

SAFE-COM Wireless

Public Safety Distributed Antenna System

Product Line Series
SAFE-0002 versions A, B, C & D

Power Amplifier

User Manual

Safe-Com Wireless
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Liability Disclaimer

The information contained in this document is assumed to be correct and current. The manufacturer is not responsible for errors or omissions and reserves the right to change specifications at any time without notice. Safe-Com Wireless assumes no responsibility for its use nor for any indirect, incidental damage or loss resulting from its use.

FCC Information

This device is designed to be used with both Class A and Class B signal booster systems.

WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device.

You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at

<https://signalboosters.fcc.gov/signal-boosters/>

Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation."

WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation."

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

ISED Information

WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

AVERTISSEMENT : Ce produit N'EST PAS un appareil de CONSOMMATION. Il est conçu pour être installé par un installateur approuvé par un titulaire de licence d'ISDE. Pour utiliser cet appareil, vous DEVEZ détenir une LICENCE d'ISDE ou avoir obtenu le consentement exprès d'un titulaire de licence autorisé par ISDE.

Under Industry Canada regulations, this radio frequency power amplifier may only be used with the transmitters with which the amplifier has been certified by Industry Canada. The certification numbers for the transmitters with which this amplifier is permitted to operate are IC:22303-SAFE1, IC:22303-SAFE2

Conformément aux réglementations d'Industrie Canada, cet amplificateur de puissance à fréquence radio ne peut être utilisé qu'avec les émetteurs avec lesquels il a été certifié par Industrie Canada. Les numéros de certification des émetteurs avec lesquels cet amplificateur est autorisé à fonctionner sont IC: 22303-SAFE1, IC: 22303-SAFE2.

Under Industry Canada regulations, this amplifier may only operate using an antenna of a type and maximum (or lesser) gain approved by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Selon la réglementation d'Industrie Canada, cet amplificateur ne peut fonctionner qu'avec une antenne d'un type et gain maximum (ou inférieur) approuvés par Industrie Canada. Pour réduire le risque de brouillage radioélectrique causé aux autres utilisateurs, le type d'antenne et son gain doivent être choisis de manière à ce que la puissance rayonnée de manière isotrope équivalente (par exemple) ne soit pas supérieure à celle nécessaire au succès de la communication.

Introduction

Safe-Coms DASAssure™ is a patent-pending fiber Distributed Antenna Systems utilizing a new architecture that addresses the challenges of designing, deploying and maintaining a Public Safety DAS over its life-time. This innovative approach utilizes channel processing that assures the lowest interference and spurious radio communications coverage enhancement available. This modular hot-swap card system permits single channel expansion on ANY frequency adding only the power and resources required. Yet the design is the most compact fiber DAS available – easily fitting 4 bands into a 19x18x6inch NEMA 4 unit. Safe-Com's high quality manufacturing system and superior applications support assures your success and the public's safety.

The amplifiers are components within the BDA and Fiber DAS to linearly amplify RF signals for boosting.

This User Manual is specifically written for the SAFE-0002 Series Power Amplifier

- VHF Band: SAFE-0002-A
- UHF Band: SAFE-0002-B
- 700 Band: SAFE-0002-Ca
- FirstNet Band: SAFE-0002-Ca
- 800 Band: SAFE-0002-Cb
- 900 Band: SAFE-0002-D

FCC Antenna Requirements

The user must assure that the installation meets FCC RF exposure limits. Minimum distance between any person and the operating antenna must be 35 inches or 89 cm. The antenna must be mounted on a stable, permanent structure.

Maximum ERP is 5 watts per FCC regulations per rule part 90.219(e)(1). The FCC licensed and qualified installer user must calculate the total transmitted power, taking into account the losses of the cables and splitters etc, plus the gain of the antenna to assure compliance with the maximum exposure regulation.

Lightening protection is required on all antennas as loss or damage as a result of lightening is not covered by the warranty. Antennas must be connected prior to turning up power to the unit.

Frequency Bands of Operation and RF output power control

The authorized bands of use include:

For FCC Part 90.219

150.8-156.2475 MHz
157.1875-161.575 MHz
161.775-161.96 MHz
162.04-173.40 MHz
406.1-454.0 MHz
456.0-462.5375 MHz
467.74-512.0 MHz
758.0-775.0 MHz
788.0-805.0 MHz
806.0-849.0 MHz
851.0-869.0 MHz
929-940.0 MHz

For ISED RSS-131

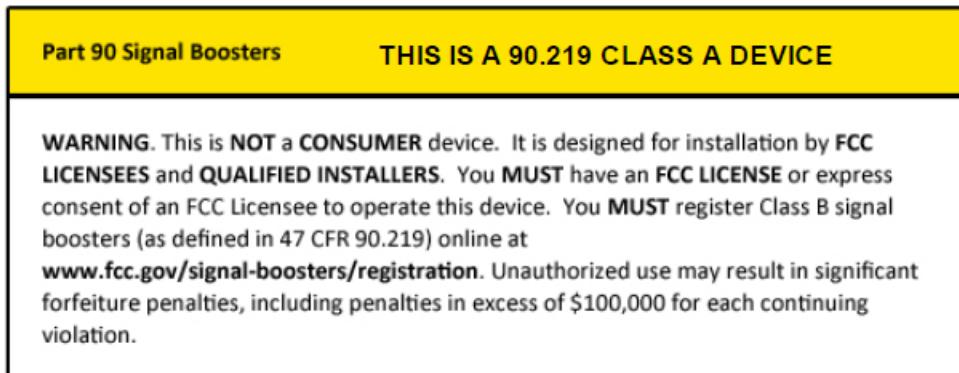
150.05-174.0 MHz
406.1-430.0 MHz
450.0-470.0 MHz
768.0-776.0 MHz
798.0-806.0 MHz
806.0-821.0 MHz
851.0-866.0 MHz
866.0-869.0 MHz
929-940.0 MHz

IMPORTANT NOTES: The Power amplifier module is factory tuned to the frequency band of operation. The User can not modify the operating frequency band. This product shall not be used to extend the boundary of the normal service area of a specific license. This product is used as both Class A and Class B however it is not meant to be used as a Class B Mobile booster. The product can be used outdoors as a fixed device. The user may not amplify service bands where the operator does not have license or license consent. Class B signal boosters cannot amplify both commercial (including CMRS and ESMR) and PLMR bands (except in-building DAS).

Part 90 booster warning label

(1) Example labels (after [R11]):

(i) Minimum information for label is as follows; also the label shall include a statement identifying as a Class A or a Class B device:

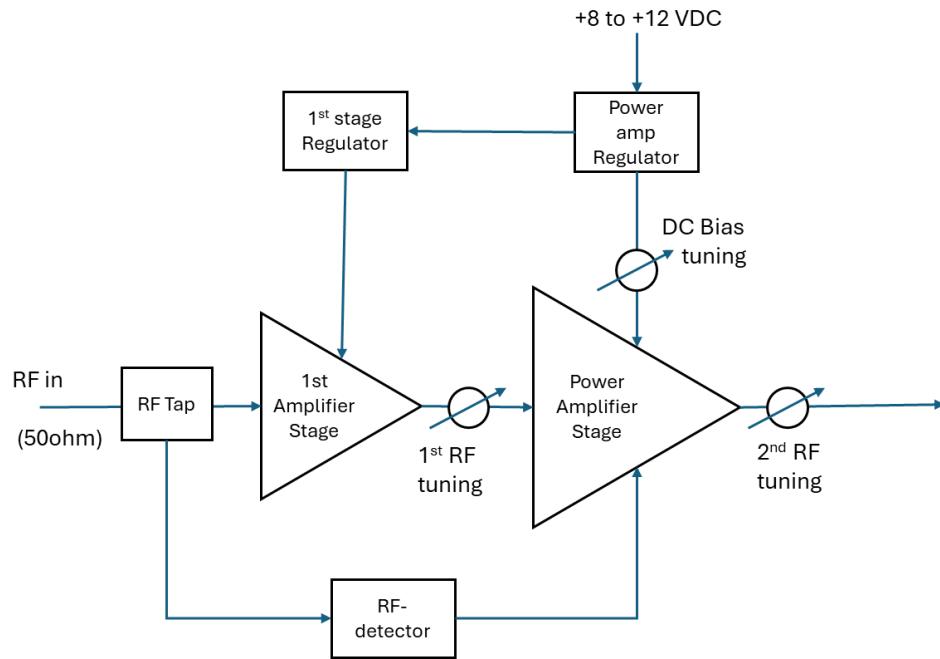


- (2) Label must specify that the booster is a Class A device or a Class B device
- (3) The booster label can be combined with the FCC ID label
- (4) The content and location of the label should be presented in the FCC ID Label e-filing exhibit
- (5) Permanently affixed to a permanently attached part of the equipment enclosure, readily visible
- (6) Alternative label text and/or layout requires advance FCC approval

The Power amplifier module is factory tuned to the frequency band of operation.
The User can not modify the operating frequency band.

Operating Information

SAFE-0002 BLOCK DIAGRAM – All versions



The SAFE-0002 is a 2 stage fixed gain amplifier. A linear regulator supplies the power to the first stage pre-amplifier and the second stage is supplied with the external power input – typically +8 to +12 VDC. The circuit is designed to provide gain of approximately 20 to 30 dB. This common circuit can be tuned to operate in the range from 150 MHz to 940 MHz. The tuning is performed in the factory prior to shipping. The user can not change the tuning.

To operate the amplifier in a Class A, the amplifier is configured by Safe-Com Wireless to properly operate as a Class A amplifier as shipped from the manufacturer. All the proper limitations of operation, e.g. frequency limits, output power limits and spurious limits automatically controlled by the equipment when delivered inside a Safe-Com Wireless Booster. Alternatively a user would need to provide three functions externally:

- Output power control limits
- Frequency passband filtering
- Frequency of operation limits and
- Spurious noise control by post amp filtering

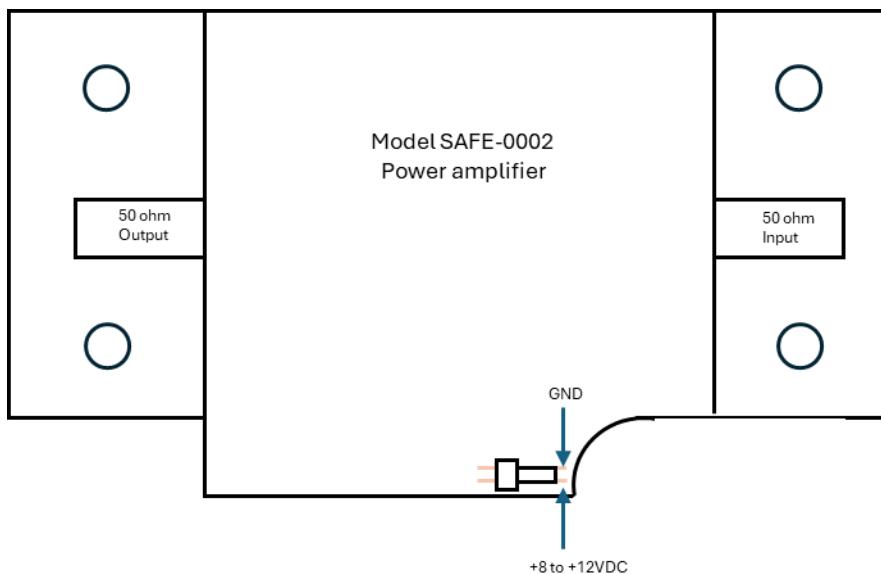
DC Input Range: 8 – 12VDC

DC Current: 2 amps maximum

RF input maximum: +10dBm (50ohms)

RF output maximum: 5 watts

Dimensions: 100mm x 52mm x 55mm (with control PCB (PAC) mounted on top)



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Installation: It is advised to use thermal grease to mount the amplifier to a heat sink with at least 10 inches sq. volume.

Power: Input DC power must be between +8Volts and +12 VDC.

Connections: 50ohm RF cable with quality SMA cables should be used. Use a torque wrench and torque to 3–5 in·lbf (0.3 to 0.6 N·m)

FCC Antenna Requirements

The user must assure that the installation meets FCC RF exposure limits. Minimum distance between any person and the operating antenna must be 14 inches or 35 cm. The antenna must be mounted on a stable, permanent structure.

Maximum ERP is 5 watts per FCC regulations per rule part 90.219(e)(1). The FCC licensed and qualified installer user must calculate the total transmitted power, taking into account the losses of the cables and splitters etc, plus the gain of the antenna to assure compliance with the maximum exposure regulation.

Lightening protection is required on all antennas as loss or damage as a result of lightening is not covered by the warranty. Antennas must be connected prior to turning up power to the unit.

Technical Specifications:

Parameter	Specification
Frequency Ranges	150 to 940 MHz
RF Output Power, average	30dBm +/- 2dB
P1dB	35dBm nominal
IP3	49dB
RF Gain	25 - 30dB
RF Gain flatness over any operating frequency range	<u>± 1</u> dB
IMD, two +26dBm tones, 1 MHz spacing	= or < -13dBm
Noise Figure	< = 9dB
Input/Output Return Loss	12 dB/12 dB (50 ohms) (TBD)
DC Input Power	+8 to +12 VDC
DC Current @ 12VDC, @2W CW	2.0 A max
Cooling	Conduction through base plate
Package Dimensions/ Outline	< 3 x <u>5</u> inch footprint, 0.5in tall max., SMA female I/O
-	-
Environmental Conditions	
Operating Temperature,	0° <u>to</u> + 50° C
Storage Temperature	-40° to +85° C