

MB Martin AVIACOM1 VHF Aviation Transceiver User's Guide

IMPORTANT!

Changes or modifications not expressly approved by the manufacture could void the user's authority to operate the equipment.

INTRODUCTION

The AVIACOM1 VHF aviation transceiver has been designed to survive harsh environments of temperature and electromagnetic noise (e.g., nearby personal computers, lighting systems, backup power subsystems etc.). It has also been designed to meet RTCA recommendations for not interfering with GPS receivers and not being jammed by FM radio broadcasts. In general, the operational qualities of this radio are orders of magnitude better than FCC requirements and RTCA recommendations.

Additionally, it has unique features for measuring/reporting operating parameters such as antenna quality, temperature, modulation level, receive signal strength and transmit power output.

IMPORTANT!

The shielding/filtering of any radio is ineffective in dealing with noise/interference which exists at the receiver's operating frequency and is present at the antenna location. Be sure to locate the antenna an adequate distance away from such sources of interference. In rare cases, the use of double-shielded antenna transmission line may also be required to prevent on-frequency noise (other than that found near the antenna) from entering the radio.

Basic operation requires:

- DC power (e.g., 12V battery)
- A source of transmit audio (e.g., microphone)
- A destination for received audio (e.g., amplifier/loudspeaker)
- An antenna

IMPORTANT!

In view of radio frequency energy exposure requirements, we recommend that the minimum separation between the antenna and people be one meter. This distance represents a comfortable margin above the calculated 22 cm distance as required when using the MB Martin SJ-1 antenna (gain= 4.5 dBi).

One of sixteen user-programmable frequencies may be selected using an integral switch. Or ... any frequency may be selected via an RS232 serial interface. The radio is shipped with software (runs on personal computer) which may be used for test, control, and setup.

All audio/power/control connections are made via a standard 25 pin male D connector. The antenna connects via a male SMB (snap-on) coaxial connector. A 9-pin female D connector is provided as an alternate way to connect to the serial port (standard IBM-PC pin assignments).

Detailed performance specifications may be found at the end of this document.

INTERFACE CONNECTORS

IMPORTANT!

There is a two-pin connector adjacent to the rotary switch. These two pins must be shorted together via a jumper block (factory installed) in order for the radio to function properly.

A suitable 50 Ohm antenna should be connected to the "SMB" male coaxial connector located in a protective recess in the top cover. Peak envelope transmit output power is Approximately 1.5 Watts. When used with the MB Martin SJ-1 antenna, this level of output power provides usable two-way air-to-ground communication out to a distance of 25 nautical miles.

A 25-pin male D connector is provided for DC power, audio connections and transmitter activation. DC power consumption is .110 A in receive and .4A during transmit.

DB25 connector pin assignments:

- 1 Receive Audio (output), 1V peak-to-peak, 600 Ohms impedance
- 2 ground
- 3 Transmit audio (input), 1V peak-to-peak for 90% modulation (600 Ohms)
- 4 Ground
- 5 Microphone Bias (output) – appears during transmit for use with carbon microphone
- 6 Push-to-Talk (input) – connect this pin to ground to transmit
- 7 Squelch (output) – measures 0 Volts when received signal exceeds squelch threshold
- 8 test point; factory use only
- 9 test point; factory use only
- 10 +12VDC power (input)
- 11 +12VDC power (input)
- 12 ground
- 13 ground

- 14 AUX1 output (open collector)
- 15 AUX2 output (open collector)
- 16 ground
- 17 test point; factory use only
- 18 RS232 Data Out - reports and command acknowledgments from radio
- 19 RS232 Data In – command input from user
- 20 test point; factory use only
- 21 connects to D3 of 16-position switch
- 22 connects to D2 of 16-position switch
- 23 connects to D1 of 16-position switch
- 24 connects to D0 of 16-position switch
- 25 ground

A nine-pin female D connector (a.k.a. DB9) is provided, allowing connection directly to a standard IBM-PC serial port using a simple male/female cable (i.e., null modem not required). Communications parameters are 4800 N,8,1 with no handshaking. In addition to the serial in/out lines as duplicated in the 25 pin connector, the DB9 includes additional RS232 signals.

DB9 connector pin assignments:

- 1 Carrier Detect – goes “low” when received signal is strong enough to break squelch
- 2 Data Out - reports and command acknowledgments from radio
- 3 Data In – command input from user
- 4 DTR - take this line “low “ to activate transmitter (alt. To PTT and \$T command)
- 5 GROUND
- 6-9 no connection

CONTROL SOFTWARE

Two versions of control software are included ... one will run under any DOS operating system and the other is a true 32-bit Windows application. The Windows version provides full RS232 support when using USB-to-serial adapters (the MS-DOS version also runs under Windows; however, the carrier-detect line is not supported when using a USB-to-serial adapter).

Using the software you may ...

- assign your own frequencies to the 16 switch positions
- re-assign the factory defaults for the 16 switch positions
- list actual switch frequencies
- manually set any allowable frequency in the 118-136.975 MHz range
- read radio temperature
- read power supply voltage

- read transmit output power
- read transmitter modulation level
- read antenna VSWR (or equivalent return loss)
- read current received signal strength
- read signal strength for latest signal which un-squelched radio
- read radio serial number and firmware version

The software is self explanatory ... so there is no need to provide instruction manual information here.

FACTORY DEFAULT FREQUENCIES

The default primary frequency (active frequency at power-up) is prescribed by the setting of the 16-position rotary switch located between the two D-connectors. The switch position is constantly monitored by the radio's microprocessor ... changing the switch position while the radio is on causes an immediate frequency update.

Here are the sixteen frequencies programmed at the factory:

Switch position 0	122.800 MHz
1	122.700
2	123.000
3	122.725
4	122.975
5	123.050
6	123.075
7	122.850 (multicom)
8	122.950 (unicom, controlled airfields)
9	122.725 (unicom, private airfields)
10	121.500 (emergency/ELT)
11	123.100 (C.A.P. search/rescue)
12	123.200 (flight schools)
13	123.300 (flight schools)
14	123.400 (flight schools)
15	123.500 (flight schools)

AVIACOM1 PERFORMANCE SPECIFICATIONS and FEATURES

- frequency coverage – 118.000 to 136.975 MHz (720++ channels)
- receiver sensitivity - .5 microVolts for 10dB signal/noise ratio
- image rejection – 80 dB minimum
- high dynamic range receiver with superior synchronous AM demodulation
- 100 dB+ receiver automatic gain control range
- transmit output power – 350 milliWatts average (1.4 Watts peak envelope)

- modulation – AM, internally clipped/filtered to legal maximum percentage
- fixed audio in/out levels; 500 mV p-p nominal (600 Ohms out/10K in)
- all radio functions may be controlled/monitored via the RS232 port
- primary frequency control – 16 position switch, user programmable via serial port
- secondary frequency control – via serial port
- power supply req. – 10.5 to 18 Volts DC; only 100mA receive / 400mA transmit!
- antenna connector – type SMB, 50 Ohms
- Audio/power/control connector – standard 25 pin male D-connector
- RS232 serial port – standard 9-pin female D-connector; auto shutdown feature
- integral RF power, modulation percentage and antenna VSWR measurements
- integral temperature and power supply voltage measurements
- squelch adjustment via RS232 port
- actual transmitted audio may be heard/verified in receiver audio output
- rugged LD-MOS field effect transistor used in transmit output stage
- microphone power supply output for supporting a wide range of microphones
- audio levels allow for direct use with most headphones/microphones/headsets
- unusually wide operating temperature range, -50 to +65 degrees Celsius
- temperature compensated for 100Hz max frequency error
- capable of supporting 8.33 KHz channel spacing (not currently enabled)
- superb shielding/filtering for use in extreme electrical noise environments
- virtually zero spurious emissions; ideal for co-location with SATCOM devices
- compact package, 4.000 X 5.700 X .625 milled aluminum housing, 18 ounces
- internal protection for accidental reverse-polarity power supply connection
- optional companion antenna provides good communications out to 50 mile radius
- companion antenna with coaxial arrestor provide direct-hit lightning protection

IMPORTANT!

Although the AVIACOM1 is capable of supporting ICAO 8.33 KHz channel spacing, operation in the USA is strictly limited to 25 KHz tuning increments. Use outside the USA is subject to government rules and AVIACOM1 certification status for the country of operation. Where allowed, 8.33 KHz channel spacing is supported with a special version of our control software (not available to USA customers).

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