

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 note 1.
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 must 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.