SD-270 Series Data Radio

User Manual

FCC RF Exposure Compliance Requirements

The Federal Communications Commission (FCC), with its action in General Docket 93-62, November 7, 1997, has adopted a safety standard for human exposure to Radio Frequency (RF) electromagnetic energy emitted by FCC regulated equipment. Friendcom subscribes to the same safety standard for the use of its products. Proper operation of this radio will result in user exposure far below the Occupational Safety and Health (OSHA) and Federal Communications Commission limits.

About your SD-270 Series Data Radio

The SD-270 Series is a PLL synthesized 5-watt FM transceiver module, which is designed for data transmission and voice communication. It can support pre-emphasis, squelch CTCSS/DCS and audio amplifier. Two-point modulation technology provides a good low frequency response and POCSAG protocol is optional. The radio has a fast start-up time, low power consumption, and the optional modem boards from 1200-19200 bps add extra applications for its use. The die cast aluminum cabinet and lid provides resistance to RF interference with the most requested mechanical footprint in the industry.

Should you have questions regarding the operation of the radio, please consult us at:

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11535 W. 83rd Terrace   Email: maxon@maxonamerica.com
Lenexa, KS 66214   Website: www.maxonamerica.com

Features

- CE, FCC, MRC & AS/NZS 4295: 2015 certified

- Programmable 16 channels (Dip Switch Select)

- External Software Channel Steering

- Configurable Power Save Feature

- FSK, 4FSK& GMSK Modem Options; Supports 19200 bps

- Frequency Step 6.25KHz

- CTCSS/DCS Encode/Decode

- Fast start-up time: 5ms

- SQ Programmable via PC (6 Levels)

- POCSAG Modulation (Optional)

- PC Programmable & Software Tune & Calibration

Applications

- Industrial telemetry & wireless remote control or Paging system

- Gas and oil flow monitoring

- Electricity, water and gas utilities

- Earthquake, weather, environmental protection

- Vehicle tracking and asset tracking systems

- Water monitoring, waste water management and irrigation control

- Railway, police, army automation system

- Aerial defense and fire alarm system

- Urban lighting control

Specifications

GENERAL

Working Frequency	V2: 136-174 MHz U1: 400-440 MHz U2: 430-470 MHz U3: 450-490 MHz
Channel Spacing	12.5KHz/25KHz Programmable
Modulation Type	F3D/F3E
Number of Channels	16
Nominal Working Voltage	12V DC
Extreme Working Voltage	9.6 V ~ 16V DC
Storage Temperature	-40℃ ~ +80℃
Operating Temperature	-30℃ ~ +65℃
Current Consumption	Standby	< 100mA (65 mA @ 12V)
	Transmit 5 watts RF Power	< 1.5A
	Transmit 1 watt RF Power	< 1A
TX to RX Attack Time		< 5ms
RX to TX attack time		< 5ms
Frequency Error		< 2.5ppm
Antenna Connector		BNC 50Ω
External interface		DB15 Female

TRANSMITTER Specification

RF Power		1W/2W/3W/4W/5W Programmable
Frequency Deviation	25KHz Channel Spacing	< 5KHz
	12.5KHz Channel Spacing	< 2.5KHz
	Subsonic	0.5KHz
Audio Response	25KHz Channel Spacing	300Hz～3KHz +1/-3dB
	12.5KHz Channel Spacing	300Hz～2.55KHz +1/-3dB
Adjacent Channel Power	25KHz Channel Spacing	< -70dBc
	12.5KHz Channel Spacing	< -65dBc
Conducted Spurious Emission		< 1GHz, < -36dBm > 1GHz, < -30dBm
Modulation Sensitivity	Voice	8~15mV
	Data	80~130mV
TX SNR	25KHz Channel Spacing	> 45dB
	12.5KHz Channel Spacing	> 40dB

RECEIVER Specification

RX Sensitivity (12dB SINAD)	25KHz Channel Spacing	< -119dBm Extreme < -115dBm
	12.5KHz Channel Spacing	< -119dBm Extreme < -115dBm
Adjacent Channel Selectivity	25KHz Channel Spacing	> 70dB
	12.5KHz Channel Spacing	> 60dB
Image Rejection		> 70dB

IF Rejection		> 70dB
Spurious Rejection		> 70dB
Intermodulation Suppression		> 65dB
Conducted Spurious Emission		< -57dBm
Receiving Audio Distortion		< 5%
RX SNR	25KHz Channel Spacing	> 45dB
	12.5KHz Channel Spacing	> 40dB
Audio Output Power		0.5W @ 8Ωload

Exterior View

Description of radio components

① DB15 Female connector

② BNC Antenna connector

③ LED (Red for TX, Green for RX)

SD-270 External DB15 female Pin Assignment

SD-270 Series is manufactured with optional modem capability, if the radio does not have a modem installed; the corresponding pin is defined as empty.

Pin No.	Function	Description	Note
①	AUDIO_IN (MOD IN)	Audio input, 3Khz LPF, Modulation sensitivity is 100mV.	AUDIO_IN is effective only when Pin7 (MIC) is vacant or with +5V high level. 3KHz LPF filter existed in audio channel.
②	AUDIO_OUT (AF OUT)	Audio output, 3Khz LPF. Output level at 60% frequency deviation is 250±50mV. This line has an internal pull-up resistor to +5V.	
③	PTT	TX control, active low, only when PTT is active AUDIO_IN and MIC IN are effective. This line has an internal pull-up to 5V.	
④	B+ (9.6～16V DC)	Positive pole input from DC power, nominal +12V.	
⑤	PROG (DATA OUT)	Programming data output, 5V TTL	
⑥	BUSY	Logical level output to indicate whether there is a carrier or not. Low lever means carrier, high level means no carrier. This line has a pull-up to +5V.	
⑦	MIC IN/RSSI	MIC IN: Microphone input. RSSI: To detect the air signal strength. Jumper selectable.	Can directly connect to electrets MIC, the DC voltage of this pin should lower than 3.5V, then MIC transmission can be activated.

⑧	PROG (DATA IN)	Programming data input, 5V TTL	
⑨	SPK/POCSAG	SPK: Audio output from the audio amplifier, @ 8Ω. POCSAG: To transmit POCSAG code. Jumper selectable.	AUDIO_IN is effective only when PIN7 (MIC) is vacant or with +5V high level. 3KHz LPF filter existed in audio channel.
⑩	RXD (MODEM)	The serial data is input to modem through this pin. Default is RS232.	The hardware is one of RS232, RS485 or TTL/5V when delivery.
⑪	TXD (MODEM)	Serial data is output from modem via this pin. Default is RS232.	The hardware is one of RS232, RS485 or TTL/5V when delivery.
⑫	CD_OUT (MODEM)	Logical level output to indicated whether a carrier or not. Low lever for carrier, high level for no carrier.	
⑬	NC	No connection	
⑭	GND	Ground	
⑮	NC	No connection	

Antenna installation

Fasten the antenna to the radio by turning the antenna connector clockwise into the receptacle on right of radio when looking at front of radio.

Powering the Data Radio

SD-270 accepts variable sources of DC power to permit more versatile use. This radio operates from 9.6V to 16V DC and standard voltage for testing is 12V DC. The 4th pin of DB15 female connector is the power input pin.

SD-270 Series Function

Channel Spacing

The radio is capable of programmable channel spacing, having 12.5KHz or 25KHz channel spacing.

SQ (Squelch) Level

Six SQ levels are set in the radio and can be selected by PC software.

The audio signal will continuously transmit. Levels are shown as below:

Level 0 is for fully open mute.

Level 1: 0.15uV

Level 2: 0.25uV

Level 3: 0.35uV

Level 4: 0.45uV

Level 5: 0.55uV

CTCSS/DCS

To help block out unwanted calls to your radio, the SD-270 can be programmed to set CTCSS/DCS code. When enabled, receiver can only receive RF signal with the same CTCSS/DCS code of the transmitter to avoid interference from unwanted signals. For fast lock times, the CTCSS/DCS is not recommended for high speed data transmission.

Channel Scan

The radio enables to detect the channels by initiate scanning mode. Scanning mode is optional and programmable. Four scan modes are provided as shown below:

0 ---------normal scan with carry only

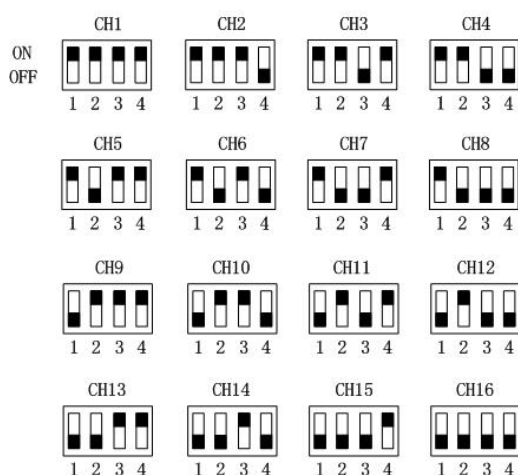1 ---------normal scan, Carry with tone

2 ---------priority scan, Carry only

3 --------priority scan, carry with tone

Channel Select

16 channels can be selected by inner dip (4) switch (HW) on power board or serial command inputted from our PC software (SW). Only in SW control mode, channel can be selected by PC software in "Channel" feature.

Channel Dip Switch Chart

TX Protection

This feature, when enabled, limits the amount of time that the radio can continuously transmit for protecting the radio from block of the channel and damage on radio which is caused by sustained transmission. In TX mode, if PTT is effective all through and exceed set time, radio will stop transmitting automatically until restart the PPT again. The time is set by programming.

Volume

The radio output voice via SPK Pin with 10 volume levels. The choice of appropriate volume for the connected speaker in set in the programming. The default volume is

6. The minimal volume is 0 and the maximum is 9.

Power Save Mode

When user enables the function, The SD-270 will operate in a status to lower power consumption in standby. If a useful signal is detected, the radio will begin to receive normally. If no useful signal detected, the radio will revert to power save. Power save intervals can be set in the programming. Not recommended when using for data transmission.

Side Tone

This feature, when enabled, transmits the MIC signal via the output from SPK port to allow user to hear his or her own voice. The feature can also be set via programming.

RSSI Detection

In TX mode, the radio can quickly detect the strength of a useful RF signal and indicate the strength by analog voltage after calculation and analysis of MCU. Stronger signal means higher output voltage. The field strength can also be viewed by serial command.

LED Status Indicator

The LED indicator gives real time status of the radio's operation, Red for TX and green for RX.

Parameter Programming

The SD-274 is configured before leave factory, the user can directly use. If the parameters of the radio need to be modified, refer to the programming software and manual.

Modem Option for Data Communication

DTE: Data Terminal Equipment

Available Baud rate for FSK modem

Channel Space	DTE Baud Rate(bps)	Modem Baud Rate(bps)
Narrow (12.5KHz)	1200	1200
Wide (25KHz)	1200	1200

Available Baud rate for GMSK modem

Channel Space	DTE Baud Rate(bps)	Modem Baud Rate(bps)
Narrow (12.5KHz)	9600	9600
Wide (25KHz)	9600	9600

Available Baud rate for 4FSK modem

Channel Space	DTE Baud Rate (bps)	Modem Baud Rate (bps)
Narrow (12.5KHz)	9600	9600
Wide (25KHz)	9600 or 19200	9600 or 19200

Communication Between DTE and Modem

The internal option-modems (FSK, GMSK, 4FSK) are applied to the SD-270 to increase capability for data applications. The goal of an internal modem is to improve the

efficiency for data transmission and provide maximum flexibility for user applications. The internal modem options consist of MCU, Modem IC, and extra circuitry. These option-boards directly communicate with DTE to send and receive meaningful data through the DB15 female connector. These modems are designed to accept RS232, RSTTL or RS485 serial data format and are also capable of high speed wireless data-transmission between two or more devices.

AT Command of Modem (Only for GMSK or 4FSK)

Mode	Command	Return	Remark
Querying radio channel	AT+CHN=?\r	\r\nCHN=N\r\n	The range of N is from 1 to 16, means channel number.
Setting channel	AT+CHN=N\r	\r\nOK\r\n or \r\nERROR\r\n	
Querying baud rate	AT+WORKMODE=?\r	\r\nWORKMODE=N\r\n	N is M9600 or M19200, M9600 means 9600bps…
Setting baud rate	AT+WORKMODE=N\r	\r\nOK\r\n or \r\nERROR\r\n	
\r stand for carriage return (ASCII is 0XOD)			
\n stand for line feed(ASCII is 0X0A)			
Only 4FSK modem can be set to 19200bps.			

Dimensions

110

122,07

51

63,2

4-∅3,5

32