ALAN HM135

Mobile VHF Transceiver

Service Manual

Contents

1 TECHNICAL SPECIFICATIONS

1.1 Test methods

- ETS 300-086 / ETS 300-113 (optional “modem board”)
- IEC 529 IP54 and MIL STD 810 C/D/E

1.2 Specifications table

General			
Characteristic	**Units**	**Value/Measurements conditions**	
Frequency	MHz	from 136 to 174	
Operating Band	MHz	38	
Number of Programmable Channels	-	up to 100	
Channel Spacing	KHz	12.5 / 20 / 25	
Frequency Steps	KHz	5 / 6.25	
Rated Power Supply	Vcc	13.8	
Current drain	A	Stand-by	0.4 (or less)
		RX	0.6 @ the maximum AF power
		TX	5 (@ 25 W) / 3.5 (@ 10 W) / 2.4 (@ 4 W)
Antenna Impedance	Ohm	50	
Speaker Impedance	Ohm	8	
Frequency Stability	ppm	±5	
Operating Temperature Range	°C	from –25 to +55	
Relative Humidity	%	90 (non condensing)	
Transmitter			
Output Power (±1 dB)	W	10 / 25 (depending on the version)	
Spurious Emissions	μW	from 9 KHz to 1 GHz	< -36 dBm
		from 1 to 4 GHz	< -30 dBm
Modulation System	-	FM (F3E) / PM (G3E)	
Maximum Deviation	KHz	± 2.5 (@ 12.5 KHz) / ±5 (@ 25 KHz)	
Adjacent Channel Power Attenuation	dB	< -60 (@ 12.5 KHz) / -70 (@ 20-25 KHz)	
Receiver			
Configuration		Double Conversion Superetherodyne	
Sensitivity (at 12 dB SINAD)	μV	< 0.3	
Squelch Sensitivity (SINAD)	μV	0.25 with 3 dB hysteresis	
Selectivity (Adjacent Channel)	dB	At least -60 (@ 12,5 KHz) / -70 (@ 25 KHz)	
Spurious Response Rejection	dB	> 70	
Intermodulation	dB	> 65	
Audio Output (1 KHz at 5% T.H.D.)	W	4 (built-in internal speaker) / 10 (external audio output)	
Mechanical Specifications			
Type of construction	-	Metallic cabinet with detachable front panel	
Size	mm	180x57x28 with front panel / 174x48x150 main unit only	
Weight	Kg	1.4	
Microphone connector	-	RJ	
Rear I/O connector	-	25-pins DB type	
Shock resistance	-	Meets MIL STD 810 specifications	
Moisture & Dust Resistance	-	According to the IEC529 and IP54 regulations	

2 CIRCUIT DESCRIPTION

2.1 General information

The HM135 is basically divided into 2 printed circuit boards: **Main board** and **Head**. Circuitry and signals can be divided in the following sections:

- Microprocessor/control
- Front panel (head) circuitry
- VCO / Synthesizer (PLL)
- Transmitter
- Receiver
- **Errore. L'origine riferimento non è stata trovata.**
- ON/OFF switch, rear connector and internal connectors

Refer to the Block Diagram and the Schematics.

2.2 Microprocessor/control

The microprocessor **DD5** is constantly operating when the radio is turned ON. It is continuously monitoring the keyboard, the PTT line and other internal inputs such as the squelch detect, etc. When a change occurs, the microprocessor makes the appropriate response according to its program in order to control the all radio functions. On channel change, the Radio emits a beep and the synthesizer is loaded with the correct frequency information. The microprocessor runs off a 8 MHz oscillator which is composed of **X3**, **C353**, **C354** and **R319**.

When the radio is first turned on, the microprocessor reads the radio status from the EEPROM **DD3** which contains all the radio's parameters.

The microprocessor determinates the receive frequency codes, then loads the synthesizer via its pins **42** (line **PLL_LE**), **43** (line **PLL_DATA**) and **46** (line **PPL_CLK**).

Pin **40** outputs a PWM signal which is converted by **DA18:B** into a CC voltage at its output (line **RF_PWR_CTRL**) which controls the RF output power.

Pins **37** and pin **39** outputs a PWM signal which are used, respectively, to generate the Selcall signal (line **MCU_SELCALL_PWM**) and CTCSS/DCS signal (line **MCU_CTCSS_DCS_PWM**) as further explained. The digital signals coming from the ADC converters which drive the microprocessor in order to decode the Selcall and CXTCSS/DCS signals are applied, respectively, to pin **59** (line **ADC_HI_SPEED_DATA_RX**) and pin **60** (**ADC_lo_SPEED_DATA_RX**).

The firmware program interface is made by means of the connector **XP3**

The microprocessor is fitted with an internal program flash memory as well, therefore functions can be customized, if necessary, upon specific request from the customer.

2.2.a PTT circuit

The PTT switching is totally controlled by the two microprocessors (**DD5** in the main board and **DD800** in the front board in the front panel): when the PTT is pressed, the line **AUX_PTT** goes low, so the transistor **VT806** changes the status of the pin **20** of microprocessor **DD800** which is "informed" that the radio is in TX mode (i.e. PTT is pressed), so it changes its output at pin **22** putting the low level at pin **8** of the connector **XT802** which is connected to the main PCB with the connector **XT2**. This means that pin **8** of **XT2** (line **HANDSET_PTT_TO_MPU**) goes low. This line is connected to the **VT56** which changes the status of pin **26** of the microprocessor **DD5** from hi to low. Now the microprocessor **DD5** is also "informed" that the radio is in TX mode, so it can control the +8V voltage which is alternatively fed to the TX or RX stages according to the radio's status. Pins **29** (line **TX_FROM_MCU**) and **30** (line **RX_FROM_MCU**) control the +8V power switches which alternatively outputs this voltage to the RX section (line **+8V_RX**) with **VT42** or to the TX one (line **+8V_TX**) with **VT41**.

The transistor **VT805** is controlled by the pin **19** of the microprocessor **DD800** and it is used to eventually disable all the over stated PTT chain according to the radio's status (e.g. busy lock out, timeout timer etc).

2.3 Front panel (head) circuitry

The microprocessor **DD800** runs off a 8 MHz oscillator which is composed of **X800**, and **R829**. **DD800** is basically used to control the LCD unit **XT80**, to decode the commands coming from the front keypad **S801** to **S808**) as well as to switch the front LEDs **DA800**. It is also used to light up the LCD backlight (**VD800** to **VD805**) as well as for the PTT circuit as over stated.

The negative voltage necessary for the LCD is created by a charge pump which consists of **VT815**, **VT813**, **VT812**, **VD809** and **VD808**. The output (line **–8V**) is fed to the regulator **DA804:A** which outputs the line **VD** in order to supply the LCD unit.

The hang-up functions work this way: the line **AUX_HOOK** is connected to the microphone's hook and it's normally grounded (microphone hooked). When the mike is removed from its hook, the line **AUX_HOOK** changes its state driving the transistor **VT809**. This changes the status of the pin **21** of the microprocessor **DD800** which opens the monitor through a command sent to the main microprocessor **DD5** through a serial command.

2.4 VCO / Synthesizer (PLL)

This section basically consists of the Temperature-Compensated Crystal Oscillator (TCXO), Voltage Controlled Oscillators (VCOs), Synthesizer and the Loop Filter.

2.4.a Temperature-Compensated Crystal Oscillator (TCXO)

The reference oscillator is composed by the temperature compensated crystal X2 and related circuitry (DA1:A. **VD19**, **VD20**, **VT21** and **VT20**), **RP2** is used to adjust the oscillator on frequency (12.8 MHz) at room temperature. The reference oscillator is held within the specifications ±5 ppm from -25 to +55℃.

2.4.b Voltage-Controlled Oscillators

The receive VCO consists of **VT11**, **CV1**, **VD6** and **VD9**. This VCO oscillates at 45.1 MHz above the programmed receive frequency (i.e. from 181.1 to 219.1 MHz for the 135-174 MHz range). The VCO's oscillating frequency is tuned by the varactors **VD6** and **VD9**.

The transmitter VCO consists of **VT17**, **CV2**, **VD11**-**VD12** and **VD13**-**VD14** and oscillates directly to the TX carrier frequency range (i.e. from 135 to 174 MHz range). The TX VCO is directly frequency-modulated by means of the varactor **VD15** which is driven by the modulating signal (line **A**) regulated by the trimmer **RP4**. This is part of the double-point modulation and works mainly in high AF modulating frequencies), the other part of the double point-modulation is explained in the par. "Transmitter Audio Circuits".

The tuning voltage for the VCOs is supplied from the output of the Loop Filter made with **R73**, **R74**, **R78**, **C99**, **C100** and **C101**.

Only one of the VCOs runs at a time. In RX the line **RXC** (which is obtained from the **+8V_RX** line coming from the voltage switch **VT41**) is high enabling the RX VCO via the transistor **VT16**. During this time the line **TXC** (which is obtained from the **+8VTX** line coming from the voltage switch **VT42**) is low, so the TX VCO is disabled. When the PTT is pressed, the **RXC** line becomes low switching the RX VCO off. At the same time the line **TXC** goes high activating the TX VCO via the transistor **VT18**.

The output of the VCOs are AC coupled (**C91** and **C109**) and sent to the synthesizer buffer **VT19**, then sent to **DA5** for an additional buffering. The output of **DA5** is connected to the low-pass filter (**L27**, **L28**, **L29** and related capacitors), then directly sent to the TX stages (line **HET_TX** which is sent to the pre-driver amplifier **VT24**) or RX stages (line **HET_RX** which is sent to the RX mixer **A1**) due to the RF switching action provided by **VD16** and **VD17** which are controlled by the lines **+8VRX** and **8V_TX_F** respectively (this last line is obtained from the line +8VTX passed through the filter created with **L52**, **L53** and related capacitors). The output from the VCO necessary to feedback the PLL IC **DA3** (i.e. line **PLL_RF** send to pin **8**) is directly output from **VT19** and fed through **R106**, **C362** and **C134**. , whilst the other part of the signal is fed to **DA5**, then passed through the low-pass filter (**L27**, **L28**, **L29**, **C130**, **C132**, **C133** and **C131**). Diodes **VD16** and **VD17** act as signal switches in order to feed the signal to RX or TX stages at the appropriate time according to the switching voltages which are, respectively, the lines **+8VRX** and **8V_TX_F**.

The PLL IC **DA3** receives the reference signal from the TCXO (pin **1**) and the feedback from the VCO (pin **8**). The synthesizer is tuned in 5.00 KHz or 6.25 KHz steps. The output from the PLL IC (pin **15** and **16**) is used to drive the PLL charge pump which consists of **VT12**, **VT13**, **VT14** and **VT15**, then the charge pumps sent the output to the PLL filter in order to close the loop.

2.4.c Synthesizer

The PLL IC frequency synthesizer is a large scale monolithic synthesizer integrated circuit **DA3**.

The synthesizer IC contains a dual modular prescaler, programmable divide-by-N counter, prescaler control (swallow) counter, reference divider, phase detector and unlock detector.

RF output from the active VCO is AC coupled to the synthesizer **DA3** prescaler input at Pin **8**. The divide-by-N counter chain in **DA3**, consisting of the dual-modulus prescaler, swallow counter and programmable counter, divides the VCO signal down to a frequency very close to 5.00 KHz or 6.25 KHz which is applied to the phase detector. The phase comparator compares the edges of this of this signal with that of the 5.00 KHz or 6.25 KHz reference signal from the reference divider and drives the external charge pump (**VT12**, **VT13**, **VT14** and **VT15**).

The synthesizer unlock detector circuit prevents the operation of the transmitter when the phase lock loop (PLL) is unlocked. The following discussion assumes the unit has been placed in the transmit mode. **DA3** lock detector Pin **7** goes high when the PLL is properly locked. This high level is applied to pin **21** of the microprocessor **DD5**. A software timing routing brings the pin 28 of the microprocessor **DD5** low making the line **PA** (connected via **R323** and **C361**) low as well. With the PA line low, **VT28** is cut off and **VT27** biases the RF driver (VT23) and RF power amplifier (**VT22**) which enables transmission.

When the PLL become unlocked, the lock detector at **DA3** pin **7** will begin pulsing low. A RC circuit (**R311** and **C347**) converts pulsing low to a low level for the microprocessor (pin **21**). The microprocessor then changes the PA line to a high switching the transistor **VT28** on. This cuts off the transistor **VT27** which is not able to supply the bias to the RF driver and RF power amplifier disabling the transmission. Therefore, the transmitter remains disabled while the phase locked loop remains unlocked.

2.5 Transmitter

2.5.a RF Power Amplifier

The TX RF amplifier is made with 3 stages: **VT24** is the pre-driver, **VT23** is the driver and **VT22** is the Power Amplifier (PA). Output from the last PLL buffer **DA5** (line **HET_TX**) feeds the pre-driver amplifier **VT24**. The output signal from **VT24** feeds the driver amplifier **VT23**, whose output from the driver stage feeds the final RF power amplifier **VT22** to produce the rated output power of 25 watts. The output of the power amplifier is applied to the RX/TX switch made with **VD21**, **VD22** and related circuitry, then to the low-pass filter (consisting of **L46** to **L49** and connected capacitors) and then to the SWR coupling line **TA1** which is directly connected to the antenna connector.

The **8V_TX_F** line supplies the total bias current to the bias regulators. Pre-driver is biased by **VT25** and both the driver and power amplifier are biased by the same transistor **VT27**. Obviously, the output of **VT27** biases these two stages via 2 different trimmers, which are **RP5** for the driver (about 200 mA) and **RP6** for the power amplifier (about 300mA).

2.5.b Antenna Switching

Switching of the antenna between the transmitter and the receiver is accomplished by the antenna transmit/receive switch consisting of diodes **VD21** and **VD22** in conjunction with **C189**, **C190** and **L44**. In reception mode both the diodes are unbiased, so the RX signal coming from the **ANTENNA** line passes through the coupling line **TA1**, the low pass filter (**L49**, **L48**, **L46**, **C193**, **C194** etc.), going to the receiver's front-end input (line **RF_RX**) via **L144**. In the transmit mode, switched **+8VTX** is applied to the base of **VT26** through **R142** and **R143** hard forward biasing the two diodes on. **VD21** thus permits the RF power from output of the power amplifier to flow to the input of the low-pass filter. At the same time, **VD22** avoids that the residual RF coming from the transmitter is accidentally sent to the receiver by removing it with the 3 capacitors **C183**, **C184** and **C185**.

2.5.c Power control

Output power is picked up from the output coupling line **TA1** and sent to the diodes **VD24** and **VD26**. The first one detects the forward power and the second one the reflected power which drops, respectively, across **R145** and **R156**. These two signals (respectively the lines **FWD_PWR** and **REFL_PWR**) are fed separately to an operational amplifier (**DA6:A** and **DA6:B**) and combined into a third one (**DA6:C**) which regulated the output power according to the input signal. The calibration of the output power is provided by the trimmer **RP7** which controls **DA6:C**. Its output is connected to the transistor **VT27** which provides the bias for the driver and power amplifier closing the power control loop. In case of excessive S.W.R., the output power is automatically reduced in order to protect the final stage.

2.5.d Transmitter Audio Circuits

The speech audio coming from the MIC connector (line **AUX_MIC**) is applied to the FET **VT804** which acts as sensitivity switch (function high/low MIC sensitivity) in 2 levels and is directly controlled by the microprocessor (pin **27**) via the transistor **VT807**. The signal is then fed to the amplifier made by **DA801:A** (**DA801:B** is used to supply the reference voltage at its positive input) providing a stronger speech signal (line **MIC_INPUT**) which is fed to the 6dB per octave pre-emphasis circuit provided by the capacitor **C277** and the resistor **R213** and applied to pin **6** of **DA11:B**.

*NOTE: Between the **C277** and the **MIC_INPUT** line, the transistor **VT48** acts as a mute switch which disable the speech audio when a Selcall is sent.*

Selcall audio PWM signaling coming from the pin **37** of the microprocessor (line **MCU_SELCALL_PWM**) is fed to the 3 KHz low pass filter which consists of **DA9:B** and related circuitry. Its output is then fed to the input of the **DA11:B**, so routed the same way of the speech audio.

The speech/Selcall signal is applied to the input of **DA11:B** which limits the peak-to-peak output, then is fed to the pin **3** of IC **DA10** which is a double digital audio regulator. After the level regulation, the speech/Selcall is output at pin **11** and sent to the first input (pin **9**) of **DA9:C** in order to be summed with the CTCSS/DCS signal.

*NOTE: The level regulation of **DA10** comes in form of digital data from the pins **6**, **7** and **8** (lines **POT_DATA**, **POT_CLK** and **DAC_CS** respectively) which are directly controlled by the microprocessor **DD5** (pins **43**, **46** and **36** respectively) via related logical inverters.*

CTCSS/DCS sub-audio tone PWM signaling coming from the pin **39** of the microprocessor (line **MCU_CTCSS_DCS_PWM**) is fed to the CTCSS/DCS 300 Hz low pass filter which consists of **DA9:A** and related circuitry, then fed in the pin **2** of the IC **DA10** which regulates the level and outputs the regulated CTCSS/DCS at its pin 12. This signal is then applied to the second input of **DA9:C** in order to be summed with the speech/Selcall signal.

DA9:C sums the two signals (speech/Selcall coming from pin **11** of **DA10** and CTCSS/DCS coming from pin **12**) feeding its combined output to **DA9:D** which is a 3 KHz low pass filter. The output of **DA9:D** is then applied to pins **4** and **5** of the **DA10**.

2.5.e Double-point modulation

The outputs (lines **REF_MOD** and **VCO_MOD**) coming, respectively, from pins **10** and **9** of **DA10** are fed to the PLL area. The line **REF_MOD** is directly applied to the trimmer **RP3** which provides the Ref. Modulation control (low audio frequencies) directly applied to the TCXO. The line **VCO_MOD** is applied via the resistors **R116** to the trimmer **RP4** which provides the VCO modulation control (high audio frequencies) directly sent to the TX VCO.

2.6 Receiver

2.6.a Receiver's Front-End

The RX signal coming from the antenna connector is fed in sequence through the coupling line **TA1**, the low pass filter (consisting of **L46** to **L49** and connected capacitors) and the antenna switching (**VD21** and **VD22)**. The output of the antenna switching (line **RF_RX**) is sent to input of the receiver and coupled to the input band-pass filter. The transistor **VT2** is the front-end amplifier and its output is applied to the second band-pass filter (**L2**, **L3**, **L4**, **L5** and related capacitors). The output from the band-pass filter is applied to the pin **4** of the RF mixer **A1**.

The diode **VD1** is used for the function local/distance. Normally the line **LOCAL_DIST** issued by the pin **25** of the microprocessor (properly adapted by **R317** and **C352**) goes to high so **VT1** is switched on forward biasing the diode **VD1**. This provides a bypass of the resistor **R5** for the RF, so the RF signal fed to the mixer is higher (distance mode). On the other side, if the line **LOCAL_DIST** drops to low, the diode **VD1** is not forward biased and the RF is attenuated of 10dB approx. due to the **R5** (local mode).

2.6.b Local Oscillator (LO)

As already explained in the PLL section, the output coming from the RX VCO (working at 45,1 MHz above the RX frequency) is sent to the synthesizer buffer **VT19**, then sent to **DA5** for an additional buffering. The output of **DA5** is connected to the low-pass filter (**L27**, **L28**, **L29** and related capacitors), then sent to the RX stages (line **HET_RX**) which is sent to the RX mixer **A1** via an attenuator which consists of **R13**, **R14** and **R15**.

2.6.c Mixer

The mixer LO frequency is 45.1 MHz above the desired receiver frequency. When the receiver frequency is present, the mixer output will be a 45.1 MHz signal. The mixer output is peaked for 45.1 MHz by means of the diplexer filter (**L12**, **L15**, **C56**, **C46**, **C47**, **R31**, **R35** and **R36**) and the RF amplifier **VT7**, then signal is filtered by crystal filters **XF1A** and **XF1B** and amplified by **VT5** and **VT4** before being applied to the input (pin **16**) of the IF IC **DA2**.

Inside **DA2**, the 45.1 MHz IF signal is sent to the input of the second mixer with a LO frequency of 44.645 MHz (the frequency of the crystal **X1** is 44.545 MHz, but it is 100 KHz shifted by means of the connected components **C68**, **C69** and **C70**, **L17**, **R54** and **R51**). The output of the second mixer is sent from pin **3** of **DA2** to the 455 KHz ceramic filters **CF2** (for 12,5 KHz bandwidth) or **CF1** (for 25 KHz bandwidth) which filter the second mixer's output, then fed to the second IF signal input of **DA2** (pin **5**). The mixer's output is then fed to the internal limiting amplifier and then on to the FM decoder.

*Note: the switching of the two filters **CF2** or **CF1** is accomplished by means of the line **12.5_25** coming from the pin **24** of the microprocessor **DD5** which drives, in sequence, the transistor **VT10** and the switches **DD1** and **DD2**.*

2.6.d FM Detector and Squelch

The FM detector output (pin **9** of **DA2**) is used for squelch, decoding tones and audio output. The setting of the squelch adjustment **RP1** sets the input to the squelch amplifier.

The squelch amplifier is internal to **DA2** and its output is fed to an internal rectifier and squelch detector.

The output on **DA2** (pin **14**) signals the microprocessor **DD5** with a low level to unmute the radio. The audio is unmuted by using the line **RX_MUTE** sent from the pin **50** of the microprocessor **DD5** to the mute switch **VT54** controlled by the transistor **VT55**.

2.6.e Audio routing

The detector's audio output (line **DETECTOR_AUDIO**) is fed to **DA13:A** and **DA13:B** (3 KHz low-pass filter deeply described in the next paragraph), then routed to the 300 Hz audio high-pass filter which consists of **DA12:A** and **DA12:B**. The output of the audio high-pass filter feeds the AF de-emphasis (**DA15:A**) and AF pre-amplifier (**DA15:B**), then the volume control provided by the IC **DA16**. The audio is then routed to Pin **1** and **9** of the audio amplifier **DA14**.

VT61 is used to enable/disable the internal speaker and is controlled by **VT52** by means of the signal **INT_SPEAKER_OFF** sent by the pin **48** of the microprocessor **DD5**.

If the radio is in alert mode, the microprocessor **DD5** generates an alert signal at its pin **38**, this signal (line **ALERT**) is injected in the low-pass filter (**DA15:C**) and routed at the input of the AF pre-amplifier **DA15:B** by means of the resistor **R269**.

2.6.f CTCSS/DCS signal routing

Similarly to the audio routing the detector's audio output (line **DETECTOR_AUDIO**) is fed to **DA13:A** and **DA13:B** which make the tone (CTCSS and DCS) 3 KHz low-pass filter, however the output of the low-pass filter (line **TO_CTCSS_DATA_FILTER**) is directly routed to the second stage tone filter which consists of **DA17:A**, **DA17:B** and **DA17:C**. The output of this filter (line **ADC_LO_SPEED_DATA_RX** is then sent to the microprocessor **DD5** (pin **60**) in order to be decoded.

2.6.g Selcall signal routing

The Selcall signal follows the same routing of the audio one, but it's picked up at the output (pin **1**) of **DA15:A** (line **TO_CCIR_DATA_FILTER**), then fed to **DA17:D** and sent (line **ADC_HI_SPEED_DATA_RX**) to the microprocessor (pin **59**) in order to be decoded.

2.7 Signaling

2.7.a General

The microprocessor is fitted with a ADC/DAC converter built-in, so it provides generating and decoding the tones for selective calls, CTCSS and DCS. It can do that without using any other external I.C.s, but only by means of some external circuitry. The deviation of the selective call can be adjusted by the trimmer IRV1.

The microprocessor manages the analogue switches for the scrambler as well, which is base-band-inversion type.

2.7.b CTCSS (Continuous Tone Coded Squelch System)/DCS (Digital Coded Squelch)

CTCSS signals and DCS signals are synthesized by the microprocessor **DD5** (pin **39** - line **MCU_CTCSS_DCS_PWM**) and appear as PWM, then smoothed by the CTCSS/DCS 300 Hz low pass filter which consists of **DA9:A** and related circuitry to produce an acceptable sine wave output. The output of the filter is fed in the pin **2** of the IC **DA10** which adjusts the level and outputs the regulated CTCSS/DCS at its pin **12**. This signal is then applied to the second input of **DA9:C** in order to be summed with the speech/Selcall signal.

The CTCSS/CTS decoding is provided by the microprocessor **DD5** (pin **60**) which gets the proper signal from the detector as explained in par. “CTCSS/DCS signal routing”.

2.7.c Selective call (Selcall) encoder

Similarly to CTCSS/DCS, Selcall signals are also generated and decoded by the microprocessor **DD5**. Selcall encoding audio PWM signaling coming from the pin **37** of the microprocessor (line **MCU_SELCALL_PWM**) is fed to the 3 KHz low pass filter which consists of **DA9:B** and related circuitry. Its output is then fed to the input of the **DA11:B**, so routed the same way of the speech audio.

The speech/Selcall signal is applied to the input of **DA11:B** which limits the peak-to-peak output, then is fed to the pin **3** of IC **DA10** which is a double digital audio regulator. After the level regulation, the speech/Selcall is output at pin **11** and sent to the first input (pin 9) of **DA9:C** in order to be summed with the CTCSS/DCS signal.

The Selcall decoding is provided by the microprocessor **DD5** (pin **59**) which gets the proper signal from the detector as explained in par. “Selcall signal routing”.

2.8 ON/OFF switch, rear connector and internal connectors

2.8.a ON/OFF switch

The line ON/OFF_SWITCH is normally pulled up by the resistor R182. When the front ON/OFF switch is switched on, this line becomes low, so the zener VD32 can bias the transistor VT35 which activates the main electronic power ON/OFF switch **VT33** which feeds the main voltage to the regulators **DA7** (+8V) and **DA8** (+5V). The diode **VD37** acts as a typical protection against polarity inversion.

2.8.b Rear connector

The rear connector **XT3** accomplishes a variety of connections and functions allowing to connect the radio to many kinds of devices. For example:

- Pins **3** and **16** (lines **EXT_SPEAKER-** and **EXT_SPEAKER+)** can be connected to an appropriate external speaker
- The line **AUX_OUT_FROM_MPU** coming from the pin **16** of the main microprocessor **DD5** drives the transistor **VT33** which can switch ON/OFF by software a 5,6 V voltage at pin **1** (line **AUX_OUT**) of **XT3** is an auxiliary output programmable by firmware.
- The pin **13** of **XT3** duplicates the hang up function normally provided by the microphone hang up: grounding or not the line **HUNG_UP** reflect a status change in the line **HANG_UP_TO_MPU** via the zener **VD27** and the transistor **VT29**
- Pin **9** duplicates the PTT connection normally provided by the microphone connector in the front panel. Its line **EXTERNAL_PTT** drives the zener **VD30** and the transistor **VT32** which reflect a status change in the line **PTT_TO_MPU**

2.8.c Internal connectors (accessory board)

The internal connectors **XP1** and **XP2** are used to internally fit a variety of option boards, such as scrambler modules, audio processing modules etc. For this reason there are many contacts in parallel with **XT3**, e.g. **XP1** has **AUX_OUT** at pin **13** and **EXTERNAL_PTT** at pin **1**. Moreover, the two connectors have other specific lines in order to handle a large number of internal signals, e.g. flat unsquelched RX audio at pin **14** pf **XP1** and microphone input/output at pins **1** and **2** of **XP2**.

3 ADJUSTMENTS

3.1 General

Adjustment trimmer potentiometer/capacitors in the HM135 main unit:

Ref. Designator	Used for…
RP1	Squelch Level Adj.
RP2	Frequency Adj.
RP3	Deviation Balance (Reference Oscillator Modulation Level)
RP4	Maximum Deviation Adj.
RP5	Transmitter Driver Bias Adj.
RP6	Transmitter Power Amplifier Bias Adj.
RP7	Transmitter Maximum Power Adj.
CV1	Receiver VCO Adj.
CV2	Transmitter VCO Adj.

3.2 Initial Settings

DO NOT CONNECT THE RADIO TO THE POWER SUPPLY BEFORE AND DURING INITIAL SETTINGS OF CONTROLS.

Control	Function	Initial Settings
RP1	Squelch Level Adj.	Center
RP2	Frequency Adj.	Center
RP3	Deviation Balance	Minimum (CCW), see note1.
RP4	Maximum Deviation Adj.	Center
RP5	Transmitter Driver Bias Adj.	Minimum, see note 2
RP6	Transmitter Power Amplifier Bias Adj.	Minimum, see note 3
RP7	Transmitter Maximum Power Adj.	Minimum, see note 4
CV1	Receiver VCO Adj.	As is
CV2	Transmitter VCO Adj.	As is

1) Connect an ohmmeter between the wiper of **RP3** and Ground. Turn **RP3** in CCW direction until readings of the ohmmeter are within 100 to 500 Ohm
2) Connect an ohmmeter between the wiper of **RP5** and Ground. Turn **RP5** in CCW direction until readings of the ohmmeter are within 100 to 300 Ohm
3) Connect an ohmmeter between the wiper of **RP6** and Ground. Turn **RP6** in CCW direction until readings of the ohmmeter are within 100 to 300 Ohm
4) Connect an ohmmeter between the wiper of **RP7** and Ground. Turn **RP7** in CCW direction until readings of the ohmmeter are within 200 to 500 Ohm

3.3 Applying power for the first time.

RF Power amplifier and AF Power Amplifier of the radio are connected to the power supply* before *the internal ON/OFF Switch, i.e. supply voltage is present even if the ON/OFF Switch is in OFF position. It is strongly recommended to disconnect the radio from the plus of the power supply if full switching OFF is needed.

Keep the minus of the Power Supply Unit connected to the GROUND.

Use pre-programmed and checked Front Panel.

☝ ***Radio contains a number of ESD, most sensitive components, without build-in protection are LDMOS RF Power transistors.***

1) Check connection between the Front Panel and the Main Unit.
2) Set ON/OFF Volume Potentiometer of the Front Panel Fully CCW (Switched Off)
3) Connect the radio's Antenna connector to a Communication Tester, preset in Transmitter Measurement mode.
4) Set a Regulated Power Supply unit, capable to deliver at least 7A of DC Current, to 13.2V and current limit to 1A.
5) Connect the radio to the Power Supply Unit. Check the current. It must be below 30mA.
6) Switch ON the radio. Check the current, it must be below 0.5A.
7) Check Radio's Internal Power Supply as follows:
   - Between pin **1** of **DA7** (KIA7808API) (the pin, nearest to the Audio Amplifier IC) and ground – plus 13.2V
   - Between pin **3** of **DA7** and ground – between 7.6 and 8.4V
   - Between the positive electrode of **C247** and ground - between plus 4.75 and 5.25V
   - Between the positive electrode of **C358** (near pin **1** of uP **DD5**) and ground plus 3.3, plus/minus 0.15V.
8) Switch off the radio.

3.4 Loading the Firmware

1) Connect a Firmware Programmer to the **XP3**, **JTAG** Connector.
2) Power On the radio
3) Load the firmware
4) Power Off the radio
5) Disconnect the Programmer.
6) Switch ON the Radio. Usually it will respond with **`BAD CRC`** Message on LCD. It is OK. Switch OFF the Radio.

3.5 Programming the radio

1) Connect the programming cable to radio's Microphone Connector.
2) Press the **F1** key, keep it pressed and switch ON the radio. Radio will respond with **`Programming...`** on the LCD and Orange light of front panel diode. Release F1 Key.
3) Program the radio using Factorytest1.hpv settings file. It includes 6 channels:
   - **CH1** - 135.100 MHz, 25 KHz Channel spacing, No CTCSS , No DCS, No Sellcall
   - **CH2** - 155.100 MHz, another settings as per **CH1**
   - **CH3** - 173.900 MHz, another settings are as per **CH1**
   - **CH4** - 135.100 MHz, 12.5 KHz Channel spacing, No CTCSS , No DCS, No Sellcall
   - **CH5** - 155.100 MHz, another settings as per CH 4
   - **CH6** - 173.900 MHz, another settings are as per CH 4
   - **CH7** - 155.1 MHz, 25 KHz spacing, CTCSS 67Hz on RX ant TX.
   - **CH8** - 155.1 MHz, 25 KHz spacing, CTCSS 254.1 Hz.
   - **CH9** - 155.1 MHz 25 KHz spacing , SELLCALL CCIR 12345 both RX ant TX
4) Switch OFF the radio and disconnect the programming cable.
5) Connect the microphone to the radio.

3.6 Setting the Power Amplifier Bias

1) Connect **TP1**, VCO voltage test point, to the ground.
2) Connect a 200 to 330 pF Disc Capacitor between the common point of **VD16**, **VD17** and **R98** and the ground.
3) Power ON the Radio. Push the **PTT** of the Microphone.
4) Note the current , it must be approx 400 to 500mA.
5) Turn slowly the **RP5**, TX Driver Bias in CW direction until the current from power supply is increased with approx. 300 mA. Note the current.
6) Turn slowly **RP6**, TXPA Bias in CW direction until the current is increased with approx. 300mA. Keep the current absolute value below 1.1 A.

7) Release the PTT.
8) Power Off the radio. Disconnect the short from **TP1**. Keep the capacitor (step 2 above) connected.

3.7 Setting the frequency and VCO's tuning.

1) Switch the radio ON
2) Go to **CH3** (173.9 MHz)
3) Connect an oscilloscope between **TP1** , located in the center of VCO shield, and ground. Turn **CV1**, RX VCO ADJ, slowly until the voltage at **TP1** is between 6.5 and 7.1VDC, without notable ripple.
4) Press the PTT. Turn **CV2** TX VCO ADJ slowly until the voltage at **TP1** is between 6.5 and 7.1 VDC, without notable ripple. Release the PTT
5) Switch to **CH1** (135.1 MHz). The voltage at **TP1** must drop to 1.8 to 3V. Press the PTT. The voltage must be within 2 and 3.1V.
6) Repeat all above, if necessary.
7) Remove the 300pF capacitor (step 2 of the paragraph "Setting the Power Amplifier Bias" above).
8) Switch to **CH2** (155 MHz).
9) Go to transmit (PTT) and turn slowly **RP7**, maximum TX Power until the output power is reached approx 5 to 8W.
10) Rotate **RP2**, FREQUENCY ADJUST until the frequency is within 155.000 MHz plus/minus 200Hz. Release the PTT.
11) Change the channel to **CH1**, check the frequency, it must be 135.000 MHz plus/minus 200Hz.
12) Go to **CH3**, 173.900 MHz, check the frequency, it must be 173.900 MHz plus/minus 280Hz. Realign the **RP2** to tune the frequency as near as possible to 173.9 MHz.

3.8 Setting the RF POWER.

1) Switch to **CH2**, 155.1 MHz. Set the power to High (20W).
2) Press the PTT. Turn **RP7**, Maximum Power ADJ, until the power is set to 20 plus/minus 1W.
3) Check the power on **CH1** and **CH3** . It must be between 18.5 and 20W.
4) Change the power on **CH1** to **CH3** to LOW. Check the power, it must be between 9 and 10 W.

3.9 Setting of modulation

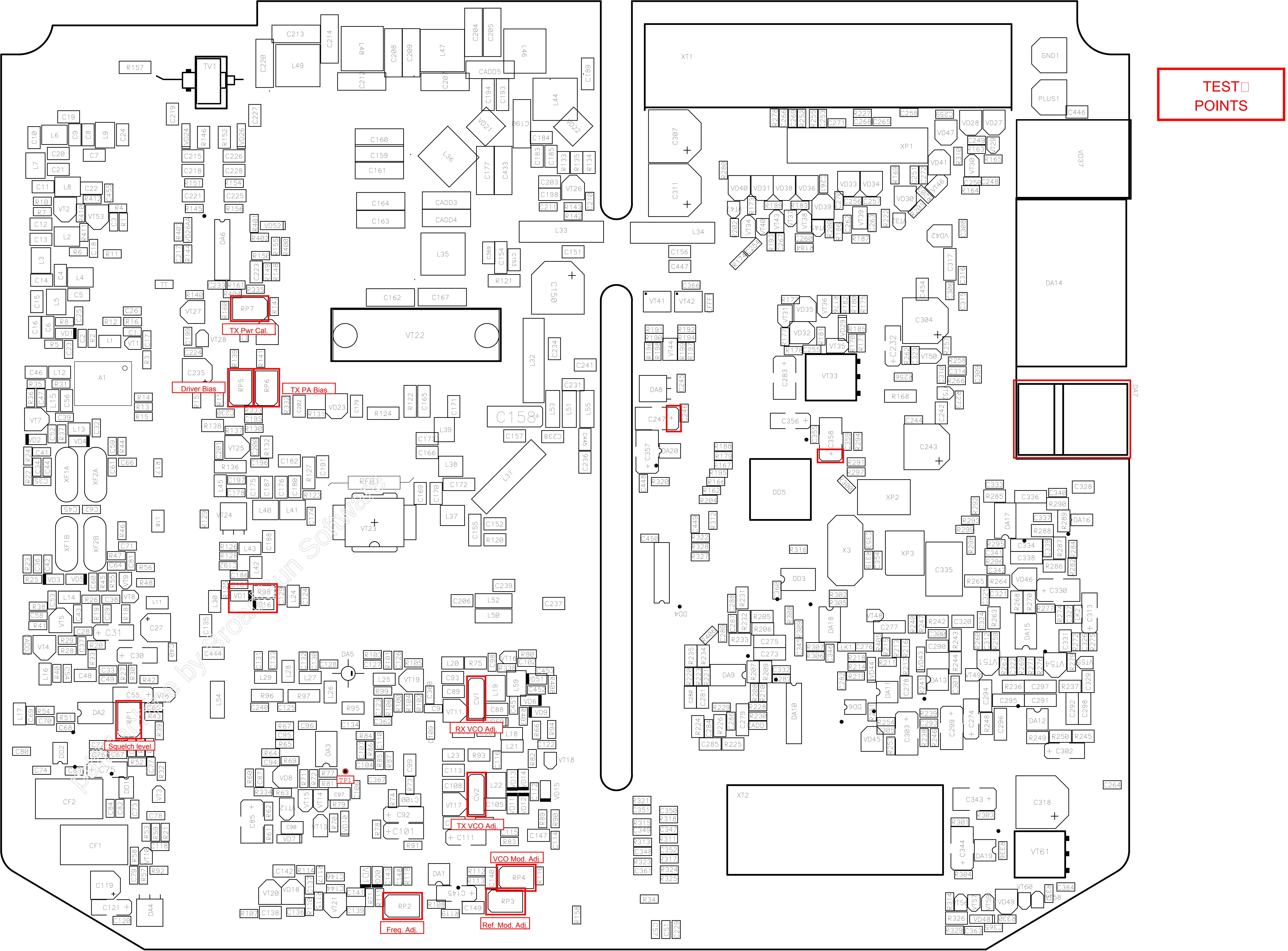
1) **VERY IMPORTANT!** Switch off all the modulator filters in the deviation meter (communication tester) before this measurement. Radio's modulation input used for this setting is (i.e. without pre-emphasis).
2) Disconnect the microphone from the radio. Set the radio to **CH2** 155.1 MHz
3) Connect an AF Generator between the pin **7** of rear DB25 connector (TX AF IN) and Ground (pin **14**).
4) Short pin **9** (External PTT) of rear DB25 Connector to the ground. It is equivalent to pressing the microphone PTT.
5) Set the AF Generator to 2000 plus/minus 50Hz and output level of 1V.
6) Adjust the **RP4**, maximum deviation control until the deviation is set to 4.6 kHz ((peak to peak)/2)
7) Decrease the output of the AF generator until the deviation is set to 2000 plus minus 50Hz.
8) Keeping the level of the AF generator the same (it must be approx 100mV) decrease the generator frequency to 100Hz.
9) Turn **RP3**, deviation balance until the deviation is set to 2000 Hz. Observe the demodulated signal, it must be clean , without notable higher (reference) frequency ripple. Presence of ripple means that balance is not set properly. Near the balance the ripple disappear.
10) Check the deviation at 300 Hz, 500 Hz, 1 KHz, 2 KHz, 2.7 KHz. It must be within 1.8 and 2.3 KHz. Repeat steps 5 to 9, to adjust the deviation as near as possible to 2kHz if necessary.
11) Increase the level of the AF Generator to 1V. Check the deviation at 1kHz, it must be approx. 4.6 kHz.
12) Remove the short at pin **9**. Disconnect the AF Generator.
13) Switch to **CH7**. Short pin **9** (**Ext. PTT**) to the ground. Check the deviation. It most be 500 plus/minus 120 Hz.
14) Go to RX, change the channel to **CH8**. Check the deviation, it must be between 400 and 650Hz.
15) Change the channel to **CH9**. Press **CALL1**. Note the maximum measured deviation. It must be between 2.55 and 2.9 KHz.

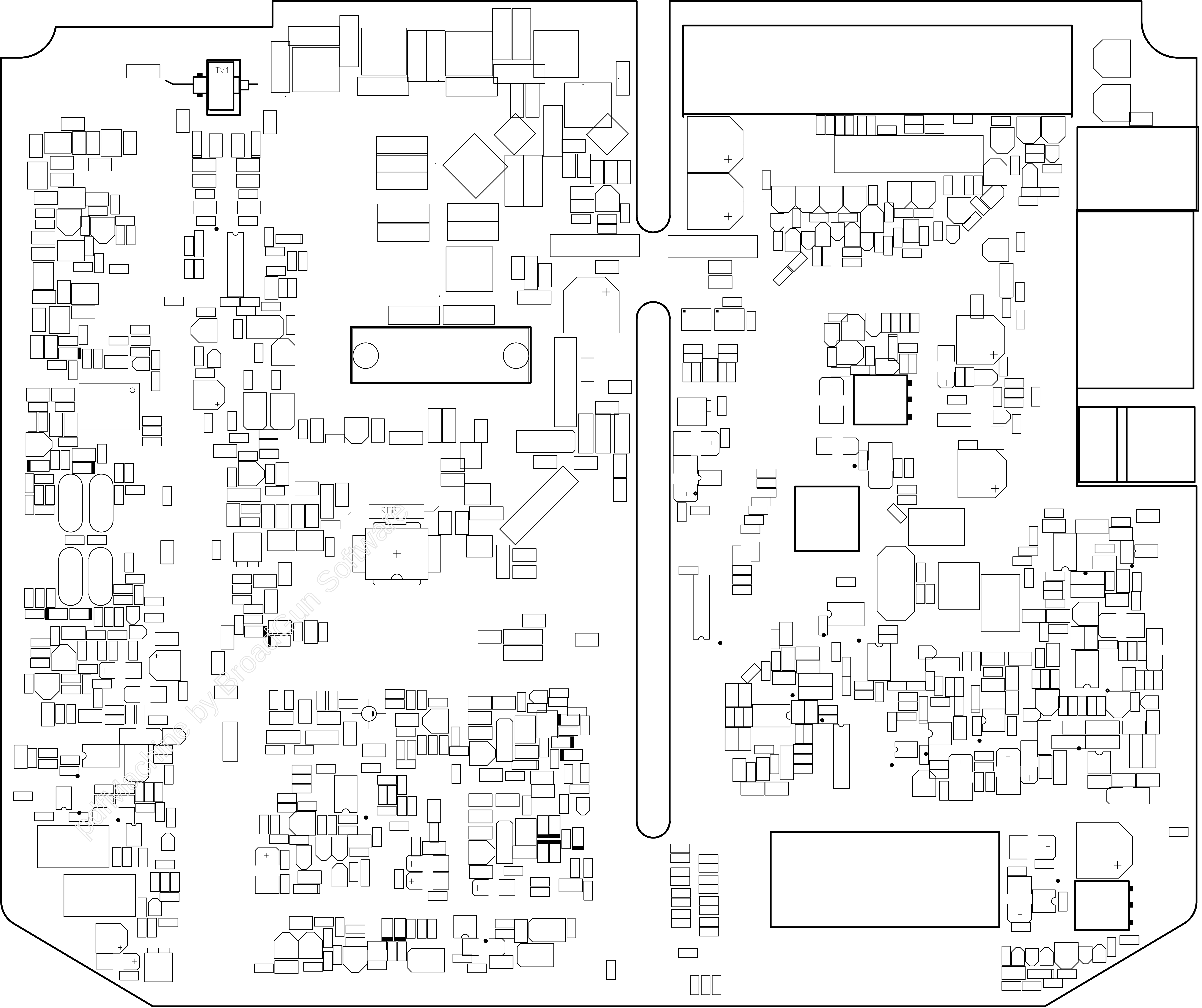
3.10 Setting of the Squelch Level.

1) Switch the radio to **CH2**, 155.100 MHz.
2) Turn **RP1**, SQUELCH LEVEL ADJ, until radio opens without signal applied to the antenna input.
3) Connect a SINAD meter to pin **5** of rear DB25 connector. Switch off the CCITT filter the SINAD meter. Connect a RF generator, tuned to 155.100 MHz to the radio's antenna connector
4) Set the RF generator modulation frequency to 1kHz and the deviation to 3 KHz. Set the RF output of the generator to –87 dBm (10 uV).
5) Decrease the level of RF generator until SINAD meter reads approx 8 to 9 dB. Note the RF generator settings.
6) Decrease the RF generator level with 6 dB. Turn slowly **RP1**, until the squelch close.
7) Increase the level of RF generator slowly until Squelch opens. Note the RF level. It must be approx the same, as set in step 5 above. If not, set the level to the same, noted in step 5 and repeat the settings of **RP1** again.

ALAN HM 135

TEST POINTS AND PCB LAYOUTS


TEST POINTS
TX Pwr Cal.
Driver Bias
TX PA Bias
Squelch level
TP1
RX VCO Adj.
TX VCO Adj.
VCO Mod. Adj.
Freq. Adj.
Ref. Mod. Adj.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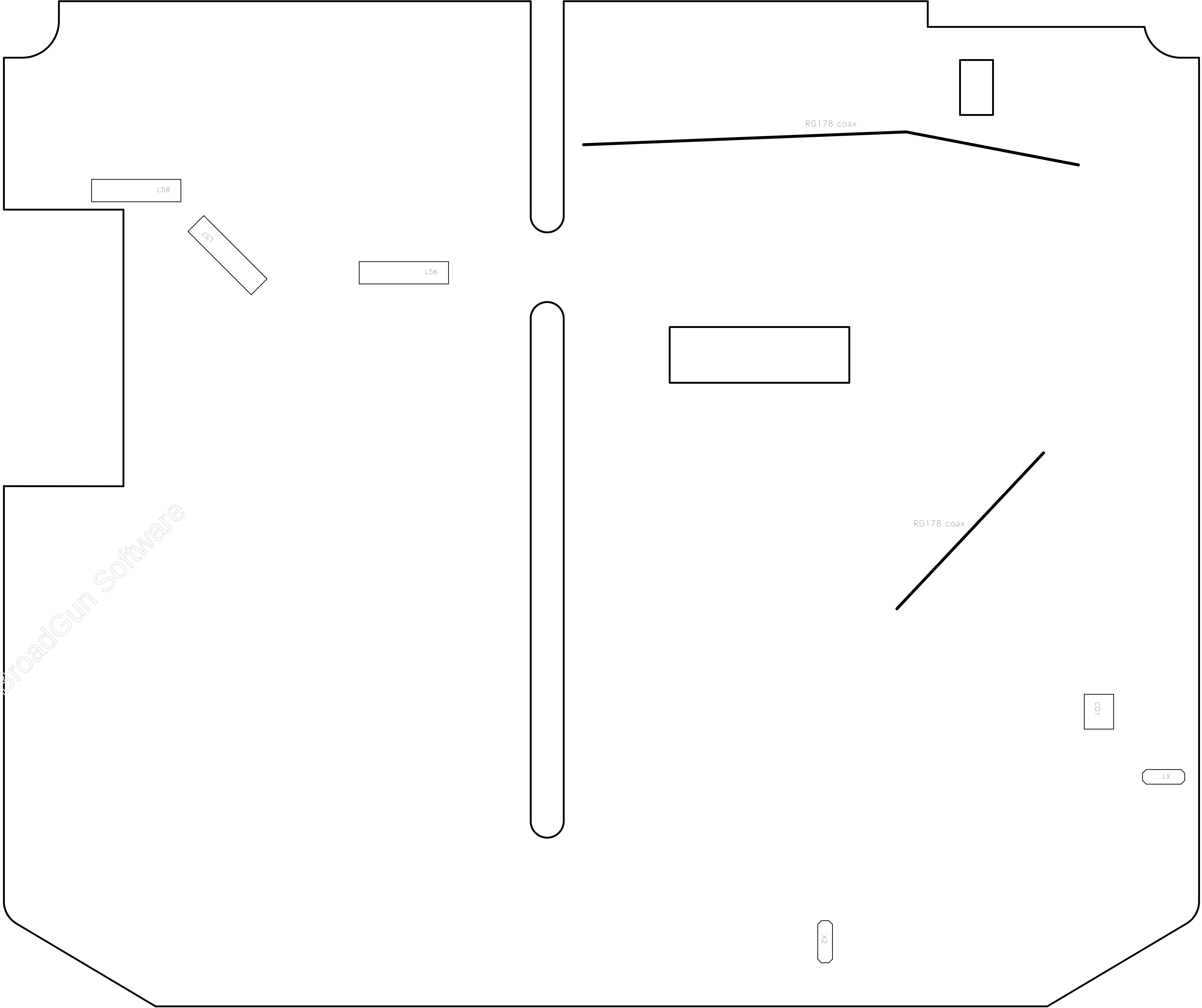
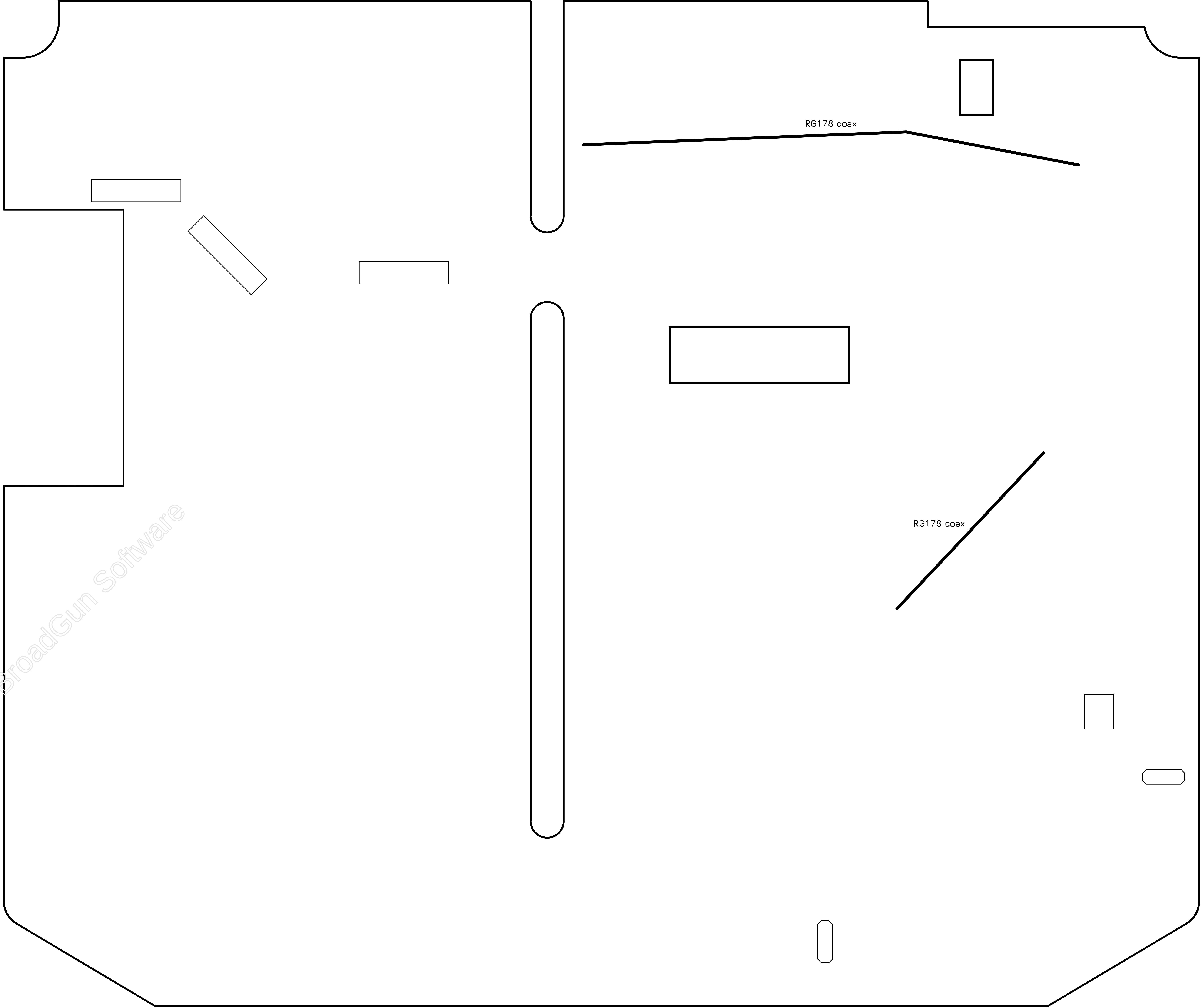
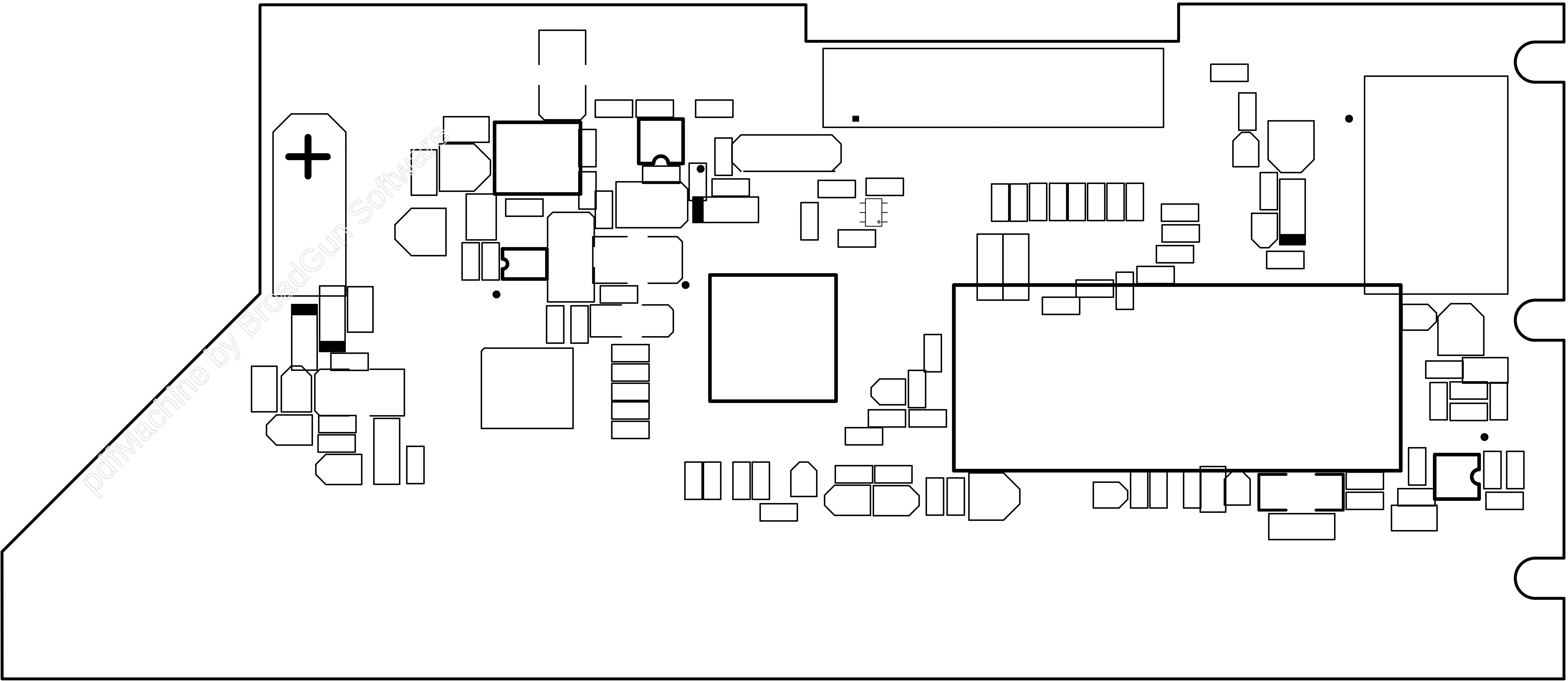
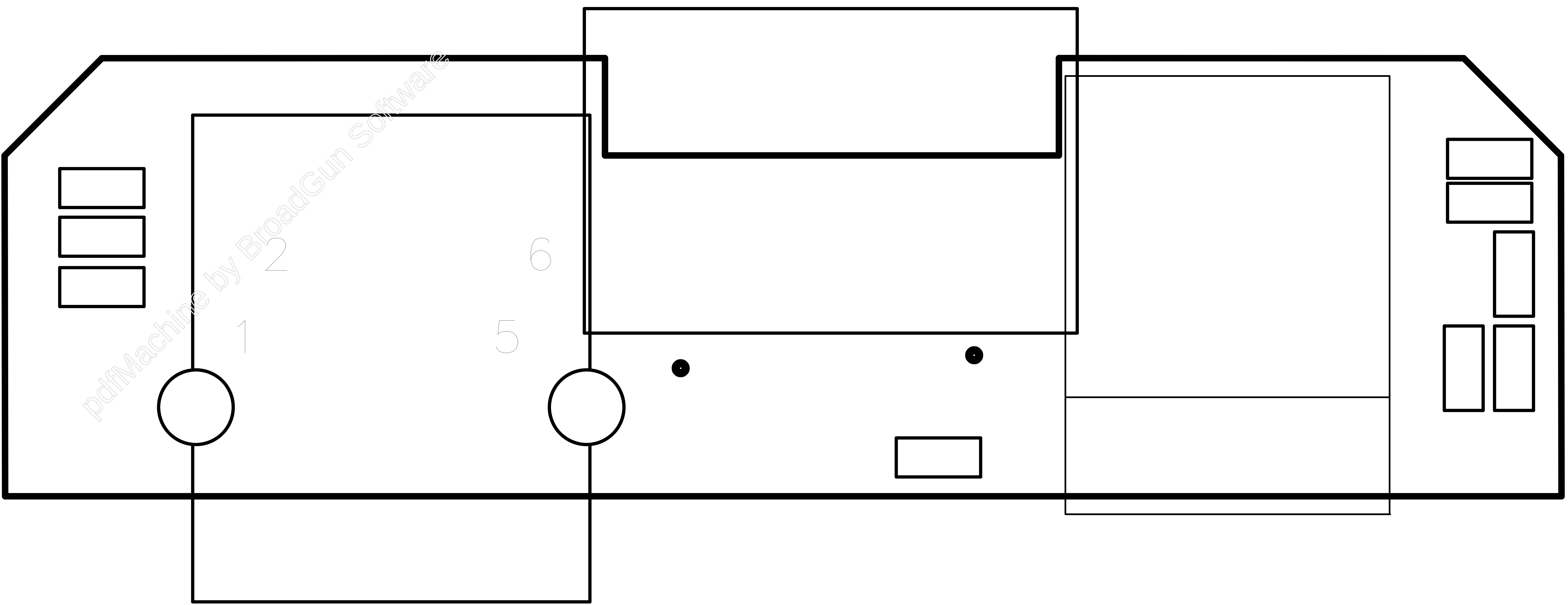
RFB1

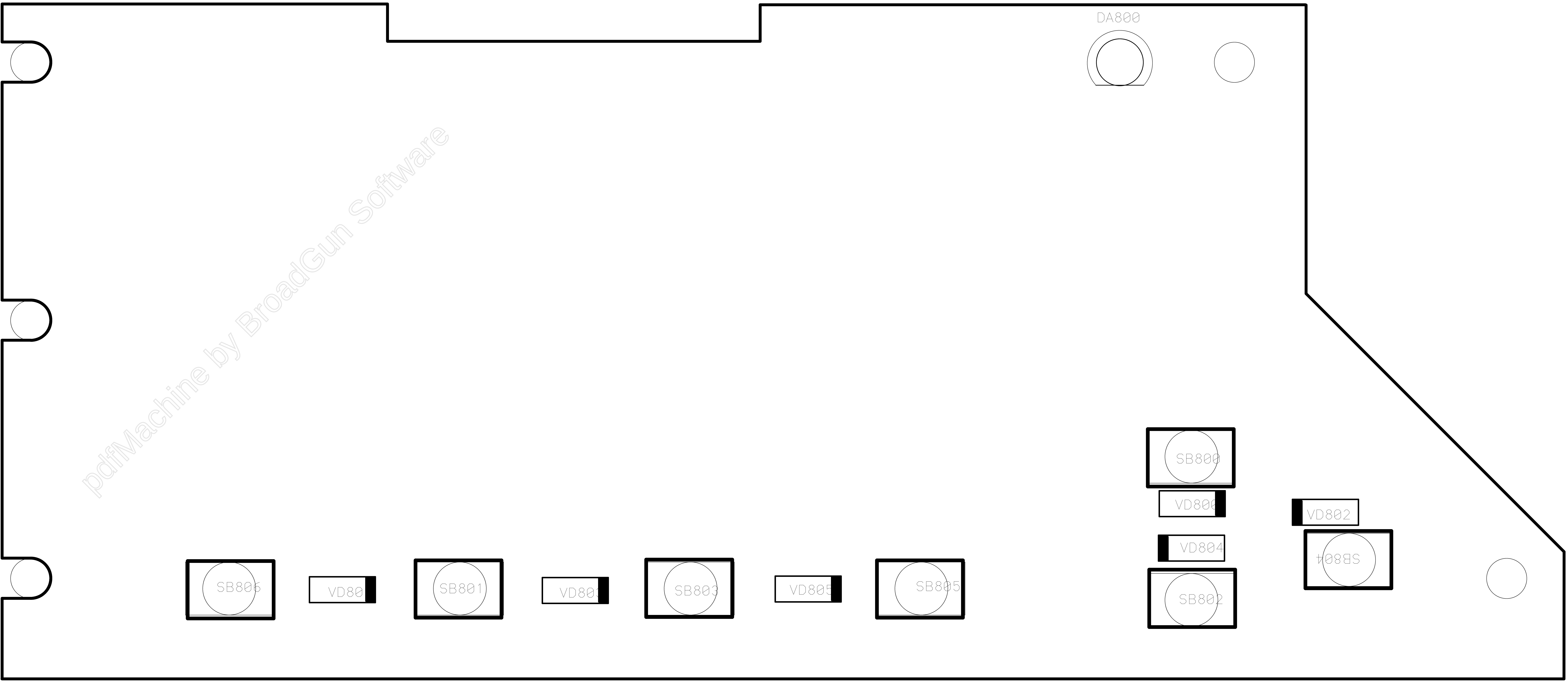


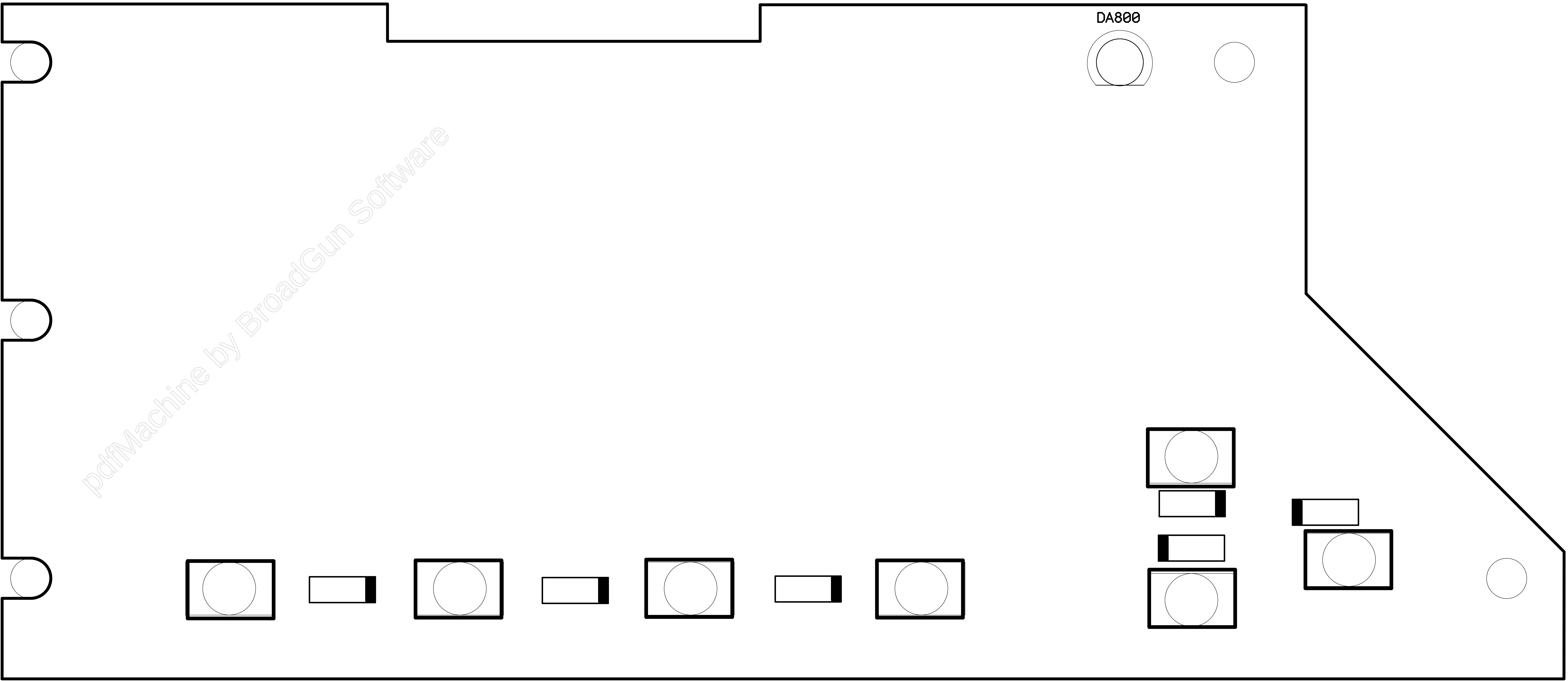
RG178 coax
L58
L57
L56
RG178 coax
CD1
X1
X2

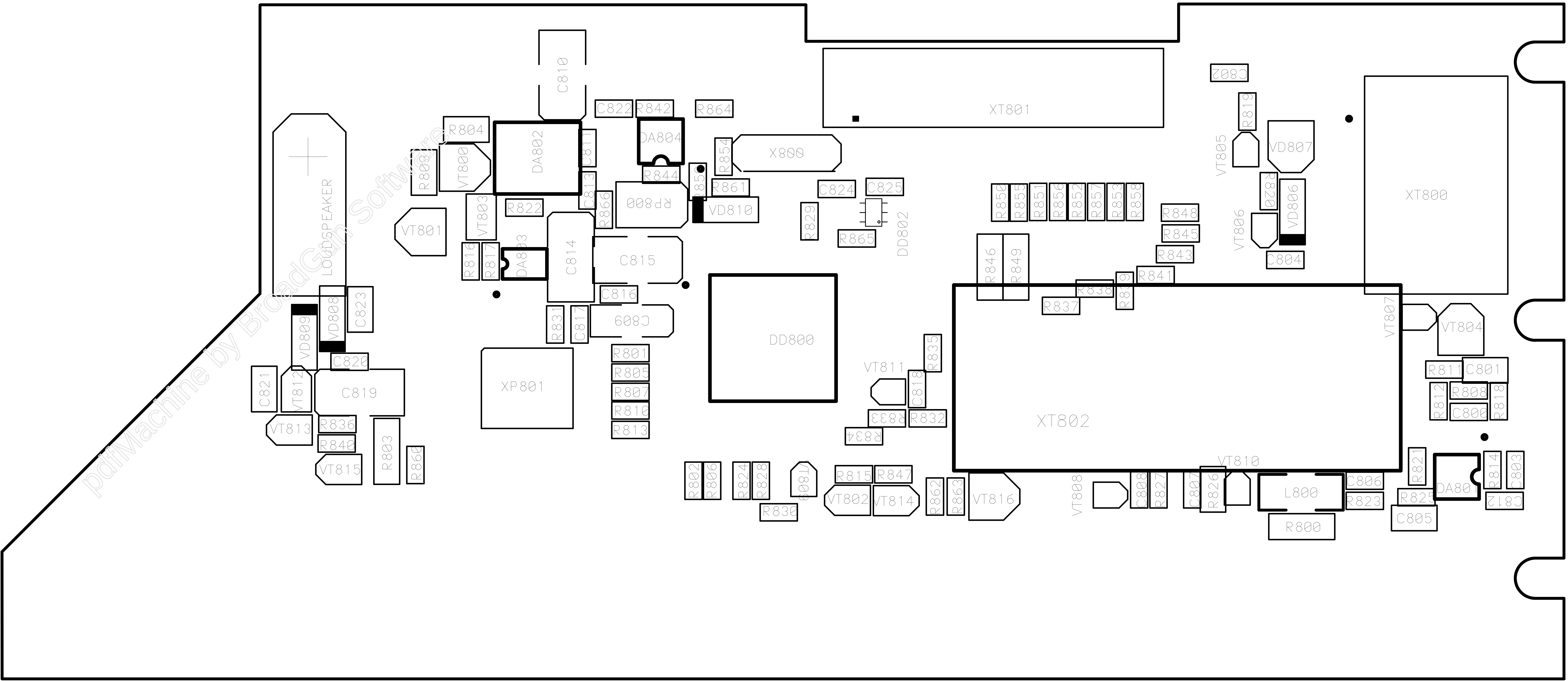

RG178 coax
RG178 coax




2
6
1
5


DA800
SB800
VD800
VD802
VD804
SB804
SB806
VD80
SB801
VD801
SB803
VD805
SB805
SB802


DA800


C810
C822
R842
R864
XT801
C802
R819
VD807
VT805
XT800
R804
DA802
C811
DA804
R854
X800
R809
VT800
R844
R859
R861
C824
C825
C813
RP800
VD810
R829
DD802
R865
R850
R855
R851
R856
R852
R857
R853
R858
R848
R845
R843
R841
R820
VD806
VT806
C804
VT803
R822
R866
VT801
LOUDSPEAKER
R816
R817
DA803
C814
C815
R846
R849
R838
R839
R837
VT807
VT804
C816
DD800
VD809
VD808
C823
R831
C817
C809
C820
R801
R805
R807
R810
R813
XP801
R835
VT811
C818
R833
R832
R834
XT802
R811
C801
R812
R808
C800
R818
C821
VT812
C819
VT813
R836
R840
VT815
R803
R860
R802
R806
R824
R828
R830
VD801
R815
R847
VT802
VT814
R862
R863
VT816
VT808
C808
R827
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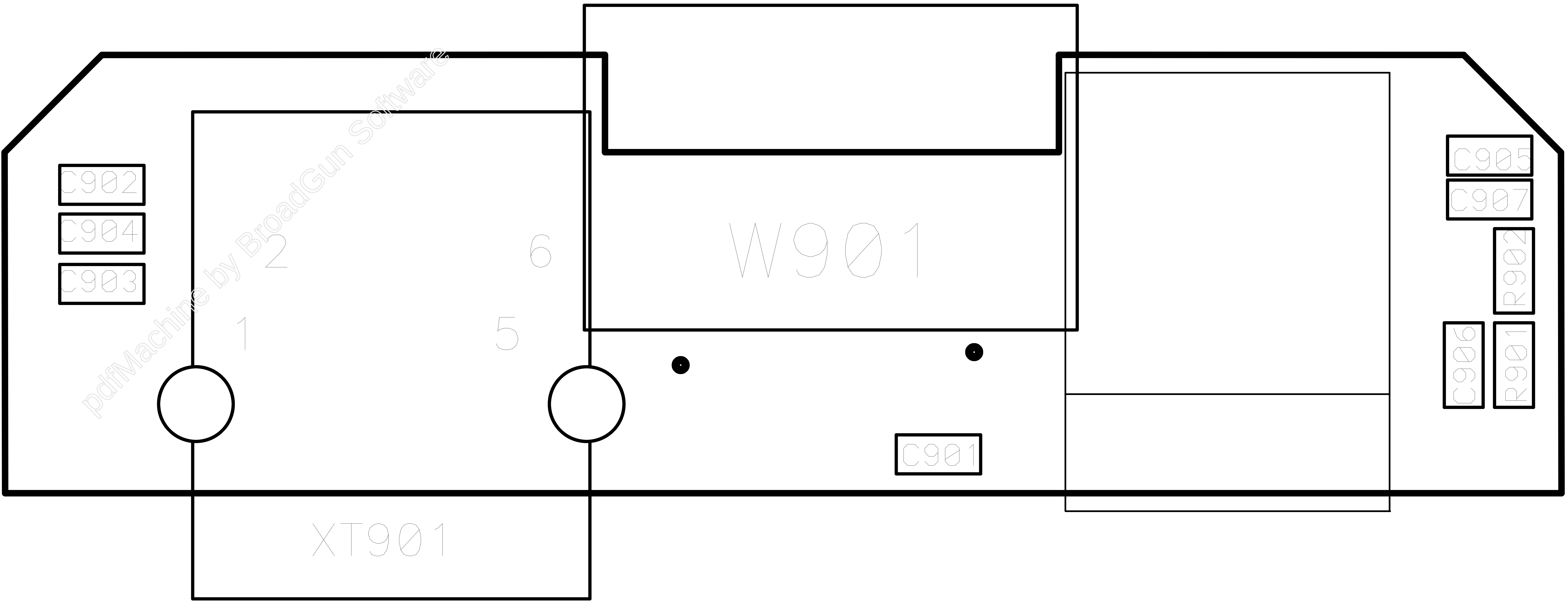
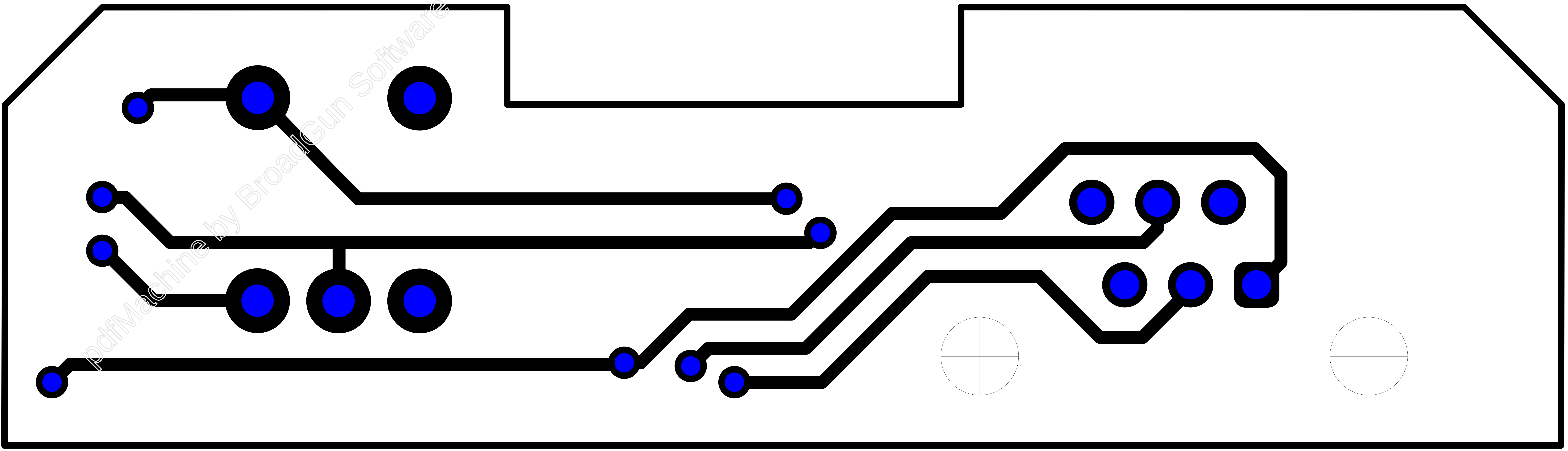
C803
C812
C805
R800


C902
C904
C903
2
1
6
5
W901
XT901
C905
C907
R902
C906
R901
C901



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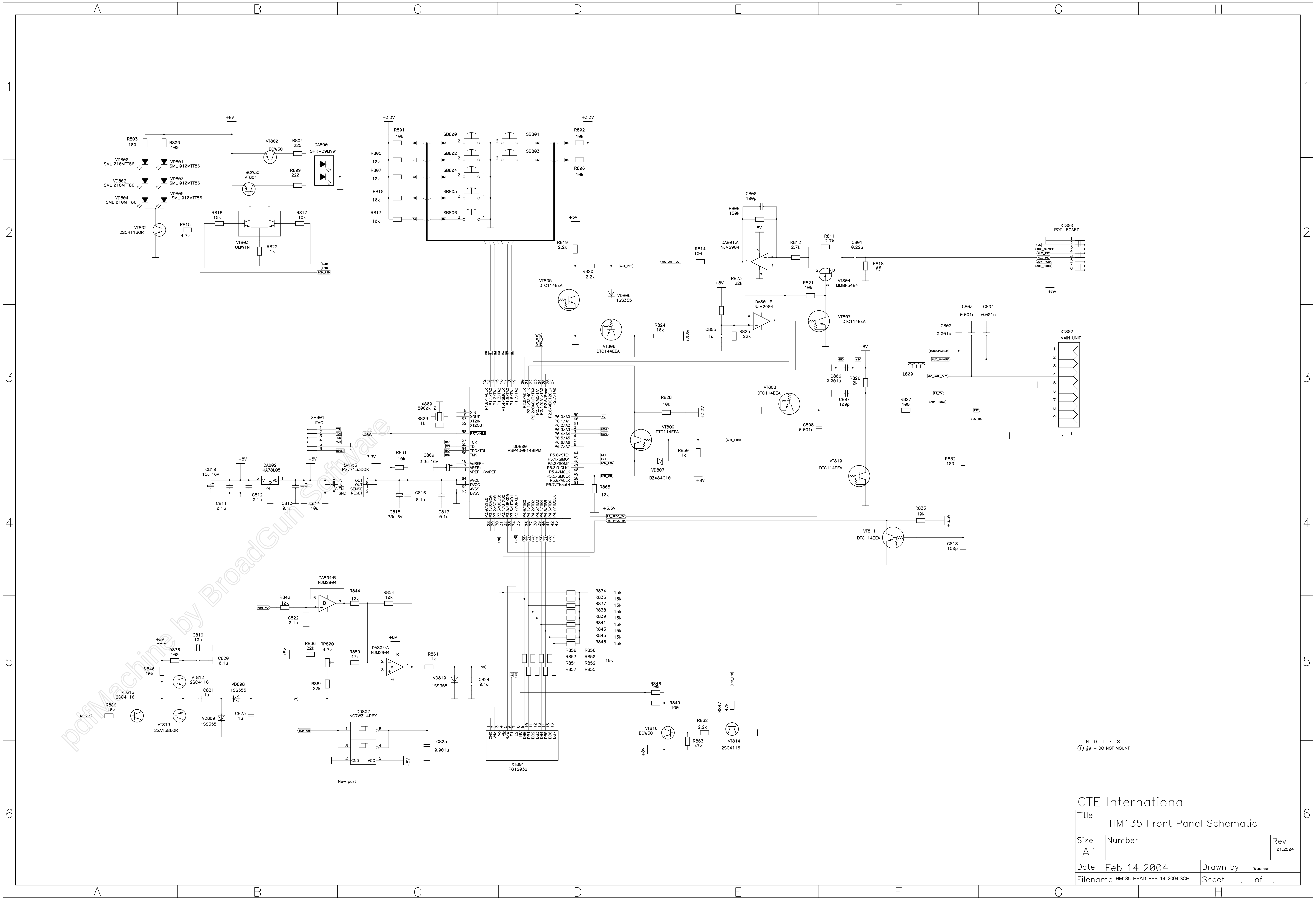
ELECTRICAL DIAGRAMS



CTE International

Title: HM135 Front Panel Schematic

Size: A1

Number:

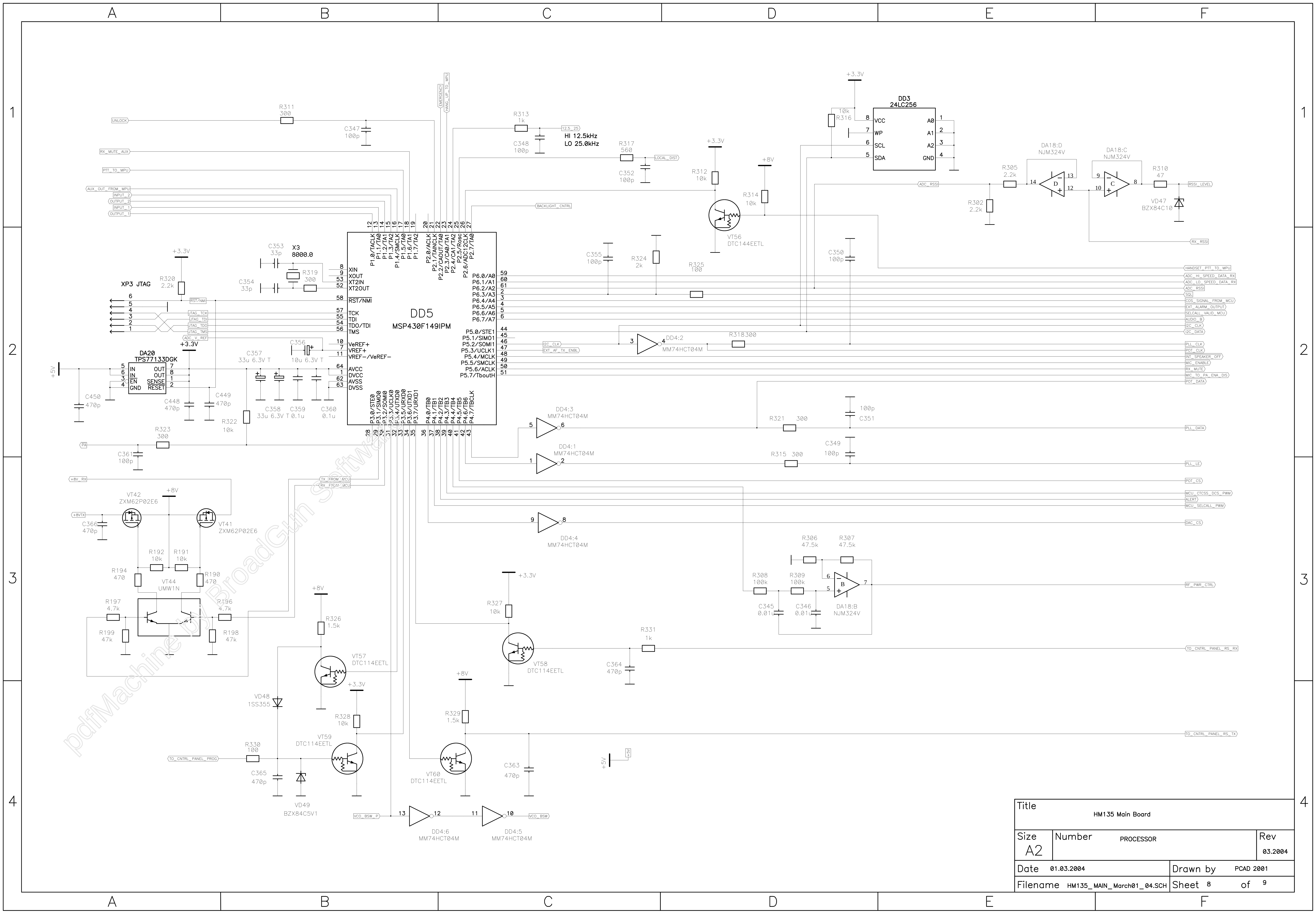
Rev: 01.2004

Date: Feb 14 2004

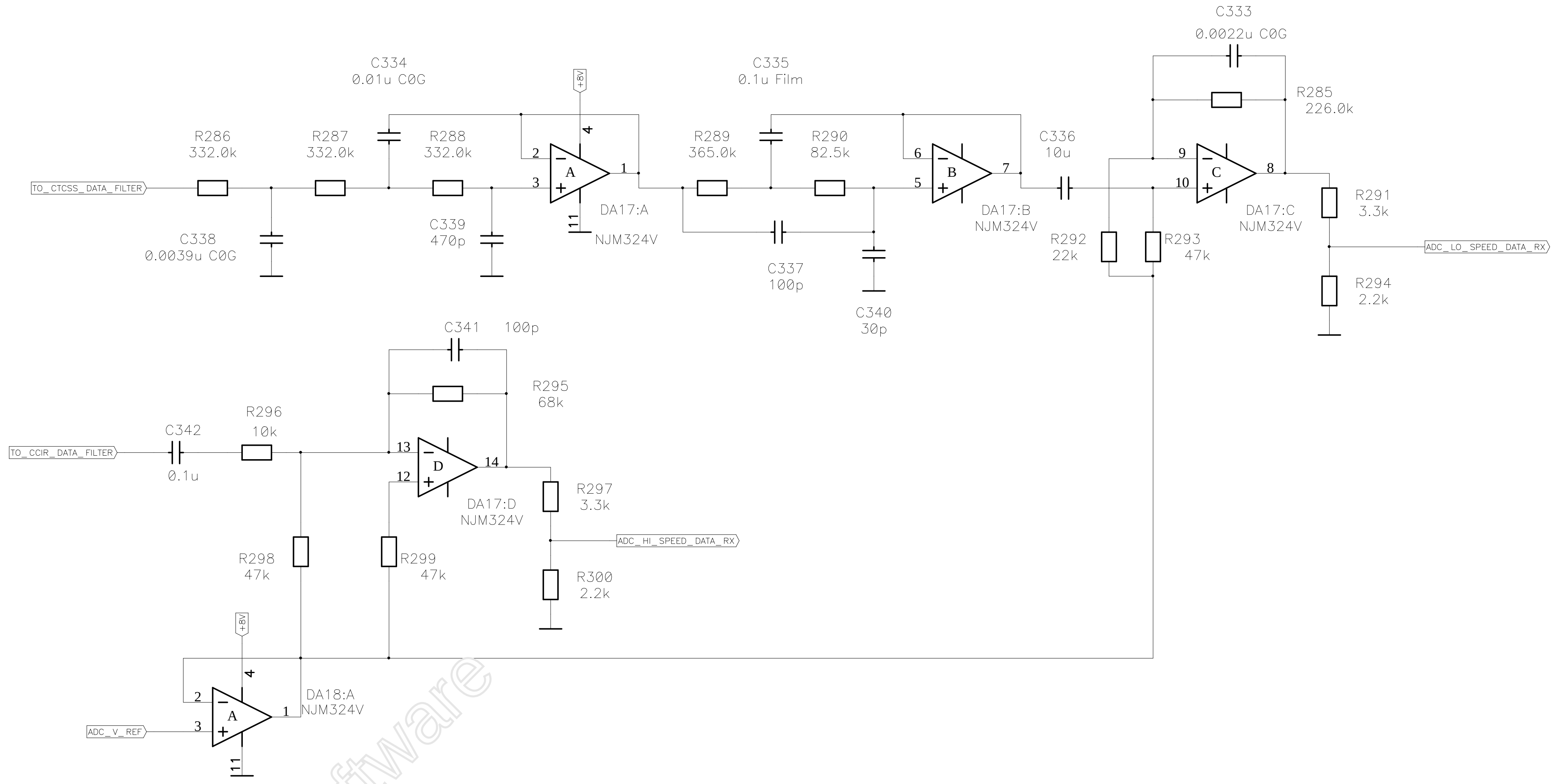
Drawn by: Woslaw

Filename: HM135_HEAD_FEB_14_2004.SCH

Sheet 1 of 1



Title	HM135 Main Board
Size	A2
Number	PROCESSOR
Rev	03.2004
Date	01.03.2004
Drawn by	PCAD 2001
Filename	HM135_MAIN_March01_04.SCH
Sheet	8 of 9



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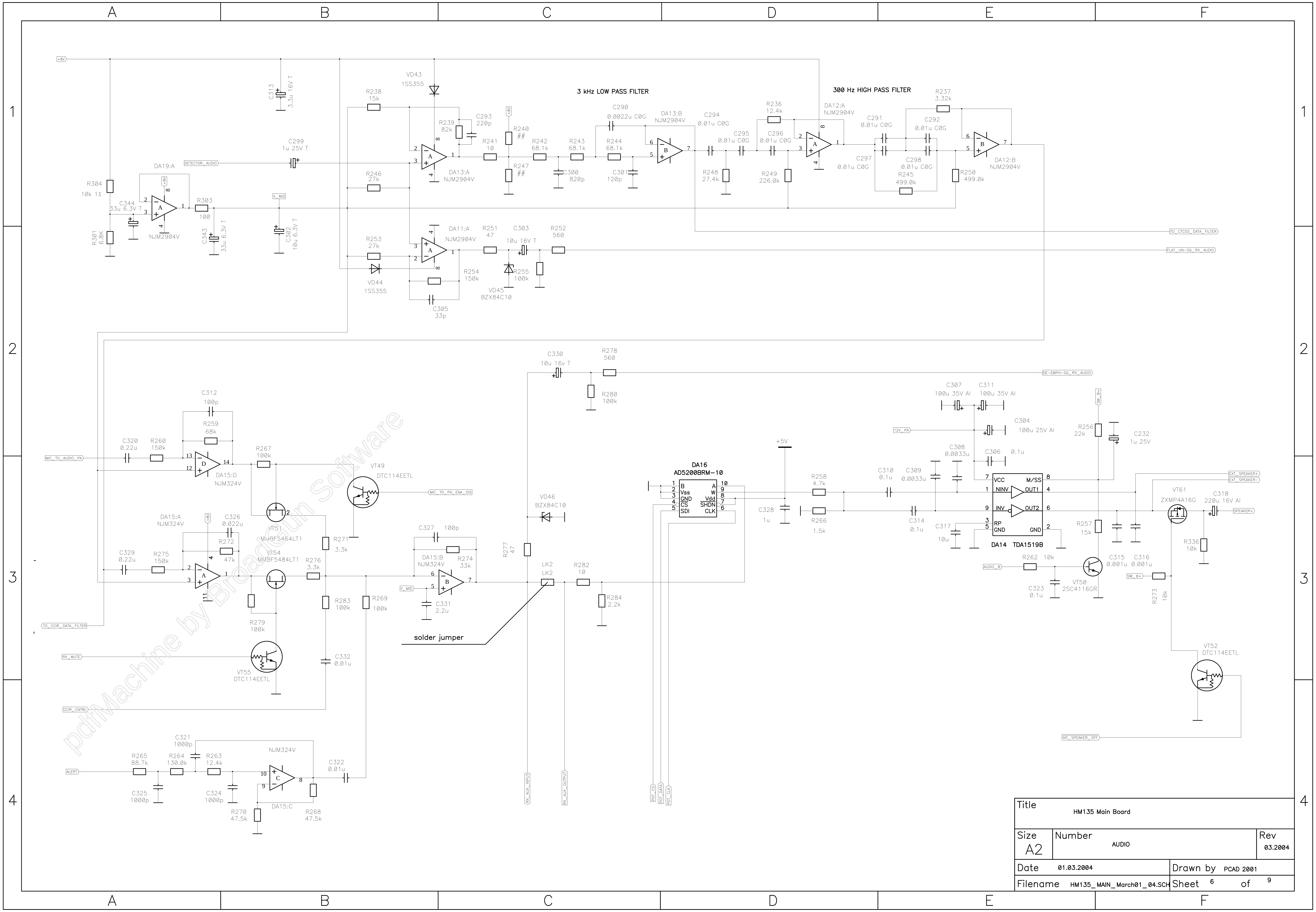
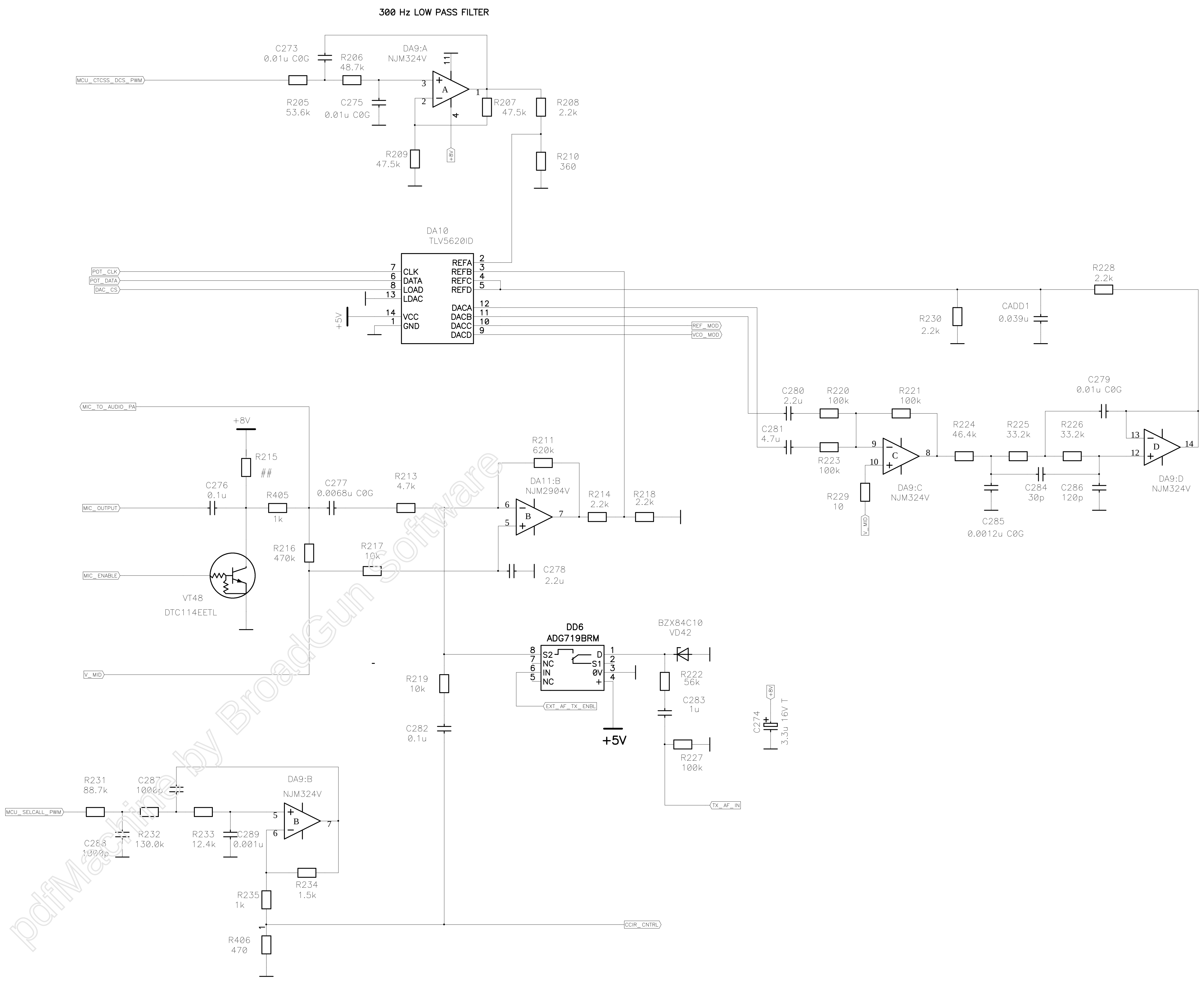
Size A2	Number ADC BUFFERS		Rev 03.2004
Date 01.03.2004		Drawn by PCAD 2001	
Filename HM135_MAIN_March01_04.SCH		Sheet 7	of 9



3 kHz LOW PASS FILTER
300 Hz HIGH PASS FILTER
DETECTOR_AUDIO
V_MID
TO_CTCSS_DATA_FILTER
FLAT_UN-SQ_RX_AUDIO
DE-EMPH-SQ_RX_AUDIO
MIC_TO_AUDIO_PA
MIC_TO_PA_ENA_DIS
TO_CCIR_DATA_FILTER
RX_MUTE
CCIR_CNTRL
ALERT
AUDIO_B
SW_B+
12V_PA
EXT_SPEAKER+
EXT_SPEAKER-
SPEAKER+
INT_SPEAKER_OFF
solder jumper
DA16
AD5200BRM-10
DA14 TDA1519B
DA12:A NJM2904V
DA12:B NJM2904V
DA13:A NJM2904V
DA13:B NJM2904V
DA11:A NJM2904V
DA19:A NJM2904V
DA15:A NJM324V
DA15:B NJM324V
DA15:C
DA15:D NJM324V
VT49 DTC114EETL
VT51 MMBF5484LT1
VT54 MMBF5484LT1
VT55 DTC114EETL
VT50 2SC4116GR
VT61 ZXMP4A16G
VT52 DTC114EETL
VD43 1SS355
VD44 1SS355
VD45 BZX84C10
VD46 BZX84C10
LK2
Title HM135 Main Board
Size A2
Number AUDIO
Rev 03.2004
Date 01.03.2004
Drawn by PCAD 2001
Filename HM135_MAIN_March01_04.SCH
Sheet 6 of 9



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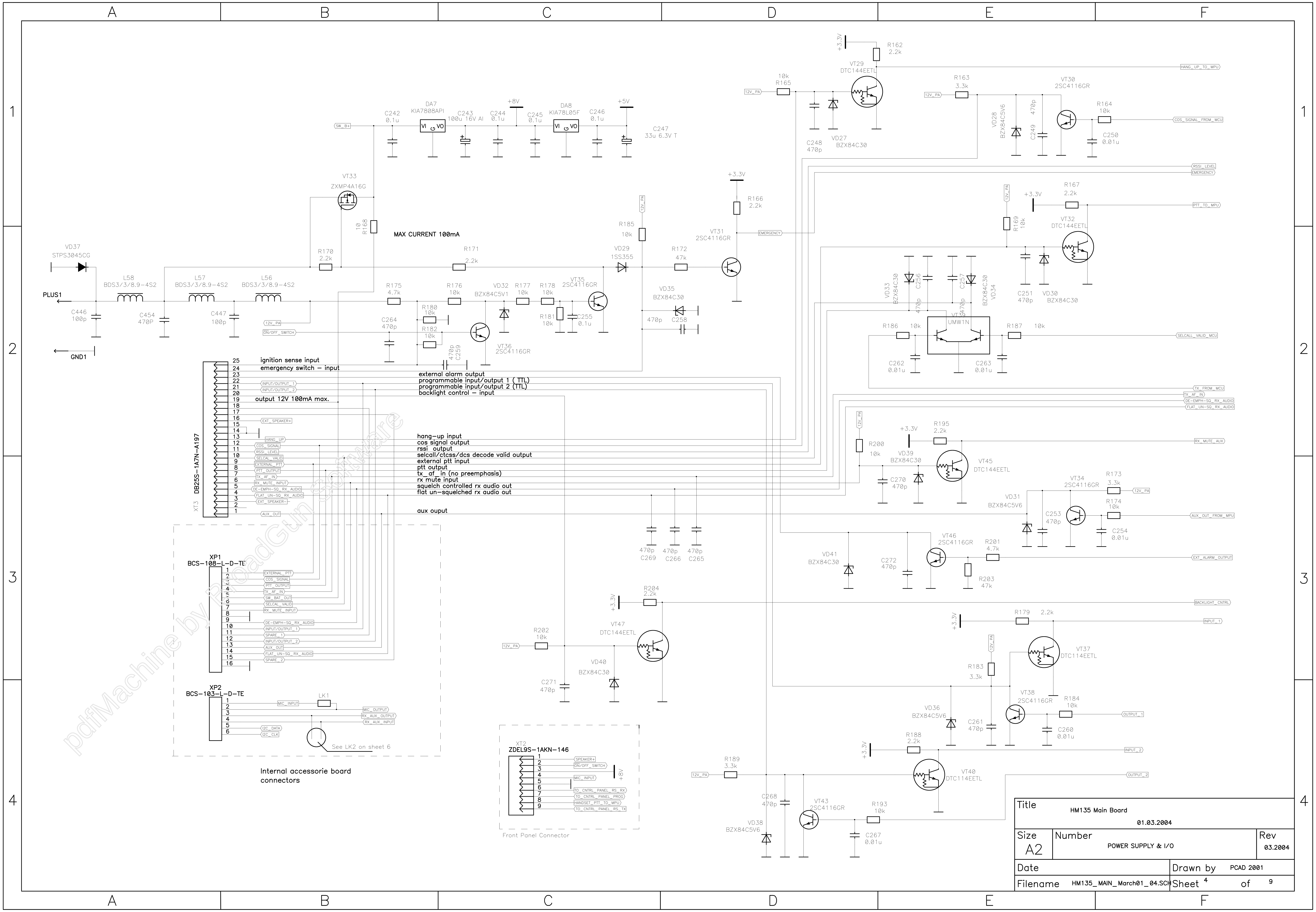
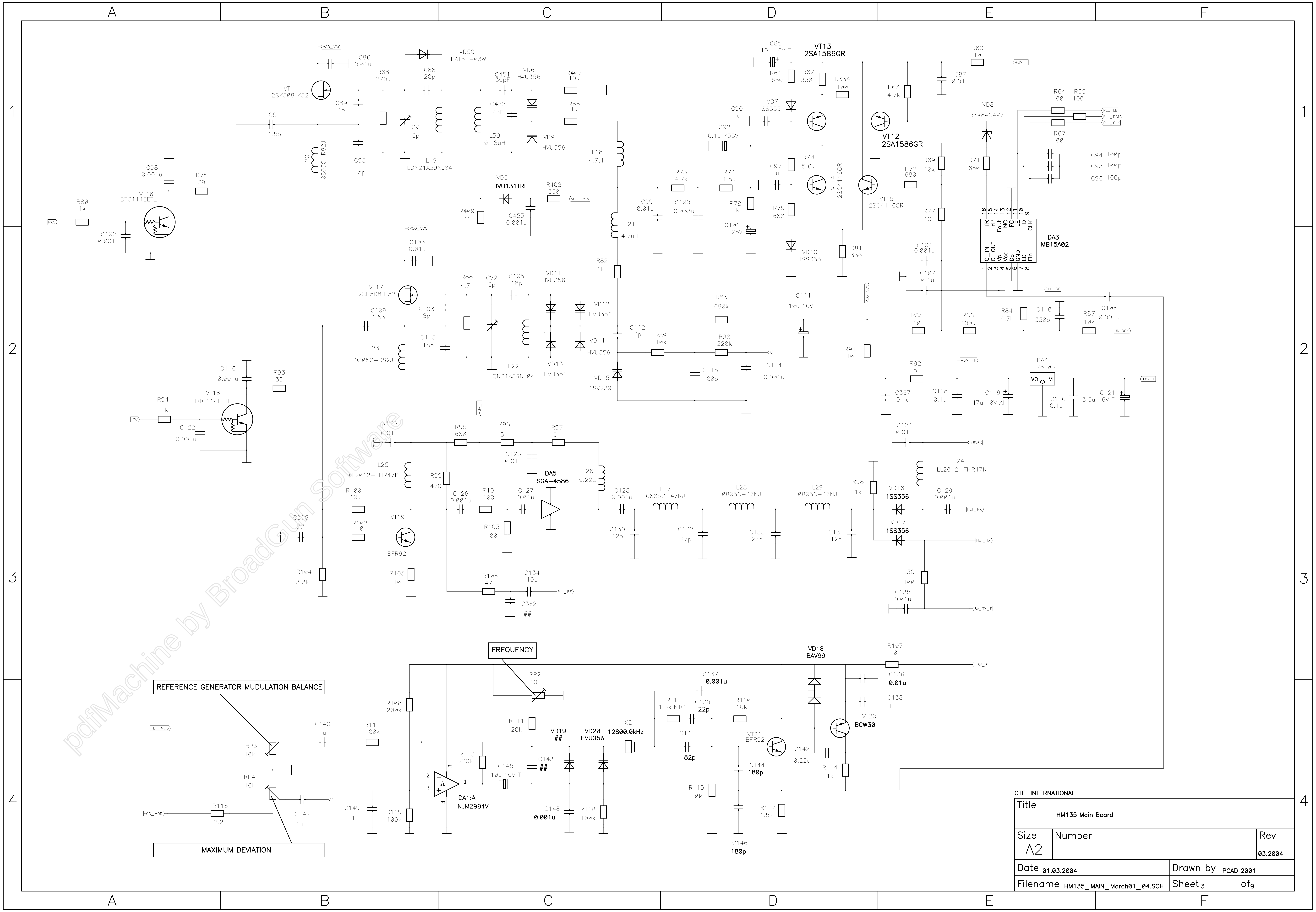
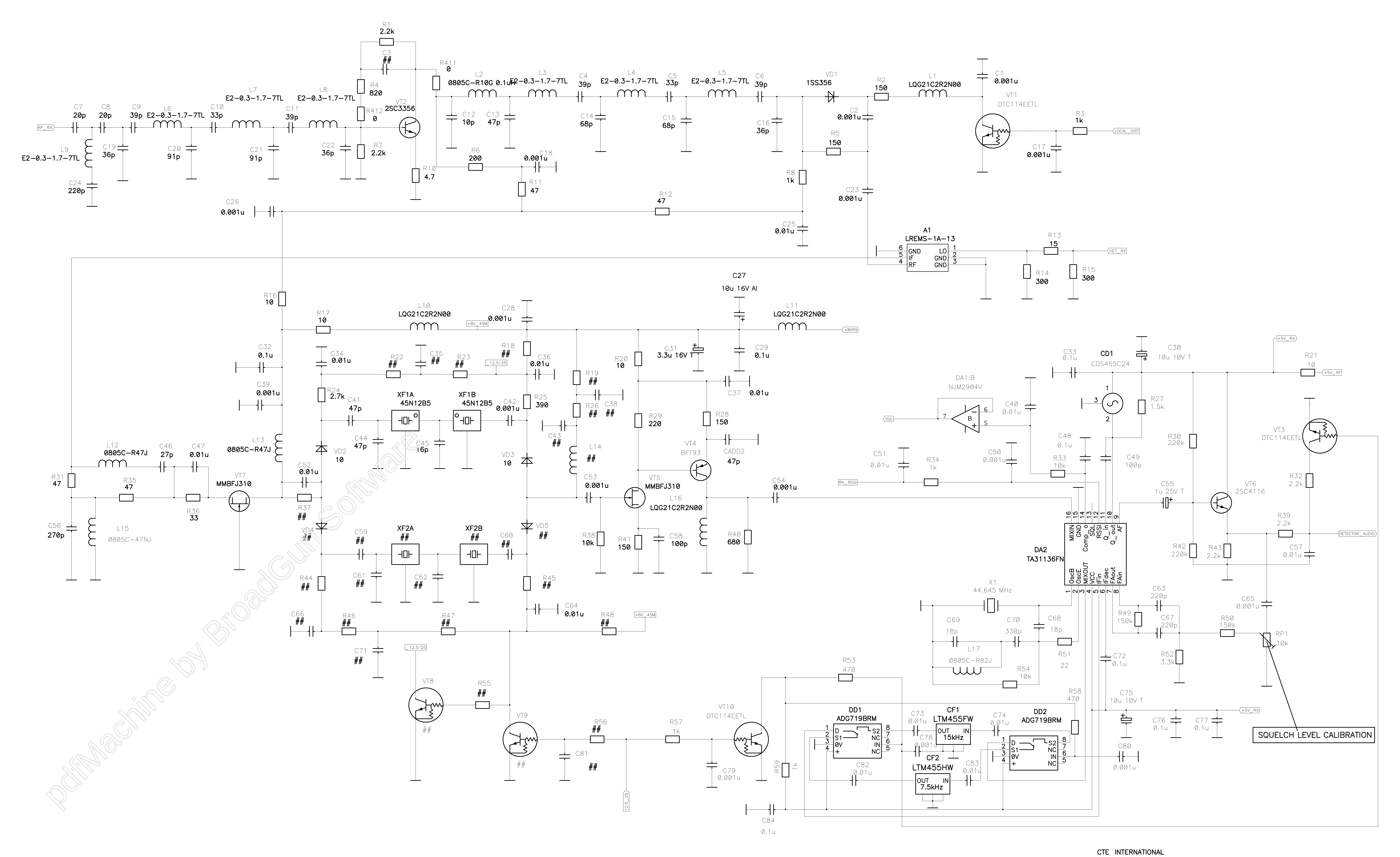
Size A2	Number MODULATION CONTROL 03.2004 01.03.2004 PCAD 2001 HM135_MAIN_March01_04.SCH 5 9		Rev
Date		Drawn by	
Filename		Sheet	of



MAX CURRENT 100mA
PLUS1
GND1
ignition sense input
emergency switch – input
external alarm output
programmable input/output 1 (TTL)
programmable input/output 2 (TTL)
backlight control – input
output 12V 100mA max.
hang-up input
cos signal output
rssi output
selcall/ctcss/dcs decode valid output
external ptt input
ptt output
tx_af_in (no preemphasis)
rx mute input
squelch controlled rx audio out
flat un-squelched rx audio out
aux ouput
DB25S-1A7N-A197
XP1
BCS-108-L-D-TE
XP2
BCS-103-L-D-TE
See LK2 on sheet 6
Internal accessorie board connectors
XT2
ZDEL9S-1AKN-146
Front Panel Connector
Title
HM135 Main Board
01.03.2004
Size
A2
Number
POWER SUPPLY & I/O
Rev
03.2004
Date
Drawn by
PCAD 2001
Filename
HM135_MAIN_March01_04.SCH
Sheet 4 of 9


REFERENCE GENERATOR MUDULATION BALANCE
FREQUENCY
MAXIMUM DEVIATION
DA3 MB15A02
DA4 78L05
DA5 SGA-4586
DA1:A NJM2904V
X2 12800.0kHz
VT13 2SA1586GR
VT12 2SA1586GR
CTE INTERNATIONAL
Title
HM135 Main Board
Size
A2
Number
Rev
03.2004
Date 01.03.2004
Drawn by PCAD 2001
Filename HM135_MAIN_March01_04.SCH
Sheet 3 of 9



CTE INTERNATIONAL

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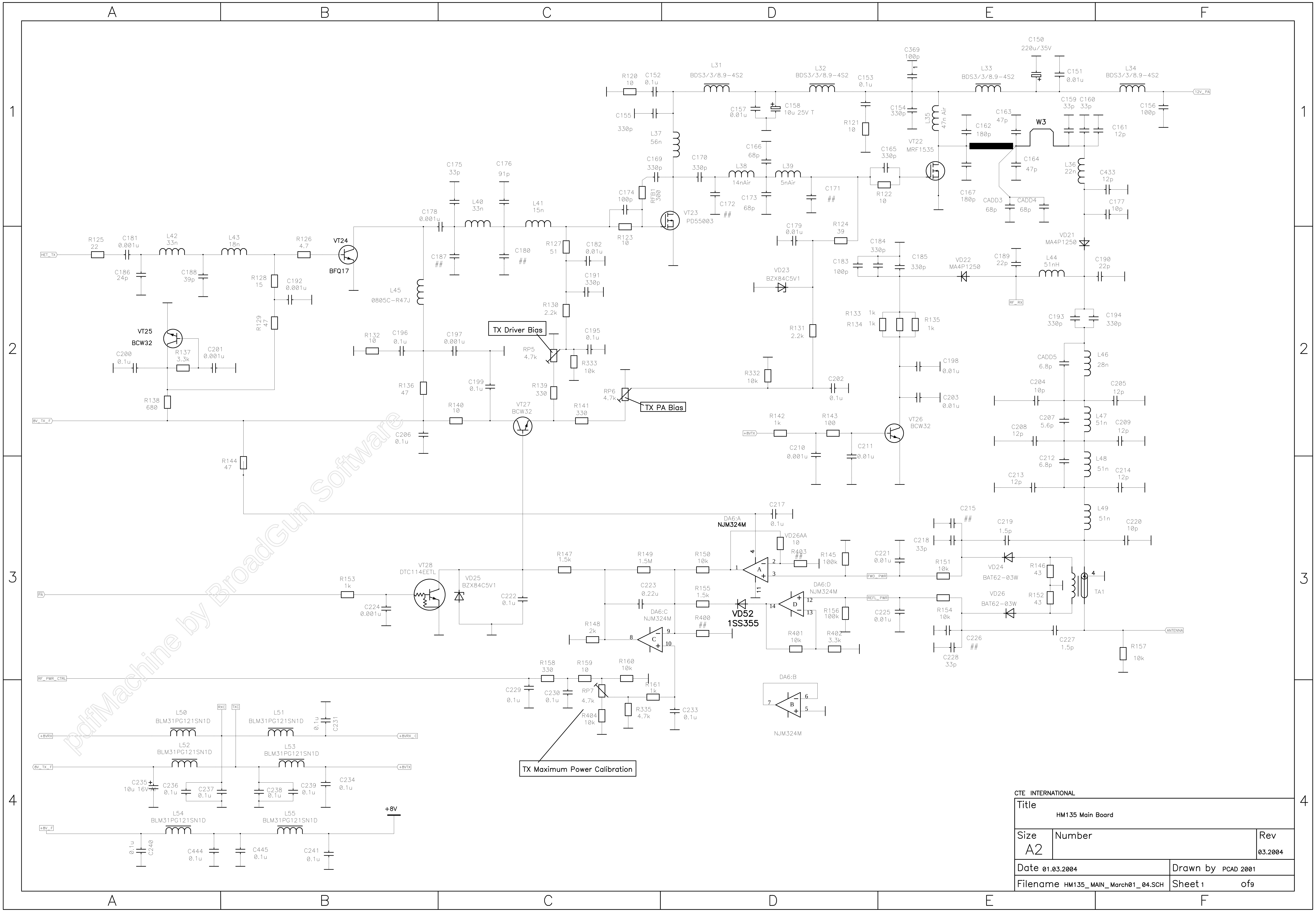
Date 01.03.2004		Drawn by PCAD 2001
Filename HM135_MAIN_March01_04.SCH		Sheet 2 of 9



CTE INTERNATIONAL

Title	HM135 Main Board	
Size A2	Number	Rev 03.2004
Date 01.03.2004	Drawn by PCAD 2001	
Filename HM135_MAIN_March01_04.SCH	Sheet 1 of 9	

Revision Notes

1) February 11 2004

R25 value changed to 390 Ohm,

R103 value changed from ### to 100 Ohm

C362 value changed from 5pF to ###

2) March 01 2004

R219 value changed to 10k

C282 changed to 0.1u

C283 type and value - now 1u ceramic

C452 changed to ### (Do Not Mount)

VD51 type changed to HVU131TRF

R409 changed to ### (Do Not Mount)

Title HM135 Main Board		
Size A2	Number NOTES	Rev
Date 01.03.2004	Drawn by	
Filename	Sheet 9 of 9	

ALAN HM 135

EXPLODED VIEW AND PART LIST

ALAN HM 135

PROGRAMMING MANUAL

HM135/HM435
VHF/UHF Mobile Transceiver

Programmer Software Guide

Preliminary version
issued on February 15th 2004

CONTENTS

1 ABOUT THIS MANUAL

1.1 Warning notes

Every effort has been made to ensure that the information in this document is complete, accurate, and up-to-date. CTE International assumes no responsibility for the results of errors beyond its control. The manufacturer of this equipment also cannot guarantee that changes in software and equipment made by non authorized people and referred to in this guide will not affect the applicability of the information in it.

Only authorized and qualified technicians should be allowed to follow the operation described into this manual.

This manual has been written for use by CTE International dealers and distributors who are programming the HM135/HM435 mobile transceivers for customers. You should be familiar with conventional radio systems, radio system and radio network settings parameters as well as general PC operation.

This programming guide is subject to change without notification. This booklet is referred to the current software version ***1.065***. If you own a later one please surf on www.cte.it or contact CTE International for the most recent updates by sending an email at **webmaster@cte.it**.

1.2 Conventions and Symbols in this Book

1.2.a Notes and warnings

This symbol marks a 'note'. Notes are hints or tips which offer additional information to help you.

This symbol marks a 'warning'. Warnings are special notices which you should read and follow carefully to avoid possible damage to your equipment, potential danger to yourself or others.

1.2.b Font format

- Window names and screen buttons will be highlighted in **bold**
- Important sentences and words are highlighted in *Italic*
- Messages which appear on the display are highlighted `with this font` (courier New)

1.2.c Screenshots

All the screenshots are normally referred to Windows XP (IT version)

2 INSTALLATION

2.1 Unpacking

The following items are in the programmer's package:

(a) CD with the programming software
(b) Programming operating instructions (this book!)
(c) Connection cable (serial to transceiver's microphone port)

If something is missing, please promptly advise your supplier.

2.2 System requirements

To use the CTE Programming Software for HM135/HM435 you need the following hardware and software:

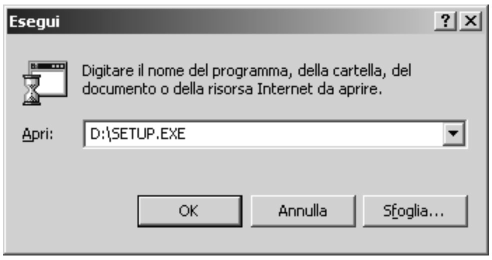
(a) IBM®-compatible personal computer with Pentium (I) processor or higher (basically depending on the operating system)
(b) Operating system Windows® 95 or higher.
(c) Hard drive - at least 2MB of free disk space and CD drive
(d) Random access memory (RAM) - basically depending on the O.S. (at least 32 MB; 64 MB recommended)

2.3 Installing programming Software (Programmer)

Setting up your programming software is easy and fast, thanks to the *Installing Wizard*, a step-by-step installing program. Just please follow these steps.

Steps can be slightly different according to the O.S. you are using

1) Start Windows, if it is not already running.
2) Insert the CD with the software in your drive.
3) Click the **Start** button, then click **Run**: you will see the **Run** dialog box.
4) Type **D:\setup.exe** (where **D:** indicates your CD drive) or click the **Browse…** button and use the **Browse** commands in order to select the said path and the executable (**.exe**) file.



5) Click **OK** and then follow the instructions which appear.
6) Several windows will ask you to insert your user's information, choose a destination location for the program and finally select the program folder. To accept the default information and go ahead with the next window click **NEXT>** button.
7) When installation is complete, the software will ask you to restart Windows. Select **Yes, I want to restart my computer now** then press the **Finish** button. Windows will restart.
8) When Windows is restarted, the **HM135** programmer's icon appears in **Start** – **Programs** – **HM135** folder

If in the installing procedure you'll get error messages, copy the software in a temporary directory on your hard disk (e.g. ***C:\temp****), then retry installing the software from the hard disk instead from the CD*

Please see your computer's operating instructions if you need help.

2.4 Connecting the radio with your computer

This section explains how to connect the transceiver to your computer's serial port. You will need to use the supplied serial cable (item c previously described in "Unpacking").

1) Make sure that the transceiver is turned off.
2) If the microphone is connected to the transceiver, unplug it as described in the user's manual
3) Insert the end of the supplied serial cable provided with RJ connector in the transceiver's microphone connector
4) Push gently the cable's RJ connector into the transceiver's microphone socket until you hear a mechanical click and it's firmly in place.
5) Connect the other end of the serial cable to your computer's serial port and make sure it's firmly in place.

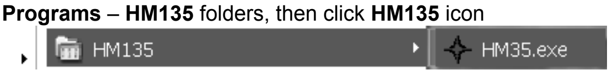
If you need to remove the RJ connector from the transceiver's microphone socket, unlock it by pushing the side release button of the RJ connector and remove it by grasping the connector itself (not the cable)

Please see your computer's operating instructions if you need help.

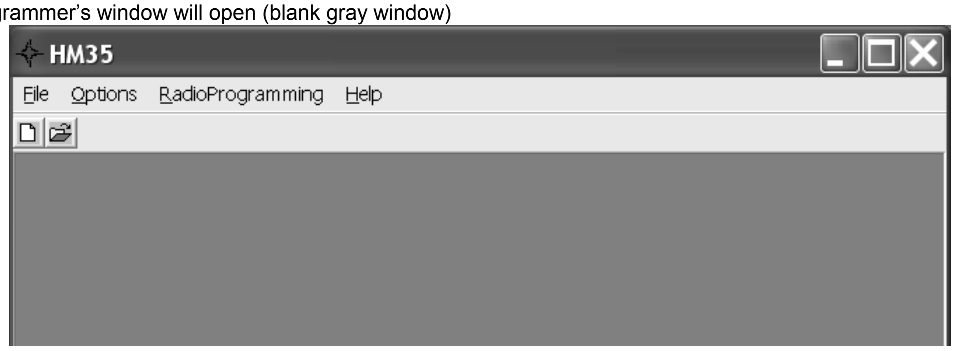
3 PROGRAMMING

3.1 Running the programmer software

1) Make sure that the radio is turned off
2) Keep the **F1** button pressed and switch the radio on by rotating clockwise the **On-Off/Volume** knob located in the front panel. After the mechanical click, the status LED will steadily glow yellow and the display shows `Programming`… showing that the radio is switched on in programming mode. In this case you can release the **F1** key
3) Click the **Start** button, point to **Programs** – **HM135** folders, then click **HM135** icon



4) The **HM35** Programmer's window will open (blank gray window)

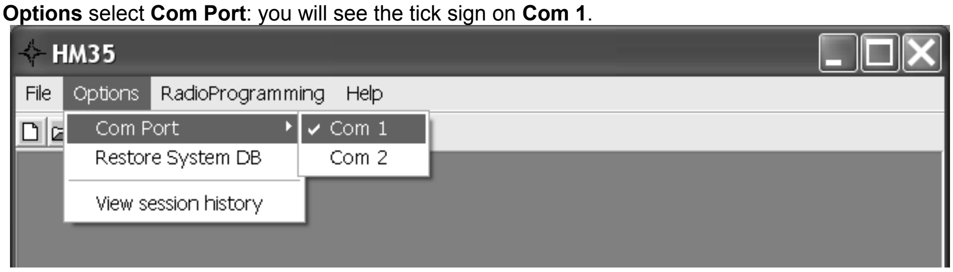


The figure shows the blank window under Windows XP

3.2 Selecting the proper COM (serial) port

The serial port **COM1** is automatically preset as default port. However, should you need to select the COM 2:

1) From the menu **Options** select **Com Port**: you will see the tick sign on **Com 1**.



2) Select **Com 2**: the tick will be moved on **Com 2** and this port will be switched as default.

3.3 Checking the software version

If you want to see the software version and other additional info, from the menu **Help** select **About**. The **About** window will open showing you the said data.

3.4 Mandatory operation for 1st time users

VERY IMPORTANT! If you have just installed the software or you are creating a new file for the first time, you have to restore signal default database as follows:

1) From the menu **Options** select **Restore System DB**. A window will open with the message **Restore the SYSTEM DB (Default Public Data, CTCSS Definition and Selcal Definition)**?
2) Press **OK** to restore the System DB. A window will confirm that the system DB has been restored successfully.

*In case of mistakes, you can press **Cancel** at step 2) in order to exit without restoring the System DB*

Should you need more information about restoring the signal default database, please see the par. 7.3

3.5 New or already stored data?

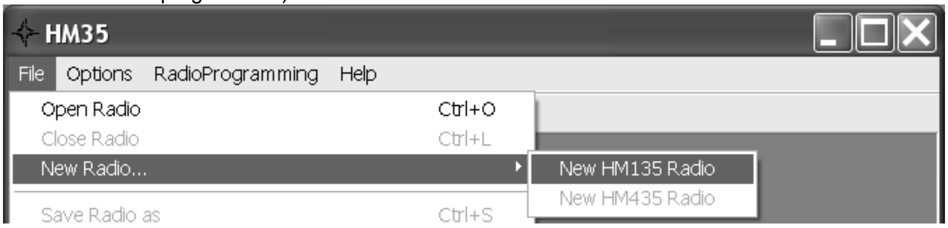
Now that you have properly run the software, and connected the programming cable to your PC, you can choose either the first or the second following procedures depending if you want to create a new programming data set or you need to use a previously stored one:

⇨ *If you need to create a new programming data set* (because you haven't previously stored same/similar programming data in your PC or in a transceiver) please start from the following paragraph 3.6.

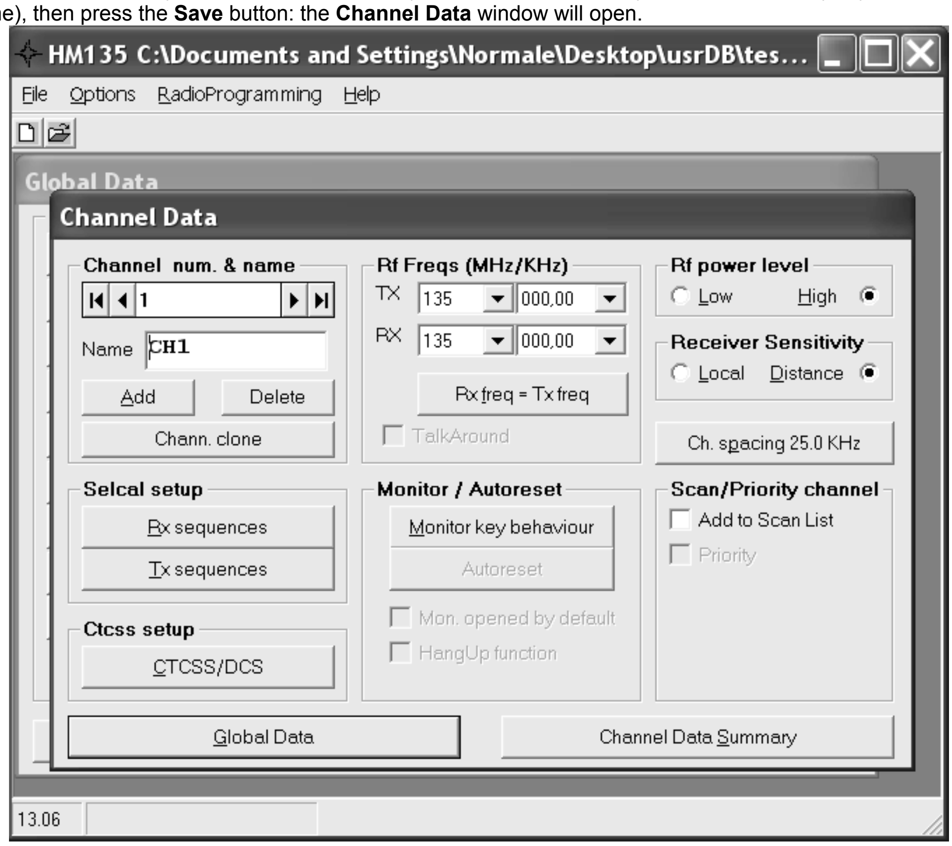
⇨ If you want to *use a data set previously stored in a transceiver* (you will download the data from it) or *in your PC* (you will use a data file), because either of them contain same/similar programming data, we recommend to "jump" to the chapter 8.1, follow it, and then go back to the chapter 3.7 below described (i.e. skipping the next paragraph 3.6).

3.6 Create a new programming filename

1) If you have just started the programmer software in your PC you will see a blank window.
2) From the menu **File** select **New radio…**, then click one of the **New HM135 Radio…** or **New HM435 Radio…** (depending on the operating band of the radio to be programmed).



3) A new file creation will open. Type the database name you want to create (any name will do, anyway we recommend to type the customer's name), then press the **Save** button: the **Channel Data** window will open.



🗎 *Important: we'll always refer this window as "**Channel Data** window". As you will see in Chapter 4, this is one of the two main windows in this program (**Channel data** and **Global Data**).*

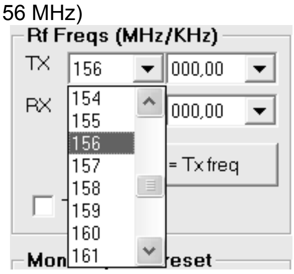
3.7 Basic parameters: TX/RX frequency, channel spacing, RF power etc.

1) Make sure that the **Channel num. & name** dialog box is displaying the channel number/name you are going to setup (if it is the first channel you are programming, only **CH1** is available).

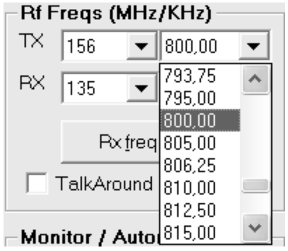
🗎 *If you are not creating a new channel, but just editing a previous one, and the channel number is not the one you want to edit, press the ◄ or ► buttons in order to select the needed one. You can also use the ⏮ or ⏭ buttons in order to quickly jump, respectively, to the first or to the last programmed channels*

2) (option) - Type in the **Name** box an alphanumeric label (12 characters max) to identify the over stated channel (e.g. if you are programming the 1st channel of a Fire Corp, you may want to type **FireCorp Ch1**). The said 12 letters will appear on the LCD when the channel will be selected.

3) Go to the **Rf Freqs (MHz/KHz)** area and select the TX frequency in MHz in the upper box **TX** by clicking its left drag down button, then click the hundreds MHz you require (e.g. **156** for 156 MHz)



4) Select now the decimal TX frequency in KHz by clicking the right drag down button, then point the decimal frequency you need (e.g. **800,00** will select 156,800.00 MHz)

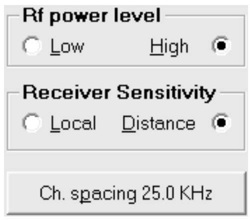


*As soon as you have clicked the right drag down button, you can quickly program to the hundred KHz you need by pressing the related number buttons in your PC's keyboard. E.g. to quickly program **825,00** KHz, just type the keys **8 2 5** in your PC's keyboard, then press the **Enter** key in order to set the said decimal frequency.*

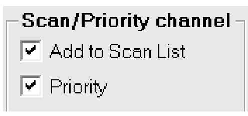
5) Now that you have selected the whole TX frequency, you have three choices:
   - ⇨ *If you are programming a simplex channel* (same RX and TX frequency), click the **Rx freq = Tx freq** button: The RX frequency will be immediately set to the just programmed TX one. After you did that, go directly to step 7) (i.e. skip the next step)
   - ⇨ *If you are programming a duplex channel* (RX frequency different than the TX one), go to **RX** box and set up the hundreds MHz and the decimal RX frequency performing the same operation described in steps 2) and 4)

6) If you have selected a duplex channel, the **TalkAround** checkbox will be available in the **Rf Freqs (MHz/KHz)** area. If you tick it, the Talk Around feature will be automatically set on as default on the selected channel.

The Talk Around feature is the possibility to communicate in simplex mode at the output frequency of the repeater (your RX frequency) in case the said repeater is faulty.



7) To select the TX output power go to **RF power level** area and select either the **Low** or **High** radio button for that channel depending on your choice (in the example we have chosen **High**).
8) To change the default receiver's sensitivity go to the **Receiver sensitivity** area and select either the **Local** or **Distance** radio button for that channel depending on your needs. For regular applications, we recommend to use the maximum sensitivity by keeping the default **Distance** setting.
9) Select the channel bandwidth (either **25** or **12.5** KHz) by clicking the **Ch. spacing** button until you'll see your choice on it (the figure shows 12.5 KHz)
10) If you want to add the channel to the scan list, go to **Scan/Priority channel** area and tick the **Add to Scan List** checkbox. In this case, the **Priority** checkbox will be immediately available. Tick it if you want to designate the channel as priority one.



Obviously, you can designate only one priority channel. If you already did that with another channel, a message will warn you until you won't remove the checkbox from the former priority channel

If you <u>don't</u> tick the priority checkbox in all the programmed channels, the user has the possibility to define the priority channel as described in the user's manual (if this function has been enabled as later explained)

11) You have now programmed the basic channel specifications in the transceiver. However, depending on your customer's requirements, you may need to program other channels and/or add CTCSS/DCS and/or Selective Call facilities and/or other options. You have three options:
   - ⇨ *If you need to program the basic parameters of additional channels*, go to step 12). CTCSS/DCS, Selective Calls and other options will be further added as we'll describe.
   - ⇨ *If you already have programmed the basic parameters of all the needed channels, but you still need to add the CTCSS/DCS and/or Selective Call facilities and/or other options,* go to the appropriate paragraph/chapter: 3.8 for CTCSS/DCS and/or Chapters 4 & 5 (the whole chapters) for Selective call and/or chapters 4 & 6 (the whole chapters) for other options
   - ⇨ *If you already have programmed the basic parameters of all the needed channels and you don't need to add any CTCSS/DCS and/or Selective Call facilities and/or other options* (i.e. you have complete the programming), go to chapter 7.1 in order to transfer the program to the unit.

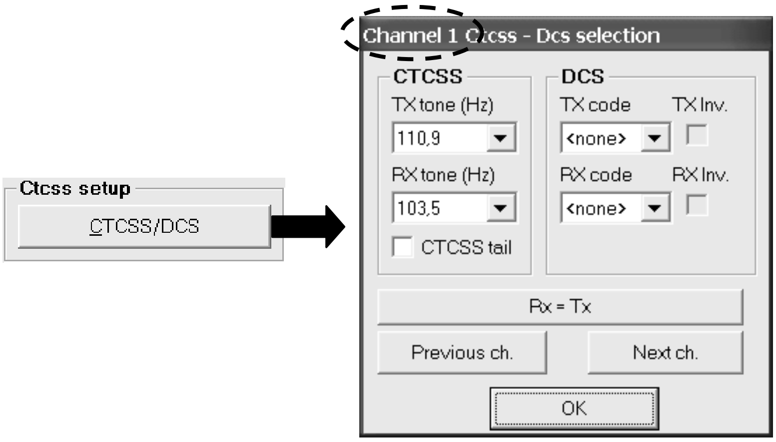
12) If you need to add/modify/delete new channels, you have two convenient options:

- ⇨ *If you need to create a new channel which has completely different parameters*, press **Add** and go back to step 1)
- ⇨ *If you need to program a new channel that only slightly differs between the current one*, you can save time by pressing the **Chann. Clone**. You'll create a new channel with the same parameters. Just go back to the step(s) related to the parameter(s) you need to modify
- ⇨ *If you need to delete a channel* (in case of total mistake), select it with the  or  buttons, then click the **Delete** button. The selected channels will be immediately deleted.

3.8 CTCSS/DCS Tx Rx Setup (CTCSS/DCS button)

As you may know CTCSS (continuous tone code squelch system) is a system which uses a sub audio frequency TX tone as an access "key" to work a repeater (encoder) or to unlock the party's sub audio tone sensitive squelch. On the other side you may want to receive only signals provided with a proper sub audio tone, in this case you'll select the decoder (tone squelch) features as well. DCS (Digital Coded Squelch) works in a similar way, but using a code instead of a fixed frequency.

1) *Make sure you are programming the CTCSS/DCS in the right channel* by checking the **Channel num. & name** box located in the upper left most position of the window.
2) Click on **CTCSS/DCS** button in the **CTCSS setup** area: the window **Channel x Ctcss – Dcs selection** (channel 1 in the figure) will open



3) If you need to activate the CTCSS *encoder* click on the **TX tone (Hz)** drag down button and select the tone encoding frequency you need (e.g. 110.9 Hz)
4) If you need to activate the CTCSS *decoder* as well, click on the **RX tone (Hz)** drag down button and select the tone decoding frequency you need (e.g. 103.5 Hz)

*If in you need to set up the same RX and TX tone frequency, just click on the **TX = Rx** button: the **RX tone** will be copied from the **TX tone***

5) If you want to leave the radio in TX for 150 ms after each release of the PTT *without transmitting* the *sub audio tone*, tick the checkbox **CTCSS tail**. It is useful to avoid that the repeater to be used could make its tail noise heard by the receiving party at the end of each transmission.
6) If you need to activate the DCS codes repeat steps 3) and 4) in the DCS area with **TX code** and **RX code** drag down buttons. Should you have code compatibility problems with an existing radio network, you can try by activating the TX and/or the RX code inversion by ticking the **TX Inv.** and/or **RX Inv.** checkboxes.
7) Now, *if you want to program CTCSS/DCS in the next or previously programmed channel*, click respectively on either **Next ch.** or **Previous ch.** button: you will see the window's name **Channel x Ctcss – Dcs selection** showing the selected channel. Go back to step 3).

*If you click either on **Next ch** or **Previous ch**. buttons, but you won't obtain any effect, it means that there are no adjacent preprogrammed channels (higher or lower respectively). In this case click the **OK** button and check the programmed channels.*

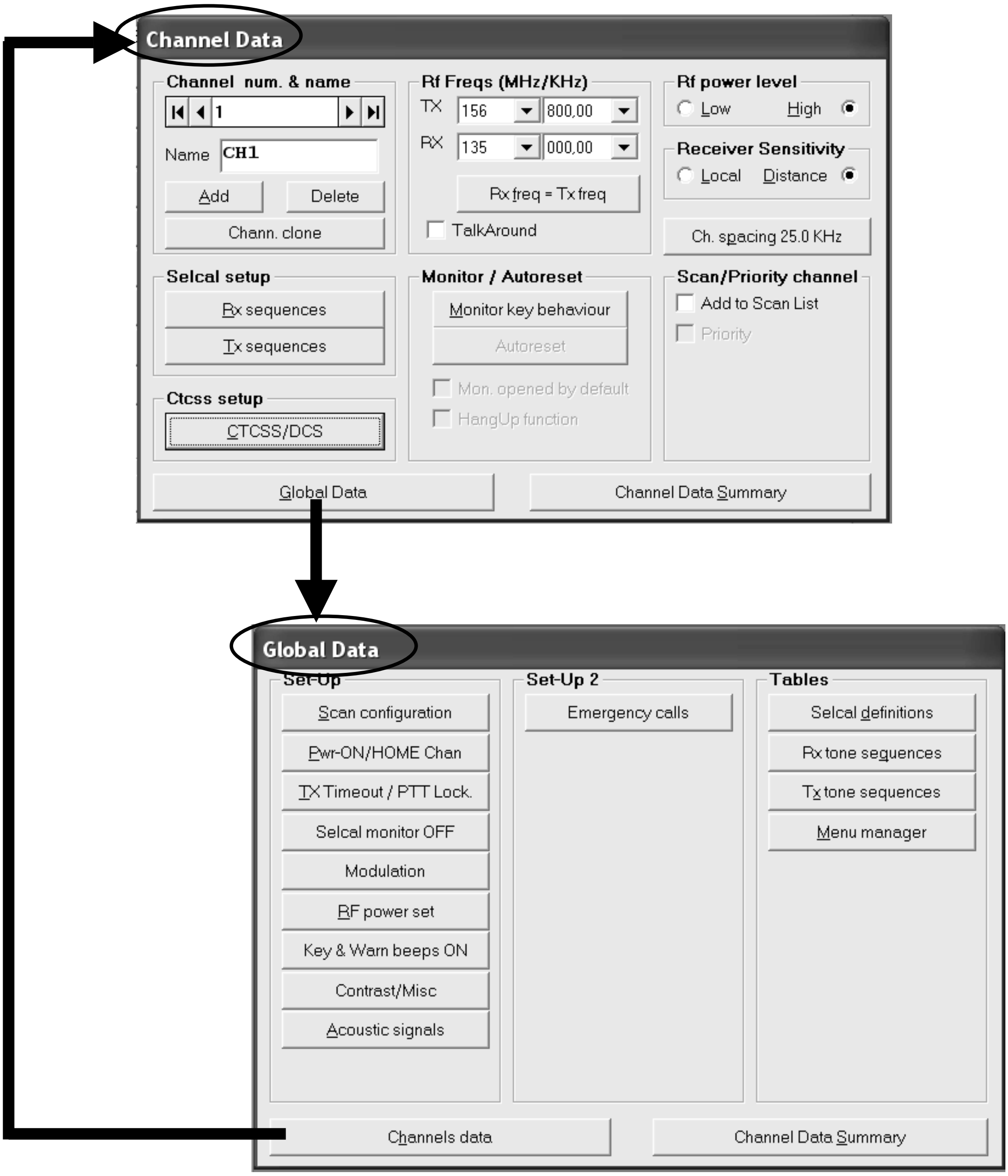
8) *If you have* finished *to program CTCSS/DCS,* click on the **OK** button: the **CTCSS – Dcs selection** window will close.

4 CHANNEL DATA AND GLOBAL DATA WINDOWS

IMPORTANT! Don't skip this chapter, otherwise you will loose an important information to keep on programming

4.1 Switching between Channel Data and Global Data windows

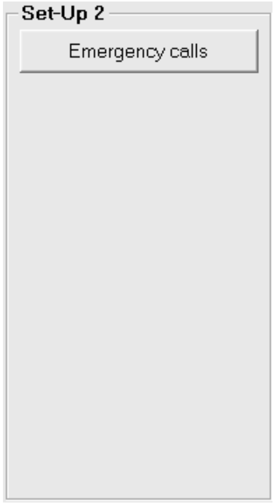
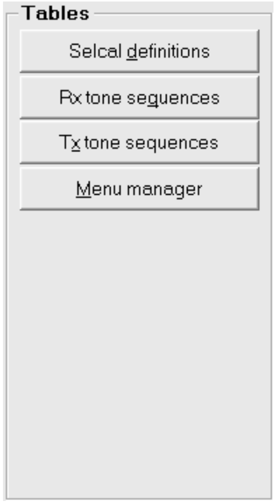
Starting from now, we'll need to switch between **Channel Data** and **Global data** Windows. **Global data** window can be recalled at any time by clicking the **Global Data** *button* from the **Channel Data** *window*.



Alternatively, you can switch back at any time to the **Channel Data** *window* by clicking the **Channels data** *button* from the **Global data** *window (please see the diagram):*

4.2 Structure of Global Data window

As you can see, **Global Data** window is divided into three areas: **Set-Up**, **Set-Up 2** and **Tables**

Set-Up	Set-Up 2	Tables
		
The **Set-Up** area allows you to adjust or enable/disable various radio's parameters, such as the scan configuration, the TX timeout and PTT lock condition, set up the acoustic signals and many other customizations. For further information please see the Chapter 6	The **Set-Up 2** area is useful to set up the emergency call. For further information please see the paragraphs 6.8.	The **Tables** area allows you to define the parameters for the Selective Calls (ref. par. 6.1), setup RX and TX tone sequences (ref. par. 5.1 and 5.2) and customize the menu commands and **F** keys functions through the Menu manager (ref. par. 6.10).

Moreover, there are two buttons at the window's bottom:

- The **Channels data** button allows to quickly recall the Channel data window as described in the par. 4.1
- The **Channel Data Summary** button allows to quickly see a channel data summary which includes the main parameters of all the programmed channels. For further information please see the par. 5.7

5 SELECTIVE CALL SETUP

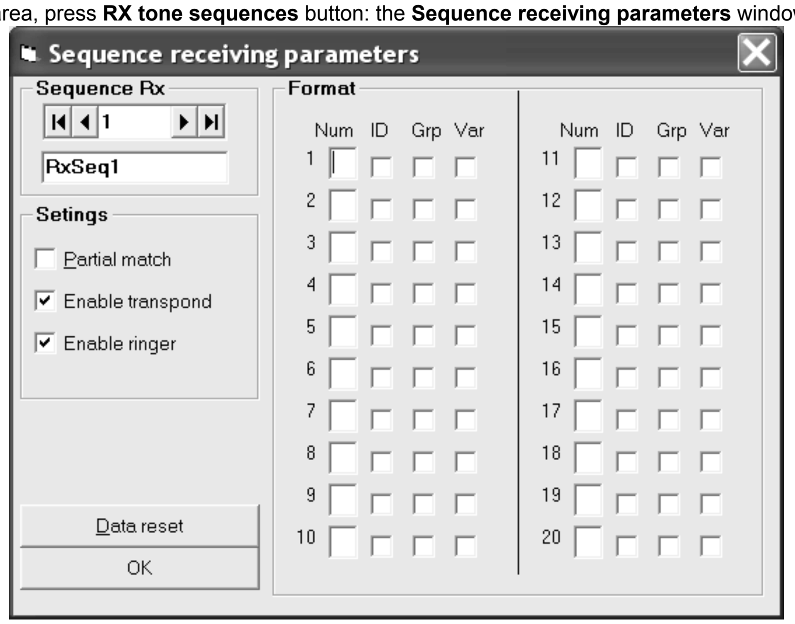
You can define two separate databases for selective calls: one is for TX and the other for RX. Each database can store up to 15 tone sequences, each of them can be programmed up to 20 tones. The radio can be programmed in order to:

- **RX** - decode up to two RX sequences (**Seq. I** and **Seq. II**) per RF channel.
- **TX** - transmit up to five fixed TX sequences per RF channel, to be set as **Call1**, **Call2**, **Emergency**, **Transpond** and **ANI** as you will see later on. Moreover, if the radio is equipped with a keypad microphone, a variable selcall can be also be transmitted.

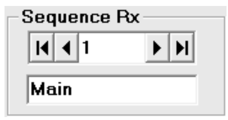
*For further details about setting **Call1**, **Call2**, **Emergency**, **Transpond** and **ANI** fixed calls please see the par. 5.4*

5.1 Defining Selcal RX parameters

1) Ensure you are in the **Global Data** window. If not select it as described in Chapter 4.
2) From the **Tables** area, press **RX tone sequences** button: the **Sequence receiving parameters** window will open.

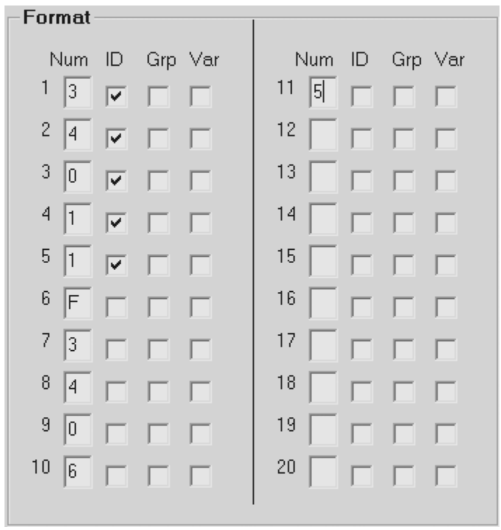


3) Go to **Sequence Rx** area and press the ◄ or ► button to select the Rx sequence you need to setup. In the following example we selected the sequence **1**.
4) If you want to assign an alphanumeric name to the selected Rx sequence, just type the new name over the existing one **RxSeq.x** (in the example we renamed the sequence 1 as **Main**).



5) Now you have 20 decode events (from box 1 to box 20) available, in which of them you can define the decoded tone. Type the related numbers (or letters) in each box and then enable the *identification* **ID** of the required tones by checking the related checkbox.

*In the example we typed the format **3 4 0 1 1 F**(pause tone) **3 4 0 6 5,** however we enabled the ID of the first five tones by ticking only the related check boxes. We'll explain later the meaning of this operation.*

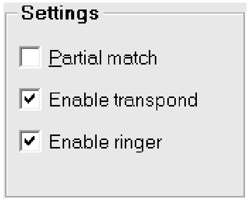


6) If you like, you can add some additional capability to each event by checking the related boxes:

- **ID** means *Identification*. It is useful to recognize a selective call even if it doesn't completely match the programmed sequence. Please have a look to *Partial Match* at the next step.
- **Grp** is the *group* checkbox, which allow you to define the related tone as a group one.
- **Var** this checkbox allows to accept a *variable* event.

*Obviously, **GRP** checkbox should be ticked only after the last ID digits, because there is no reason to define the first tones to be decoded as group ones.*

7) You have now other available options:



- if you check **Partial Match** you will enable to decode the sequence if it partially matches as well. In other words receiving just the tones with a tick in the ID checkbox are sufficient for a full decode operation. With the over stated example, you will accept any sequence beginning with **3 4 0 1 1**.
- **Enable transpond** *is checked by default*. It enables the transpond function (emission of a sequence that will be defined later on) at the reception of the appropriate selective call. *Remove the tick if you don't need it.*
- **Enable ringer** *is checked by default*. It will make the ringer sounding every time a selective call is properly decoded. *Remove the tick if you don't need it.*

You can set up different rings (acoustic signals) according to the decoded Selcall. For further detail please the par. 6.6

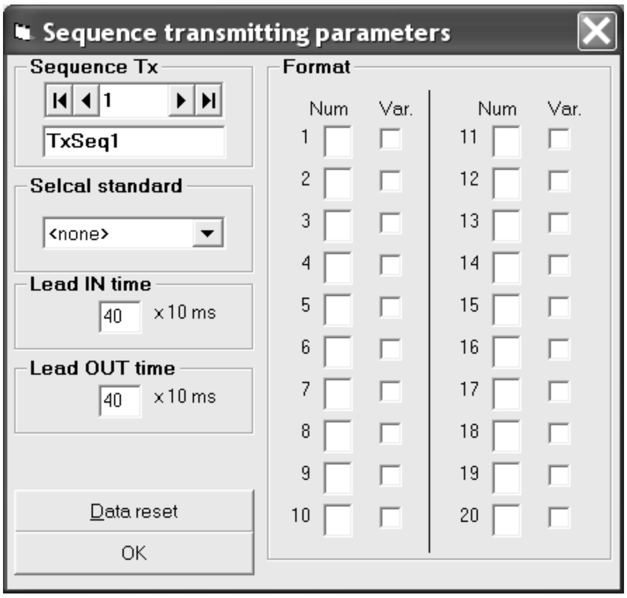
8) You can now:
   - ⇨ *Keep on setting up new Rx sequences* in this case go back to step 3).
   - ⇨ *Enter the settings and close the Rx sequence set up*. In this case click the **OK** button and go straight to the next paragraph
   - ⇨ *Close the Rx sequence set up without entering all the settings (in case of big mistakes).* In this case click the button (located in the uppermost right corner) and start from the beginning of this paragraph.

*If you composed a completely wrong sequence set up, you can also reset the screen by clicking the **Data reset** button: all the settings of the selected sequence will be canceled.*

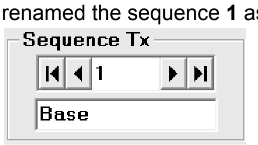
5.2 Defining Selcal TX parameters

You can define 15 Tx sequences (up to 20 tones each) and rename them with alphanumeric labels. The setup of the Tx sequences is similar to the one described for the Rx ones.

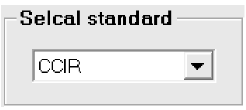
1) Ensure you are in the **Global Data** window. If not switch it as described in Chapter 4.
2) From the **Global Data** window - **Table** area - press the **Tx tone sequences** button: the **Sequences transmitting parameters** window will open.



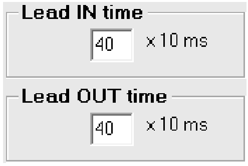
3) Go to **Sequence Tx** area and press the or button to select the Tx sequence you need to setup.
4) If you want to assign an alphanumeric name to the selected Tx sequence go to the *bottom* box of the **Sequence Tx** area and type the new name over the **TxSeq.x** one (in the example we renamed the sequence **1** as **Base** call).



5) Select the TX selcall standard by clicking on the **Selcal standard** drag down button and clicking again on the standard you need (we choose CCIR in the example). If you like, you can select **PERSONAL** in order to later set a non-standard Selective call (we'll describe how to set it up in the chapter 6.1).



6) Now you have 20 events (from box 1 to box 20) in which you can define the tone sequence you need. Type the related numbers or letters related to the tones you want to send. In the example we typed the format **4 3 0 1 1 F**(pause tone) **4 3 0 0 0 0 0**.
7) If you like, you can define some tones as *variable* by ticking the **Var** checkbox , in the example we enabled events **3**, **4** and **8** as variable tones.
8) If necessary you can adjust the *Lead IN time*. This allows to adjust the delay between the beginning of carrier and the beginning of the transmitted sequence in order to allow a proper operation in the other party's decoders (for example some old decoders need more time to start decoding after receiving a carrier). In this case go to the **Lead IN time** area and type the time length you need.



9) Similarly, you might need to set the Lead OUT time. This allows to adjust the delay between the end of the transmitted sequence and the end of the carrier. In this case go to the **Lead OUT time** area and type the time length you need.

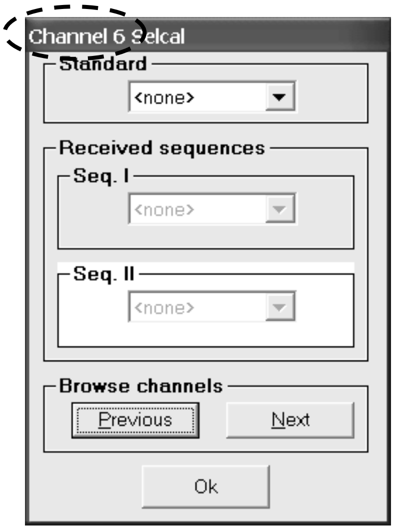
Lead IN time and Lead OUT time are expressed in x 10 ms, so if you type 40 you will obtain 400 ms.

10) You can now:
    - ⇨ *Keep on setting up new Tx sequences* in this case go back to step 3).
    - ⇨ *Enter the settings and close the Tx sequence set up*. In this case click the **OK** button and go straight to the next paragraph
    - ⇨ *Close the Tx sequence set up without entering all the settings (in case of big mistakes).* In this case click the button (located in the uppermost right corner) and start from the beginning of this paragraph.

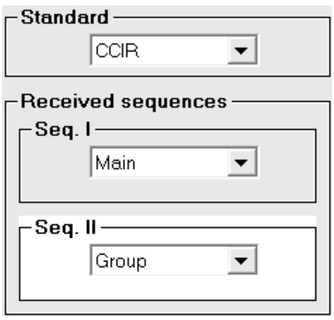
*If you composed a completely wrong sequence set up, you can also reset the screen by clicking the **Data reset** button: all the settings of the selected sequence will be canceled.*

5.3 Defining RX Standard and sequences

1) Ensure you are in the **Channel Data** window. If not switch it as described in Chapter 4.
2) Make sure to be on the right RF channel and, from the **Selcal setup** area, click on **RX sequences** button: the **Channel x Sequency** window will open.

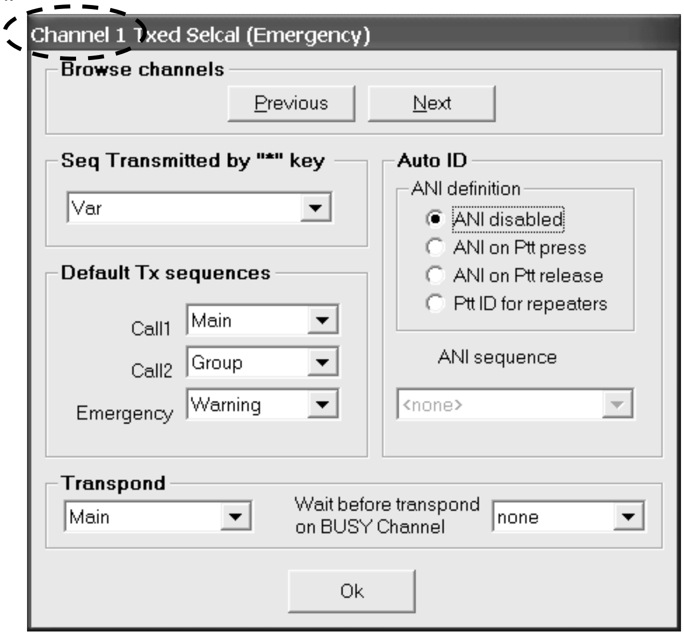


3) *Be sure you are selecting parameters on the proper channel* (shown in the heading of the window – Channel 6 in the example). If you want to set up another channel, in the **Browse Channels** area click **Previous** or **Next** buttons to select the appropriate channel.
4) Select the RX selcal standard you need to use *for the selected channel* by clicking on the drag down **Standard** and clicking again on the standard you need (we choose the CCIR in the example).
5) Select the received sequence(s) you may want to decode: in the **Received sequences** area click on either **Seq. I** and/or **Seq. II** drag down button (in the example we have chosen **Main** and **Group** respectively).
6) Now you have two choices:
    - ⇨ *If you need to program RX standard and sequences for another channel* go back to step 3).
    - ⇨ *If you don't need to program RX standard and sequences for other channels* click the **Ok** button to enter the programmed data.



5.4 Defining TX calls: Call1, Call2, Emergency, Transpond and Auto ID (ANI)

1) Make sure to be on the right RF channel and, from the **Selcal setup** area, click on **TX sequences** button: the **Channel X Txed Selcal (Emergency)** window will open.



2) *Be sure you are selecting parameters on the proper channel* (shown in the heading of the window - Channel 1 in the example). If you want to set up another channel click **Previous** or **Next** buttons to select the appropriate channel.
3) Select the TX Sequence you want to send as Call 1 by clicking the **Call1** drag down button in the **Default Tx sequences** area and then click the appropriate sequence (in the example we have chosen **Main**).
4) Select the TX Sequence you want to send as Call 2 by clicking the **Call2** drag down button in the **Default Tx sequences** area and then click the appropriate sequence (in the example we have chosen **Group**).
5) Select the TX Sequence you want to send as emergency by clicking the **Emergency** drag down button in the **Default Tx sequences** area and then click the appropriate sequence (in the example we have chosen the sequence **Warning**).

*The **Emergency** selcall can be transmitted not only by the keypad, but also by an appropriate connection in the rear connector. For further information, please contact the engineering office at CTE International.*

6) You can now define one of the previously programmed sequences to be sent when a selcall is recognized. Click the drag down button in the **Transpond** area and then click the appropriate sequence (in the example we have chosen the sequence **Main**). You can also set the time which the radio has to wait before sending the transpond sequence just set if the channel is busy. Just go to the **Wait before transpond on BUSY Channel** drag down button and select the time you need which is available in 2.5 sec. steps
7) Select the condition in which you want the transceiver be sending the ANI by activating the related radio button in the **Auto ID** area: **ANI disabled**, **ANI on Ptt press**, **ANI on Ptt release** or **Ptt ID for repeaters**.
8) Unless you have left **ANI disabled**, the **ANI sequence** drag down button will be activated: click it and select the TX Sequence you want to use as ANI.

ANI (Automatic Number Identification), is a tone sequence transmitted before or after the normal voice transmission in order to identify the radio in use. These last two steps allows you to set the condition in which the transceiver will automatically send it as well as the sequence to be transmitted.

9) Define the variable TX sequence you want to transmit by pressing the ⊛ (call) key on the microphone with keypad by clicking on **Seq Transmitted by "*" key** drag down button in the **Seq Transmitted by "*" key** area and selecting one of the available calls (we have selected **Var**).
10) Now you have two choices:
    - ⇨ *If you need to program the said parameters for another channel* go back to step 2).
    - ⇨ *If you don't need to program the said parameters for other channels* press the **OK** button and go to the next paragraph.

5.5 Monitor Key Behaviour

You can define the behaviour of the monitor function (e.g. activated by a preset **F** key or by the menu). If you have set an open traffic channel, only the **Monitor key opens SQUELCH** is normally available. However, *depending on the previous settings you have made for Selcal and CTCSS/DCS in that channel, you will find different active options*. For example, if you have activated CTCSS in the channel, the **Monitor key opens CTCSS signalling** checkbox will be available as well.

*If the monitor command is issued a second time (e.g. **F** key assigned to mon function pressed twice), it restores the previous monitor condition.*

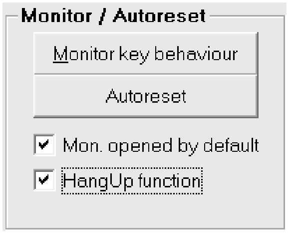
1) *Be sure you are selecting parameters on the right channel*, if not please select the right one by clicking on either the ◄ or ► button in the **Channel num.** area in **Channel Data** window

2) From the **Channel Data** window – **Monitor / Autoreset** area - click the **Monitor key behaviour** button: the **Monitor key behaviour** window will open.
3) in the **Monitor opens...** area, tick the available ckeckbox(es) you need to activate (not available checkboxes will be shaded in gray). In the example we activated **Monitor key opens SELCAL signalling**.
4) Click the **OK** button to confirm or **Cancel** to leave this window without changing the settings.
5) Now you have two choices:
   ⇨ *If you need to program the monitor key behaviour for another channel,* go back to step 1)
   ⇨ *If you don't need to program the monitor key behaviour for other channels go to the next paragraph.*

5.6 Manual/Autoreset for selective calls

This option allows to define if the reset of the selective call should be made only manually (e.g. by an **F** key assigned to the **mon** function, or by the menu **Radio Param** – **Monitor**, if enabled) or automatically after a certain time. In this last condition you can define the autoreset time.

1) *Be sure you are selecting parameters on the right channel*. If not, in **Channel Data** window - **Channel num.** area - please select the right one by clicking on either ◄ or ► button.
2) If you want the radio starting with monitor active (open squelch) every time is switched on and at every channel switching, in the **Channel Data** window – **Monitor / Autoreset** area – you can tick the checkbox **Mon. opened by default** in order to enable it, then go to step 6).



*Obviously, to manually reset the monitor (closing the squelch) the users has to activate the monitor function (by an **F** key assigned to the **mon** function or by the menu).*

3) Differently, if you need the automatic reset (i.e. you haven't ticked the **Mon. opened by default** checkbox), click the **Autoreset** button: the **Autoreset** window will open.
4) Select the autoreset time you need by clicking the **Autoreset** drag down button and then click the needed time. You can select a time from **5** to **155** sec. in 5 sec steps or leave **<disabled>** if you need the manual reset only. In the example we have chosen an automatic reset time of **10 sec.**

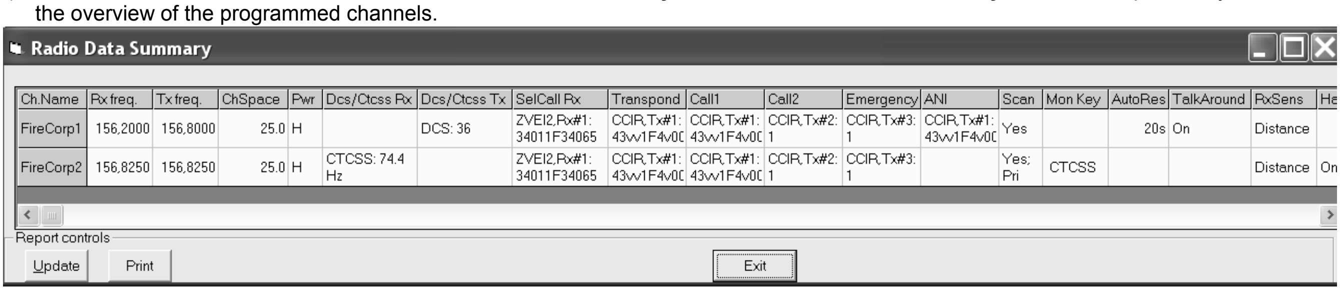
*The kind of reset action provided by monitor function (activated by an **F** key assigned to the **mon** function or by the menu) depends by the settings described at chap. 5.5*

5) If you want to activate the Hung-Up function (CTCSS monitor activated when the microphone is removed from its hook properly connected to the vehicle's ground), tick the **HungUp Function** checkbox.
6) Click the **OK** button to confirm or **Cancel** to leave this window without changing the settings.
7) Now you have two choices:
   ⇨ *If you need to program the autoreset for another channel* go back to step 1).
   ⇨ *If you don't need to program the autoreset for other channels go to the next paragraph.*

5.7 Overviewing a Channel Data Summary

This smart feature allows you to overview a channel data summary which includes the channel parameters (e.g. Rx/Tx frequency, channel spacing, sub audio tone/CTCSS etc.). You may decide to print this report as record for future references and/or steadily leave it on the screen during the programming operations in order to avoid mistakes.

1) From the **Channel Data** window click the **Channel Data Summary** button: the **Radio Data Summary** window will open and you will see the overview of the programmed channels.



2) You can decide to see the data in compact or in extended way. In this last case just expand the window as you do with the other software windows: go to the border, click on it with the mouse and extend the windows area in the direction you need by dragging it out. The over stated picture shows a slightly extended summary window.
3) You have two options:

- ⇨ *if you want to use the summary as a programming monitor*, click the **Update** button. It will remain on the screen providing an useful programming monitor. In fact, it can be manually updated every time you press the **Update** button or automatically after any programming operation you will make as described in par. 7.1.
- ⇨ *if you need to print the summary* click the **Print** button.

4) To escape the **Radio Data Summary** window click the **Exit** button.

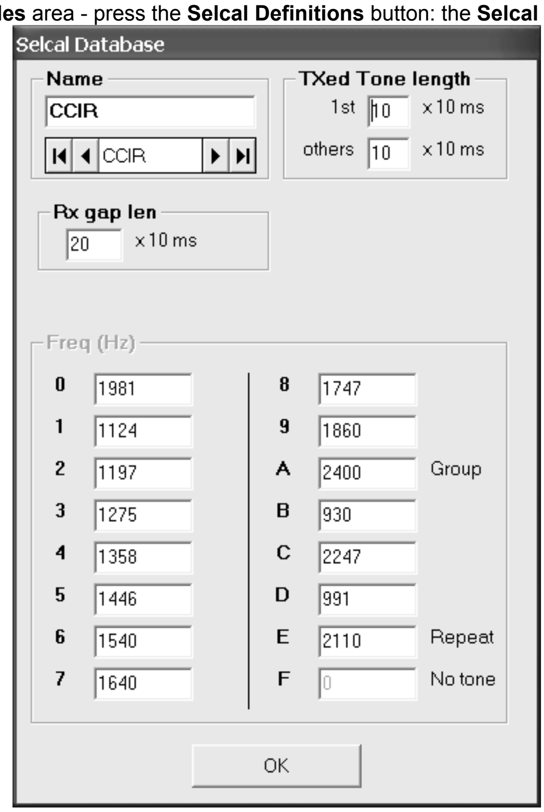
6 CUSTOMIZATIONS

In this section we'll explain how to define personal (non-standard) Selcall parameters. Moreover you can define the availability of the menu commands and function keys to the end user in order to boost the customization in order to make the radio better matching with your needs. You can configure the scanning, set up some controls such as the transmission timeout, the PTT lock and enabling/disabling the key and warn beeps as well as setting the acoustic signals, enabling/disabling the optional scrambler board and many others.

6.1 Selcal database (Selcal definitions button)

If necessary, you can change some parameters of the standard Selcals. Moreover, if you don't want to use the standard Selcal tone frequencies, you can totally define your own Selcal standard called **PERSONAL**.

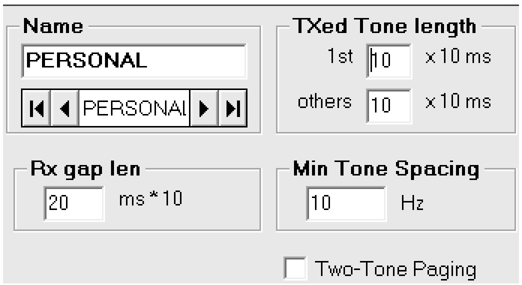
1) From the **Global Data** window – **Tables** area - press the **Selcal Definitions** button: the **Selcal database** window will open.



2) By means of the ◄ or ► buttons of the **Name** area, select the Selcal standard you need to modify. You have two choices*:*

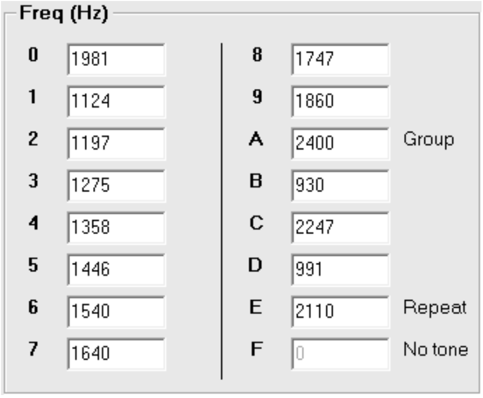
- ⇨ if you need to completely define a new Selcal standard, select PERSONAL and go on with step 3)
- ⇨ *if you need to modify some allowed parameters of existing Selcal standards,* just select it (e.g. **CCIR**) and go to step 7)

3) If necessary, in the **Name** box, type a new name over **PERSONAL** (e.g. **FireCorp**)



4) You can set the *Minimum Tone Spacing*. It's the minimum frequency space between the various tones in order to avoid interferences between them if decoded by a old (and too wide) decoder. Go to **Min. Tone spacing** box and type 10 or 100 Hz.

5) Go directly to the proper **Freq (Hz)** boxes (from **0** to **F**) and type the new tone frequencies or modify the preset ones.



6) The **Two-tone paging** checkbox enables the said paging standard which is used in the U.S.A. *This option is not normally supported* in the standard HM135/435 versions and needs to be implemented upon specific request. For further information please contact your dealer. If you are sure that your radio supports it and you need to enable this option tick the **Two-tone paging** checkbox.

*The settings described till now are available only in the **PERSONAL** standard.*

7) Now you can set the *Maximum Rx gap length*. It's the maximum time in which the received selective call is assumed as over. Go to **Rx gap len** box and type the maximum accepted Rx gap length.

***Rx gap len** parameter is expressed in x 10 ms, so if you type 20 you will obtain 200 ms.*

8) If necessary, you can adjust now the *tone length* both for the *first* one and for *other* ones. Go to the **TXed Tone length** area and type the tone lengths you need respectively in the **1st** and **others** boxes

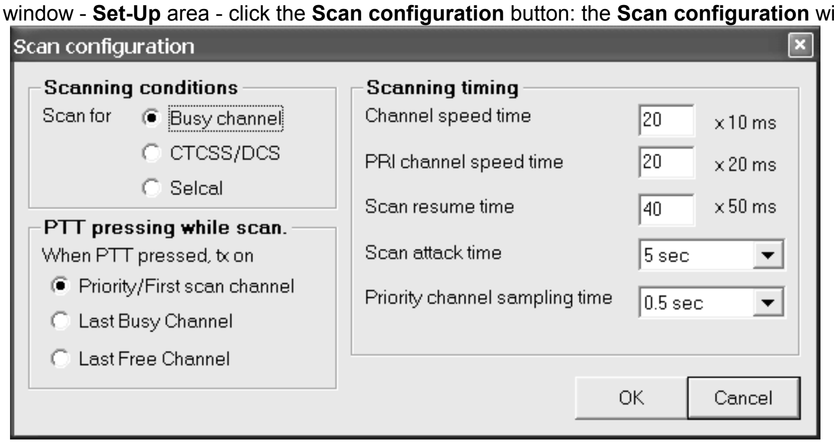
***TXed Tone length** parameters are expressed in x 10 ms, so if you type 20 you will obtain 200 ms.*

9) Click on the **OK** button to close the database window and return to **Global Data** window.

6.2 Scanning Configuration (Scan configuration button)

This button allows to define which condition the scan should stop in, as well as the scan speed, the priority scan speed and scan wait time.

1) From the **Global Data** window - **Set-Up** area - click the **Scan configuration** button: the **Scan configuration** window will open.



2) In the **Scanning conditions** area, you can define the condition in which the scan should stop:
   - ⇨ If you need the scanning should stop *when a busy channel is detected* (carrier presence) click the **Busy channel** radio button.
   - ⇨ If you need the scanning should stop *when the proper CTCSS/DCS is detected*, select the **CTCSS/DCS** radio button.
   - ⇨ If you need the scanning should stop *when the proper Selcal is detected*, select the **Selcal** radio button.

3) In the **PTT Pressing while scan.** area, you can define the channel in which the radio should transmit if PTT is pressed during scan:
   - ⇨ Select the **Priority/First scan channel** radio button if you need the transmission on the priority channel or the first scanned channel (the one which has been set before starting the scan). The first or the second condition is selected depending if you have ticked the checkbox **Priority** described at step 10) in chap. 3.7)
   - ⇨ Select the **Last Busy Channel** radio button to allow the transmission on the last busy channel.
   - ⇨ Select the **Last Free Channel** radio button to allow the transmission on the last free channel.

4) In the **Scanning timing** area, you can define your preferred scan timings. Go to each box and type/select your preferred values:
   - **Channel speed time** – It's the time which the radio stays on each channel checking the condition defined at step 2)
   - **PRI channel speed time** – It's the time which the radio stays on the Priority channel, checking the condition defined at step 2)
   - **Scan resume time** – defines the time to wait before automatically restart the scan when the radio is stopped on a channel and the condition defined at step 2) ceases

- **Scan attack time** – defines the maximum time which the radio can stay on a channel before automatically restart the scan even if the condition defined at step 2) is not ceased. If this timer is set to **OFF**, the radio stays on the channel all the time in which the said condition (which stopped the scan) is present
- **PRI channel sampling time** – It's the time after that the radio switches on the priority channel (Dual watch)

The over stated parameters are expressed, respectively, in x10, x20 and x50 ms. so if you type, for example 30 in the priority scan speed box, the time you will obtain will be: 30 x 20 = 600 ms.

*The scan attack timer is useful to avoid that the scan could uselessly stop too much on a channel (e.g. with long-timed noise or non modulated carriers). However ensure to set it with a sufficient time (or to **OFF**) in order to avoid the risk to loose the end of long messages due to an anticipated scan restart*

5) Click the **OK** button to confirm or **Cancel** to exit without changing the previous settings.

6.3 Power-ON Selcal auto sending

You can define a selective call to be automatically transmitted every time the radio is switched on and which channel the radio should send it.

1) From the **Global Data** window - **Set-Up** area - click the **Power-ON/HOME Chan** button: the **Power-ON/Home Channel** window will open.

2) In the **Power on** area:
   - Click the **Channel** drag down button and select the required channel to be automatically selected every time the radio is powered on. You can also select **Last channel accessed** if you want to automatically select the last channel used before it was switched off.
   - Click the **Txed selcal** drag down button and select the required selcal to automatically being sent *every time the radio is switched on*.
3) In the **Home Channel** area, click the **Home Channel** drag down button and select the required home channel which must be automatically select every time the related command is activated (by an **F** key assigned to **mon** function or by the menu).
4) Click the **OK** button to confirm or **Cancel** to exit without changing the previous settings

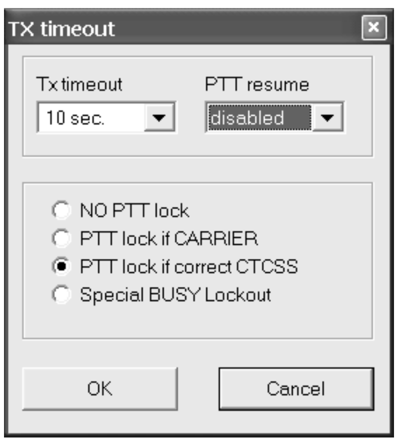
*If you don't want to automatically send a selective call every time the radio is switched on, at step 2 leave the **Txed selcal** drag down button set to **<none>***

6.4 Transmission timeout / PTT lock (Tx Timeout / PTT Lock button)

This window allows you to reduce the risks of accidental /excessive transmissions on the operating channel, even by non expert users:

- ***TX timeout*** - defines the maximum transmission time available for the end user for every message. If he/she continuously presses the PTT and reaches a certain preset time, the TX will be momentarily disabled and an error beep is emitted. The TX is automatically restored when the end user releases the PTT or, if needed, after a certain time with the PTT released (*PTT resume time*).
- ***PTT lock*** – locks the transmission if the channel shown some activities. You can configure this setting in order to lock the PTT in several activity conditions: just if a carrier is detected or if a correct/wrong CTCSS is detected. When the preset activity is detected, the TX will be momentarily disabled and an error beep is emitted.

To access this settings, From the **Global Data** window - **Set-Up** area - click the **Tx Timeout / PTT Lock button**: the **Tx timeout** window will open.

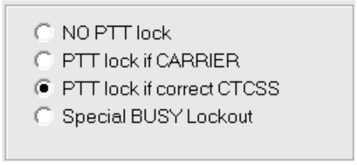


6.4.a Setting the Transmission timeout

1) Click the **Tx timeout** drag down button and select the *maximum transmission time available for the user*.
2) Obviously, as soon as you will select a **Tx timeout** value *different than **disabled***, you will also automatically activate the **PTT resume** drag down button. Leave it to **disabled** if you want to restore the transmission just after the PTT has been released or set the time which the user has to wait with the PTT released.

6.4.b Setting the PTT lock

3) You have now three choices to lock the PTT in certain conditions:
   - ⇨ *If you don't want to lock the PTT,* even when the channel is busy or the correct CTCSS tone is present, leave the **NO PTT Lock** radio button active.
   - ⇨ *If you need the Tx inhibited when a carrier is detected* (busy channels), use the **PTT lock if CARRIER** radio button.
   - ⇨ *If you need the Tx inhibited when the correct CTCSS tone is detected,* use the **PTT lock if correct CTCSS** radio button.
   - ⇨ *If you need the Tx inhibited when the wrong CTCSS is detected,* use the **Special BUSY Lockout** radio button.



4) Click the **OK** button to confirm or **Cancel** to exit without changing the previous settings.

6.5 Enabling/disabling the key and warn beeps (Key & Warn beeps button)

Normally, when you press any key, you hear a short beep as a confirmation in the loudspeaker. Moreover, in case of mistakes or particular events, different beeps are emitted. If your customer requires a very silent use, you can disable the said acoustic signals as follows:

From the **Global Data** window - **Set-Up** area - click the **Key & Warn beeps** button: you will toggle it **OFF** or **ON** depending on the times you press the button.

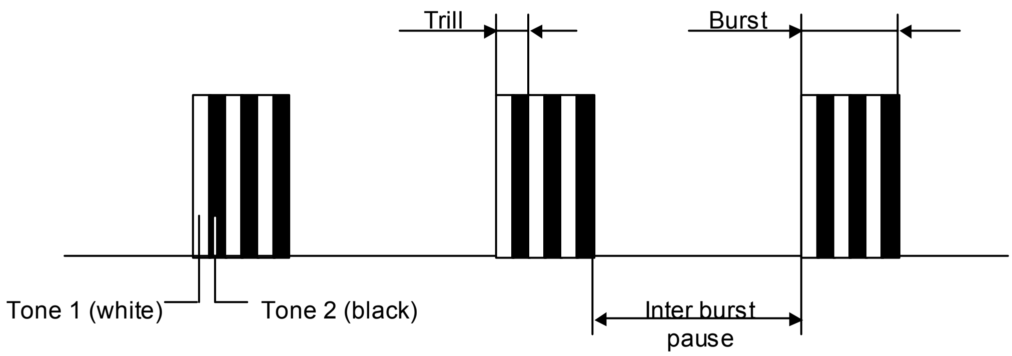
We recommend, when possible, to leave the acoustic signals ON in order to improve the transceiver's ease of use.

6.6 Setting the acoustic signals (rings)

You can set up and configure the acoustic warning signals which the radio emits when a Selcall is received in order to obtain the audio effect you prefer. Independent settings are available for each kind of received Selcall, i.e. *Primary (Seq I)*, *Secondary (Seq II)* or *Group (Group call)*. Before doing that, have a look to the following paragraph in order to know how each ring is composed.

6.6.a Format of rings (acoustic signals)

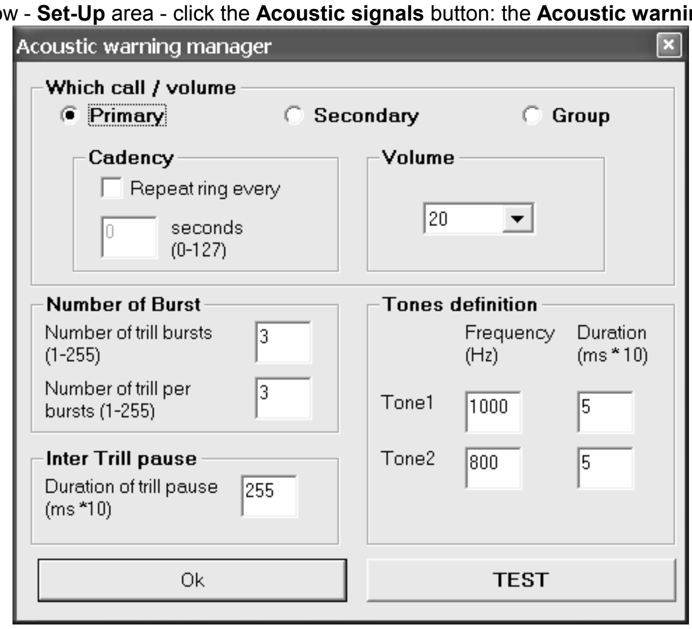
Each *ring* is composed by a preset number of *bursts* (from 1 to 255). Each burst is obtained by alternating two tones (Tone *1* and *Tone 2*) a preset number of times. Let's call each alternation as *trill*. In other words, a *ring* is composed by a preset number of *bursts* which are composed by a preset number of *trills* which are composed by two tones. You can set not only the frequency and duration of each tone, but also the number of trill per burst, the number of bursts which make each ring, the pause between each burst and the cadency (repetition of each ring). The following diagram shows a ring made by 3 burst, each of them made by 3 trills



A good management of burst, trills etc. allow you to create a wide range of sounds in the rings which can imitate a lot of situations (e.g. alarm tones) or well known rings (e.g. your Country's typical phone ring when a Selcall is received). This additionally improves the ease of use.

6.6.b Setting procedure

1) From the **Global Data** window - **Set-Up** area - click the **Acoustic signals** button: the **Acoustic warning manager** window will open.



2) Select the event which you want to change the acoustic signal using the related radio button in the **Which call** area:
   - **Primary** – When primary selcal (with Sequence I) is properly received
   - **Secondary** – When secondary selcal (with Sequence II) is properly received
   - **Group** – When group selcal (with group sequence) is properly received
3) In the **Volume** area, use the **Volume** drag down button to select the volume which the acoustic signals are sent from the speaker.

You might decide to temporarily reduce the volume during the following tests, in this case don't forget to restore the regular volume after them.

4) Press the **TEST** button in order to check the current ring for the selected event. Now you have three choices:
   - ⇨ If you need to change it, go on with the following step(s)
   - ⇨ If you want to check another ring, go back to the step 2)
   - ⇨ If you don't want to change any ring, go to step 10)
5) If you need to continuously repeat the ring, go to the **Cadency** area, tick the **Repeat ring every** checkbox in order to make available the **seconds (0-127)** box (normally disabled), then type in it the time interval (in seconds) between each repeating
6) If you want to change the number of bursts to be emitted for each ring, go to the **Number of burst** area, then type the number of burst you need in the **Number of burst (1-255)** box, then type the number of trills (alternations of Tone 1 and Tone 2) per burst in the **Number of trill per burst** box
7) If you have selected more than one burst for each ring, you can set the pause time between each burst. Go to the **Inter trill pause** area and type the duration of the pause between each burst (1 to 255) in the **Duration of trill pause** box.

This parameter is expressed in x 10 ms, so if you type 20 you will obtain 200 ms.

8) If you want to change the frequency and/or the duration of Tone 1 or Tone 2 which compose each burst, go to the **Tones definition area**, then type the **frequency** (from 300 to 3000 Hz) and **duration** (from 1 to 255) of each tone in the proper boxes

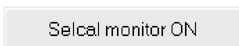
The tone duration is expressed in x 10 ms, so if you type 20 you will obtain 200 ms

9) When finished, press the **TEST** button in order to check the new ring obtained. You have several choices:
   - ⇨ If you need to provide other modifications to the current ring, go back to step 5)
   - ⇨ If you need to change another ring, go back to step 2)
   - ⇨ If you want to exit without any modification (in case of big mistakes). Press ☒ in the upper right corner of the **Acoustic warning manager** window
10) Check if the **Volume** setting is the regular one you need (see the note at step 3).
11) Exit by pressing **OK**

6.7 Enabling/disabling the selective call audio monitor (Selcal monitor button)

Normally, when you send a selective call, you hear the related tones in the loudspeaker as an audio monitor. If your customer requires a silent use, you can disable this monitor as follows:

From the **Global Data** window - **Set-Up** area - click the **Selcal monitor** button: you will toggle it **OFF** or **ON** depending on the times you press the button.

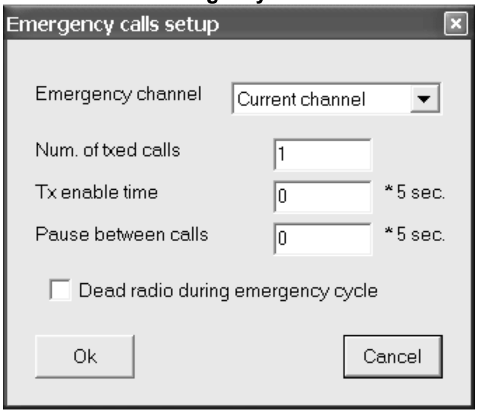


We recommend, when possible, to leave the monitor ON in order to improve the transceiver's ease of use.

6.8 Emergency call setup

You can better define the radio behavior in emergency state, for example design a fixed emergency channel, how many calls must be transmitted, the pause between calls etc.

1) From the **Global Data** window - **Set-Up 2** area - click the **Emergency calls** button: the **Emergency calls setup** window will open.



2) Use the **Emergency channel** drag down button to define the channel in which you want the emergency call should be sent. *You can chose a fixed channel* among one of the previously programmed ones, *or leave the emergency selective call transmitted in the currently selected channel* by selecting **Current channel**.
3) Type the number of selective calls which must be transmitted in the **Num. of txed calls** box.
4) Type the time to allow free Tx after the selective call has been transmitted in the **Tx enable time** box.

The time can be selected in multiple of 5 seconds, e.g. if you need to select 10 seconds type 2.

5) Type the pause time between each calls in the **Pause between calls** box.

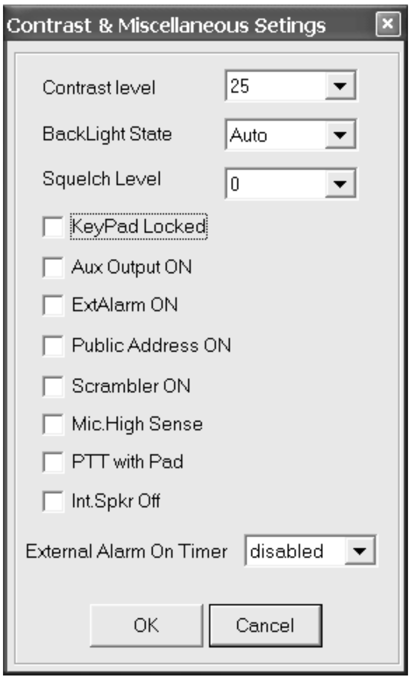
The time can be selected in multiple of 5 seconds, e.g. if you need to select 10 seconds type 2.

6) If you want to deactivate all the functions during the emergency cycle, tick the **Dead radio during emergency cycle** checkbox.
7) Click the **OK** button to confirm or **Cancel** to exit without changing the previous settings

6.9 Contrast and miscellaneous setups

This window allows to adjust the preset LCD contrast and backlight and the default squelch level. Moreover, you can enable/disable a variety of miscellaneous settings, such as the microphone with keypad, the optional internal scrambler board, the internal speaker and so on.

1) From the **Global Data** window - **Set-Up** area - click the **Contrast/Misc.** button: the **Contrast & Miscellaneous settings** window will open.
2) Click the **Contrast level** drag down button and set the LCD contrast level.
3) Click the **Backlight state** drag down button and set the LCD/keypad backlight mode:
   - **Auto** - LCD backlight automatically activated every time a command is used and automatically switched off about 20 seconds after the last command is used
   - **Off** – LCD backlight permanently disabled
   - **On** - LCD backlight permanently enabled
4) Click the **Squelch Level** drag down button and set the squelch level you want to preset on the radio
5) If you want to preset the keypad locked, tick the **KeyPad Locked** checkbox
6) If you want to enable the auxiliary output on the rear connector, tick the **Aux Output ON** checkbox
7) If you want to enable the external alarm, tick the **ExtAlarm ON** checkbox
8) If you want to enable the PA (public address) service, tick the **Public Address ON** checkbox
9) If you want to enable the optional scrambler (internal) board, tick the **Scrambler ON** checkbox
10) If you want to preset the high sensitivity of the microphone, tick the **Mic.High Sense** checkbox
11) If the radio is equipped with the optional microphone with keypad (e.g. for variable selcall service), tick the **PTT with Pad** checkbox
12) If you want to disable the internal speaker (you need the radio working only with the external speaker), tick the **Int.Spkr Off** checkbox
13) If you want to enable the external alarm on timer, select the appropriate timer value with



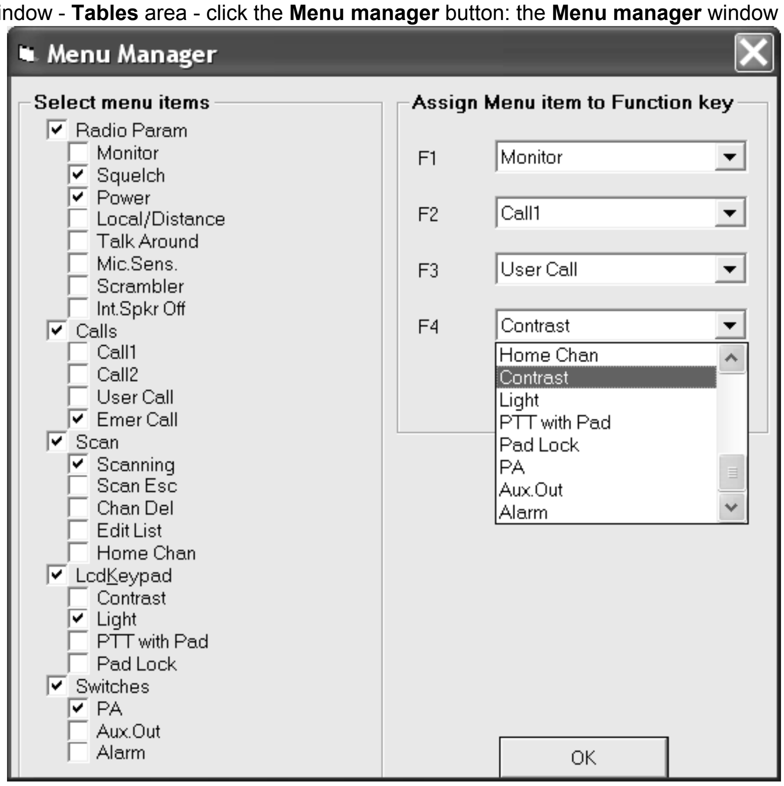
the related drag down button (leave **disabled** if you don't need this function)

14) Click the **OK** button to confirm or **Cancel** to exit without changing the previous settings

6.10 Customizing the menu and F keys

You can make available or not the various menus and submenus in the radio (to be accessed when the **M** key). Moreover, you can assign shortcuts of the menus to the various **F** keys in order to quickly recall the most frequently used commands with one-touch operation. You might also decide to assign selcalls to one or more **F** key(s).

1) From the **Global Data** window - **Tables** area - click the **Menu manager** button: the **Menu manager** window will open.



2) To enable a menu or submenu, go to the **Select menu items** area and just tick the related checkbox.

*In the example we activated all the main menus and activated only the submenus **Squelch**, **Power**, **Emer Call**, **Scanning**, **Light** and **PA**.*

3) To assign a function or selcall to one or more **F** key(s), go to the **Assign menu item to Function key** area and use each drag down buttons to select the proper function or selcall (**Call1**, **Call2**, **User Call** or **Emergency Call**) to the related key.

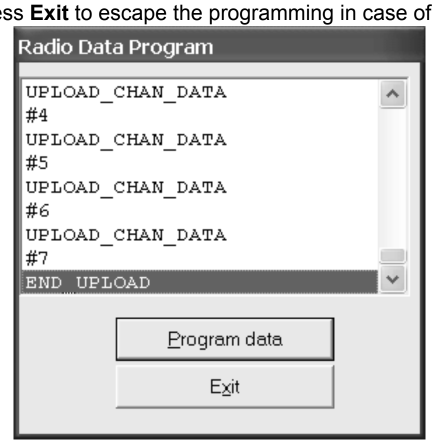
*In the example we assigned **F1** to **Monitor** function, **F2** to **Call1** selcall, **F3** to **User call** selcall and **F4** to **Contrast** adjusting.*

7 FINAL OPERATIONS

7.1 Uploading programming data to the radio

Once you are sure to have properly programmed all the radio's data (at least one TX/RX frequency with basic parameters) you can transfer the said data to its memory and terminate the programming. Do as follows:

1) From the menu **Radio Programming** select **Program radio**: the **Radio Data Program** window will open (or use the shortcut Ctrl+P)
2) Make sure the radio has been properly connected as described in par. 2.4.
3) Switch off the radio (if switched on), then keep the **F1** button pressed and switch the radio on by rotating clockwise the **On-Off/Volume** knob located in the front panel. After the mechanical click, the status LED will steadily glow yellow and the display shows `Programming`… showing that the radio is switched on in programming mode. In this case you can release the **F1** key
4) Click the **Program data** button (or press **Exit** to escape the programming in case of mistakes): a writing sequence will start.



5) The program window will show the following simultaneous messages:

PROGRAM WINDOW MESSAGES	NOTES
(blank)	(idle state before clicking on Program data button)
Performing channel data check	First message after clicking on **Program data** button
WHICH RADIO **Radio type – HM35**	
START_UPLOAD	
UPLOAD_SYS_RADIO_DATA	
UPLOAD_RX_SEQ_DEF	These two messages are repeated for each RX channel (x is the number of the uploaded RX channel)
#x	
UPLOAD_TX_SEQ_DEF	These two messages are repeated for each TX channel (x is the number of the uploaded TX channel)
#x	
UPLOAD_CHAN_DATA	These two messages are repeated for each <u>programmed</u> channel (x is the number of the uploaded TX channel)
#x	
END UPLOAD	If the programming will fail an error message will be shown

6) Press the **Exit** button
7) Disconnect the programmer cable from the transceiver
8) Switch off and on the radio in order to exit the programming mode and restore its normal use
9) Check if all the parameters work properly

7.2 Saving programming data

It's recommended to save all the programmed data in the hard disk of your PC or diskette(s) in order to obtain a programming archive containing the data of all the radios you have programmed. This will be useful in case your customer would like to add new radios to the existing network or if you have to create new networks which have similar programming.

1) From the menu **File** select **Save Radio as**: the **Save Radio database as** window will open.
2) Type the file name in the appropriate box (usually called **File name:**).
3) Define the directory in which you want to store the file (default is **C:\Programs\HM135\usrDB**), then press the **Save** button

7.3 Restoring the default signal database

This option is basically useful in two conditions:

- When a software upgrade has been performed. The Programmer software is in continuous development in order to add new features to the radio and make your programming operations easier. So if you have just upgraded your software by substituting the ".exe" main file with a new updated one, restoring the default signal database is mandatory.
- If you have set up your own signaling standard (i.e. **PERSONAL** selcal) and you want to restore it to the default values.

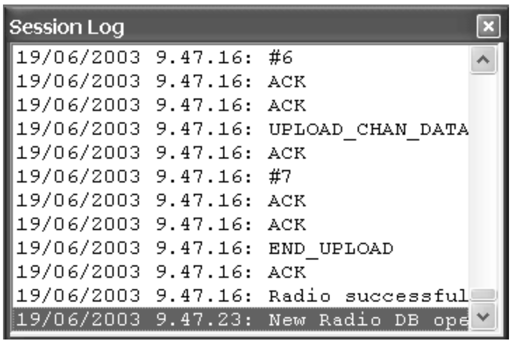
To restore the signal default database:

1) Ensure you have not opened any programming file (i.e. the background of the programmer's window must be blank gray), otherwise close the file with the command **File** – **Close radio**
2) From the menu **Options** select **Restore System DB**. A window will open with the message **Restore the SYSTEM DB (Default Public Data, CTCSS Definition and Selcal Definition)?**
3) Press **OK** to restore the System DB. A window will confirm that the system DB has been restored successfully.

*In case of mistakes, you can press the **Cancel** button at step 3) in order to exit without restoring the System DB*

7.4 Viewing session history

If you want to see the history of the various programming sessions, from the menu **Options** select **View session history**. The **Session log** window will open showing the log of the various programming sessions as per the following example:



You can scroll them using the vertical scrolling bar.

To close the **Session log** window, press the X key on the upper-right corner.

7.5 Exit the programmer Software

From the menu **File** select **Exit**: the programmer software will close.

8 ADDITIONAL OPTIONS

8.1 Modifying previously programmed parameters

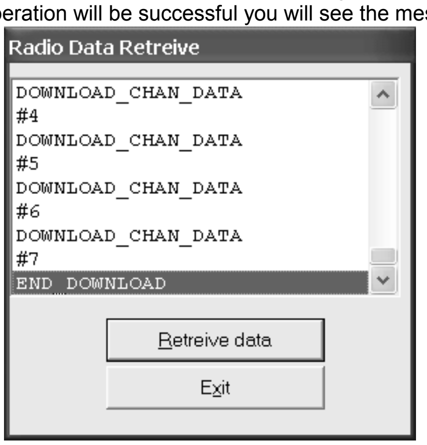
If you already have saved programming data in a transceiver unit or in a PC file *and you need to "clone" them to other transceiver(s),* or the said programming data are very close to a new programming data you have to set up, you can download previously stored programming data from a HM135/435 transceiver or open a programming file previously stored in your PC as follows:

8.1.a Open a programming data file in the PC

1) Connect the programming cable to the radio and start the programmer software (as previously described in paragraphs 2.4 and 3.1).
2) From the menu **File** select **Open Radio** (ore use the button): the **Select radio** window will open.
3) Use the **File type:** drag down button (at the bottom of the window) to select either **HP VHF radio (*.hmv)** or **HP UHF radio (*.hmu)** depending if you are programming respectively a VHF or UHF radio of the HMx35 series.
4) In the **Filename:** box, type the name of the file containing the required programming data or browse it using the directory tree in folder box (programming files use the extension **.hmv** or **.hmu** and are usually placed in the directory **C:\Programs\HM135 Programmer\usrDB**).
5) As soon as you have selected the appropriate file name, click the **OK** (or **Open**) button: the **Channel Data** window will open and will show the parameters previously programmed in the file.

8.1.b Modifying data previously stored in a radio

1) From **RadioProgramming** menu select **Retrieve radio data** (or use the shortcut Ctrl+R): the **Radio data retrieve** dialog box will open
2) *Make sure that the radio is properly connected to the PC and switched on in programming mode*, then click on **Retrieve data** button (or press **Exit** in case of mistakes): a dialog box will ask you to type a PC file name for the data to be stored
3) In the **Filename** box type a file name (we recommend to use the customer's name).
4) Click the **Save** button: the transceiver's data will be copied into the file showing some messaging similar to the table stated in par. 7.1 (DOWNLOAD instead of UPLOAD). If the operation will be successful you will see the message **End download**



5) Click the **Exit** button: **Channel Data** window will open and will show the parameters previously programmed in the radio.

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