SD-174

Data Radio

User Instruction 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. Maxon 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 Act (OSHA) and Federal Communications Commission limits.

Power listed is conducted. This device must not exceed a maximum transmitting duty factor of 50%. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 49cm (19.29 inches) from all persons, must not be co-located or operating in conjunction with any other antenna or transmitter, and must not exceed a gain of 7 dBc. Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.

About your SD-170 Series Data Radio

The SD-170 Series of RF Link Modules utilize the latest technology in their designs and manufacturing. SD-170 models are Phase Lock Loop Synthesizer (PLL) / microprocessor controlled and offer two (2) watts of power with 16-channel capability. Multiple functions including 1200 to 9600 baud rates, AC and/or DC audio coupling, GMSK, FFSK and FSK modulation are standard in these fully programmable RF Link Module units. Programmable sub-audio squelch system (CTCSS & DCS) and two-tone squelch system are added to the signal level detect squelch system (RSSI). GPS Data handling is provided to interface and control an internal GPS receiver.

To assure satisfaction from the radio, we urge you to thoroughly read the operation and function information in this manual before operating your SD-174.

Applications of some of the functions described in this manual are determined by the system you use. Your dealer will program your radio so that you have the greatest number of functions possible relative to your needs.

Should you have questions regarding the operation of the radio, please consult your Dealer.

Specifications

GENERAL

Equipment Type ..... Data radio

Performance Specifications.....TIA / EIA-603 & AS-4295

Band ..... UHF

Channel Spacings ..... 25 kHz, 12.5 kHz programmable

RF Output Power ..... 5 watt / 1 watt programmable

Modulation Type F2D, F3E

Intermediate Frequency ..... 45.1 MHz & 455 kHz

Number of Channels 16

Frequency Source ..... Synthesizer

Operation Rating ..... Intermittent
90 : 5 : 5 (Standby: RX: TX)

Power Supply ..... Ext. Power Supply(12 VDC Nominal)
9V - 18.0V DC EXTREME

Temperature Range
Storage ..... from - 40°C to + 80°C
Operating ..... from - 30°C to + 60°C

Current Consumption
Standby (Muted) ..... < 65 mA
Transmit 2 Watt RF power ..... < 1.0 A

Frequency Bands:

	RX	TX
UHF :	U2 450.000 - 490.000 MHz	450.000 - 490.000 MHz

Lock Time .....< 10 mS

TX to RX attack time ..... < 20 mS (No Power Saving)
RX to TX attack time ..... < 20 mS

Dimensions..... (32 mm)H x (58 mm)W x (125 mm)D

Weight ..... 253 grams

TRANSMITTER Specification

Carrier Power:	**Nom.**	**Max.**	**Min.**
High	5W	< 6W	> 4.5W
Low	1W	< 1.5W	> 0.8W

Sustained Transmission ..... Nominal conditions
Time : 5 10 30 Sec.
Power: >90% >85% >80%

Frequency Error ..... ±5.0 ppm Extreme condition for UHF

Frequency Deviation:
25 kHz Channel Spacing..... Peak ±5.0, Min. ±3.8
12.5 kHz Channel Spacing..... Peak ±2.5, Min. ±1.9

Audio Frequency Response.....Within +1/-3dB of 6dB octave
@ 300 Hz to 2.55 kHz for 12.5 kHz C.S.
@ 300 Hz to 3.0 kHz for 25 kHz C.S.

Adjacent Channel Power
25 kHz ..... < 70 dBc @ Nominal Condition
< 65 dBc @ Extreme Condition

12.5 kHz ..... < 60 dBc @ Nominal Condition
< 55 dBc @ Extreme Condition

Conducted Spurious Emission ..... < -60 dBc

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

Hum & Noise:
25 kHz Channel Spacing ..... > 40 dB (with no PSOPH)
12.5 kHz Channel Spacing ..... > 40 dB (with PSOPH)

Modulation Symmetry ..... < 10 % Peak Dev @ 1 kHz input
for nominal dev +20dB

Load Stability ..... No osc at ≥ 10:1 VSWR all phase angles and suitable antenna
No destroy at ≥ 20:1 all phase angle

Peak Deviation Range Adjustment @ 1 kHz, Nom. Dev +20dB:
25 kHz Channel Spacing ..... Min. 3.5, Max. 6.0
12.5 kHz Channel Spacing ..... Min. 1.5, Max. 4.0

RECEIVER Specification

Sensitivity (12dB Sinad) ..... Standard B.W < -118 dBm, Narrow B.W <-117 dBm @ Nom. Condition

Standard B.W < -115 dBm, Narrow B.W <-114 dBm @ Extreme Condition

Amplitude Characteristic. . . . . . < ±3 dB

Adjacent Channel Selectivity:
25 kHz Channel Spacing ..... > 70 dB @ Nom., > 60 dB @ Extreme Condition
12.5 kHz Channel Spacing ..... > 60 dB @ Nom., > 50 dB @ Extreme Condition

Spurious Response Rejection ..... > 70 dB (100 kHz - 4 GHz)

Image Response .....> 70 dB

IF Response..... > 70 dB

Others. ..... > 70 dB

Intermodulation Response Rejection:
±25 kHz/ 50 kHz ..... > 70 dB
±50 kHz/ 100 kHz ..... > 70 dB

Conducted Spurious Emission @ Nominal Conditions:
9 kHz - 1 GHz ..... < -57 dBm
1 GHz - 4 GHz. .....< -47 dBm

RX Spurious Emissions (Radiated) @ Nominal Conditions
9 kHz - 1 GHz ..... < -57 dBm
1 GHz - 12.75 GHz ..... < -47 dBm

AF Distortion. ..... < 5% @ Nom., < 10 % @ Extreme condition

RX Hum & Noise:
25.0 kHz CP ..... < 40 dB No PSOPH
12.5 kHz CP ..... < 40 dB with PSOPH

Receiver Response Time .....< 16 mS

Squelch Opening Range: .....RF level for 6 to 14 dB Sinad

Squelch Closing Range (Hysteresis): ..... 0 - 6 dB Sinad @ Nominal Condition

Squelch Attack Time:
RF Level at Threshold ..... < 40 mS
RF Level at Threshold + 20 dB ..... < 30 mS

Squelch Decay Time ..... 5 mS Min., 20 mS Max.

Antenna Socket Input Match ..... > 10 dB Return Loss

L.O. Frequency Temperature Stability ..... 1st < 5 ppm, 2nd < 15 ppm from -30° to + 60° C

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

Unpacking information

Remove and carefully inspect the contents of your package(s) for the following items:

Radio

Fused power cord

User manual

If any items are missing, please contact the dealer from which you purchased the radios, or contact us at phone number 1-816-241-8500 or Fax. 1-816-241-5713.

SD-174 Features

• Synthesized Operation with 16 channel capability

• 1 / 5 Watt programmable output power

• Programmable 12.5 / 25KHz channel spacing

• Channel scan

• Busy channel lockout

• Tx Time-out timer

• Power Save

• Marked Idle

• Tx Delay

• Data transmission and reception through GMSK modem

• Data transmission and reception through FFSK modem

• Support transmission of global position data

Description of radio components

❶ Antenna connector

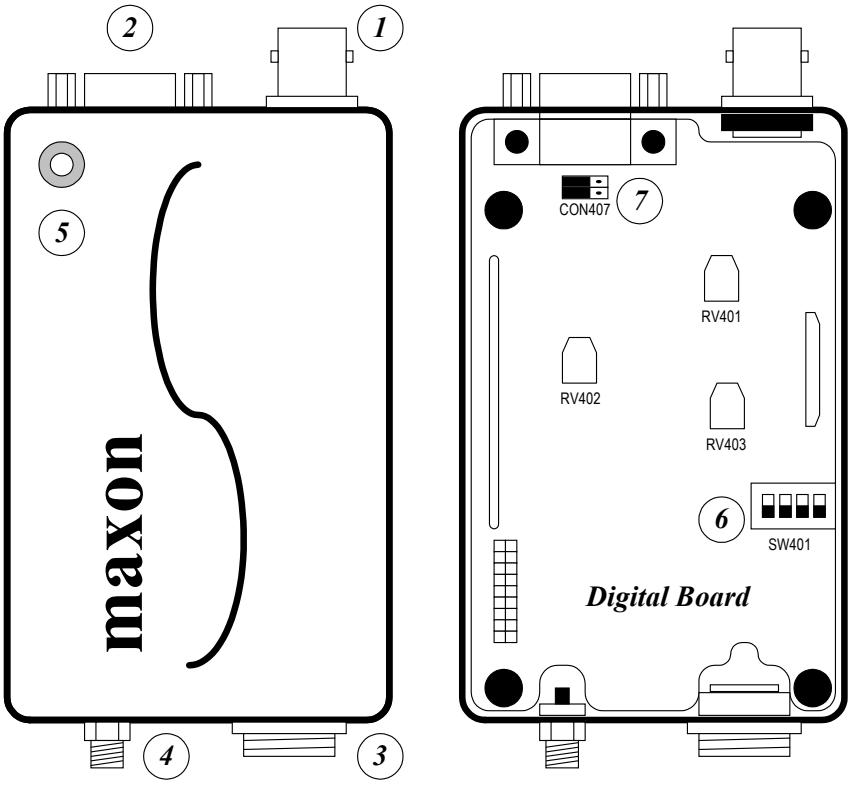
❷ DB-15 connector

❸ Power connector

❹ GPS Antenna connector (option)

❺ LED (Busy / Tx indicator)

Exterior View



Antenna installation

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

Powering the data radio

Your data radio accepts many sources of DC power to permit more versatile use. This radio operates from 9V to 18V DC and standard voltage for test is 12V DC.

Connecting the data radio to DC power

Connect DC power plug of power cable to radio's DC IN power connector and then fasten power plug to the radio by turning the ring clockwise.

SD-170 Series Operation

Channel select / SCAN

Your radio's channel can be selected by inner DIP-S/W or serial command inputted from external control system. To change channel by inner DIP-S/W (❻), you should open the upper cover and then look for the DIP-S/W(❻) on the digital board of the bottom cover. Once located change the DIP-S/W to select wanted channel according to channel dip switch chart.

To use a serial command for channel selection, it should be inputted by external equipment or device(ex. Personal computer) through Pin 8 of DB-15 connector. See the message format for serial command for full details.

If your radio has been programmed the channel scan, you must enter the scan mode by serial command.

Transmit

The transmission will be made by various inputs such as PTT signal (Pin 3 of DB-15 connector), TX serial command and Serial data input (Pin 10 of DB-15 connector : This input is only available when a modem option board is installed). TTL level is used as PTT signal and is active low. If you installed an option modem board, you can use RS-232 level as a PTT signal instead of TTL level. To maintain transmission, continuous PTT signal input is required. If you use Tx serial command for transmission, normally, it's released by Rx serial command. Before the transmission, check the color of the radio's top-panel LED(❺). It will glow orange if RF activity is present; it will not be illuminated if the radio indicates a "clear" channel. When the channel is "clear", input the PTT signal or Tx serial command and transmit data or audio. Remove the PTT signal or input Rx serial command when you have finished transmission.

CAUTION : Operation of the transmitter without a proper antenna installed may result in permanent damage to the radio.

Receive

When you have finished transmission, remove the PTT signal or input Rx serial command. You will receive data from another radio or hear another person talking from the connected external speaker.

Scan modes

Scanning is a dealer programmable feature that allows you to monitor a number of channels. Your dealer will help you define a scanning mode and your channel “scan list”

Channel scan

Once the scan list has been established, initiate scan by serial commands. If a conversation is detected on any of the channels in the scan list, the radio will stop on that channel and you will be able to hear the conversation. At that time, busy channel data is sent to external equipment or device through serial command. So, you can identify busy channel data as decoding of received serial command from your radio in the external equipment or device.
Normally, if you try to transmit during scanning, the transmission will be made on the channel that the call was received during the programmable scan delay time. (The scan delay time is the amount of time the radio will stay on that channel once activity has ceased. Dealer programming of 4 ~ 7 seconds is typical). The radio will resume scanning once the scan delay time has expired, and will continue to scan until the serial command for scan stop is inputted by external equipment. After the scan resumes, if a transmission is made, the radio will transmit on the selected priority channel. This feature is similar to priority scan TX except for selection of priority channel. You can assign a priority channel by inner dip switch only.

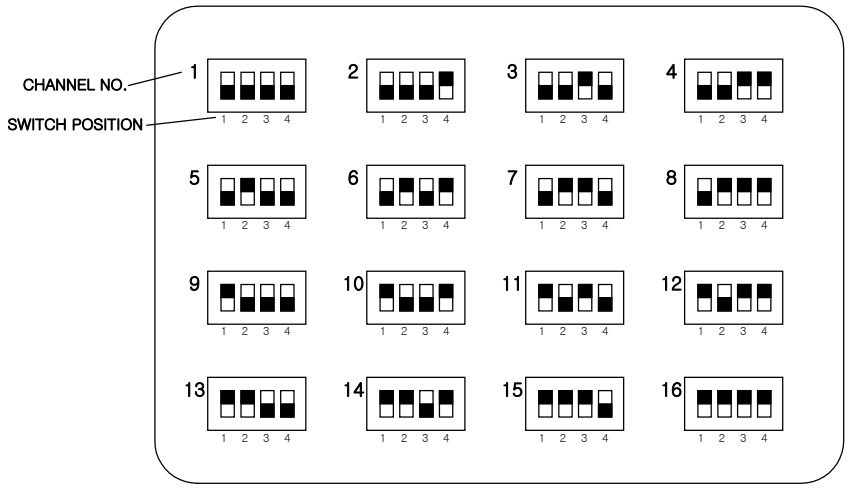
Scan channel delete

To temporarily delete a channel from the scan list, simply input the serial command for scan deletion to the radio while scanning and stopped on the channel to be deleted. This will temporarily remove that channel from the scan list until the scan is closed or the radio’s power is reset.

CTCSS / DCS Scanning

To help to block out unwanted calls to your radio, the SD-170 series can be programmed by your dealer to scan for tones.

Channel dip switch chart



SW401
CHANNEL SELECT SWITCH

Serial command

Serial RX/TX Data Format

(1) Asynchronous Serial Data Transfer

(2) Baud Rate : 4,800 bit/sec

(3) Data Bit : 8bit , Non Parity

(4) Stop Bit : 1bit

(5) MSB first transmission

Each serial command is consist of 3 bytes.

1_{st} byte is command and 2_{nd} is data required by command and 3_{rd} is check sum to decide validity of total contents.

Byte0

ST	1_{st} Byte (Command)	SP

Byte1

ST	2_{nd} Byte (Data)	SP

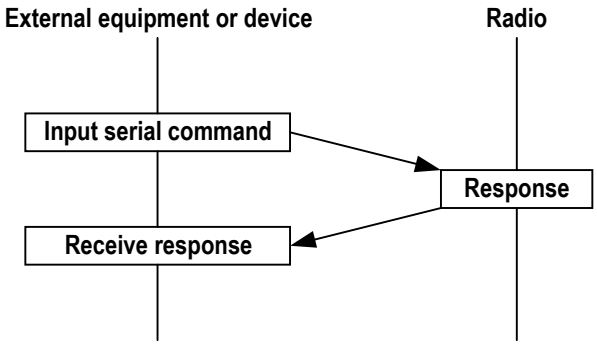
Byte2

ST	3_{rd} Byte (Check Sum)	SP

Data Protocol

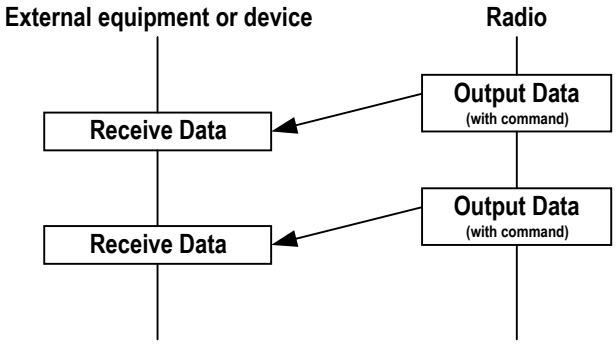
Protocol for input Serial command

Protocol of data transmission from external equipment or device (: PC) to radio :



Protocol for output data

Protocol of data transmission from radio to external equipment or device (: PC) :



Serial Commands

Transmit Command & data

	Mode		Transmit Command (BYTE0)	Transmit data(BYTE1)	Check sum(BYTE2) : Transmit Command + data
1.	Channel Change		0x64	0x?? :Current channel	(0x64 + Channel)
2.	RTX Mode Send.		0x61	R(0x72) : Rx mode T(0x74) : TX mode	(0x61+0x72) (0x61+ 0x74)
3.	Scan Mode	From PC To Radio	0x62	F(0x46) : Scan Stop S(0x73) : Scan Start O(0x4F) : Scan Delete	(0x62+ 0x46) (0x62+ 0x73) (0x62+ 0x4F)

		From Radio To Pc	0x66	0x00 : 1 Channel 0x01 : 2 Channel 0x02 : 3 Channel 0x0f : 16 Channel	0x66 + 0x00 0x66 + 0x01 *Only for Unmute Channel, Correct Call Channel
		Error Message	0x65	● It occurs when Scan Delete command comes except for Busy/Correct Call ● It occurs when PTT key is pushed except for Busy/Correct Call. ● It occurrs when channel change command exists during Scanning.	
4.	GPS mode	Control of GPS Power	0x6a	0x00 : GPS Power Off 0x01 : GPS Power On	(0x6a + 0x00) (0x6a + 0x01)
		Control of GPS Data	0x63	0x00 : GPS Data Disable 0x01 : Release GPS Data to DB-15 0x02 : Release GPS Data to Modem	(0x63 + 0x00) (0x63 + 0x01) (0x63 + 0x02)
5.	Modem test mode		0x75	0x78 : Enable test data 0x79 : Disable test data	(0x75 + 0x78) (0x75 + 0x79)
6.	Modem alignment mode	GMSK	0x7a	0x00 : Disable 0x01 : Enable	(0x7a + 0x00) (0x7a + 0x01)
		FFSK	0x7c	0x00 : Disable 0x01 : Enable Mark data	(0x7c + 0x00) (0x7c + 0x01)
			0x7e	0x00 : Disable 0x01 : Enable Space data	(0x7e + 0x00) (0x7e + 0x01)

Receive Command & data

	Mode	**Transmit Command (BYTE0)**	**Transmit data (BYTE1)**	**Check sum(BYTE2) : Transmit Command + data**
1	Process Complete Commands	0xaa	ACK	
		0x55	NACK	

Note)

This command is return signal for receiving command.

If Byte2 and sum of Byte0 and Byte1 among received data are same, Radio would send ACK data and execute command. If not, Radio sends Nack data.

User would go into next step if receives ACK data. If user receives Nack data, user should send command again.

example) If user changes from 1st Channel to 2nd Channel,

User should send Channel Change Command (0x64,0x02 , (0x64 + 0x2)) to Radio.

If Byte2 and sum of Byte0 and Byte1 among received data are same, Radio sends ACK data to user and changes to 2nd channel. If not, Radio would send Nack data.

Status indicators and audible alert tones

Your SD-170 series data radio has a sophisticated microprocessor control which provides a range of LED displays. LED displays operation mode, current status of radio, warning, and etc. Moreover, if you connect the Speaker filtered OUT (Pin 9 of DB-15 connector) to an external speaker, you can hear audible tones at the following conditions:

• Attempt to transmit on a channel that is already in use when busy channel lockout has been programmed into the radio

• Transmission time has exceeded time-out timer programmed length

• When the other group or people finished transmission using repeater

See the status indicators and audible alert tones chart for full details.

STATUS	DESCRIPTION	LED COLOR	AUDIBLE TONE
NORMAL	POWER ON	Green-Yellow-Red	
	Busy Channel	Yellow	
	Correct Call	Green	
	Transmit	Yellow	
	Transmit Not Allowed		
SCANNING	Normal Scan Mode	Green LED Flash	
	Scan Delete	One time Red LED	
	Scan All Delete	Two times Red LED	
WARNING	Busy Channel lockout	Two times Green LED	Single Beep Tone
	Time out Time	One time Green LED	
	Before 5S T-O-T	One time Green LED	Single Beep Tone
	EEPROM Error	One time Yellow LED	
	Unlock	Four times Yellow LED	
	Communication error with Modem MCU	Green LED flash	
	Transmit Hang on time	-	Single Beep Tone
	Under channel programmed sub-audio SQ, when transmission is tried by input of FSK or GMSK data.	Two times Green LED	
PROGRAM	Read Mode	Red LED flash	
	Write Mode	Green LED flash	
AUTO TEST		Yellow	
SQUELCH PROGRAM MODE	Open Squelch Mode	Three times Green LED	
	Close Squelch Mode	Two times Green LED	
	Save Squelch Mode	One time Green LED	
	Init Data Load	One time Green LED	

DB 15 PIN descriptions with input/output level

D-Type Pin No.	Function	Description	Signal Type	Input/ Output
1	Data modulation IN (Tx Mod)	Signal is directly injected to MOD through data low pass filter without pre-emphasis.	Analog signal 1KHz audio at 60% peak system deviation input level = 100 to 120mVrms	I/P
2	Data unfiltered OUT (RX disc)	Discriminator audio from the SD-170. This is the unprocessed AF signal prior to tone filtering and de-emphasis.	Analog signal 1KHz audio at 60% peak system deviation produces 200 to 300mVrms	O/P
3	PTT In (Tx Key)	Signal from the 'external device' to key the SD-170 transmitter. This line has an internal pull up resistor to +5V. Pulling the line to 0V turns on the transmitter. **Note : If you installed option modem board, you can select RS-232 signal level by Jumper (CON407, ❼) on the digital board.**	TTL level 0V = Tx o/c = Rx RS-232 level (option) +12V = Tx -12V = Rx	I/P
4	Ground	Ground connection to chassis of the radio.	0V (Chassis)	
5	Serial Data Out (TXD)	Serial data output for radio control or program. It uses asynchronous data format.	TTL level	O/P
6	Busy (CD)	Logic level output from SD-170 to indicate whether a carrier is present or not **Note : If you installed an option modem board, you can select RS-232 signal level by Jumper (CON407, ❼) on the digital board.**	TTL level 0V = carrier 5V = no carrier RS-232 level (option) +12V = carrier -12V = no carrier	O/P
7	Microphone filtered audio IN	This signal is injected to the MOD at the point through audio-amplification, pre-emphasis and high pass filtering where sub-audio tone is mixed with audio.	Audio 1KHz audio at 60% peak system deviation input level = 6 to 8Vrms	I/P
8	Serial data IN (RXD)	Serial command or data input for radio control or program. It uses asynchronous data format.	TTL level	I/P
9	Speaker filtered OUT	Audio output from the audio amplifier. It's filtered by tone-filter, de-emphasis circuit.	Audio 1KHz audio at 60% peak system deviation produces Nominal 1Vrms @ 8Ω	O/P
10	Serial data IN for option modem	The Serial data to be transmitted is input to this pin. It's only available when option modem board is installed. Inputted data are modulated by modem IC and then injected to MOD. It uses asynchronous data format.	RS-232 level	I/P
11	Serial data Out for option modem	The recovered asynchronous serial data output from the receiver. It's only available when option modem board is installed. It uses asynchronous data format.	RS-232 level	O/P
12	Serial data busy for option modem (reserved)	To eliminate data loss according to buffer overrun of slave MCU's memory, it indicates buffer status.	RS-232 level	O/P

13	GPS data input	Data input for initial setting of GPS module. It follows NMEA 0183 format and uses asynchronous data format.	TTL level	I/P
14	DGPS data input	Data input for DGPS Correction of GPS module. It follows NMEA 0183 format and uses asynchronous data format.	TTL level	I/P
15	GPS data output	Position data output from the GPS module. It follows NMEA 0183 format and uses asynchronous data format.	TTL level	O/P

Modem option for data communication

DESCRIPTION

The ACC-513 and ACC-514 are internal option-modems, which are applied to the SD-170 series 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 most obvious method of increasing the data efficiency is to maximize the data signaling speed in the limited channel bandwidth. But, FSK, called direct FM modulation, has a very wide transmission bandwidth requirement. To solve this problem a GMSK(Gaussian Filtered Minimum Shift Keying) internal option-board can be used. Generally data has a wider bandwidth than audio. So, direct application of data is not matched with an audio system and its application. For instance, if sub-audio (Tone) SQ system applied to a data application, its frequency conflicts with that of sub-audio. Moreover, the inputted data is filtered by the audio filter circuit resulting in broken data transmission. To overcome these problems and provide maximum flexibility, an FFSK(Fast Frequency Shift Keying) internal option-board can be used.

COMMUNICATION BETWEEN DTE AND OPTION-BOARD

Our internal modem options consist of Slave MCU, Modem IC, and extra circuitry. These option-boards directly communicate with DTE (Data Terminal Equipment) to send and receive meaningful data through the DB-15 connector on the digital board of the SD-170. These modems are designed to accept RS232 serial data format and are also capable of high speed wireless data-transmission between two or more devices. More detailed information for the modem option boards is given in the technical manual for the ACC-513/514. Your dealer will help you define a TX On/Off delay time, RX On delay time, Baud Rate, Modem Enabled, Modem Baud Rate, Data flow control, and Test Mode.

Table for modem speed

Channel Space	DTE Baud Rate	Modem Baud Rate
Narrow (12.5KHz)	1200	1200
	2400	2400
Standard (25KHz)	1200	1200
	2400	2400
	4800	4800

Table 1. Available Baud rate for FFSK modem

Channel Space	DTE Baud Rate	Modem Baud Rate
Narrow (12.5KHz)	4800	4800
Standard (25KHz)	4800	4800
	9600	9600

Table 2. Available Baud rate for GMSK modem

Transmission GPS Data through Modem

The SD-170 supports GPS data handling. That may help your implementation for a system related to GPS. If it is not enough for your application, received position data from the GPS module placed in an SD-170 can be reprocessed by your own application. The ACC-515 is a GPS module for the SD-170, which releases 11 different output data according to the NMEA-0183 format, which can be selected by you, the available data should be processed by your application. Received data from the ACC-515 will be released via the DB-15 connector of the SD-170 and/or transmitted to another system through an installed modem. More detailed information for the GPS option board is given in the technical manual for the ACC-515.

Option board pin-out chart

FFSK Modem Option board

Connector No.	Pin No.	Function	Description	Input/ Output
Connector 1	1	VCC	6V to 12V Power Input	I/P
	2	GND	Ground	
	3	PTT	Signal from the digital board to transmit data key the SD-170 transmitter	I/P
	4	TXD_EN	It ensures that the radio has stabilized in transmission before the data is processed for modulation.	I/P
	5	TX_END	To finish transmission, it indicates memory buffer of Master MCU of digital board is empty.	O/P
	6	MUTE (Busy)	Logic level input from digital board to indicate whether a carrier is present or not	I/P
	7	MODEM_EN	Modem Enable input	I/P
	8	POWER_SAVE	Power save input for modem board.	I/P
	9	CMD_EN	It indicates that command for Modem programming is effective.	I/P
	10	CMD_IN/OUT	Data Input and Output for Modem programming.	I/P, O/P
	11	CMD_CLK	Clock Input for Modem programming.	I/P
	12	MODEM_SEL	It Indicates modem type to Master MCU for programming.	O/P
	13	RX_IN	The FFSK/MSK signal input for the receiver of modem IC.	I/P
	14	TX_OUT	The FFSK/MSK signal output when the transmitter is enabled.	O/P
Connector 2	1	Serial_IN	The Serial data to be transmitted is input to this pin.	I/P
	2	Serial_OUT	The recovered asynchronous serial data output from the receiver.	O/P
	3	Busy	To eliminate data loss according to buffer overrun of slave MCU's memory, it indicates buffer status.	O/P
	4	Carrier_Detect	Handshake signal for RTS control mode. It indicates whether Slave MCU of modem has decoded data or not.	O/P
	5	PTT_IN	Handshake signal for RTS control mode. It requests data transmission to Slave MCU of modem.	I/P
	6	PROGRAM	It's reserved input for firmware upgrade.	I/P

GMSK Modem Option board

Connector No.	Pin No.	Function	Description	Input/ Output
Connector 1	1	VCC	6V to 12V Power Input	I/P
	2	GND	Ground	
	3	PTT	Signal from the digital board to enable transmitter circuit of modem board.	I/P
	4	TXD_EN	It ensures that the radio has stabilized in transmission before the data is processed for modulation.	I/P
	5	TX_END	To finish transmission, it indicates memory buffer of Master MCU of digital board is empty.	O/P
	6	MUTE (Busy)	Logic level input from digital board to indicate whether a carrier is present or not	I/P
	7	MODEM_EN	Modem Enable input	I/P
	8	POWER_SAVE	Power save input for modem board.	I/P
	9	CMD_EN	It indicates that command for Modem programming is effective.	I/P
	10	CMD_IN/OUT	Data Input and Output for Modem programming.	I/P, O/P
	11	CMD_CLK	Clock Input for Modem programming.	I/P
	12	MODEM_SEL	It Indicates modem type to Master MCU for programming.	O/P
	13	RX_IN	The GMSK signal input for the receiver of modem IC.	I/P
	14	TX_OUT	The GMSK filtered Tx output signal.	O/P
Connector 2	1	Serial_IN	The Serial data to be transmitted is input to this pin.	I/P
	2	Serial_OUT	The recovered asynchronous serial data output from the receiver.	O/P
	3	Busy	To eliminate data loss according to buffer overrun of slave MCU's memory, it indicates buffer status.	O/P
	4	Carrier_Detect	Handshake signal for RTS control mode. It indicates whether Slave MCU of modem has decoded data or not.	O/P
	5	PTT_IN	Handshake signal for RTS control mode. It requests data transmission to Slave MCU of modem.	I/P
	6	PROGRAM	It's reserved input for firmware upgrade.	I/P

GPS Option board

Pin No.	Function	Description	Input/ Output
1	VCC	6V to 12V Power Input	I/P
2	VBAT	Backup Power Input (3.3V)	I/P
3	ENABLE	GPS Data Out Enable	I/P
4	PSAVE	GPS Power Enable (& Power save input for GPS)	I/P
5	GND	Ground	
6	GPS_OUT	Position Data Output	O/P
7	DGPS_IN	DGPS Correction Data Input	I/P
8	GPS_IN	Initial Setting Data Input	I/P
9	+5V	5V Power Input	I/P

Compatible accessory list

ACC-513 9600 baud GMSK modem

ACC-514 4800 baud FFSK modem

ACC-515 GPS receiver

ACC-160 GPS antenna

ACC-516 PCB Interface - used to separate digital and RF board for alignment

ACC-916 Personality programming software

ACC-2016 Individual programming cable