116 54714
R 3008	2,05K	1	MR25	5322 116 50664
R 3009	154K	1	MR25	5322 116 54714
R 3010	2,05K	1	MR25	5322 116 50664
R 3011	154K	1	MR25	5322 116 54714
R 3012	2,05K	1	MR25	5322 116 50664
R 3013	154K	1	MR25	5322 116 54714
R 3014	2,05K	1	MR25	5322 116 50664
R 3015	154K	1	MR25	5322 116 54714
R 3016	464 1		MR25	5322 116 50536
R 3017	56,2K	1	MR25	4822 116 51264
R 3018	2,49K	1	MR25	5322 116 50581
R 3019	56,2K	1	MR25	4822 116 51264
R 3101	1,62K	1	MR25	5322 116 55359
R 3102	6,19K	1	MR25	5322 116 55426
R 3103	3,3K	20	0.5W	5322 101 14215
R 3104	10M	5	VR25	4822 110 72214
R 3105	220	20	0.5W	5322 101 14051
R 3106	15,4K	1	MR25	5322 116 55459
R 3107	100	1	MR25	5322 116 54469
R 3108	4,64K	1	MR25	5322 116 50484
R 3109	205K	1	MR25	5322 116 54727
R 3110	649K	1	MR25	5322 116 55331
R 3111	3,32K	1	MR25	5322 116 54005
R 3112	46,4K	1	MR25	5322 116 50557
R 3113	46,4K	1	MR25	5322 116 50557
R 3114	46,4K	1	MR25	5322 116 50557
R 3115	46,4K	1	MR25	5322 116 50557
R 3116	10	1	MR25	5322 116 50452
S 3101	DIGIT SELECT			5322 273 30268
V 3001	BAW62		PH	4822 130 30613
V 3002	BAW62		PH	4822 130 30613
V 3101	BFQ12 SEL			5322 130 44648
V 3102	BAW62		PH	4822 130 30613
V 3103	BAW62		PH	4822 130 30613
V 3104	BAW62		PH	4822 130 30613
V 3105	BAW62		PH	4822 130 30613
V 3106	BAW62		PH	4822 130 30613
V 3107	BAW62		PH	4822 130 30613
V 3108	BAW62		PH	4822 130 30613
V 3109	BAW62		PH	4822 130 30613
V 3110	BZX79-C6V8		PH	4822 130 34278

6.2.2. PM9258/01 HF voltage unit (N26)

POSNR	DESCRIPTION			ORDERING CODE
C 2601	22UF-10+50	25		4822 124 20698
C 2602	22NF-20+80	40		4822 122 30103
C 2603	22UF-10+50	25		4822 124 20698
C 2604	22NF-20+80	40		4822 122 30103
C 2605	10NF-20+50	100		4822 122 31414
C 2606	10NF-20+50	100		4822 122 31414
C 2607				5322 121 54253
C 2608	4,7NF	10	100	4822 122 30128
C 2609	4,7NF	10	100	4822 122 30128
C 2610	22NF-20+80	40		4822 122 30103
C 2611	22NF-20+80	40		4822 122 30103
C 2612	10NF-20+50	100		4822 122 31414
C 2613	2,2NF	10	100	4822 122 30114
C 2614	10NF-20+50	100		4822 122 31414
C 2615	2,2NF	10	100	4822 122 30114
C 2616	10NF-20+50	100		4822 122 31414
C 2617	21,5NF 1%	63V		5322 121 54181
K 2601	REED RELAY ASSY.			5322 280 80459
K 2602	REED RELAY ASSY.			5322 280 80459
K 2603	REED RELAY ASSY.			5322 280 80459
K 2604	REED RELAY ASSY.			5322 280 80459
K 2605	REED RELAY ASSY.			5322 280 80459
L 2601	COIL	1MH		5322 158 10278
R 2601	4,02K	1	MR25	5322 116 55448
R 2602	1M	1	MR30	5322 116 54188
R 2603	47K	20	0.5W	5322 101 14293
R 2604	1M	1	MR30	5322 116 54188
R 2605	10M	5	VR25	4822 110 72214
R 2606	1M	1	MR30	5322 116 54188
R 2607	100	1	MR25	5322 116 54469
R 2608	47K	20	0.5W	5322 101 14293
R 2609	10K	1	MR25	4822 116 51253
R 2610	8,25K	1	MR25	5322 116 54558
R 2611	27,4K	1	MR25	5322 116 50559
R 2612	3,83K	1	MR25	5322 116 54589
R 2613	33,2K	1	MR25	4822 116 51259
R 2614	68,1	1	MR25	5322 116 54455
R 2615	4,64K	1	MR25	5322 116 50484
R 2616	5,62K	1	MR25	4822 116 51281
R 2617	12,1K	1	MR25	5322 116 50572
R 2618	15,4K	1	MR25	5322 116 55459
R 2619	178	1	MR25	5322 116 54492
R 2620	15,4K	1	MR25	5322 116 55459
R 2621	5,62K	1	MR25	4822 116 51281
R 2622	10K	1	MR25	4822 116 51253
R 2623	15,4K	1	MR25	5322 116 55459
R 2624	178	1	MR25	5322 116 54492
R 2625	15,4K	1	MR25	5322 116 55459
R 2626	15,4K	1	MR25	5322 116 55459
R 2627	154	1	MR25	5322 116 50506
R 2628	2,26K	1	MR25	5322 116 50675
R 2629	154	1	MR25	5322 116 50506
R 2630	2,26K	1	MR25	5322 116 50675
R 2631	2,26K	1	MR25	5322 116 50675
V 2601	BC547B	PH		4822 130 40959
V 2602	BC547B	PH		4822 130 40959

POSNR	DESCRIPTION		ORDERING CODE
V 2603	BC547B	PH	4822 130 40959
V 2604	BC547B	PH	4822 130 40959
V 2605	BC547B	PH	4822 130 40959
V 2606	BC547B	PH	4822 130 40959
V 2607	OA95	PH	4822 130 30191
V 2608	BAX12A	PH	5322 130 34605
V 2609	BAX12A	PH	5322 130 34605
V 2610	BAX12A	PH	5322 130 34605

6.2.3. PM9259/01 Peak voltage unit (N27)

POSNR	DESCRIPTION			ORDERING CODE
C 2702	6,8UF 20%		25V	5322 124 14081
C 2703	6,8UF 20%		25V	5322 124 14081
C 2704	22UF 40%		10V	4822 124 20943
C 2705	22UF 40%		10V	4822 124 20943
C 2706	2,2UF 20%		35V	5322 124 14014
C 2707	680NF 10%		100V	5322 121 40233
C 2708	220NF 10%		100V	4822 121 40232
C 2709	2,2UF 20%		35V	5322 124 14014
C 2710	2,2UF 20%		35V	5322 124 14014
C 2711	5,6PF 0,25PF		100	4822 122 31047
C 2712				5322 121 54255
D 2701	HEF4066BP	PH		5322 209 14104
D 2702	HEF4528BP	PH		5322 209 14191
D 2703	HEF4104BP	PH		5322 209 14443
K 2201	REED RELAY ASSY.			5322 280 80459
R 2704	10,1K	0,1	MR24E	5322 116 55285
R 2705	90,9K	0,1	MR24E	5322 116 55224
R 2706	330	20	0.5W	5322 101 14244
R 2707	36,5K	0,1	MR24E	5322 116 51379
R 2708	100	20	0.5W	5322 101 14072
R 2709	1K	1	MR25	4822 116 51235
R 2710	10K	0,1	MR24E	5322 116 50748
R 2711	1K	1	MR25	4822 116 51235
R 2712	22K	20	0.5W	5322 100 10118
R 2713	22K	20	0.5W	5322 100 10118
R 2716	1,8M	5	CR25	5322 111 34187
R 2717	1,1M	5	CR25	5322 111 44178
R 2718	33M	5	VR37	4822 110 42227
R 2719	100K	1	MR25	4822 116 51268
R 2720	226K	1	MR25	5322 116 54729
R 2721	287	1	MR25	5322 116 54506
R 2722	5,62K	1	MR25	4822 116 51281
R 2723	5,62K	1	MR25	4822 116 51281
R 2724	48,7K	1	MR25	5322 116 50442
R 2725	105K	1	MR25	5322 116 54698
R 2726	4,87K	1	MR25	5322 116 50509
R 2727	3,83K	1	MR25	5322 116 54589
R 2728	22,6	1	MR25	5322 116 50491
R 2729	22,6K	1	MR25	5322 116 50481
R 2730	48,7K	1	MR25	5322 116 50442
R 2731	48,7K	1	MR25	5322 116 50442
V 2705	BAX12A	PH		5322 130 34605
V 2706	BAW62	PH		4822 130 30613
V 2707	BAV45	PH		5322 130 34037
V 2708	BAW62	PH		4822 130 30613
V 2709	BC559B	PH		4822 130 44358
V 2710	BAW62	PH		4822 130 30613
V 2711	BZX79-C6V2	PH		4822 130 31111
V 2712	BZX79-C3V6	PH		5322 130 34834
V 2713	BAV45	PH		5322 130 34037
V 2714	BC547B	PH		4822 130 40959
V 2715	BC559B	PH		4822 130 44358
V 2716	ON528	PH		5322 130 44405
V 2717	BZX79-C8V2	PH		4822 130 34382
V 2718	BZX79-C8V2	PH		4822 130 34382

6.2.4 PM9291/01 IEC-bus interface and galvanic separation (N30, N32)

POSNR	DESCRIPTION			ORDERING CODE
B 3001	SELECTED CNX35			5322 130 31718
B 3002	SELECTED CNX35			5322 130 31718
B 3003	SELECTED CNX25			5322 130 31718
B 3004	SELECTED CNX35			5322 130 31718
B 3005	SELECTED CNX35			5322 130 31718
C 3002	22NF	30	16	4822 122 10166
C 3003	22NF	30	16	4822 122 10166
C 3004	22NF	30	16	4822 122 10166
C 3006	2,2NF	10	50	4822 122 10175
C 3007	22NF	30	16	4822 122 10166
C 3008	22NF	30	16	4822 122 10166
C 3009	47UF-10+50		10	4822 124 20678
C 3010	470PF	10	50	4822 122 31435
C 3201	100PF	2	100	4822 122 31504
C 3202	10UF-10+50		63	4822 124 20728
C 3203	33PF	2	100	4822 122 31067
C 3204	47UF-10+50		10	4822 124 20678
C 3205	47UF-10+50		10	4822 124 20678
C 3206	100PF	2	100	4822 122 31504
C 3207	100PF	2	100	4822 122 31504
C 3208	22NF-20+80		40	4822 122 30103
C 3209	22NF-20+80		40	4822 122 30103
C 3210	22NF-20+80		40	4822 122 30103
C 3211	22NF-20+80		40	4822 122 30103
C 3212	22NF-20+80		40	4822 122 30103
C 3213	22NF-20+80		40	4822 122 30103
C 3214	22NF-20+80		40	4822 122 30103
C 3215	22NF-20+80		40	4822 122 30103
C 3216	22NF-20+80		40	4822 122 30103
C 3217	22NF-20+80		40	4822 122 30103
C 3218	22NF-20+80		40	4822 122 30103
C 3219	22NF-20+80		40	4822 122 30103
C 3220	22NF-20+80		40	4822 122 30103
C 3221	330PF	2	100	5322 122 34148
D 3001	HEF4049BP	PH		5322 209 14049
D 3002	HEF4011BP	PH		5322 209 14046
D 3003	HEF4013BP	PH		5322 209 10002
D 3004	HEF4013BP	PH		5322 209 10002
D 3005	HEF40097BP	PH		5322 209 14433
D 3006	HEF4049BP	PH		5322 209 14049
D 3007	HEF4555BP	PH		5322 209 14188
D 3201	MC3441P	MO		5322 209 85464
D 3202	MC3441P	MO		5322 209 85464
D 3203	MC3441P	MO		5322 209 85464
D 3204	MC3441P	MO		5322 209 85464
D 3205	HEF4738VP	PH		5322 209 14509
D 3206	HEF4021BP	PH		4822 209 10049
D 3207	HEF4021BP	PH		4822 209 10049
D 3208	SAA1060	PH		4822 209 80512
D 3209	HEF4014BP	PH		5322 209 14219
D 3210	HEF4014BP	PH		5322 209 14219
D 3211	HEF4070BP	PH		5322 209 14073
D 3212	HEF40438P	PH		5322 209 14244
D 3213	HEF4071BP	PH		5322 209 14053
D 3214	HEF4001BP	PH		5322 209 14045
D 3215	HEF4011BP	PH		5322 209 14046
D 3216	HEF4049BP	PH		5322 209 14049

POSNR	DESCRIPTION			ORDERING CODE
R 3001	9,09K	1	MR25	4822 116 51284
R 3002	464	1	MR25	5322 116 50536
R 3003	464	1	MR25	5322 116 50536
R 3004	464	1	MR25	5322 116 50536
R 3005	464	1	MR25	5322 116 50536
R 3006	2,05K	1	MR25	5322 116 50664
R 3007	154K	1	MR25	5322 116 54714
R 3008	2,05K	1	MR25	5322 116 50664
R 3009	154K	1	MR25	5322 116 54714
R 3010	2,05K	1	MR25	5322 116 50664
R 3011	154K	1	MR25	5322 116 54714
R 3012	2,05K	1	MR25	5322 116 50664
R 3013	154K	1	MR25	5322 116 54714
R 3014	2,05K	1	MR25	5322 116 50664
R 3015	154K	1	MR25	5322 116 54714
R 3016	464	1	MR25	5322 116 50536
R 3017	56,2K	1	MR25	4822 116 51264
R 3018	2,49K	1	MR25	5322 116 50581
R 3019	56,2K	1	MR25	4822 116 51264
R 3201	22,6K	1	MR25	5322 116 50481
R 3202	10K	1	MR25	4822 116 51253
R 3203	10K	1	MR25	4822 116 51253
R 3204	10K	1	MR25	4822 116 51253
R 3205	10K	1	MR25	4822 116 51253
R 3206	10K	1	MR25	4822 116 51253
R 3207	10K	1	MR25	4822 116 51253
R 3208	10K	1	MR25	4822 116 51253
R 3209	10K	1	MR25	4822 116 51253
R 3210	10K	1	MR25	4822 116 51253
R 3211	10K	1	MR25	4822 116 51253
R 3212	10K	2	7X0.2W	5322 111 94166
R 3213	10K	2	7X0.2W	5322 111 94166
R 3214	10K	2	7X0.2W	5322 111 94166
R 3215	10K	2	7X0.2W	5322 111 94166
S 3201	THUMB WHEEL SWITCH 7-POLE			5322 277 10594
V 3001	BAW62		PH	4822 130 30613
V 3002	BAW62		PH	4822 130 30613
V 3201	OA95		PH	4822 130 30191
V 3202	BC559B		PH	4822 130 44358
X 3201	IEC-BUS SOCKET			5322 265 54057
N30	GALVANIC SEPARATION			5322 214 70115

6.2.5. PM9292/01 BCD output and galvanic separation (N30, N34)

POSNR	DESCRIPTION			ORDERING CODE
B 3001	CNX35 SELECTED			5322 130 31718
B 3002	CNX35 SELECTED			5322 130 31718
B 3003	CNX35 SELECTED			5322 130 31718
B 3004	CNX35 SELECTED			5322 130 31718
B 3005	CNX35 SELECTED			5322 130 31718
C 3002	22NF	30	16	4822 122 10166
C 3003	22NF	30	16	4822 122 10166
C 3004	22NF	30	16	4822 122 10166
C 3006	2,2NF	10	50	4822 122 10175
C 3007	22NF	30	16	4822 122 10166
C 3008	22NF	30	16	4822 122 10166
C 3009	47UF-10+50		10	4822 124 20678
C 3010	470PF	10	50	4822 122 31435
C 3401	47UF-10+50		10	4822 124 20678
C 3402	4,7NF	10	100	4822 122 30128
C 3403	22NF-20+80		40	4822 122 30103
C 3404	22NF-20+80		40	4822 122 30103
C 3405	22NF-20+80		40	4822 122 30103
C 3406	22NF-20+80		40	4822 122 30103
C 3407	22NF-20+80		40	4822 122 30103
C 3408	22NF-20+80		40	4822 122 30103
C 3409	22NF-20+80		40	4822 122 30103
D 3001	HEF4049BP	PH		5322 209 14049
D 3002	HEF4011BP	PH		5322 209 14046
D 3003	HEF4013BP	PH		5322 209 10002
D 3004	HEF4013BP	PH		5322 209 10002
D 3005	HEF40097BP	PH		5322 209 14433
D 3006	HEF4049BP	PH		5322 209 14049
D 3007	HEF4555BP	PH		5322 209 14188
D 3401	SAA1060	PH		4822 209 80512
D 3402	HEF4001BP	PH		5322 209 14045
D 3403	N7406N	SC		5322 209 86327
D 3404	SAA1060	PH		4822 209 80512
D 3405	HEF4013BP	PH		5322 209 10002
D 3406	HEF4528BP	PH		5322 209 14191
R 3001	9,09K	1	MR25	4822 116 51284
R 3002	464E	1%	0,4W	5322 116 50536
R 3003	464E	1%	0,4W	5322 116 50536
R 3004	464E	1%	0,4W	5322 116 50536
R 3005	464E	1%	0,4W	5322 116 50536
R 3006	2,05K	1	MR25	5322 116 50664
R 3007	154K	1	MR25	5322 116 54714
R 3008	2,05K	1	MR25	5322 116 50664
R 3009	154K	1	MR25	5322 116 54714
R 3010	2,05K	1	MR25	5322 116 50664
R 3011	154K	1	MR25	5322 116 54714
R 3012	2,05K	1	MR25	5322 116 50664
R 3013	154K	1	MR25	5322 116 54714
R 3014	2,05K	1	MR25	5322 116 50664
R 3015	154K	1	MR25	5322 116 54714
R 3016	464E	1%	0,4W	5322 116 50536
R 3017	56,2K	1	MR25	4822 116 51264
R 3018	2,49K	1	MR25	5322 116 50581
R 3019	56,2K	1	MR25	4822 116 51264
R 3401	19,6K	1	MR25	5322 116 54641

POSNR	DESCRIPTION			ORDERING CODE
R 3402	46,4K	1	MR25	5322 116 50557
R 3403	46,4K	1	MR25	5322 116 50557
R 3404	46,4K	1	MR25	5322 116 50557
R 3405	12,1K	1	MR25	5322 116 50572
R 3406	15,4K	1	MR25	5322 116 55459
R 3407	6,81K	1	MR25	4822 116 51252
R 3408	17,8K	1	MR25	5322 116 54637
R 3409	12,1K	1	MR25	5322 116 50572
R 3410	7,5K	1	MR25	5322 116 54608
R 3411	15,4K	1	MR25	5322 116 55459
R 3413	100K	1	MR25	4822 116 51268
R 3414	8,2K	2	7X0.2W	5322 111 94043
R 3415	8,2K	2	7X0.2W	5322 111 94043
R 3416	8,2K	2	7X0.2W	5322 111 94043
R 3417	8,2K	2	7X0.2W	5322 111 94043
R 3418	8,2K	2	7X0.2W	5322 111 94043
V 3001	BAW62		PH	4822 130 30613
V 3002	BAW62		PH	4822 130 30613
V 3401	BC547B		PH	4822 130 40959
V 3402	BC557B		PH	4822 130 44568
X 3401	BCD SOCKET			5322 267 60097
N 30	GALVANIC SEPARATION			5322 214 70115

CONTENTS

7. CIRCUIT DIAGRAMS AND COMPONENT LAY-OUTS

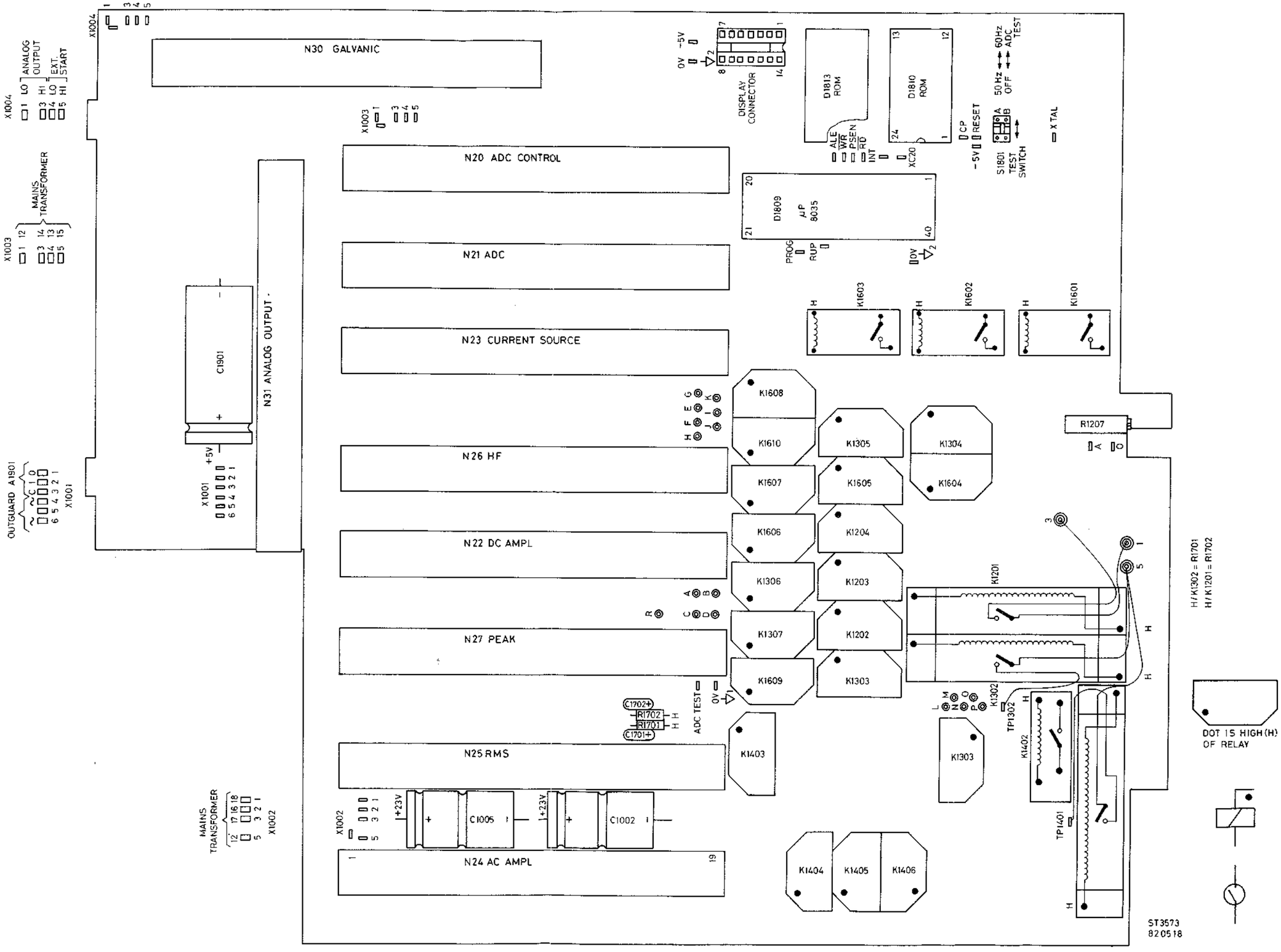


Fig. 7.1. N1 Component side with test points lay out

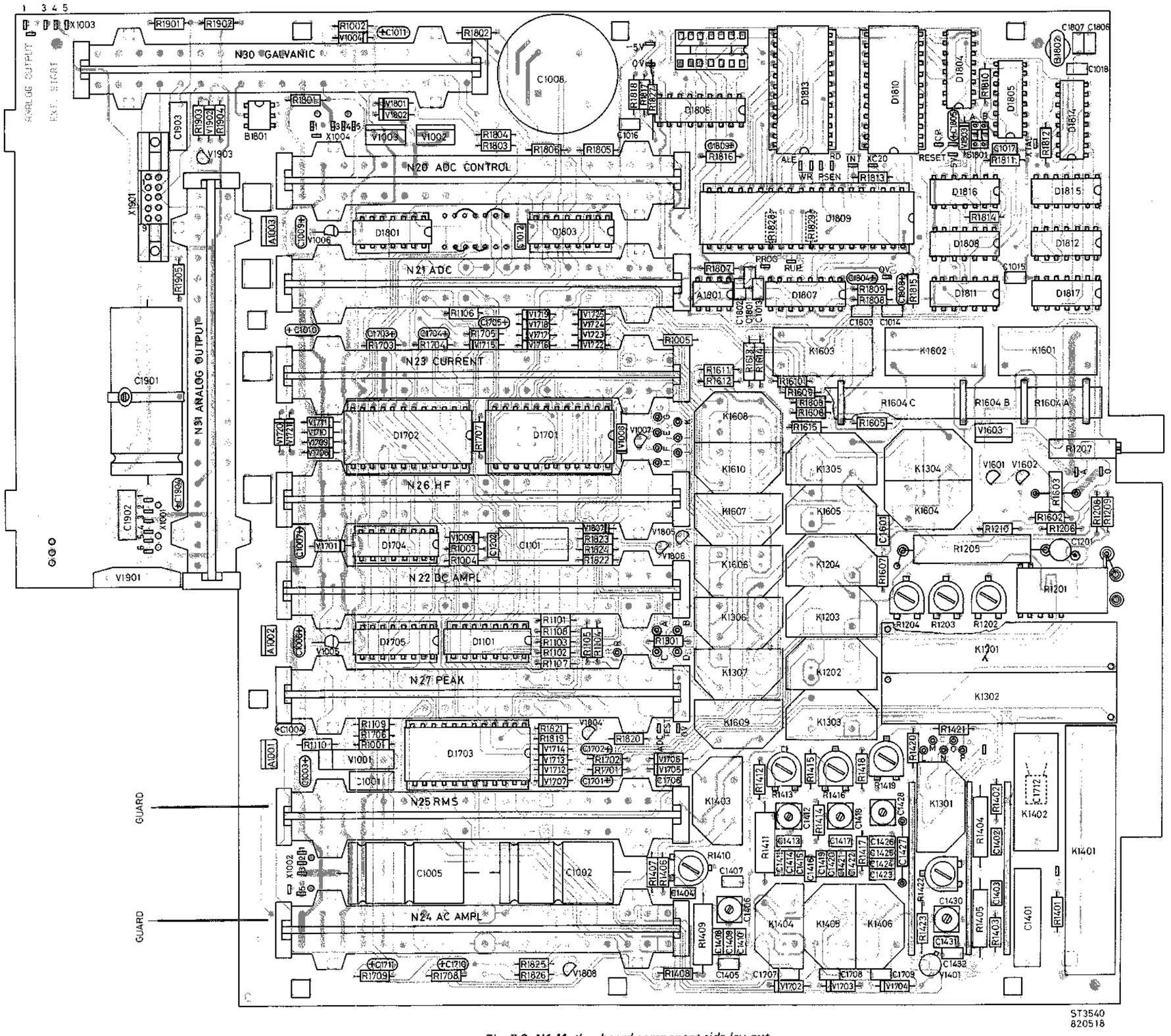
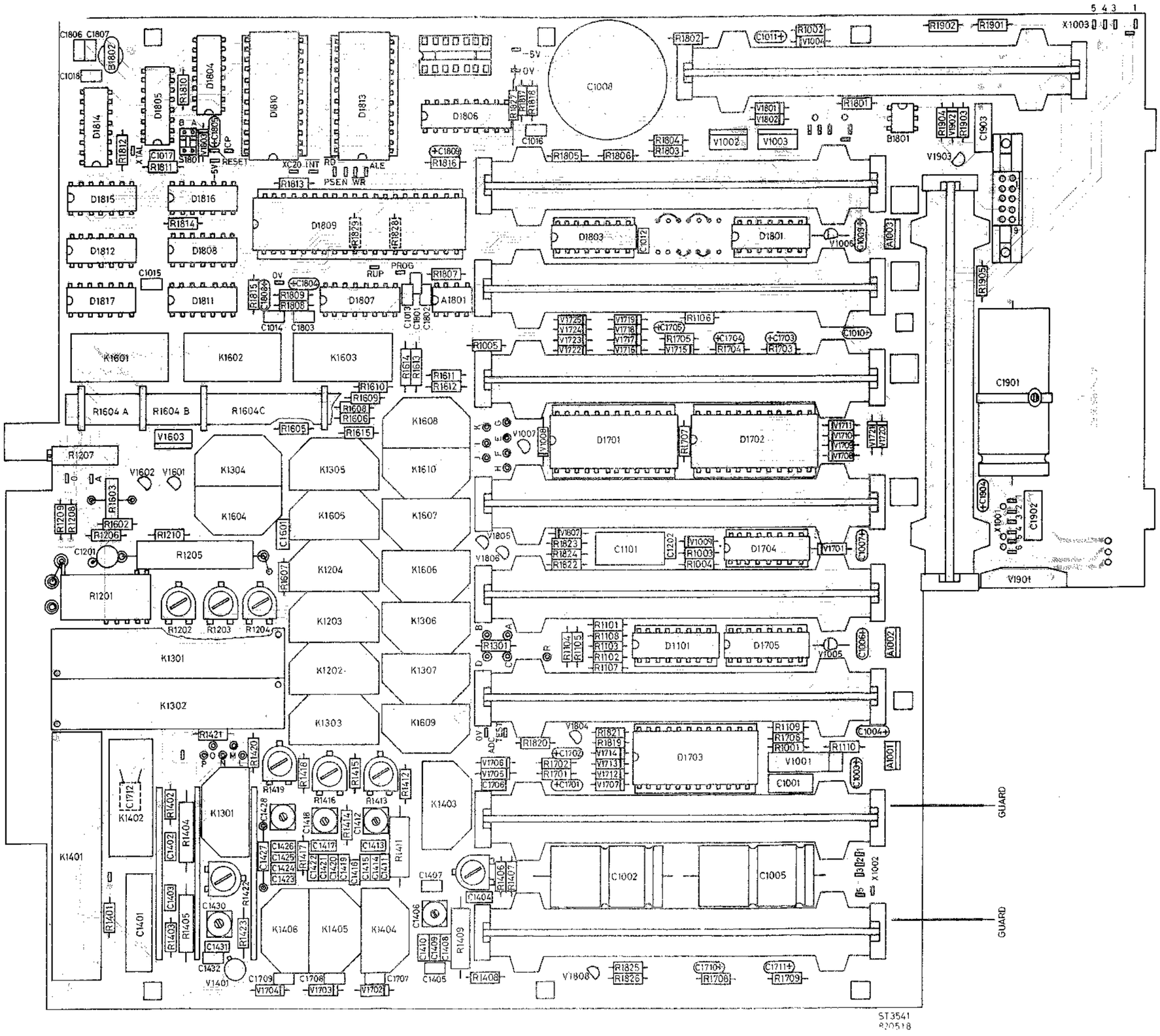
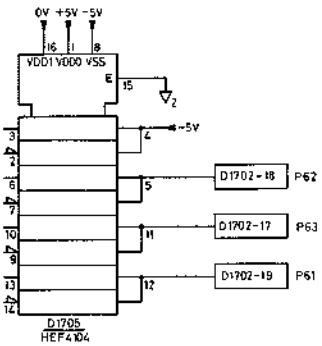


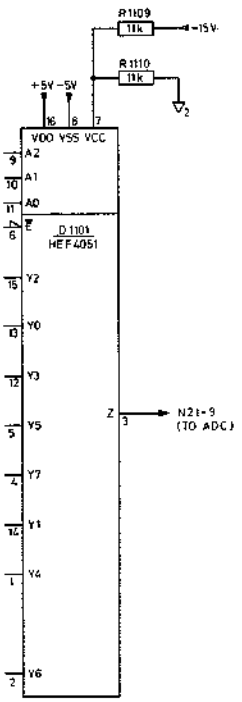
Fig. 7.2. N1 Mother board component side lay out

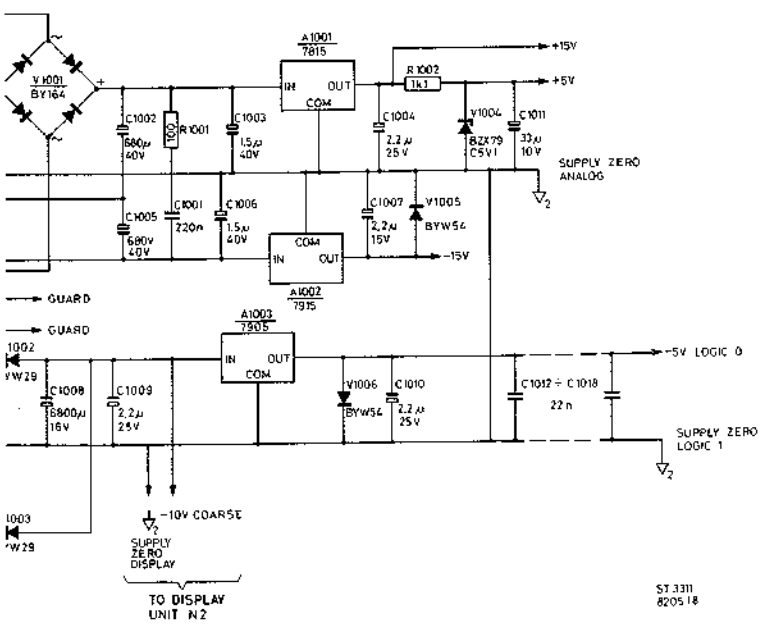


ST3541
R20518

Fig. 7.3. N1 Mother board conductor side lay out


0V +5V -5V
16 11 8
VDD1 VDD VSS
E
15
-5V
4
5
D1702-18
P62
11
D1702-17
P63
12
D1702-19
P61
D1705
HEF4104


R1109
11k
-15V
R1110
11k
+5V -5V
16 8 7
VDD VSS VCC
A2
A1
A0
E
D1101
HEF4051
Y2
Y0
Y3
Y5
Y7
Y1
Y4
Y6
Z
3
N2E-9
(TO ADC)


V1001
BY164
A1001
7815
IN
OUT
COM
+15V
R1002
1k3
+5V
C1002
680µ
40V
R1001
100
C1003
1,5µ
40V
C1004
2,2µ
25V
V1004
BZX79
C5V1
C1011
33µ
10V
SUPPLY ZERO
ANALOG
C1005
680µ
40V
C1001
220n
C1006
1,5µ
40V
C1007
2,2µ
15V
V1005
BYW54
-15V
A1002
7915
GUARD
GUARD
A1003
7905
1002
BYW29
C1008
6800µ
16V
C1009
2,2µ
25V
V1006
BYW54
C1010
2,2µ
25V
C1012 ÷ C1018
22n
+5V LOGIC 0
SUPPLY ZERO
LOGIC 1
1003
BYW29
-10V COARSE
SUPPLY
ZERO
DISPLAY
TO DISPLAY
UNIT N2
ST.3311
820518

N1 ANALOG/POWER SUPPLY

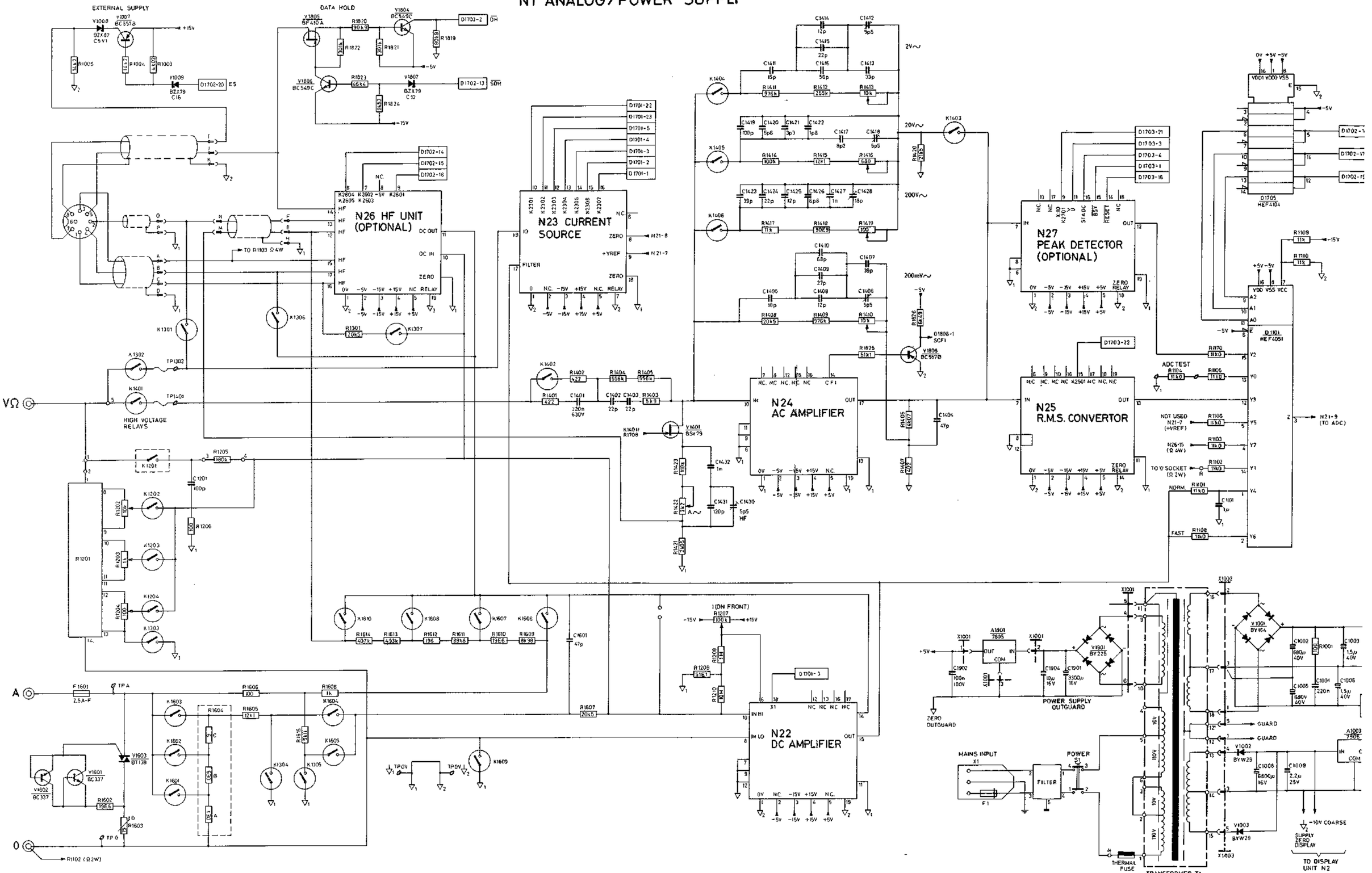
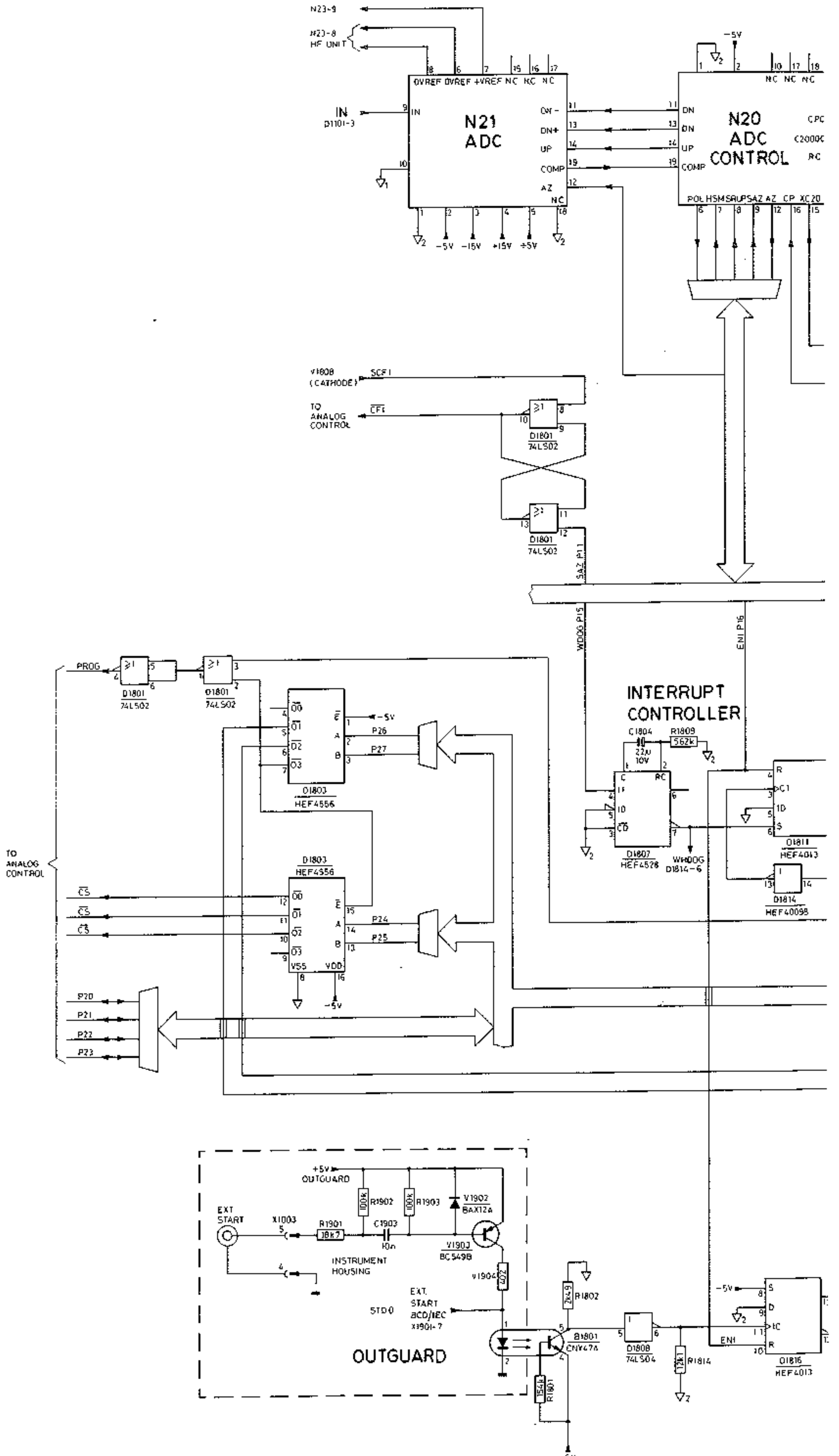


Fig. 7.4. N1 Analog and power supply circuit diagram

711



N23-9
N23-8
HF UNIT
IN
D1101-3
N21
ADC
OVREF OVREF +VREF NC NC NC
DN-
DN+
UP
COMP
AZ
NC
-5V -15V +15V +5V
-5V
N20
ADC
CONTROL
DN
DN
UP
COMP
NC NC NC
POL HSMSAUPSAZ AZ CP XC20
V1808
(CATHODE)
SCF1
TO
ANALOG
CONTROL
CF1
D1801
74LS02
SAZ P11
WDOG P15
ENI P16
INTERRUPT
CONTROLLER
C1804
22u
10V
R1809
562k
D1807
HEF4528
WHDOG
D1814-6
D1811
HEF4013
D1814
HEF40098
PROG
D1801
74LS02
-5V
P26
P27
D1803
HEF4556
TO
ANALOG
CONTROL
CS
P24
P25
VSS
VDD
P20
P21
P22
P23
+5V
OUTGUARD
R1902
R1903
100k
100k
V1902
BAX12A
EXT
START
X1003
R1901
18k7
C1903
10n
V1903
BC549B
INSTRUMENT
HOUSING
V1904
402
EXT.
START
BCD/IEC
X1901-7
STDO
OUTGUARD
2k49
R1802
B1801
CNY47A
D1808
74LS04
12k1
R1814
154k
R1801
5V
-5V
ENI
D1816
HEF4013

N1 DIGITAL

COUNTER

N20 ADC CONTROL

ADDRESS LATCHES

MEMORY

ROM CHIP SELECT

INTERRUPT CONTROLLER

SYCHRONUS MAINS/ADC START

μP

TO GALVANIC SEPARATION N30 (INTERFACES AND OPTIONS OUTGUARD

TO DISPLAY UNIT N2

Fig. 7.5. N1 Digital circuit diagram

N1 ANALOG CONTROL

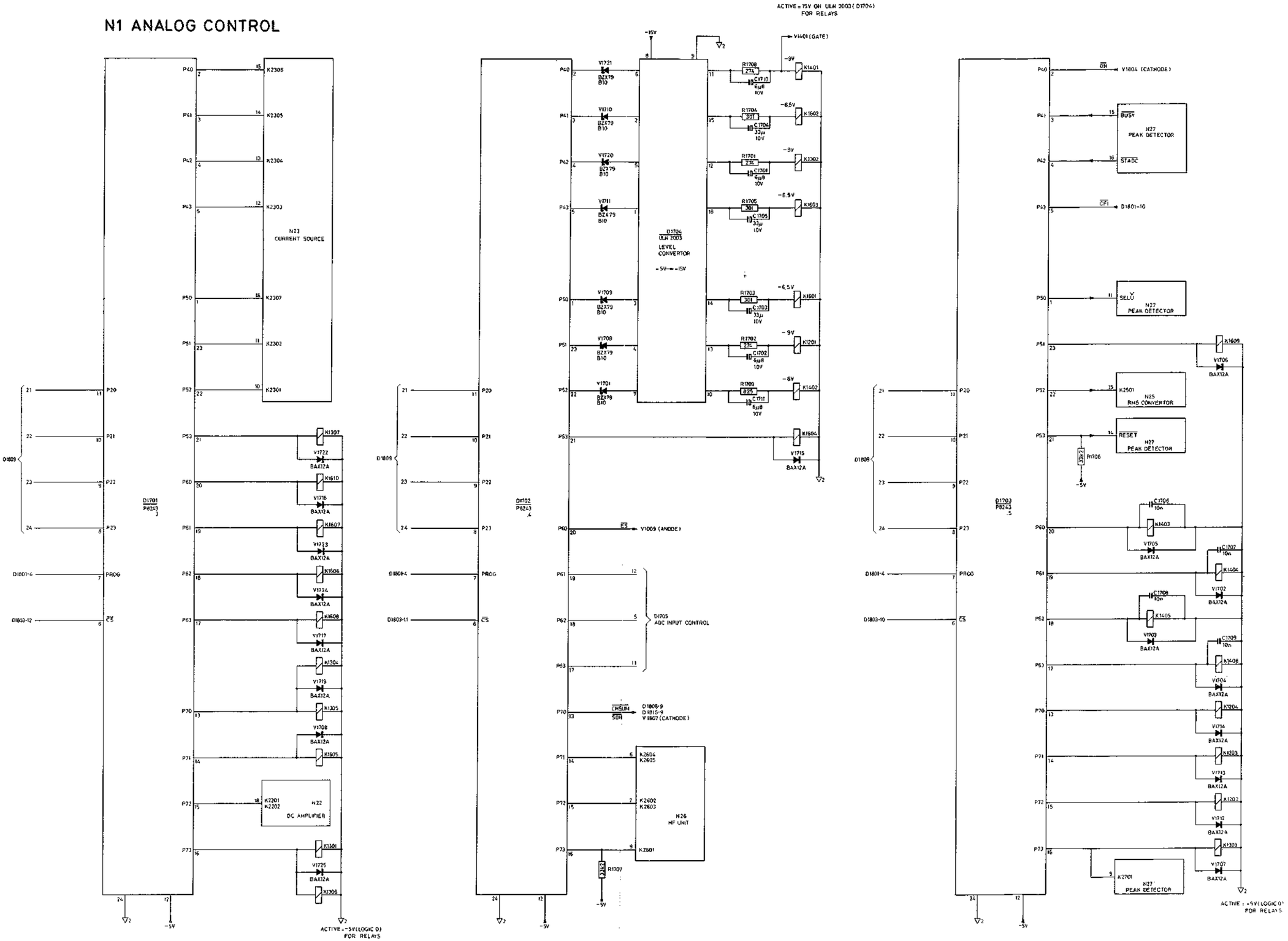
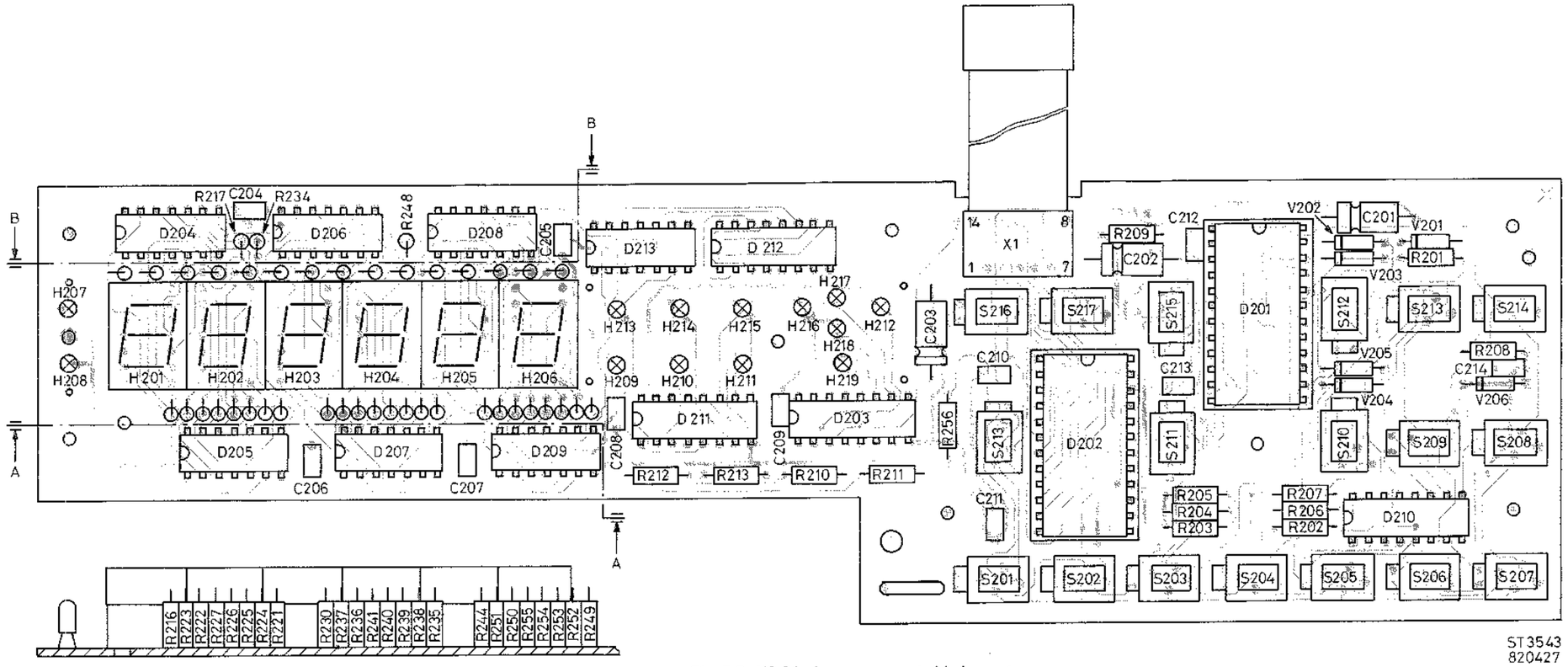
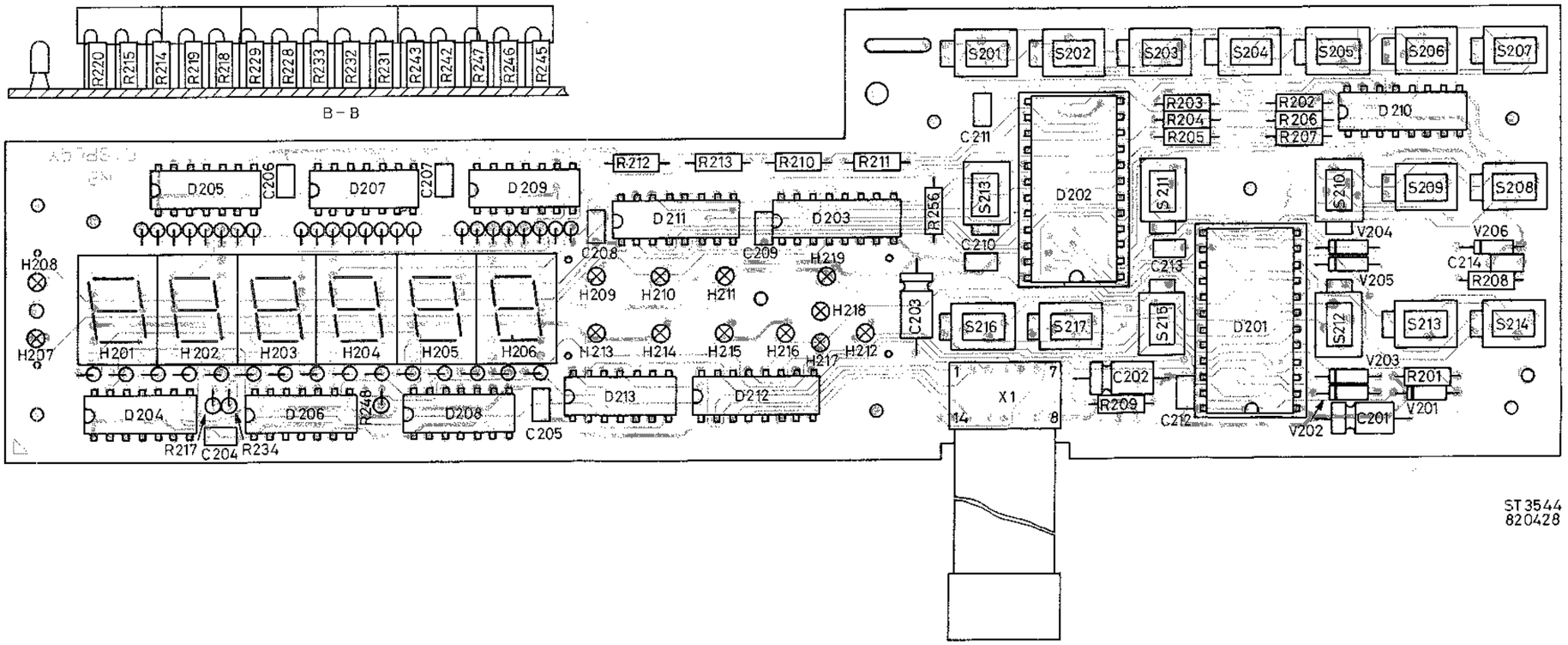


Fig. 7.6. N1 Analog control circuit diagram



ST 3543
820427

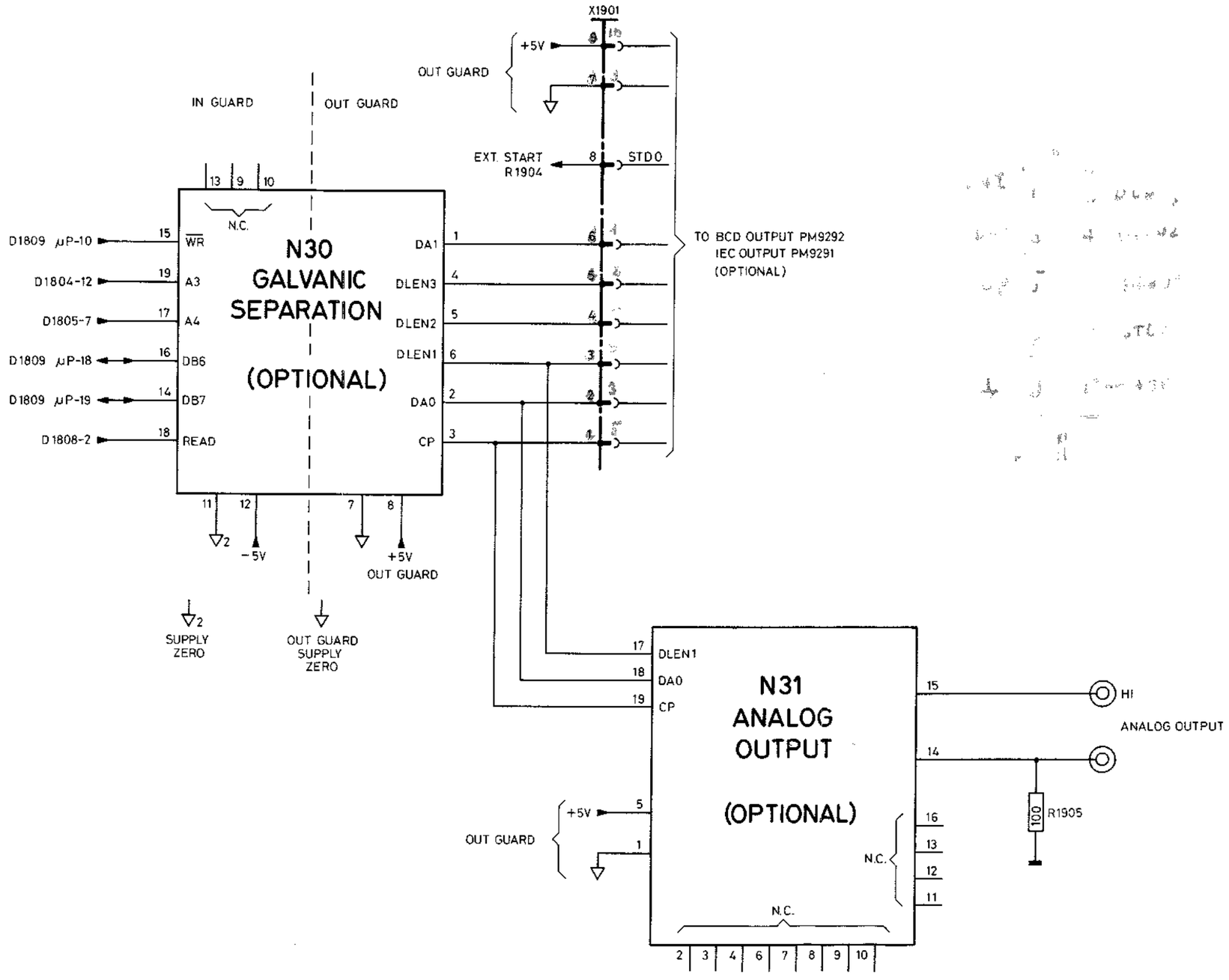
Fig. 7.8. N2 Display component side lay out



ST 3544
820428

Fig. 7.9. N2 Display conductor side lay out

N1 OUT GUARD



ST 3309
820408

Fig. 7.7. N1 Outguard circuit diagram

N2 DISPLAY UNIT

FUNCTION INDICATION

Fig. 7.10. N2 Display unit circuit diagram

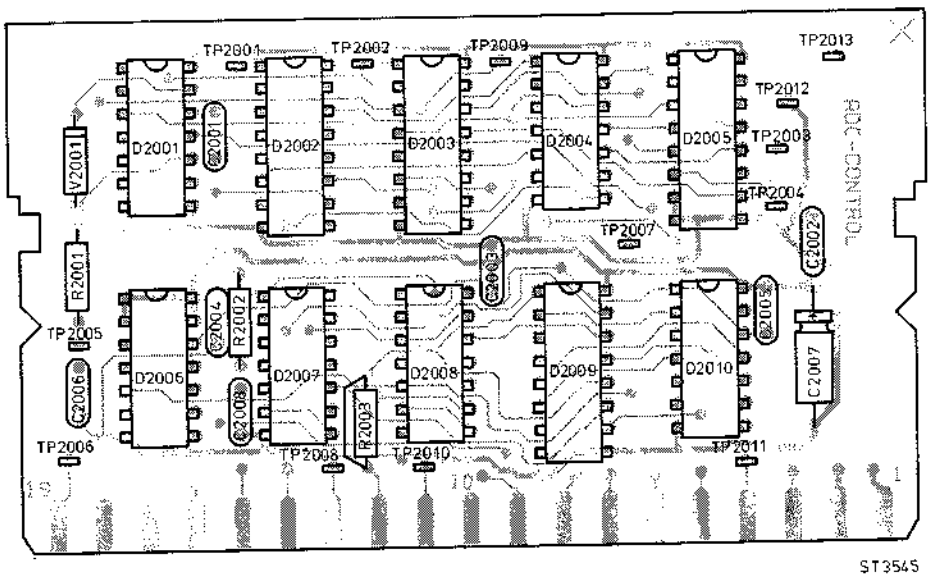


Fig. 7.11. N20 ADC control component side lay out

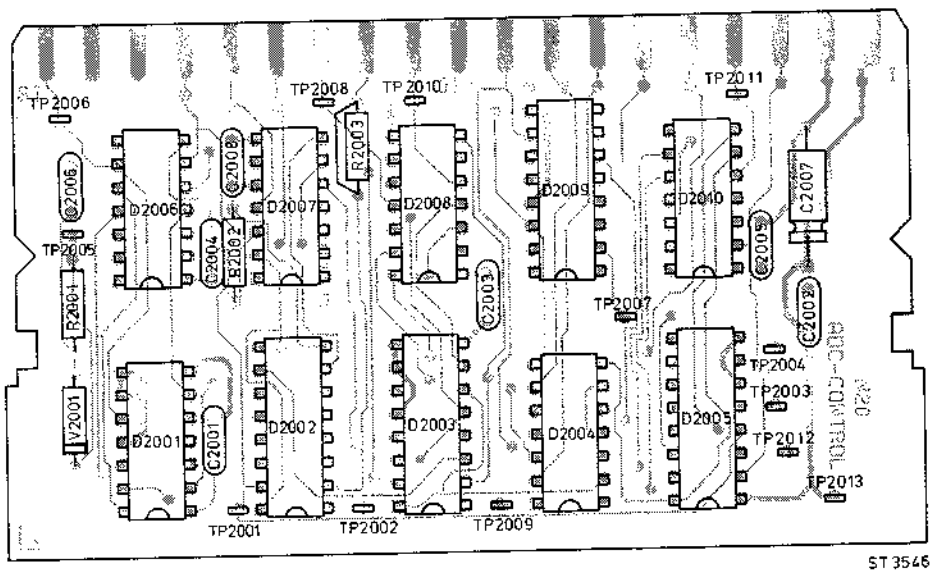


Fig. 7.12. N20 ADC control conductor side lay out

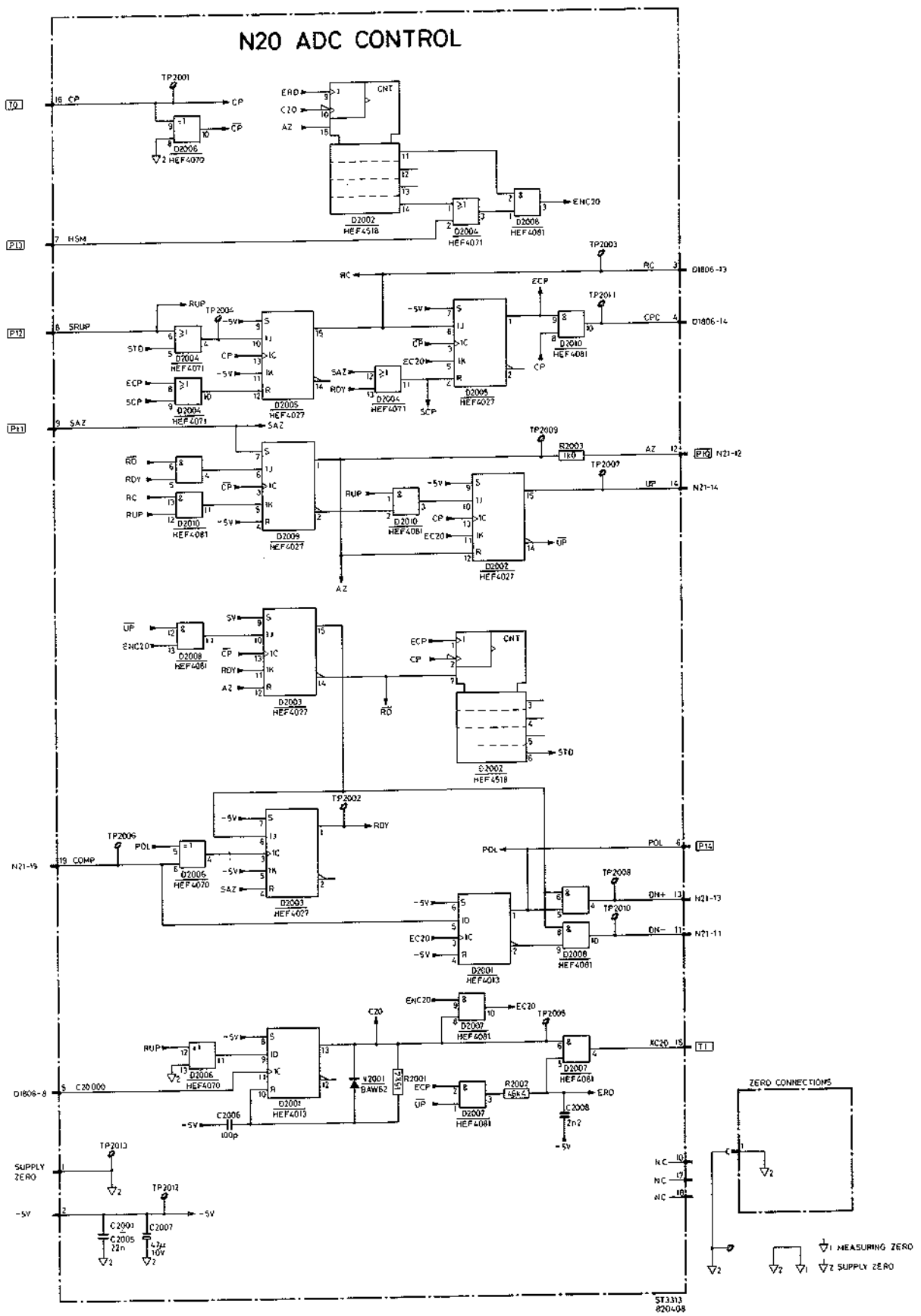


Fig. 7.13. N20 ADC control circuit diagram

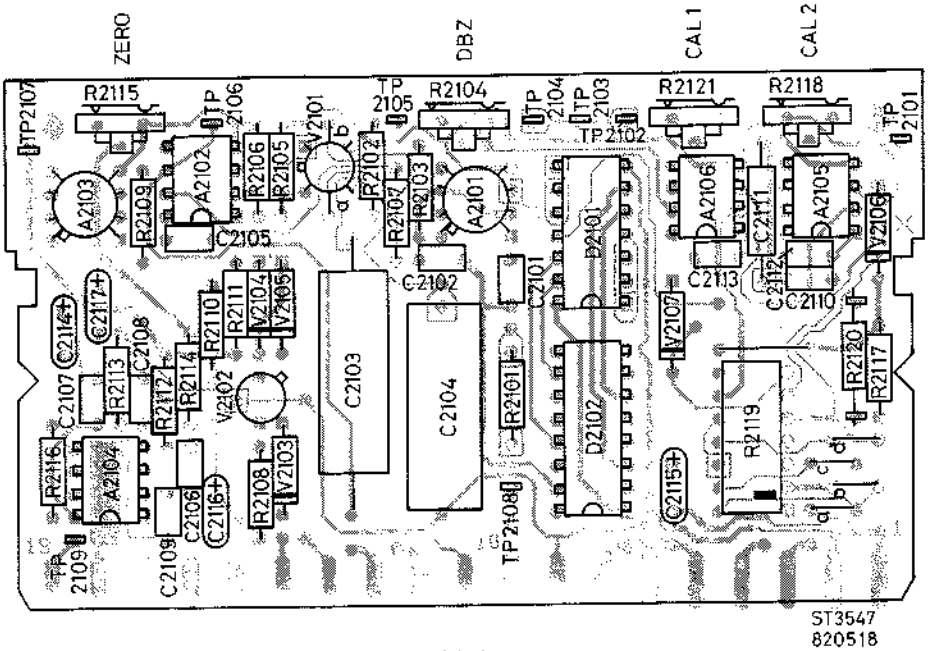


Fig. 7.14. N21 ADC analog component side lay out

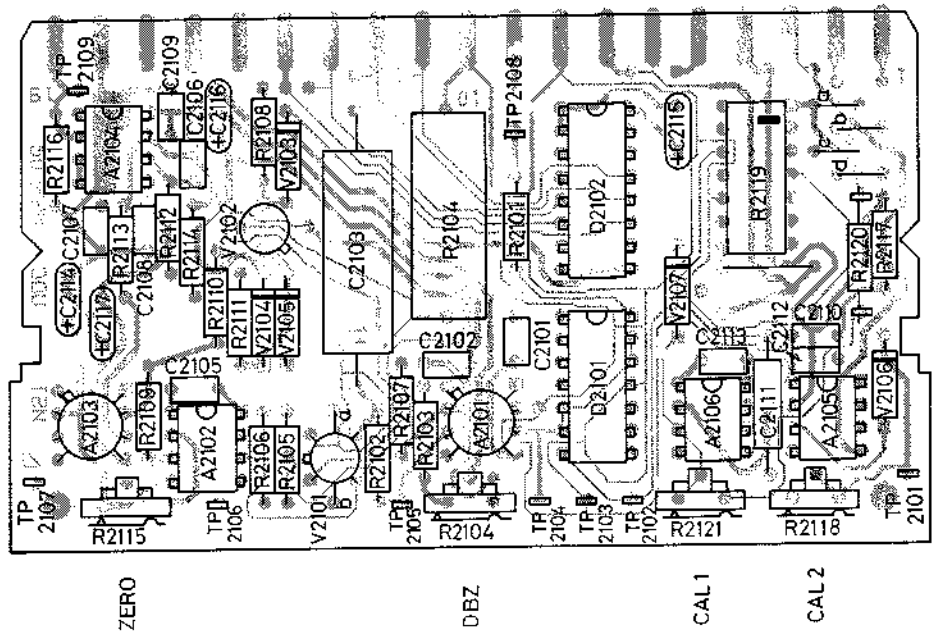


Fig. 7.15. N21 ADC analog conductor side lay out

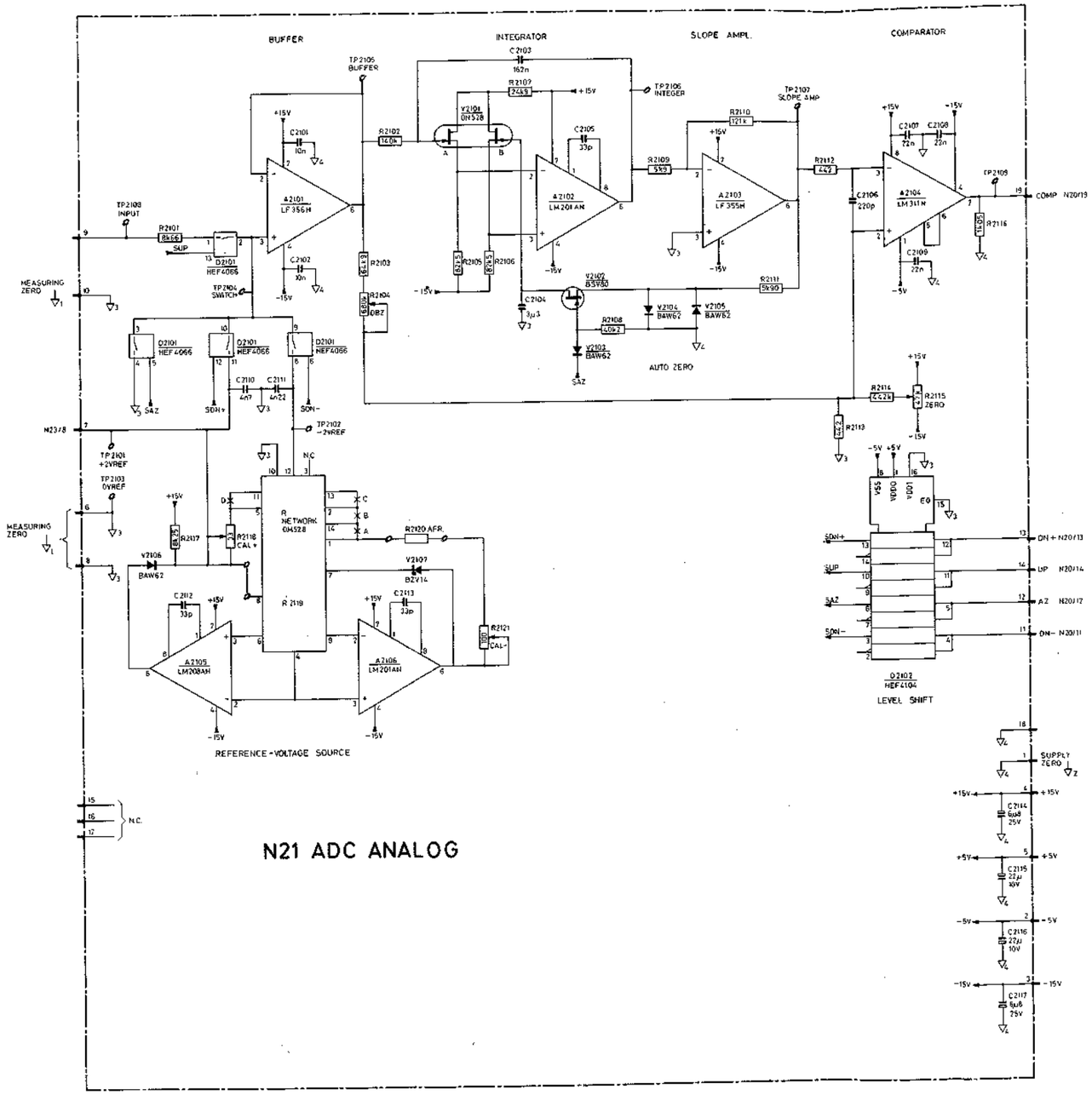


Fig. 7.16. N21 ADC analog circuit diagram

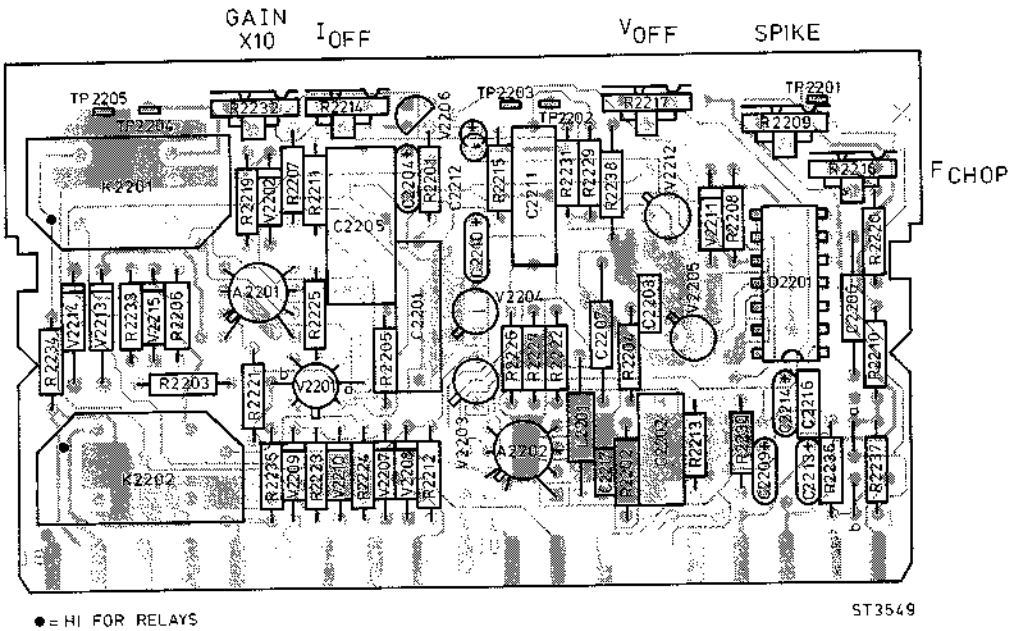


Fig. 7.17. N22 DC amplifier component side lay out

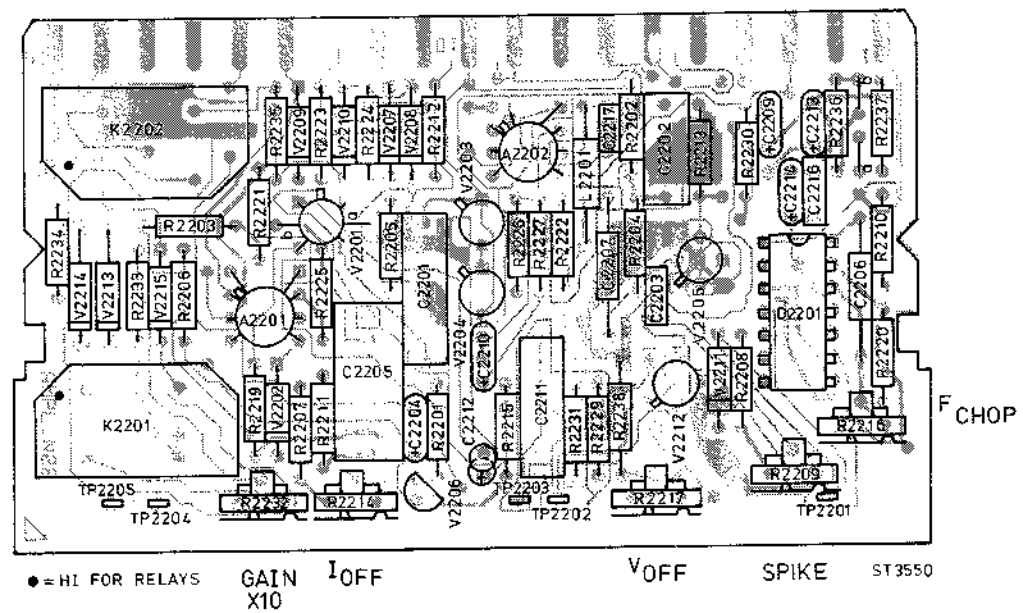


Fig. 7.18. N22 DC amplifier conductor side lay out

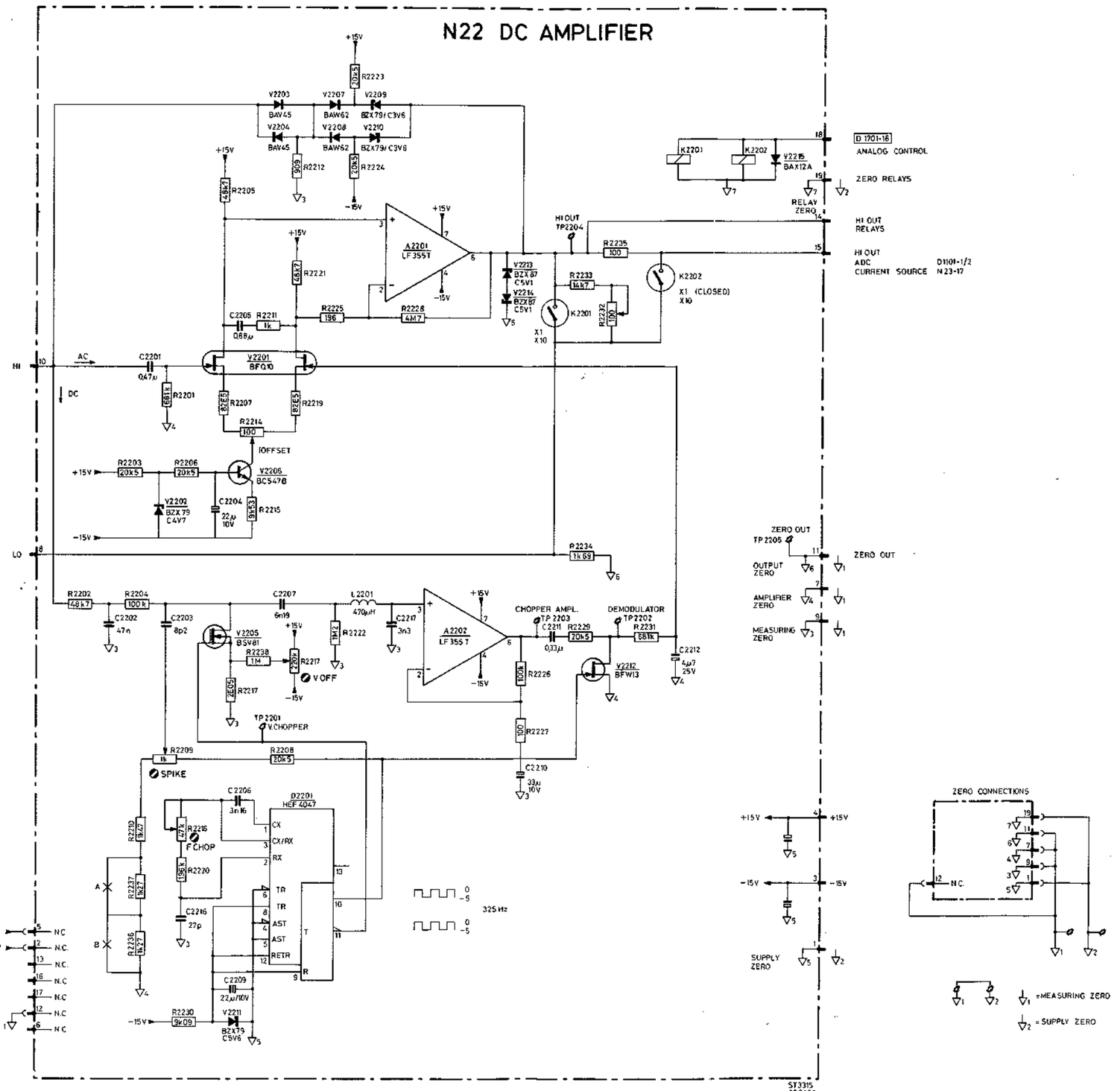


Fig. 7.19. N22 DC amplifier circuit diagram

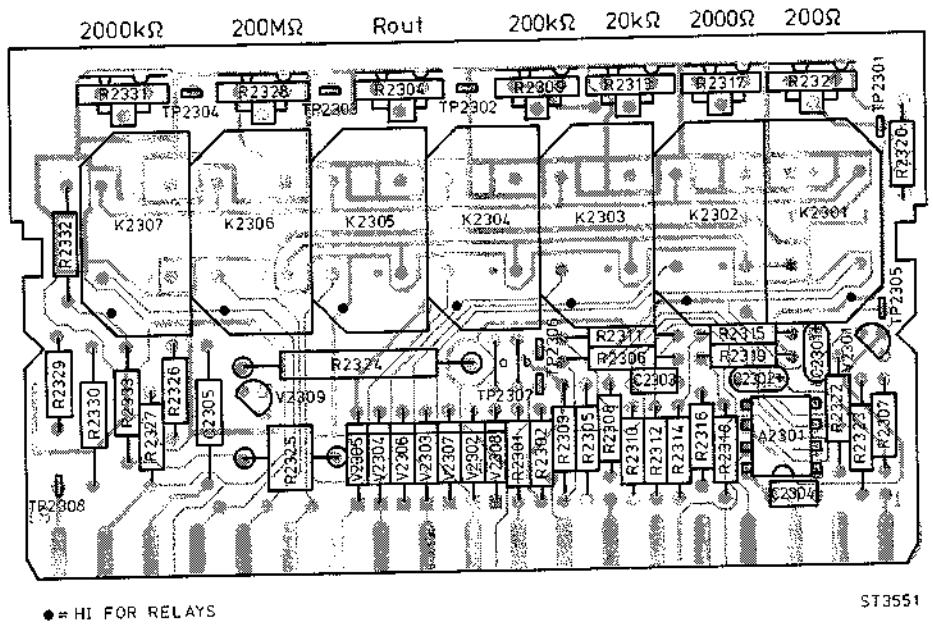


Fig. 7.20. N23 Current source component side lay out

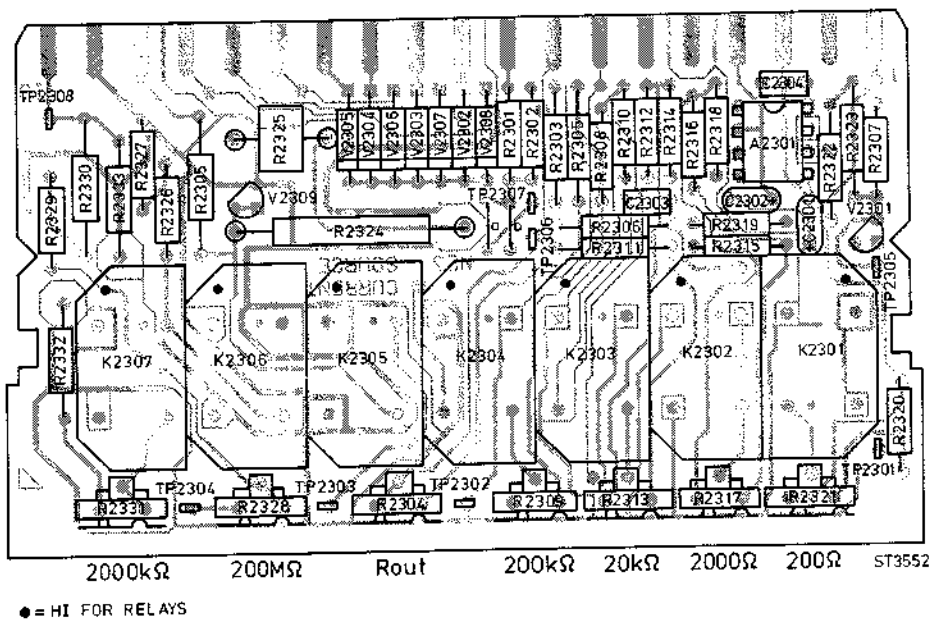


Fig. 7.21. N23 Current source conductor side lay out

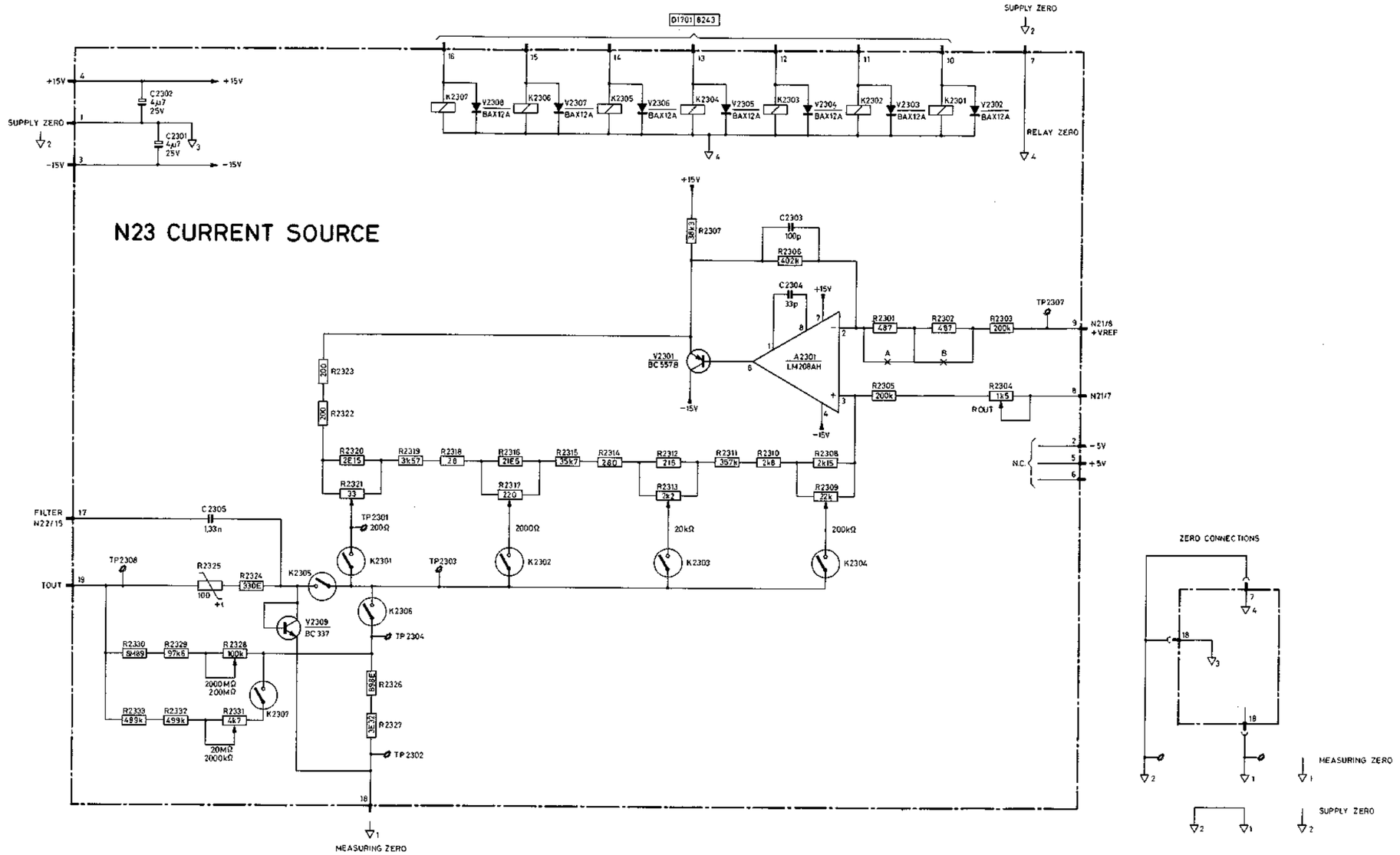


Fig. 7.22. N23 Current source circuit diagram

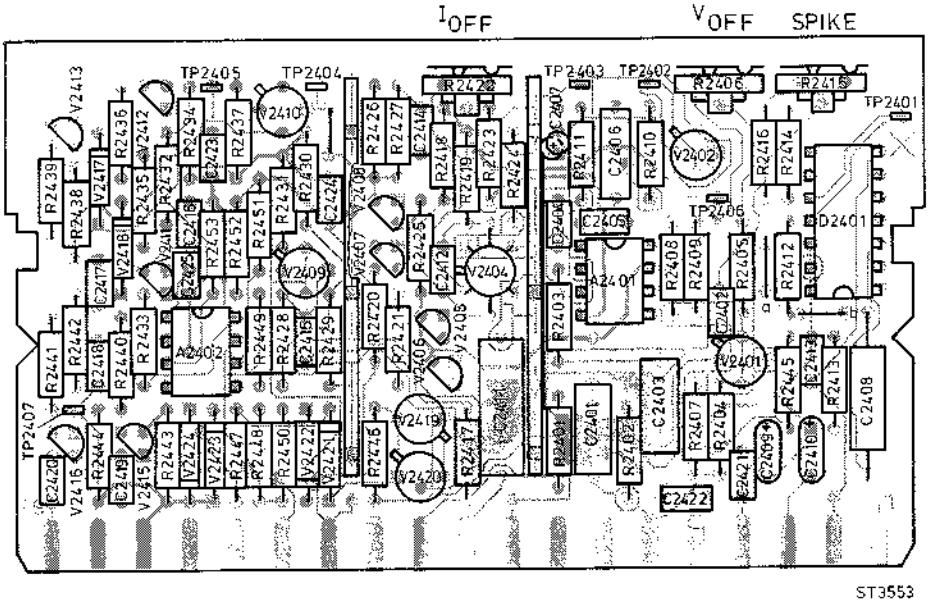


Fig. 7.23. N24 AC amplifier component side lay-out

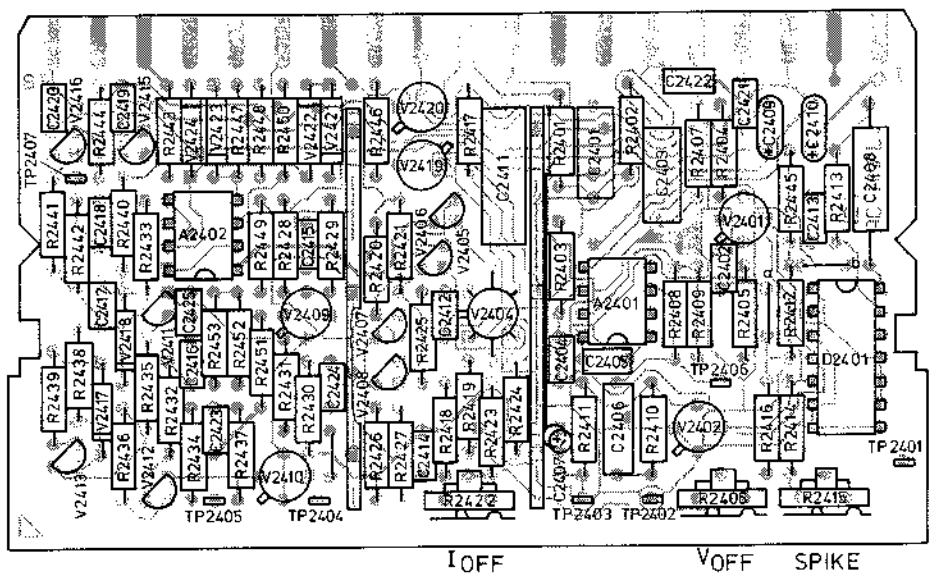


Fig. 7.24. N24 AC amplifier conductor side lay out

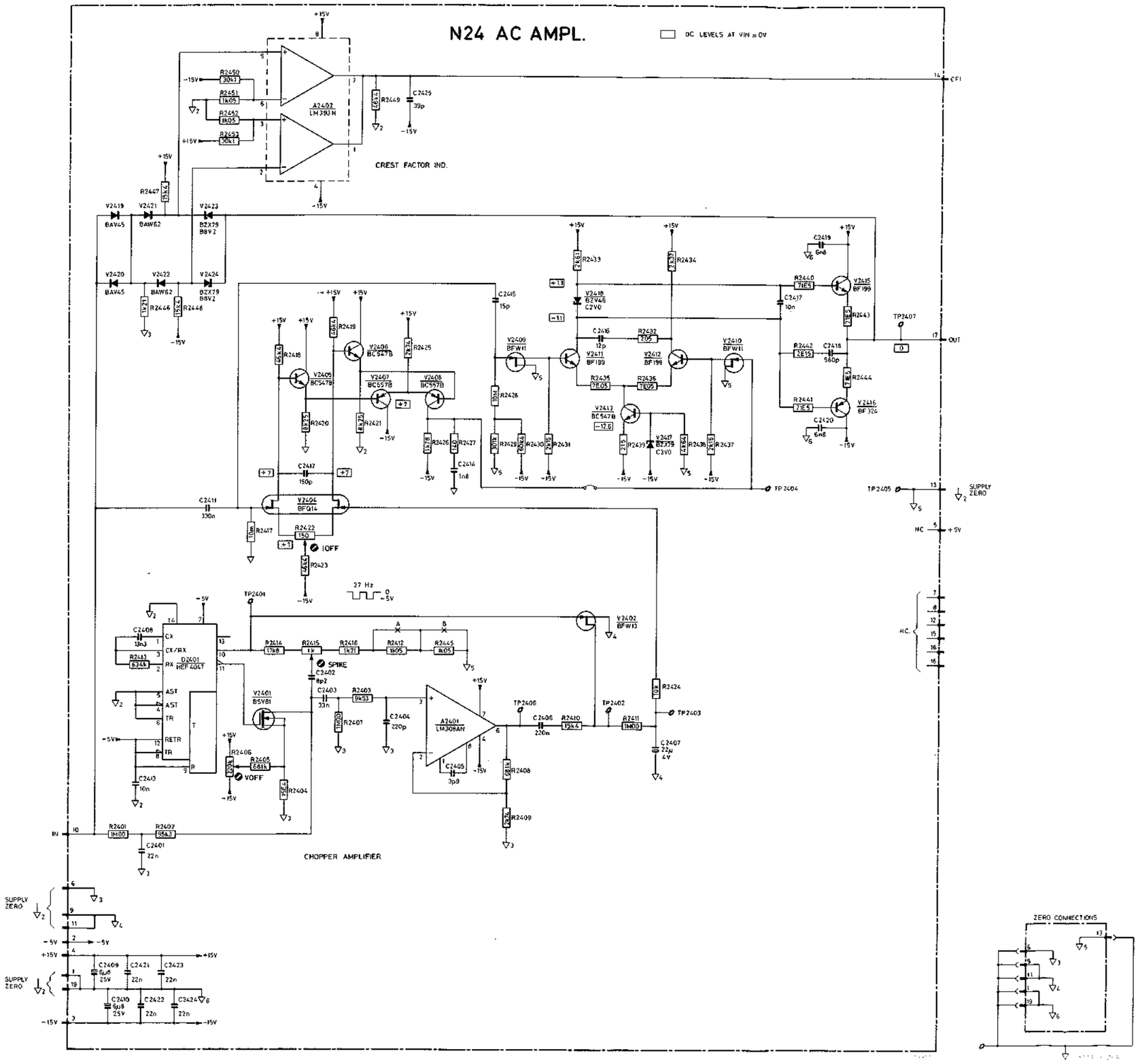


Fig. 7.25. N24 AC amplifier circuit diagram

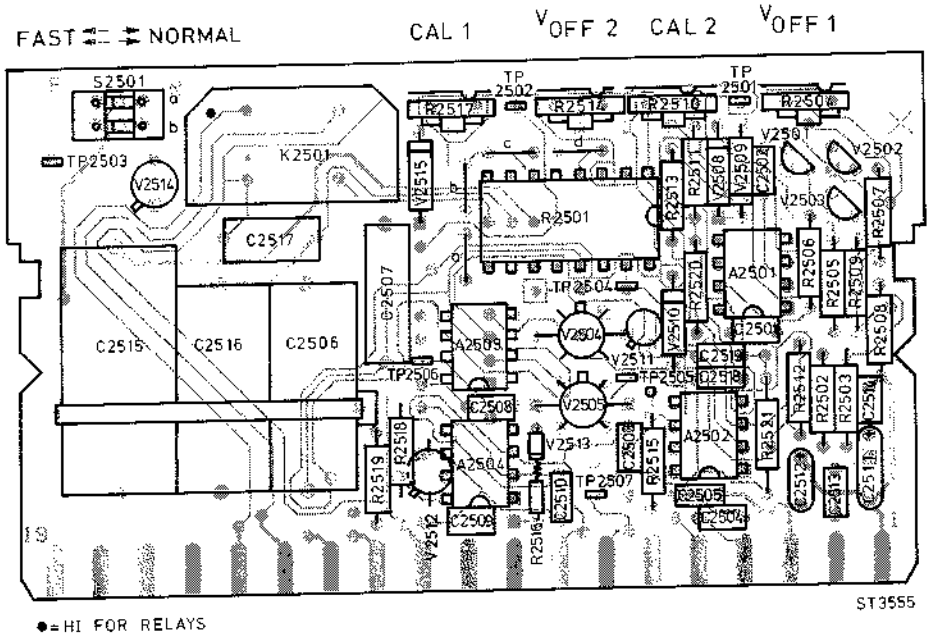


Fig. 7.26. N25 RMS convertor component side lay out

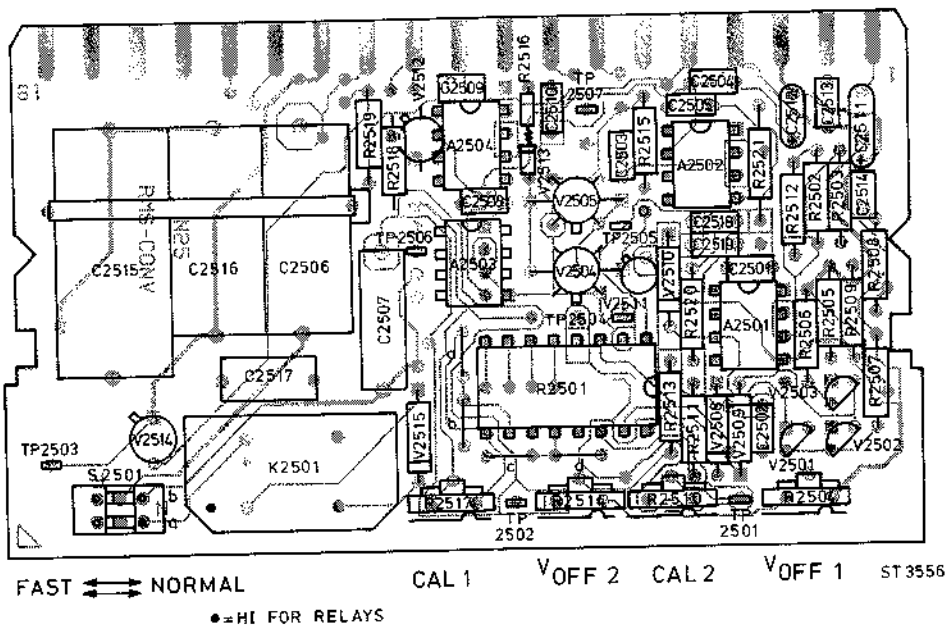


Fig. 7.27. N25 RMS convertor conductor side lay out

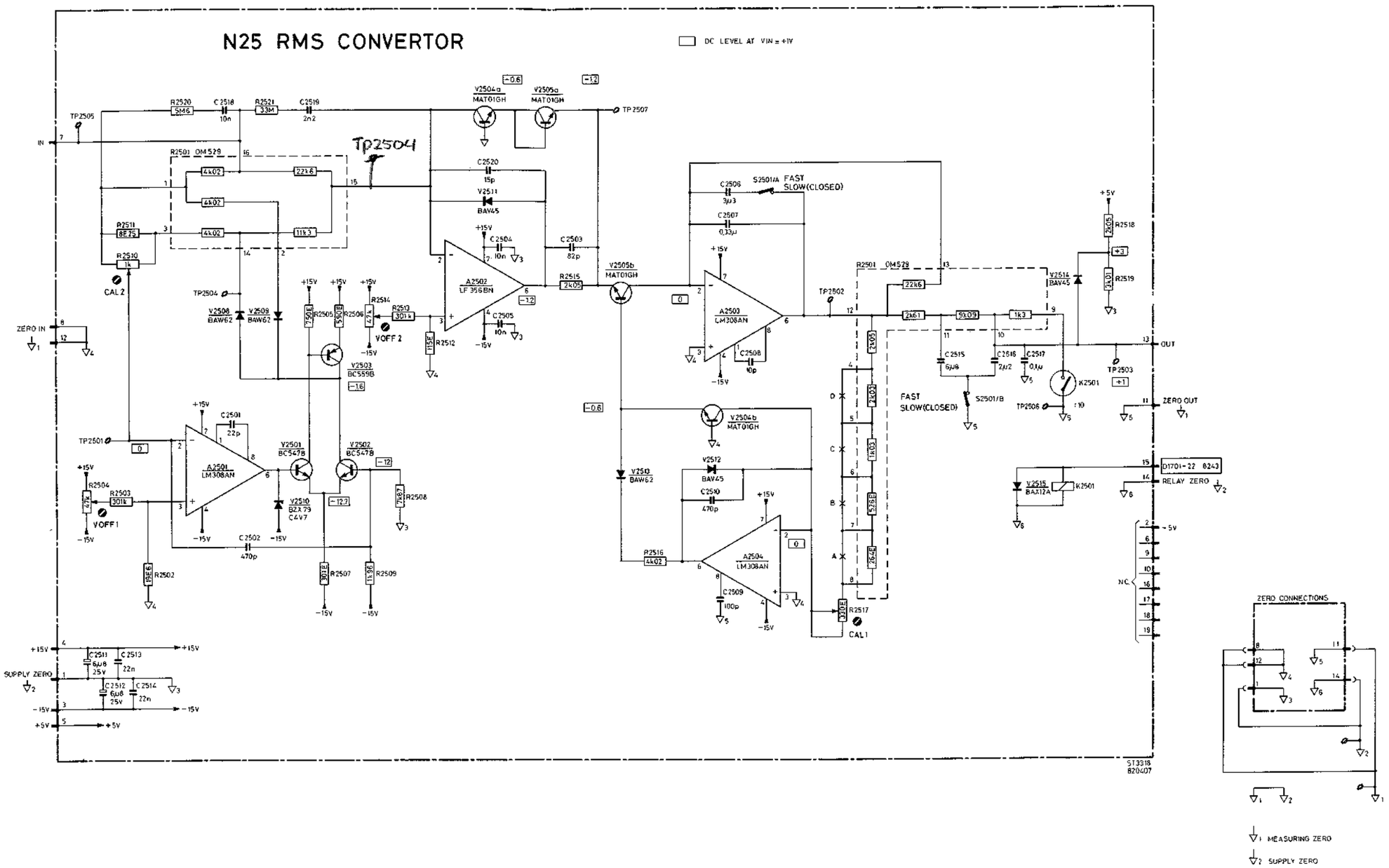


Fig. 7.28. N25 RMS convertor circuit diagram

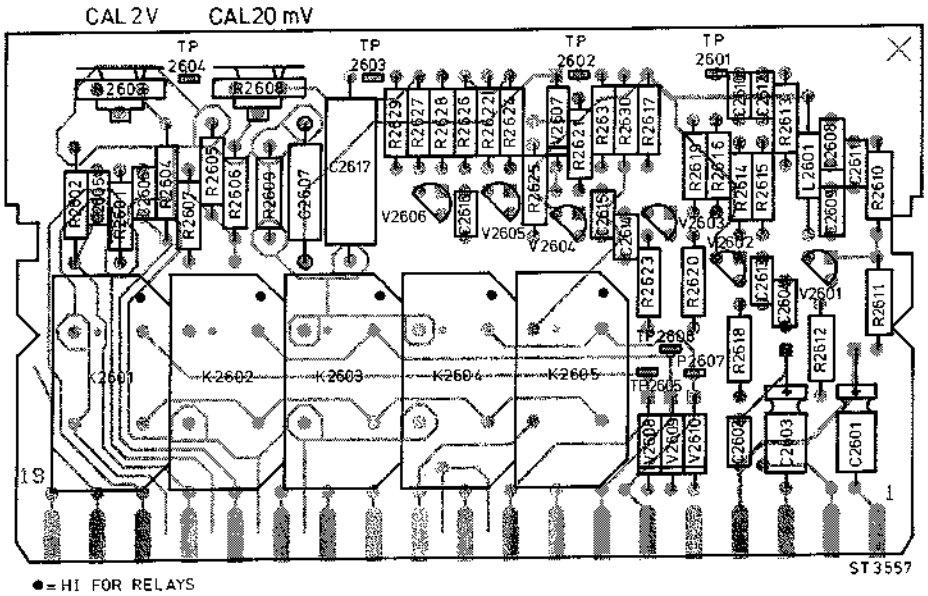


Fig. 7.29. N26 HF unit component side lay out

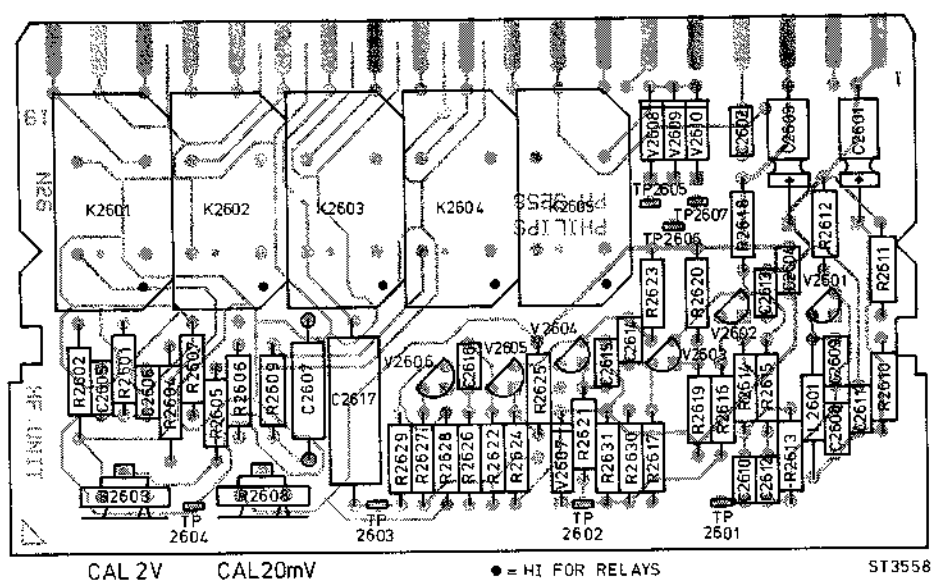
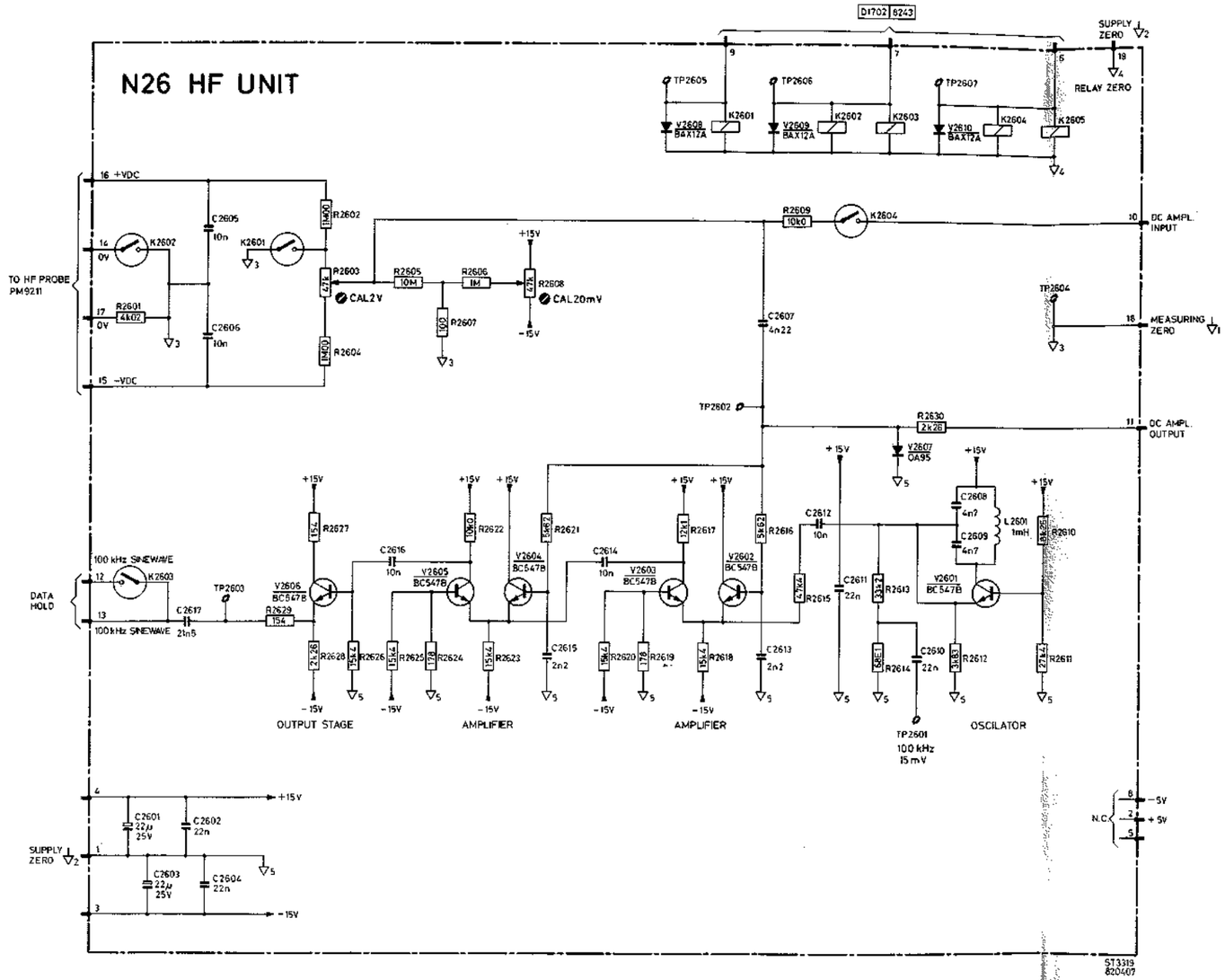


Fig. 7.30. N26 HF unit conductor side lay out



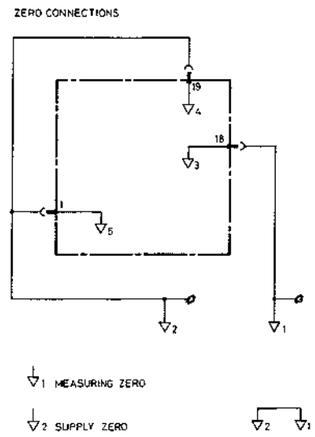


Fig. 7.31. N26 HF unit circuit diagram

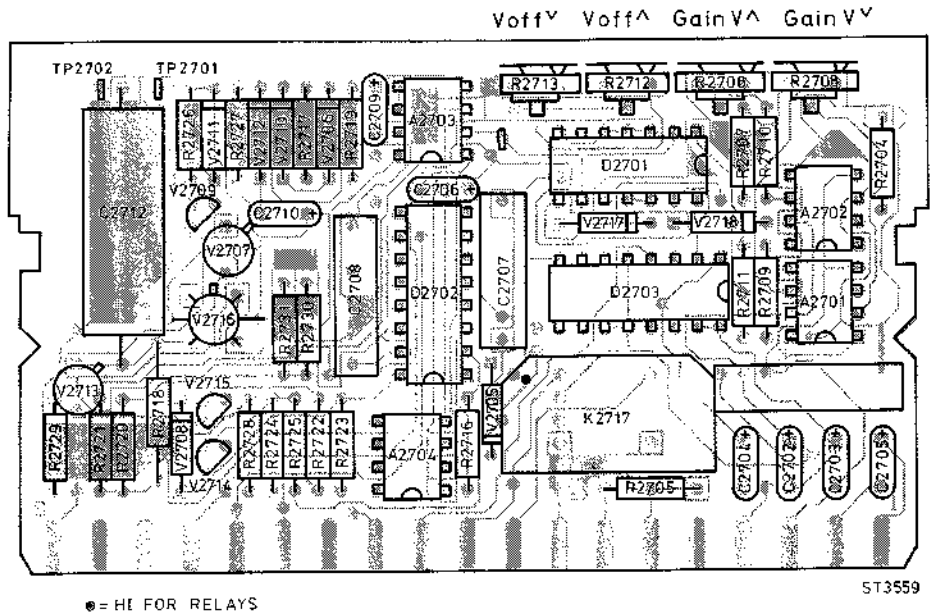


Fig. 7.32. N27 Peak detector component side lay out

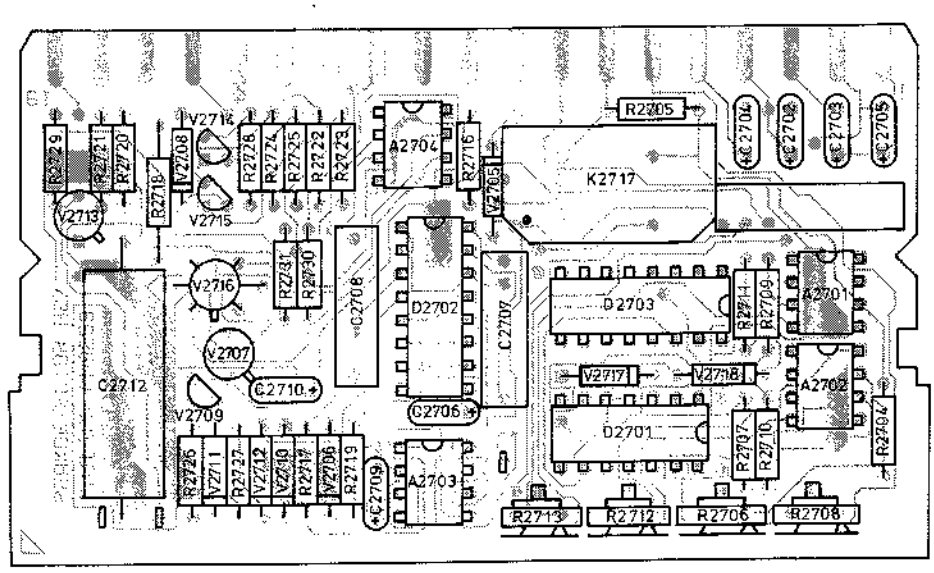
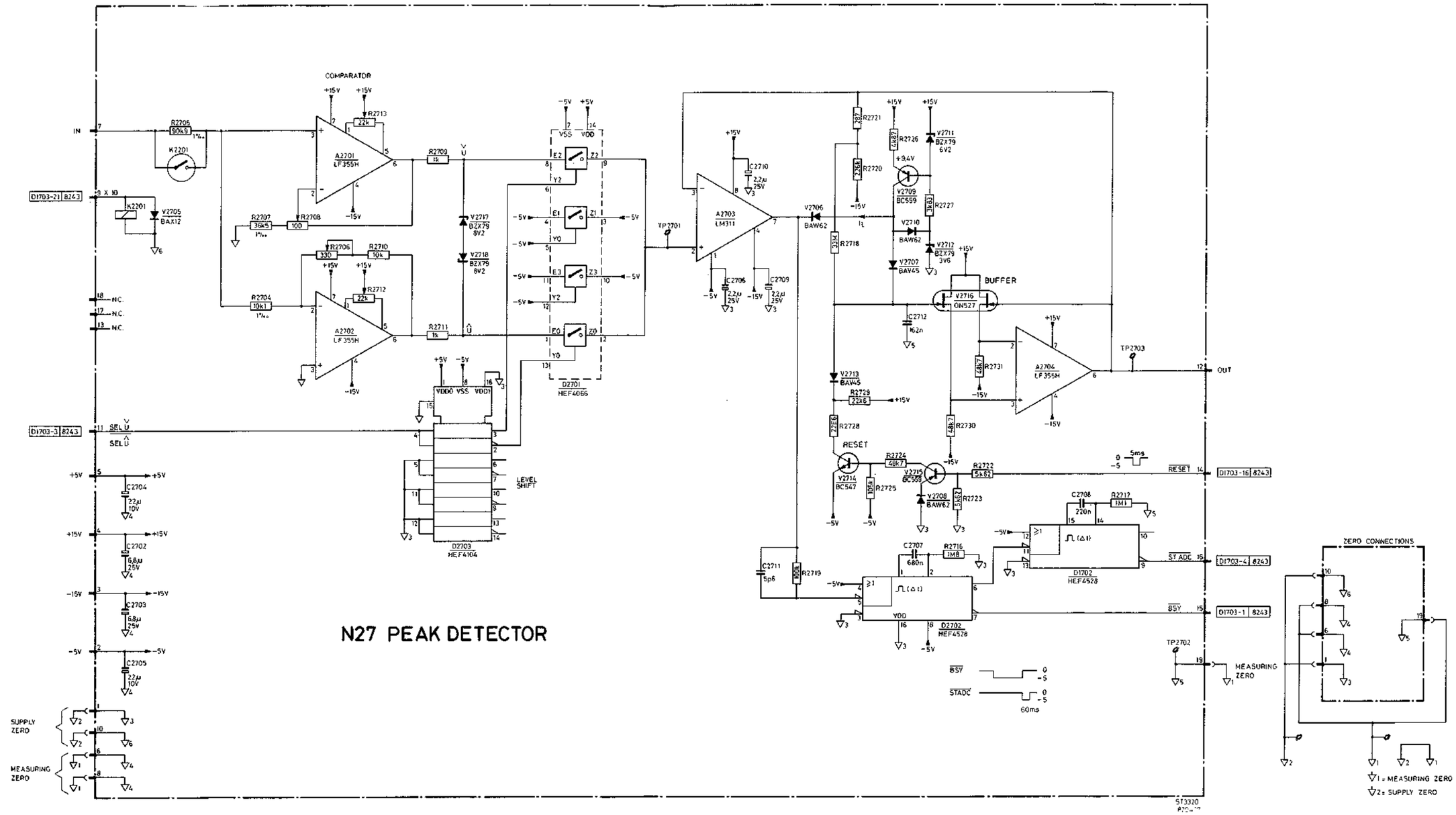


Fig. 7.33. N27 Peak detector conductor side lay out



N27 PEAK DETECTOR

Fig. 7.34. N27 Peak detector circuit diagram

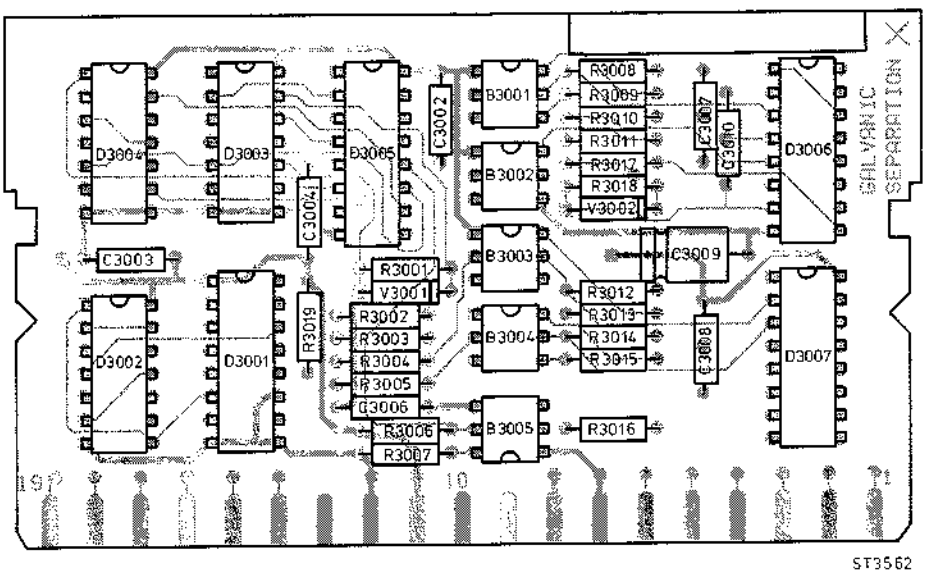


Fig. 7.35. N30 Galvanic separation component side lay out

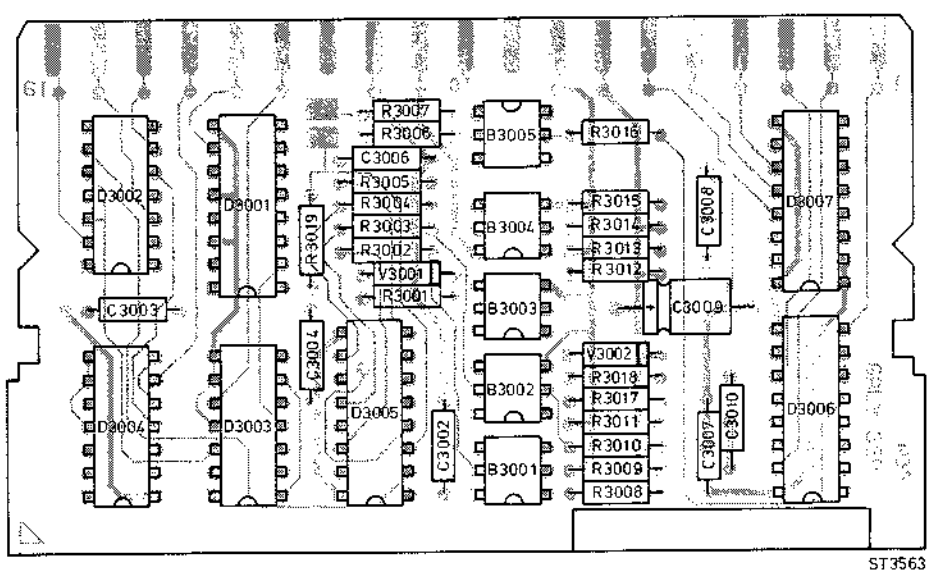


Fig. 7.36. N30 Galvanic separation conductor side lay out

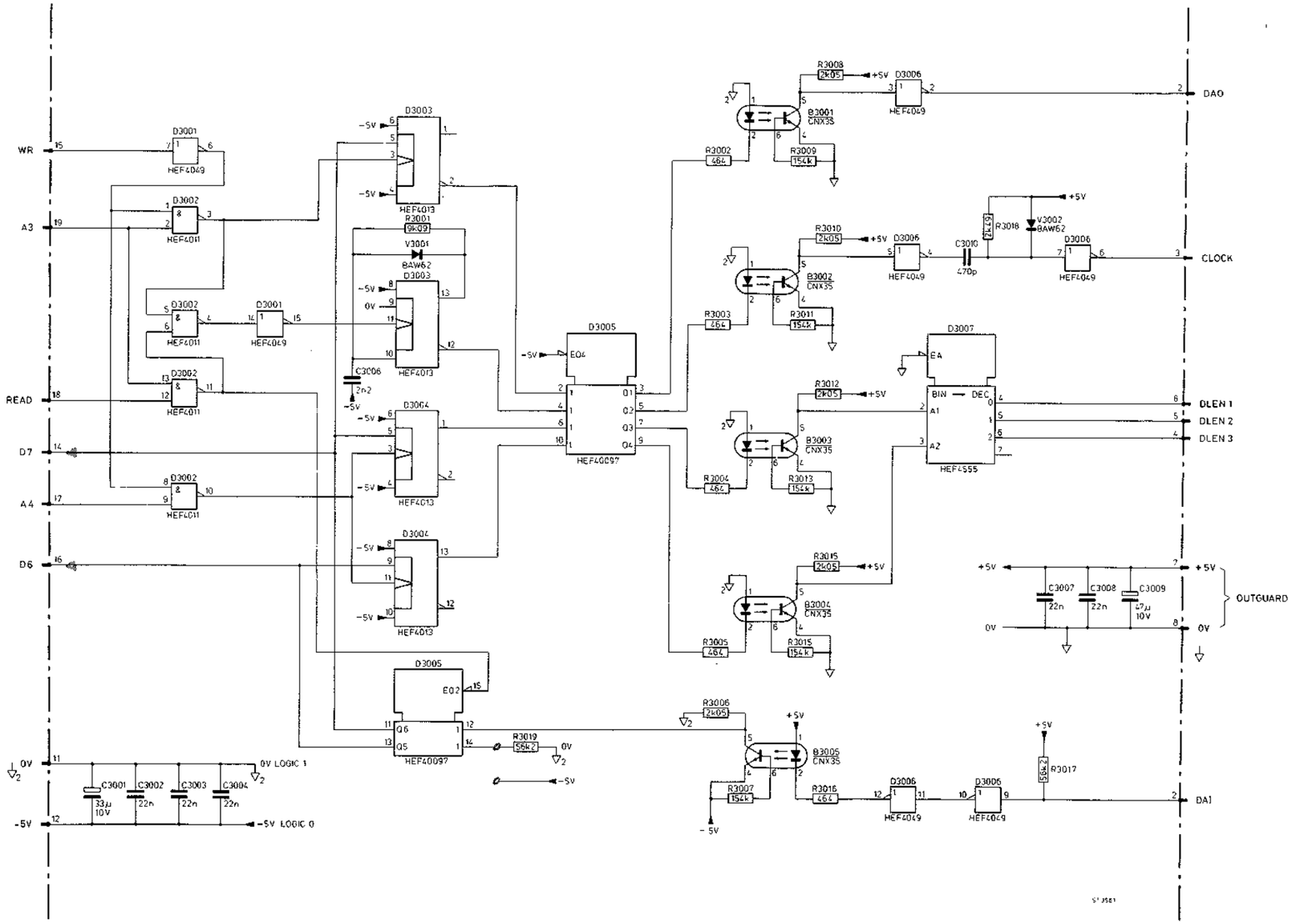


Fig. 7.37. N30 Galvanic separation circuit diagram

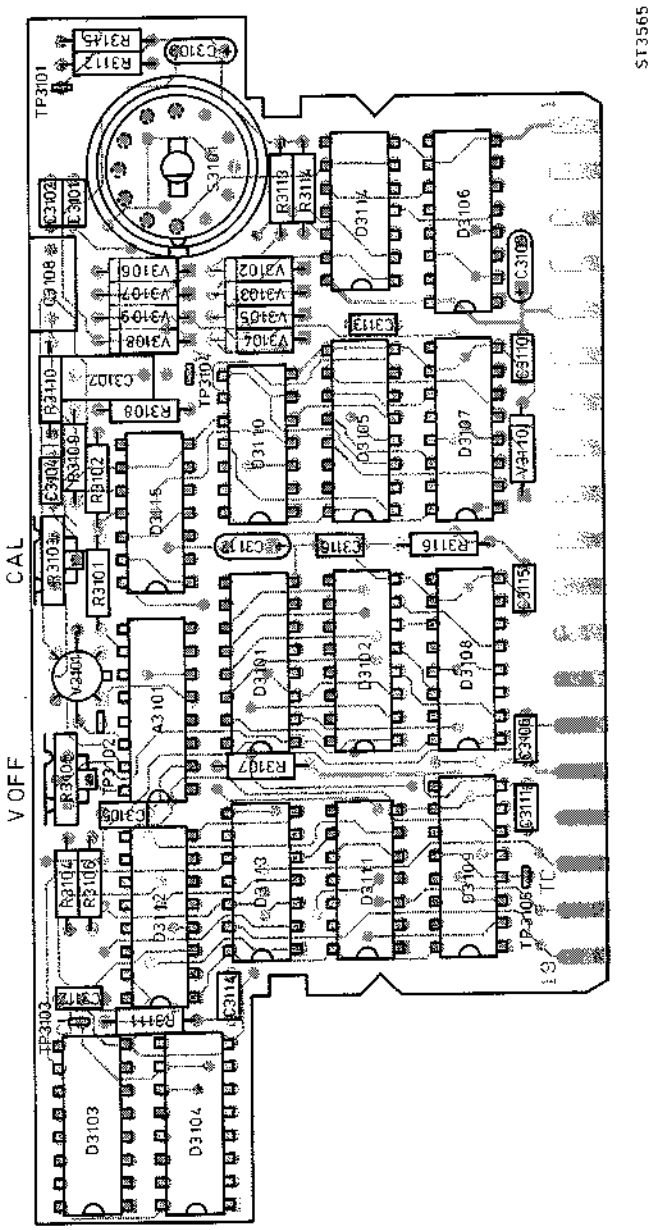


Fig. 7.38. N31 Analog output component side lay out

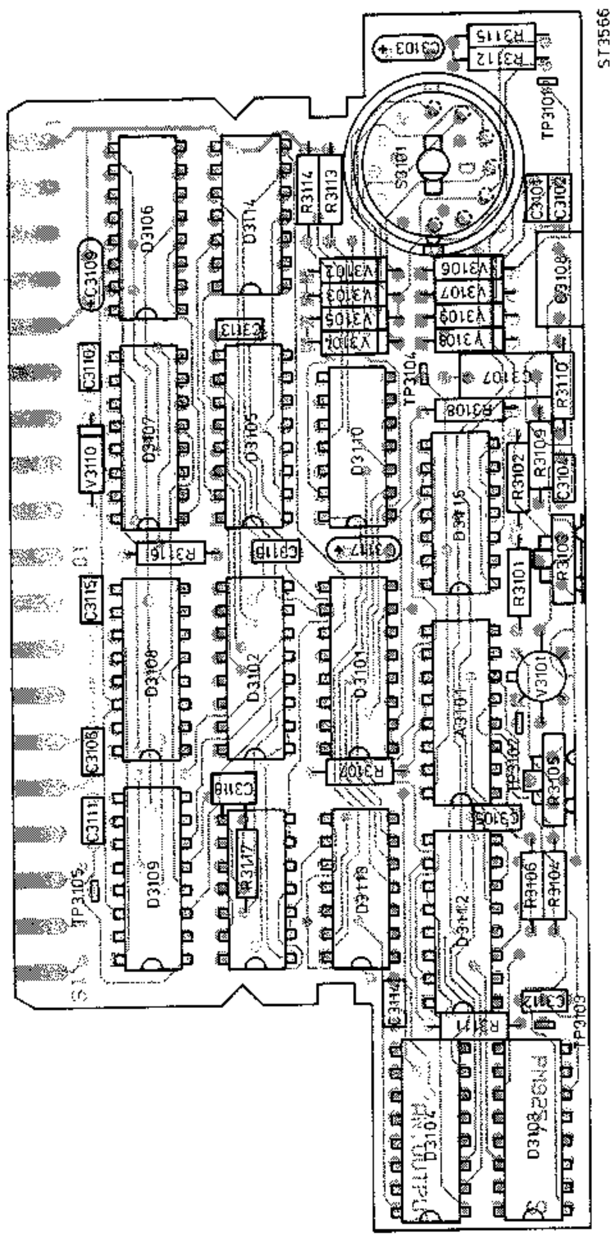


Fig. 7.39. N31 Analog output conductor side lay out

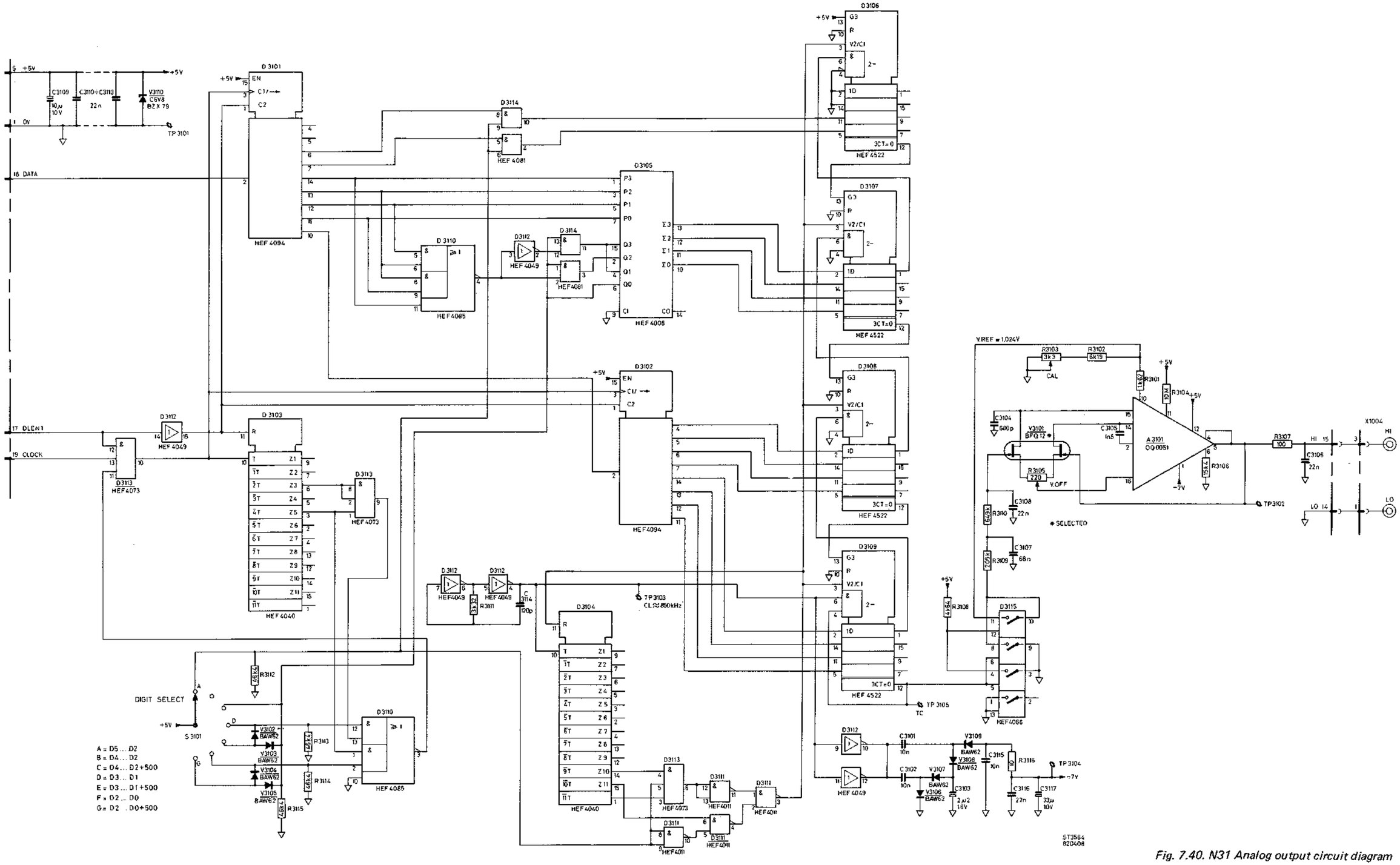


Fig. 7.40. N31 Analog output circuit diagram

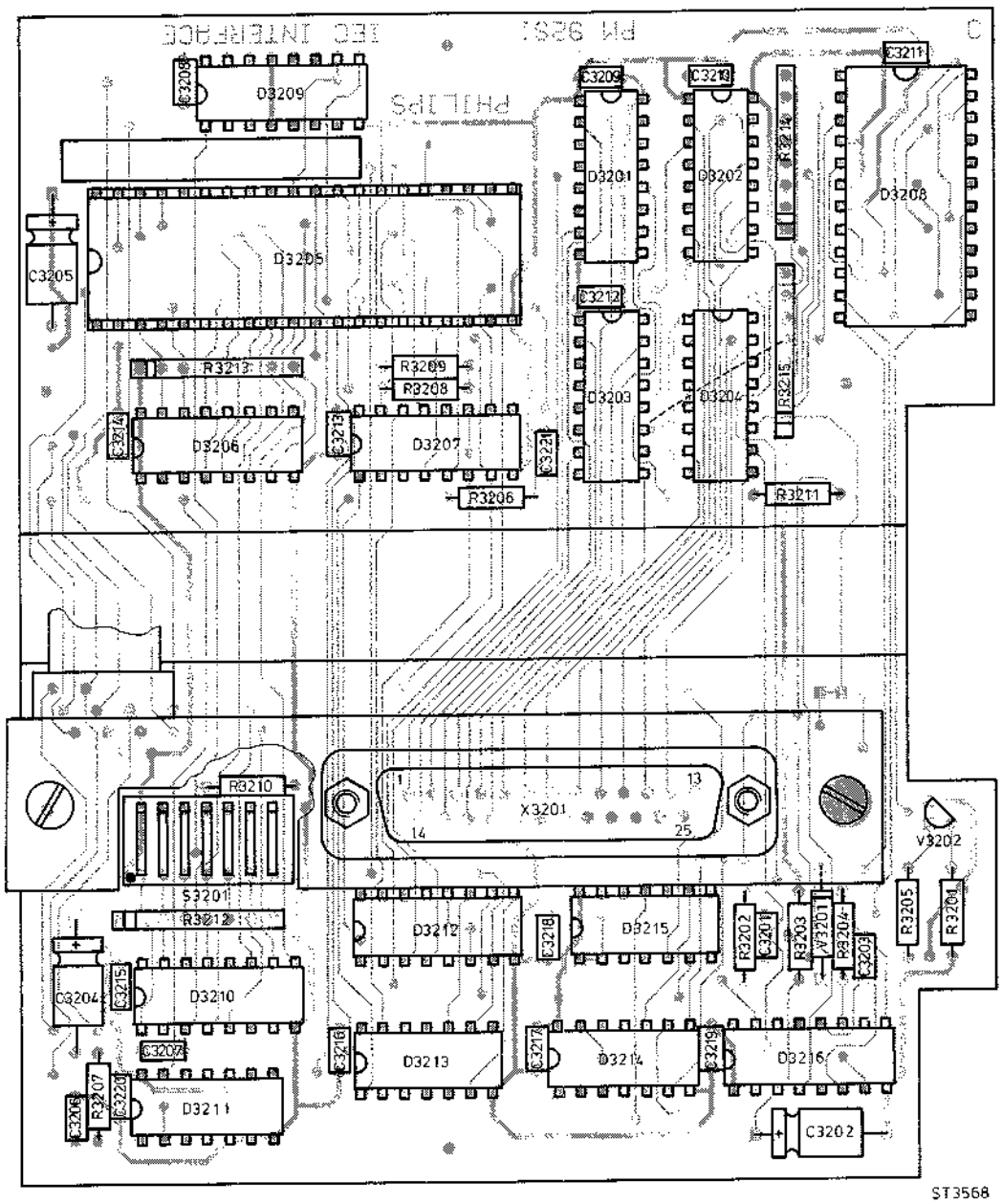


Fig. 7.41. N32 IEC bus component side lay out

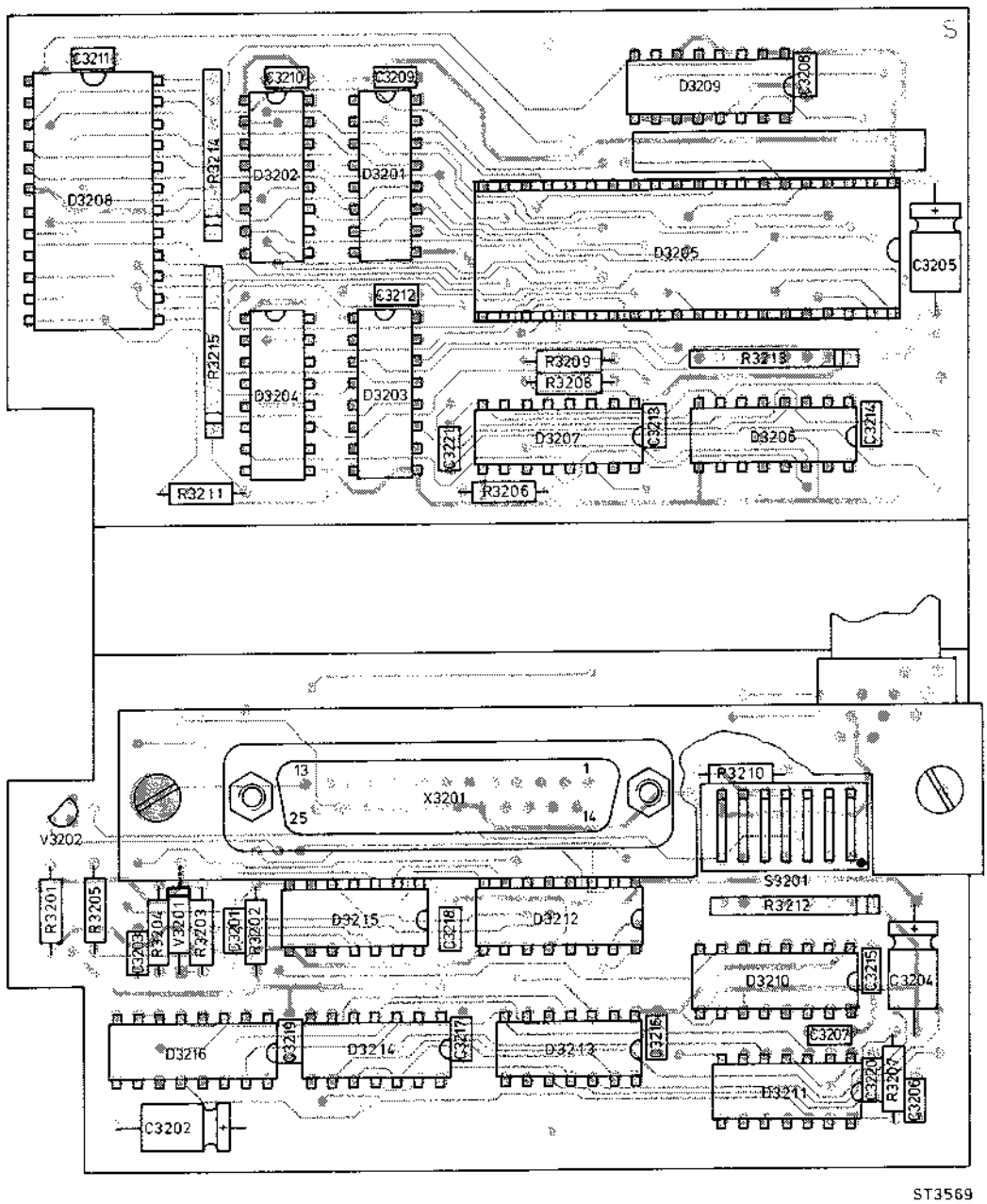


Fig. 7.42. N32 IEC bus conductor side lay out

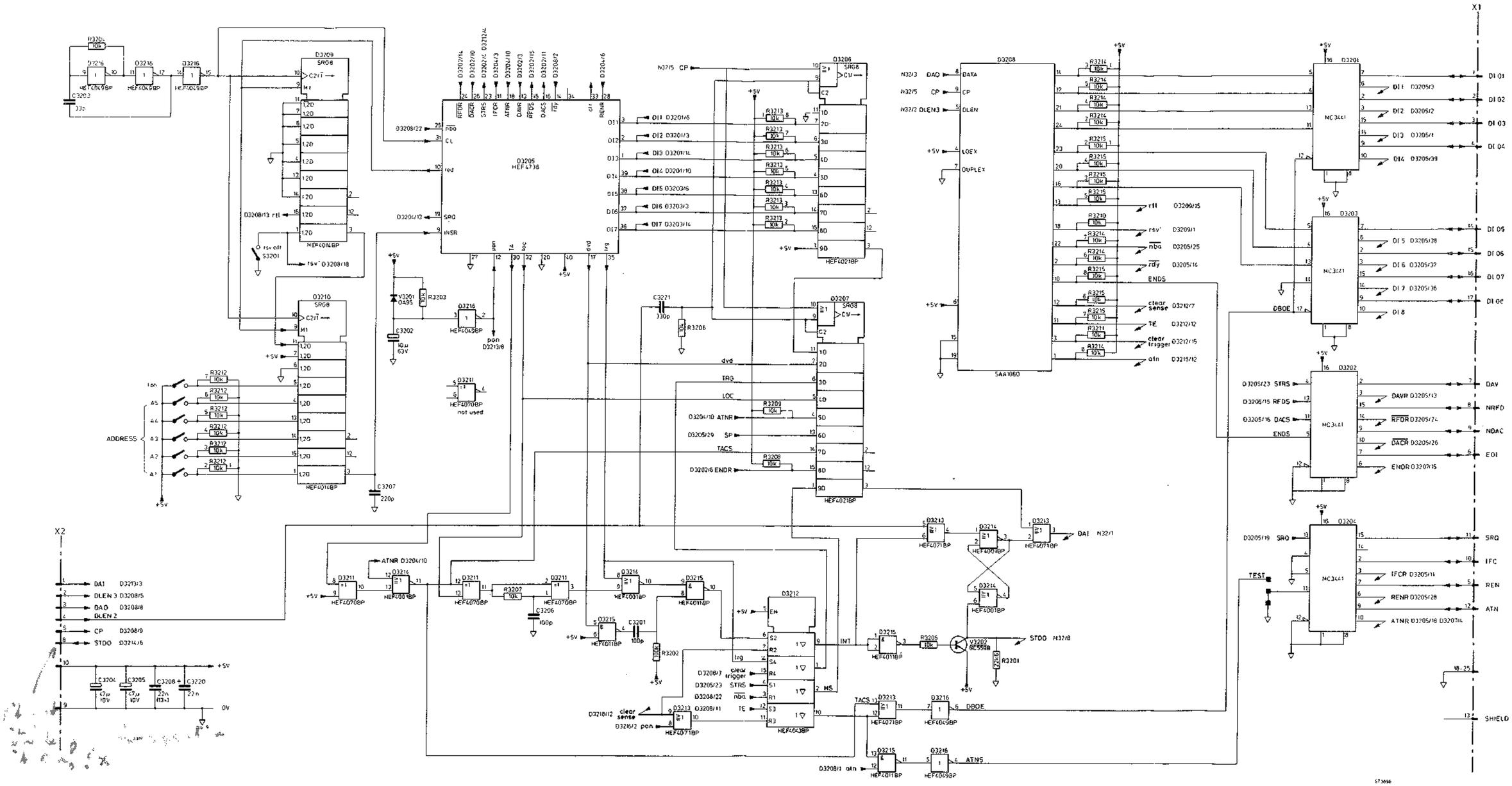


Fig. 7.43. N32 IEC bus circuit diagram

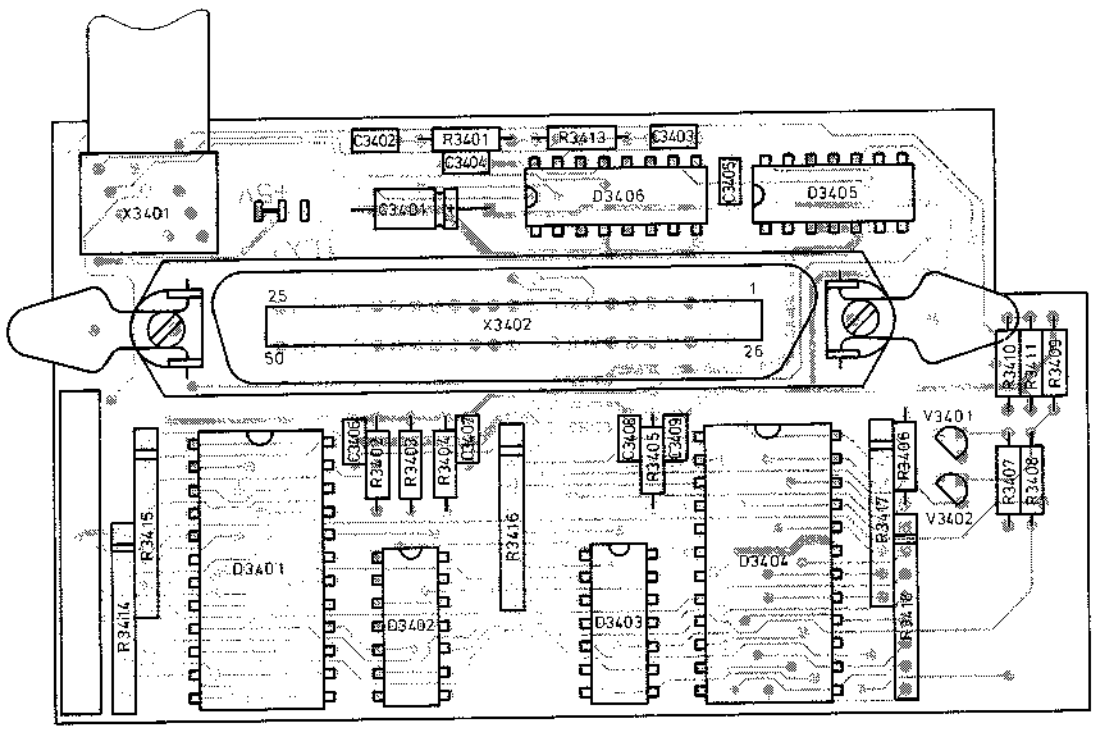


Fig. 7.44. N34 BCD output component side lay out

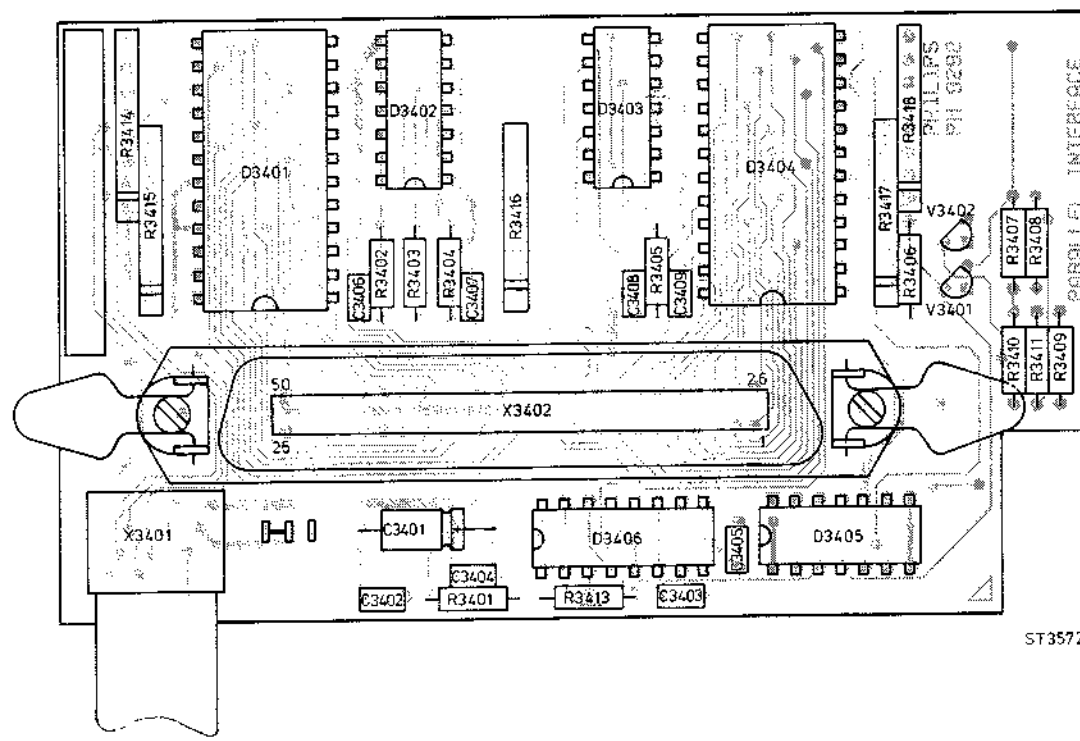


Fig. 7.45. N34 BCD output conductor side lay out

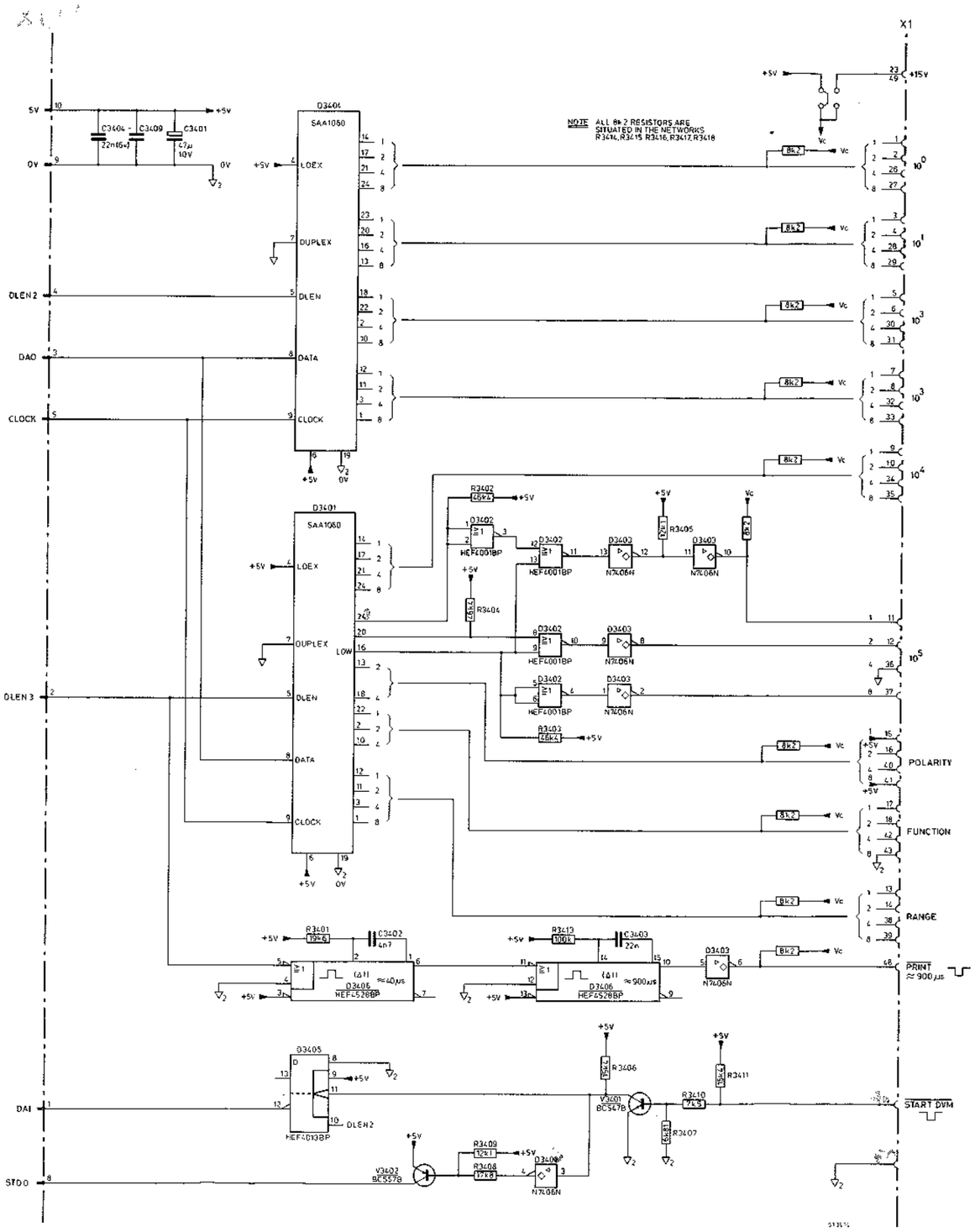


Fig. 7.46. N34 BCD output circuit diagram

8. CLOSSARY OF ABBREVIATIONS AND TERMS USED IN THE SERVICE MANUAL OF THE PM 2528

A	Address
ALE	Address latch enable
ATN	Attention
ATNR	Attention reset
AZ	Auto zero
BSY	Busy
CFI	Crest-factor indication
CHSUM	Check-sum
cl	Clear
clr	Clear
CMRR	Common-mode rejection ratio
COMP	Comparator
CP	Clock-pulse
CPC	Clock-pulse for counter
CS	Chip select
CO5	Carry output 5 (HEF4737)
C20000	Carry 20000
DACR	Data accepted received
DAO	Data out
DAI	Data in
DAVR	Data valid reset
DACS	Data accepted set
DAV	Data valid
DB	Databus
DBZ	Dead band zero
DC out	DC voltage out
DC in	DC voltage in
dcd	Don't change data
DH	Data hold
DI	Data in
DLEN	Display latch enable
DN−	Down ramp at −polarity of the display
DN+	Down ramp at +polarity of the display
DP	Decimal point
dvd	Data valid device
E	Enable
ECP	Enable clock-pulse
EC20	Enabled carry 20000
ENI	Enable interrupt
ENC20	Enable carry 20000
ENDR	End received
EOI	End or identify
ES	External supply
EXT START	External start
FCHOP	Chopper frequency

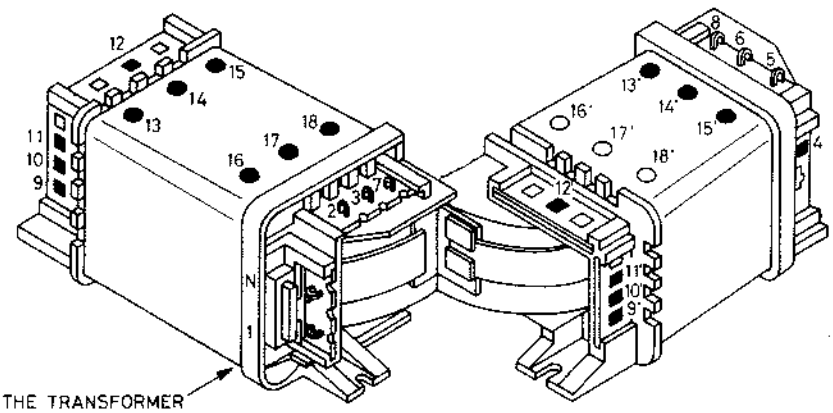
HF	High frequency
HI	High
HS	Handshake
HSM	High speed mode
IFC	Interface clear
IFCR	Interface clear reset
INSR	Input shift register
INT	Interrupt
INTO	Interrupt from output
INTK	Interrupt from keyboard
IOFF	I (current) offset
K	Relay, relay contact
LO	Low
loc	Local
MR	Master reset
N . .	Printed-circuit board
nba	New byte available
NC	Not connected
NDAC	Not data accepted
NRFD	Not ready for data
O.	BCD output
P	I/O port of μP
PD	Power down
POL	Polarity
pon	Power on
PROG	Program pulse, output strobe for 8243
PSEN	Program store enable
PS1/2	Program store keyboard
RC	Reset counter
red	Ready for reset shift cycle
REN	Remote enable
RENR	Remote enable reset
RD	Read or Ramp down N20
rdy	Ready
RETR	Retrigger
RFDR	Ready for data reset
RFDS	Ready for data set
RQS	Requeted service state
rsv	Request for service
SA, SB, SC	Digit select inputs
SAZ	Set auto zero
SCFI	Set crest factor indication
SCP	Set clock-pulse
SDH	Set data hold
SEL V	Select V
SP	Serial poll
SRQ	Service request
SRUP	Set ramp up
STADC	Start ADC
STD	Start down ramp

STRS	Source transfer state
STDO	Start data out
SUP	Set ramp up
T0	Clock output μP
T1	Input event counter μP
TA	Talker active
TACS	Talker active state
TE	Talker enable
ton	Talk only
trg	Trigger
TR	Trigger
Vcc	Positive supply voltage
Vdd	Zero supply voltage
Vss	Negative supply voltage
Vref	Reference voltage
Voff	Offset voltage
WDOG	Watchdog
WHDOG	Watchdog
WR	Output strobe for bus write
XC20	Carry 20000
XTAL	Crystal
y1/y6	Inputs HEF4051
Z	Output HEF4051

CONTENTS

9. COMPONENT DATA

9.1. MAINSTRANSFORMER T1



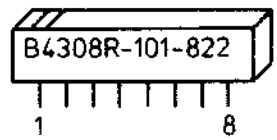
THE THERMAL FUSE OF THE TRANSFORMER IS SITUATED AT THE BOTTOM (BETWEEN N AND 1) IF THE BOTTOM OF THE PM2528 IS REMOVED, THE THERMAL FUSE ORDERING NUMBER 5322 252 20088 IS ACCESSIBLE FOR REPLACEMENT

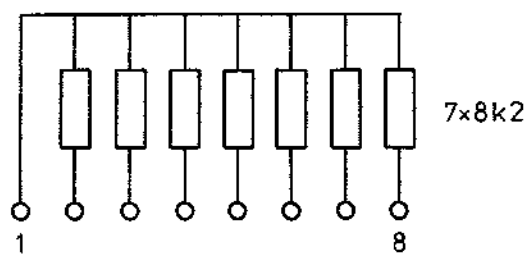
WARNING: NEVER SHORT CIRCUIT THE THERMAL FUSE.

WINDING	V UNLOADED	R IN Ω ± 10 %
1 - 2	110	37
2 - 3	10	3
4 - 5	10	3
5 - 6	110	37
9 - 10	8,3	1
13 - 14	7,7	0,39
14 - 15	7,7	0,39
16 - 17	17,7	5,5
17 - 18	17,7	5,5

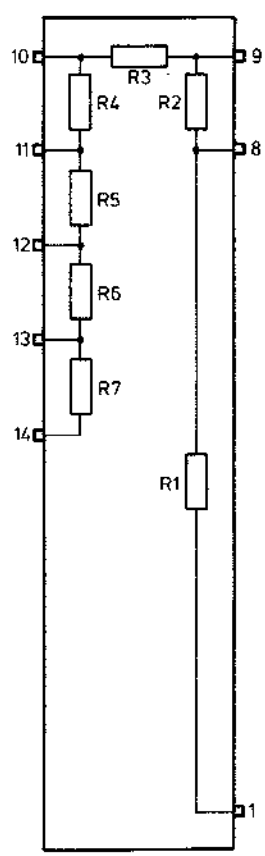
9.2. RESISTOR NETWORKS

9.2.1. R3414,15,16,17,18





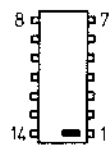
9.2.2. OM503 R1201

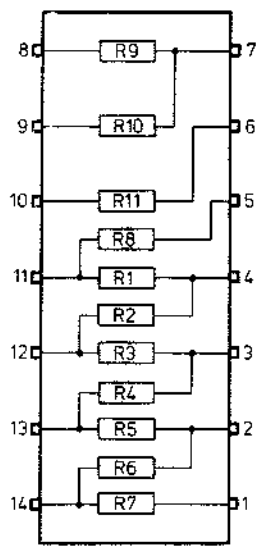


	VALUE	TOL
R1	8998k	0,8%
R2	4k668	2%
R3	898k	0,95%
R4	518E4	2%
R5	89k78	0,95%
R6	52k32	2%
R7	9k98	0,95%

9.2.3. OM528

R2119

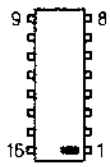


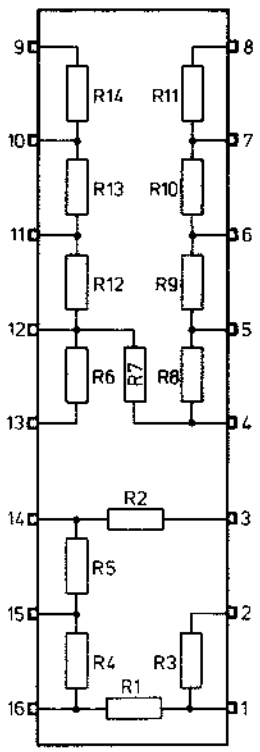


	VALUE	TOL
R1	15k377	0,05%
R2	15k400	2%
R3	29k539	0,1%
R4	2k538	0,1%
R5	2k600	0,5%
R6	1k300	1%
R7	650E	2%
R8	21E5	2%
R9	1k	0,2%
R10	11k800	2%
R11	11k800	2%

9.2.4. OM529

R2501



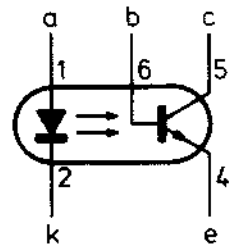


	VALUE	TOL
R1	4k023	1%
R2	4k023	0,2%
R3	4k023	2%
R4	22k600	2%
R5	11k300	1%
R6	22k600	0,5%
R7	20k570	1%
R8	2k034	1%
R9	1k037	1%
R10	527E	2%
R11	264E	2%
R12	2k609	2%
R13	9k090	5%
R14	1k299	0,05%

9.3 SEMI CONDUCTORS

9.3.1. Opto couplers B1801/B3001, 02, 03, 04, 05

CNY 57
CNX 35



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Diode

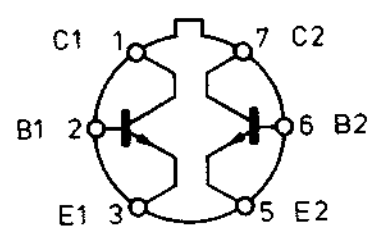
Continuous reverse voltage	V_R	max.	3 V
Forward current			
d.c.	I_F	max.	100 mA
(peak value); t_p = 10 μs; δ = 0,1	I_{FM}	max.	1000 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150 mW
Operating junction temperature	T_j	max.	125 °C

Transistor

Collector-emitter voltage (open base)	V_{CEO}	max.	30 V
Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Emitter-collector voltage (open base)	V_{ECO}	max.	7 V

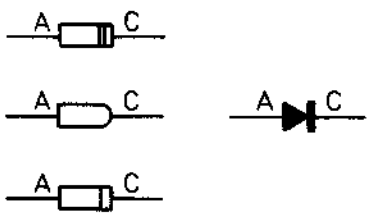
9.3.2. Dual transistor V2505 Mat-01

	MAT -01 AH, GH	MAT -01 H, FH
Collector-Base Voltage (BV_{CBO})	45V	60V
Collector-Emitter Voltage (BV_{CEO})	45V	60V
Collector-Collector Voltage (BV_{CC})	45V	60V
Emitter-Emitter Voltage (BV_{EE})	45V	60V
Emitter-Base Voltage (BV_{EBO})(note 1)	5V	5V
Collector Current (I_C)	25mA	25mA
Emitter Current (I_E)	25mA	25mA



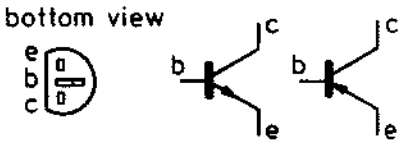
9.3.3. General

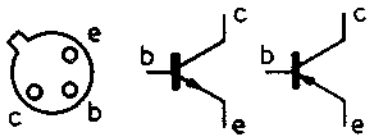
Diodes



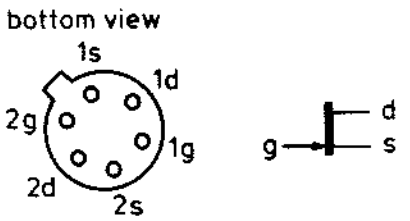
Zener diodes

Transistors

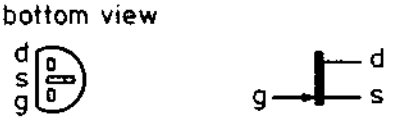




Dual fets

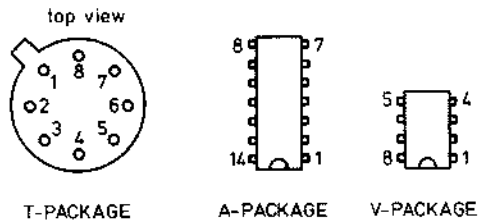


Fets



9.4. ANALOG INTEGRATED CIRCUITS

9.4.1. General



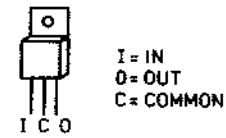
9.4.2. Voltage regulators

7800 SERIES A1001, 1902

THREE-TERMINAL POSITIVE VOLTAGE REGULATOR

FEATURES

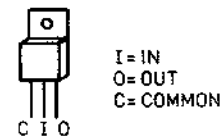
- Output current in excess of 1 amp
- No external components
- Internal thermal overload protection
- Internal short circuit current limiting
- Output transistor safe-area compensation
- Available in the TO-220 and the TO-3 package
- Output voltages of 5, 6, 8, 12, 15, 18, and 24 volts



7900 SERIES A1002, 1003

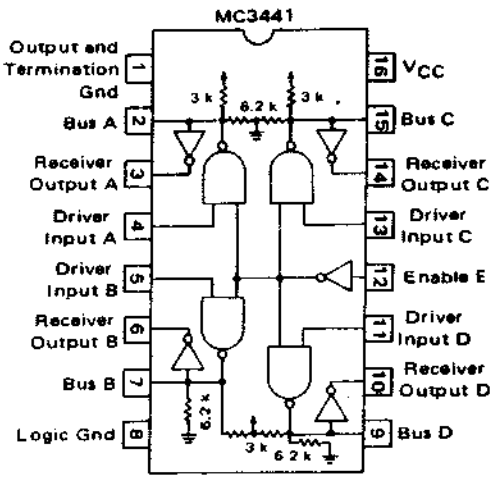
THREE-TERMINAL NEGATIVE VOLTAGE REGULATOR

- Output current in excess of 1 amp
- No external components
- Internal thermal overload protection
- Internal short circuit current limiting
- Output transistor safe-area compensation
- Available in the TO-220 and the TO-3 packages
- Output voltages of -5, -5.2, -6, -8, -12, -15, -18 and -24 volts



9.5. DIGITAL INTEGRATED CIRCUITS

9.5.1. MC3441 D3201, 02, 03, 04



QUAD GENERAL PURPOSE INTERFACE BUS TRANSCEIVERS

The MC3440, MC3441, MC3443 are quad bus transceivers intended for usage in instruments and programmable calculators equipped for interconnection into complete measurement systems. These transceivers allow the bidirectional flow of digital data and commands between the various instruments. Each of the transceiver versions provides four open-collector drivers and four receivers featuring input hysteresis.

The MC3440 version consists of three drivers controlled by a common Enable input and a single driver without an Enable input. Termination resistors are provided in the device.

The MC3441 differs in that all four drivers are controlled by the Common Enable Input. Again, the termination resistors are provided.

The MC3443 is identical to the MC3441 except that the termination resistors have been omitted. As such it is pin compatible, and functionally equivalent to the SN75138. It does offer the advantage of receiver input hysteresis.

- Receiver Input Hysteresis Provides Excellent Noise Rejection.
- Open-Collector Driver Outputs Permit Wire-OR Connection.
- Tailored to Meet the Proposed Standards Set by the IEEE and IEC Committees on Instrument Interface.
- Termination Resistors Provided (except MC3443 version).
- Provides Electrical Compatibility with Hewlett Packard Interface Bus.

9.5.2. ULN 2003 D203 HIGH VOLTAGE/HIGH CURRENT DARLINGTON TRANSISTOR ARRAYS

DESCRIPTION

These high-voltage, high-current Darlington transistor arrays are comprised of seven silicon NPN Darlington pairs on a common monolithic substrate. All units feature open collector outputs and integral suppression diodes for inductive loads. Peak inrush currents to 600mA are allowable, making them ideal for driving tungsten filament lamps also.

The Type ULN-2003 has a series base resistor to each Darlington pair, and thus allows operation directly with TTL or CMOS operating at a supply voltage of 5V.

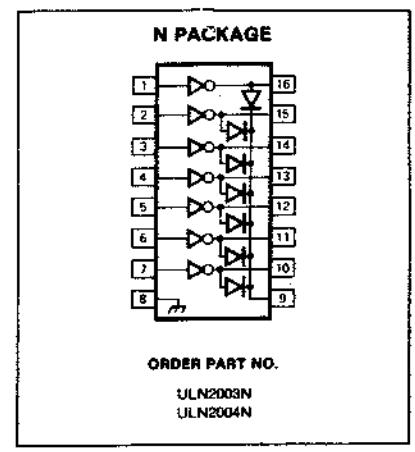
The Type ULN-2004 has an appropriate series input resistor to allow its operation directly from CMOS or PMOS outputs utilizing supply voltages of 6 to 15V. The required input current is below that of the Type ULN-2003 while the required input voltage is less than that required by the Type ULN-2002.

In all cases, the individual Darlington pair collector current rating is 500mA. However, outputs may be paralleled for higher load current capability. All devices are supplied in a 16-pin dual in-line plastic package.

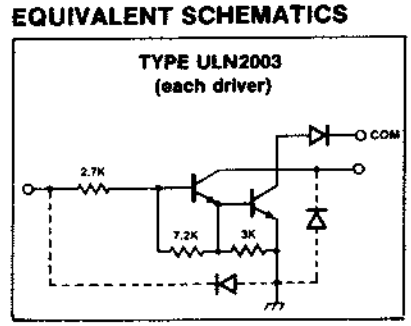
FEATURES

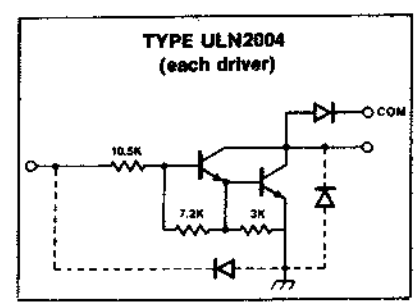
- **Peak inrush current 600mA**
- **Protected internally against inductive loads**
- **Open collector topology**
- **Compatible with most logic technologies**

PIN CONFIGURATION

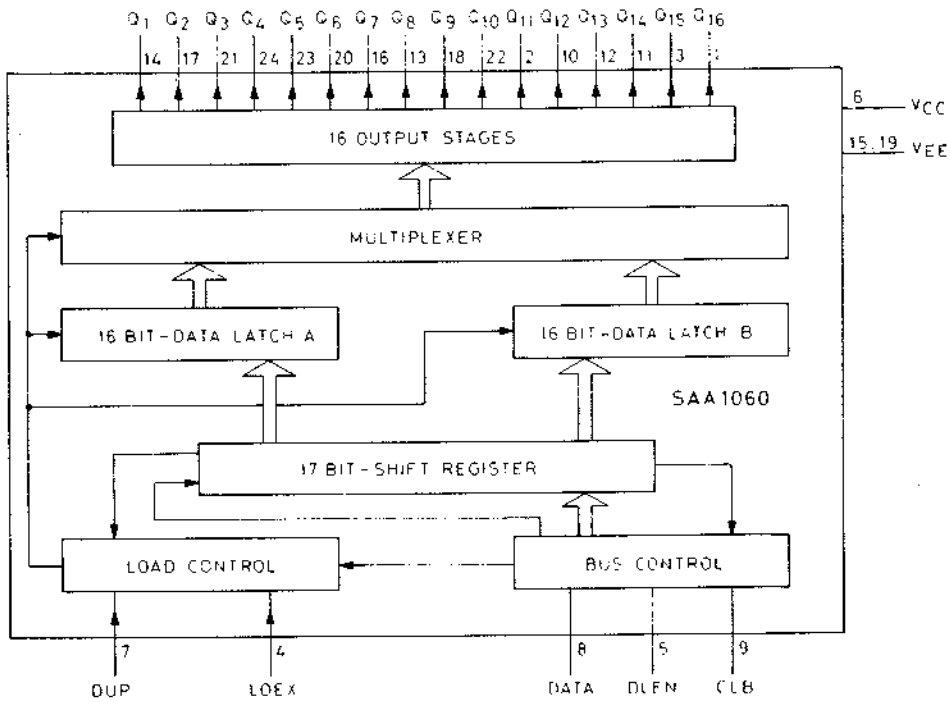


EQUIVALENT SCHEMATICS

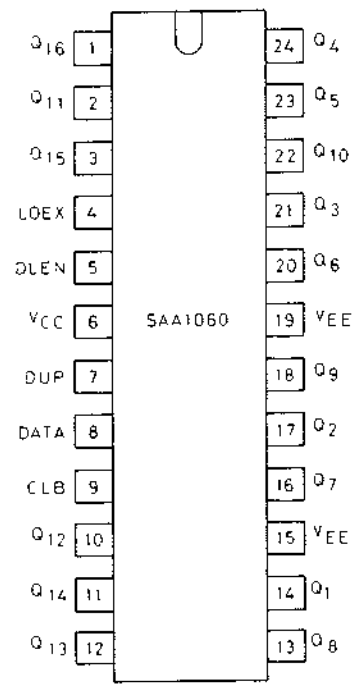




9.5.3. SAA 1060 Led display/Interface circuit D3401/D3402



Block diagram



GENERAL DESCRIPTION

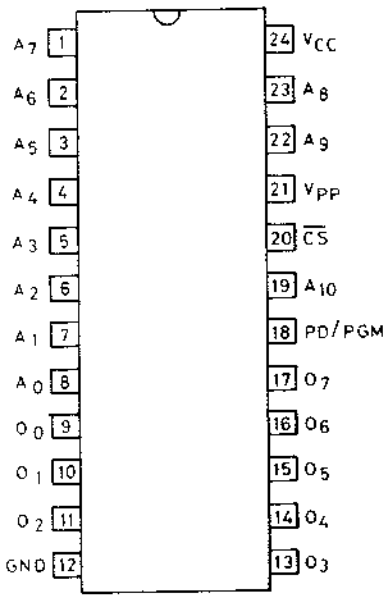
Data transmission is initiated by means of a burst of clock pulses (CLB), a data line enable signal (DLEN) and the data signal (DATA). The bus control circuit distinguishes between interference and valid data by checking word length (17 bits) and the leading zero. This allows different bus information to be supplied on the same bus lines for other circuits (e.g. SAA1056 with 16 bits).

The last bit (bit 17) of the data word contains the information which of the two internal latches will be loaded. The input LOEX determines if the latched data of the selected latches is presented directly to the outputs, or synchronized with the data select signal DUP.

The output stages are n-p-n transistors with open collectors. The current capability is designed for the requirements of duplex operation. Two of the outputs (Q_8 and Q_{16}) are arranged for double current, so that 2 x 2 segments can be connected in parallel.

9.5.4. 2716 D1810, 1813
16k (2kx8) UV ERASABLE PROM

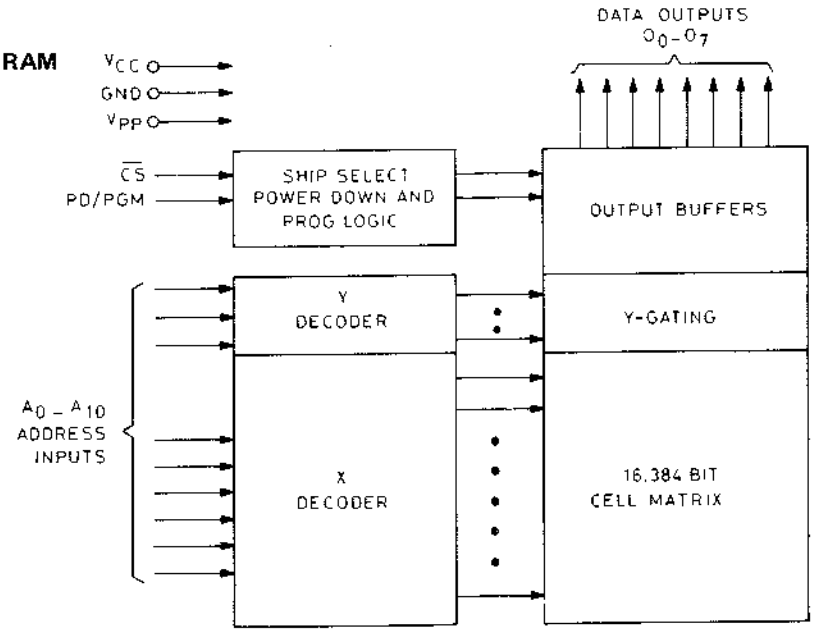
PIN CONFIGURATION



PIN NAMES

A_0–A_{10}	ADDRESSES
PD/PGM	POWER DOWN/PROGRAM
$\overline{CS}$	CHIP SELECT
O_0–O_7	OUTPUTS

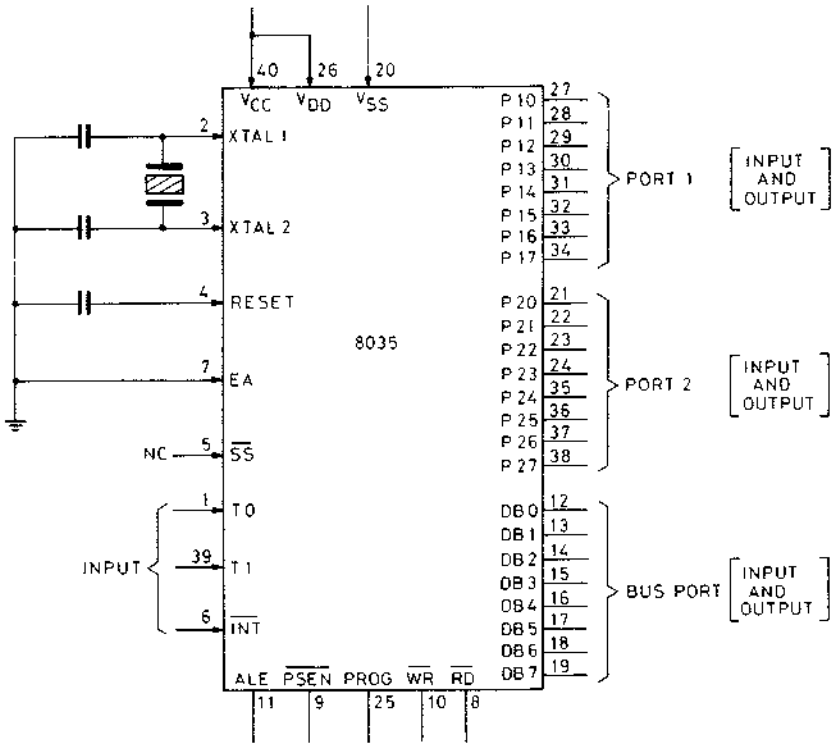
BLOCK DIAGRAM



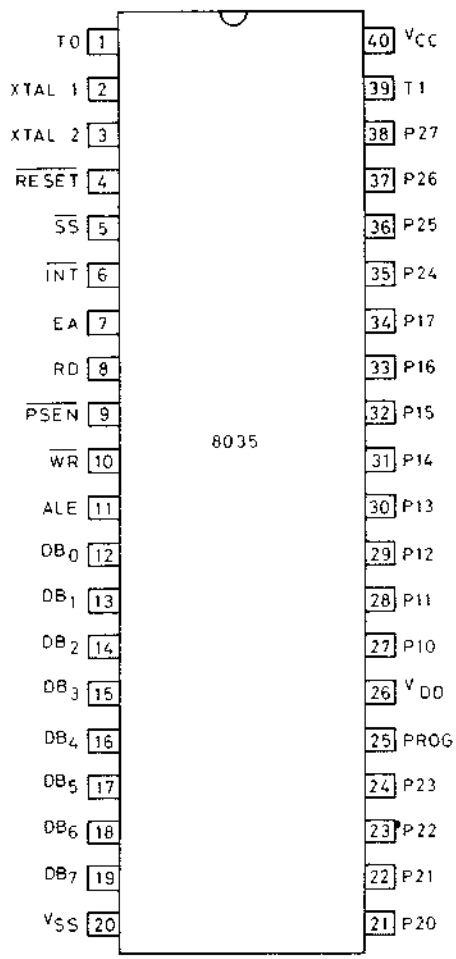
MODE SELECTION

Mode \ Pins	$\overline{CE}$/PGM (18)	$\overline{OE}$ (20)	Vpp (21)	V_{CC} (24)	Outputs (9-11, 13-17)
Read	V_{IL}	V_{IL}	+5	+5	D_{OUT}
Standby	V_{IL}	Don't care	+5	+5	High Z
Program	Pulsed V_{IL} to V_{IH}	V_{IH}	+25	+5	D_{IN}
Program Verify	V_{IL}	V_{IL}	+25	+5	D_{OUT}
Program Inhibit	V_{IL}	V_{IH}	+25	+5	High Z

9.5.5. 8035 Micro computer D1909



MCS-48 PIN CONFIGURATIONS



Designation	Pin number	Function
V_{SS}	20	Circuit GND potential
V_{DD}	26	Programming power supply; +25V during program, +5V during operation for both ROM and PROM. Low power standby pin in 8048 ROM version.
V_{CC}	40	Main power supply; +5V during operation and 8748 programming.
PROG	25	Program pulse (+25V) input pin during 8748 programming. Output strobe for 8232 I/O expander.
P10-P17 (Port 1)	27-34	8-bit quasi-bidirectional port. Internal Pullup $\approx 50K\Omega$)
P20-P27 (Port 2)	21-24 35-38	8-bit quasi-bidirectional port. (Internal Pullup $\approx 50K\Omega$) P20-P23 contain the four high order program counter bits during an external program memory fetch and serve as a 4-bit I/O expander bus for 8243.
D0-D7	12-19	True bidirectional part which can be written or read synchronously using the $\overline{RD}$, $\overline{WR}$ strobes. The port can also be statically latched. Contains the 8 low order program counter bits during an external program memory fetch, and receives the addressed instruction under the control of PSEN. Also contains the address and data during an external RAM data store instruction, under control of ALE, $\overline{RD}$, and $\overline{WR}$.
T0	1	Input pin testable using the conditional transfer instructions JT0 and JNT0. T0 can be designated as a clock output using ENTO CLK instruction. T0 is also used during programming.
T1	39	Input pin testable using the JT1, and JNT1 instructions. Can be designated the event counter input using the STRT CNT instruction.
$\overline{INT}$	6	Interrupt input. Initiates an interrupt if interrupt is enabled. Interrupt is disabled after a reset. (Active low)
$\overline{RD}$	8	Output strobe activated during a BUS read. Can be used to enable data onto the BUS from an external device. (Active low). Used as a Read Strobe to External Data Memory.
$\overline{RESET}$	4	Input which is used to initialize the processor. Also used during PROM programming and verification. (Active low). (Internal pullup $\approx 200K\Omega$).
$\overline{WR}$	10	Output strobe during a BUS write. (Active low). Used as write strobe to external data memory.
ALE	11	Address Latch Enable. This signal occurs once during each cycle and is useful as a clock output. The negative edge of ALE strobes address into external data and program memory.
$\overline{PSEN}$	9	Program Store Enable. This output occurs only during a fetch to external program memory. (Active Low).
$\overline{SS}$	5	Single step input can be used in conjunction with ALE to "single step" the processor through each instruction. (Active Low) (Internally pullup $\approx 300K\Omega$).
EA	7	External Access input which forces all program memory fetches to reference external memory. Useful for emulation and debug, and essential for testing and program verification. (Active High) Internal pullup $\approx 10M\Omega$) on 8048/8049, 8035L, 8039 only).
XTAL1	2	One side of crystal input for internal oscillator. Also input for external source.
XTAL2	3	Other side of crystal input.

9.5.6. Programmable 1/O Expander 8243 (D1701, 02, 03, D201, D202)

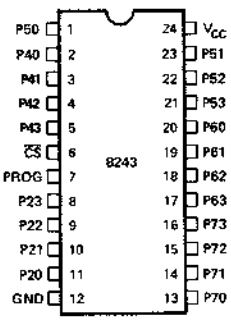
- **Low Cost**
- **Simple Interface to MCS-48™ Microcomputers**
- **Four 4-Bit I/O Ports**
- **AND and OR Directly to Ports**
- **24-Pin DIP**
- **Single 5V Supply**
- **High Output Drive**
- **Direct Extension of Resident 8048 I/O Ports**

The Intel® 8243 is an input/output expander designed specifically to provide a low cost means of I/O expansion for the MCS-48™ family of single chip microcomputers. Fabricated in 5 volts NMOS, the 8243 combines low cost, single supply voltage and high drive current capability.

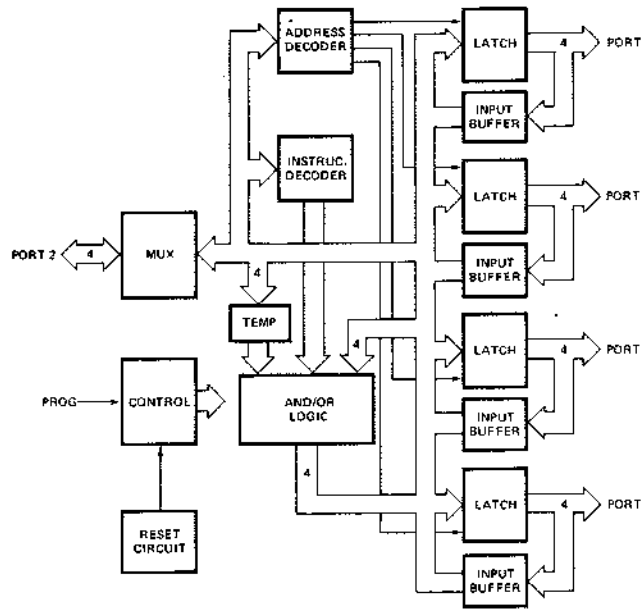
The 8243 consists of four 4-bit bidirectional static I/O ports and one 4-bit port which serves as an interface to the MCS-48 microcomputers. The 4-bit interface requires that only 4 I/O lines of the 8048 be used for I/O expansion, and also allows multiple 8243's to be added to the same bus.

The I/O ports of the 8243 serve as a direct extension of the resident I/O facilities of the MCS-48 microcomputers and are accessed by their own MOV, ANL, and ORL instructions.

PIN CONFIGURATION



BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

General Operation

The 8243 contains four 4-bit I/O ports which serve as an extension of the on-chip I/O and are addressed as ports 4-7. The following operations may be performed on these ports:

- Transfer Accumulator to Port.
- Transfer Port to Accumulator.
- AND Accumulator to Port.
- OR Accumulator to Port.

All communication between the 8048 and the 8243 occurs over Port 2 (P20-P23) with timing provided by an output pulse on the PROG pin of the processor. Each transfer consists of two 4-bit nibbles.

The first containing the "op code" and port address and the second containing the actual 4-bits of data.

A high to low transition of the PROG line indicates that address is present while a low to high transition indicates the presence of data. Additional 8243's may be added to the 4-bit bus and chip selected using additional output lines from the 8048/8748/8035.

Power On Initialization

Initial application of power to the device forces input/output ports 4, 5, 6, and 7 to the tri-state and port 2 to the input mode. The PROG pin may be either high or low when power is applied. The first high to low transition of PROG causes device to exit power on mode. The power on sequence is initiated if V_{CC} drops below 1V.

P21	P20	Address Code	P23	P22	Instruction Code
0	0	Port 4	0	0	Read
0	1	Port 5	0	1	Write
1	0	Port 6	1	0	ORLD
1	1	Port 7	1	1	ANLD

Read Mode

The device has one read mode. The operation code and port address are latched from the input port 2 on the high to low transition of the PROG pin. As soon as the read operation and port address are decoded, the appropriate outputs are tri-stated, and the input buffers switched on. The read operation is terminated by a low to high transition of the PROG pin. The port (4, 5, 6 or 7) that was selected is switched to the tri-stated mode while port 2 is returned to the input mode.

Write Modes

The device has three write modes. MOVD Pi, A directly writes new data into the selected port and old data is lost. ORLD Pi,A takes new data, OR's it with the old data and then writes it to the port. ANLD Pi,A takes new data AND's it with the old data and then writes it to the port. Operation code and port address are latched from the input port 2 on the high to low transition of the PROG pin. On the low to high transition of PROG data on port 2 is transferred to the logic block of the specified output port.

After the logic manipulation is performed, the data is latched and outputed. The old data remains latched until new valid outputs are entered.

Normally, a port will be in an output (write mode) or input (read mode). If modes are changed during operation, the first read following a write should be ignored; all following reads are valid. This is to allow the external driver on the port to settle after the first read instruction removes the low impedance drive from the 8243 output. A read of any port will leave that port in a high impedance state.

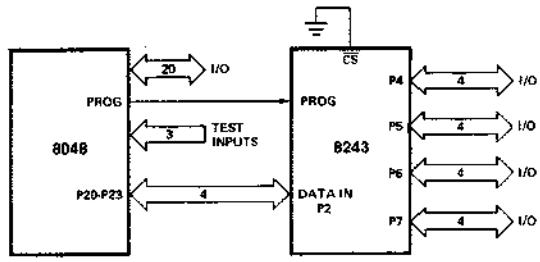
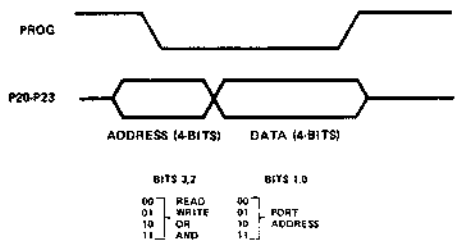


Figure 2. Expander Interface



PIN DESCRIPTION

Symbol	Pin No.	Function
PROG	7	Clock Input. A high to low transistion on PROG signifies that address and control are available on P20-P23, and a low to high transition signifies that data is available on P20-23.
$\overline{CS}$	6	Chip Select Input. A high on CS inhibits any change of output or internal status.
P20-P23	11-8	Four-bit bidirectional port contains the address and control bits on a high to low transition of PROG. During a low to high transition contains the data for a selected output port if a write operation, or the data from a selected port before the low to high transition if a read operation.
GND	12	0V supply.
P40-P43 P50-P53 P60-P63 P70-P73	2-5 1,23-21 20-17 13-16	Four-bit bidirectional I/O ports. May be programmed to be input (during read), low impedance latched output (after write) or a tri-state (after read). Data on pins P20-23 may be directly written, ANDed or ORed with previous data.
V_{CC}	24	+5V supply.

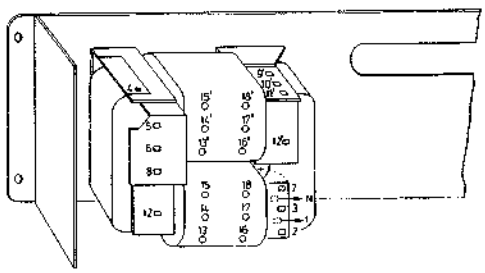
CONTENTS

10. ADAPTION TO THE LOCAL MAINS

10.1. ADAPTION TO THE LOCAL MAINS VOLTAGE

For the adaption to the local mains voltage the wiring on the mains transformer must be altered. Proceed as follows:

—Remove the top cover.
—Remove the rear cover including the mains transformer from the PM2528.
The wiring between transformer and mother p.c.b. is made with cables and plugs.
—Alter the wiring.



MAINS VOLTAGE	TRANSFORMER CONNECTIONS			FUSE SLOW BLOW	REMARKS
	FASE	ZERO	CONNECT		
220V	N	5	2 TO 6	125mA-T	AT DELIVERY
110V	N	5	1 TO 6 *2 TO 5	250mA-T	*USE BROWN RESERVE WIRE IN CABLE LOOM
120V	N	4	1 TO 6 *3 TO 4	250mA-T	*USE BROWN RESERVE WIRE IN CABLE LOOM
240V	N	4	3 TO 6	125mA-T	

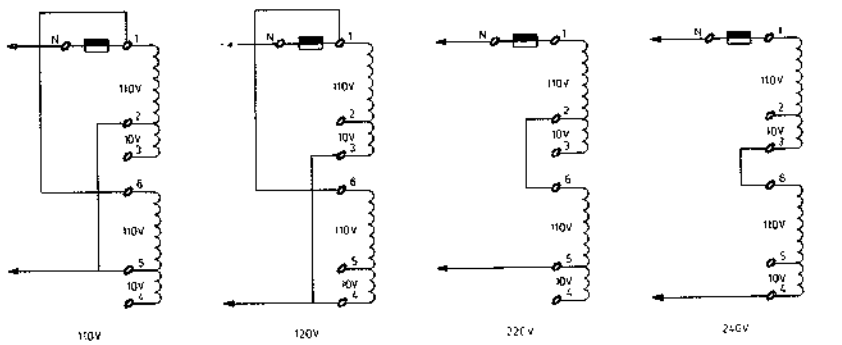


Fig. 10.1. Adaption to the mains voltage

10.2. ADAPTION TO THE LOCAL MAINS FREQUENCY

The PM2528 can be adapted for a local mains frequency of 50Hz or 60 Hz.

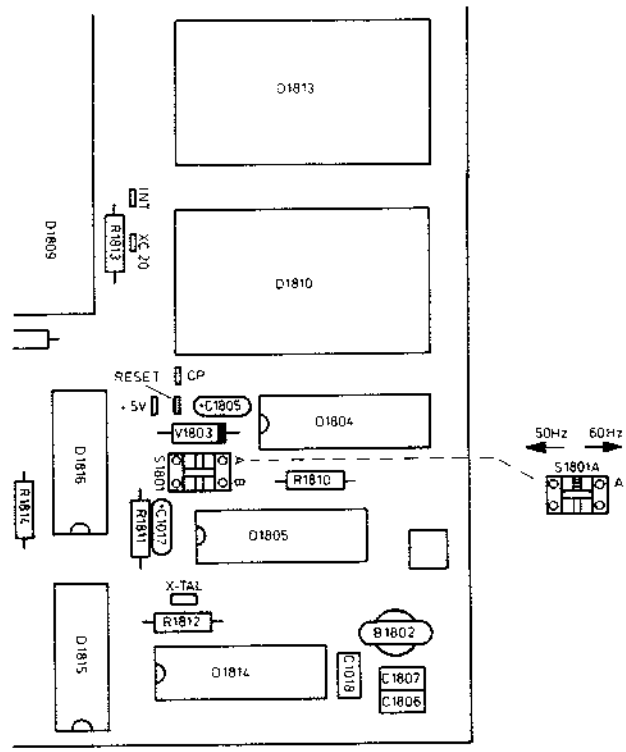


Fig. 10.2. Adaption to the mains frequency

ST3667

Proceed as follows

- Switch S1801A in correct position.
- Replace X-tal B1802 and ROM's D1810 andD1813.

	DESCRIPTION	ORDERING NUMBER
50Hz	X-tal, B1802, 6MHz ROM, D1810 ROM, D1813	5322 242 74364 5322 209 50026 5322 209 50027
60Hz	X-tal, B1802, 4.8 MHz ROM, D1810 ROM, D1813	Contact: S&I T&M Service Department Lelyweg 1 7602 EA Almelo The Netherlands Tel.: 31 05490-18291 Telex number: 44191 Telex routing indicator: nlxalsi

11. MODIFICATIONS

WARNING: The opening of covers or removal of parts, except those to which access can be gained by hand is likely to expose live parts, and accessible terminals may also be live.

The instrument shall be disconnected from all voltage sources before any replacement or maintenance and repair during which the instrument will be opened.

If afterwards, any adjustment, maintenance or repair of the opened instrument under voltage conditions is inevitable, it shall be carried out only by a skilled person who is aware of the hazard involved.

Bear in mind that capacitors inside the instrument may still be charged even if the instrument is separated from all voltage sources.

11.1. SOFTWARE PM 2528 OVERVIEW

11.1.1. Short description

PROMS INDICATION

R28.1+date (D1810)
R28.2+date (D1813) = old

DM01 600 - DM01 620 Pre-series

2514.X (D1810)
2515.X (D1813)

.X = version number of the PROMS

NOTE: The version numbers are written on the PROMS.
The version numbers are factory numbers. When ordering the PROMS the service ordering numbers should be used (5322 209 . . . . .).

PROMS VERSIONS

.1 and .2 — Used in the pre-series of the PM 2528 (DM01 600 - DM01 620)
INDICATION R28.1 and R28.2 + date

.3 — Used in DM01 621 - DM01 713
INDICATION 2514.3 (D1810)
2515.3 (D1813)

Modifications with respect to .1 .2

Software : No down ranging (AUTO) in Vpeak-peak mode
Delay for optocouplers of the galvanic-separation pcb N30 (IEC-bus) HP85.
Hardware : Selected optocouplers
R3009, 3007, 3011, 3013, 3015 from 356 k to 154 k.

.4 — Used in DM01 713 - DM01 890 onwards.
INDICATION 2514.4 (D1810)
2515.4 (D1813)

Modifications with respect to .3

Software : Unstable measuring result with continuous serial-poll (IEC-bus)
Hardware : 2x track cut P10 and P14
2x resistor P10 and P14

.4A

Special version for FORSCHUNGS LABOR AACHEN (temporary), 5 sets.
Can be ordered in Almelo.

Modifications with respect to .4

Software : Adaption to PET controller
Functions Vpeak/Vhf cannot be reached if not present.

.4A PROM final in DM 890 of PM 2528 from december 1981 on under version .5 (revised).

.5

Used in DM01 890 onwards.
INDICATION 2514.5 (D1810)
2515.5 (D1813)

Modifications with respect to .4

Software : – Vhf, Vpeak locked.
– Fast ranging PET.
– OLin Vpeak^and v MAN/EXT START mode does not stop the measurement anymore.
– Skip DH in MAN/EXT Start mode.
– Internal smoothing of the Vpeak^ and v measurements in MAN/EXT START mode. Range end 24000 to 45000.

.5/.6

Used in DM01 1212 onwards

INDICATION 2514.5 (D1810)
2515.6 (D1813)

Modifications with respect to (D1815) .5

Software: Adapted delay time in software to avoid overload in the lower ranges in automatic ranging mode

REPLACING THE PROMS

– The PROMS have to be replaced as a pair.
– Service ordering numbers: 5322 209 50026 (D1810)
5322 209 50027 (D1813)
Under these ordering numbers Concern Service delivers the latest software release.
The latest PROMS can be mounted in the elder PM 2528 without any problems, however when the above mentioned errors are maintained. They can be solved when carrying the above mentioned modifications.

11.1.2. PROM .3

CONCERNS : PM 2528 Vpeak-peak mode and IEC-BUS interface PM 9291.

PROBLEMS : a. No down ranging (AUTO) in Vpeak-peak mode
b. Timing problems IEC-BUS PM 9291 (misformed read-out HP85, missing digits, system stop after some minutes)

CAUSE : a. Incorrect software
b. Incorrect software and galvanic separation N30

REMEDY : — New PROMS .3 (a and b)

Version number ↓

Version .3	Service number	Factory code	PROM
	5322 209 50026	2514.3	D1810
	5322 209 50027	2515.3	D1813

From serial number DM01 621 on the .3 PROMS are already build in by the factory. Under the above mentioned service numbers Concern Service delivers the latest version numbers.

— Modification of the galvanic separation pcb N30 (b)
(PM 9291 IEC-BUS interface)

NOTE: The galvanic separation pcb is included in the IEC-BUS PM 9291, BCD output PM 9292 and ANALOG output PM 9254.

- Replace the optocouplers B3001 upto B3006 by selected optocouplers with ordering number 5322 130 31718

Was: CNY57A New: CNX35 selected. It it possible that both opto-couplers with a white dot are used.
CNY57A+dot. Both are correct.
CNX35+dot.

- Replace resistors R3009, 3007, 3011, 3013 and 3015 for 154 k MR25 1 %, 5322 116 54714.
Was: 365 k

- To reduce delay also resistor R3002, 3003, 3004 and 3016 are replaced by 464 Ω MR25 1 %, 5322 116 50536.
Was: 154 Ω

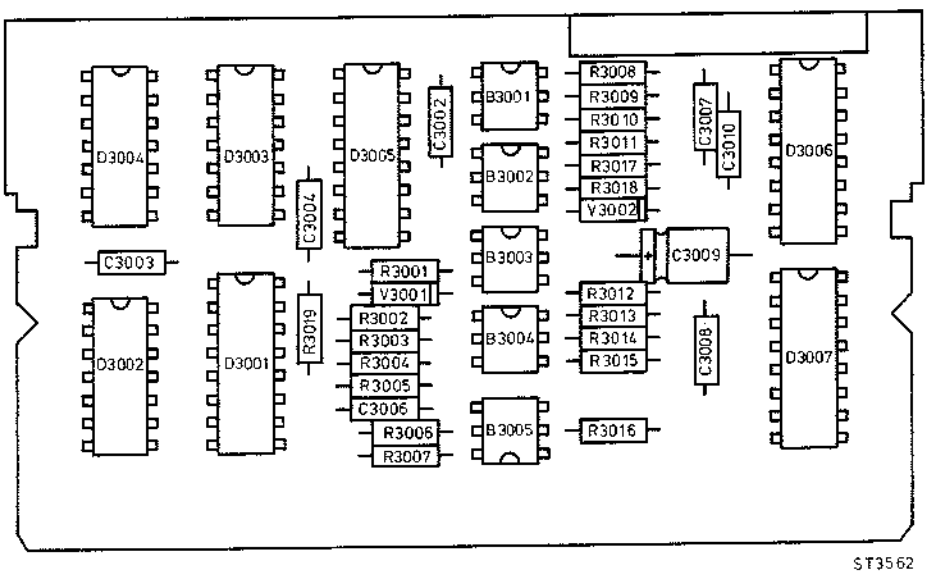


Fig. 11.1. N30 Galvanic separation lay out

11.1.3. PROM .4

CONCERNS : PM 2528 with IEC-BUS interface PM 9291.

PROBLEM : Unstable measuring result while continuous serial-polling the IEC-BUS interface.

CAUSE : Serial-poll activates the interrupt ($\overline{INT}$) input of the micro-processor. On the outputs P10 (AZ) and P14 (POL) this results in spikes which influence the measuring result while the PM 2528 is measuring.

REMEDY : A suppressor resistor in the AZ (P10) and POL (P14) lines, shortcircuit R2003 and new PROMS .4.

For modification proceed as follows:

- Remove the top- and bottom cover.
- Remove the top- and bottom guard-plate.
- Pull-out the micro-processor.
- Cut two tracks, on the component side of N1, situated in the micro-processor foot (See Fig. 11.3)
- Place two suppressor resistors, on the solder-side of N1, in the lines AZ (P10) and (POL) (P14). (See Fig. 11.2)
  The value of the resistors should be: 1 k MR16 5322 116 55393.
- Shortcircuit resistor R2003 on the ADC-CONTROL pcb N20 (see Fig. 11.4).
- Place new PROMS of version .4 in the PM 2528.

Version .4	Service code	Factory code	PROM
	5322 209 50026	2514.4	D1810
	5322 209 50027	2515.4	D1813

Version number

From serial-number DM01 713 the new PROMS and the above mentioned modifications are already build-in by the factory.

The version .4 PROMS may also be used in the earlier versions of the PM 2528. Always both PROMS have to be replaced.
To eliminate the unstable measuring result problem also the above mentioned modifications have to be carried out.

- Place the micro-processor in the PM 2528 again.
- Mount the top- and bottom guard-plate and the top- and bottom cover again.

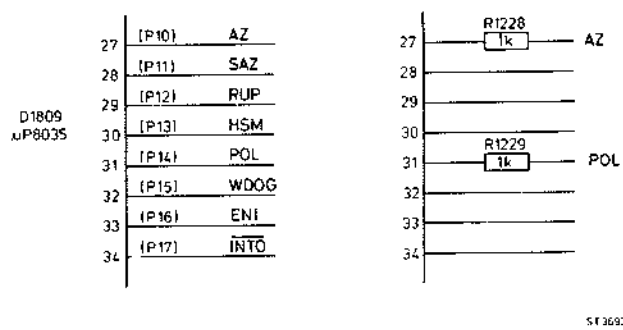


Fig. 11.2. Circuit diagram R1228/R1229

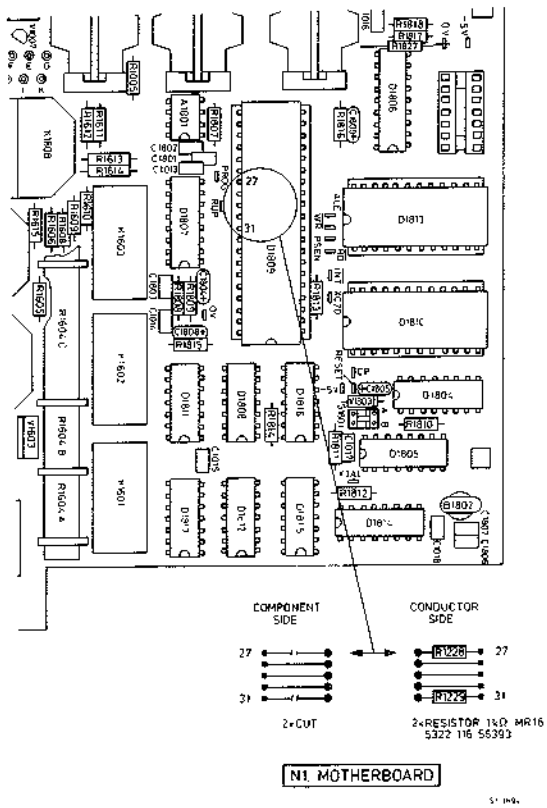


Fig. 11.3. Lay out R1228/R1229

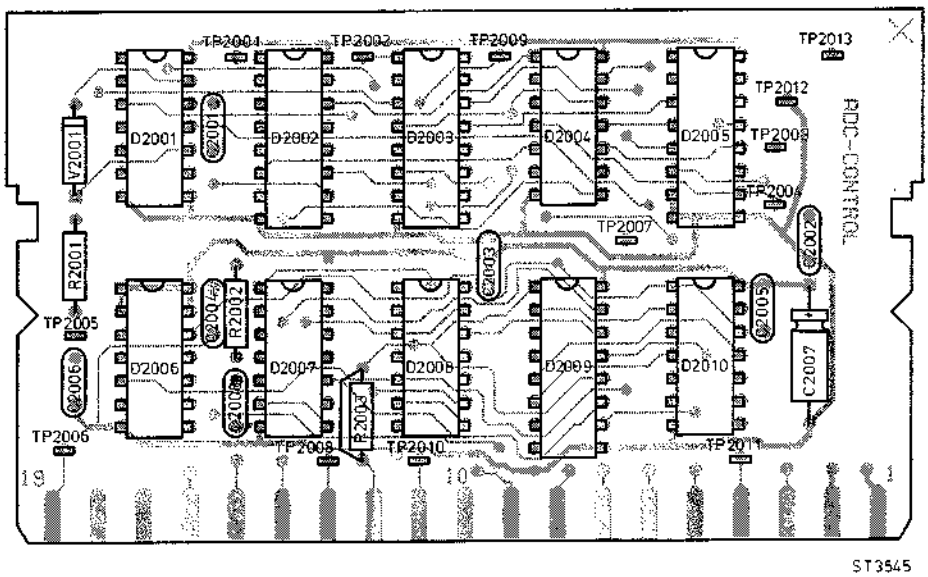


Fig. 11.4. N20 ADC control lay out

let op! : indien geen gebruik v/d SRQ gemaakt wordt, dan ook niet programmeren, dus D0 i.p.v. D1 en verder op het apparaat SRQ OFF

11.1.4. PROM .5

1. Modifications

- Vhf and Vpeak can only be selected manually via the frontpanel if the units are mounted. However via the IEC BUS the functions can still be selected without mounted units.
- Fast ranging in combination with PET controller.
- Overload in Vpeak ^ and v, MAN/EXT START mode does not stop the measurement anymore.
- DATA HOLD: Skip DH in MAN/EXT START mode. This means, no DH when HF unit + probe are used in the MAN/EXT START mode in another function then HF.

PROMS

Version .5	Service code	Factory code (Version ↓)	PROM
	5322 209 50026	2514.5	D1810
	5322 209 50027	2515.5	D1813

From serial number DM 890 on the ROMS are build in by the factory.
Under the above mentioned service code Concern Service delivers the latest ROM versions.

2. Modifications of IEC-bus interface of PM 2528 in combination with the PET controller

1. PM 2528 disables the talker, while busy measuring.

2. – When D0 has been programmed, PM 2528 will call the IEC-bus output routine when ready measuring. So when it is still addressed as talker it will output to the IEC-bus; when it is not addressed as talker it will exit the IEC-bus output routine without output to the IEC-bus.
   – End measurement will not cause Service Request (not modified).

3. – When D1 has been programmed, PM 2528 will skip the IEC-bus output routine when ready measuring. So when it is still addressed as talker it will not output to the IEC-bus. Only when it is not addressed as talker or when it is unaddressed as talker and after that readdressed as talker it will output to the IEC-bus.
   – This mode (D1 programmed) can be used for CBM commodore to prevent asynchronous interrupt of the source handshake caused by "talker time out" ST = 2 (see program examples).
   – This mode cannot be used for controllers, which do not repeatedly, address the talker e.g. PM 4400 or HP-85, except when using Service Request to signal the end of the measurement.
   – End of measurement will cause Service Request (not modified).

Summarizing the following shall be noticed:
When not using the Service Request mode to signal the end of the measurement, D0 must be programmed, except for CBM Commodore D1 must be programmed to prevent asynchronous interrupt by "talker time out" (see program examples).

3. Programming examples

```
CBM COMMODORE <=> PM2528

100 OPEN3,22
110 PRINT#3,"F00R01101"
120 PRINT#3,"E1"
130 INPUT#3,A$:IFST=2THEN130
140 PRINTA$
150 GOTO120
160 CLOSE3
170 END
READY
```

PM4400 ⇔ PM2528

```
100 PRINT #22:"F00R0T1D0"
110 PRINT #22,8:
120 INPUT #22:A$
130 PRINT A$
140 GOTO 110
```

HP85 ⇔ PM2528

```
100 OUTPUT 722  "F00,R0,T1;S0,D0
   "
110 TRIGGERT 722
120 ENTER 722 USING "%,11A"; A$
130 DISP A$
140 GOTO 110
```

11.1.5. PROM .5/.6

PROBLEM : Continuous overload on the display if the ADC is overloaded in the lower ranges in automatic ranging mode.

CAUSE : Tolerance in ADC clamp-circuits.

REMEDY : Adaption of software delay times in D1812 (.5 to .6).

Version .5/.6	Service code	Factory code	PROM
	5322 209 50026	2514.5	D1810
	5322 209 50027	2515.6	D1813

Version number

From serial number DM01 1212 on the .5/.6 PROMS are already build-in by the factory.
Under the above mentioned service numbers Concern Service delivers the latest version numbers.

11.2. IEC-BUS PM 9291

11.2.1. PM 9291 history

Pre-series (about 10 pieces)

Indication : a. Black textplate around the IEC-bus plug (no text)
b. Handmade ALU textplate with text

Status : No modifications related to .3 and .4 PROMS of the PM 2528.

Problems : – Timing problems HP-85 (missing information, system hang-up).
Solved with .3 PROM with modifications on the galvanic separation pcb N30 (PM 9291).
– Unstable measuring result (serial-poll).
Solved with .4 PROM with modifications in the PM 2528.
– Missing EXT bit (EXTENSION).
Solved with modifications on the IEC-bus pcb.
– Software hang-up after switching off and on the PM 2528.
Solved with modification on the IEC-bus pcb.

Normal series

Beginning Modifications on the galvanic separation pcb N30

.3 PROM – R3009, 3007, 3011, 3013 and 3015 from 365 k to 154 k.
– Opto-couplers B3001 to B3006 selected.
CNY57A or CNX35 marked with white dot.

NOTE: It may occur that in the beginning the Opto-couplers are not marked.

Later .3 PROM with modifications final

Later .4 PROM with modifications final

Later EX-bit (EXTENSION) modification.

Later POWER ON circuit HEF4738 modification.

NOTE: Due to missing serial numbers on the interfaces (also PM 9254, PM 9292) it is not possible to give exact figures in what interface the modifications are carried out.
In the field it is possible to meet all kind of combinations of PM 2528 with PM 9291 especially in the early PM 2528 (New PM 2528 with old PM 9291 which means new software with not modified PM 9291, so the error still will be there).
TAKE CARE.

– From the PM 9291/02 on (can be seen on the p.c. board) the above mentioned modifications are printed in the new pcb layout.

11.2.2. IEC-bus modifications

1. PROBLEM : Missing EX (Extension) bit (DIO-8) in device status byte. (See Fig. 11.5 and 11.6)

   CAUSE : Not connected DIO-8 line.

   REMEDY : Cut track which connects zero to D3203/11 (1)
   Connect D3203/11 to D3215/5 (1)

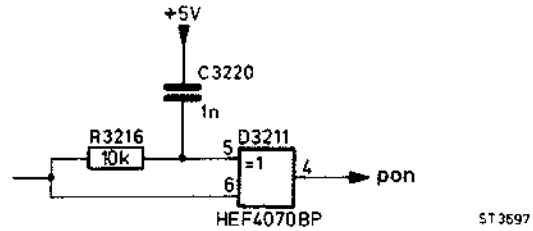
   Cut track which connects D3209/15 to signal "rtl" (2)
   Connect D3209/15 to D3209/14 (2)

2. PROBLEM : Software hang-up after switching off and on the power of the PM 2528.
   (See Fig. 11.8 and 11.9)

   CAUSE : Incorrect power on of the IEC-BUS INTERFACE IC HEF4738 (D3205).

   REMEDY : Delay signal pon (power on).
   By means of switching the not used port of D3211 into the pon line.

Proceed as follows (Fig. 11.8)



Modifications component side:
- Cut track between D1311/5-6 and D1311/6-7 (release zero)
- Cut track between C3220 and C3206 (release zero of C3220)

Modifications conductor side:
- Connect C3206 to C3215
- Modify C3220 from 22 nF to 1 nF 4822 122 31175
- Connect a wire from D3211/4 to the feed-through spot under C2316 (pon)
- Connect a resistor of 10 k (MR25, 1 %, 5322 116 54619) between D3211/5 and 6.
- Connect a wire between D3211/6 and D3216/2 (pon).

NOTE: From .4 factory version on, the modifications are printed on the p.c. board. (Factory number 4022 325 7931.4 is printed on the p.c. board.)

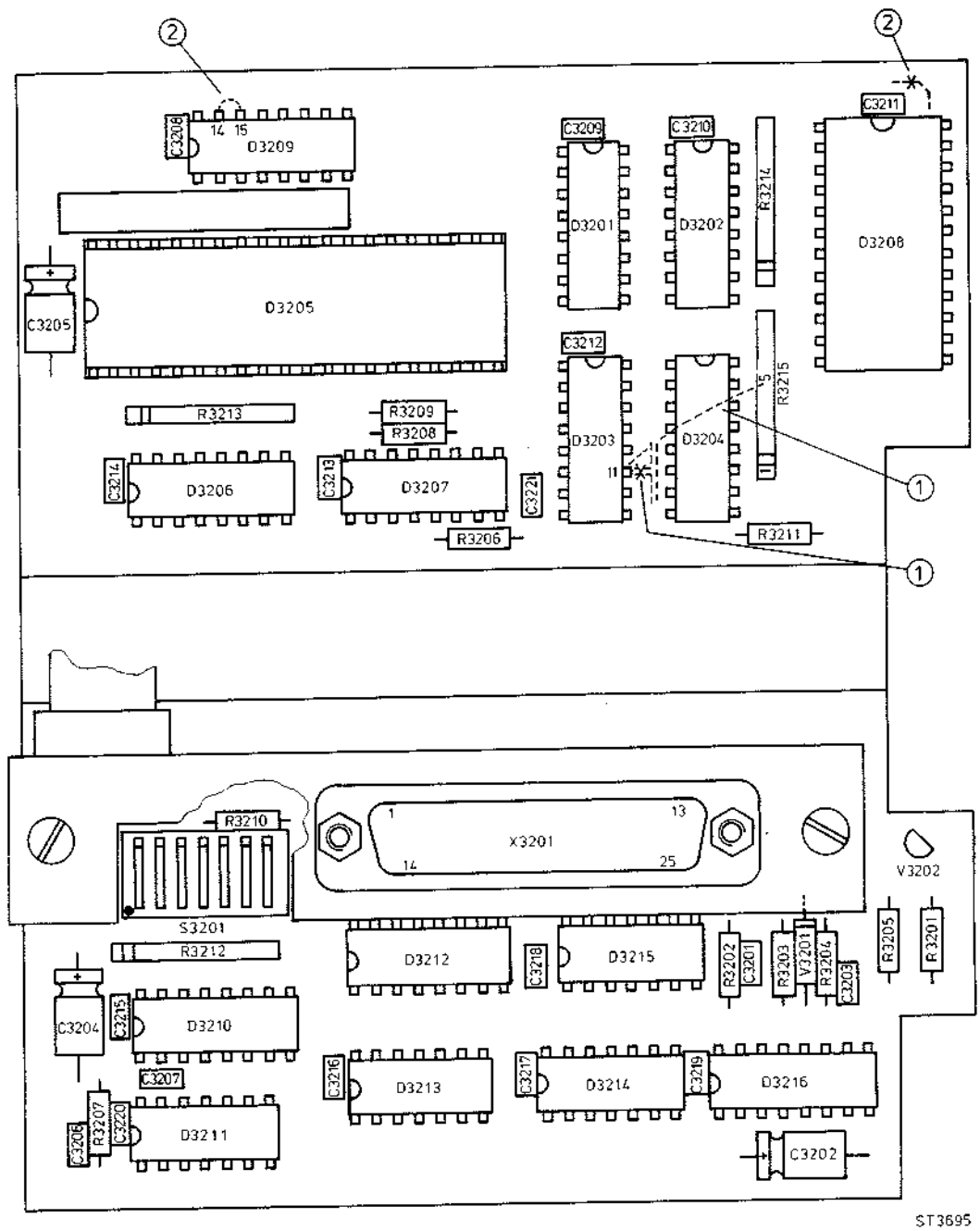


Fig. 11.5. N32 IEC bus lay out EX modification

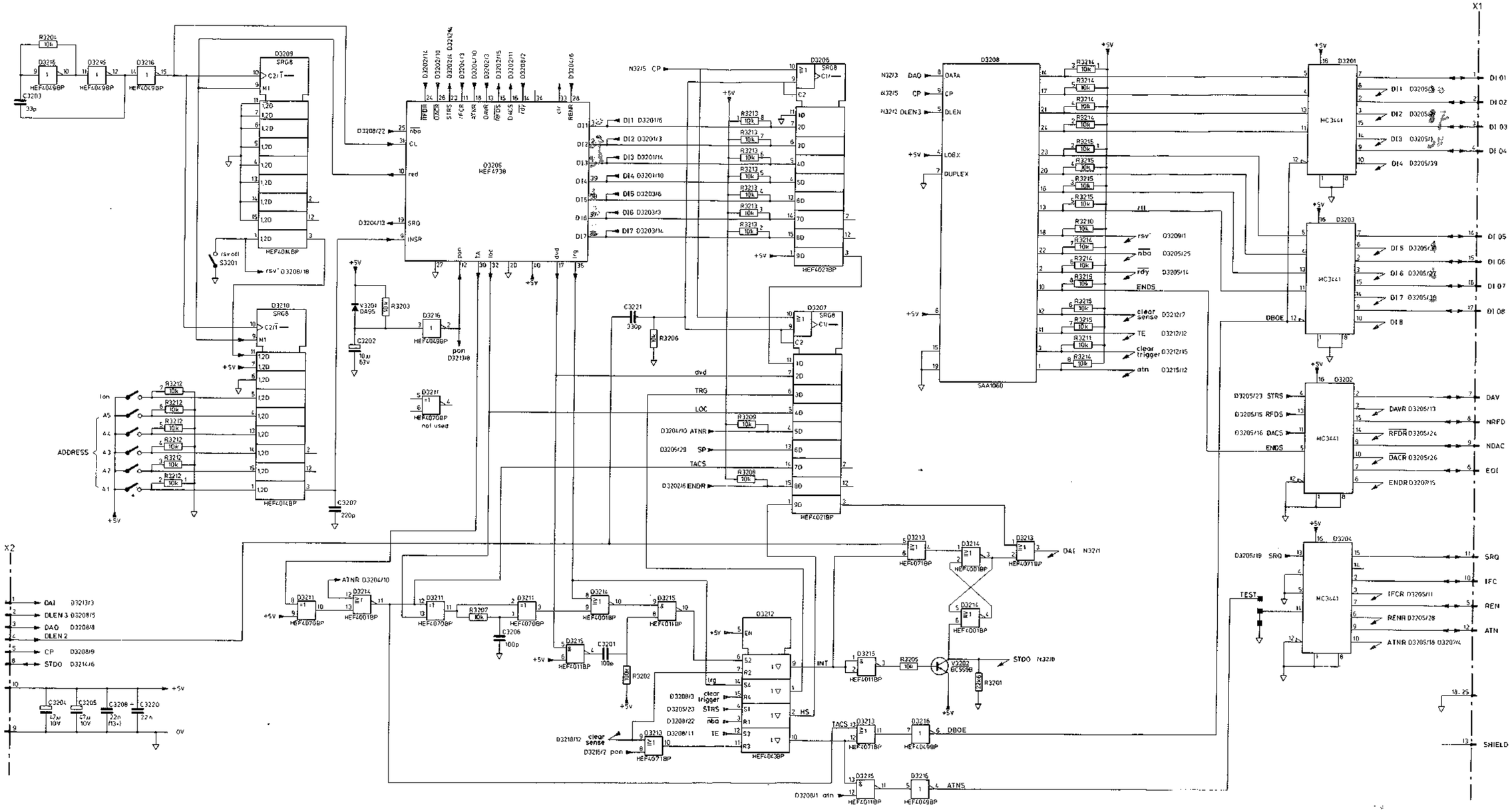


Fig. 11.6. Circuit diagram N32 IEC bus with EX

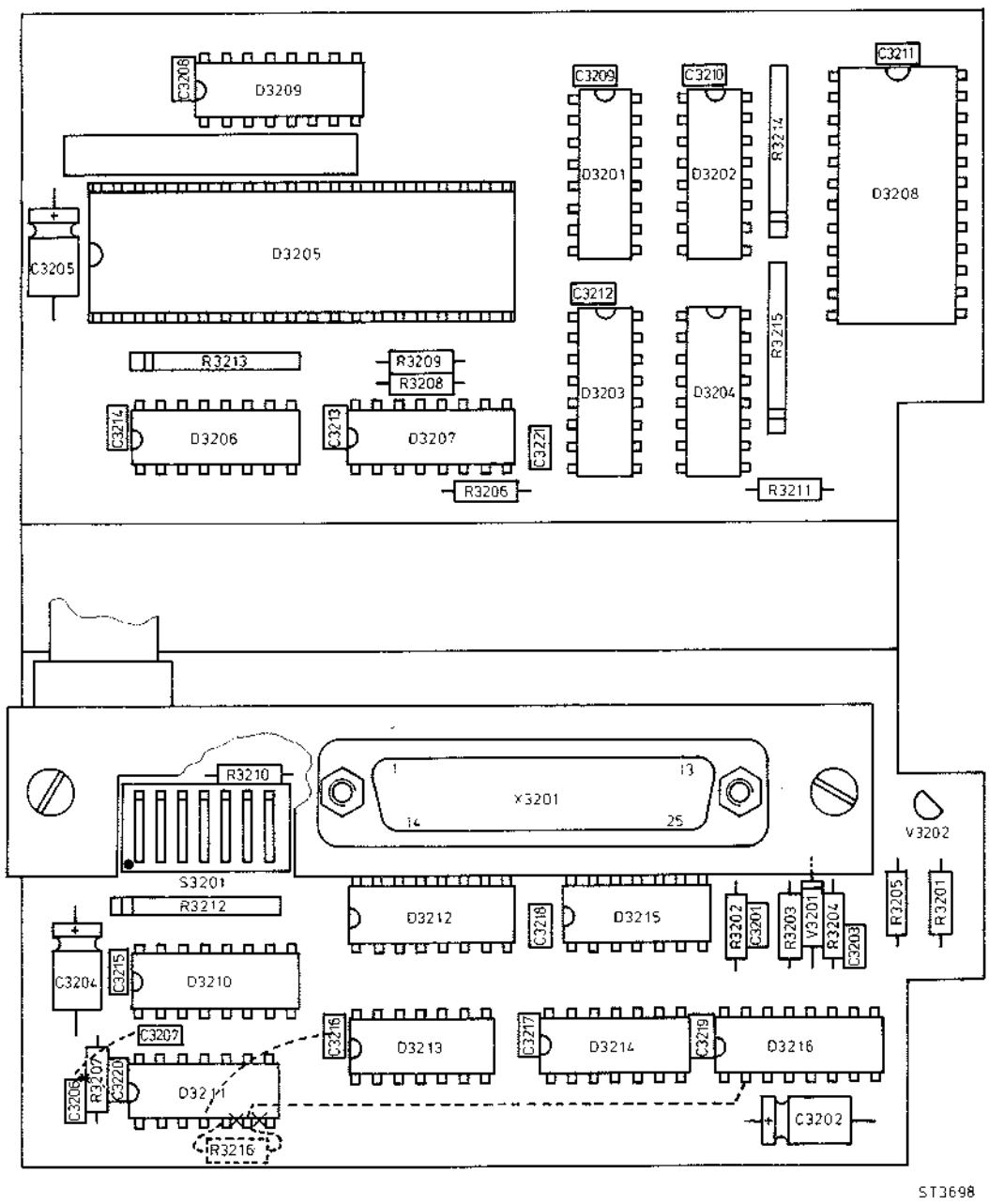


Fig. 11.8. N32 IEC bus lay out PON modification

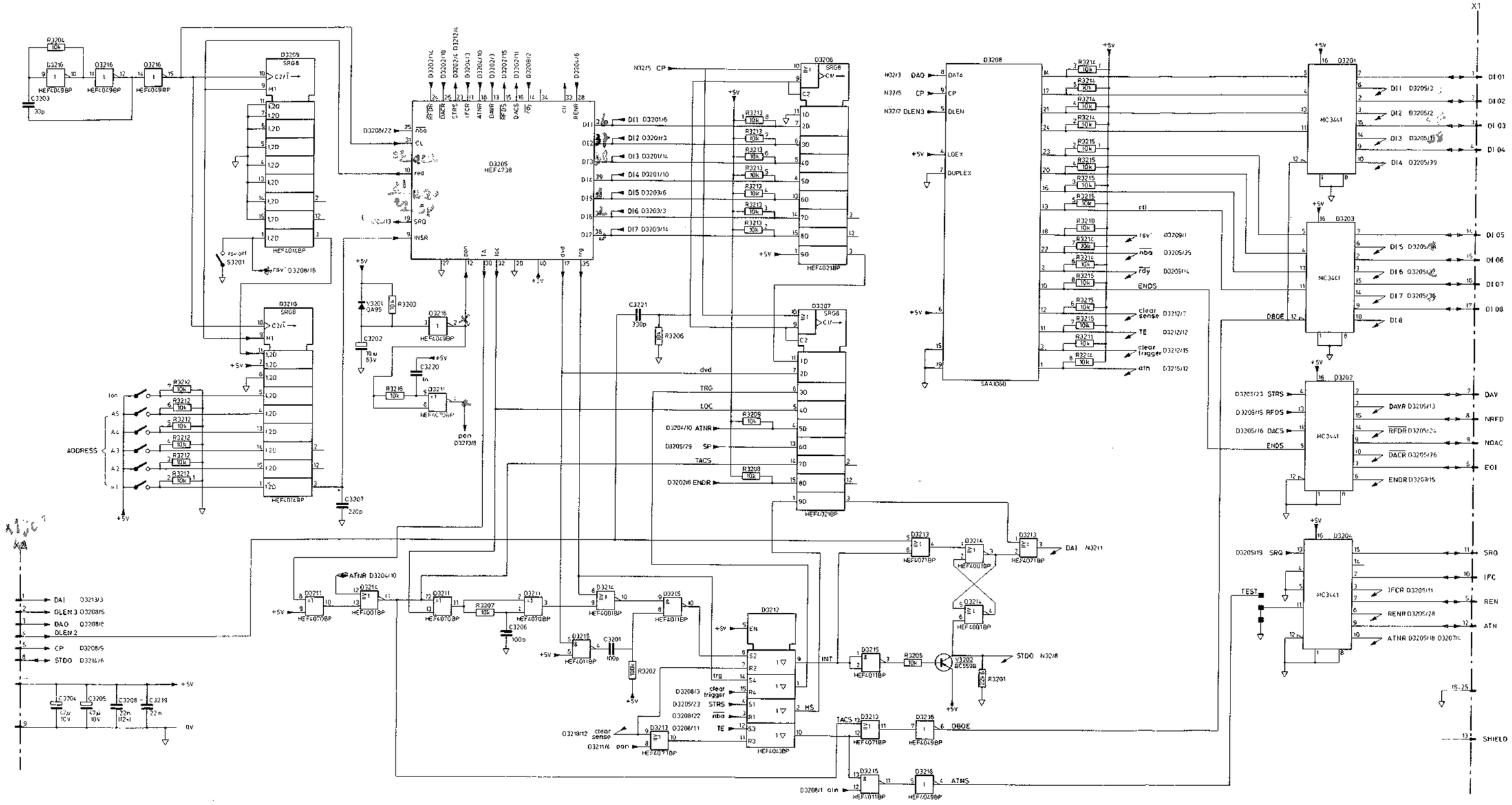


Fig. 11.9. N32 IEC bus circuit diagram PON modification

11.3. NOT SERIAL NUMBER RELATED MODIFICATIONS IN THE PM2528 (<DM01 1000)

C1429 (// to C1428)	68 pF, 2 %, 100 V, 4822 122 31076 removed
C1432	1 nF, 10 %, 500 V, 4822 122 31175 modified to 820 pF, 10 %, 100 V, 4822 122 30031
C2212	22 µF, 20 %, 4 V, 5322 124 14059 modified to 4.7 µF, −20/+20 %, 25 V, 5322 124 14064
C2503	82 pF, 2 %, 100 V, 4822 122 31243 modified to 100 pF, 2 %, 100 V, 4822 122 31316
C2520	15 pF, 2 %, 100 V, 4822 122 31058 modified to 18 pF, 2 %, 100 V, 4822 122 31076
R1403	5k9, 1 %, 0.4 W, 5322 116 50583 modified to 7k5, 1 %, MR25, 5322 116 54608
R1828	1 k, 1 %, MR16, 5322 116 55393 added
R1829	1 k, 1 %, MR16, 5322 116 55393 added
R2228	3.9 MΩ, VR25, 4822 110 72203 removed

11.4. ANALOG OUTPUT PM 9254

PROBLEM : 1 V output at offset adjustment when the output signal comes below 0 V.

CAUSE : Incorrect reset pulse for D3104/11.

REMEDY : Delay of reset pulse.
Proceed as follows (Fig. 11.10 and 11.11)
- Cut track between the two feed through spots under D3111 (conductor side)
- Place a 10kΩ resistor between these two spots (5322 116 54619)
- Place a 100 pF capacitor (4822 122 31504) between D3111/7 and the 10kΩ resistor.

Modifications at the conductor side

- Cut track between the two feed-through spots under D3111.
- Place the 10 kΩ resistor between the spots.
- Place the 100 pF capacitor between D3111/7 and the 10 kΩ resistor.

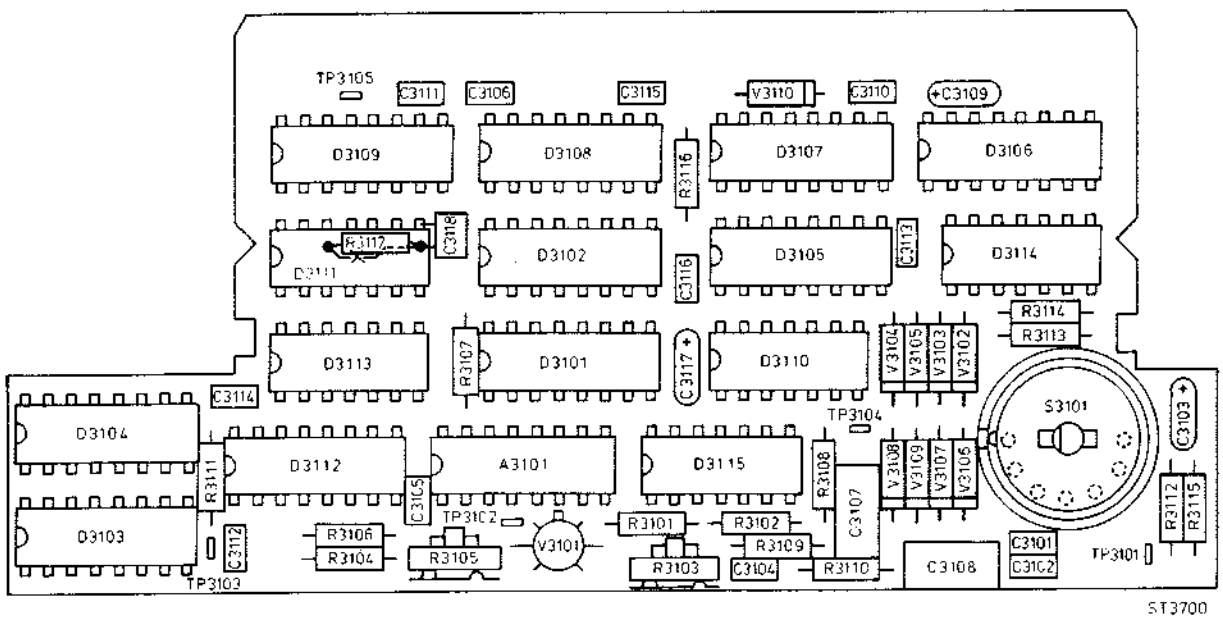


Fig. 11.10. N31 Analog output lay out offset modifcation

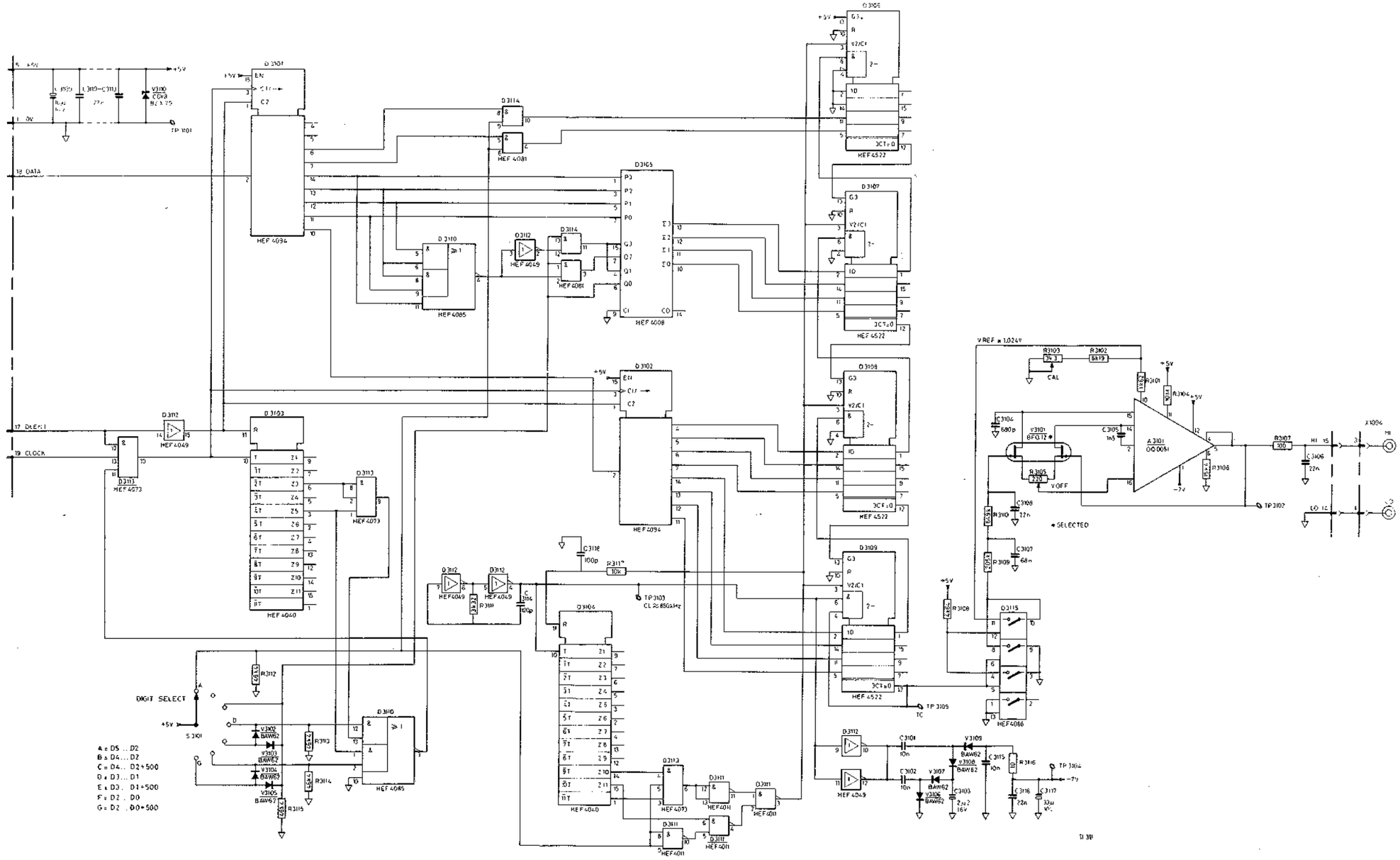


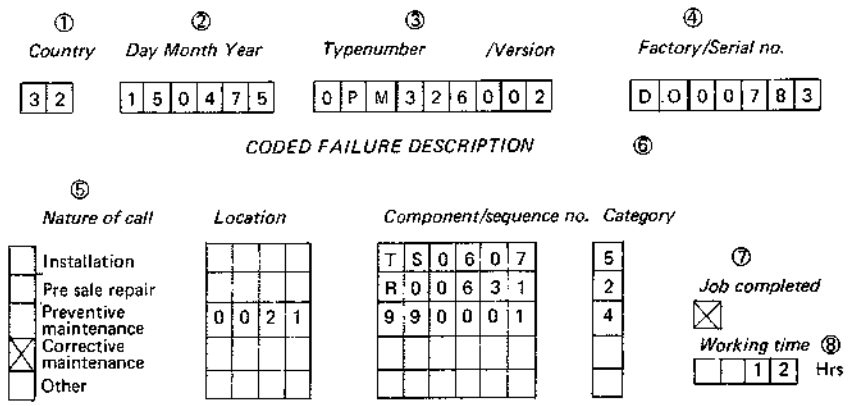
Fig. 11.11. N31 Analog output circuit diagram offset modification

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS

(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.



Detailed description of the information to be entered in the various boxes:

①Country: [3][2] = Switzerland

②Day Month Year [1][5][0][4][7][5] = 15 April 1975

③Type number/Version [O][P][M][3][2][6][0][0][2] = Oscilloscope PM 3260, version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number [D][O][0][0][7][8][3] = DO 783 These data are mentioned on the type plate of the instrument

⑤Nature of call: Enter a cross in the relevant box

⑥Coded failure description

Location

[ ][ ][ ][ ]

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
000A for Unit A
0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

[ ][ ][ ][ ][ ][ ]

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric, the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002 Knob (incl. dial knob, cap, etc.)
990003 Probe (only if attached to instrument)
990004 Leads and associated plugs
990005 Holder (valve, transistor, fuse, board, etc.)
990006 Complete unit (p.w. board, h.t. unit, etc.)
990007 Accessory (only those without type number)
990008 Documentation (manual, supplement, etc.)
990009 Foreign object
990099 Miscellaneous

Category

[ ]

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement (of transistor, resistor, etc.)
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

⑦Job completed: Enter a cross when the job has been completed.

⑧Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

[ ][ ][1][2] = 1,2 working hours (1 h 12 min.)

1024

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equipment for science and industry

750326 PM 2421 SME 42

TEST AND MEASURING INSTRUMENTS

Already issued: Cd 627, Cd 641, Cd 666, Cd 737, SME 14, SME 16 and SME 23

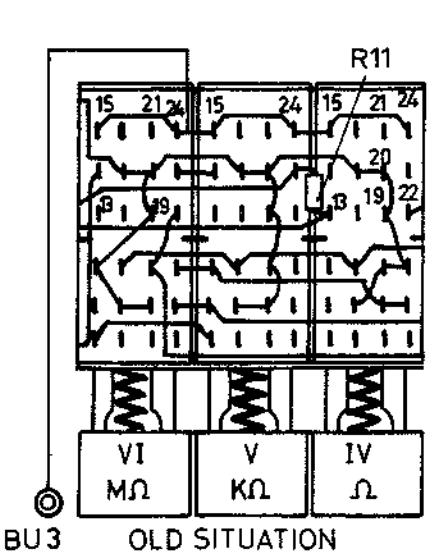
Re: protection of the kΩ and MΩ ranges

It is possible to protect the following resistance ranges against external voltages by addition of a resistor.

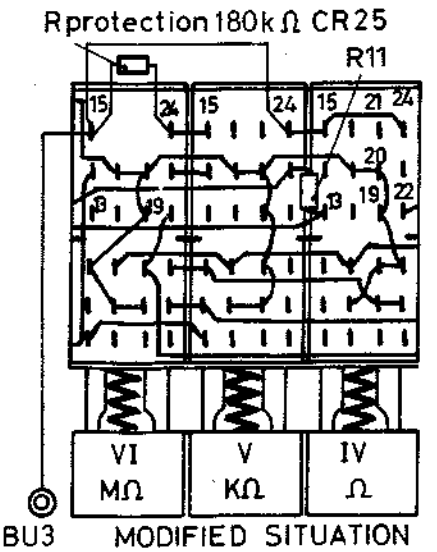
Range	Maximal permissible voltage	
MΩ	up to 250 V ac or dc	Between BU2 and BU3
kΩ	up to 30 V ac or dc	
Ω remains	up to 5 V ac or dc	

Note: In all resistance ranges the maximum permissible voltage between BU2 and any LO-terminal is 5 V ac or dc.

The mounting of the protection resistor is shown in figures below.
It is advised to modify every instrument to be repaired.



OLD SITUATION



MODIFIED SITUATION

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PRODUCT SAFETY / LIABILITY.

In almost all the countries in the world where S&I products are sold, installed and used, product safety is gaining increasing attention. In this context it should be noted that:

- Increasingly, buyers of equipment or services are being forced by law to buy only those which comply with the relevant recognised national or international safety standards.
  In some cases conformity with national standards must be verified by a third party such as the UL or CSA - bringing in the question of "trade barriers".

- Of particular importance in Europe is the "Low voltage directive" of the Council of the European Communities. This lays down mandatory requirements for all manufacturers of electrical equipment in the E.E.C. According to this document no electrical equipment may be placedon the market if it endagers the safety of persons, domestic animals or property.

- Claims for compensation are on the increase in respect of number and cash amount. This is evident in both the U.S.A. and Europe and stems from the fact that users are becoming increasingly aware of the possibilities of compensation. Court decisions tend, in general, towards favoring the complainant.

- Should a product appear to be unsafe and to be liable to cause damage or bodily harm, the reputation of its brand will be seriously affected.

It is therefore vital that S&I equipment, as stated by S&I Management (see letter DB2-3-1152), both of our own original construction and bought from third parties fulfils the safety requirements laid down in the relevant safety documents.
This implies that even more than before the manufacturer must demonstrate that he has not been neglient and that he has taken all precautions to avoid production and distribution of unsafe products by:

a) meeting as a minimum internationally recognised safety standards and

b) implementing a consistent and comprehensive quality assurance system throughout the process of research, design, development, production sales and service. It must be noted that product safety rules and procedures are part of such a quality assurance system.

Safety standards

The following international IEC-Publ. are mandatory safety standards for S&I:

-IEC-Publ. 348: Safety requirements for electronic measuring apparatus.
-IEC-Publ. 435: Safety of data processing equipment (partly; for large equipment).

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Furthermore, as was mentioned already, sometimes also national safety standards have to be taken into account. For S&I-T&M the following national standards are important:

UL (USA)

- UL1244: Standard for safety: Electrical and Electronic measuring- and testing equipment.

CSA (Canada)

- CSA Electr. Bul. 556: Electronic instruments and scientific apparatus.

- CSA Standard C 22.2 No. 151: Laboratory equipment.

Service aspects

For Service, product safety plays an important role in the following areas:

-(Pre-) Installation manual incl. Product Safety checklist.

-Warnings in instruction manuals.

-Product Safety as a part of service training.

-Indication in service doc's what components/adjustments will influence product safety.

-Safety components may only be replaced by identical components.

-Safety after repair, e.g.:

.visual inspection
.resistance to earth measurement
(between protective earth-lead connection (at the plug) and the cabinet ($< 0{,}5\ \Omega$)
.checking the insulating resistance ($> 2\ M\Omega$)
.leakage current measurement (e.g. large equipment: X-ray, E.O. etc.).

C. Nix

Telephone: 88412.