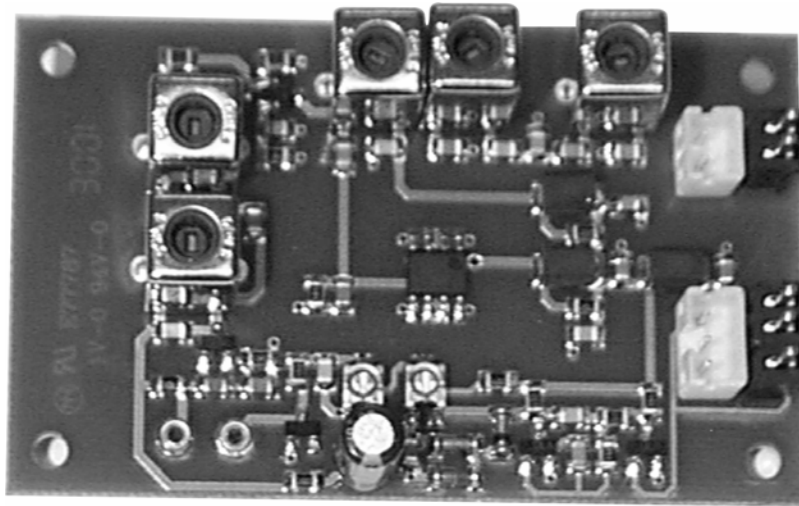


RFD1FM

Retro-fit Standard FM RF Module
With 2mm and Deans Connectors

Part Number: RFD1FM(Freq)

User's Guide



Note: Read this manual carefully before operating this product.

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Introduction

Thank you for purchasing the RFD1FM retro-fit FM RF module. Please follow the instructions carefully for successful installation and operation of the module. The RFD1FM RF module may be mounted to any Pro-Line or ACE R/C transmitter from the Pulse Commander to and including the Micropro 8000. This FM module provides 500 mW (+27 dbm) nominal output power and delivers clean, AMA 1991 compliant output meeting FCC requirements for occupied spectrum, power, and stability when used in that electronic environment. Regardless of transmit frequency, this unit produces negative FM/FSK shift when connected to ACE transmitters and can be used to transmit to most known Radio Control PPM FM/FSK receivers having negative shift. JR and Sanwa/Airtronics receivers will not work with this RF deck because they are the opposite FSK shift (positive). On 53 MHz and lower frequencies, negative modulation is compatible only with ACE compatible receivers. Units are factory tuned and ready for installation in existing ACE transmitters. Power and signal connections are available via 2mm or Deans 3 pin connectors. RF output is via 2mm or Deans 2 pin connectors. Available on 50, 53, 72, and 75 MHz. The user may legally shift from one band to another or one frequency to another by the simple step of installing a different module.

We are pleased that the use of Surface Mount Technology permits the output spectrum and power of the RFD1FM module to be significantly improved over the original ACE RF deck designed and licensed to ACE R/C by FMA, Inc. under FCC ID FM 1-8 TX.

WARNING: Use of the RFD1FM module in transmitters other than ACE R/C or FMA transmitters may impose unknown modulation input amplitudes and waveforms that can cause the RF deck to operate off-frequency and/or with an unknown spectral content. Such application can be done legally only by the holder of a Second Class Telecommunication License with equipment capable of measuring output spectrum and power to ensure compliance with FCC regulations. Compliance with FCC regulations in that circumstance is the responsibility of the user. FMA, Inc. has no way of knowing or of certifying such use of the module and accepts no liability or responsibility for such use.

RFD1FM specifications

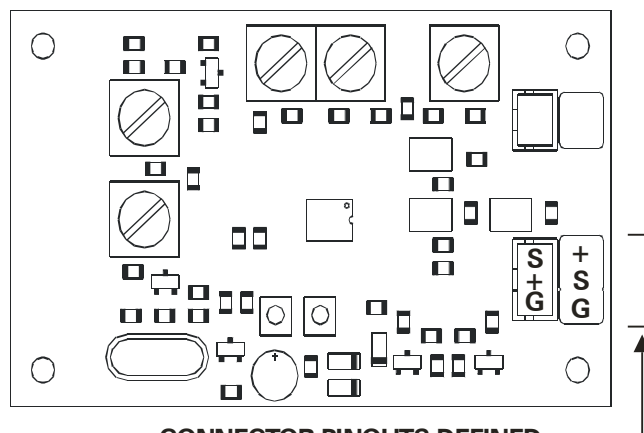
Operating voltage	+8 to +12 volts DC (8 cell Alkaline or NiCad batteries recommended)
Operating current	<180 milliamps
Modulation	FM/FSK
FM Shift	Negative shift when used in conjunction with ACE manufactured transmitters
Deviation	+ or - 1.5 kHz
Spectrum	>55 dB down @ + or - 20 KHz
FCC Identification	KH8-RFD1

Package contents

Item	Quantity
RF deck with crystal installed	1
Male-female stand-off (4 - 40 x 1/4")	4
Machine screw (#4 x 1/4")	4
#4 Hex nut	4
#4 Split lock washer	4
User's guide	1

IMPORTANT NOTE: If you purchase the RFD1FM on 72 MHz, your RF deck has an identifier on it designating it as an A or B P/N. The "A" P/N is designated for 72 MHz channels 11 through 33. The "B" P/N is designated for 72 Mhz channels 34 through 60. They are not interchangeable. Please verify that the correct crystal was shipped with the RF module.

P.C.B. Connections diagram



CONNECTOR PINOUTS DEFINED:
G = GROUND
+ = +8 TO +12V DC
S = MODULATION SIGNAL

Installation

Step 1

Select and prepare the site for the RF deck

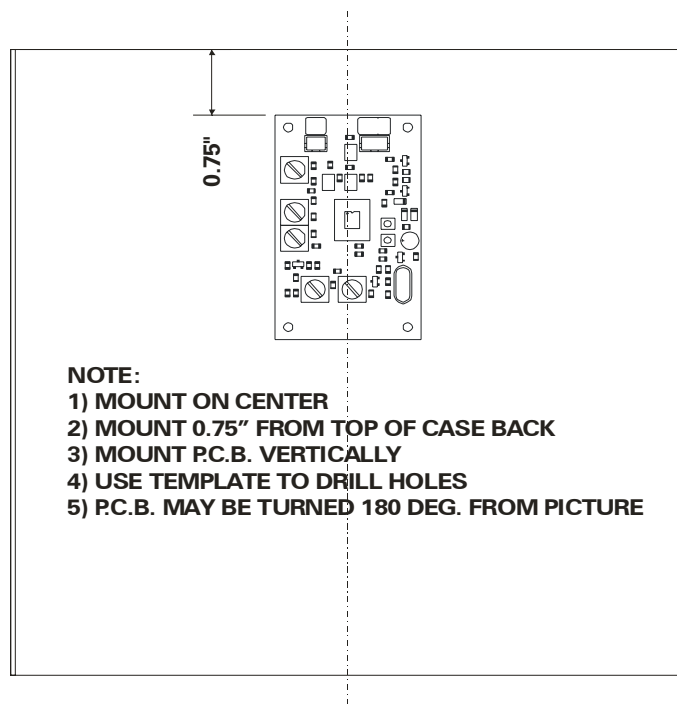
The original site for the RF deck you are replacing is the site you should use if possible. The wire lengths and radiation characteristics will be best retained at that location. However, the original mount holes will not be used. The optimum location for the Micropro 8000 is on the back case cover between the control sticks. Mount the RF deck as shown in Sketch A

- Cut out the template provided to mark the mount holes.
- Use a sharp pointed object such as a center punch, awl, or ice pick to mark the center of the four corner mount holes accurately on the transmitter enclosure at the chosen location. It is best to tape the template to the enclosure first so that no slippage occurs as holes are drilled.
- Use a sharp 1/8" diameter drill bit to drill the four mount holes at the corner locations marked on the template.
- Use a sharp # 11 knife blade to smooth the edges of the four holes you just drilled both inside and outside the case.

Step 2

Prepare and mount the RF deck

- Carefully clamp the edges of the fiberglass printed circuit board in a vise to hold the RF deck so it can not slip. Rubber jaw protectors or a wood vise are the safest bet. The component side should face down.
- Use a nut driver or 4-40 box end wrench to seat each of the four hex stand-offs into a corner hole in the p.c.b. **DO NOT** drill out the mount holes to make insertion easier. These four holes are plated and the contact between the threads and the plating makes the ground to the case most secure. It will take a little force to thread the screws through the holes. You may make the job easier by running a 4-40 tap through the holes before you start assembly.
- Once the screws are seated fully, place the lock washers on the now-protruding male screw and run a 4-40 nut onto each. Use the nut driver to tighten those nuts firmly. This action secures the nuts but also pulls the stand-offs tight against the p.c.b. plating.
- Position the RF deck with the power and antenna connectors as near to the original location of the RF deck removed as practical so the old power and antenna cables mate well. Your RF deck should come with the crystal you have selected in place. Avoid dropping the RF deck or banging the crystal with your tools. Insert the four machine screws through the case into the female threads of the four stand-off mounts. Use a phillips screw driver that is an exact match with the screw slots. Use caution not to let the blade slip such that it mars the vinyl covering of the case. Insert all four screws, then tighten the screws firmly.
- If you have a continuity meter, check to make sure there is continuity between ground "G" on the connector and the case back. In rare cases, the use of additional flat washers between the stand-offs and the p.c.b. may be required.



Sketch A

Step 3

Hook up the RF deck to the power and antenna connectors

- Be certain the power switch is turned OFF.
- Plug in the power cable. NOTE: Observe polarity of the power connector. The connector is polarized. Do not reverse or force the connector. The red, white, and black leads go to +, signal, and ground respectively. If you are unsure of the polarity, see the p.c.b. connections diagram on page 2.
- Plug in the antenna cable. This is the twin-lead cable that has a two-pin female Dean's connector on it.

Step 4

Additional Adjustments

The Micropro 8000 is different from all the other Pro Line and ACE transmitters. The FMA and the old ACE FM RF deck have a circuit called a Miller Integrator (MI) on it that is set at the factory and must not be adjusted in any way by the user. The MI sets the slope of the modulation pulses precisely and is the filter that ensures spectral purity for the RF deck.

The MP8K encoder was originally designed to operate with an AM RF deck that was part of the Silver 7 and all other ACE radios until the use of FM was permitted in the early 1980's. When the current frequencies were obtained by the AMA Frequency Committee in behalf of the AMA in 1982, the requirement for narrowing the occupied spectrum (so that receivers could operate with 20 KHz spacing vs. the previous 80 KHz spacing) required that the original AM RF decks/modules be "narrowbanded". This was done for all ACE R/C AM transmitters by making an in-line module available that was inserted be-

Operation

Range Test

To assure proper performance, the RFD1FM must be range tested following installation. FMA would like to suggest the following guidelines: Begin by placing the system's receiver on a cardboard box or another non-metallic surface to elevate it about 2 feet off the ground. Connect only one servo and the battery direct. Do not install a switch harness for the initial range test because switch harnesses are often the cause of poor range. Perform the range test with the receiver antenna fully extended VERTICALLY into the air on a dowel rod or the like, and the transmitter antenna collapsed. Apply power and walk away from the receiver moving one stick on the transmitter. You should obtain at least 200 feet of line-of-sight ground range if everything is operating properly. If any loss of servo control occurs, the system must be calibrated by an FMA service station. Phone (301) 668-7614 for FMA Direct technical assistance. In certain cases, the FMA service station may ask you to send in your entire transmitter along with your receiver.

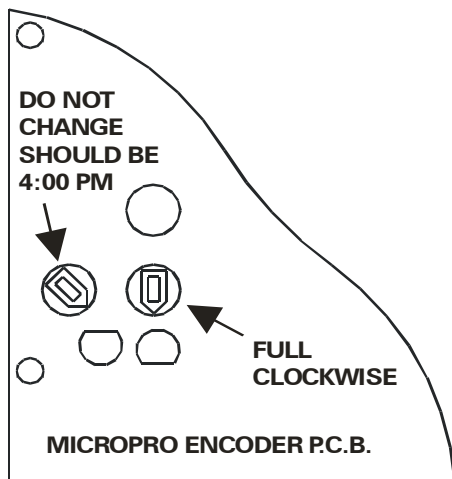
tween the encoder and the old AM RF deck in the power cable. The MI was adjustable by two trim pots to set the sidebands properly. This action was sanctioned via an FCC permissive change.

The MP8K was planned for use with either the old AM RF deck or the new FM RF deck. Thus, ACE R/C decided to make the Miller Integrator part of the MP8K encoder rather than make it an in-line module. This means that, when you plug in an FM RF deck on an MP8K, there are two MI circuits in-line. This must be accommodated as follows:

- See Sketch B as you proceed with the following procedure. At the left end of the MP8K encoder board, find two small, white trim pots that adjust the Miller Integrator on the encoder. Leave the left one of the two set as it is. That should be at about the 4:00 position.
- Turn the right pot all the way clockwise.
- If you choose to revert to use of the AM RF deck, leave the two pots set as you were just instructed.
- This procedure guarantees AMA compliance with the ACE or FMA FM RF decks; however, to ensure proper calibration of any AM modules used in conjunction with your MP8K, more precise calibration by an authorized service station might be necessary.

All other ACE or Pro-Line transmitters

All other ACE or ProLine transmitters will operate properly with filtering provided by the MI on the FM RF deck and no adjustment is needed or provided on the encoder. If you have such a transmitter that has the MI module in-line as used to narrowband one of the original AM RF decks, remove both the module and the Miller Integrator before installing the new FM module.



Sketch B