Unit 4

Channel UP Converter

1. Channel UP converter:

1.1. Introduction:

This module converts an IF signal, into "a" UHF band channel, maintaining its characteristics and the same bandwidth.

1.2. IF filter and amplifier AGC (for transposer):

The filter and IF amplifier establish the necessary bandwidth to the input signal and supply a gain in it, maintaining a constant level, through an AGC loop. It is used only in the transposer equipments.

1.3. IF pre-distortion:

The IF module pre-distortion corrects the intermodulation, the differential gain, the differential phase and the synchronism compression. This correction is done by pre-distortion on IF level (41-47 MHz). This module is placed after the audio and video modulator and before the channel converter module.

1.4. Automatic Level Control (ALC):

This module maintains the output peak power at its nominal value, even if there is gain variation due to the temperature and power supply variations.

It allows a maximum correction of ±1dB.

1.5. Channel converter:

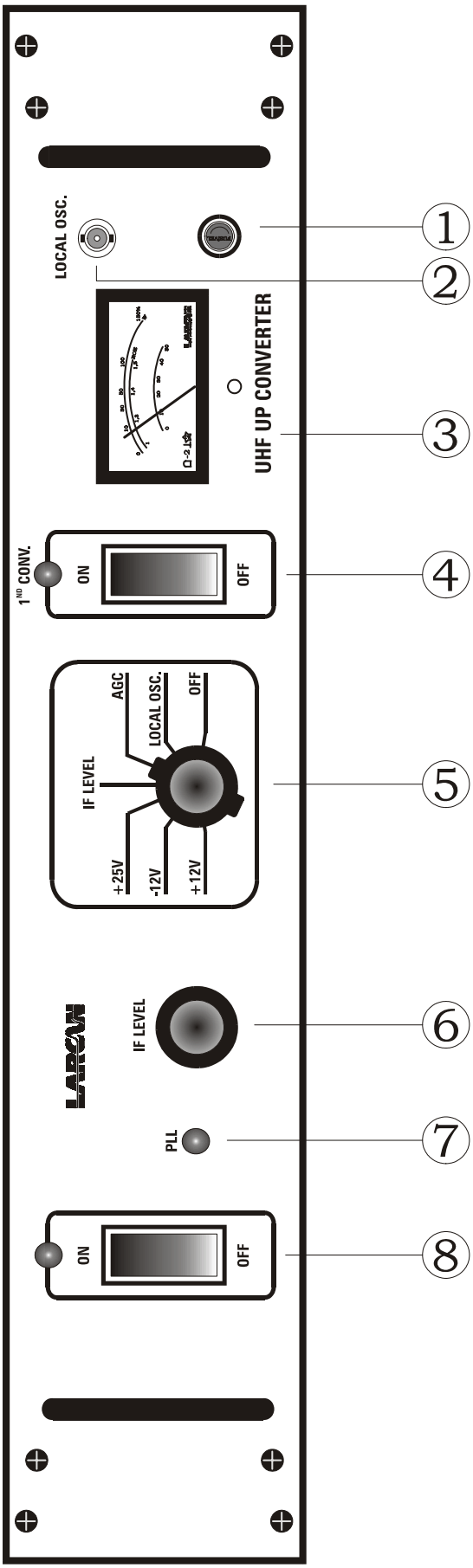
The UHF channel UP converter has an oscillator that is controlled by PLL, whose frequency operation is selected by DIP switch from the Local Oscillator control board, according to the channel programming chart.

1.6. Protections/signals:

The channel UP converter has in its front panel a PLL (Phase Locked Loop) alarm led that shows if the converter is out of the operation frequency.

2. Front and back panel:

2.1. UP Converter Frontal Panel (for transposer):



Each element in the panel has the following function:

1. FUSE: 2 A fuse.

2. LOCAL OSC: BNC connector used to monitor the local oscillator by spectrum analizer.

3. METER: Allows measurements of +12V, -12V, +25V, IF level, AGC (Automatic Gain Control) and Local Oscillator.

4. 1st CONV ON/OFF SWITCH: it allows turn on and off the 1st converter.

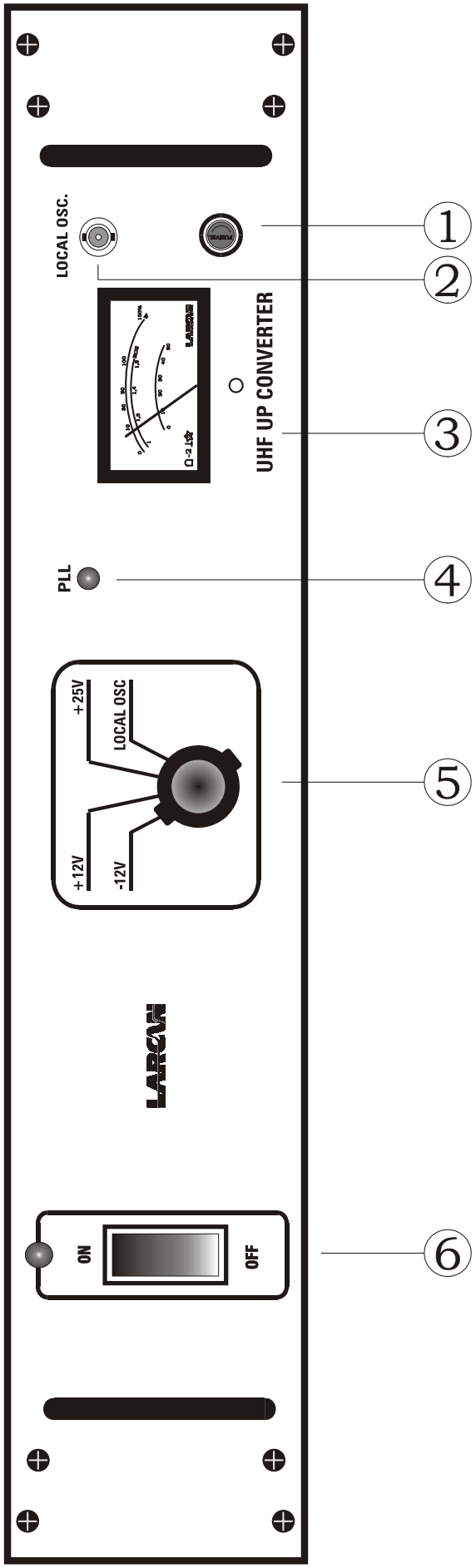
5. SELECTOR SWITCH: According to the switch position, the values are indicated in the meter.

6. IF LEVEL: it sets the output power by adjusting the IF level.

7. PLL Led: When the led is lighted, it indicates that the local oscillator is out of frequency.

8. ON/OFF SWITCH: this switch allows turn on and off the UP converter.

2.2. UP Converter Frontal Panel (for tranmitter):



Each element in the panel has the following function:

1. FUSE: 2 A fuse.

2. LOCAL OSC: BNC connector used to monitor the local oscillator by spectrum analizer.

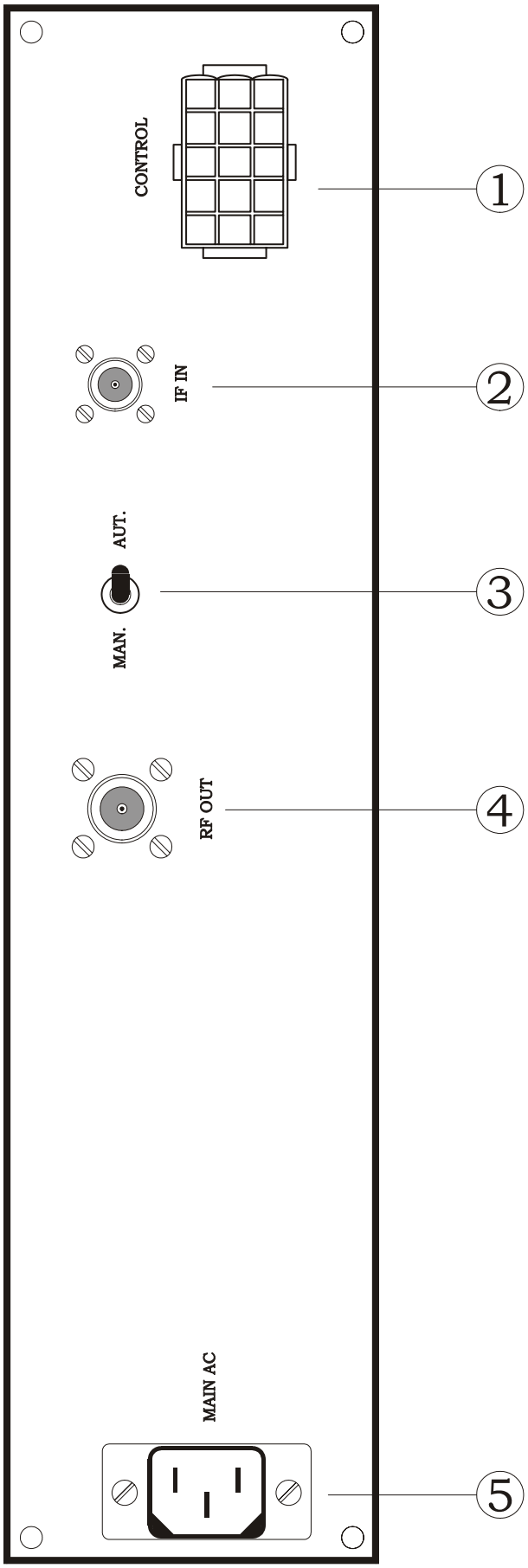
3. METER: Allows measurements of +12V, -12V, +25V and Local Oscillator.

4. PLL Led alarm: When the led lights, it indicates that the local oscillator is out of frequency.

5. SELECTOR SWITCH: According to the switch position, the values are indicated in the meter.

6. ON/OFF SWITCH: this switch allows turn on and off the UP converter.

2.3. UP Converter Back Panel (for transposer and transmitter):



Each element in the panel has the following function:

1. CONNECTOR 15P: main power supply, commands and measurements.

2. IF IN: IF input connector type BNC.

3. Automatic/Manual selector switch: Automatic: the equipment operation depends on the Video or IF signal. Manual: its operation does not depend on the Video or IF signal.

4. RF OUT: RF output connector type N.

5. MAIN AC: Main AC input 220V.

3. IF filter amplifier:

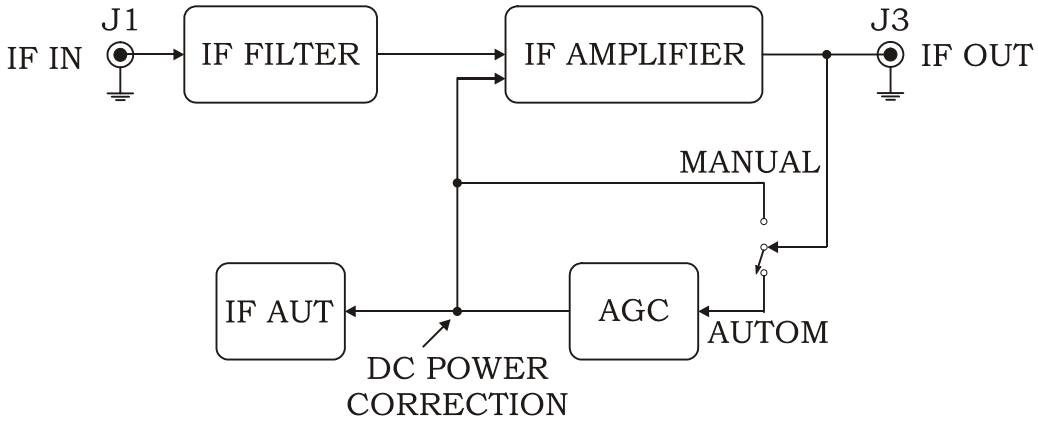
3.1. Function:

The IF filter establishes the adequate bandwidth to the input signal and the IF amplifier supplies the gain for this signal, maintaining a constant level, through AGC loop.

3.2. Technical Characteristics:

Central Frequency	44 MHz
Bandwidth	6 MHz
Input and Output impedance	50 Ohms
Maximum output level	+3 dBm
Linearity	+ or – 0.25 dB in ± 3 MHz
Maximum gain	60 dB
AGC band	50 dB
Supply	+12V at 250mA

3.3. Block Diagram:



3.4. Technical description:

3.4.1. IF Filter:

The input signal is applied by J1. The integrated circuit IC1 amplifies the applied signal to the IF filter.

The function of the circuit that is formed by C7, L3, C8, C9, L4, C10, C11, L5, C12, C13, C14 and C16 is to determine the IF amplifier operation bandwidth. This filter is adjusted to obtain a 6MHz bandwidth.

3.4.2. IF amplifier:

The IF signal received from IF filter is, through C17, connected to the adjustable attenuating loop, that is formed by diodes D2, R9, D4 and D3. After the attenuating loop, the signal is amplified by the integrated circuit MAR-7 (IC2).

The amplified signal passes through another attenuating loop, formed by diodes and resistors D5, R14, D7 and D6, and it is connected by the capacitor C28 to the integrated circuit MAR-6 (IC3), and finally, through capacitor C29, reaches the integrated circuit MAR-7 (IC4).

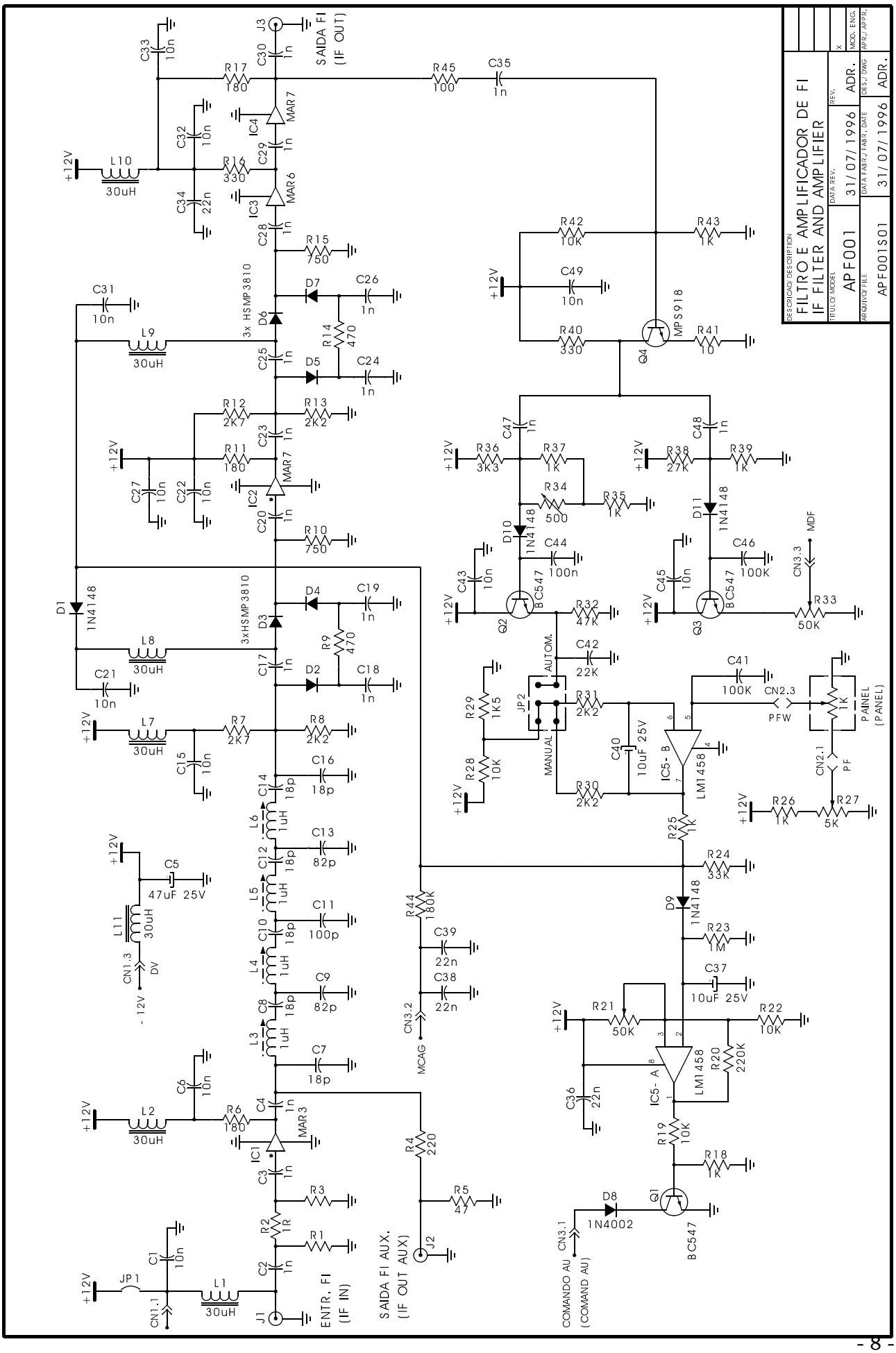
A sample signal from the output signal is taken from the resistor R45; after, it is amplified by transistor Q4 and detected by the diodes D10 and D11. The detected signal by the diode D11 is supplied, by the emitter follower Q3, to check the IF level in the panel.

The integrated circuit IC5-B supplies in its output a dc level, that is the function of the received signal J1. The diode D1 and L9 act respectively in the polarization of the attenuating loops, altering the final gain of the IF amplifier. When JP2 is in the AUT position, this dc level is proportional due to the detected signal by the diode D10, maintaining the IF level constant in the output J3.

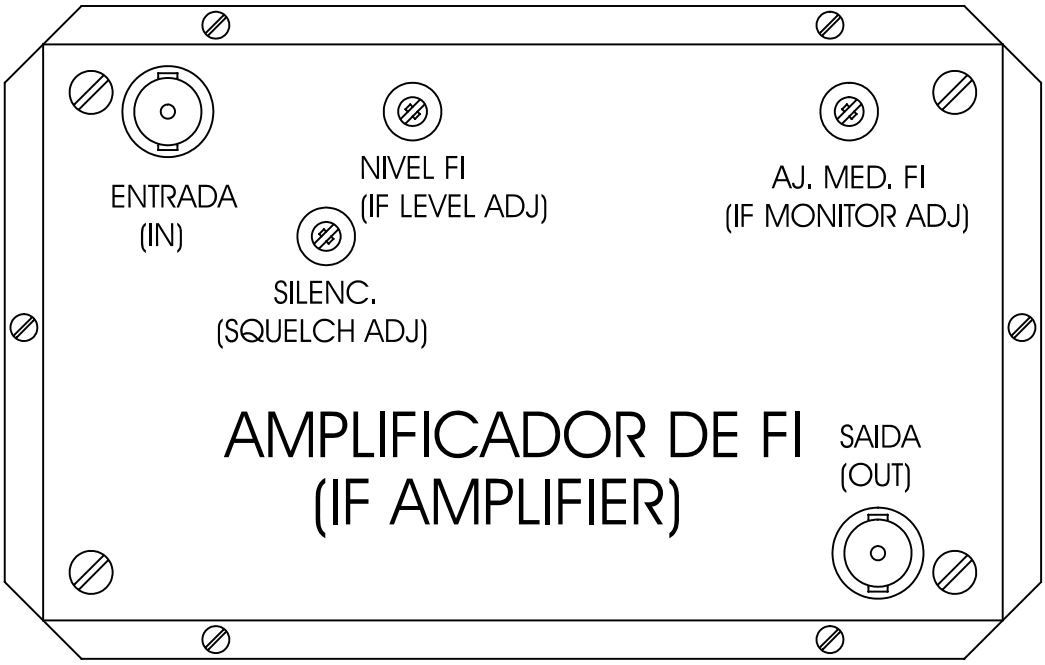
The IC5-A output level is the result of input levels voltage comparison between pins 3 and 2.

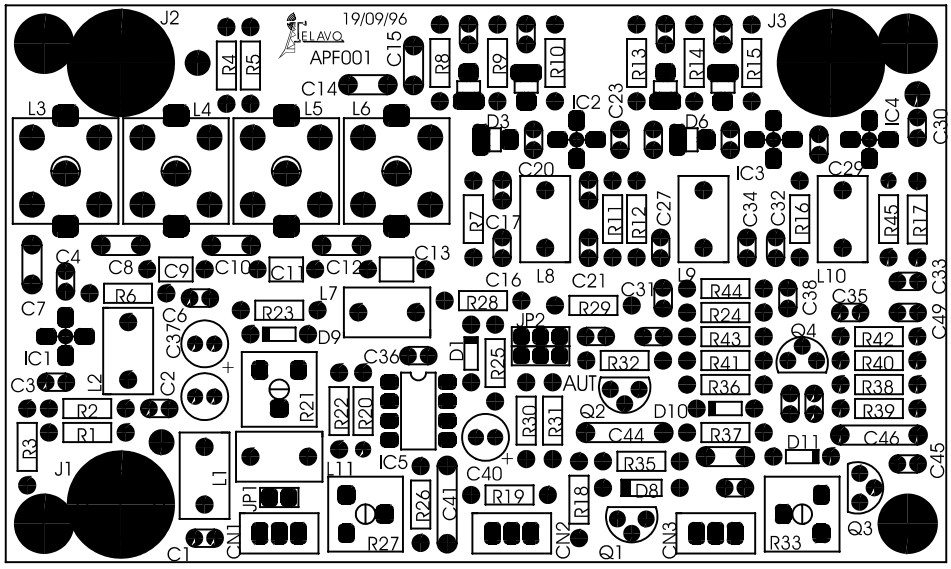
This way we can determine the operation point of the IF command adjusting R21. Through CN3-1 the following circuits are enabled.

3.5. Circuit diagram APF001:



3.6. Layout APF001:





3.7. Parts List APF001:

Quant.	Description	Position	Code
7	SHOCK 30 μH	L1,L2,L7,L8,L9,L10,L11	50001
1	INTEGRATED CIRCUIT 1458	IC5	60035
2	CAPACITOR ELCO. RADIAL 10μF 25V	C37,C40	74028
1	CAPACITOR ELCO. RADIAL 47μF 25V	C5	74029
3	CAPACITOR METAL POL. 100ηF	C41,C44,C46	75004
17	CAPACITOR CER. MULTILAYER 1ηF	C2,C3,C4,C17,C18,C19,C20,C23,C24,C25, C26,C28,C29,C30,C35,C47,C48	76044
5	CAPACITOR CER. MULTILAYER 22ηF	C34,C36,C37,C39,C42	76045
12	CAPACITOR CER. MULTILAYER10ηF	C1,C6,C22,C21,C27,C31,C32,C33,C36, C43,C45,C49	76046
6	CAPACITOR MICA CMO 18 ρF	C7,C8,C10,C12,C14,C16	79907
2	CAPACITOR MICA CMO 76 ρF	C9,C13	79909
1	CAPACITOR MICA CMO 100 ρF	C11	79940
1	DIODE 1N 4002	D8	82001
4	DIODE 1N 4148	D1,D9,D10,D11	82011
1	TRIMPOT 5 K	R27	90004
2	TRIMPOT 50 K	R21,R33	90006
1	RESISTOR 1/8W 10 Ohms	R41	100008
1	RESISTOR 1/8W 100 Ohms	R45	100018
3	RESISTOR 1/8W 180 Ohms	R6,R11,R17	100020
2	RESISTOR 1/8W 330 Ohms	R16,R40	100023
2	RESISTOR 1/8W 470 Ohms	R9,R14	100025
7	RESISTOR 1/8W 1 K	R18,R25,R26,R35,R37,R39,R43	100028
1	RESISTOR 1/8W 1 K 5	R29	100030
4	RESISTOR 1/8W 2 K 2	R8,R13,R30,R31	100032
2	RESISTOR 1/8W 2 K 7	R7,R12	100033
1	RESISTOR 1/8W 3 K 3	R36	100035
4	RESISTOR 1/8W 10 K	R19,R22,R28,R42	100041
1	RESISTOR 1/8W 27 K	R38	100046
1	RESISTOR 1/8W 33 K	R24	100047
1	RESISTOR 1/8W 47 K	R47	100048
1	RESISTOR 1/8W 180 K	R44	100055
1	RESISTOR 1/8W 220 K	R20	100056
1	RESISTOR 1/8W 1 M	R23	100059

2	RESISTOR 1/8W 750 Ohms	R10,R15	100063
1	RESISTOR 1/2W 1 R 2	R2	102039
1	THERMISTOR NTC 500 Ohms	R34	111003
3	TRANSISTOR BC 546 A	Q1,Q2,Q3	120005
1	TRANSISTOR MPS 918	Q4	125016
3	CONNECTOR BNC FEM. R. C/ROSCA	J1,J2,J3	800200
3	CONECTOR MULT. MACHO 3 P.	CN1,CN2,CN3	800817
1	INTEGRATED CIRCUIT MAR-6	IC3	IMPCI0019
2	INTEGRATED CIRCUIT MAR-7	IC1,IC2	IMPCI0020
1	INTEGRATED CIRCUIT MAR-3	IC4	IMPCI0022
6	DIODE HSMP 3810	D2,D3,D4,D5,D6,D7	IMPC00038
1	IF FILTER AND AMPLIFIER	PCI1	PCIAPF001

4. IF Pre-distortion linearity:

4.1. Function:

It corrects the non-linearity and/or intermodulation that are generated at the final stage of the transmitter amplification.

4.2. Technical characteristics:

Frequency band: _____ 41 to 47 MHz
Input level: _____ -4.0 dBm ± 1.0 dBm
Output level (adj): _____ + 3.0 dBm (max)
Input/Output Impedance:_____ 50 ohm
Supply: _____ +25V

4.3. Technical Description:

IF signal applied to the input J1 is amplified by Q1, and in Q2 is divided in order to supply two circuits, a linear one and a non-linear one.

The linear circuit has about a 40 ns delay line to compensate the delay caused in the non-linear circuit. After the delay line, the signal is inserted through trimpot R13 in the adder circuit that is formed by Q4 and Q5.

The non-linear circuit causes a distortion in the signal through D3 and D4 that have its conduction region determined by trimpots R11 and R29. This signal, distorted and amplified by Q7 and Q8, is put in phase by equalizer circuit formed for L11, C29, R40 and R41, again amplified for Q9, via trimpot R50 and transistor Q10 and finally is added to the linear signal.

The composed IF signal passes by the attenuator circuit, and its level is adjusted by R44, and amplified by IC1 when it is delivered to output J2.

4.4. Adjustment Procedure:

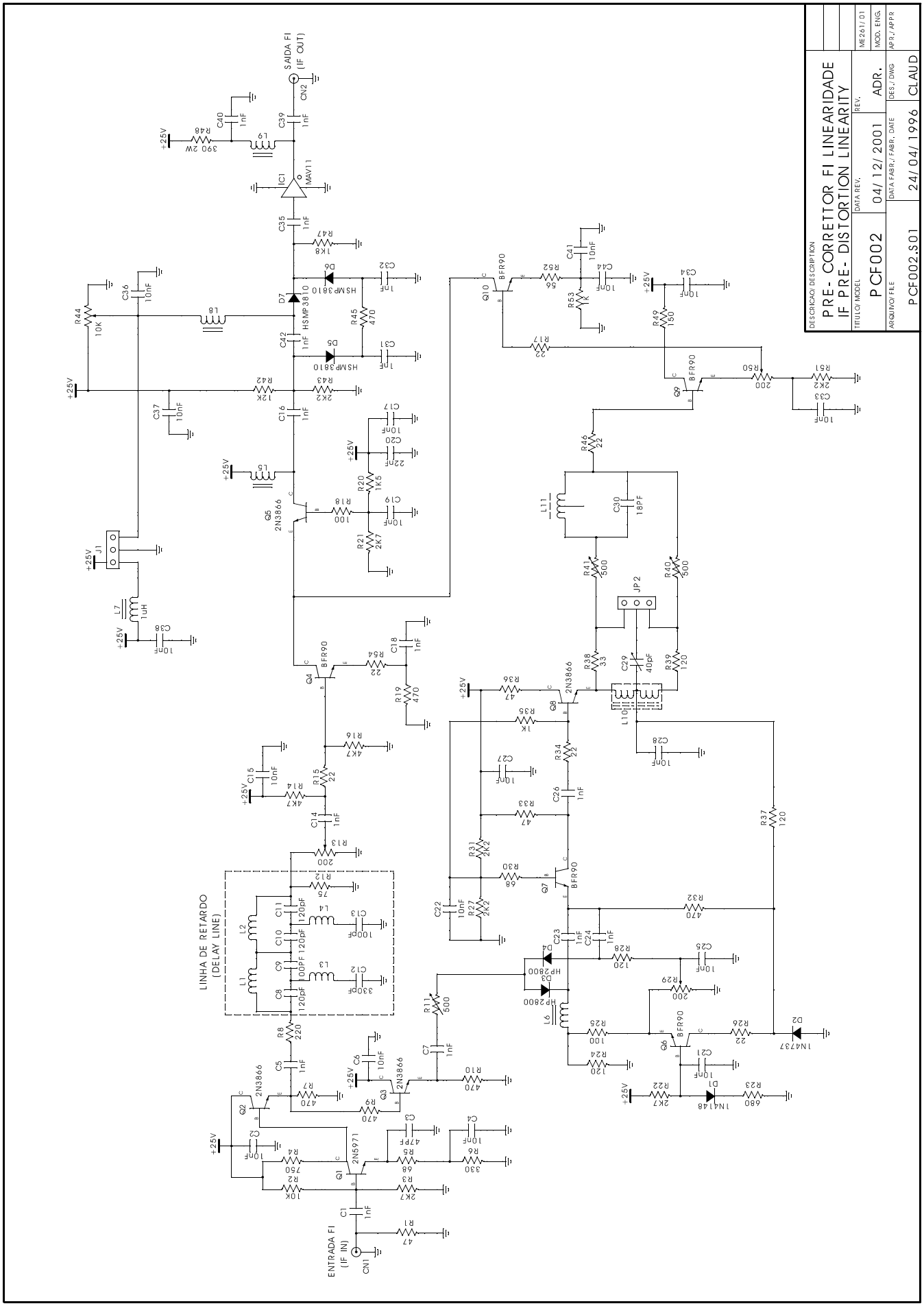
The signal should be constantly checked by the spectrum analyzer using the red pattern modulated signal.

1) Insert the circuit in the system when the IF level is about –3.0 dBm in the input and all the trimpots are in the minimum.

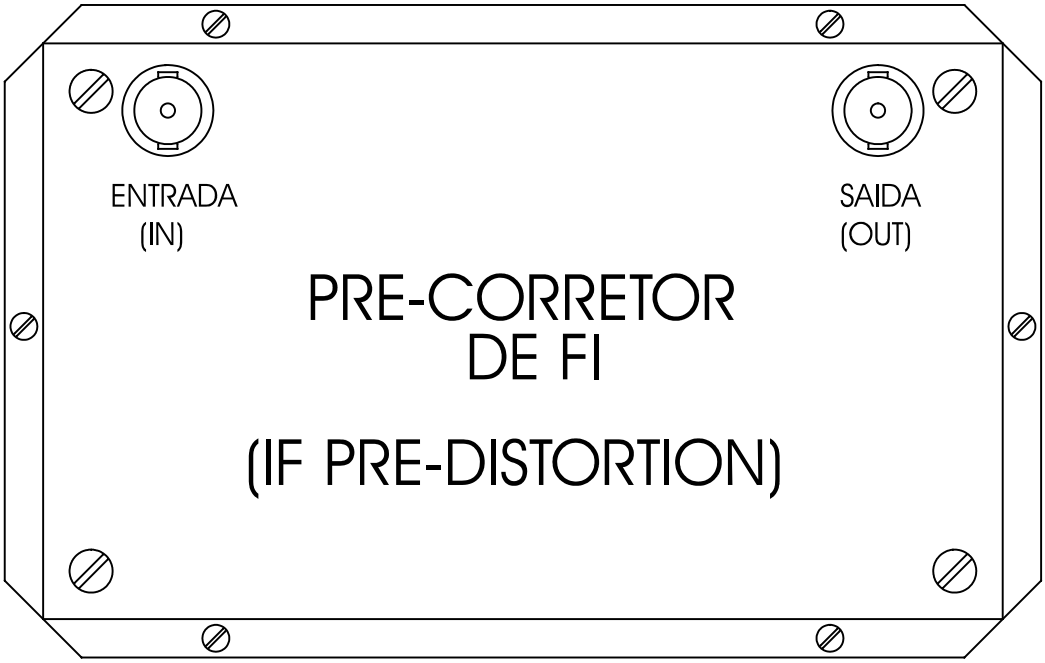
2) Adjust trimpot R44 to 80% of its course approximately, then increase the level in R13 until the nominal power is reached.

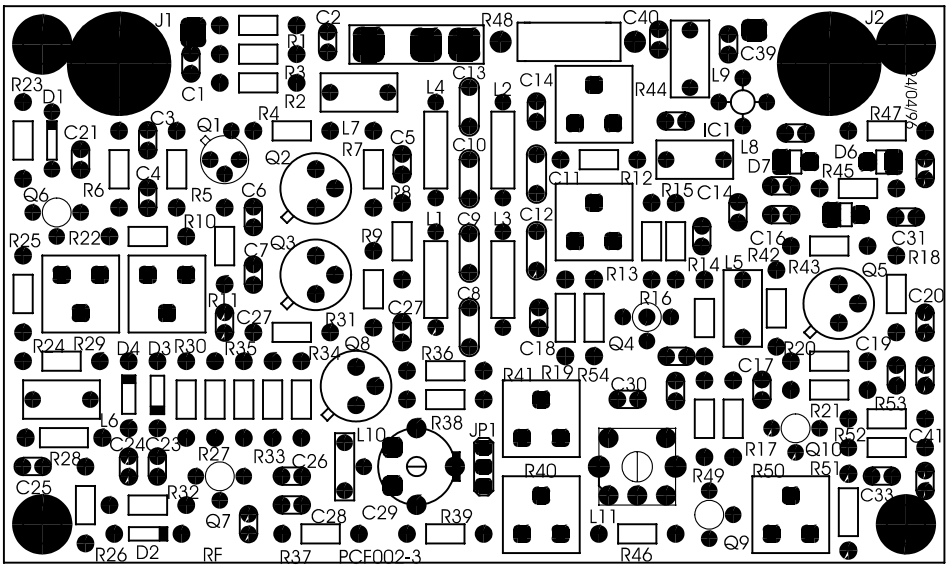
3) Adjust trimpots R11 and R29 in order to cause the needed distortion to cancel the distortion that comes from the amplifying final stage, adjusting the level of this signal in the trimpot R50 and compensating the power variation in the trimpot R13, in order to maintain it as a nominal one. Adjust the inductor L11 to obtain the distorted signal phase inversion that will be inserted in the system.

4.5. Circuit diagram PCF002:



4.6. Layout PCF002:





4.7. Parts List PCF002:

Quant.	Description	Position	Code
5	SHOCK 1 μH	L5,L6,L7,L8,L9	50017
14	CAPACITOR CER. MULTILAYER 1ηF	C5,C5,C14,C16,C18,C23,C24,C26,C31, C32,C35,C39,C40,C42	76044
5	CAPACITOR CER. MULTILAYER 22ηF	C20	76045
19	CAPACITOR CER. MULTILAYER 10ηF	C2,C4,C6,C15,C17,C19,C20,C21,C22,C25, C27,C28,C33,C34,C36,C37,C38,C41,C44	76046
1	CAPACITOR PLATE 18ρF	C30	79515
1	CAPACITOR PLATE 47ρF	C3	79518
2	CAPACITOR MICA CMO 100ρF	C9,C13	79940
3	CAPACITOR MICA CMO 120ρF	C8,C10,C11	79941
1	CAPACITOR MICA CMO 330ρF	C12	79942
1	DIODE 1N 44148	D1	82011
1	DIODE 1N 4737 A 7V5	D2	82036
3	TRIMPOT 200 Ohms	R13,R29,R50	90003
1	TRIMPOT 10 K	R44	90005
3	TRIMPOT 500 Ohms	R11,R40,R41	90008
6	RESISTOR 1/8W 22 Ohms	R15,R17,R26,R34,R46,R54	100010
1	RESISTOR 1/8W 33 Ohms	R35	100012
3	RESISTOR 1/8W 47 Ohms	R1,R33,R36	100013
1	RESISTOR 1/8W 56 Ohms	R52	100014
2	RESISTOR 1/8W 68 Ohms	R5,R30	100015
1	RESISTOR 1/8W 75 Ohms	R12	100016
2	RESISTOR 1/8W 100 Ohms	R13,R18	100017
4	RESISTOR 1/8W 120 Ohms	R12,R24,R37,R39	100018
1	RESISTOR 1/8W 150 Ohms	R49	100019
1	RESISTOR 1/8W 220 Ohms	R8	100021
1	RESISTOR 1/8W 330 Ohms	R6	100023
6	RESISTOR 1/8W 470 Ohms	R7,R9,R10,R19,R32,R45	100025
1	RESISTOR 1/8W 680 Ohms	R23	100027
2	RESISTOR 1/8W 1 K	R35,R55	100028
1	RESISTOR 1/8W 1 K 5	R20	100030
1	RESISTOR 1/8W 1 K 8	R47	100031
4	RESISTOR 1/8W 2 K 2	R31,R43,R51,R53	100032
3	RESISTOR 1/8W 2 K 7	R3,R21,R22	100033

2	RESISTOR 1/8W 4 K 7	R14,R18	100037
1	RESISTOR 1/8W 10 K	R2	100041
1	RESISTOR 1/8W 12 K	R42	100042
1	RESISTOR 1/8W 750 Ohms	R4	100063
1	RESISTOR 2W 390 Ohms	R48	104023
4	TRANSISTOR 2N 3866	Q2,Q3,Q5,Q8	126009
1	TRANSISTOR 2N 5179	Q1	128015
2	CONNECTOR BNC FEM.	CN1,CN2	800200
1	CAPACITOR TRIMMER 40ρF	C29	130007
1	INTEGRATED CIRCUIT MAV 11	IC1	IMPCI0032
2	DIODE HP2800 (5082)	D3,D4	IMPD00001
3	DIODE HSMP 3810	D5,D7,D8	IMPD00038
5	TRANSISTOR BFR 90 / BFR 91	Q4,Q6,Q7,Q9,Q10	IMPT00006
1	IF LINEARITY PRE-DISTORTION PCB	PCI1	PCIPCF002

5. Automatic Level Control (ALC):

5.1. Function:

The Automatic Level Control corrects the transmitter output peak sync power due to the variation gain of the amplifiers.

5.2. Technical Description:

This circuit has a total attenuation of 1dB, allowing controlling the power to positive and negative variation of 0.5dB.

The command occurs through the obtained voltage from the TV monitor through wire identified by the CAP cord. If the Turn on/turn off switch in the panel is OFF, it allows adjusting the output power, as it fixes the CP input in 3.7V. We can observe in the circuit the variable attenuator by the diodes PIN formed by diodes D1, D2 and D3, and capacitors C10, C11 to C14 and resistors R14 and R15.

The Pin diodes current occurs through the integrated circuit IC1A, by shock CH1. The TV monitor CAP command voltage supplies the IC1A inverter gate through R1. The integrate circuit IC1A amplifies this voltage increasing its range from –0.5 to -10V.

The integrated circuit IC1B receives this voltage of –0.5 to -10V by R10, adding it to a pre-fixed value R7, R8 and R9. This causes the IC1B output variation from –1.5 to -8V approximately, causing the circuit attenuation to PIN diode, which does not exceed a total variation of 1dB.

The divisor formed by R18, R19 and R20, allows obtaining the reference voltage (REF) to calibrate the transmitter power in the ALC OFF situation.

5.3. Adjustment Procedure:

a) Turn the switch to OFF position (in the panel).

b) Adjust R19 to a 3.7V reading in a digital multimeter in the output REF pin.

c) Adjust the sweep generator, the detector and the oscilloscope to 0dBm IF frequency, inserting the circuit.

d) Through CN1 turn on R1 to ground.

e) Verify if the attenuation is inferior to 1dB in the oscilloscope and memorize the response.

f) Through CN1, turn on R1 to -12V.

g) Through R9 adjust the attenuation to 1dB in the oscilloscope.

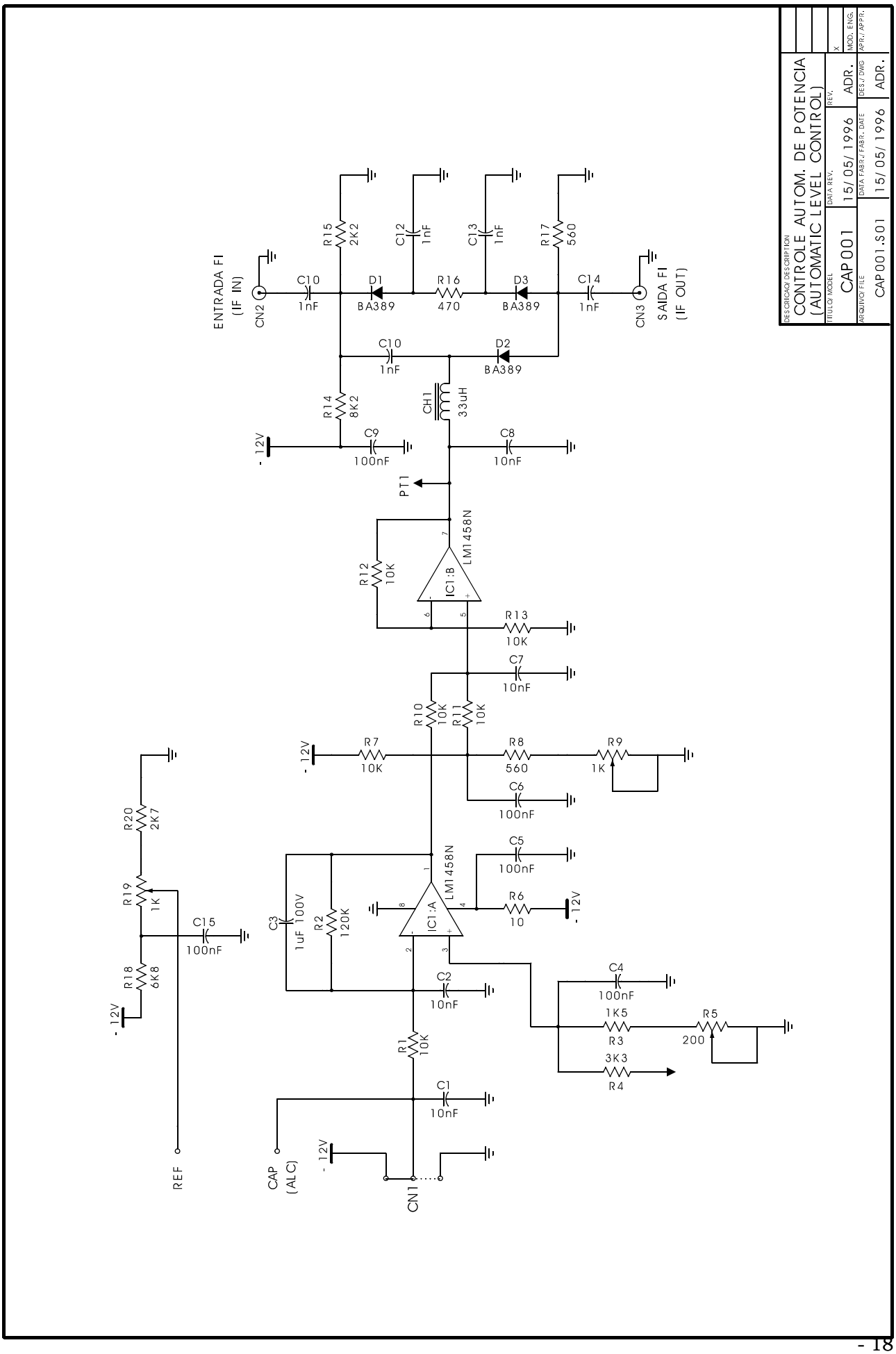
h) Turn off CN1 and adjust R5 to half of the range in the oscilloscope.

i) Insert the circuit between the modulator and the channel converter.

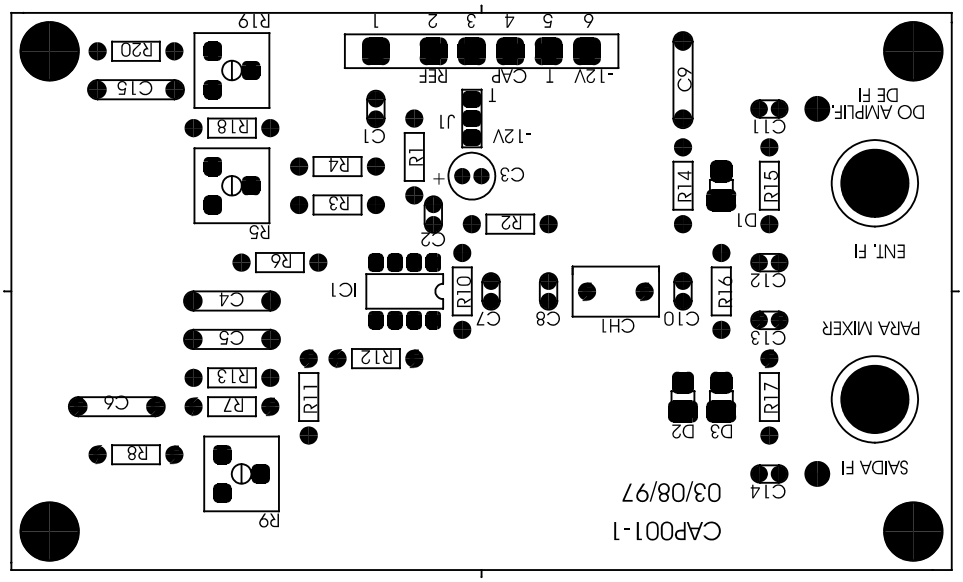
j) The IF level is adjusted to nominal power when the switch is in OFF position.

k) Change to the ON position, verifying the output power.

5.4. Circuit Diagram CAP001:



5.5. Layout CAP001:



5.6. Parts list CAP001:

Quant.	Description	Position	Code
1	SHOCK 30 μH	CH1	50001
1	INTEGRATED CIRCUIT 1458	IC1	60035
1	CAPAC. ELCO. RADIAL 1μF 100V	C3	74026
5	CAPAC. POL. METAL. 100ηF	C4,C5,C6,C9,C15	74005
5	CAPAC. CER. MULTILAYER 1ηF	C10,C11,C12,C13,C14	76044
4	CAPAC. CER. MULTILAYER 10ηF	C1,C2,C7,C8	76046
2	TRIMPOT 1 K	R9,R19	90002
1	TRIMPOT 200 Ohms	R5	90003
1	RESISTOR 1/8W 10 Ohms	R6	100008
1	RESISTOR 1/8W 470 Ohms	R16	100025
2	RESISTOR 1/8W 560 Ohms	R8,R17	100026
1	RESISTOR 1/8W 1 K 5	R3	100030
1	RESISTOR 1/8W 2 K 2	R15	100032
1	RESISTOR 1/8W 2 K 7	R20	100033
1	RESISTOR 1/8W 3 K 9	R4	100036
1	RESISTOR 1/8W 6 K 8	R18	100039
1	RESISTOR 1/8W 8 K 2	R14	100040
6	RESISTOR 1/8W 10 K	R1,R7,R10,R11,R12,R13	100041
1	RESISTOR 1/8W 120 K	R2	100052
2	CONNECTOR BNC FEM. R. C/ROSCA	CN2,CN3	800205
3	DIODE HSMP 3810	D1,D2,D3	IMPD00038
1	PCB AUTOMATIC LEVEL CONTROL	PCI1	PCICAP001

6. Channel UP Converter:

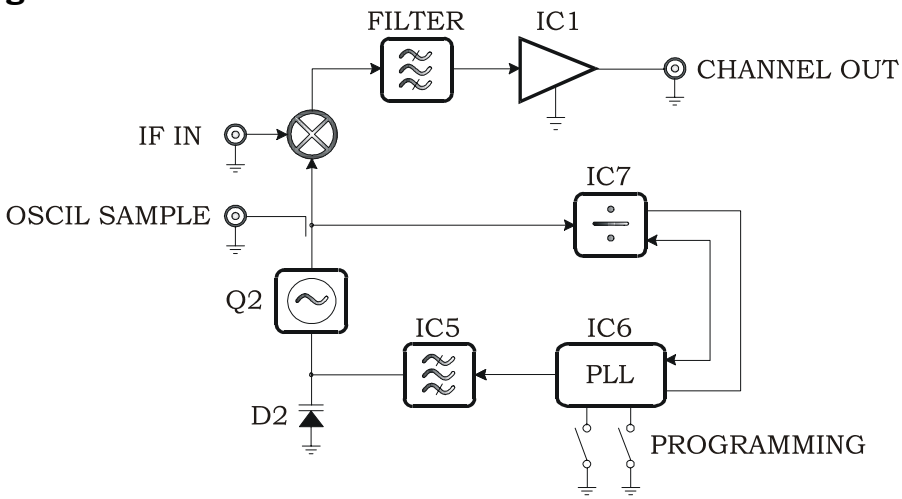
6.1. Function:

The channel UP converter function is to convert the IF frequency (41 to 47 MHz) to a determined channel in UHF.

6.2. Technical Characteristics:

Input frequency band: _____ 41 to 47 MHz
Output frequency band:_____ 470 to 890 MHz
Gain: _____ 0 dB
Input/Output Impedance: _____ 50 Ohms
Channel bandwidth: _____ 6 MHz
Consume: _____ +12V at 150mA

6.3. Block Diagram:



6.4. Technical Description:

The oscillator, transistor Q2, generates a low noise signal in the used frequency band. Its frequency is determined by the control voltage applied to diode varicap D2. The amplifier IC3 receives the oscillator signal and provides load isolation and, the amplifier IC2 delivers to the mixer a +17 dBm level. A sample from the oscillator signal is, through R25, delivered to IC7 prescaler, that divides the signal into 64 and 65, according to the control that comes from PLL, integrated circuit IC8. PLL receives the prescaler signal and divides it according to the external programming (1 to 8), and compares it in phase to a reference signal controlled by crystal generated by the own integrated circuit.

In the integrated circuit output results a proportional voltage that is the phase difference among the signals. This voltage is filtered by IC5 and applied to diode D2 for the frequency correction

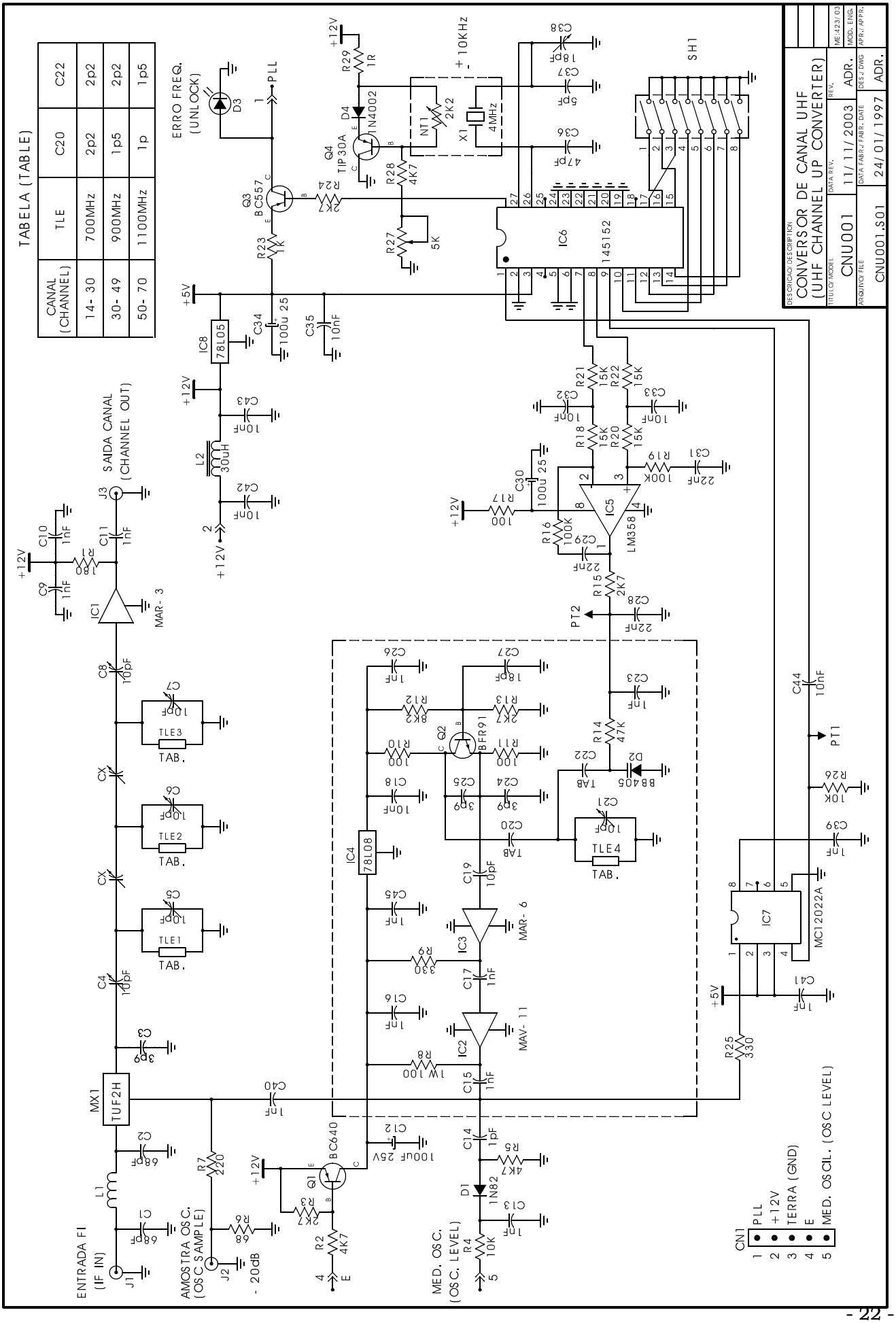
The mixer MX1 receives IF signals and the local oscillator, and generates through the signal beating the desired channel. The conversion loss in the mixer is aproximately 8dB at most. The signal after the mixer passes through the channel filter that rejects the local oscillator and the undesirable product in the conversion. The amplifier IC1 compensates the mixer and the channel filter losses.

6.5. System alignment:

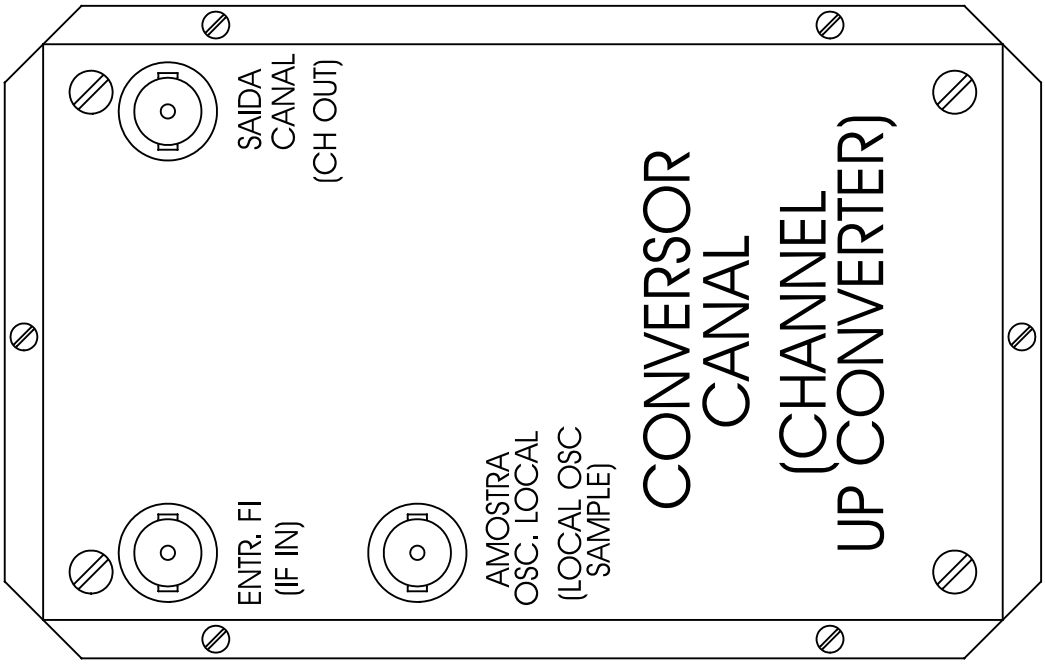
1. Program the oscillator according to the given channel chart and with a multimeter in PT2, adjust trimmer C21 to a 4.5V reading. The led helps the adjustment, when it is turned off it indicates that the oscillator is in the desired frequency. In the point meas. at oscillator shows 0.5V level indicating the RF presence that comes from the local oscillator.

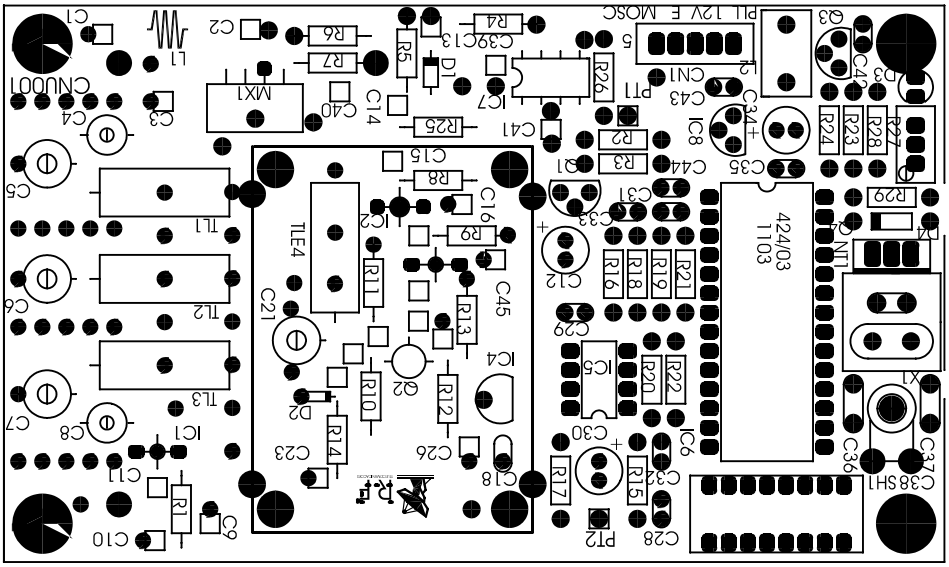
2. Put the sweep generator in the IF band in 41 to 47 MHz, and apply to the IF input, in JP1. Adjust the channel filter to the maximum gain and a better linearity, with the detector in the channel output.

6.6. Circuit diagram CNU001:



6.7. Layout CNU001:





6.8. Parts List CNU001:

Quant.	Description	Position	Code
1	SWITCH DIP 8 POSTIONS	CH1	41066
1	CRYSTAL 4,000.00 HC49/U	X1	45024
1	SHOCK 30 μH	L2	50001
1	INTEGRATED CIRCUIT LM 358	IC5	60052
3	CAPACITOR ELCO. RADIAL 100μF 25V	C12,C30,C34	74010
3	CAPACITOR CER. MULTILAYER 22ηF	C28,C29,C31	76045
7	CAPACITOR CER. MULTILAYER 10ηF	C18,C32,C33,C35,C42,C43,C44	76046
1	CAPACITOR MICA CMO 47ρF	C36	79912
1	CAPACITOR MICA CMO 5ρF	C37	79917
1	DIODE RED LED 3 mm	D3	82017
1	CAPACITOR TRIMMER 22ρF	C38	85002
1	RESISTOR 1/8W 68 Ohms	R6	100015
3	RESISTOR 1/8W 100 Ohms	R10,R11,R17	100017
1	RESISTOR 1/8W 180 Ohms	R1	100020
2	RESISTOR 1/8W 220 Ohms	R7	100021
2	RESISTOR 1/8W 330 Ohms	R9,R25	100023
1	RESISTOR 1/8W 1 K	R23	100028
4	RESISTOR 1/8W 2 K 7	R3,R13,R23,R24	100033
2	RESISTOR 1/8W 4 K 7	R2,R5	100037
1	RESISTOR 1/8W 8 K 2	R12	100040
2	RESISTOR 1/8W 10 K	R4,R26	100041
4	RESISTOR 1/8W 15 K	R18,R20,R21,R22	100043
1	RESISTOR 1/8W 47 K	R14	100048
2	RESISTOR 1/8W 100 K	R16,R19	100051
1	RESISTOR 1W 100 Ohms	R8	103007
1	TRANSISTOR BC 556 A	Q3	120006
1	TRANSISTOR BC 640	Q1	120008
1	TRANSISTOR UA 78L08 ACP	IC4	126025
3	CONNECTOR BNC FEM.	CN1,CN2,CN3	800200
1	CAPACITOR MONOLITIC 1ρF	C20 (50 TO 70)	IMPC00017
1	CAPACITOR MONOLITIC 1 ρ 5	C20 (30 TO 49),C22 (50 TO 70)	IMPC00018
2	CAPACITOR MONOLITIC 2 ρ 2	C20 (30 TO 49),C22 (50 TO 70)	IMPC00019
2	CAPACITOR MONOLITIC 3 ρ 9	C24,C25	IMPC00020
13	CAPACITOR MONOLITIC 1ηF	C9,C10,C11,C13,C15,C16,C17,C23,C26,	IMPC00086

		C39,C40,C41,C45	
1	CAPACITOR MONOLITIC 18ρF	C27	IMPC00089
1	CAPACITOR MONOLITIC 47ρF	C19	IMPC00096
2	CAPACITOR MONOLITIC 68ρF	C1,C2	IMPC00097
6	CAPACITOR TRIMMER JMC 9371 2 p 5	C4,C5,C6,C7,C8,C21	IMPC00102
1	INTEGRATED CIRCUIT MAR 6	IC3	IMPCI0019
1	INTEGRATED CIRCUIT MAR 3	IC1	IMPCI0022
1	INTEGRATED CIRCUIT MAV 11	IC2	IMPCI0032
1	INTEGRATED CIRCUIT MC 12022 AP	IC7	IMPCI0034
1	INTEGRATED CIRCUIT MC 145152 P2	IC6	IMPCI0035
1	DIODE 1N 82	D1	IMPD00002
1	DIODE BB 405 B	D2	IMPD00030
4	RESSON. COAXIAL SP 8800 SPQ 700	TLE1,TLE2,TLE3,TLE4 (14 TO 29)	IMPDR0005
4	RESSON. COAXIAL SP 8800 SPQ 900	TLE1,TLE2,TLE3,TLE4 (30 TO 49)	IMPDR0004
4	RESSON. COAXIAL SP 8800 SPQ 1100	TLE1,TLE2,TLE3,TLE4 (50 TO 70)	IMPDR0006
1	MIXER TUF 2 HSM	MX1	IMPM00012
1	TRANSISTOR BFR 90 / BFR 91A	Q2	IMPT00006
1	TRANSISTOR MC 78L05 ACZ	IC8	IMPT00062
1	PCB CHANNEL UP CONVERTER	PCI1	PCICNU001

6.9. Programming table CNU001:

Channel N°	Local Osc Freq MHz	1	2	3	4	5	6	7	8	Channel Freq MHz	Video Carrier Freq MHz	Audio Carrier Freq MHz
14	517	0	0	0	0	1	0	0	0	470-476	471.25	475.75
15	523	0	0	0	1	0	1	0	0	476-482	477.25	481.75
16	529	0	0	0	0	0	0	1	0	482-488	483.25	487.75
17	535	0	0	0	1	1	0	1	0	488-494	489.25	493.75
18	541	0	0	0	0	1	1	1	0	494-500	495.25	499.75
19	547	0	0	0	1	0	0	0	1	500-506	501.25	505.75
20	553	0	0	0	0	0	1	0	1	506-512	507.25	511.75
21	559	0	0	0	1	1	1	0	1	512-518	513.25	517.75
22	565	0	0	0	0	1	0	1	1	518-534	519.25	523.75
23	571	0	0	0	1	0	1	1	1	524-530	525.25	529.75
24	577	0	1	0	0	0	0	0	0	530-536	531.25	535.75
25	583	0	1	0	1	1	0	0	0	536-542	537.25	541.75
26	589	0	1	0	0	1	1	0	0	542-548	543,25	547,75
27	595	0	1	0	1	0	0	1	0	548-554	549.25	553.75
28	601	0	1	0	0	0	1	1	0	554-560	555.25	559.75
29	607	0	1	0	1	1	1	1	0	560-566	561.25	565.75
30	613	0	1	0	0	1	0	0	1	566-572	567.25	571.75
31	619	0	1	0	1	0	1	0	1	572-578	573.25	577.75
32	625	0	1	0	0	0	0	1	1	578-584	579.25	583.75
33	631	0	1	0	1	1	0	1	1	584-590	585.25	589.75
34	637	0	1	0	0	1	1	1	1	590-596	591.25	595.75
35	643	1	0	0	1	0	0	0	0	596-602	597.25	601.75
36	649	1	0	0	0	0	1	0	0	602-608	603.25	607.75
37	655	1	0	0	1	1	1	0	0	608-614	609.25	613.75
38	661	1	0	0	0	1	0	1	0	614-620	615.25	619.75
39	667	1	0	0	1	0	1	1	0	620-626	621.25	625.75
40	673	1	0	0	0	0	0	0	1	626-632	627.25	631.75
41	679	1	0	0	1	1	0	0	1	632-638	633.25	637.75
42	685	1	0	0	0	1	1	0	1	638-644	639.25	643.75
43	691	1	0	0	1	0	0	1	1	644-650	645.25	645.75
44	697	1	0	0	0	0	1	1	1	650-656	651.25	655.25
45	697	1	0	0	1	1	1	1	1	656-662	657.25	661.75
46	709	1	1	0	0	1	0	0	0	662-668	663.25	667.75

47	715	1	1	0	1	0	1	0	0	668-674	689.25	673.75
48	721	1	1	0	0	0	0	1	0	674-680	675.25	679.75
49	727	1	1	0	1	1	0	1	0	680-686	681.25	685.75
50	733	1	1	0	0	1	1	1	0	686-692	687.25	691.75
51	739	1	1	0	1	0	0	0	1	692-698	693.25	697.75
52	745	1	1	0	0	0	1	0	1	698-704	699.25	703.75
53	751	1	1	0	1	1	1	0	1	704-710	705.25	709.75
54	757	1	1	0	0	1	0	1	1	710-716	711.25	715.75
55	763	1	1	0	1	0	1	1	1	716-722	717.25	721.75
56	769	0	0	1	0	0	0	0	0	722-728	723.25	727.75
57	775	0	0	1	1	1	0	0	0	728-734	729,25	733,75
58	781	0	0	1	0	1	1	0	0	734-740	735.25	739.75
59	787	0	0	1	1	0	0	1	0	740-746	741.25	745.75
60	793	0	0	1	0	0	1	1	0	746-752	747.25	751.75
61	799	0	0	1	1	1	1	1	0	752-758	753.25	757.75
62	805	0	0	1	0	1	0	0	1	758-764	759.25	763.75
63	811	0	0	1	1	0	1	0	1	764-770	765.25	769.75
64	817	0	0	1	0	0	0	1	1	770-776	771,25	775,75
65	823	0	0	1	1	1	0	1	1	776-782	777.25	781.75
66	829	0	0	1	0	1	1	1	1	782-788	783.25	787.75
67	835	0	1	1	1	0	0	0	0	788-794	789.25	793.75
68	841	0	1	1	0	0	1	0	0	794-800	795.25	799.75
69	847	0	1	1	1	1	1	0	0	800-806	801.25	805.75
70	854	0	1	1	0	1	0	1	0	806-812	807.25	811.75

7. PLL protection:

7.1. Function:

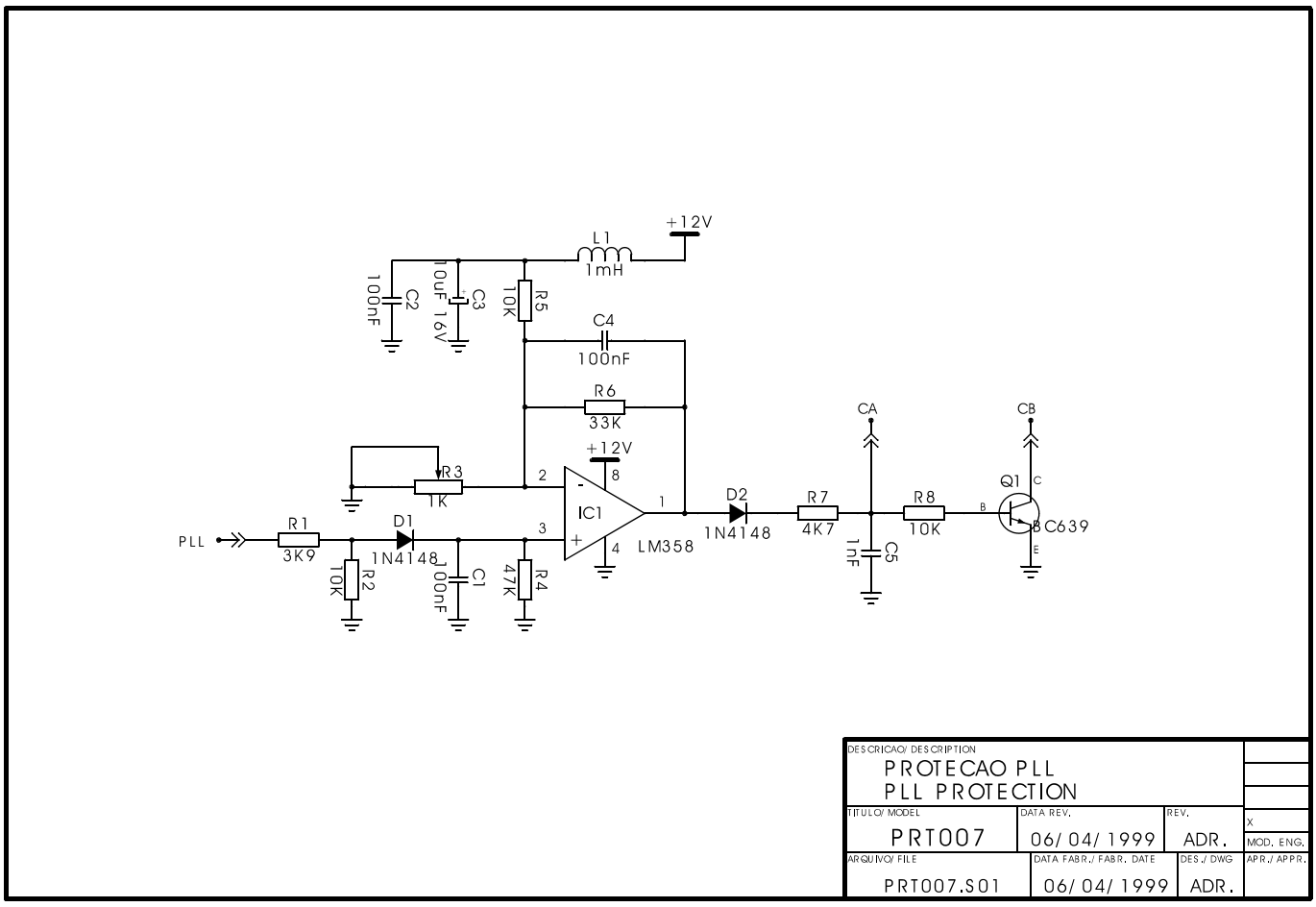
This circuit function is to turn off the transmitter.

7.2. Technical Description:

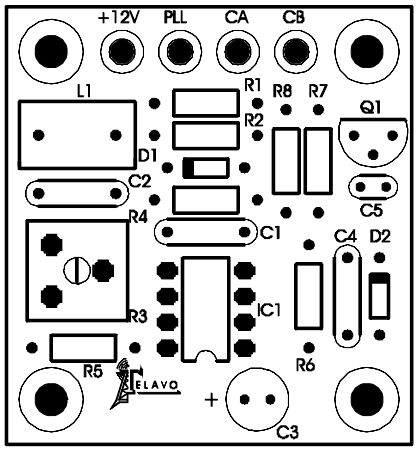
The DC voltage that comes from the channel converter, more precisely from the channel converter Led diode, is applied to the comparator through diode D1 by resistor R1 and reaches circuit integrated IC1pin 3.

Through the adjustment in the trimpot R3, we can act in the integrated circuit comparison, moving pin 1 to high level (operational gain X comparing voltage). Then, through diode D2 this voltage is applied to CA output (High level) or CB (Low level), by the transistor Q1 collector saturation.

7.3. Circuit diagram PRT007:



7.4. Layout PRT007:



7.5. Parts list PRT007:

Quant.	Description	Position	Code
1	SHOCK 1 m H	L1	50008
1	INTEGRATED CIRCUIT LM 358	IC1	60052
1	CAPACITOR ELCO. RADIAL 10µF 25V	C3	74028
3	CAPACITOR POL. METAL. 100ηF	C1, C2,C4	75004
1	CAPACITOR CER. MULTILAYER 1ηF	C5	76044
2	DIODE 1N 4148	D1,D2	82011
1	TRIMPOT 1 K	R3	90002
1	RESISTOR 1/8W 3 K 9	R1	100036
1	RESISTOR 1/8W 4 K 7	R7	100037
3	RESISTOR 1/8W 10 K	R2,R5,R8	100041
1	RESISTOR 1/8W 33 K	R6	100047
1	RESISTOR 1/8W 47 K	R4	100048
1	TRANSISTOR BC 639	Q1	120007
1	PCB PLL PROTECTION	PCI1	PCIPRT007

8. UP Converter supply -12, +12 and +24V:

8.1. Function:

The power supply function is to generate -12V, +12V and +24V voltage suitable to supply the UP Converter.

8.2. Technical Description:

The main AC input voltage is reduced by the transformer T1.

T1 has two secondarie winds, one for the +24V and the second for the +12V and –12V supplies.

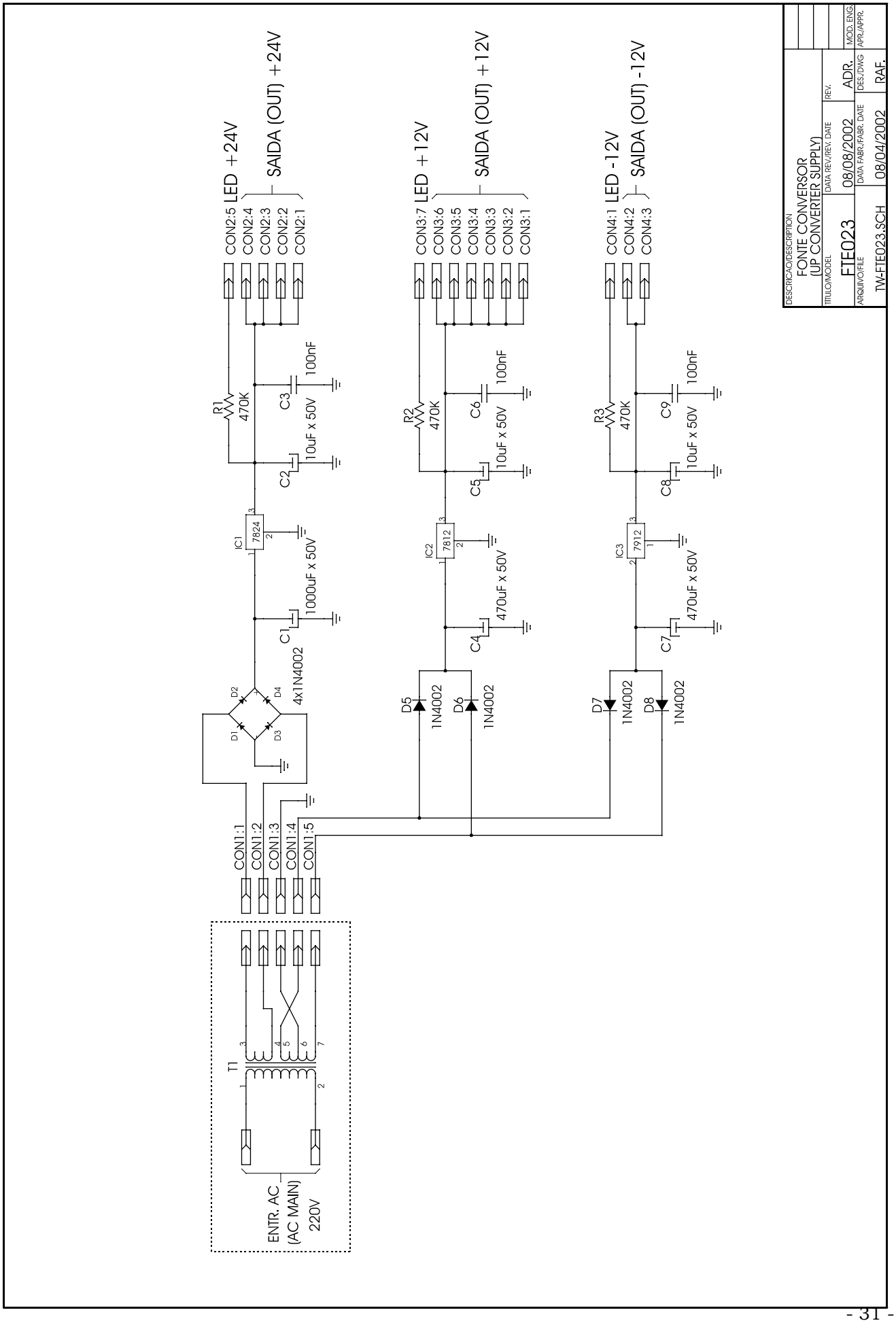
D1, D2, D3 and D4 rectifiers the secondary voltage that is filtered by the capacitor C1. IC1 is a linear regulator that feeds +24V at the output.

D5 and D6 are the retifier diodes for the positive voltage filtered by C4.

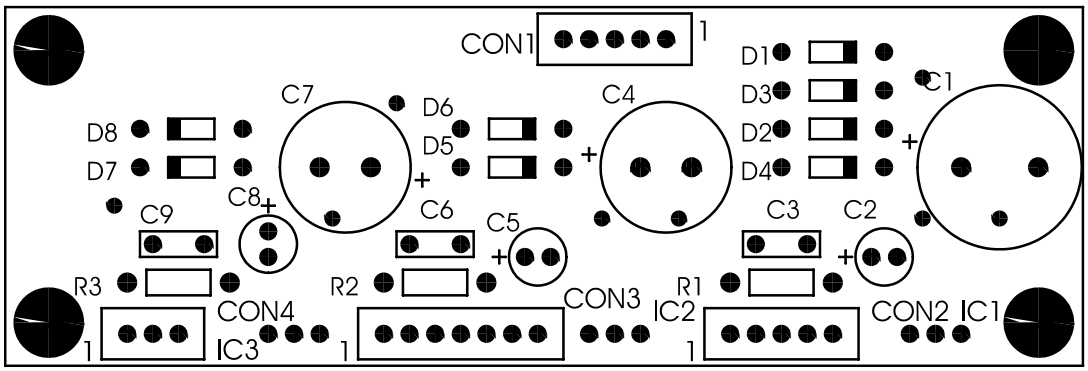
IC2 is a linear regulator for the +12V output supply.

In the same manner there are a rectifier and a linear regulator for the negative voltage –12V.

8.3. Circuit diagram FTE023:



8.4. Layout FTE023:



8.5. Parts list FTE023:

Quant.	Description	Position	Code
2	CAPACITOR ELCO. RADIAL 470µF 50V	C4	74008
1	CAPACITOR ELCO. RADIAL 1000µF 50V	C1	74020
3	CAPACITOR ELCO. RADIAL 10µF 50V	C2,C5,C8	74028
3	CAPACITOR POL. METAL. 100ηF	C3,C6,C9	75019
8	DIODE 1N 4002	D1,D2,D3,D4,D5,D6,D7,D8	82001
3	RESISTOR 1/8W 470 K	R1,R2,R3	100058
1	REGULADOR DE TENSÃO FIXA 7912	IC3	126006
1	REGULADOR DE TENSÃO FIXA 7812	IC2	126019
1	REGULADOR DE TENSÃO FIXA 7824	IC1	126022
1	PCB UP CONVERTER SUPPLY	PCI1	PCIFTE023