

FC-301/D RF Link Module USER MANUAL

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MANDATORY SAFETY INSTRUCTIONS TO INSTALLERS AND USERS

- Use Only manufacturer or dealer supplied antennas.
- Antenna minimum safe distance: 35 cm.
- Antennas used for this transmitter must not exceed an antenna gain of 3 dBi.

The FCC (Federal Communications Commission) has adopted a safety standard for human exposure to RF energy which is below the OSHA (Occupational Safety and Health Act) limits.

- **Antenna mounting:** The antenna supplied by the manufacturer or radio dealer must not be mounted at a location such that during radio transmission, any person can come closer than the above indicated minimum safe distance to the antenna (i.e. 35cm).
- To comply with current FCC RF Exposure limitations, the antenna must be installed at or exceeding the minimum safe distance indicated above, and in accordance with the requirements to the antenna manufacturer or supplier.
- **Vehicle installation:** The antenna can be mounted at the center of a vehicle metal roof or trunk lid if the minimum safe distance is observed.

Antenna substitution: Don't substitute any antenna for the one supplied or recommended by the manufacturer or radio dealer. You may be exposing person(s) to excessive radio frequency radiation. You may contact your radio dealer or the manufacturer for further instructions. **Warning**



Maintain a separation distance from the antenna to person(s) at least 108cm.

Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note: The manufacturer is not responsible for any radio or tv interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

TABLE OF CONTENTS

TABLE OF CONTENTS	01
INTRODUCTION.....	02
FEATURES.....	02
SPECIFICATION	02
WIRING DIAGRAM.....	8
TROUBLESHOOTING GUIDE.....	10
FACTORY DEFAULT SETTING	11

INTRODUCTION

The FC-301/D RF Link Modules from Friendcom utilizes the latest technology in its design and manufacturing. It's PLL (Phase Lock Loop Synthesizer) / microprocessor controlled, and offers one to five watts of power with 16 channel capability. Multiple functions including AC audio coupling, 1200 to 9600 baud rates GMSK and FSK modulation capability are standard in this fully programmable wide bandwidth RF Link Module units.

FEATURES

- **16 Channels**
- **1 - 5 Watt Programmable RF Output**
- **12.5 kHz Programmable Channel Spacing**

SPECIFICATIONS

GENERAL

Equipment Type.....Data Radio

Frequency BandUHF

Channel Spacing.....12.5KHz programmable

RF Output Power.....1W - 5W Programmable

Modulation type8K5F3E

Intermediate Frequency..... 45.1MHz & 455KHz

Number of Channels.....16

Frequency SourceSynthesizer

Operation Rating.....Intermittent

5:5:90 (TX: RX: Standby)

Power Supply12.5V DC Nominal Voltage

Temperature Range

Storage.....from -40°C to +80°C

Operating.....from -30°C to +60°C

Current Consumption

Standby (Muted) \leq 40mA

Transmit 5 Watts RF Power< 1.5A

Transmit 1 Watt RF Power.....<0.8A

Dimensions.....(120mm)L x (60mm)W x (20mm)H

Weight..... \leq 150 grams

TRANSMITTER

Sustained Transmission..... Nominal conditions

Time: 5 10 30 sec

Power: >95% >95% >90%

Frequency Error..... ± 2.5 ppm

Frequency Deviation:

12.5kHz Channel Spacing..... $\leftarrow \pm 2.5$ kHz,

Audio Frequency Response..... Within +1/-3dB of 6dB octave

@300Hz to 2.55kHz for 12.5kHz C.S

Adjacent Channel Power

12.5kHz< 60 dBc @ Nominal Condition

< 55 dBc @ Extreme Condition

Conducted Spurious Emission< -36 dBm

Modulation Sensitivity..... 100mV RMS@60% peak Dev.

Hum & Noise:

12.5kHz Channel Spacing.....>36 dB (with POSPH)

Modulation Symmetry<10% Peak Dev@1kHz input

for nominal dev +20dB

Load Stability.....No osc at $\geq 10:1$ VSWR all

phase angles and suitable antenna

No destroy at $\geq 20:1$ all phase angle

RECEIVER

**Sensitivity(12dB Sinad)UHF <-117 dBm,
VHF<-118dBm@Nom.Condition**

Amplitude Characteristic.....<±3dB

Adjacent Channel Selectivity:

12.5kHz Channel Spacing.....➤60dB@Nom.

Spurious Response Rejection.....70dB

Image Response..... > 70 dB

IF Response >70 dB

Others.....> 70 dB

Intermodulation Response Rejection.....➤65 dB

Conducted Spurious Emission @ Nominal Conditions.....<-57 dBm

**AF Distortion<5% @ Nom.,
<10%@ Extreme Condition**

RX Hum & Noise:

12.5kHz CP< 40dB with PSOPH

Receiver Response Time< 20ms

Squelch Opening sensitivity:-118dBm

Squelch Closing sensitivity -121dBm

Squelch Attack Time:

RF Level at Threshold <40ms

RF Level at Threshold +20dB.....<30ms

L.O. Frequency Temperature Stability.....1 st <2.5 ppm,

2 nd <10 ppm for -30°C to +60°C

L.O. Frequency Aging Rate.....±2 ppm/year

REFERENCE CRYSTAL

Frequency..... 13MHz

Temperature Characteristic.....+/- 2.5PPM

from -30°C to +60°C

Aging Rate.....< 2ppm/year in 1 st year

<1ppm/year thereafter

Lock Time<10 ms

TX to RX < 20 ms

RX to TX < 25 ms

ENVIRONMENTAL (performance without degradation unless stated)

Temperature..... deg C

Operating.....-30° to +60°C

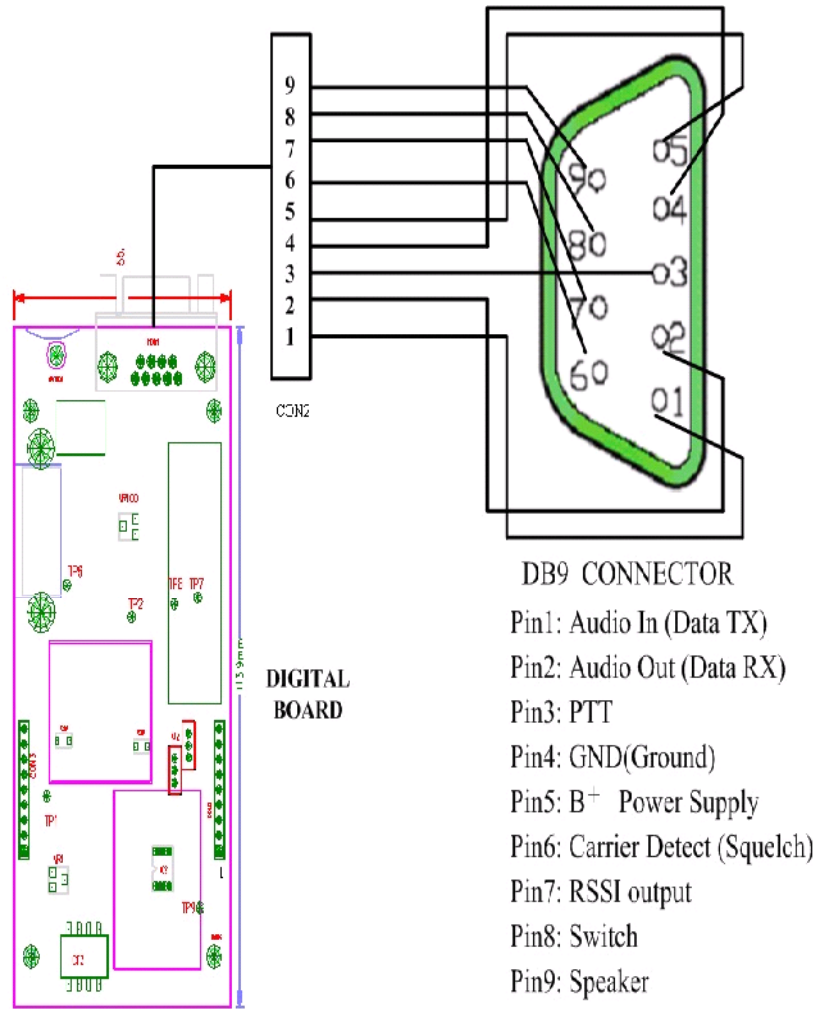
Degradation Specified@Extreme

Storage -40°C to +80°C

Recharging -10 to +55

ESD..... 20kV (C-MIC >= 15kV)

WIRING DIAGRAM



Pin	Function	Type	Range	Description
Pin 1	Audio in(Data TX)	Input	200VP-P ----- 300VP-P	External Modulation Input
Pin 2	Audio out (Data RX)	Output	150mV-250mV	Demodulation Output
Pin 3	PTT	Input	0 V/+5V	Transmit Enable 0V - Radio in Transmit status 5V - Radio in receive status(Default)
Pin 4	GND	GND	0V	GND
Pin 5	B+	V+	10-15V	Power Supply(+12.5V typical)
Pin 6	SQ	Output	Open/Short	RF Carrier Detect Open -- low level, Short -- high level (Default).
Pin 7	RSSI	Output	0.8V-2.2V	
Pin 8	Switch	Input	0V/5V	Programming Enable 0V - Radio programmable 5V - Radio work (Default)
Pin 9	Speaker	Output	8ohm /0.5W	

When Pin 8 is connected to GND(0V), the radio is in program mode. The parameters of the radio can be changed in this mode. When Pin 8 is connected to 5V voltage, the radio works normally in transmission or receiving status.

TROUBLE SHOOTING GUIDE

SYMPTOM S	CAUSES	COUNTERMEASURES
Unit does not work	<ol style="list-style-type: none"> 1.No power incomplete connection 2. No input voltage of 5V or 8V 3. CPU does not work 4. EEPROM fail 5. Channel error 6. PLL error 	<ol style="list-style-type: none"> 1.Check COM1 connection 2. Check IC500 `IC504 3. Check IC510 4. Check IC502 5. Check CF3 6. Check TCXO `VCO `PLL IC
Bad RX Sensitivity	<ol style="list-style-type: none"> 1.Antenna signal short-circuit 2.Antenna signal open-circuit 3. Bad electronic tuner 4. Defective high frequency amplifier 5. Bad mixer 6. Local signal amplitude become small 7. Bad 1st and 2nd intermediate frequency 	<ol style="list-style-type: none"> 1. Check D106 D107 2. Antenna loose weld 3. Check L23 L24 L25 L26 4. Replace Q15 5. Check IC3 T3 T4 6. Check D103 Q111 7. Check XF1 XF2 IC2
Defective RX	<ol style="list-style-type: none"> 1. No output signal 2. Bad signal waveform 3. Bad stability of VCO 	<ol style="list-style-type: none"> 1. Replace IC801 2. Check U2 c412 c404 3. Check component of VCO
PLL Error	<ol style="list-style-type: none"> 1. TCXO frequency error 2. Bad stability of VCO 3. PLL can't be locked 	<ol style="list-style-type: none"> 1.Check crystal oscillator of TCXO 2.Check the component of TX/RXVCO 3. IC301 Q321 Q320 C327
Low TX Power	<ol style="list-style-type: none"> 1. Bad amplifier circuit 2. Bad APC circuit 	<ol style="list-style-type: none"> 1. Replace IC102 2. Check D102 IC1
No TX Power	<ol style="list-style-type: none"> 1. No power on TX 2. No signal on driver 3. Bad amplifier circuit 4. Bad APC circuit 	<ol style="list-style-type: none"> 1. Check Q502 Q503 2. Check Q1 Q2 D101 3. Check IC102 D102 4. Check IC1
No Modulation	<ol style="list-style-type: none"> 1. No input signal 2. No TX signal 	<ol style="list-style-type: none"> 1. Check IC801 2. Check U1 R403 R404

FACTORY DEFAULT SETTING

FC-301/D UHF Default Frequency and Tx Power

Channel	RX Frequency	TX Frequency	TX Power
1	400.1250MHZ	400.1250MHZ	5W
2	405.1250MHZ	405.1250MHZ	5W
3	410.1250MHZ	410.1250MHZ	5W
4	415.1250MHZ	415.1250MHZ	5W
5	420.1250MHZ	420.1250MHZ	5W
6	425.1250MHZ	425.1250MHZ	5W
7	430.1250MHZ	430.1250MHZ	5W
8	435.1250MHZ	435.1250MHZ	5W
9	436.1250MHZ	436.1250MHZ	5W
10	440.1250MHZ	440.1250MHZ	5W
11	445.1250MHZ	445.1250MHZ	5W
12	450.125MHZ	450.1250MHZ	5W
13	455.1250MHZ	455.1250MHZ	5W
14	460.1250MHZ	460.1250MHZ	5W
15	465.1250MHZ	465.1250MHZ	5W
16	469.9750MHZ	469.9750MHZ	5W