MMT – HMT /P
DMT – HMR /P

Portable 2 GHz Microwave
Audio/Video link

User's Manual

Release 1.0

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SAFETY NOTICES

WARNING

To avoid risks of electrical shocks or fire, only qualified personnel should execute the procedures specified in this manual.

WARNING

When the protective covers of any device or component connected to a 110 / 240 VAC source by a power cord are removed, voltages and currents dangerous to life may be exposed.

WARNING

Contact with 110 / 240 Volts of alternating current and associated direct current and voltages can be fatal.

CAUTION

To reduce the risks of electrical shock, do not remove the cover (or the back). Refer, for servicing, to qualified service personnel. This installation should be done by a qualified person and should conform to all local applicable laws.

NOTICE: ALL THE SPECIFICATIONS AND TECHNICAL INFORMATION IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE

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FIGURES INDEX

1. MMT-HMT /P GENERAL DESCRIPTION

The MMT-HMT /P is a portable 2 GHz microwave link that can carry simultaneously 1 video and up to 2 high-quality 15 kHz analog audio programs.
The audio channels are fully compatible with DB digital audio codecs TD/16 and RD/16 (2-channels).
With the MMT-HMT /P, the following performances are guaranteed:
-A/V intermodulation is almost canceled;
-system accepts simultaneously 1 video, up to 4 digital audio programs, and up to 4 x 4800 bps data channels.
- RF frequency channels are easy to change with a 125 kHz steps digital PLL. No tuning is required within 100 MHz range.
- All circuits are fitted into boxes suitable to be mounted at the rear of parabolic antennas with direct connection to the microwave feeder.
DB parabolic antennas enable the direct connection to the microwave feeder without wave-guide losses.
A front panel digital multimeter and alarms permit to check audio and video levels, RF signal level, PLL lock and squelch status. The equipment meets or exceeds the international standards for safety and electrical specifications.

2. MMT-HMT /P FUNCTIONAL DESCRIPTION

The 2 GHz MMT-HMT /P transmitter is composed of two fundamental parts:

I) MMT (Microwave TV Modulator)

This is an audio/video microwave TV circuit, synthesized, 1.3 to 2.7 GHz band -2 dBm output with the following functions:

- Video signal processing
- 7.500 MHz, 8.065 MHz subcarrier modulation
- RF video + audio 1.3 to 2.7 GHz (-2dBm output power level)

As seen in Fig. 2.4 the circuit is composed of:

1) Video processor stage with:
   75 Ω BNC input
   signal attenuation
   pre-emphasis circuit
   low pass filtering
   delay group pre-corrector
   adjustable modulation
   Video and subcarriers signals addition
2) Up to 2 subcarriers stages with:
   600 Ω XLR CANON input
   balun transformer
   adjustable modulation
   pre-emphasis circuit
   low pass filtering
   7.500 MHz or 8.065 MHz modulation
   band-pass filtering
3) 1.3 – 2.7 GHz PLL carrier modulation of video and audio signals.
4) System check (PLL locking, depth modulation measurement and power supply presence)

II) HMT (Microwave 1.3 to 2.7 GHz Amplifier)

It consists of a wide band microwave amplifier in the 1.3 to 2.7 GHz band with –2dBm input and 1W or 5W output.

Fig. 2.1 - MMT-HMT /P FRONT VIEW

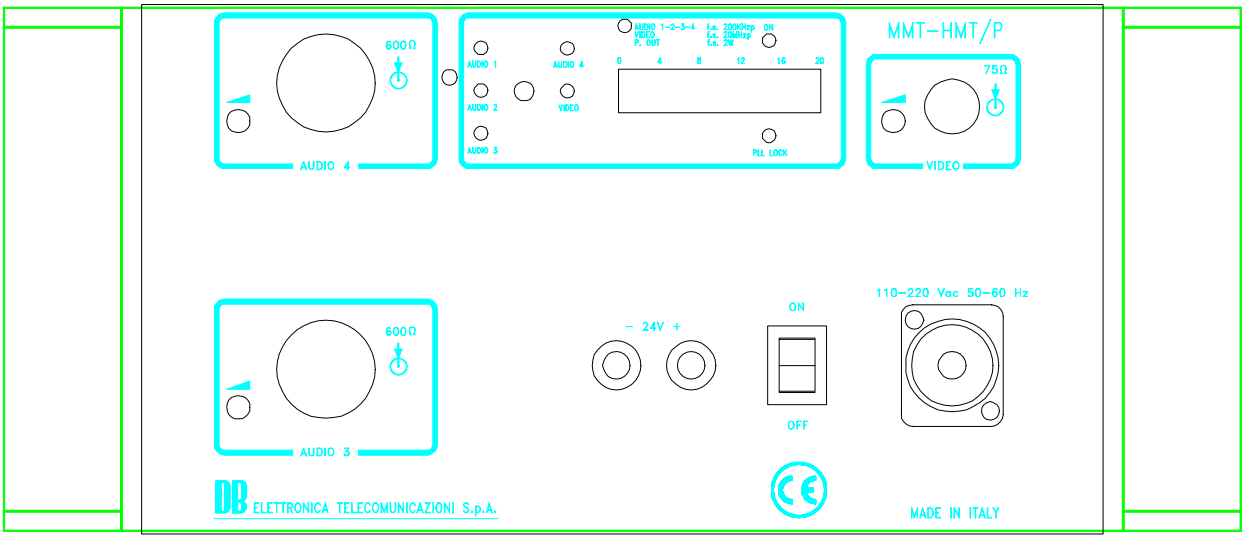
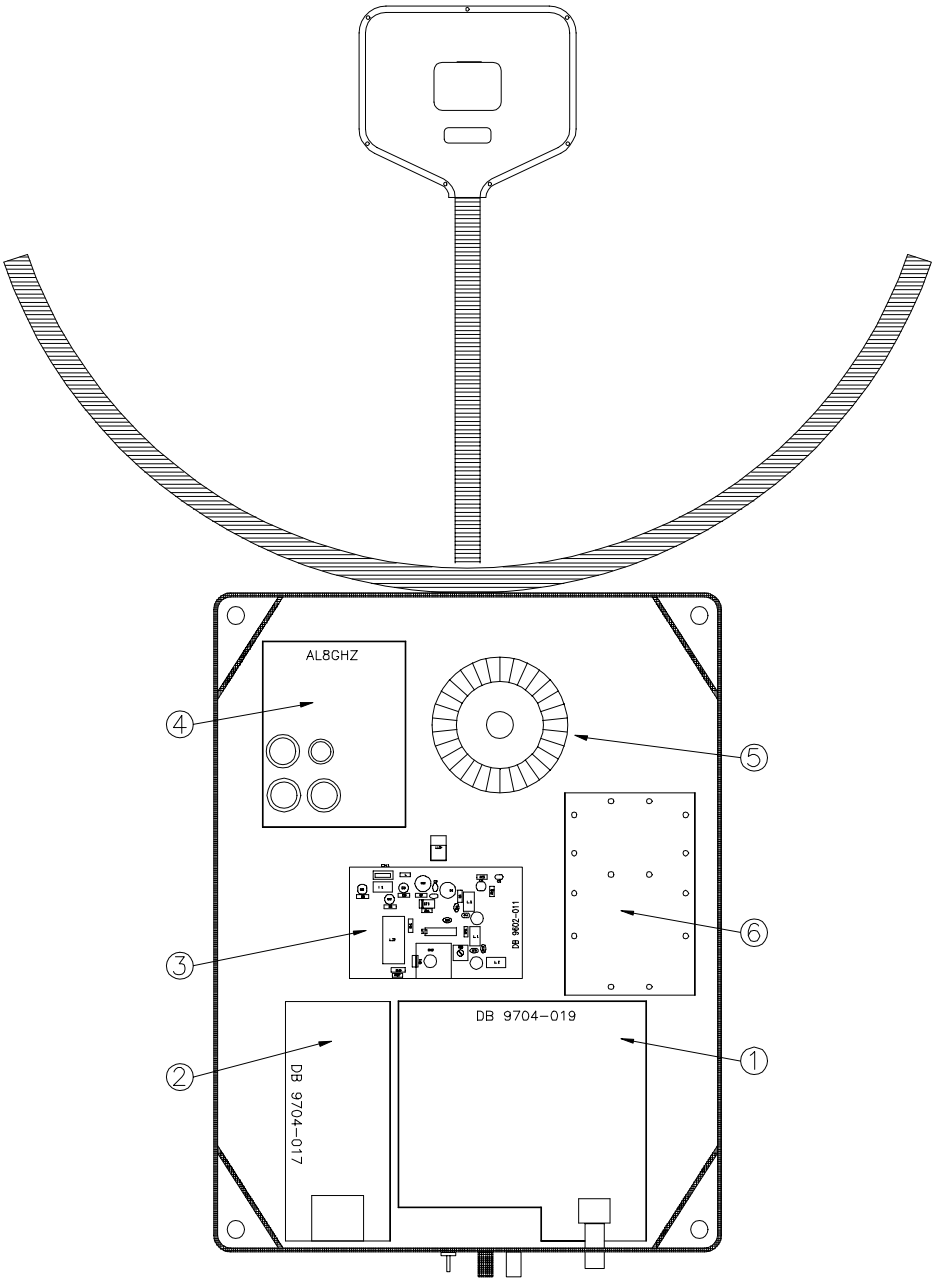
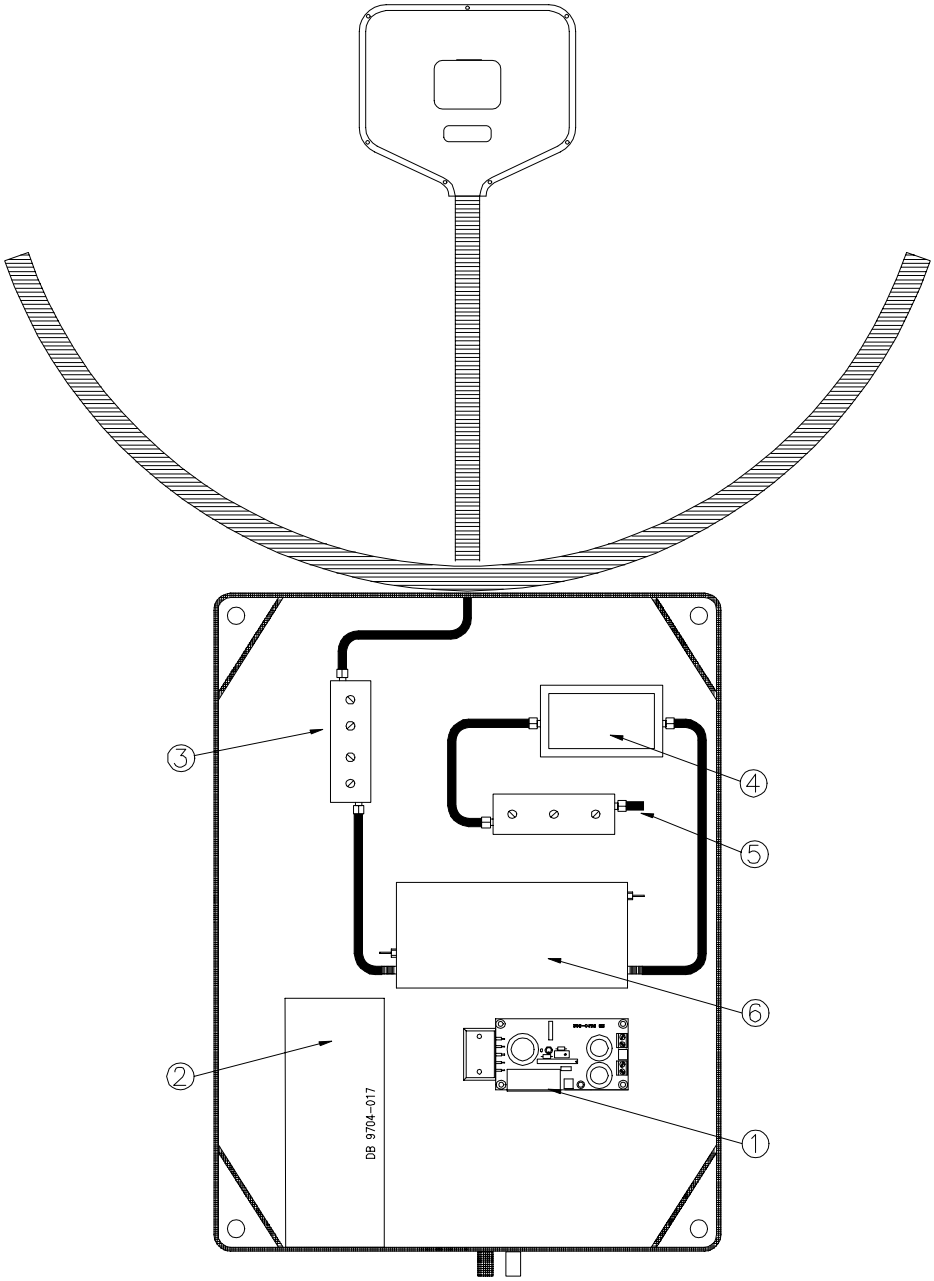


Fig. 2.2 - MMT-HMT /P UP LAYOUT



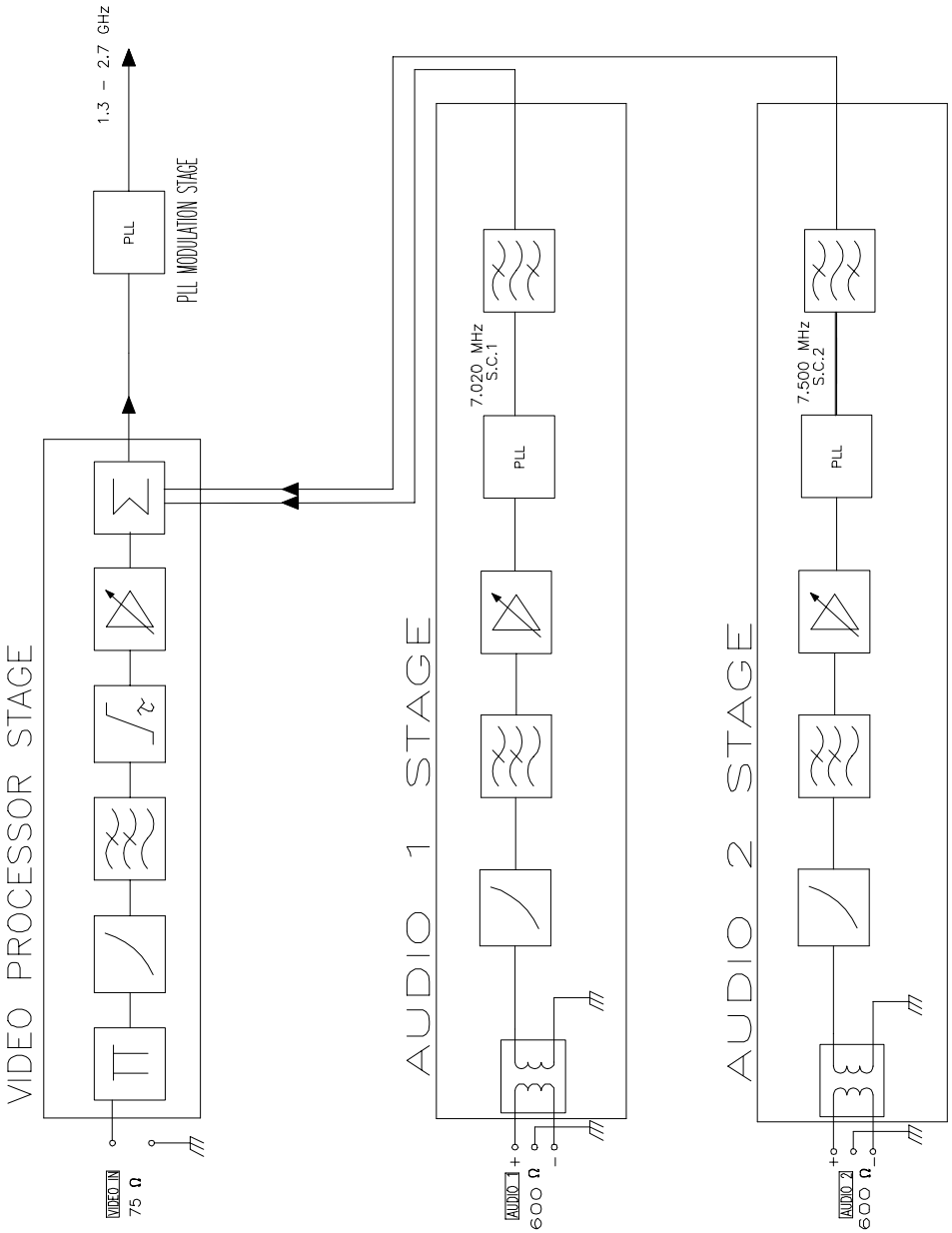
1) Video stage (DB 9704-019)
2) Audio subcarrier stage (DB 9704-017)
3) Power supply (+8V,-12V) (DB 9602-011)
4) Power supply (+12V) (AL8GHz)
5) Transformer
6) VCO stage

Fig. 2.3 - MMT-HMT /P DOWN LAYOUT



1) Amplifiers Power Supply
2) Audio Subcarrier
3) Output Low Pass Filter
4) Preamplifier Stage
5) Band Pass Filter
6) Power Amplifier

Fig. 2.4 - TRANSMITTER GENERAL BLOCK DIAGRAM



3. TX VIDEO STAGE

Fig. 3.1 - TX VIDEO STAGE GENERAL ELECTRICAL SCHEMATIC

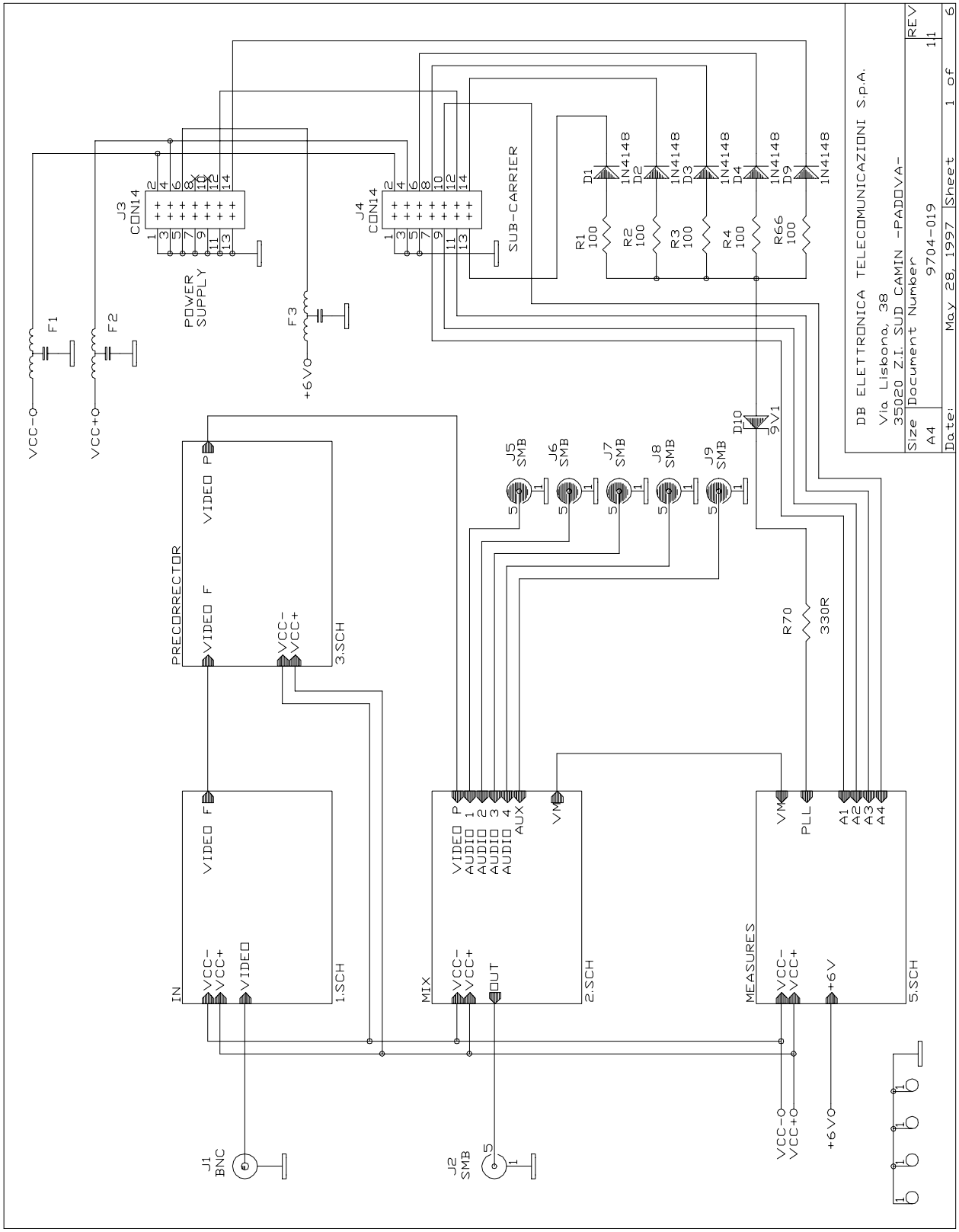


Fig. 3.2 - TX VIDEO INPUT ELECTRICAL SCHEMATIC

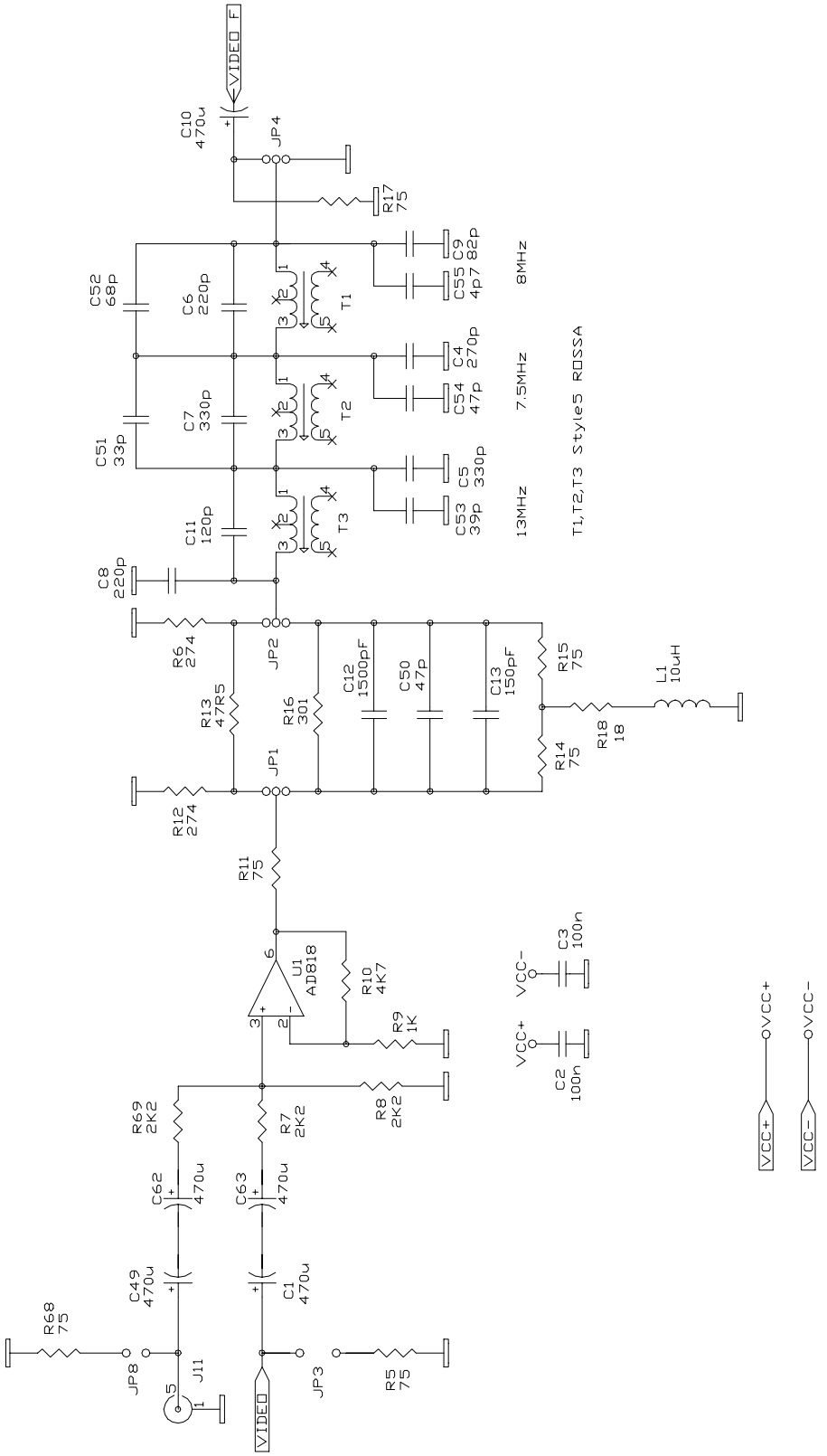


Fig. 3.3 - TX VIDEO MIX ELECTRICAL SCHEMATIC

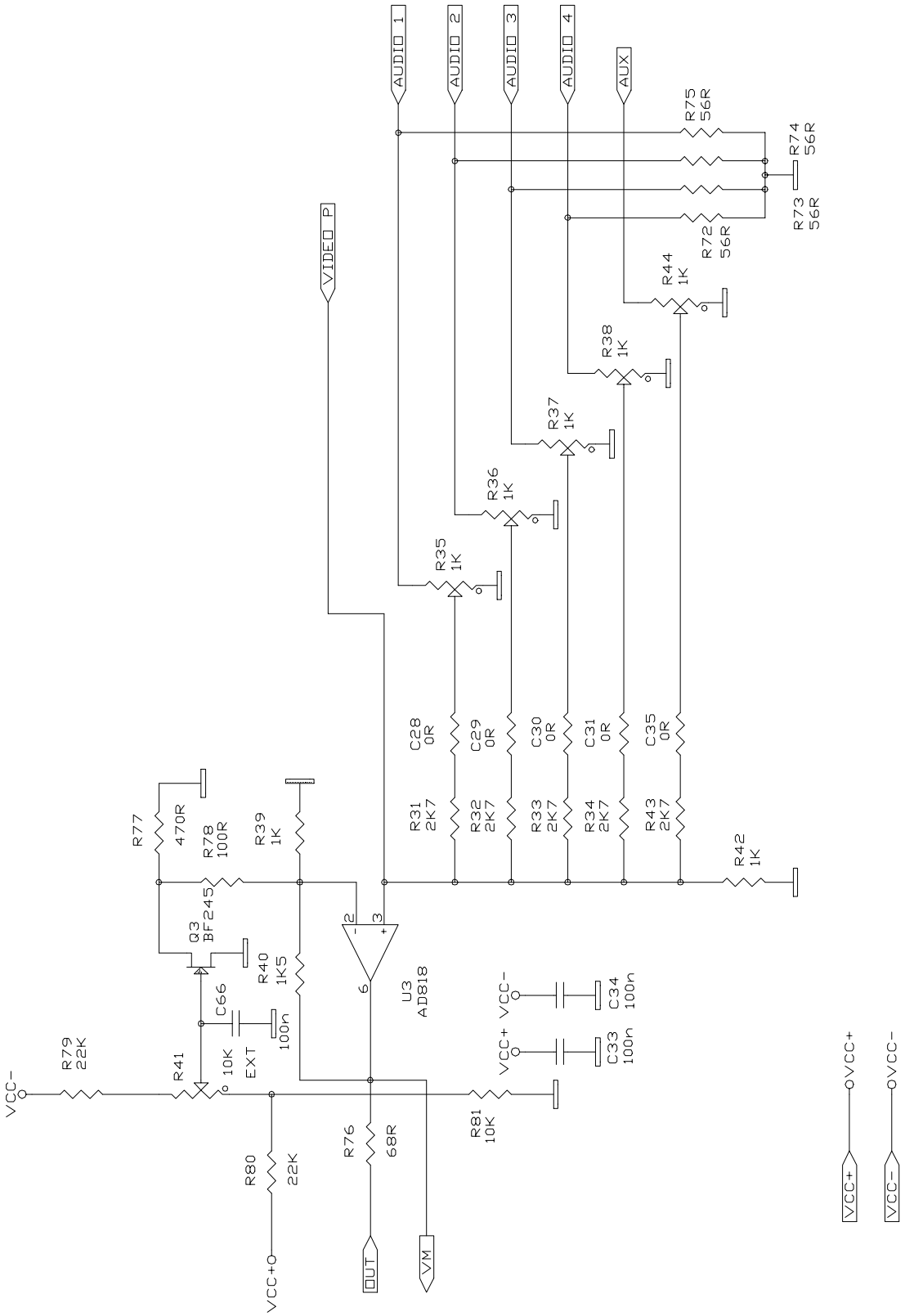


Fig. 3.4 - TX VIDEO PRECORRECTOR ELECTRICAL SCHEMATIC

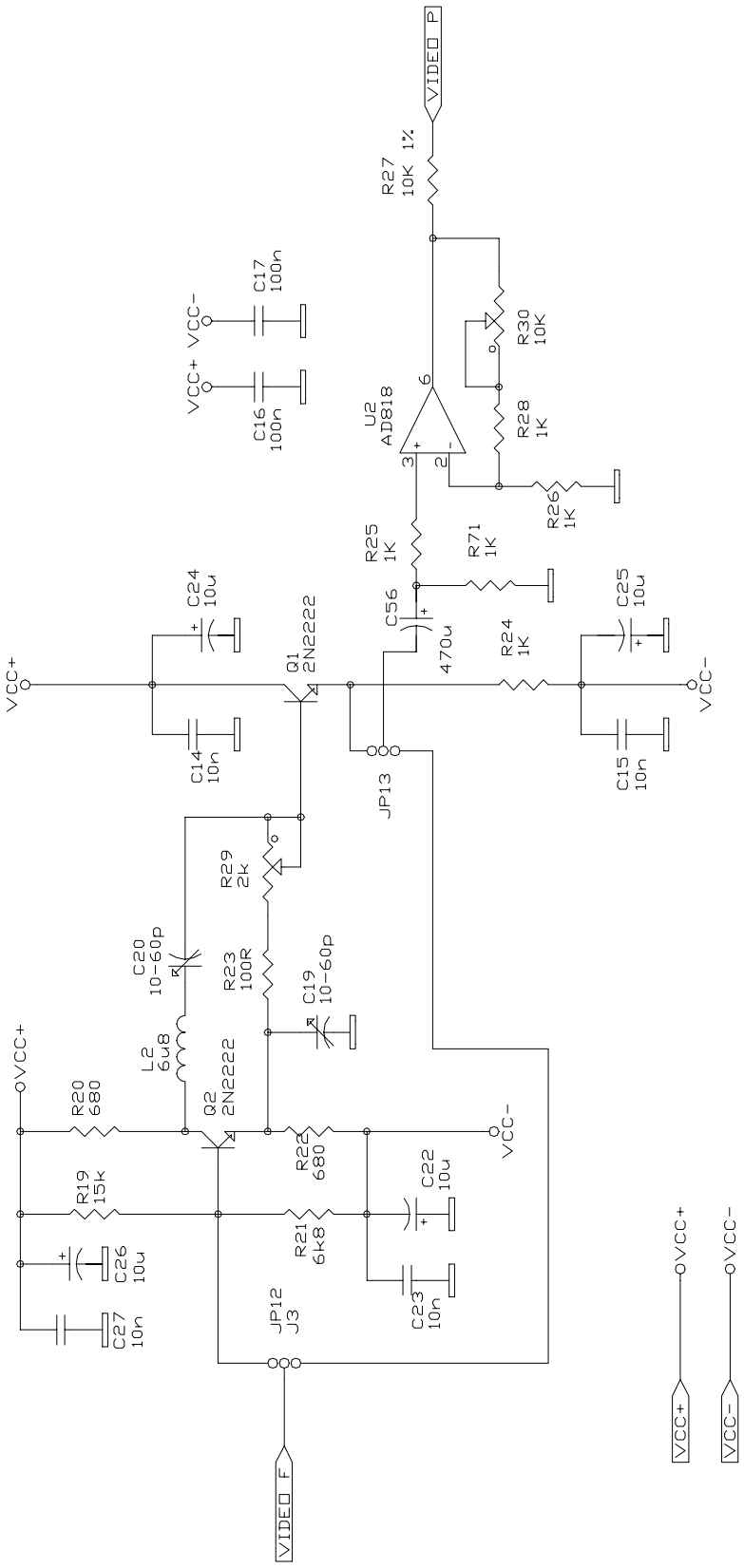


Fig. 3.5 - TX VIDEO MEASURES ELECTRICAL SCHEMATIC

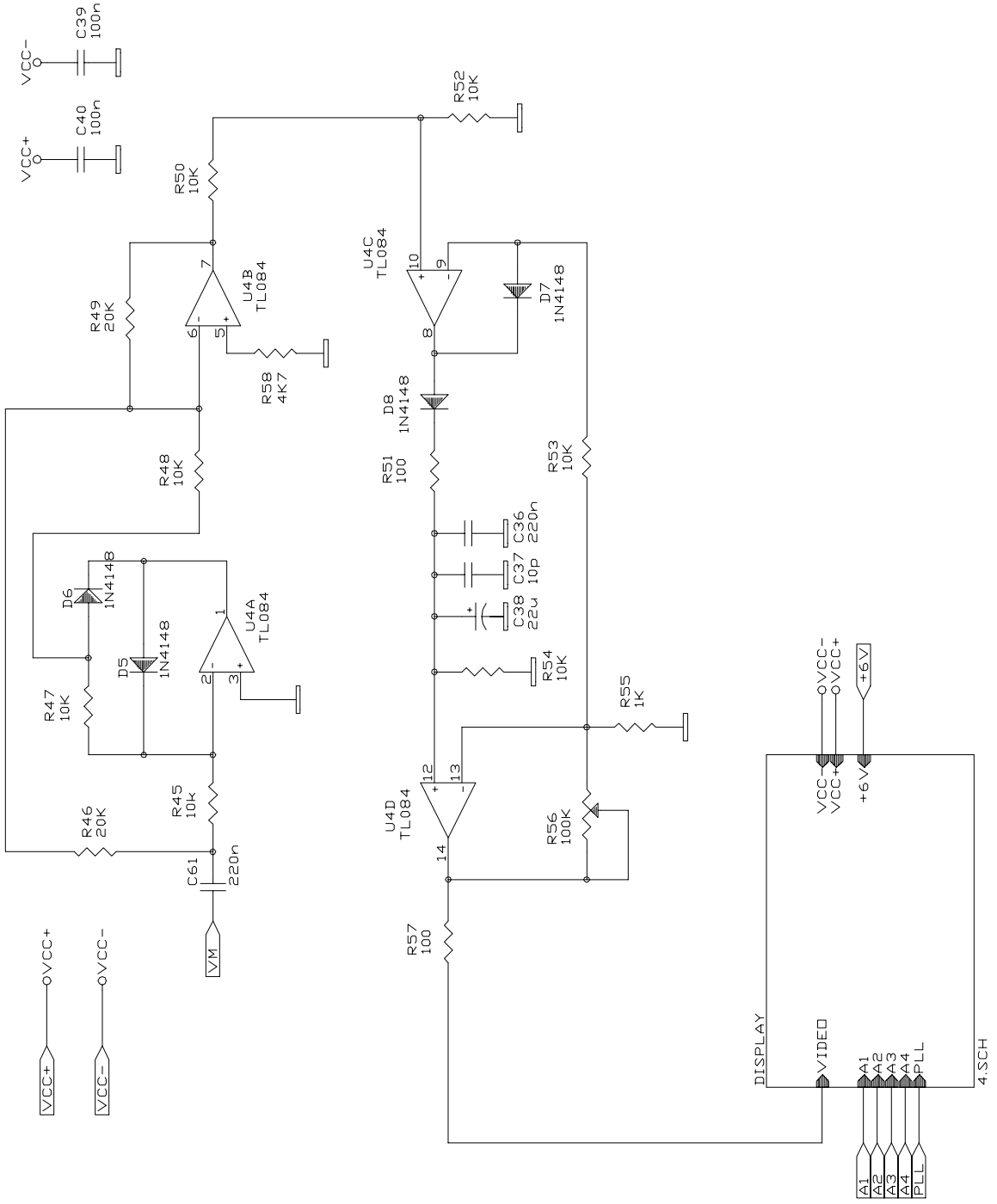


Fig. 3.6 - TX VIDEO DISPLAY ELECTRICAL DIAGRAM

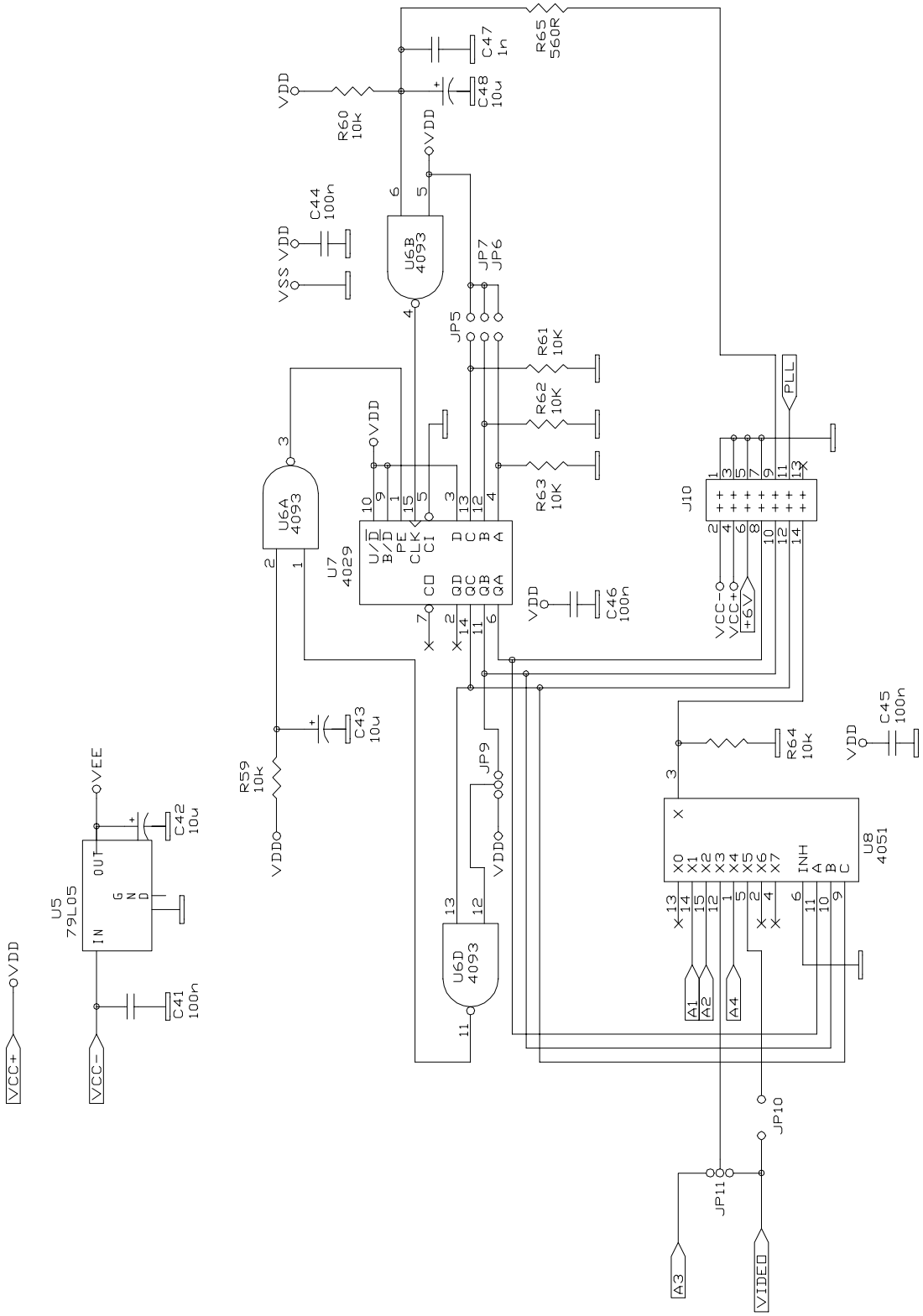
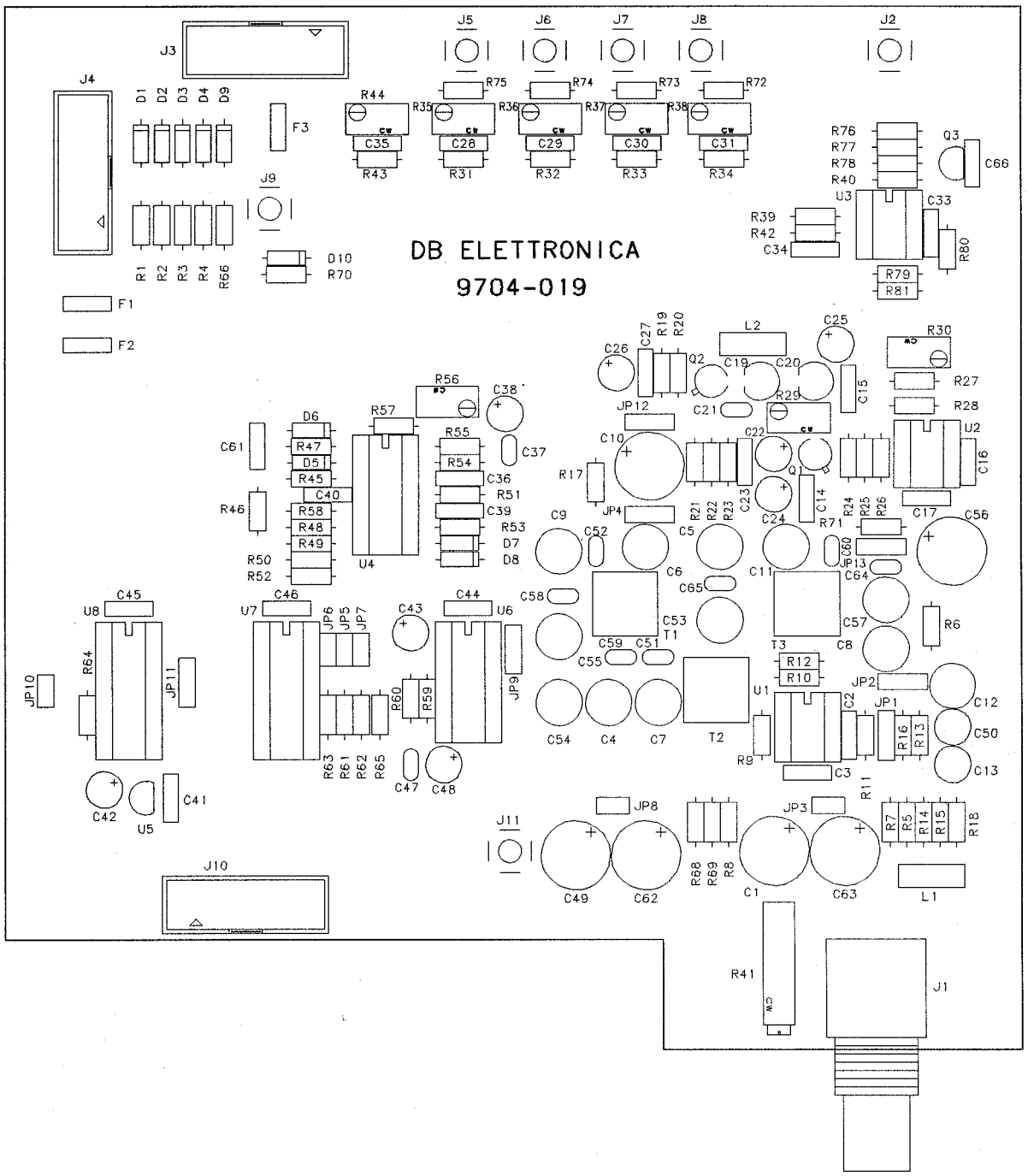


Fig. 3.7 - TX VIDEO STAGE COMPONENT LAYOUT (DB 9704-019)



3.1 TX VIDEO STAGE PARTS LIST

ITEM	QUANTITY	REFERENCE	PART	
1	4	C1,C10,C63,C56	470u	Electr Cap 25V
2	14	C2,C3,C16,C17,C23,C33,C34, C39,C40,C41,C44,C45,C46,C66	100n	POLY. CAP.
3	1	C4	270p	cer. cap.
4	2	C7,C5	330p	cer. cap.
5	2	C8,C6	220p	cer. cap.
6	1	C9	82p	cer. cap. NP0
7	1	C11	120p	cer. cap. NP0
8	1	C12	1500pF	POLY. cap.
9	1	C13	150pF	POLY. cap.
10	3	C14,C15,C27	10n	POLY. cap.
11	2	C19,C20		Mur. brown
12	1	C47 C48	1n	Cer.
13	7	C22,C24,C25,C26,C42,C43,C48	10u	Elec. cap. 25V
14	2	C36,C61	220n	POLY. cap.
15	1	C37	10p	cer. cap. NP0
16	1	C38	22u	Elec. Cap. 25V
17	2	C50,C54	47p	NPO
18	1	C51	33p	NPO
19	2	C52	68p	NPO
20	1	C53	39p	NPO
21	1	C55	4p7	NPO
22	9	D1,D2,D3,D4,D5,D6,D7,D8,D9	1N4148	DIODE SI
23	1	D10	9V1	Zener diode
24	3	F1,F2,F3		EMI
25	7	JP1,JP2,JP4,JP9,JP11→JP13	JP3	JUMPER X3
26	5	JP3,JP5,JP6,JP7,JP10	JP2	JUMPER X2
27	1	J1	BNC	CS 90°
28	7	J2,J5,J6,J7,J8,J9,J11	SMB	SMB CS
29	3	J3,J4,J10		CON14
30	1	L1	10Uh	inductance
31	1	L2	6u8	inductance
32	2	Q2,Q1	2N2222	NPN transistor
33	1	Q3	BF245	FET transistor
34	8	R1,R2,R3,R4,R51,R57,R66,R78	100	RES 1/4W
35	5	C28,C29,C30,C31,C35	0R	1/4W
36	5	R5,R11,R14,R15,R17	75R	1/4W 1%
37	2	R6,R12	274R	1/4W 1%
38	2	R7,R8	2K2	1/4W
39	9	R9,R24,R25,R26,R28,R39,R42 R55,R71	1K	1/4W 1%
40	2	R10,R58	4K7	1/4W 1%
41	1	R13	47R5	1/4W1%
42	1	R16	301R	1/4W 1%
43	1	R18	18R	1/4W 1%

ITEM	QUANTITY	REFERENCE	PART	
44	1	R19	15K	1/4W
45	2	R20,R22	680R	1/4W
46	1	R21	6K8	1/4W
47	5	R31,R32,R33,R34,R43	2K7	1/4W
48	1	R40	1K5	1/4W
49	3	R45,R47,R48	10K	1/4W 1%
50	2	R46,R49	20K	1/4W
51	11	R50,R52,R53,R54,R59,R60, R61,R62,R63,R64,R81	10K	1/4W
52	1	R56	100K	Trim. MG RV
53	1	R65	560R	1/4W
54	1	R70	330R	1/4W
55	4	R72,R73,R74,R75	56R	1/4W
56	1	R76	68R	1/4W
57	1	R77	470R	1/4W
58	2	R79,R80	22k	1/4W
59	1	R29	2K	Trim MG RV
60	1	R41	10K	Trim
61	5	R35,R36,R37,R38,R44	1K	Trim MG RV
62	1	R30	10K	Trim MG RV
63	3	T1,T2,T3	RED	Style 5
64	3	U1,U2,U3	AD818	
65	1	U4	TL084	
66	1	U5	79L05	
67	1	U6	4093 CMOS I.C.	
68	1	U7	4029 CMOS I.C.	
69	1	U8	4051 CMOS I.C.	

4. TX AUDIO SUBCARRIER STAGE

Fig. 4.1 - TX AUDIO SUBCARRIER STAGE GENERAL ELECTRICAL SCHEMATIC

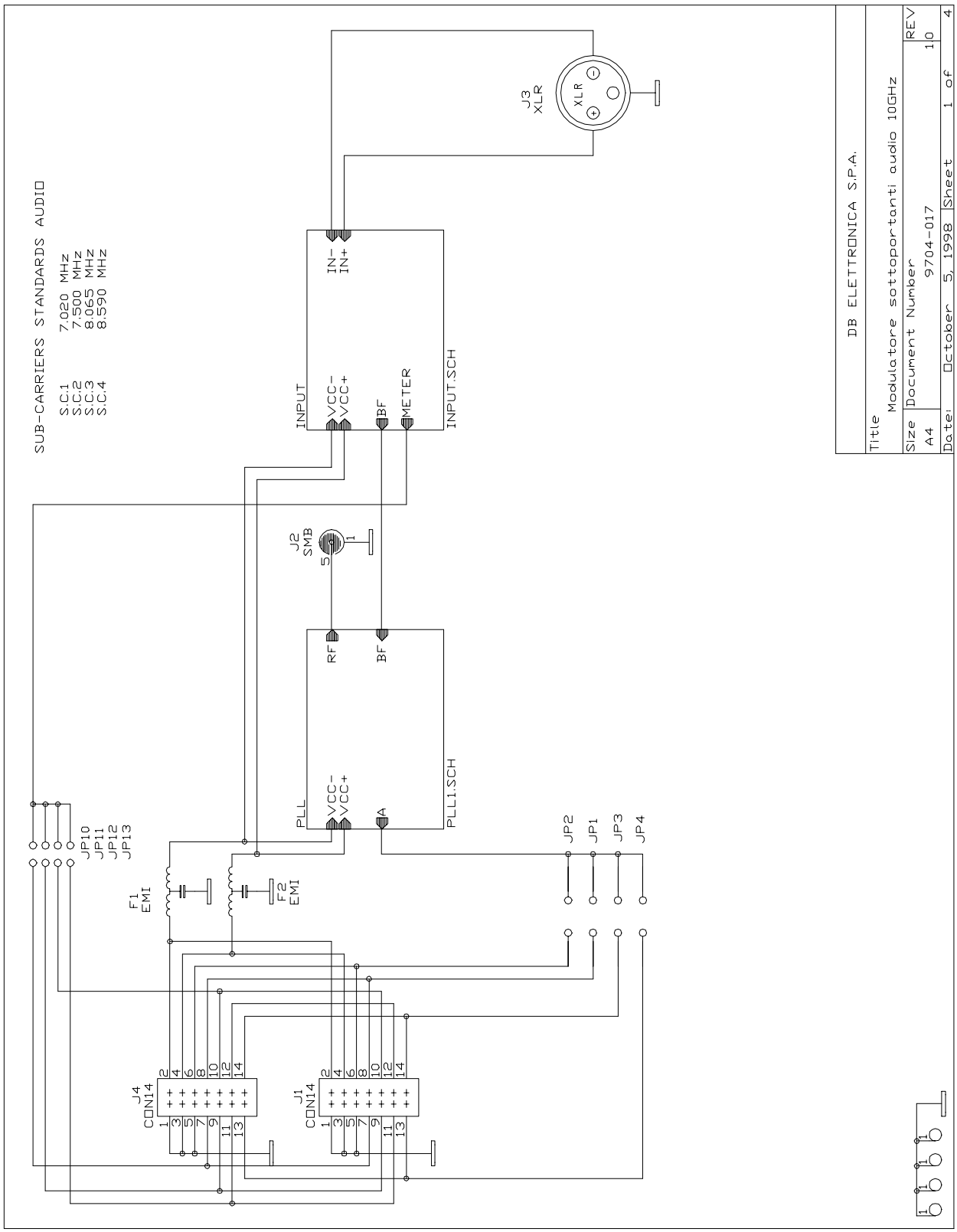


Fig. 4.2 - TX AUDIO SUBCARRIER INPUT ELECTRICAL SCHEMATIC

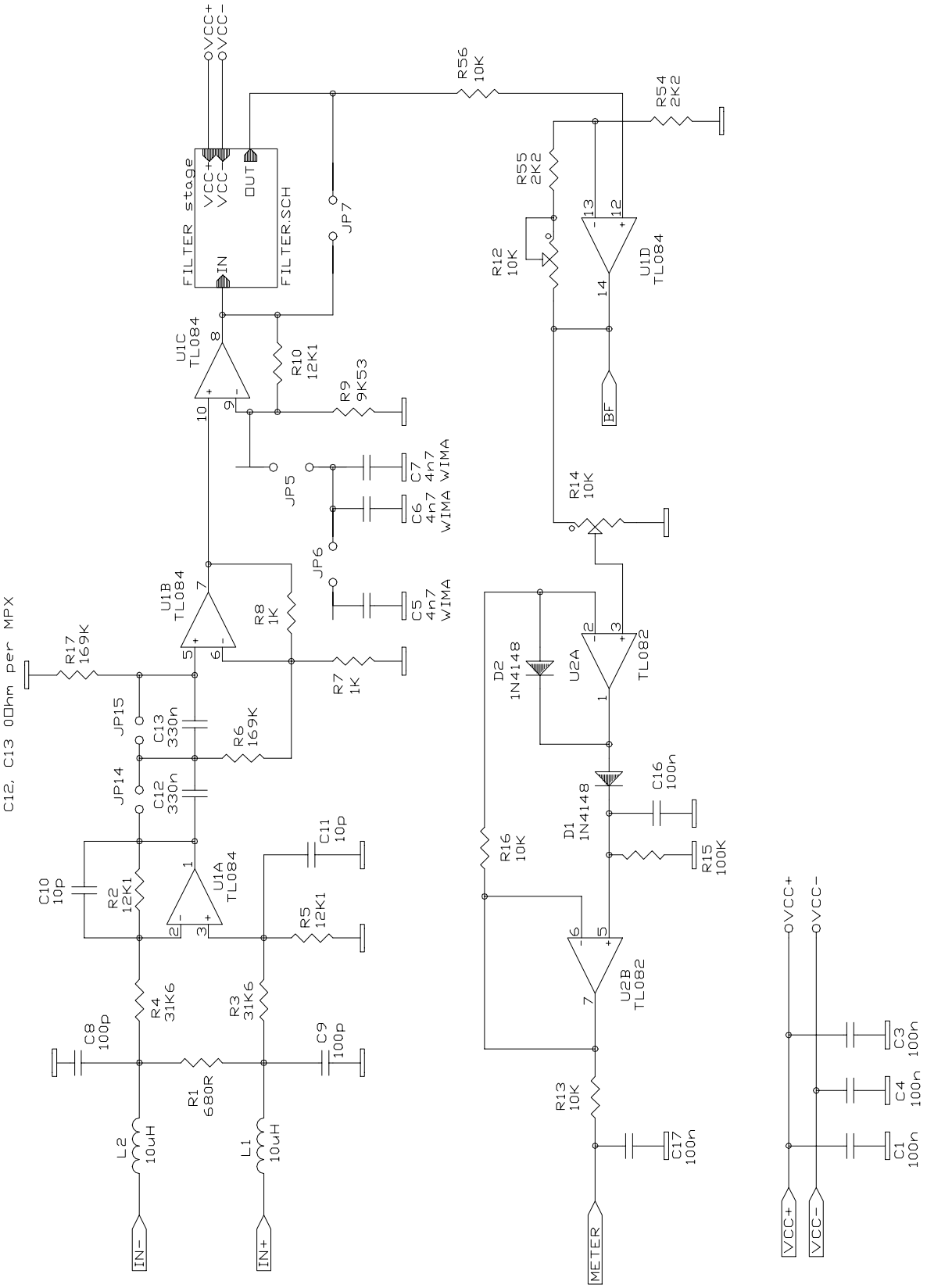


Fig. 4.3 - TX AUDIO SUBCARRIER FILTER ELECTRICAL SCHEMATIC

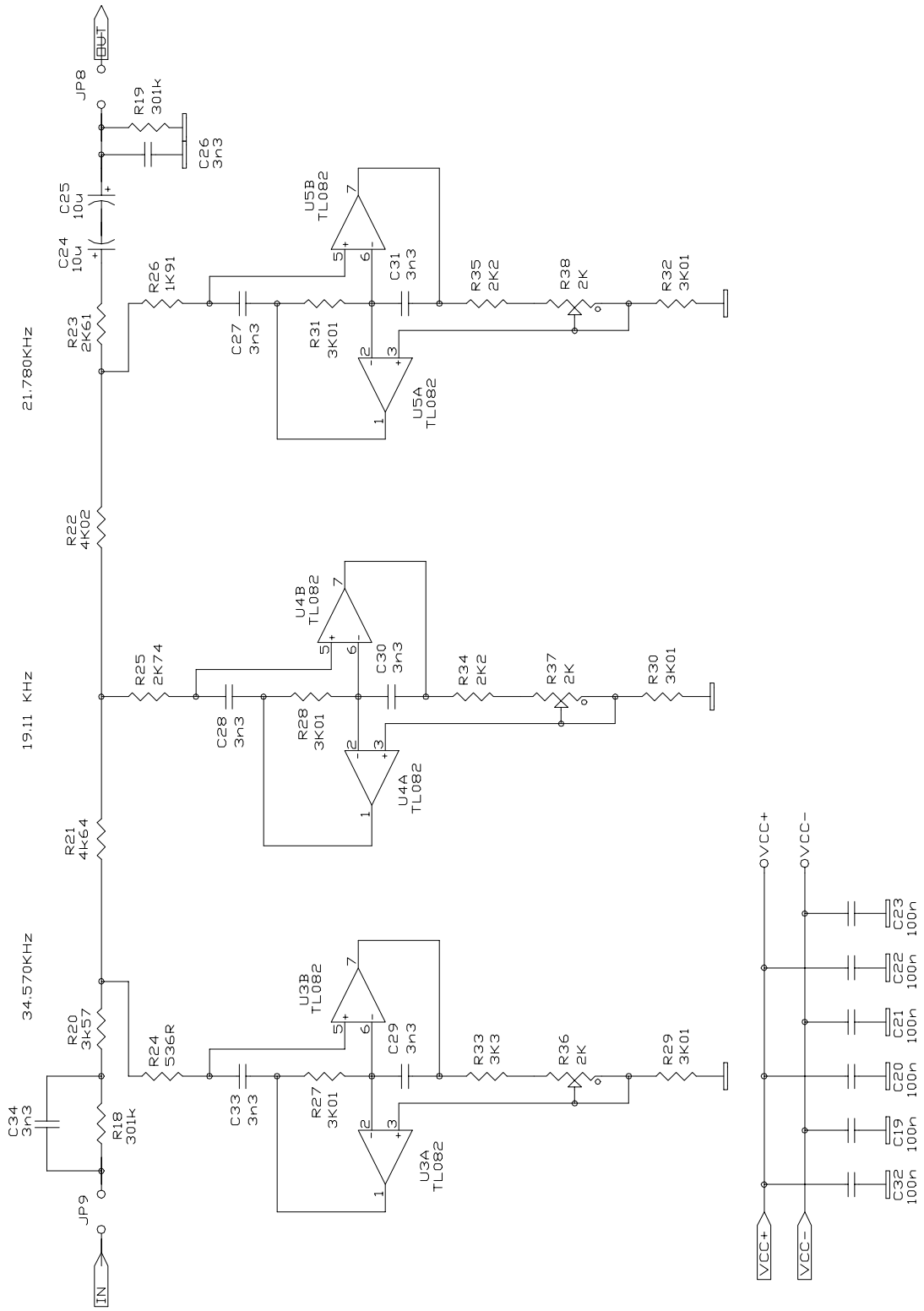


Fig. 4.4 - TX AUDIO SUBCARRIER PLL / VCO ELECTRICAL SCHEMATIC

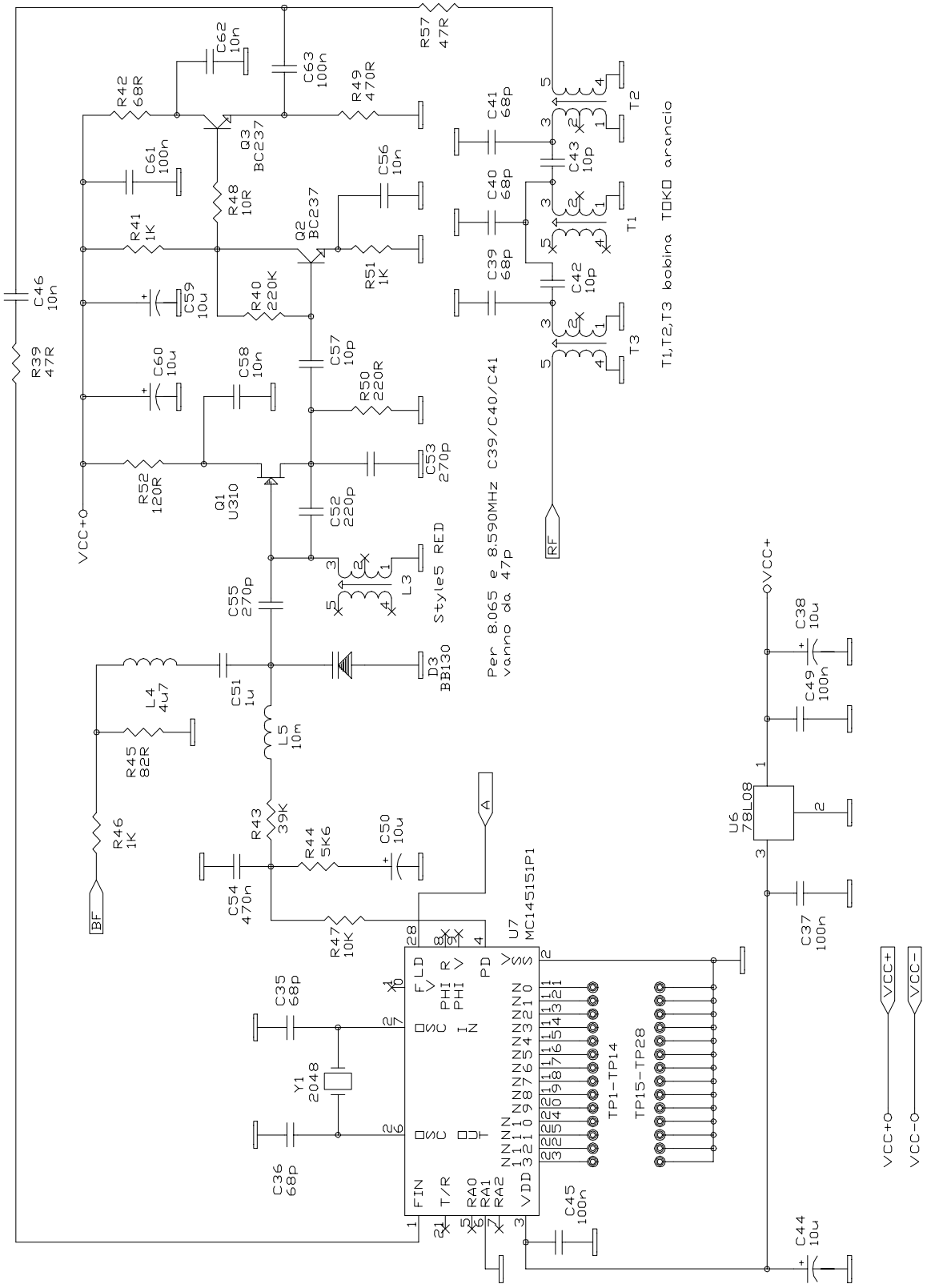
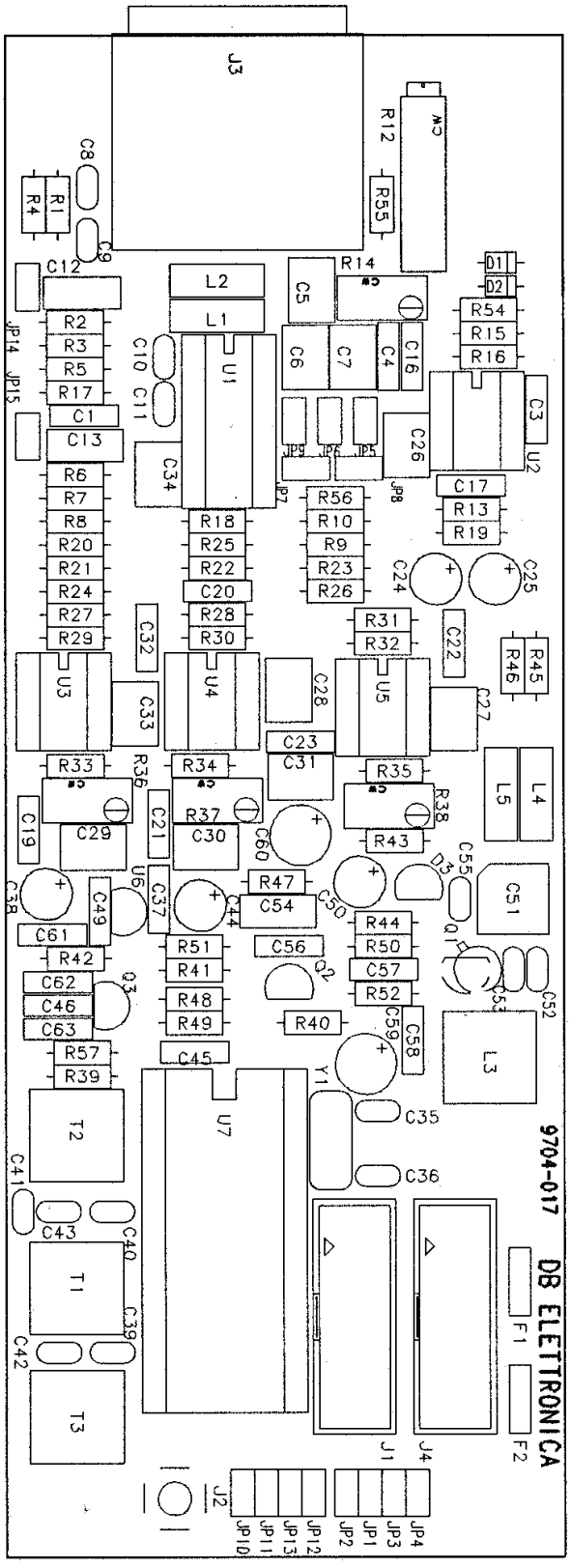


Fig. 4.5 - TX AUDIO SUBCARRIER STAGE COMPONENT LAYOUT (DB 9407-017)



4.1 TX AUDIO SUBCARRIER STAGE PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	16	C1,C3,C4,C16,C17,C19,C20, C21,C22,C23,C32,C37,C45, C49,C61,C63	100n poly. cap.
2	3	C5,C6,C7	4n7 poly. cap.
3	2	C8,C9	100p cer. cap.
4	5	C10,C11,C42,C43,C57	10p cer. cap.
5	2	C13,C12	330n poly. cap.
6	7	C24,C25,C38,C44,C50,C59,C60	10u Elect cap. 25V
7	8	C26,C27,C28,C29,C30,C31,C33,C34	3n3 poly. cap.
8	2	C35,C36	68p cer. cap. NP0
9	4	C46,C56,C62,C58	10n POLY. cap.
10	1	C51	1u POLY. cap.
11	1	C52	220p CER. cap.
12	2	C55,C53	270p CER. cap.
13	1	C54	470n POLY. cap.
14	2	D2,D1	1N4148 DIODE
15	1	D3	BB130 Varicap
16	2	F1,F2	EMI EMI filters
17	9	JP1,→,JP9,	JP2 JUMPER X2
18	6	JP10,→,JP15	JP JUMPER X2
19	2	J1,J4	CON 14p
20	1	J2	SMB CS
21	1	J3	XLR Cannon CS F
22	2	L2,L1	10u Inductance
23	1	L3	STYLE 5 Inductance
24	1	L4	4u7 Inductance
25	1	L5	10m Inductance
26	1	Q1	U310 FET transistor
27	2	Q3,Q2	BC237 transistor NPN
28	1	R1	680R RES 1/8W
29	3	R2,R5,R10	12K1 RES 1/4W 1%
30	2	R3,R4	31K6 RES 1/4W 1%
31	2	R6,R17	169K RES 1/4W 1%
32	5	R7,R8,R41,R46,R51	1K RES 1/4W 1%
33	1	R9	9K53 RES 1/4W 1%
34	1	R12	10K TRIMMER MG P
35	4	R13,R16,R47,R56	10K RES 1/4W
36	1	R14	10K TRIMMER MG RV
37	1	R15	100K RES 1/4W
38	2	R19,R18	301K RES 1/4W 1%
39	1	R20	3K57 RES 1/4W 1%
40	1	R21	4K64 RES 1/4W 1%
41	1	R22	4K02 RES 1/4W 1%
42	1	R23	2K61 RES 1/4W 1%
43	1	R24	536R RES 1/4W 1%

ITEM	QUANTITY	REFERENCE	PART	
44	1	R25	2K74	RES 1/4W 1%
45	1	R26	1K91	RES 1/4W 1%
46	6	R27,→,R32	3K01	RES 1/4W 1%
47	1	R55	1K5	RES 1/4W 1%
48	1	R33	3K3	RES 1/4W
49	3	R34,R35,R54	2K2	RES 1/4W
50	3	R36,R37,R38	2K	TRIM MG RV
51	2	R39,R57	47R	RES 1/4W
52	1	R40	220K	RES 1/4W
53	1	R42	68R	RES 1/4W
54	1	R43	39K	RES 1/4W
55	1	R44	5K6	RES 1/4W
56	1	R45	82R	RES 1/4W
57	1	R48	10R	RES 1/4W
58	1	R49	470R	RES 1/4W
59	1	R50	220R	RES 1/4W
60	1	R52	120R	RES 1/4W
61	3	T1,T2,T3	TOKO	Inductances
62	1	U1	TL084	OP. AMP.
63	4	U2,U3,U4,U5	TL082	OP. AMP.
64	1	U6	78L08	Voltage reg
65	1	U7	MC145151	PLL
66	1	Y1	2.048MHz	Quartz Crystal

5. MODULATION STAGE

Fig. 5.1 - MODULATION STAGE GENERAL ELECTRICAL SCHEMATIC

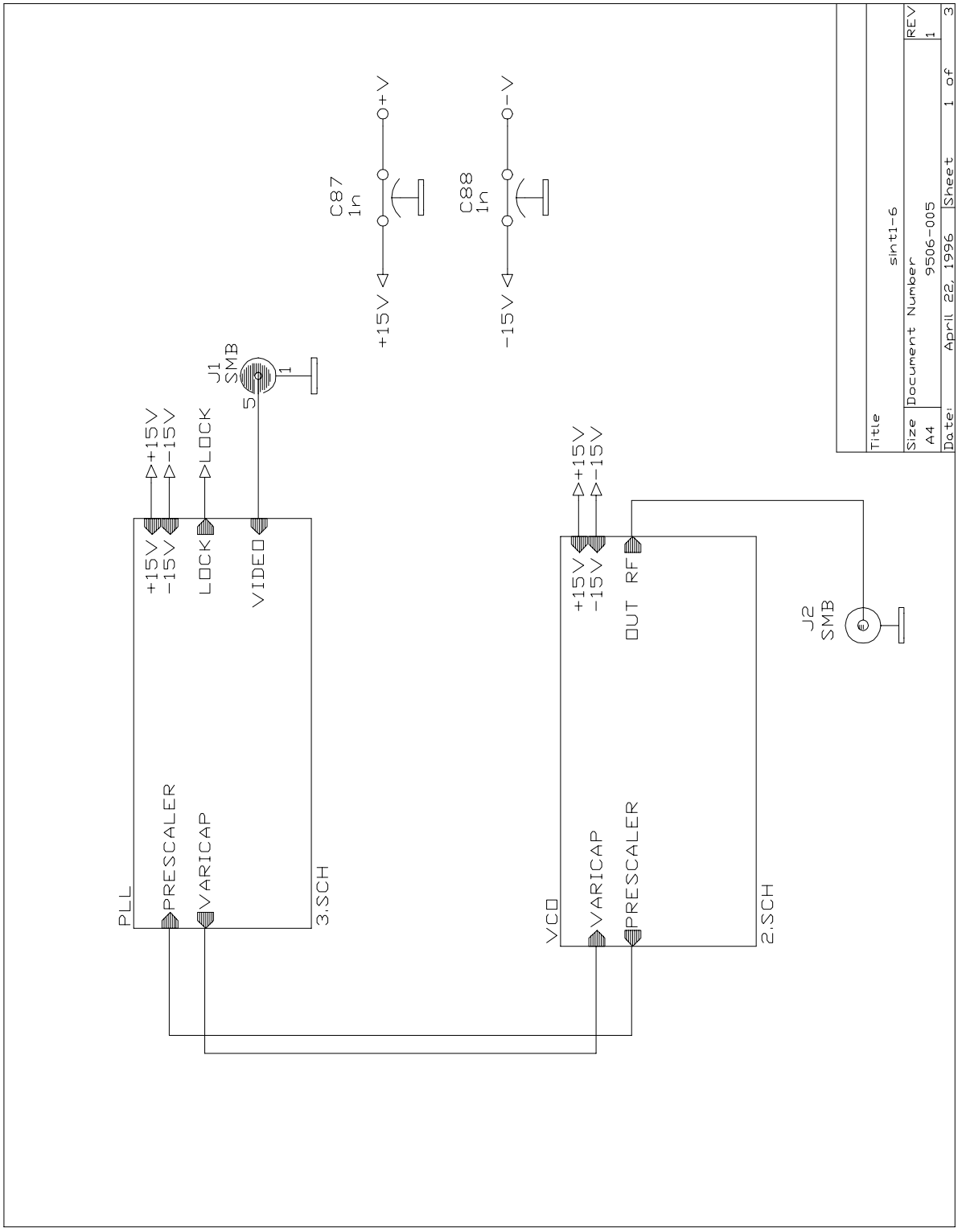


Fig. 5.2 - MODULATION STAGE VCO ELECTRICAL SCHEMATIC

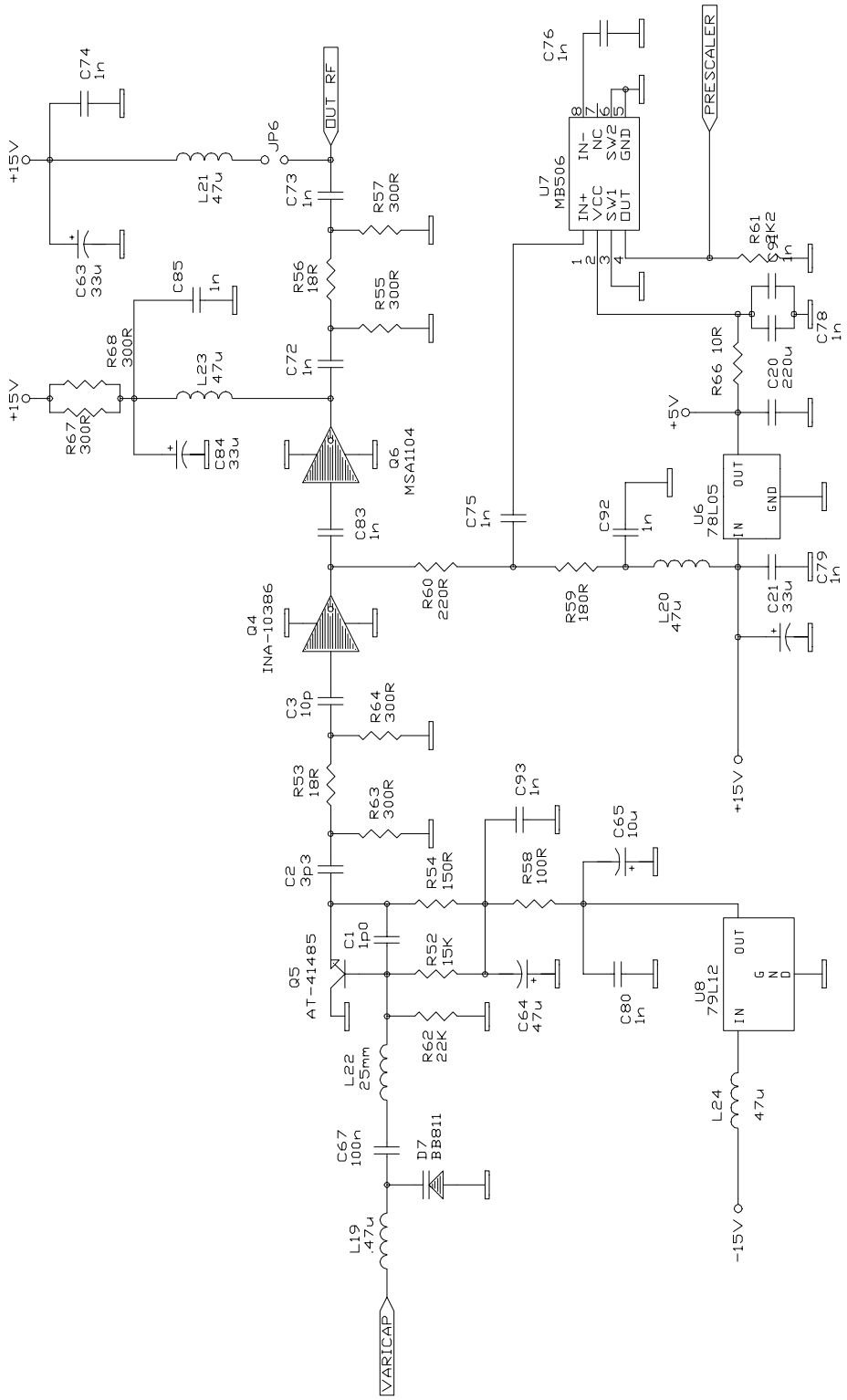


Fig. 5.3 - MODULATION STAGE PLL ELECTRICAL SCHEMATIC

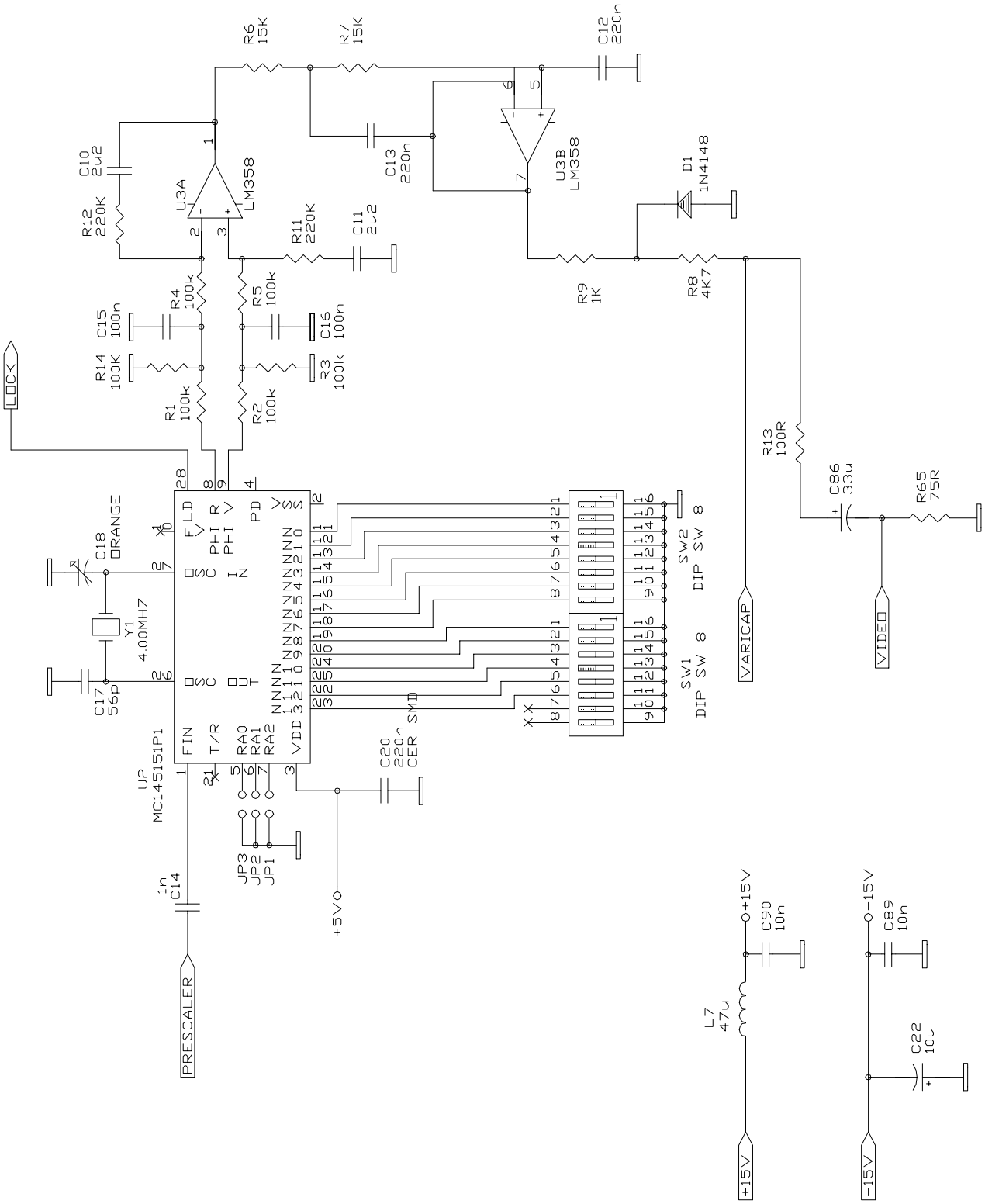
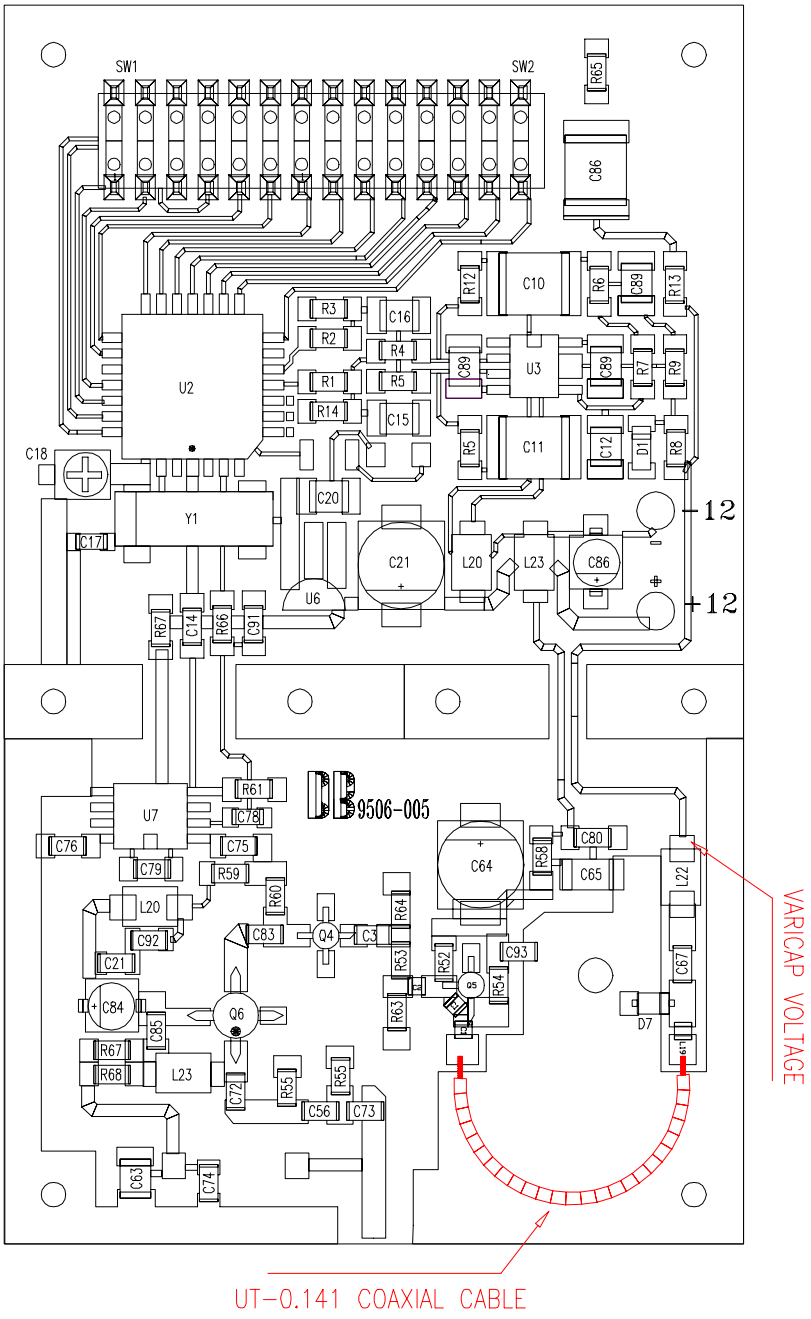


Fig. 5.4 - MODULATION STAGE COMPONENT LAYOUT (DB 9506-005)



5.1 MODULATION STAGE PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	1	C1	1p0 CER HQ SMD
2	2	C2,C3	3p3 CER HQ SMD
3	2	C10,C11	2u2 CER SMD
4	3	C12,C13,C20	220n CER SMD
5	11	C14,C72,C73,C75,C76,C78, C79,C83,C85,C92,C93	1n CER SMD
6	2	C15,C16	100n CER SMD
7	1	C17	56p CER SMD
8	1	C18	ORANGE VAR. CAP. SMD
9	2	C20,C64	220u ELECT CAP SMD
10	3	C21,C84,C86	33u ELECT CAP SMD
11	1	C22	10u ELECT CAP SMD
12	1	C65	10u TANTALUM
13	1	C67	10n CER SMD
14	3	C87,C88,C98	1n feed-trough CAP
15	2	C90,C89	10n CER SMD
16	1	C94	1n CER SMD
17	1	C95	4u7 ELECT CAP SMD
18	1	C96	10u ELECT CAP
19	1	C97	1n CER SMD
20	1	C99	33u ELECT CAP SMD
21	1	D1	1N4148 Diode SMD
22	1	D7	BB811 Diode Varicap SMD
23	2	JP1,JP2	JP2 JUMPER 2 poles
24	1	JP3	JP2 JUMPER 2 poles
25	2	J1,J2	SMB connectors
26	4	L7,L20,L23,L24	47u Inductance SMD
27	1	L19	.47u Inductance SMD
28	1	L22	25mm Coaxial cable
29	1	L25	VK200 Inductance
30	1	Q4	INA10386 Micro int. amp.
31	1	Q5	AT-41485 Micro int. amp.
32	1	Q6	MSA1104 Microw int. amp.
33	6	R1,R2,R3,R4,R5,R14	100k R. SMD
34	3	R6,R7,R52	15K R. SMD
35	1	R8	4K7 R. SMD
36	1	R9	1K R. SMD
37	2	R11,R12	220K R. SMD
38	2	R58,R13	100R R. SMD
39	2	R56,R53	18R R. SMD
40	1	R54	150R R. SMD

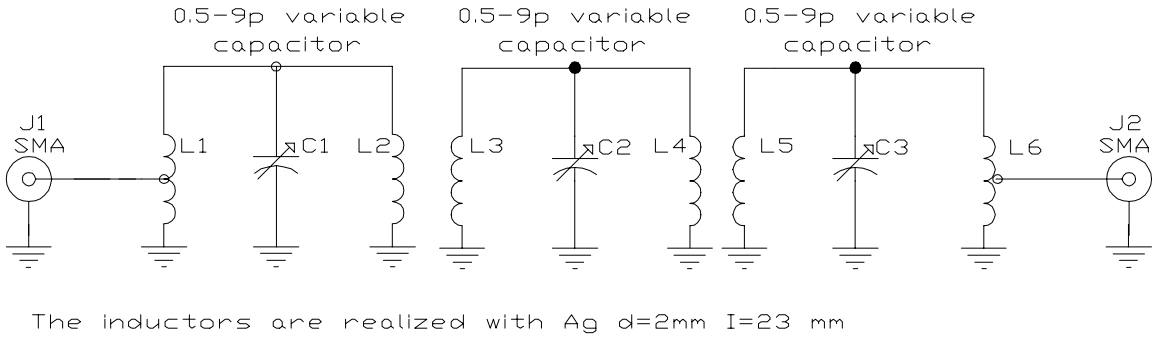
ITEM	QUANTITY	REFERENCE	PART
41	4	R55,R57,R63,R64	300R R. SMD
42	1	R59	180R R. SMD
43	1	R60	220R R. SMD
44	1	R61	2K2 R. SMD
45	1	R62	22K R. SMD
46	1	R65	75R R. SMD
47	1	R66	10R R. SMD
48	2	R67,R68	390R R. SMD
49	2	SW1,SW2	DIP SW 8 Dip switches
50	1	U2	MC145151 Integr cir SMD
51	1	U3	LM358 Integr cir SMD
52	1	U6	78L05 Voltage reg.
53	1	U7	MB506 Integr cir SMD
54	1	U8	79L12 Voltage reg.
55	1	Y1	4.00MHZ quartz cry SMD

6. FILTER STAGES

6.1 BAND PASS FILTER GENERAL DESCRIPTION

The pass band filter permits to obtain a desired frequency by means a multiply of its input frequency.

Fig. 6.1 - BAND PASS FILTER ELECTRICAL SCHEMATIC



6.2 OUTPUT LOW PASS FILTER GENERAL DESCRIPTION

The output low pass filter permits to eliminate the harmonic and spurious emission of the transmitting frequency, and they are taken below the nominal value required by international standards.

No settings or adjustments are required even in case of transmitting frequency change, within the maximum limits that we have indicated (± 20 MHz from pre-imposed transmission frequency).

7. TX AMPLIFIER SECTION

7.1 GENERAL DESCRIPTION

The amplifier section is basically composed of a preamplifier (DB 9606-018 - 30 dB gain) that receive the input signal at 1.3 - 2.7 GHz, and a power amplifier stage that furnish 2 or 5W output power.

The electrical schematic and layout components are following indicated.

Fig. 7.1 - TX PRE AMPLIFIER ELECTRICAL SCHEMATIC (DB 9606-018)

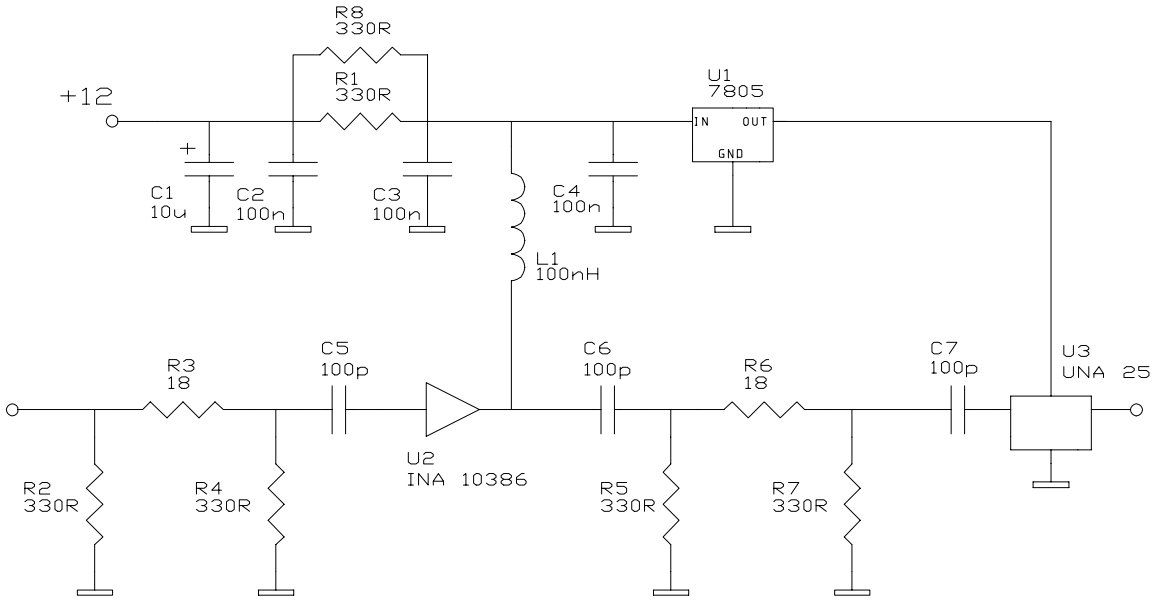
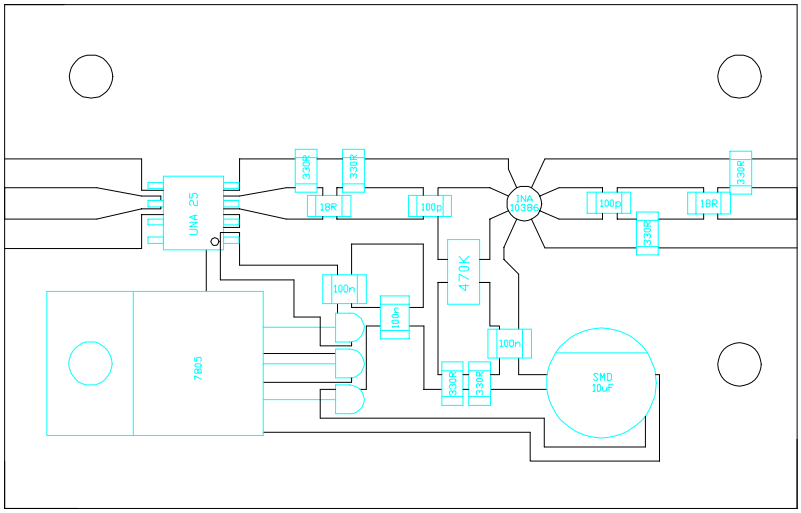


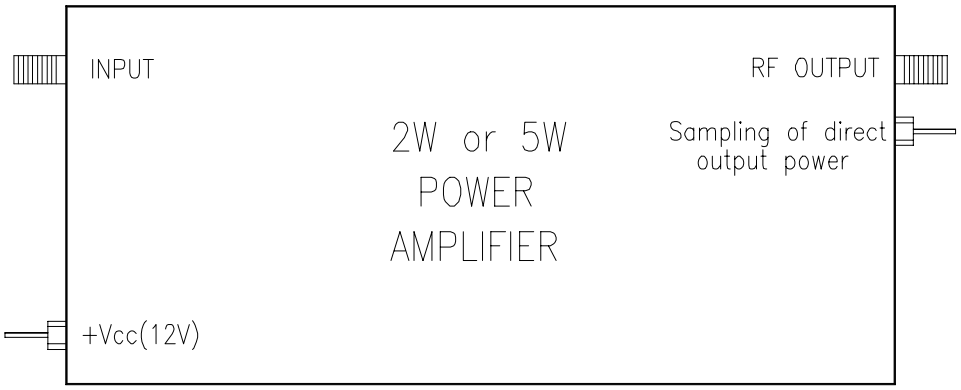
Fig. 7.2 - TX PRE AMPLIFIER COMPONENT LAYOUT (DB 9606-018)



7.2 TX PRE AMPLIFIER PARTS LIST (DB 9606-018)

ITEM	QUANTITY	REFERENCE	PART
1	1	C1	10u Elett.SMD
2	3	C2,C3,C4	100n SMD
3	3	C5,C6,C7	100p SMD
4	6	R1,R2,R4, R5,R7,R8	330R SMD
6	2	R3,R6	18R SMD
7	1	U1	7805
8	1	U2	INA 10386
9	1	U3	UNA 25

Fig. 7.3 - TX 2/5W POWER AMPLIFIER SCHEMATIC



8. TX AMPLIFIER POWER SUPPLY SECTION

Fig. 8.1 - TX AMPLIFIER POWER SUPPLY ELECTRICAL SCHEMATIC

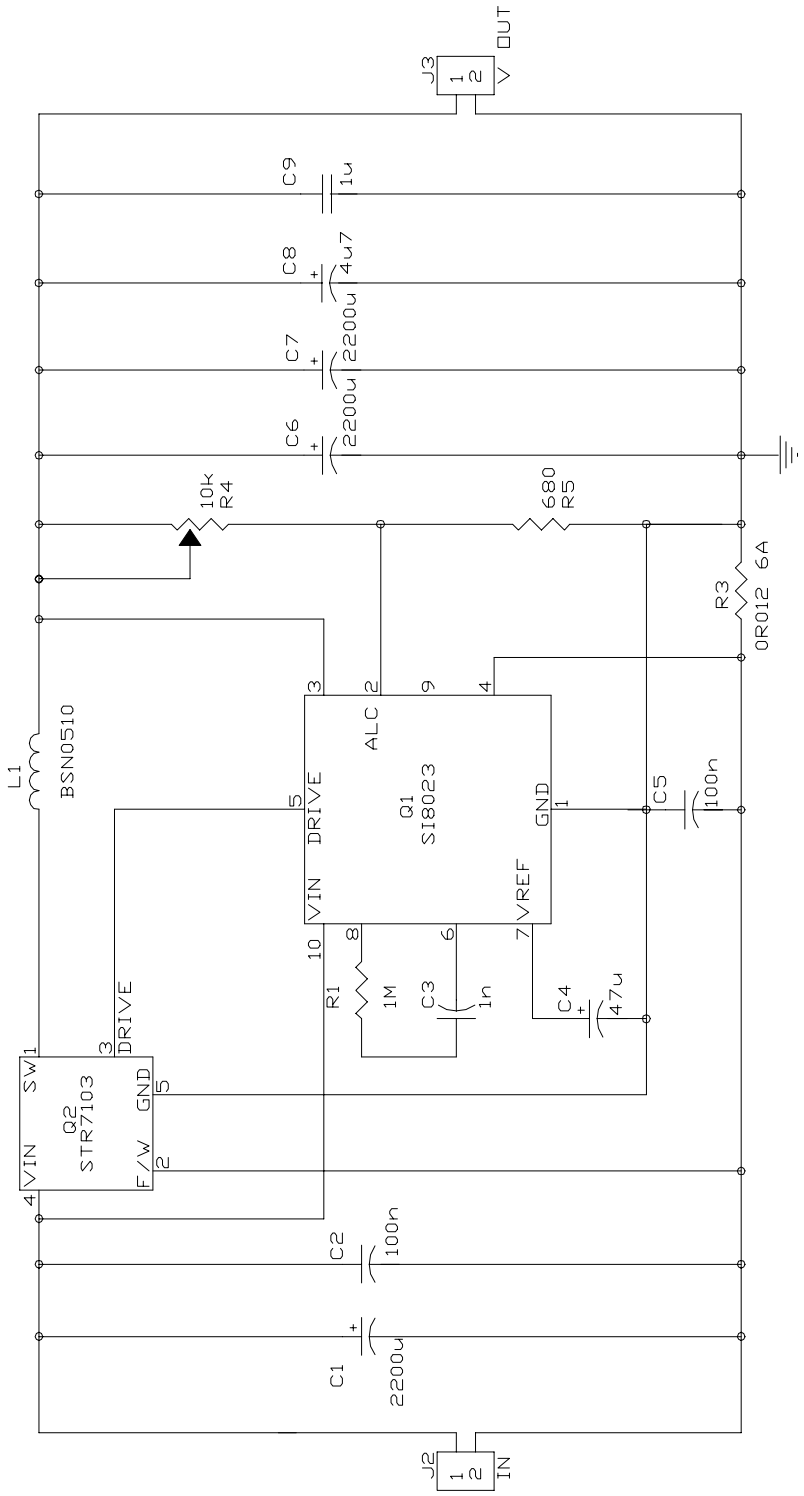
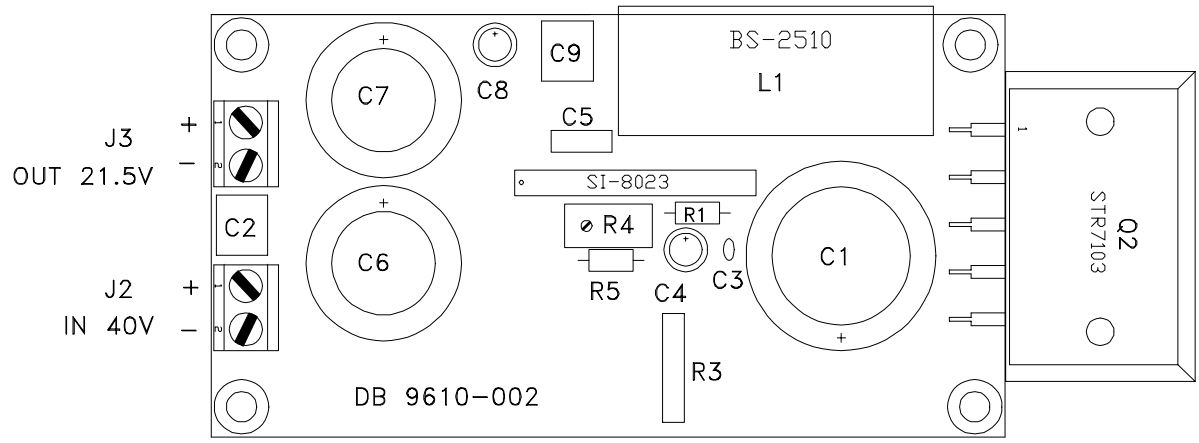


Fig. 8.2 – TX AMPLIFIER POWER SUPPLY COMPONENT LAYOUT (DB 9610-002)



8.1 TX AMPLIFIER POWER SUPPLY PARTS LIST

ITEM	QUANTITY	REFERENCE	TYPE	PART
1	1	C1	Electrolytic capacitor 63V	2200u
2	2	C2,C5	Polyester capacitor 63V	100n
3	1	C3	Ceramic capacitor	1n
4	2	C4,C8	Electrolytic capacitor 63V	4u7
5	2	C6,C7	Electrolytic capacitor 50V	2200u
6	1	C9	Polyester. capacitor 63V	1u
7	1	Q1	Integrated circuit	SI8023
8	1	L1	Inductor	BSN0510
9	2	J2,J3	Morsetto CSV 2 pin	AK7002VIE
10	1	Q2	Integrated circuit	STR7103
11	1	R1	Resistor 1/4W	1M
12	1	R5	Resistor 1/4W	680R
13	1	R3	Resistor	0R012 6A
14	1	R4	Trimmer mul.	10k

9. DMT-HMR /P FUNCTIONAL DESCRIPTION

The 2 GHz receiver is composed of two fundamental parts:

I) DMT (Microwave TV Demodulator)

DMT performs the following functions:

- Global signal (Video and subcarriers) demodulation at 70 MHz.
- Video signal processing.
- Subcarriers signals (7500, 8065 kHz) demodulation.

As seen in block diagram, the circuit is composed of :

1) Video and subcarrier IF (70 MHz) demodulation stage with:
   amplification
   mixer
   band-pass filter
   demodulator
2) Video processing stage with:
   low-pass filter
   delay group pre corrector
   adjustable amplification
   deemphasis circuit
   75 Ω BNC output
3) Four subcarriers demodulation stage with:
   band-pass filter
   demodulation (signal at 7500, 8065 KHz)
   adjustable amplification
   deemphasis circuit
   low-pass filter
   balun transformer
   600 Ω XLR CANON output

II) HMR (Head Microwave Receiver)

It consists of a wideband receiver in the 1.3 to 2.7 GHz band with input level range from –-90dBm to –15dBm.

Fig. 9.1 - DMT-HMR /P FRONT VIEW

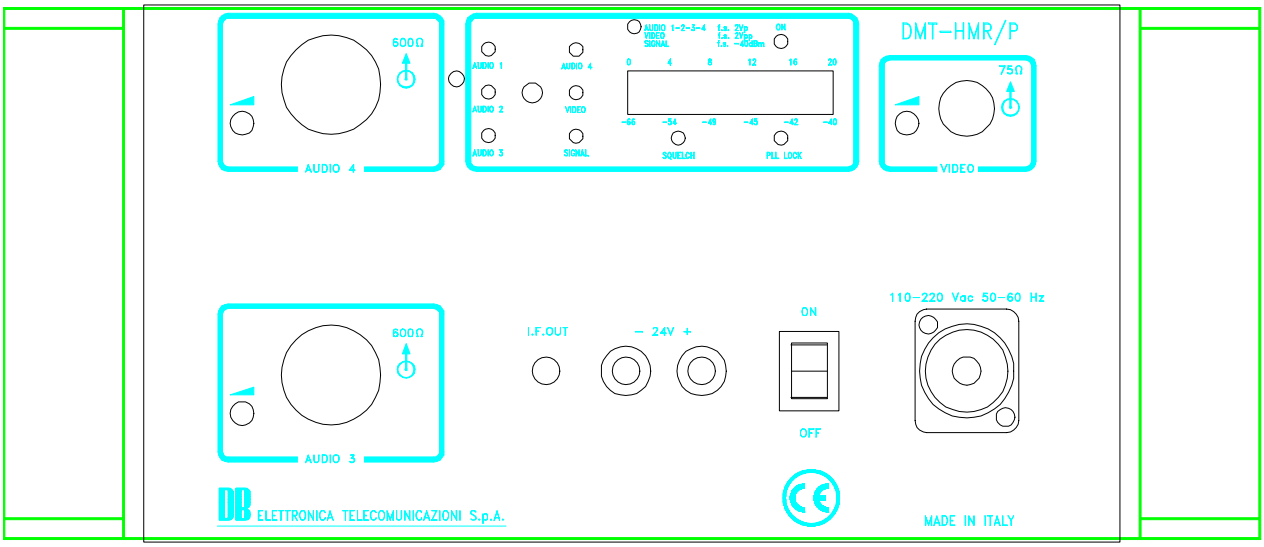
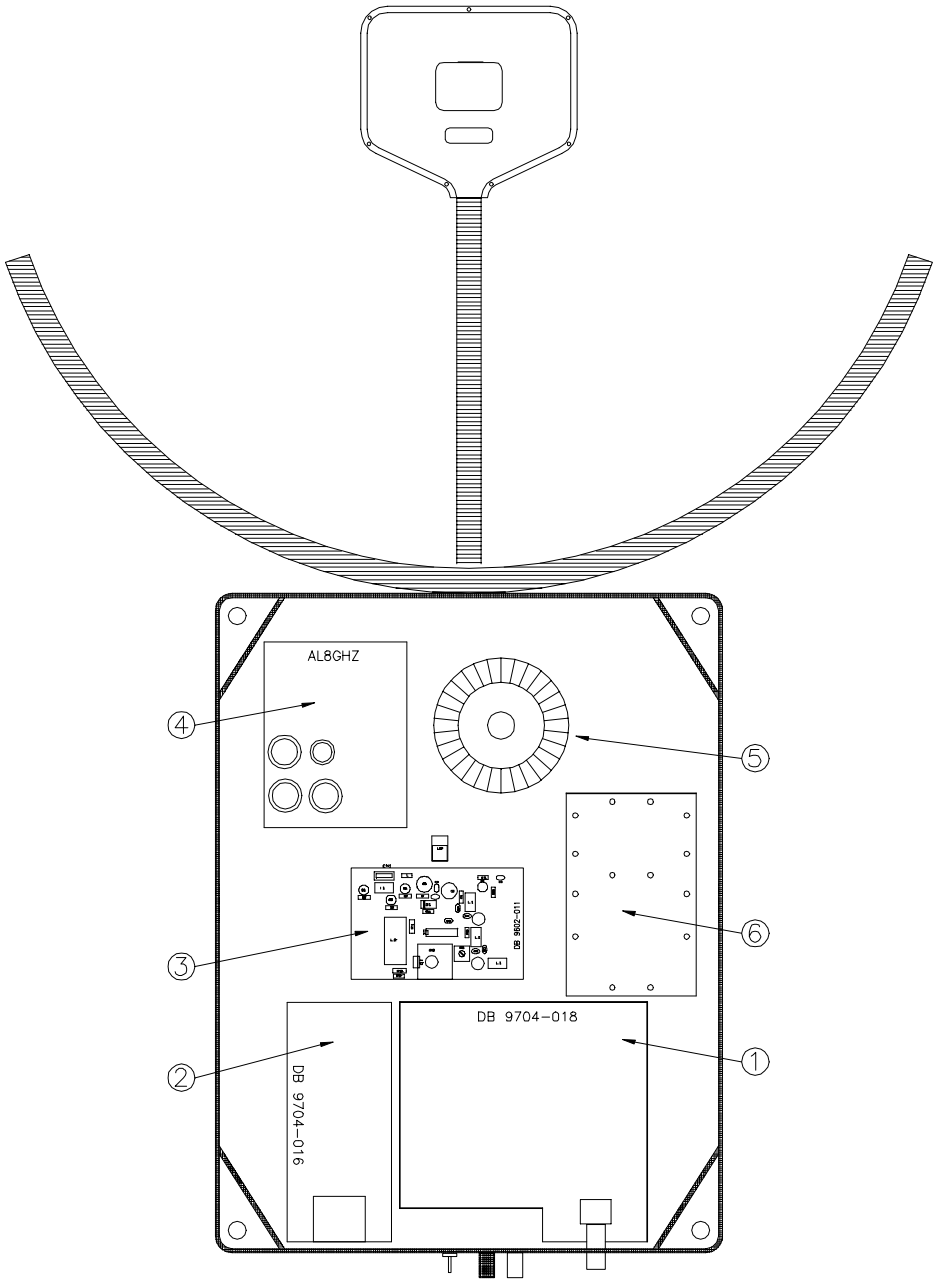
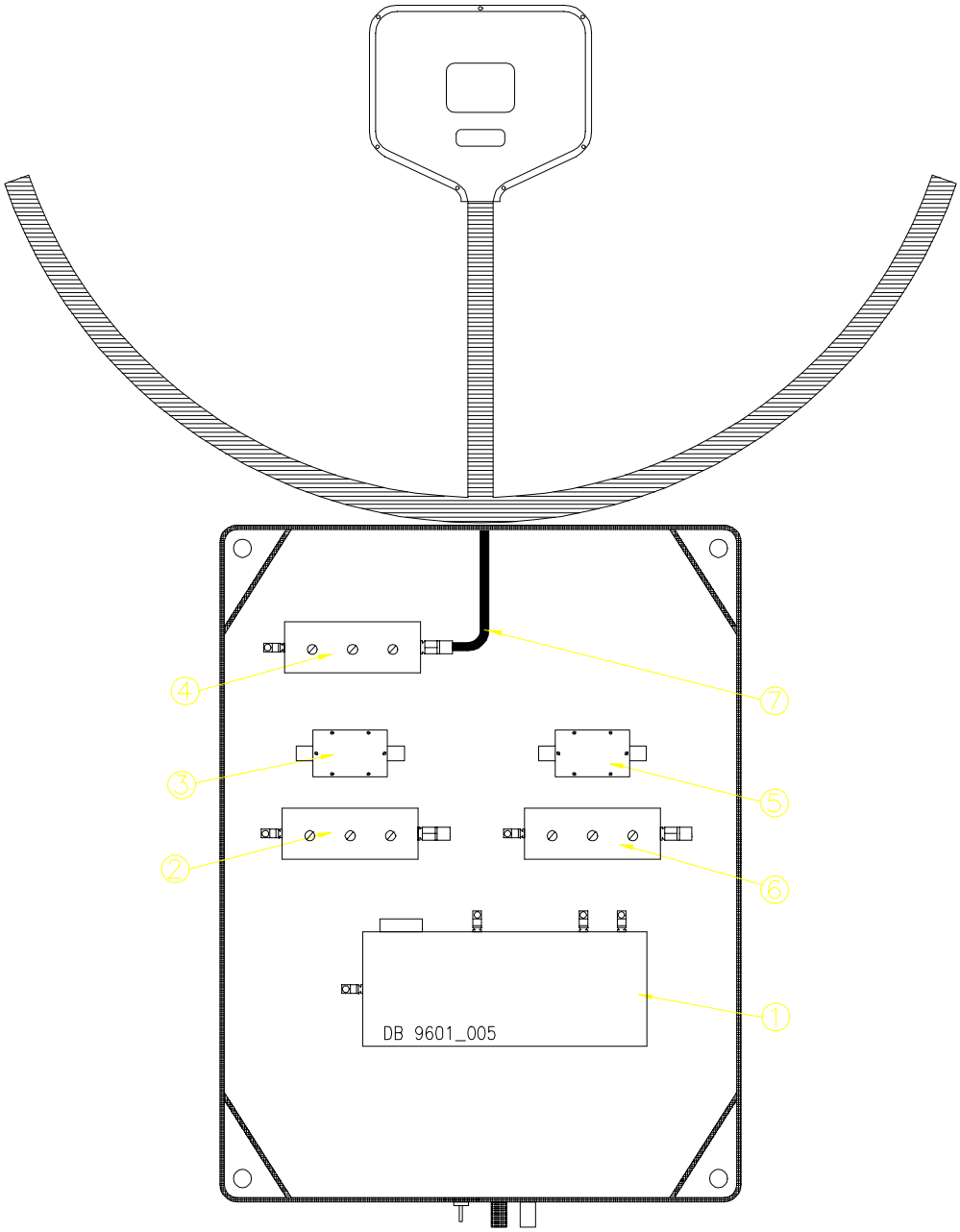


Fig. 9.2 - DMT-HMR /P UP LAYOUT



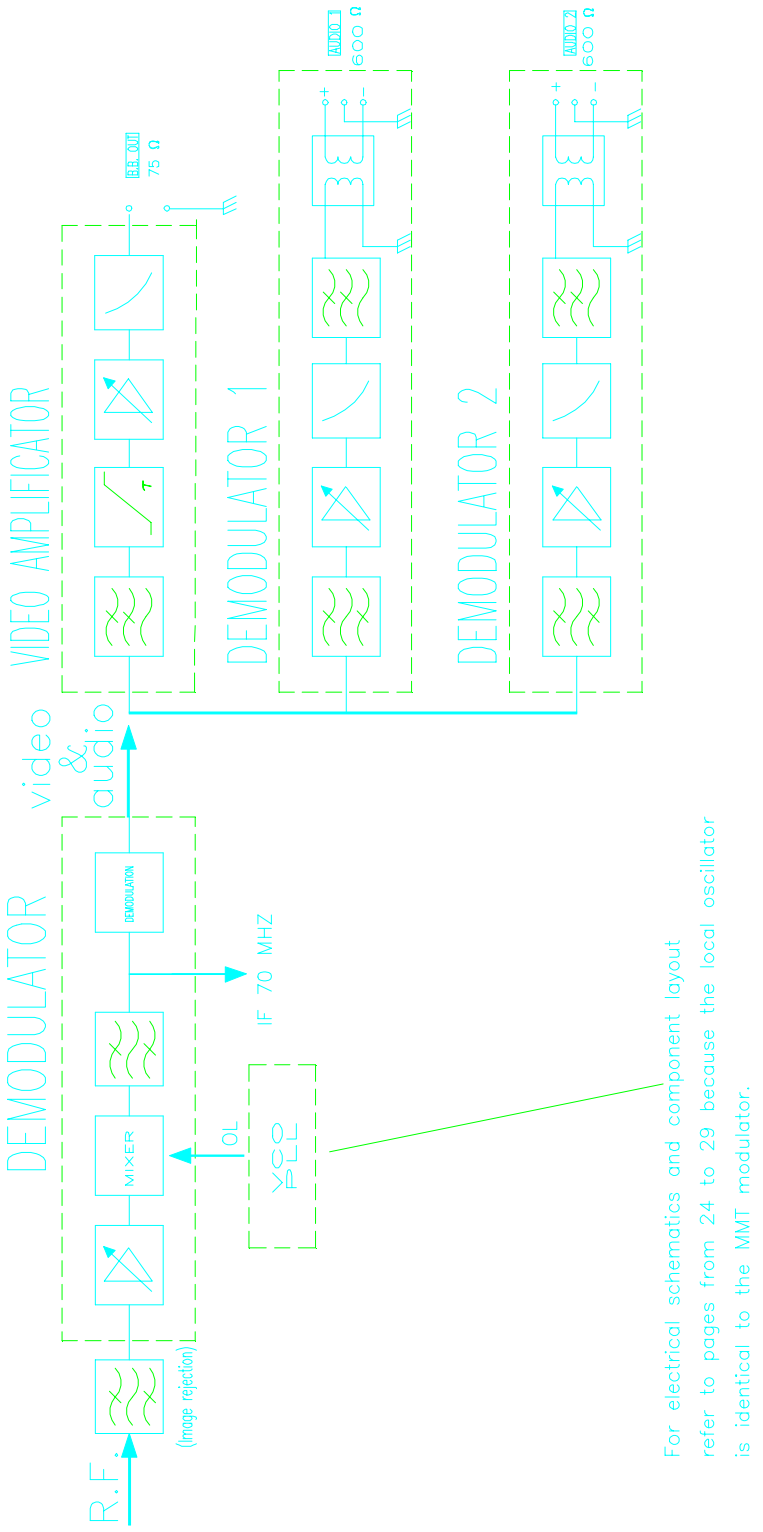
1) Video stage (DB 9704-018)
2) Audio subcarrier stage (DB 9704-016)
3) Power supply (+8V,-2V) (DB 9602-011)
4) Power supply (+12V) (AL8GHz)
5) Transformer
6) VCO stage

Fig. 9.3 - DMT-HMR /P DOWN LAYOUT



1)Video Demodulator 70MHz.
2,4,6) Bandpass Filter 2 GHz.
3,5) Front end
7) Connection to the feeder

Fig. 9.4 - RECEIVER GENERAL BLOCK DIAGRAM



10. RX VIDEO STAGE

Fig. 10.1 – RX VIDEO STAGE GENERAL ELECTRICAL SCHEMATIC

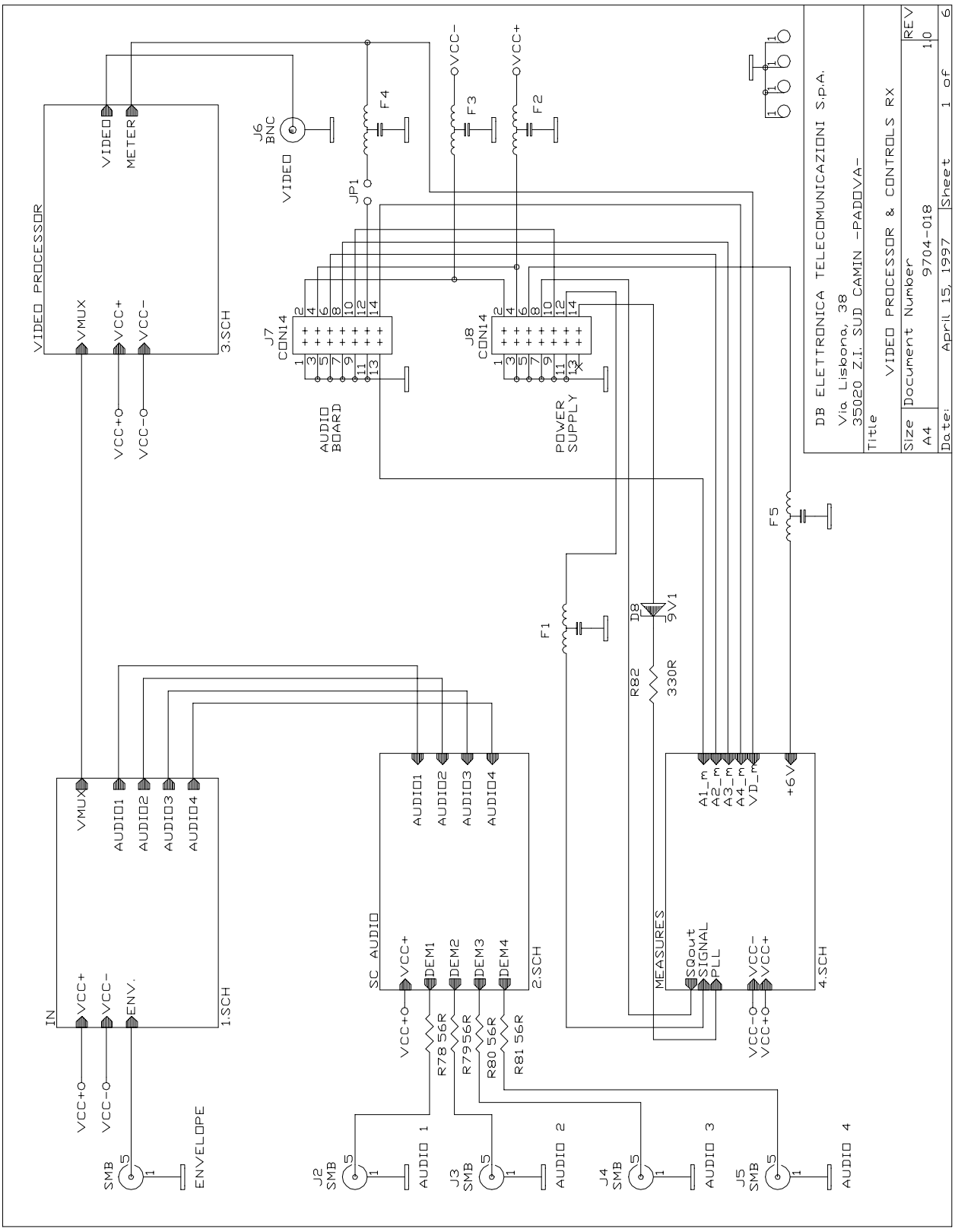


Fig. 10.2 - RX VIDEO INPUT ELECTRICAL SCHEMATIC

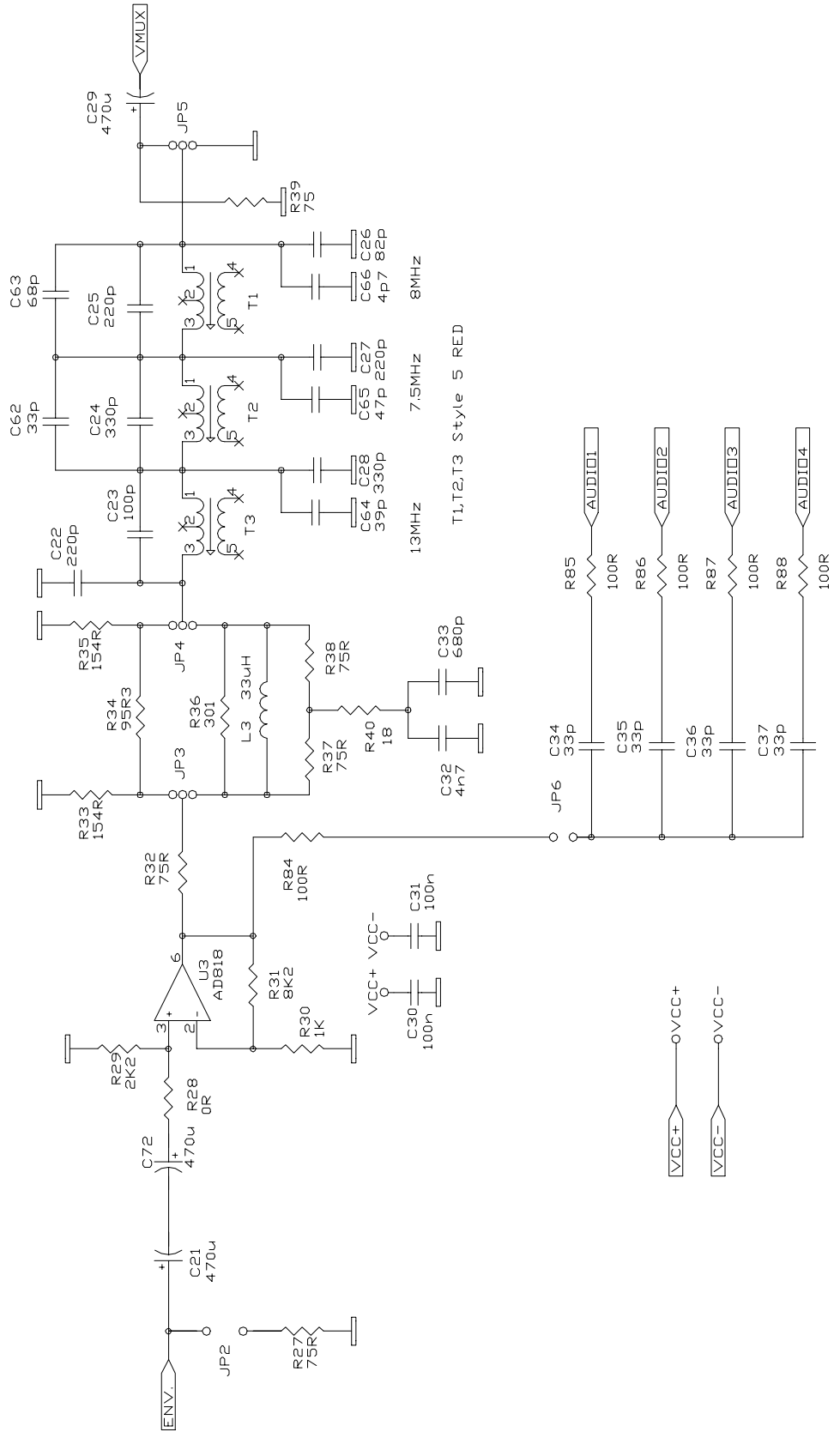


Fig. 10.3 - RX VIDEO SC AUDIO ELECTRICAL SCHEMATIC

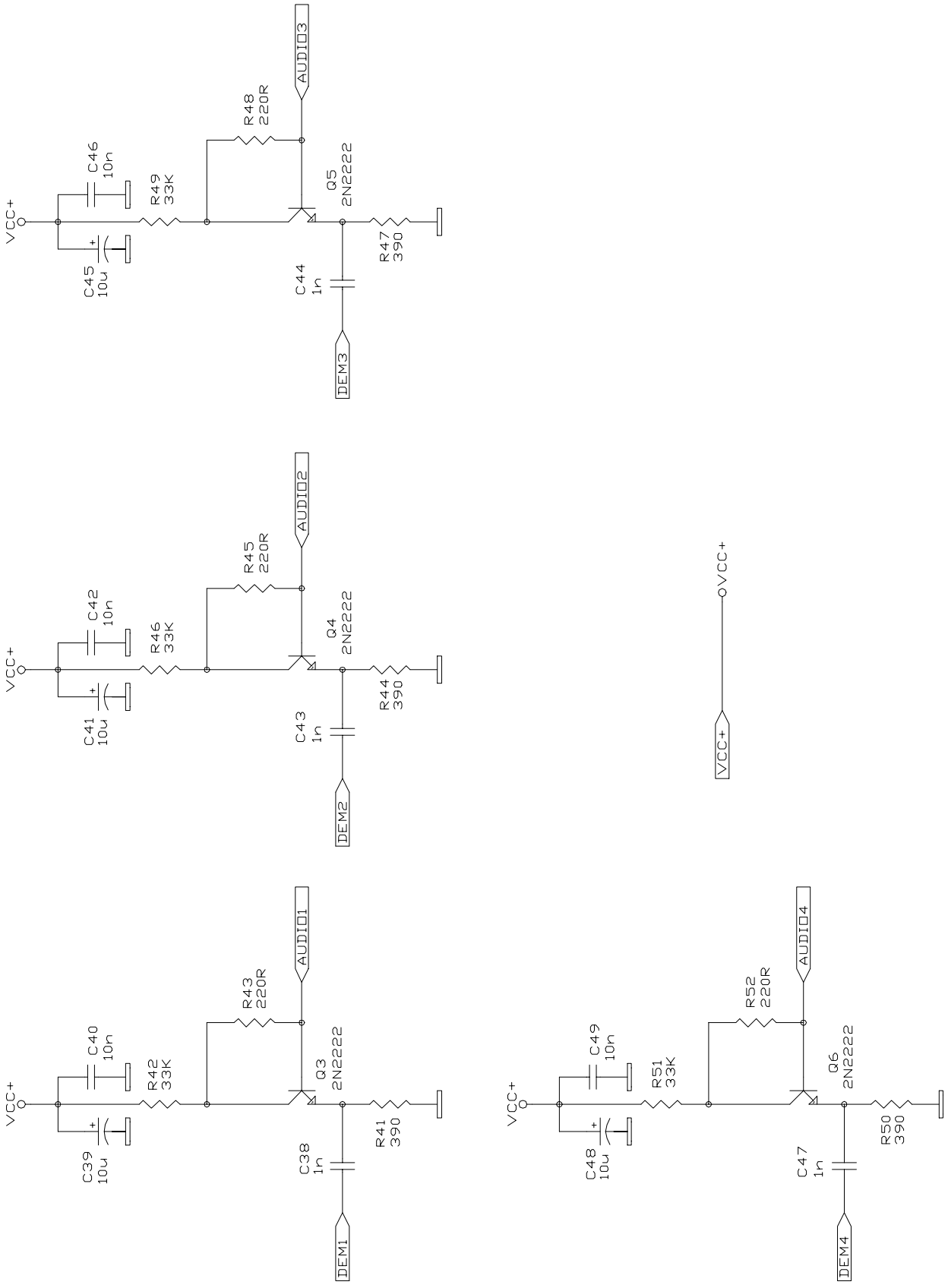


Fig. 10.4 - RX VIDEO PROCESSOR ELECTRICAL SCHEMATIC

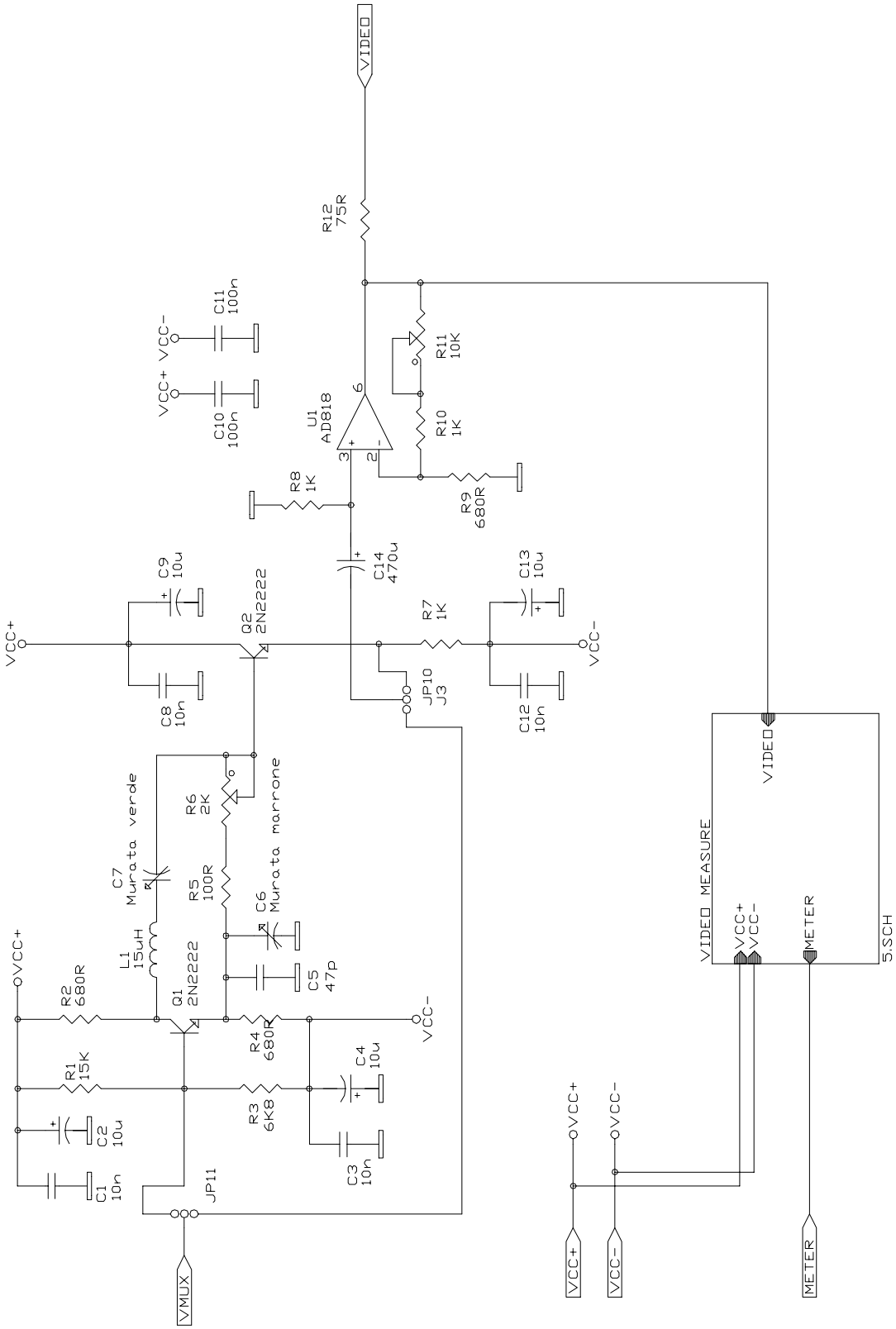


Fig. 10.5 - RX VIDEO MEASURES ELECTRICAL SCHEMATIC

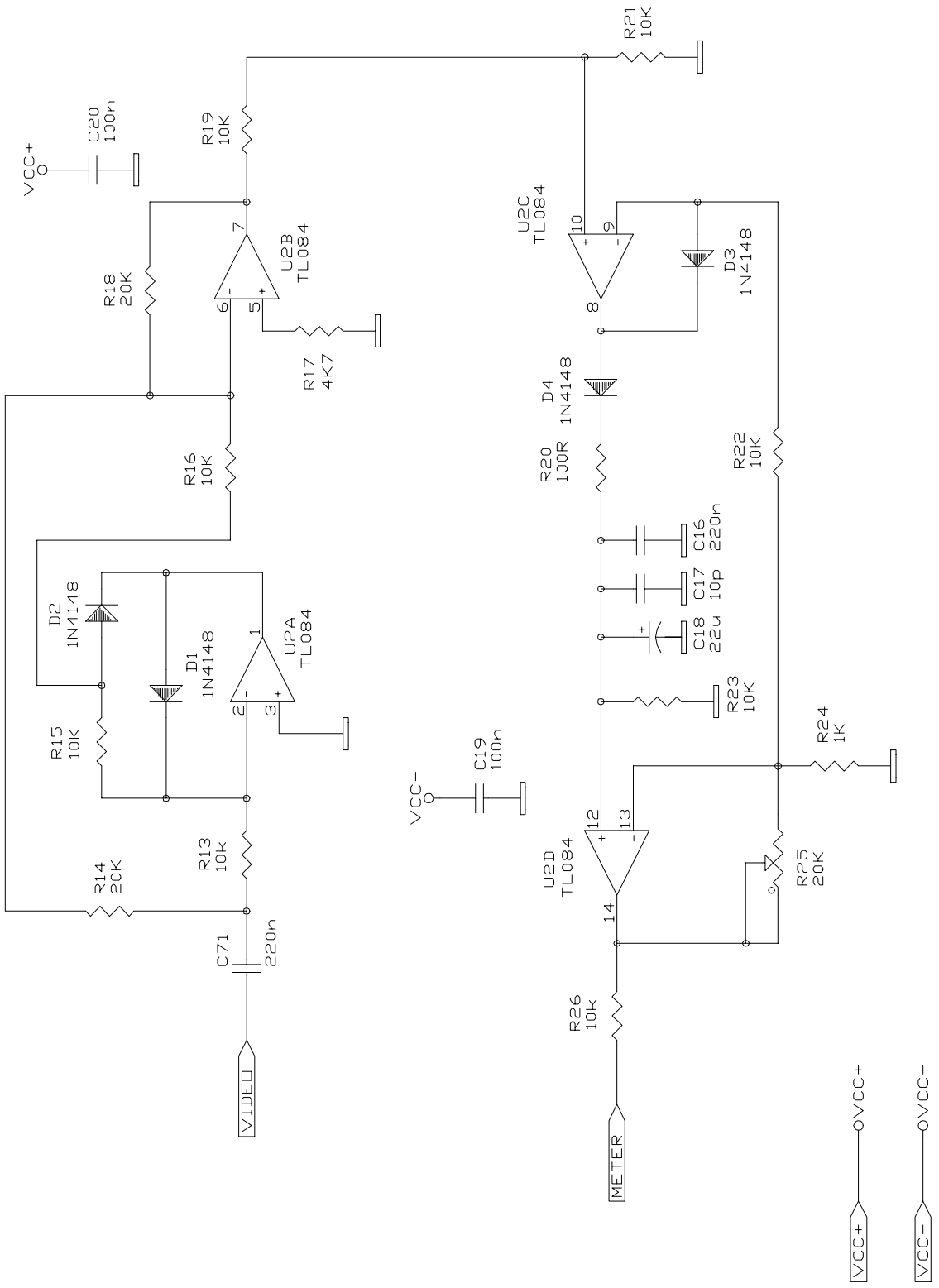


Fig. 10.6 - RX MEASURES CONTROL ELECTRICAL SCHEMATIC

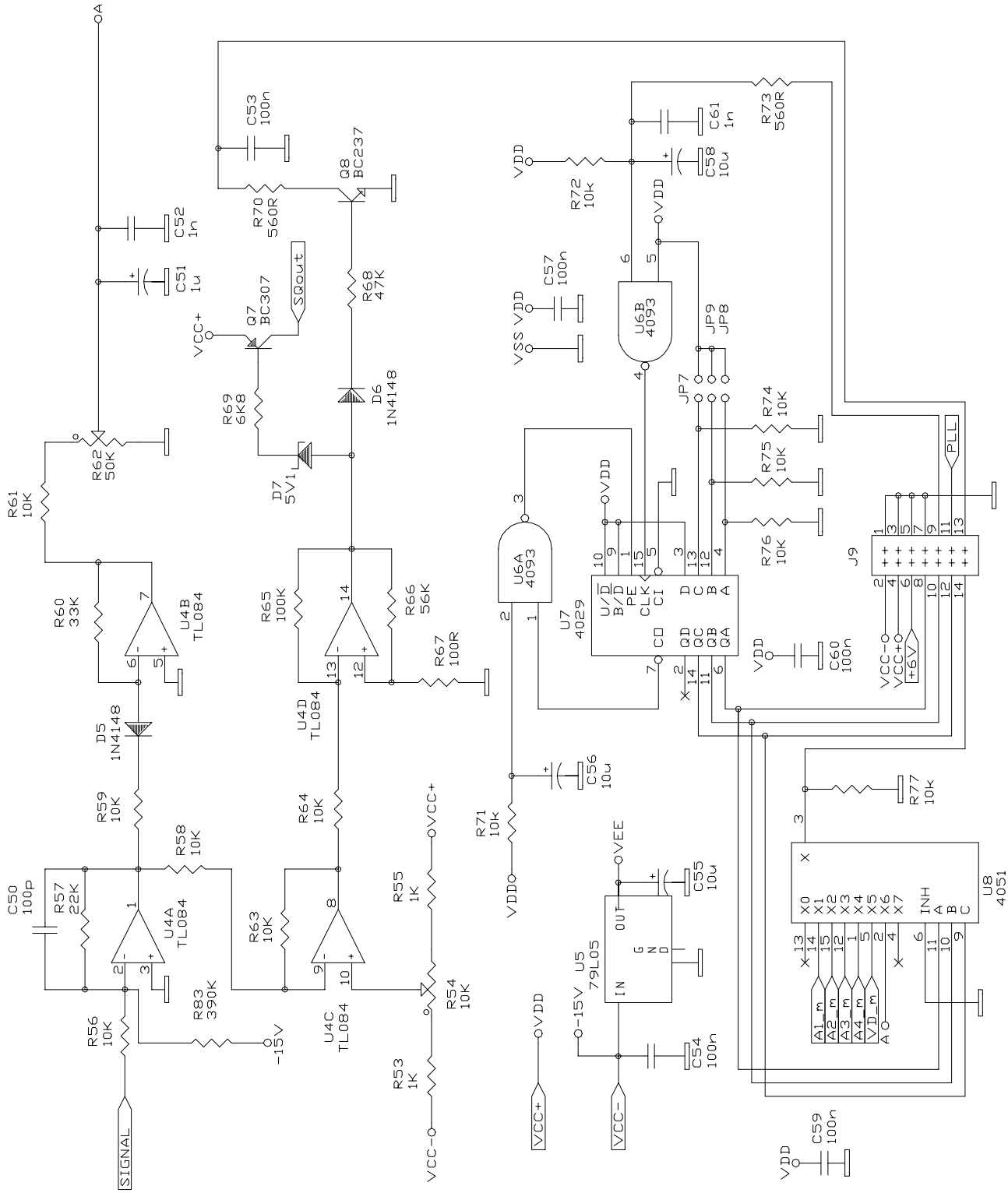
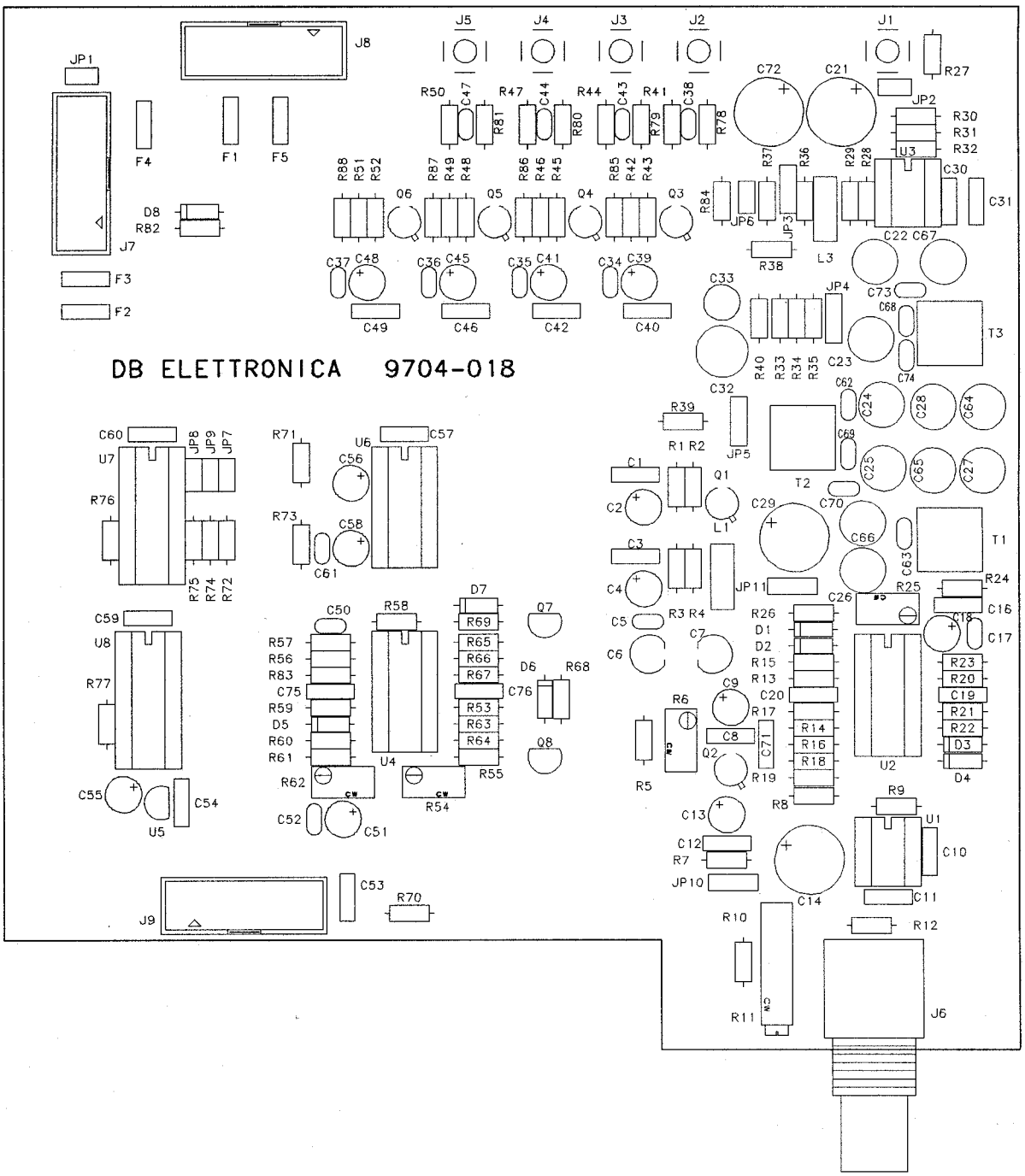


Fig. 10.7 - RX VIDEO STAGE COMPONENT LAYOUT (DB 9704-018)



10.1 RX VIDEO STAGE PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	8	C1,C3,C8,C12,C40,C42,C46,C49	10n POLY. cap.
2	11	C2,C4,C9,C13,C39,C41,C45, C48,C55,C56,C58	10u Elec. cap. 25V
3	1	C5	47p CER. cap.
4	1	C6	Mur. brown
5	1	C7	Mur. green
6	13	C10,C11,C19,C20,C30,C31,C53,C54, C57,C59,C60,C75,C76	100n POLY. cap.
7	4	C14,C21,C29,C72	470u Elec. cap. 25V
8	2	C16,C71	220n POLY. cap.
9	1	C17	10p CER. cap.
10	1	C18	22u Elec. cap. 25V
11	3	C22,C25,C27	220p cer. cap.
12	2	C23,C50	100p cer. cap. NP0
13	2	C24,C28	330p cer. cap.
14	1	C26	82p cer. cap. NP0
15	1	C32	4n7 Poly. cap.
16	1	C33	680p Poly. cap.
17	4	C34,C35,C36,C37	33p CER. cap.
18	6	C38,C43,C44,C47,C52,C61	1n CER. cap.
19	1	C51	1u Elec. cap. 25V
20	1	C62	33p cer. cap. NP0
21	1	C63	68p cer. cap. NP0
22	1	C64	39p cer. cap. NP0
23	1	C65	47p cer. cap. NP0
24	1	C66	4p7 cer. cap. NP0
25	6	D1,D2,D3,D4,D5,D6	1N4148 DIODE
26	1	D7	5V1 Zener diode
27	1	D8	9V1 Zener diode
28	5	F1,F2,F3,F4,F5	EMI EMI filters
29	6	JP1,JP2,JP6,JP7,JP8,JP9	JP2 JUMPER X2
30	5	JP3,JP4,JP5,JP10,JP11	JP3 JUMPER X3
31	5	J1,J2,J3,J4,J5	SMB smb connector
32	1	J6	BNC BNC connector
33	3	J7,J8,J9	CON14
34	1	L1	4u7 inductance
35	1	L3	33uH inductance
36	6	Q1,Q2,Q3,Q4,Q5,Q6	2N2222 transistor NPN
37	1	Q7	BC307 TRANSISTOR PNP
38	1	Q8	BC237 TRANSISTOR NPN
39	1	R1	15K RES 1W4
40	3	R2,R4,R9	680R RES 1W4
41	2	R3,R69	6K8 RES 1W4
42	8	R5,R20,R67,R84,→,R88	100R RES 1W4
43	1	R6	2K TRIMER MG RV

ITEM	QUANTITY	REFERENCE	PART
44	7	R7,R8,R10,R24,R30,R53,R55	1K RES 1W4
45	1	R29	2K2
46	1	R11	10K TRIMMER
47	6	R12,R27,R32,R37,R38,R39,	10k RES 1W4 1%
48	3	R13,R15,R16	10K RES 1W4 1%
49	2	R14,R18	20K RES 1W4
50	1	R17	4K7 RES 1W4
51	17	R19,R21,R22,R23,R26,R56, R58,R59,R61,R63,R64,R71, R72,R74,R75,R76,R77	10K RES 1W4
52	1	R25	20K TRIMMER MG RV
53	1	R28	0R RES 1W4
54	1	R31	8K2 RES 1W4
55	2	R33,R35	154R RES 1W4 1%
56	1	R34	95R3 RES 1W4 1%
57	1	R36	301R RES 1W4 1%
58	1	R40	18R RES 1W4 1%
59	5	R41,R44,R47,R50,R82	390R RES 1w8
60	4	R42,R46,R49,R51	33K RES 1w4
61	4	R43,R45,R48,R52	1K2 RES 1W4
62	1	R54	10K TRIMMER MG RV
63	1	R57	22K RES 1W4
64	1	R60	33K RES 1W4
65	1	R62	50K TRIMMER MG RV
66	1	R65	100K RES 1W4
67	1	R66	56K RES 1W4
68	1	R68	47K RES 1W4
69	2	R73,R70	560R RES 1W4
70	4	R78,R79,R80,R81	56R RES 1W4
71	1	R83	390K RES 1W4
72	3	T1,T2,T3	STYLE 5R Inductance
73	2	U1,U3	AD818 Op. amp.
74	2	U2,U4	TL084 Op. amp.
75	1	U5	79L05 Voltage reg.
76	1	U6	4093 CMOS I.C.
77	1	U7	4029 CMOS I.C.
78	1	U8	4051 CMOS I.C.

11. RX AUDIO SUBCARRIER STAGE

Fig. 11.1 – RX AUDIO SUBCARRIER STAGE GENERAL ELECTRICAL SCHEMATIC

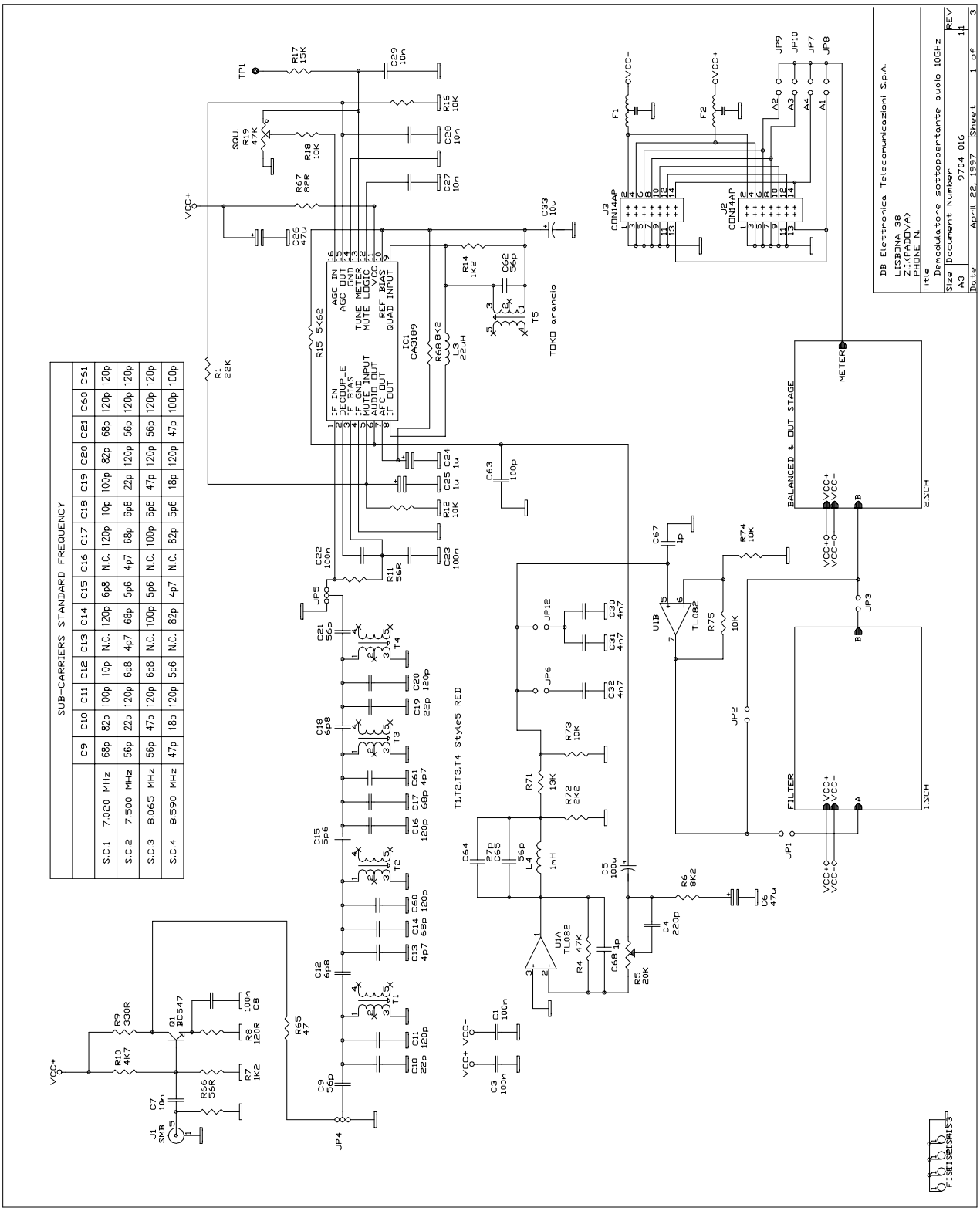


Fig. 11.2 - RX AUDIO SUBCARRIER FILTER ELECTRICAL SCHEMATIC

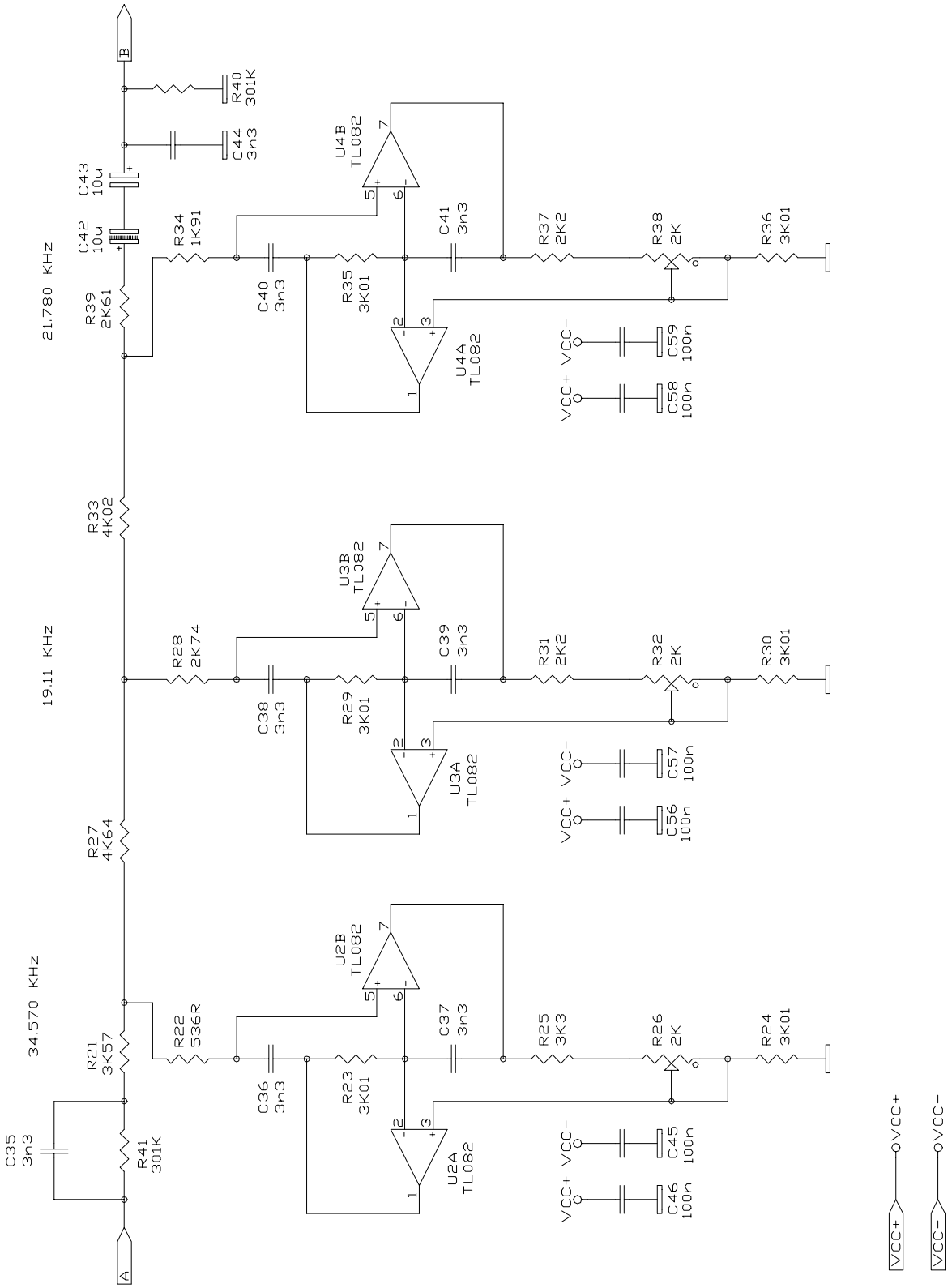


Fig. 11.3 - RX AUDIO SUBCARRIER STAGE BALAN/ OUTPUT ELECTR. SCHEMATIC

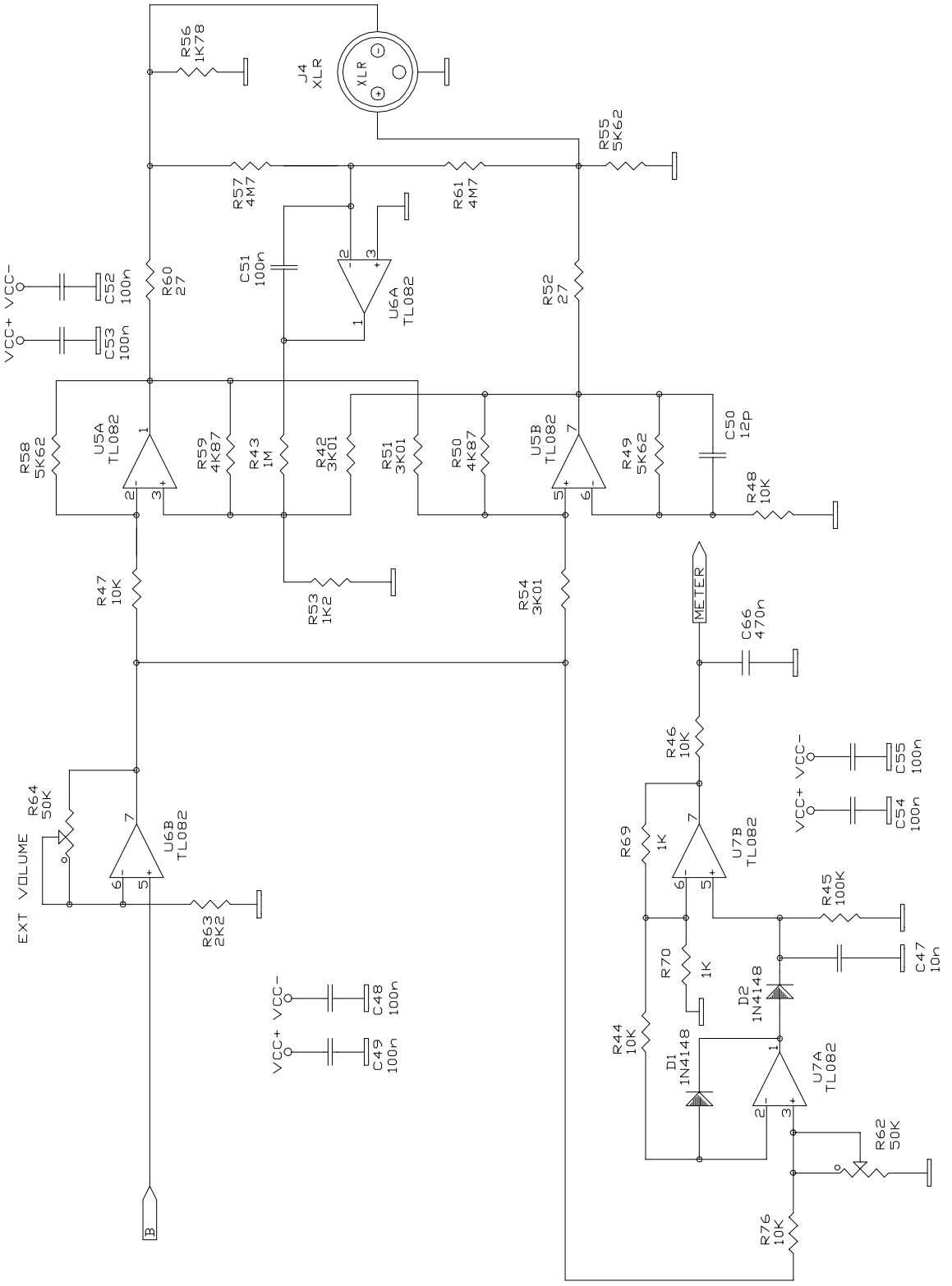
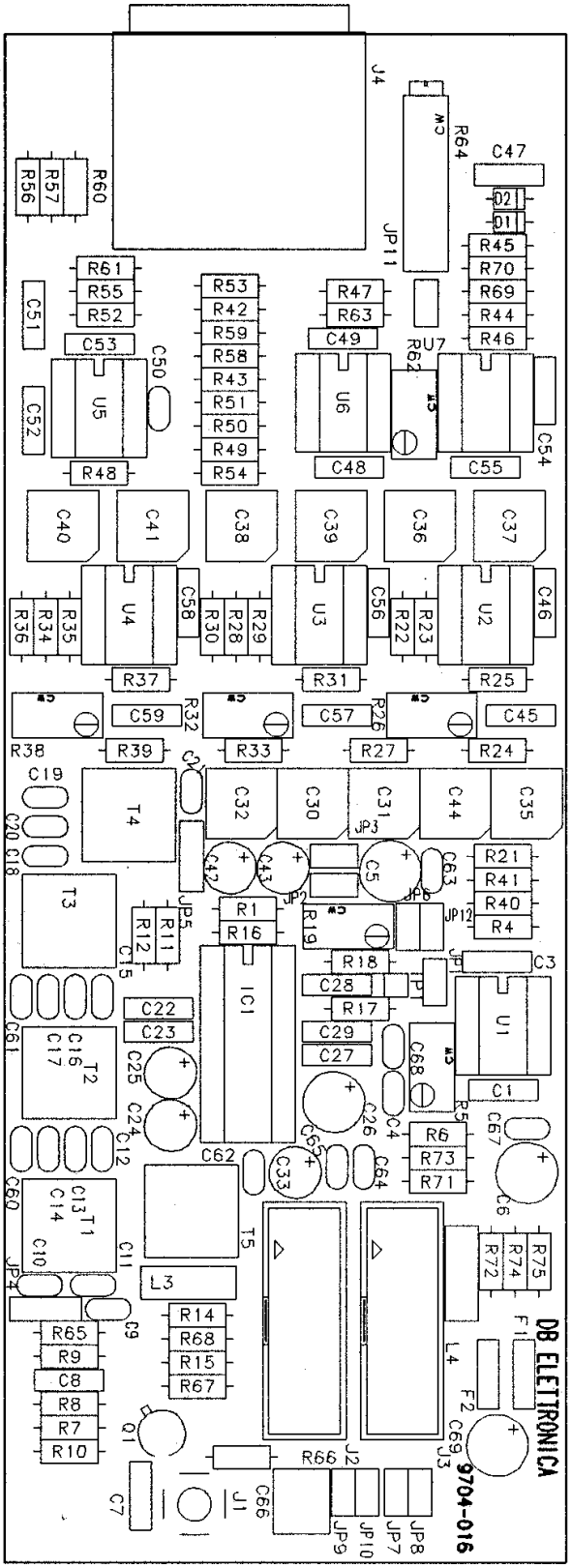


Fig. 11.4 - RX AUDIO SUBCARRIER STAGE COMPONENT LAYOUT (DB 9704-016)



11.1 RX AUDIO SUBCARRIER PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	18	C1,C3,C8,C22,C23,C45,C46, C48,C49,C51,→,C59	100n POLY. cap.
2	1	C4	220p CER. cap.
3	1	C5	100u Electrolytic
4	2	C6,C26	47u Elec. cap. 25V
5	5	C7,C27,C28,C29,C47	10n POLY. cap.
6	3	C9,C21,C62	56p cer. cap. NP0
7	2	C10,C19	22p cer. cap. NP0
8	4	C11,C16,C20,C60	120p cer. cap. NP0
9	2	C12,C18	6p8 cer. cap. NP0
10	2	C13,C61	4p7 cer. cap. NP0
11	2	C14,C17	68p cer. cap. NP0
12	1	C15	5p6 cer. cap. NP0
13	2	C25,C24	1u Elec. cap. 25V
14	3	C30,C31,C32	4n7 POLY
15	3	C33,C42,C43	10u Elec. cap. 25V
16	8	C35,→,C41,C44	3n3 POLY. cap.
17	1	C50	12p cer. cap. NP0
18	1	C63	100p CER
19	1	C64	27p
20	1	C65	56p
21	1	C66	470n POLY
22	2	C67,C68	1p CER
23	2	D1,D2	1N4148 DIODE
24	4	FIS1,FIS2,FIS3,FIS4	FIS 3.5
25	2	F1,F2	EMI EMI filters
26	1	IC1	CA3189 I.C.
27	8	JP1,JP2,JP3,JP7,→,JP11	JP JUMPER X2
28	2	JP5,JP4	JP JUMPER X3
29	2	JP6,JP12	JP
30	1	J1	SMB CS
31	2	J3,J2	CONN14 14AP.
32	1	J4	XLR XLR male
33	1	L3	22uH axial
34	1	L4	1Mh AXIAL IND.
35	1	Q1	BC547 trans. NPN
36	1	R1	22K RES 1/4W
37	1	R4	47K RES 1/4W
38	1	R5	20K TRIM MG RV
39	2	R6,R68	8K2 RES 1/4W
40	2	R7,R14	1K2 RES 1/4W
41	1	R8	120R RES 1/4W

ITEM	QUANTITY	REFERENCE	PART
42	1	R9	330R RES 1/4W
43	1	R10	4K7 RES 1/4W
44	2	R11,R66	56R RES 1/4W
45	7	R12,R16,R18,R44,R46 R74,R75	10K RES 1/4W
46	1	R15	5K62 RES 1/4W
47	1	R17	15K RES 1/4W
48	1	R19	47K TRIM MG RV
49	1	R21	3K57 RES 1/4W 1%
50	1	R22	536R RES 1/4W 1%
51	9	R23,R24,R29,R30,R35, R36,R42,R51,R54	3K01 RES 1/4W 1%
52	1	R25	3K3 RES 1/4W
53	3	R26,R32,R38	2K TRIM MG RV
54	1	R27	4K64 RES 1/4W 1%
55	1	R28	2K74 RES 1/4W 1%
56	4	R31,R37,R63,R72	2K2 RES 1/4W
57	1	R33	4K02 RES 1/4W 1%
58	1	R34	1K91 RES 1/4W 1%
59	1	R39	2K61 RES 1/4W 1%
60	2	R40,R41	301K RES 1/4W 1%
61	1	R43	1M RES 1/4W 1%
62	1	R45	100K RES 1/4W
63	2	R47,R48	10K RES 1/4 1%
64	3	R49,R55,R58	5K62 RES 1/4W 1%
65	2	R50,R59	4K87 RES 1/4W 1%
66	2	R52,R60	27R RES 1/4W 1%
67	1	R53	1K2 RES 1/4W 1%
68	1	R56	1K78 RES 1/4W 1%
69	2	R57,R61	4M7 RES 1/4W 1%
70	1	R62	50K TRIM MG RV
71	1	R64	50K TRIM MG P
72	1	R65	47R RES 1/4W
73	1	R67	82R RES 1/4W
74	3	R69,R70,R76	1K RES 1/4W
75	1	R71	13K RES 1/4W
76	1	R73	10K RES 1/4W
77	1	TP1	TP TEST POINT
78	4	T1,T2,T3,T4	Style 5R Inductance
79	1	T5	TOKO Inductance
80	7	U1,U2,U3,U4,U5,U6,U7	TL082 OP. AMP.

12. DEMODULATOR STAGE

Fig. 12.1 - DEMODULATOR STAGE ELECTRICAL SCHEMATIC

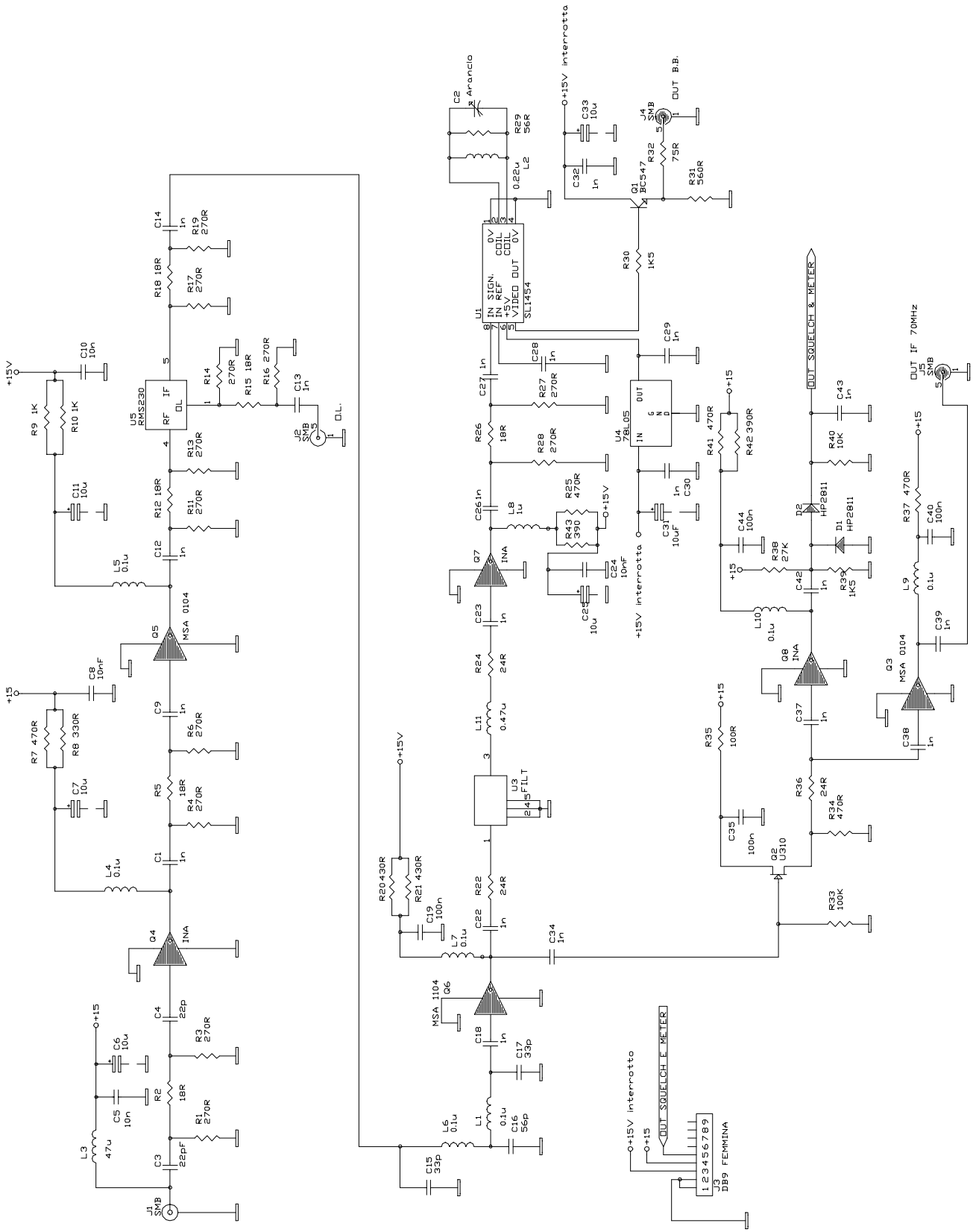
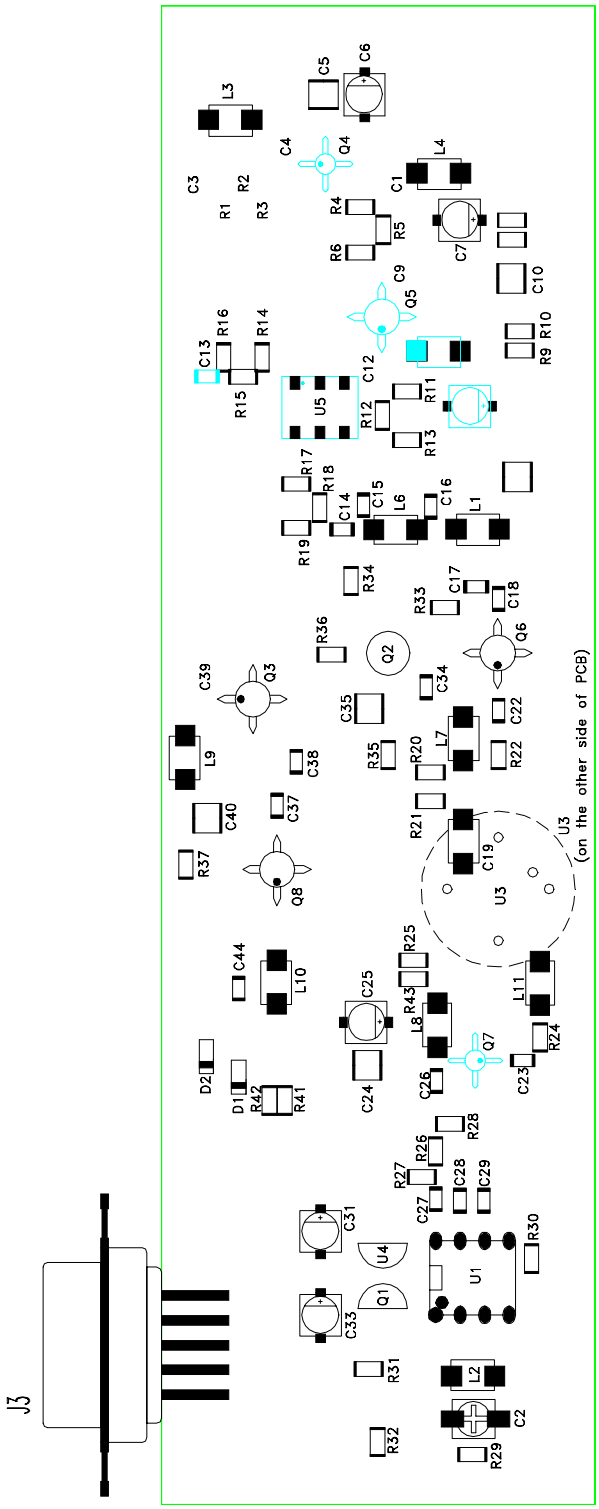


Fig. 12.2 - DEMODULATOR STAGE COMPONENT LAYOUT (DB 9601-005)



12.1 DEMODULATOR STAGE PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	1	C1	1n CER. cap. SMD
2	1	C2	Arancio VARIABLE cap. SMD
3	1	C3	22pF CER. cap. SMD
4	1	C4	22p CER. cap. SMD
5	2	C5,C43	10n CER. cap. SMD
6	1	C6	10u Electrolytic cap. SMD
7	4	C7,C11,C25,C33	10u Electrolytic cap. SMD
8	2	C8,C24	10nF CER. cap. SMD
9	16	C9,C12,C13,C14,C18,C22, C23,C26,C27,C28,C29,C34, C37,C38,C39,C42	1n CER. cap. SMD
10	1	C10	10u Electrolytic cap. SMD
11	2	C15,C17	33p CER. cap. SMD
12	1	C16	56p CER. cap. SMD
13	4	C19,C35,C40,C44	100n CER. cap. SMD
14	1	C31	10uF Electrolytic cap. SMD
15	2	D1,D2	HP2811 diode
16	4	J1,J2,J4,J5	SMB connector
17	1	J3	DB9 9 poles connector
18	3	L1,L6,L7	0.1uH inductor SMD
19	1	L2	0.22uH inductor SMD
20	3	L3,L4,L5	1uH inductor SMD
21	3	L8,L9,L10	47uH inductor SMD
22	1	L11	0.47uH inductor SMD
23	1	Q1	BC547 NPN transistor
24	1	Q2	U310 FET transistor
25	2	Q3,Q5	MSA 0104 Micr integ amp
26	3	Q4,Q7,Q8	INA10386 Micr integ amp
27	1	Q6	MSA 1104 Micr integ amp
28	12	R1,R3,R4,R6,R11,R13,R14, R16,R17,R19,R27,R28	270R res SMD
29	6	R2,R5,R12,R15,R18,R26	18R res SMD
30	6	R7,R21,R25,R34,R37,R41	470R res SMD
31	3	R8,R20,R42	390R res SMD
32	2	R9,R10	1K res SMD
33	3	R22,R24,R36	27R res SMD
34	1	R29	56R res SMD
35	1	R30	1K5 res SMD
36	1	R31	560R res SMD
37	1	R32	75R res SMD
38	1	R33	100K res SMD

ITEM	QUANTITY	REFERENCE	PART
39	1	R35	100R res SMD
40	1	R38	27K RES 1/8W
41	1	R39	1K5 RES 1/8W
42	1	R40	10K res SMD
43	1	R43	390 res SMD
44	1	U1	SL1454 I.C.
45	1	U3	SAF70MB Integ I.F. filt
46	1	U4	78L05 Voltage reg.
47	1	U5	RMS230 Mixer

13. RX AMPLIFIER SECTION

13.1 GENERAL DESCRIPTION

DB 9606-019 Front-end board is composed by two equal amplifier stage.

It has typical gains' of 40 dB (band center).

The technology transistor utilized is INA10386.

Fig. 13.3 - RX AMPLIFIER ELECTRICAL DIAGRAM (DB 9606-019)

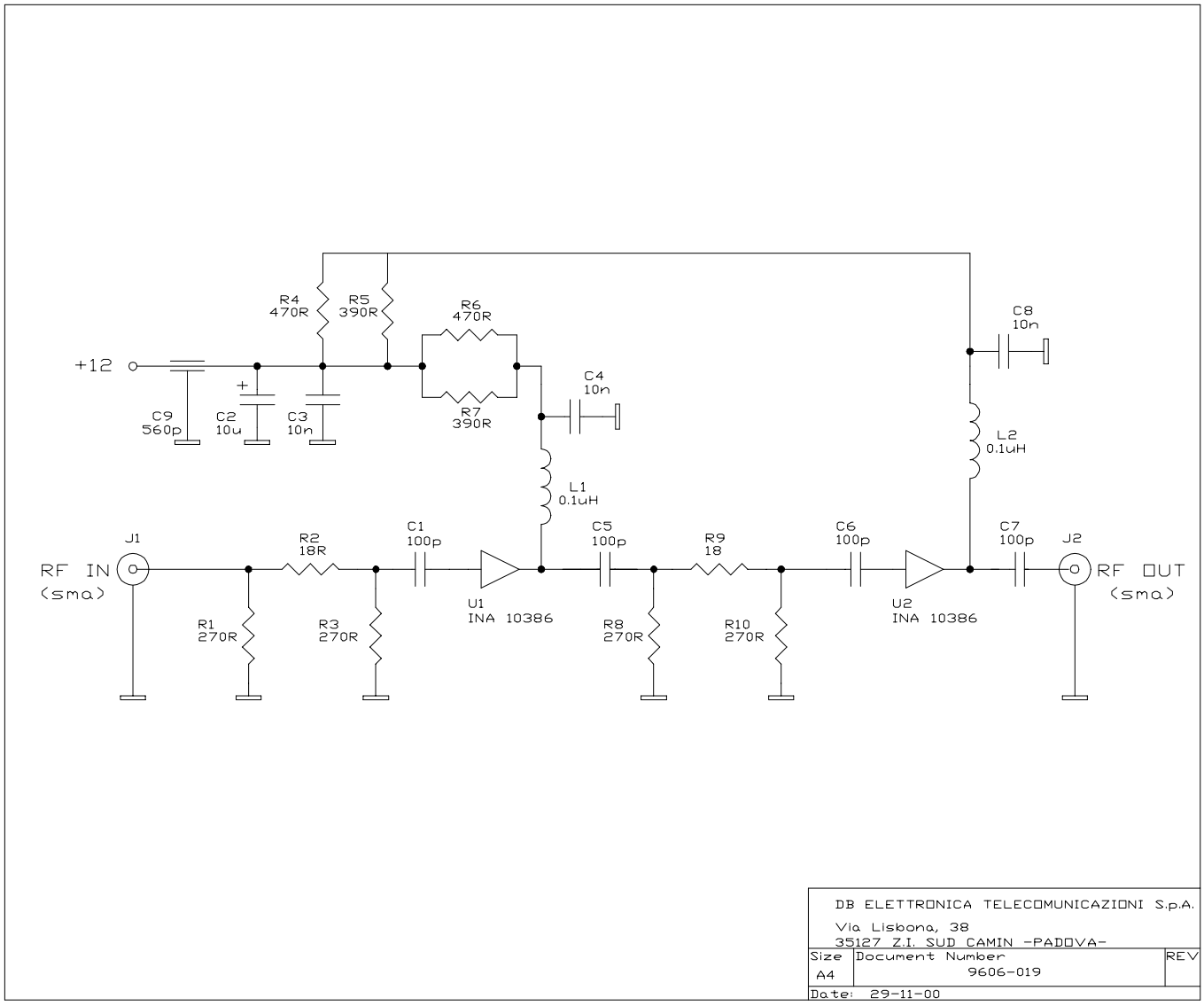
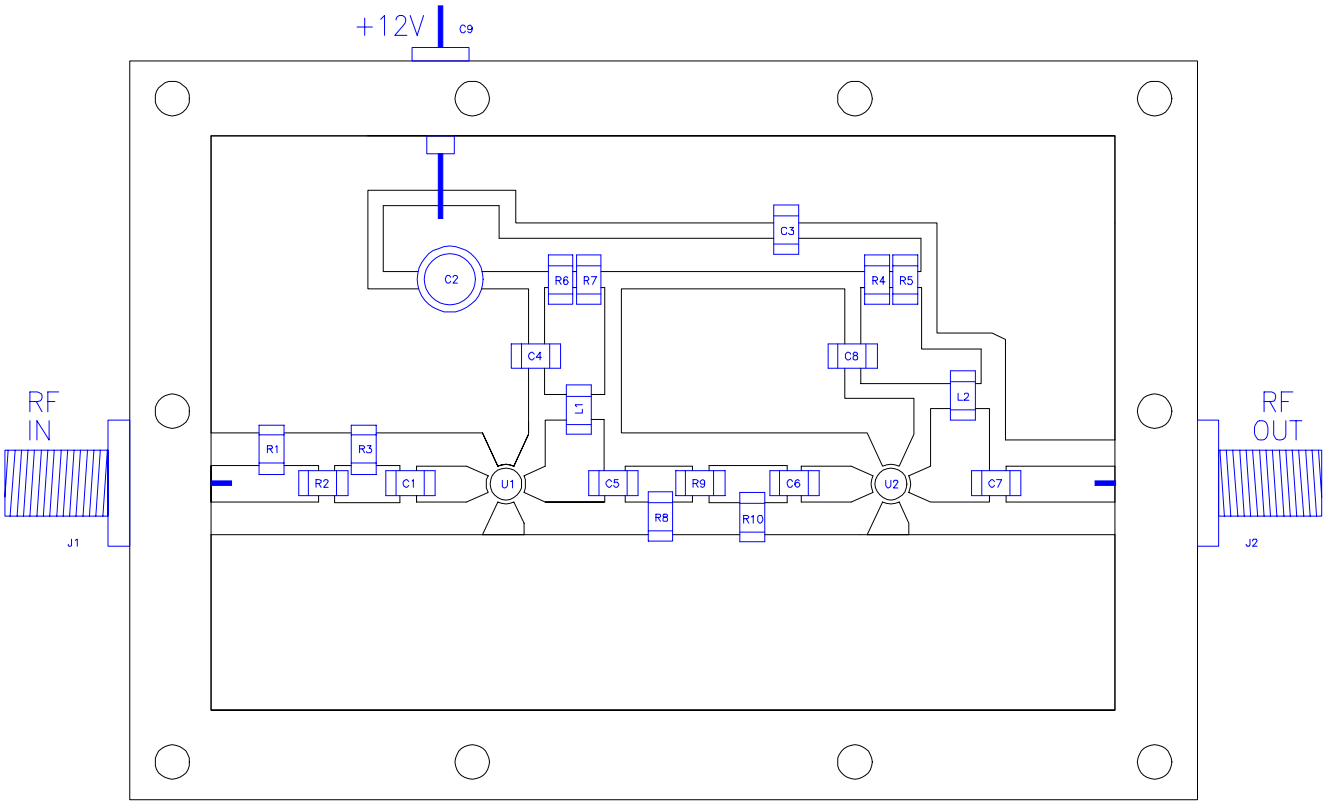


Fig. 13.1 - RX AMPLIFIER COMPONENT LAYOUT (DB 9606-019)



13.2 RX AMPLIFIER PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	2	J1,J2	SMA conn.
2		R1,R3,R8,R10	270R chip
3		R2,R9	18R chip
4		R4,R6	470R chip
5		R5,R7	390R chip
6		C1,C5,C6,C7	100p HQ
7		C3,C4,C8	10n BQ
8		C2	10u elect.
9		C9	560p
10		L1,L2	0.1µH
11		U1,U2	INA10386 Trans.

14. TX /RX POWER SUPPLY BOARDS

Fig. 14.1 - MMT - DMT PWR SUPPLY ELECTRICAL SCHEMATIC

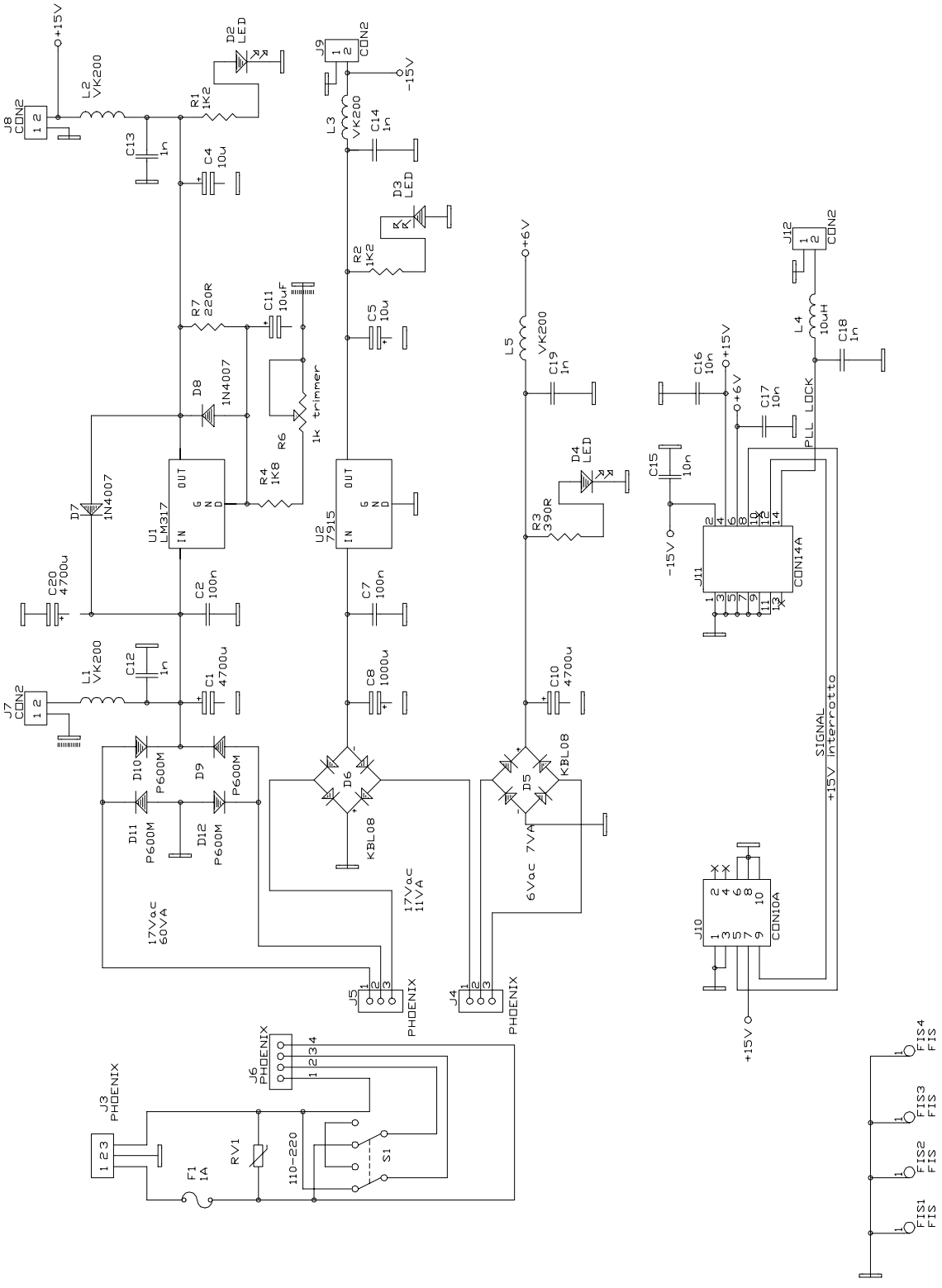
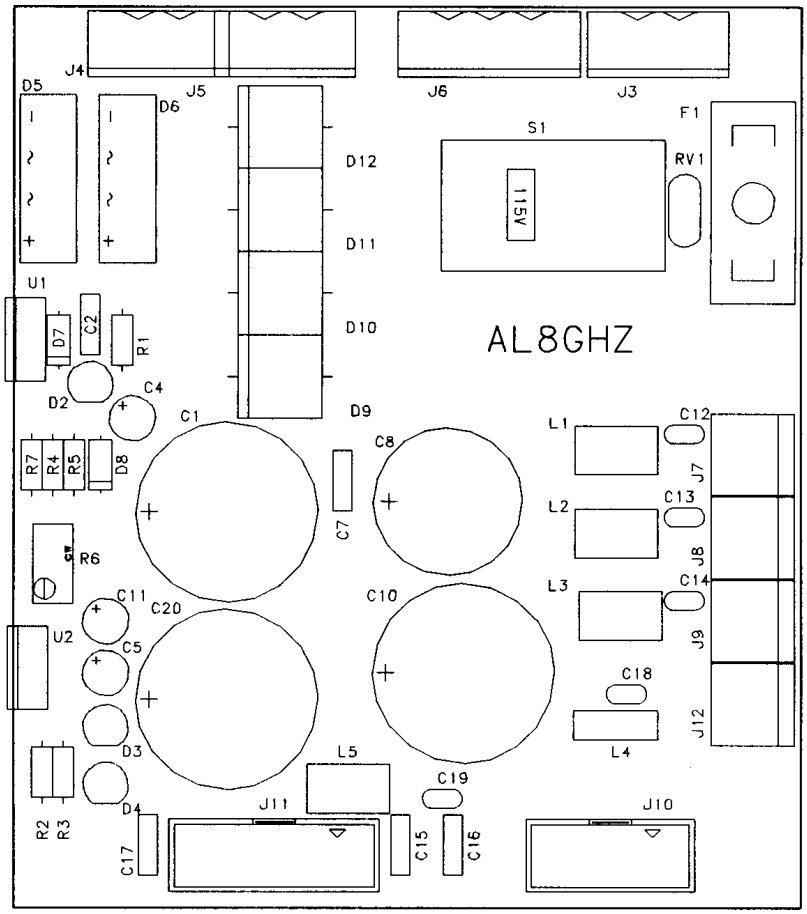


Fig. 14.2 - MMT - DMT PWR SUPPLY COMPONENT LAYOUT (AL8GHZ)



14.1 MMT - DMT PWR SUPPLY PARTS LIST

ITEM	QUANTITY	REFERENCE	PART	
1	3	C1,C10,C20	4700u	Elett.
2	2	C2,C7	100n	Pol.
3	3	C4,C5,C11	10u	
4	1	C8	1000u	Elett.
5	5	C12,C13,C14,C18,C19	1n	Cer.
6	3	C15,C16,C17	10n	Cer.
7	3	D2,D3,D4	Red	Led
8	2	D5,D6	KBL08	Bridge diode
9	2	D7,D8	1N4007	Diode
10	4	D9,D10,D11,D12	6A6	Diode
11	3	L1,L2,L3	VK200	Ind.
12	1	L4	10u	Axial ind.
13	1	RV1	275V	Varist.
14	1	S1	115/230V	Change volt.
15	1	U1	LM317	Stab. int.
16	1	U2	UA7915	Stab. int.
17	1	F1	5x20mm	Fus.
18	3	J3,J4,J5	Phoenix	Con. 3p
19	1	J6	Phoenix	Con. 4p
20	4	J7,J8,J9,J12	Terminal	2p
21	2	R1,R2	1K2	1/4W 5%
22	1	R3	390R	1/4W 5%
23	1	R4	8K2	1/4W 5%
24	1	R6	1K	Var.Trimm.
25	1	R7	220R	1/4W 5%

Fig. 14.3 - HMT - HMR POWER SUPPLY ELECTRICAL SCHEMATIC

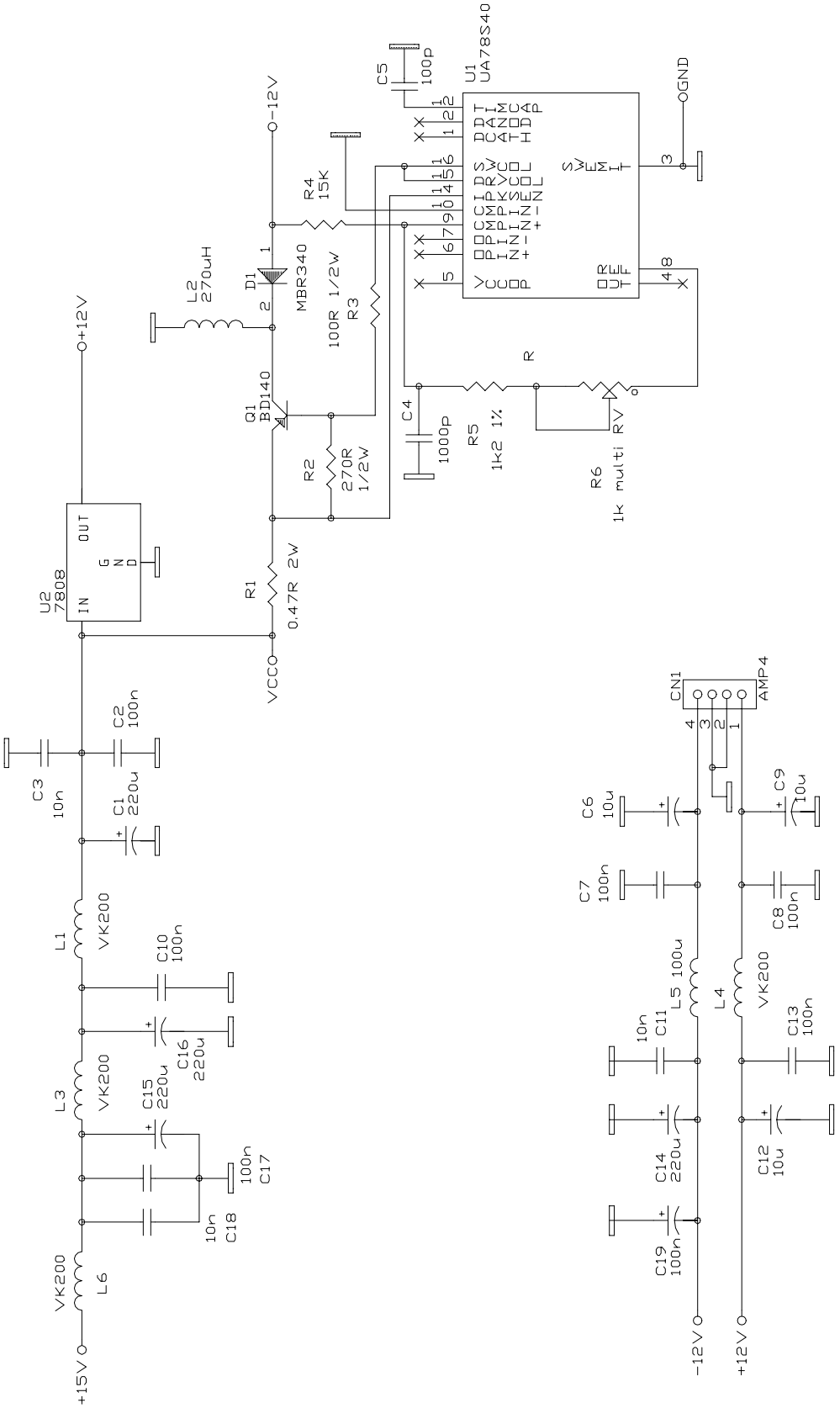
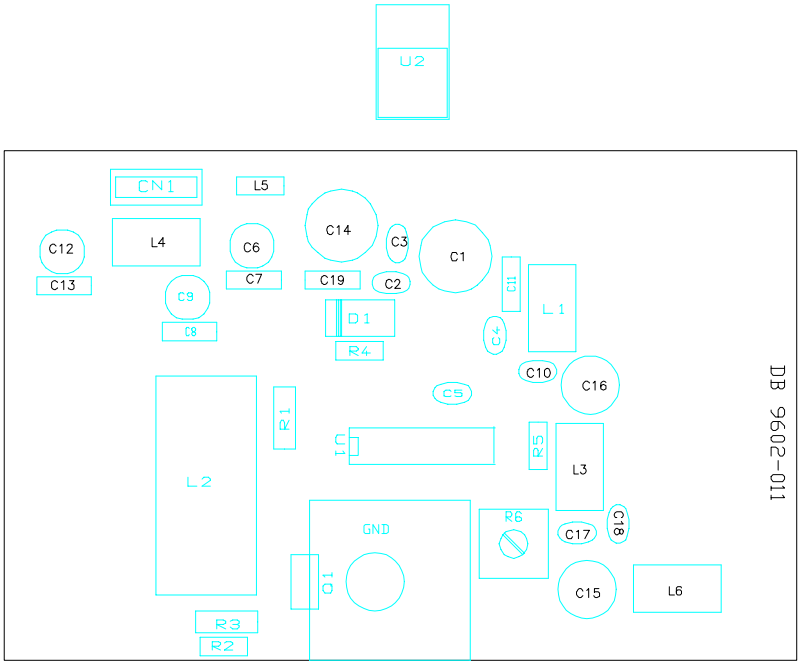


Fig. 14.4 - HMT - HMR POWER SUPPLY COMPONENT LAYOUT (DB 9602-011)



14.2 HMT - HMR POWER SUPPLY PARTS LIST

ITEM	QUANTITY	REFERENCE	PART
1	4	C1,C14,C15,C16	220u Elett. 25V
2	3	C2,C10,C17	100n Mult.
3	3	C3,C11,C18	10n Cer.
4	1	C4	1n Cer.
5	1	C5	100p Cer.
6	3	C6,C9,C12	10u Elett. 25V
7	4	C7,C8,C13,C19	100n Pol.
8	4	L1,L3,L4,L6	VK200
9	1	L2	270u Tor.
10	1	L5	100u
11	1	D1	1N5819 Diode
12	1	Q1	BD140 Trans.
13	1	U1	UA78S40
14	1	CN1	AMP Conn. 4
15	1	R1	0R47 2W 5%
16	1	R2	100R 1/2W 5%
17	1	R3	270R 1/2W 5%
18	1	R4	15K 1/4W 5%
19	1	R5	1K2 1/4W 5%
20	1	R6	1K Var.trimm.

15. TX AND RX TECHNICAL SPECIFICATIONS

Overall IF/IF specifications

IF standard frequency ..... 70 MHz

IF standard group delay (IF ± 8 MHz) ..... ≤ 3 ns

Overall BB/BB specifications (-43 dBm at receiver input)

BB amplitude/frequency response (5 Hz to 9.1 MHz) ..... edsgd within 0.9 dB

Video amplitude/frequency response (5 Hz to 5 MHz) ..... within 0.5 dB

Group delay in video band (5 Hz to 5 MHz) ..... within 20 ns

Differential gain ..... ≤ 2 %

Differential phase ..... ≤ 2°

Audio channels frequency response (30 Hz to 15 kHz)..... within 0.5 dB

Audio channels THD (1 kHz, 0 dBm) .....≤ 0.3 %

Transmitter characteristics

Modulation ..... CCIR 405/1

Frequency deviation..... 20 MHz pp

Output power ..... 2W for HMT2 /2G or 5W for HMT5 /2G

IF+ 15 VDC output connector ..... N female

BB/Video input level ..... 1 Vpp (75 Ω unbal.)

Video input connector ..... BNC

Video preemphasis (bypassable)..... C.C.I.R. 625 lines

Audio input level (Δf = 75 kHz peak.).....-3 to +12 dBm (600 Ω bal./unbal.)

Audio input connector. ..... XLR female

Audio pre-emphasis (bypassable) ..... 50 µS, 75 µS

Audio subcarrier frequencies.....7500, 8065 MHz

Power supply.....AC 110/220 ± 15% , 50/60 Hz

Receiver characteristics

RF range..... -90 to -15 dBm (50 Ω)

Video de-emphasis (by-passable) ..... C.C.I.R. 625 lines

BB/Video output level.....1 Vpp (75 Ω)

Video output connector ..... BNC

Audio output level (Δf = 75 kHz peak) ..... -3 to +12 dBm (600Ω bal./unbal.)

Audio de-emphasis (bypassable) ..... 50 µS, 75 µS

Power supply .....AC 110/220 ± 15% , 50/60 Hz

Transmitter/receiver general data

Outdoor operating temperature range ..... -20 to +50 °C

Outdoor operating humidity range ..... ≤ 95 %

TX – RX Dimensions (W x L x H)..... 305 x 400 x 140 mm

16. INSTALLATION

16.1 INSTALLING MMT-HMT /P

For installing the MMT-HMT /P transmitter, perform the following steps.

1) Power the device with the cable supplied.
2) Remove the first panel.
3) On the second panel connect the filter to the feeder
4) Power on the equpment.

   The PWR led on front panel should light up.

   The LOCK led on front panel should light down.
5) Connect a video signal, with BNC connector video input.

   It may be necessary to set the modulation depth in correspondence of video input signal level, then adjust a panel trimmer (Trimmer R41). The value we suggest is 20 MHz peak to peak.

   The Led Bar on the front panel furnishes the modulation level (kHz or MHz). To select the signal that must be measured (Video, Audio1, Audio2) press the button; when the Video signal is selected the led Video lights on.
6) Connect an audio signal, with XLR connector to subcarrier 1, 2 input.

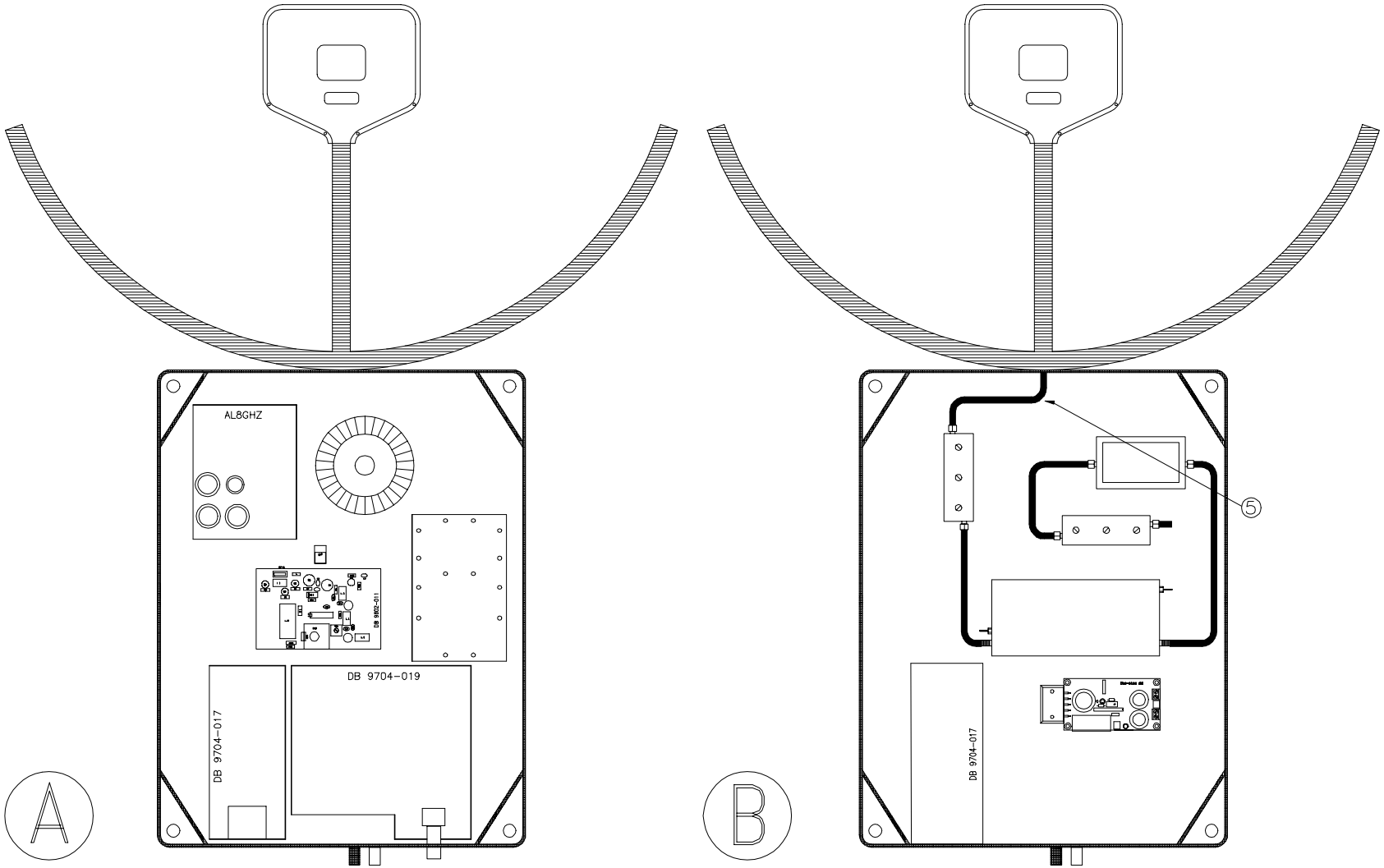
   It may be necessary to set the modulation depth in correspondence of video input signal level, then adjust panel trimmers (R12 trimmer Fig. 4.5). The value we suggest is 70 kHz peak.

   The Led Bar on the front panel furnishes the modulation level (kHz or MHz). To select the signal that must be measured (Video, Audio1, Audio2) press the button; when the desired signal is selected the led Audio1 or Audio 2 on.

   For pre-emphases de-insertion disconnect JP5 and JP6 jumper for 75µs (Fig. 4.5).

   It can be necessary to adjust the relative level between the subcarriers and the Video signal, then adjust R37,R38 trimmers for subcarriers levels and R30 trimmer for Video level (see Fig. 3.7); in case the regulation of trimmer R41 it is not enough adjust trimmer R30 (see Fig. 3.7)

Fig. 16.1 - MMT-HMT /P INSTALLATION



16.2 INSTALLING DMT-HMR /P

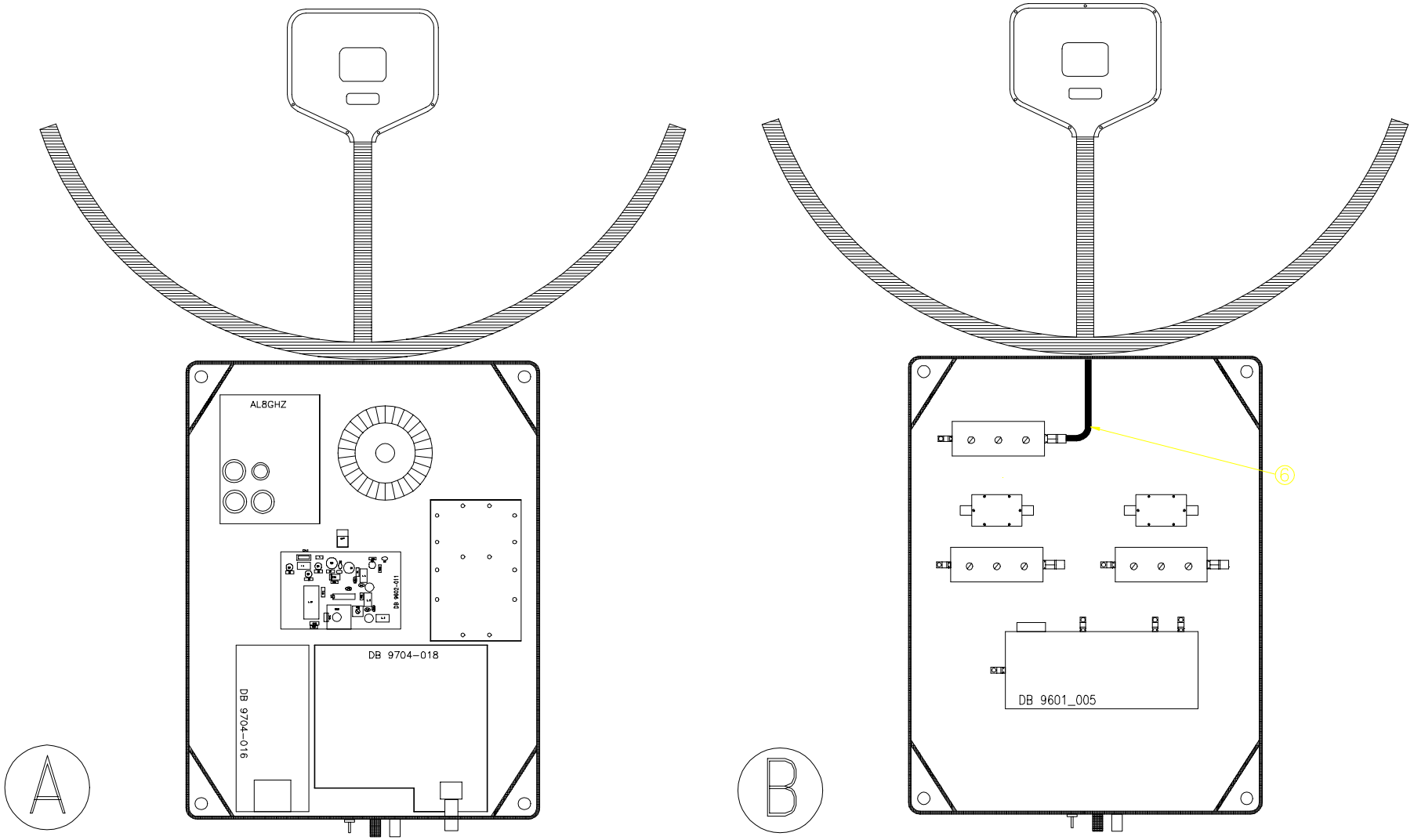
For installing DMT-HMR /P receiver, perform the following steps.

1) Power the device with the cable supplied.
2) Remove the first panel.
3) On the second panel connect the filter to the feeder.

Warning : RF input level of HMR must not exceed -30dBm

4) Power on the equipment
   The ON led on front panel should light up.
   The PLL LOCK led on front panel should light down.
5) Connect a video signal receiver with BNC connector in Video output.
   If it is necessary, adjust panel trimmer (R11 trimmer
   Fig. 10.7) for signal level setting.
   The Led Bar on the front panel furnishes the signal level (Volts). To select the signal level (Video, Audio1, Audio2) or the carrier level (SIGNAL) that must be measured, press the button; when the desired signal is selected its led lights on.
6) Connect an audio signal receiver to Subcarrier 1 or 2 output with XLR connector.
   It can be necessary the signal level settings, then adjust panel trimmers (Trimmer R64
   Fig. 11.4).
   The Led Bar on front panel furnishes the signal level (Volts). To select the signal (Video, Audio1, Audio2 signal) that must be measured push the button; when the desired signal is selected its led is light on.
   For de-emphases de-insertion connect JP6 jumper for 50 µs (see
   Fig. 11.4).
   For de-emphases de-insertion connect JP6 and JP12 jumper for 75 µs (see
   Fig. 11.4).

Fig. 16.2 - DMT-HMR /P INSTALLATION



16.3 CHANNEL SETTING

The channel settings is factory made under user's indication.

The transmitter channel settings is realized by means of jumpers located on VCO board .

See the following indications for jumper settings:

1 - Each jumper has a rising weight from left to right (0.125 MHz, 0.250 MHz , ..) (

Fig. 11.4).

2- Leave jumpers open so that the sum of the weights is the channel frequency.

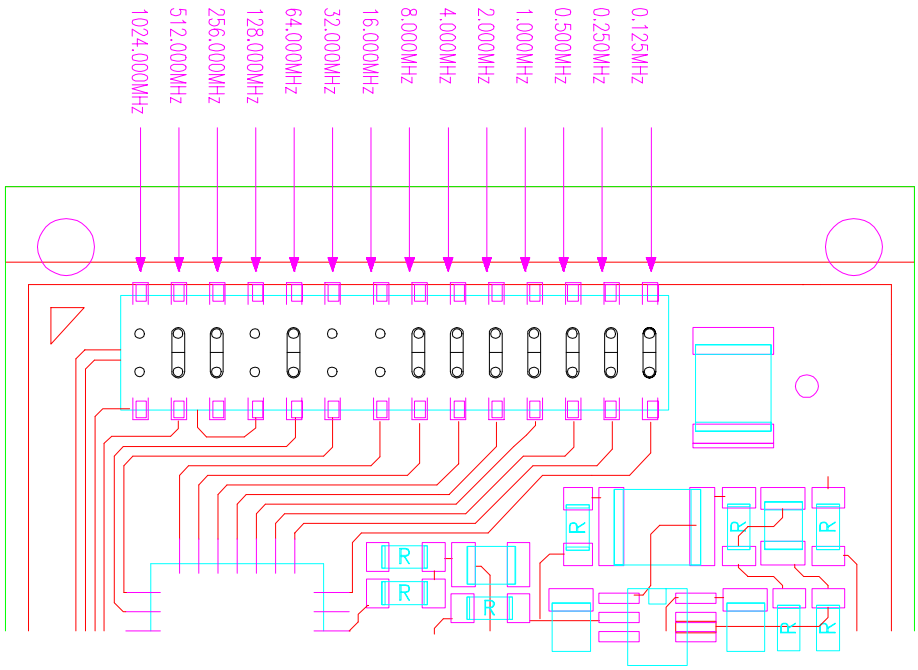
EXAMPLE: Setting a channel with carrier at 10500 MHz.

The up-converter and the down-converter make a 9300 MHz frequency transposition therefore it is necessary an IF of 1200 MHz.

Transmitter : for 1200 MHz carrier the weights to set off (leave jumper open) in the VCO board are:

- 1024 MHz
- 128 MHz
- 32 MHz
- 16 MHz

Fig. 16.3 - TRANSMITTER JUMPERS (VCO BOARD ON MMT)

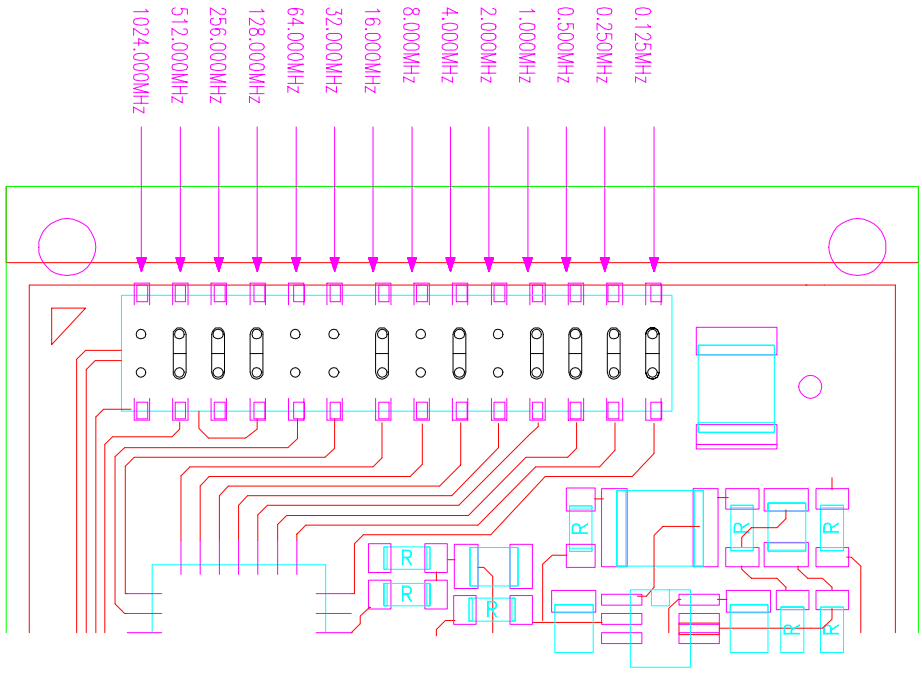


Receiver: for 1200 carrier it is necessary to subtract the 70 MHz reference frequency obtaining 1130 MHz ;

the weights to set in the local oscillator (L.O.) board are:

- 1024 MHz
- 64 MHz
- 32 MHz
- 8 MHz
- 2 MHz

Fig. 16.4 - RECEIVER JUMPERS (L.O. BOARD ON DMT)

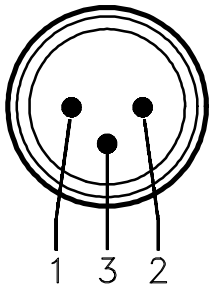


17. APPENDIX A

17.1 XLR AUDIO CONNECTORS PINOUTS FOR MMT

The pattern below shows how to connect the cables of the audio signal to the male XLR connectors for balanced or unbalanced signal.

MALE XLR

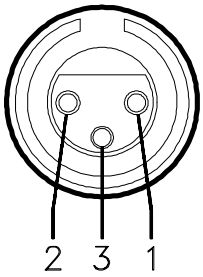


XLR CONNECTOR PIN	BALANCED SIGNAL	UNBALANCED SIGNAL
1	ground	ground
2	" + "	ground
3	" – "	signal

17.2 XLR AUDIO CONNECTORS PINOUTS FOR DMT

The pattern below shows how to connect the cables of the audio signal to the female XLR connectors for balanced or unbalanced signal.

FEMALE XLR



XLR CONNECTOR PIN	BALANCED SIGNAL	UNBALANCED SIGNAL
1	ground	ground
2	" +"	not connected
3	" – "	signal