

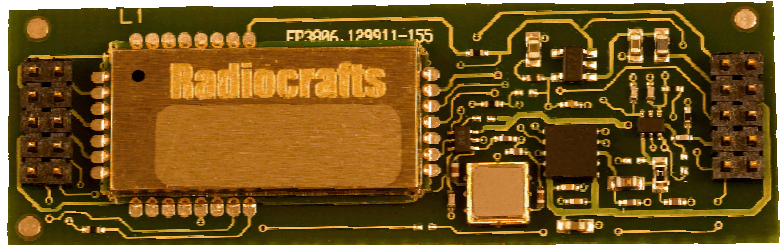
High Performance 500 mW Multi-Channel RF Transceiver Module

Product Description

The RC1280HP is based on the RC1280 RF Transceiver Module for FSK operation with embedded protocol and up to 500 mW output power for increased range. The modules are pre-certified for operation under the European radio regulations for license-free use. When used with quarter-wave antennas a line-of-sight range of 5-6 km can be achieved. The -HP module uses the same protocol (RC232™) and channels as the RC1280, thus interoperation between RC1280 and RC1280HP is possible in a network with long- and shorter range modules.

Applications

- Automatic meter reading (AMR)
- OEM equipment
- Alarm and security systems
- Point-of-sales terminals
- Bar code scanners
- Telemetry stations
- Fleet management



Features

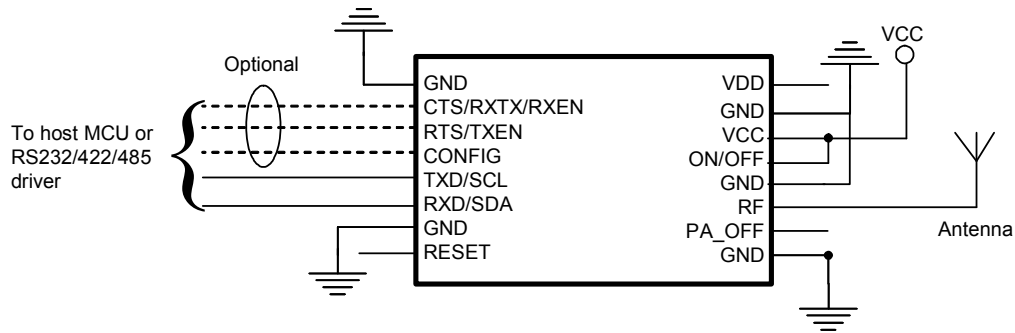
- Small size (19.5 x 60.5 x 6.0 mm)
- 25 kHz narrow band multi-channel operation
- Very low current consumption, 3nA OFF mode
- Embedded RC232™ protocol
- Addressing and Error check
- 128 byte data buffer
- Simple UART interface for easy RS232/422/485 wire replacement
- No external components
- No configuration required for single-channel use
- Easy to use data interface, 3/5 V tolerant I/O (not VCC)
- Conforms with EU R&TTE directive (EN 300 220, EN 301 489, EN 60950)

Quick Reference Data

Parameter	RC1280HP	Unit
Frequency band	869.400 – 869.650 (500 mW) 868-870 (10 mW)	MHz
Number of channels	5 (high power mode), 80 (low power mode)	
Channel bandwidth	25	KHz
Data rate	4.8	kbit/s
Max output power	500	mW
Sensitivity	-108	dBm
Supply voltage	3.3	Volt
Current consumption, RX	20.7	mA
Current consumption, TX	28 / 650*	mA
Current consumption, SLEEP	0.9	mA
Current consumption, OFF	0.003	uA

* At 500mW output power

Typical Application Circuit



Quick Product Introduction

How do I transmit data?

Send your data to the RXD pin on the module. Use the UART format with settings (19200, 8, 1, N, no flow control), use 2 stop-bits if CTS is enabled. Up to 128 bytes are buffered in the module. The module will transmit the data when

- the max packet length is reached
- the unique end character is sent
- the modem timeout limit is reached

The packet length, end character and timeout limit are configurable in-circuit.

How do I receive data?

Any received data packet with correct address and check sum will be sent on the TXD pin using the same UART format as for transmit.

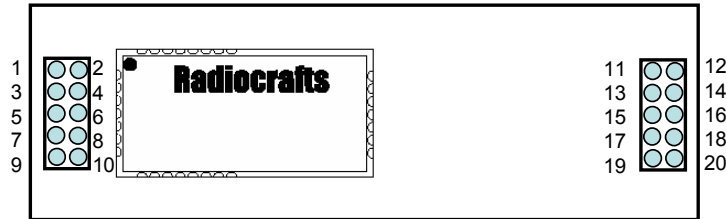
What about the antenna?

In most cases a simple quarter wavelength wire or a PCB track will do. Connect a piece of wire to the RF pin with length corresponding to the quarter of a wavelength. For space limited products, contact Radiocrafts and we will recommend the best antenna solution for your application.

How do I change the RF channel or any other parameter?

To change configurable parameters, assert the CONFIG pin, and send the command string using the same serial interface as for transmitting data. Parameters can be changed permanently and stored in non-volatile memory in the module.

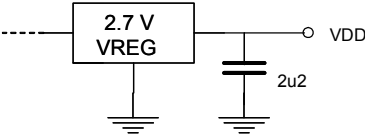
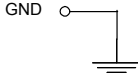
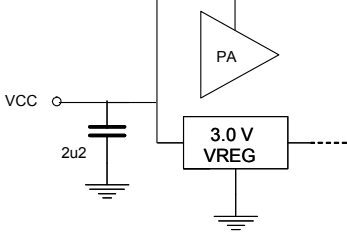
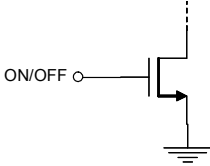
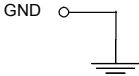
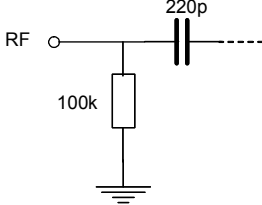
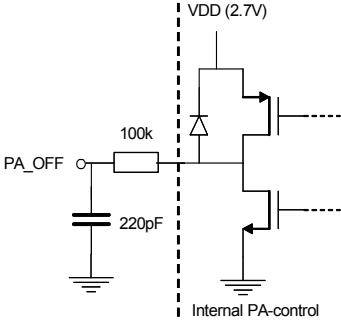
Pin Assignment

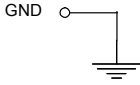


BOTTOM / CONNECTOR-SIDE VIEW

Pin Description

Pin no	Pin name	Description	Equivalent circuit
1	GND	System ground	
2	CTS/RXTX/RXEN	UART Clear to Send, UART RXTX, Receive Mode Enable, or SLEEP mode activation. Connect to VDD if not used. Internal 100 kΩ series resistor	<p>Input:</p>
3	RTS/TXEN	UART Request to Send, Transmit Mode Enable, or SLEEP mode activation. Connect to VDD if not used. Internal 100 kΩ series resistor	
4	CONFIG	Configuration Enable. Active low. Should normally be set high. Connect to VDD if not used. Internal 100 kΩ series resistor	<p>Output:</p>
5	TXD/SCL	UART TX Data, or serial data clock. Internal 100 kΩ series resistor	
6	RXD/SDA	UART RX Data, or serial data I/O. Internal 100 kΩ series resistor	<p>Output:</p>
7	GND	System ground	
8	RESET	Main reset (active low). Should normally be left open. Internal 100 kΩ pull-up resistor, 10 kΩ series resistor	<p>VDD (2.7V)</p>
9-10	N/C	Do not connect, leave floating	

11	VDD	Supply voltage output, regulated. Should normally be left open	
12	GND	System ground	
13-14	VCC	Supply voltage input. Internally regulated except for supply voltage to PA. Maximum rise-time requirement apply, see Electrical Specifications. Connection to one pin is sufficient, internally connected on module	
15	ON/OFF	Module on/off (shutdown). ON when high, OFF when low. For threshold see Electrical Specifications. Or connect to VCC. See important note under Power Management page 7	
16	GND	System ground	
17-18	RF	RF I/O connection to antenna (connection to one pin is sufficient, internally connected on module)	
19	PA_OFF	Forces PA "OFF" and fix internal RF switches. Pull low (GND) for frequencies where high power is not allowed or if low-power output is wanted. Leave floating (do not pull high) for PA "ON". PA_OFF overrides internal PA-control signal.	

20	GND	System ground	
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Note 1: In UART mode the TXD and RXD are used for serial data, and CTS/RXTX and RTS for flow control (optional). If flow control is not used, and RXEN and TXEN are both asserted (active low) the module is set in SLEEP mode. RXEN and TXEN should be connected to VDD if not used for SLEEP mode activation. A pull-up resistor is not necessary due to an internal series resistor.

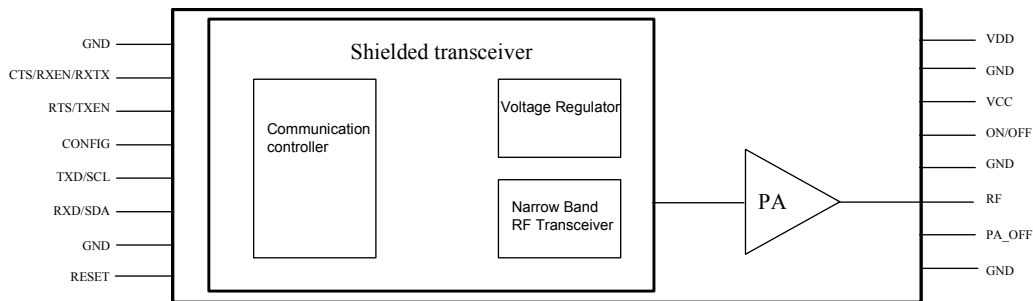
Note 2: In synchronous mode the SCL (data clock) and SDA (Data input and output) are used for serial data. The RXEN and TXEN pins are then used to select the operation mode of the device. Signals are active low.

Note 3: The CONFIG pin is used to enter configuration mode (change of default settings). Active low.

Note 4: Do not use VDD for supply to external circuits. Should only be used for pull-ups, if required.

Note 5: RXEN, TXEN, CONFIG, TXD and RXD have internal 100 kΩ series resistors. Driving capability when used as outputs is therefore limited and should be connected to CMOS inputs only.

Block Diagram



Circuit Description

The module contains a communication controller with embedded RC232™ protocol software, a narrow band high performance RF transceiver, an RF power amplifier and an internal voltage regulator.

The communication controller handles the radio packet protocol, the UART interface and controls the RF transceiver. Data to be sent by the host is received at the RXD pin and buffered in the communication controller. The data packet is then assembled with preamble, start-of-frame delimited (SOF), address information and CRC check sum before it is transmitted on RF. The preamble and SOF is always used. The address and CRC are optional.

The RF transceiver modulates the data to be transmitted on RF frequency, and demodulates data that are received. Narrow band technology is used to enhance sensitivity and selectivity.

The power amplifier (PA) is used to increase the output power up to 500mW. The PA_OFF signal can be used to disable and bypass the PA.

Received data are checked for correct address and CRC by the communication controller. If the address matches the modules own address, and no CRC errors were detected, the data packet is sent to the host on the TXD line after removing the header.

The asynchronous UART interface consists of RXD and TXD. Optionally CTS, RTS/RXTX can be used for hardware handshake flow control. RTS/RXTX can be used to control the direction of an RS485 driver circuit.

The module can also be used in an un-buffered transparent mode. In this case the data interface is synchronous using SCL and SDA for data transfer to/from the host. The RXEN and TXEN are then used to set the operational mode.

When the CONFIG pin is asserted the communication controller interprets data received on the RXD pin as configuration commands. There are commands to change the radio channel, the output power, the destination address etc. Permanent changes of the configuration is also possible and are then stored in internal non-volatile memory (EEPROM).

The RF protocol and the configuration commands are described in detail in the RC232™ User Manual.

The supply voltage is connected to the VCC pin. The module contains an internal voltage regulator and can therefore operate over a wide supply voltage range. The regulated voltage is available at the VDD pin, but should not be used to supply external circuits.

The ON/OFF pin can be used to turn the module completely off, and hence reduce the power consumption to a minimum. For normal operation the ON/OFF pin must be connected to VCC. To turn the module completely off, connect the ON/OFF pin to ground (logic low level).

RC232™ Embedded Protocol

The module offers a buffered packet radio as well as an un-buffered transparent mode in the RC232™ embedded protocol.

Using the buffered packet radio mode, all data to be sent is stored in the module before they are transmitted by the RF circuitry. Likewise, when data is received they are stored in the module before they are sent to the host. This allows the communication controller to add address information and to do error check of the data. In buffered mode the UART interface is used to communicate with the host.

If the application requires a transparent data link, the module can be configured to operate in an un-buffered mode. In this mode the module adds only a preamble and start-of-frame bytes to synchronize the receiver. No addressing or checksum is provided in this case. A synchronous interface is used to transfer data to/from the host. Note however, that the configuration of the module is done using the UART even if the un-buffered mode is used for data transfer.

The embedded protocol, configuration commands and configuration memory is described in the RC232™ User Manual. This protocol is used in a wide range of RF modules available from Radiocrafts. Please refer to the latest revision available on Radiocrafts web-site.

Power Management

The module can be set in SLEEP mode or OFF mode in order to reduce the power consumption.

The low power SLEEP mode is entered by using the SLEEP command, see RC232™ User Manual, or by pulling both RXEN and TXEN low. In sleep mode the module will not receive or detect incoming data, neither from the host (UART port) nor from the RF transceiver. The module is awakened from the SLEEP mode by a positive edge on the CONFIG, RXEN or TXEN pins if the module was set in SLEEP mode using the 'Z' command. The module is awakened by a positive edge on the RXEN or TXEN pin if these two pins were used to enter SLEEP mode. CONFIG must be high when awakening the module to avoid setting the module directly in configuration mode.

Note: If UART handshake is used, the RXEN and TXEN pins cannot be used to enter SLEEP mode. In this case, use the SLEEP command.

The ultra-low power OFF mode is entered by pulling the ON/OFF pin low. The module will then shut down completely. The module is turned on by setting the ON/OFF pin high (to VCC). After the module has been in OFF mode all operational parameters are set to the values stored in configuration memory.

The VDD output should not be used to supply external circuits, other than for pull-ups for RXEN, TXEN and CONFIG.

Power on Reset

In order to ensure that the internal Power on Reset (POR) operates correctly, the maximum rise-time specification for VCC must be met (see Electrical Specifications). Longer VCC rise-time or short supply voltage interrupts may cause improper operation that is not handled by the internal POR. For proper operation it is crucial to use an external control of the RESET pin as described below (see also Application Note AN001).

When turning the module OFF by setting ON/OFF low, or switching VCC off, great care should be taken to ensure proper power-on-reset (POR). I/O pins driving the module when the module is off can give a low residual voltage in the module that prevents triggering of the internal POR. Also in this case an external RESET signal is required to ensure proper start-up.

The figures below shows suggested circuits for RESET control. The MCU can operate over the whole VCC operation range. But do note that the module TXD output operates at 2.7 V, and hence the host MCU must accept this lower voltage swing. If not, a voltage translator must be used, see section 'I/O pin Interfaces' page 11). The suggested solutions are:

- Control the RESET pin by a separate I/O pin from the MCU (RESET has an internal 10k series resistor and a 100k pull-up to VDD). Set RESET low before ON/OFF is turned low, and keep low until ON/OFF is high again ($VCC - 10\%$). This will ensure proper power-on reset (POR). See Figure 1 below.
- Control the RESET pin by the same I/O in used to control ON/OFF. See Figure 2 below.
- Use an external POR and brown-out supervisory circuit. The circuit should be connected between VDD and GND, controlling RESET. This solution will force RESET low as long as VDD is below the threshold voltage. The RESET has an internal pull-up resistor to VDD, thus an open-drain output supervisory circuit can be used. A threshold voltage between 2.3 and 2.6 V is recommended. See Figure 3. Supervisory circuits are suggested below.
- If the host system already has an external POR and brown-out supervisory circuit, this can also be used to control the module RESET. The supervisory circuit should be connected between VCC (or the MCU supply voltage if different) and GND, controlling RESET directly. This solution will force RESET low as long as VCC is below the threshold voltage. The RESET has an internal pull-up resistor to VDD, thus an open-drain output supervisory circuit can be used. A threshold voltage of 2.8 V or higher is recommended. See Figure 4. Supervisory circuits are suggested below.

In figure 1-4 on the following pages the N/C- and optional pins are not shown while the Reset-pin is placed on the longer side for improved visibility.

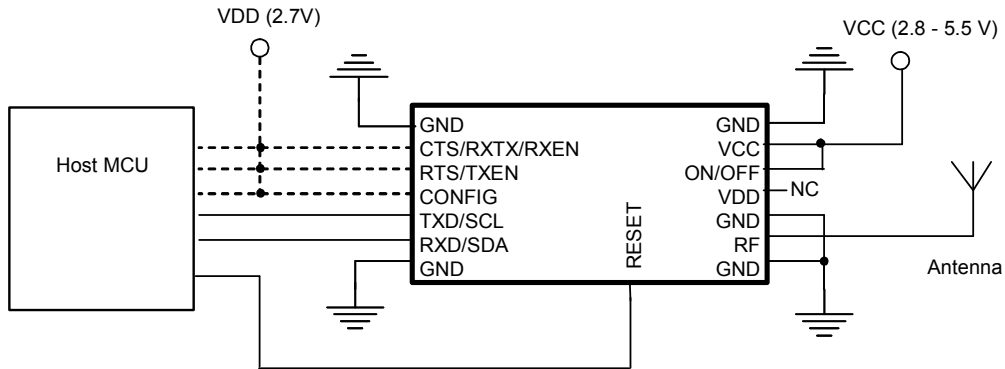


Figure 1. Reset circuit using host MCU

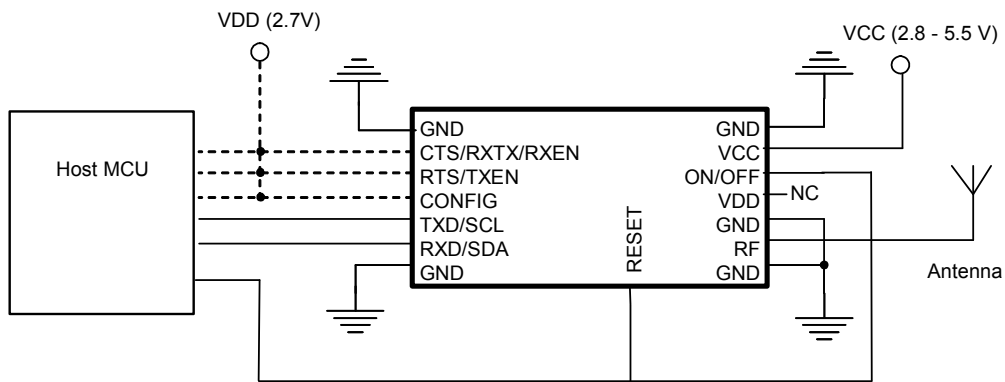


Figure 2. Reset circuit controlling ON/OFF

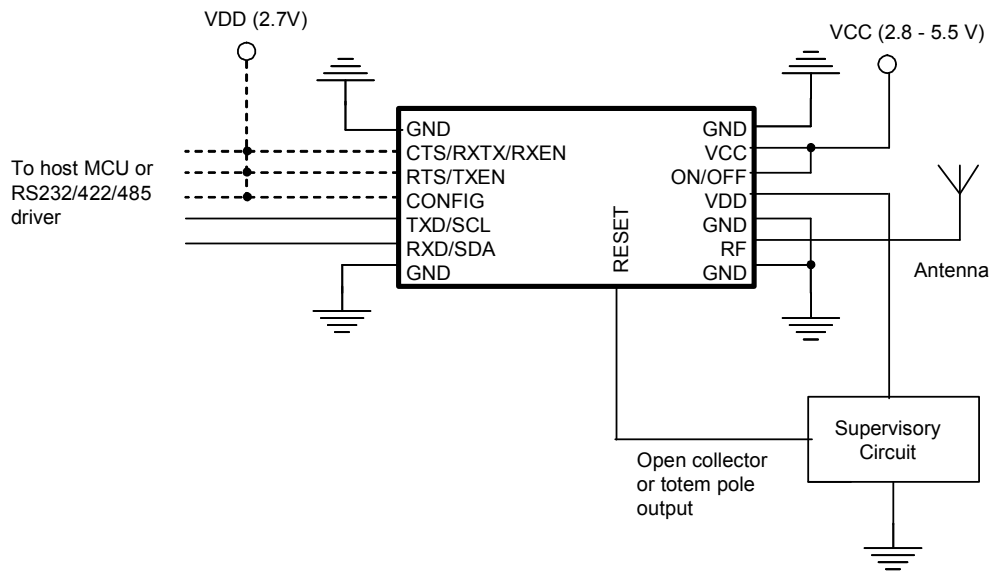


Figure 3. Reset circuit using supervisory circuit on VDD

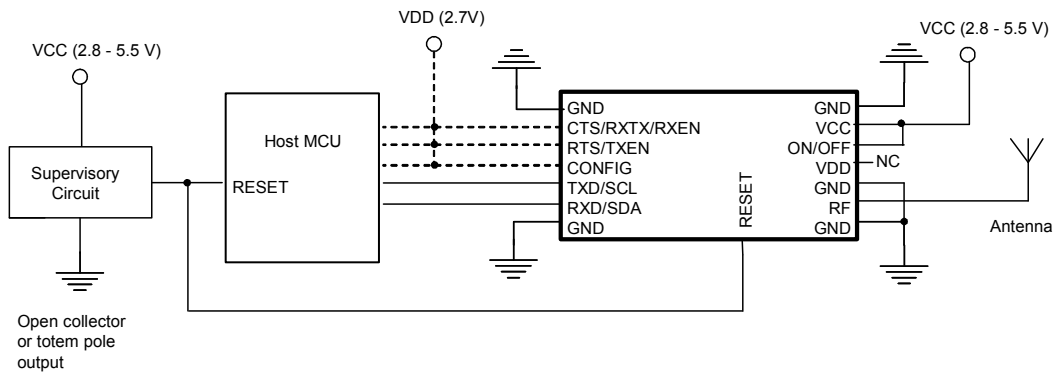


Figure 4. Reset circuit using supervisory circuit on VCC

As a reference, potential suppliers of supervisory circuits are provided below. Radiocrafts does not endorse any specific vendor. In most cases, similar components from other suppliers will provide satisfactory performance. A threshold voltage of 2.3 – 2.6 V is recommended if the supervisory circuit is connected to VDD.

Manufacturer	Model number	Delay [ms]	Nominal trigger volt.	Max trigger volt.	Output	Package	Distributor
Microchip	MCP100-270	150-700	2.62	2.70	Push-pull	SOT-23/3 & TO92	Future, Digi-Key
Microchip	TC1275-20ENB	100-300	2.55	2.64	Complementary 100k pull down for RST=0V	SOT-23B/3	Future, Digi-Key

Maxim	MAX803R/ MAX809R	140- 460	2.63	2.70	Open-drain/ push-pull	SOT-23/3 SC-70/3	Maxim direct
Maxim	MAX6328_ R25-T	100- 280	2.50	2.562	Open drain, external pull- up resistor	SOT-23/3 SC-70/3	Maxim direct
Analog Devices	ADM809_ Z	140- 460	2.32	2.38	Push-pull	SOT-23/3 SC-70/3	Arrow
Texas Instruments	TPS3800G 27	60- 140	2.5	2.55	Push-pull	SC-70/5	Avnet, Digi-Key
Texas Instruments	TPS3809J 25	120- 280	2.25	2.30	Push-pull	SOT-23/3	Avnet, Digi-Key
Texas Instruments	TPS3836J 25	5-15	2.25	2.29	Push-pull	SOT-23/5	Avnet, Digi-Key
Sipex	SP810EK- 2-3	100- 1030	2.3	2.346	Push-pull	SOT-23/3	Future, Newark
National Semiconduc tor	LM3722E M5-2.32	100- 560	2.32	2.37	Push-pull	SOT-23/5	Future

I/O pin Interfaces

As noted in the Pin Description, RXEN (CTS/RXTX), TXEN (RTS) and CONFIG pins should have their pull-ups connected to VDD, not VCC. If RXEN is used as CTS (hardware handshake) or as RXTX (RS485) output, no pull-up is required and should be avoided as this reduces the voltage swing due to the internal resistor.

Important note: The RXEN (CTS/RXTX) and TXD (SCL) and SDA pins are logic signals with 0 – VDD voltage swing, where VDD is 2.7 V. When connecting these signals to external circuitry operating on supply voltage above 2.7 V, a level translator may be required. Single transistor buffers or integrated level translators can be used for this purpose. An example of such a level translator is SN74LVC1t45.

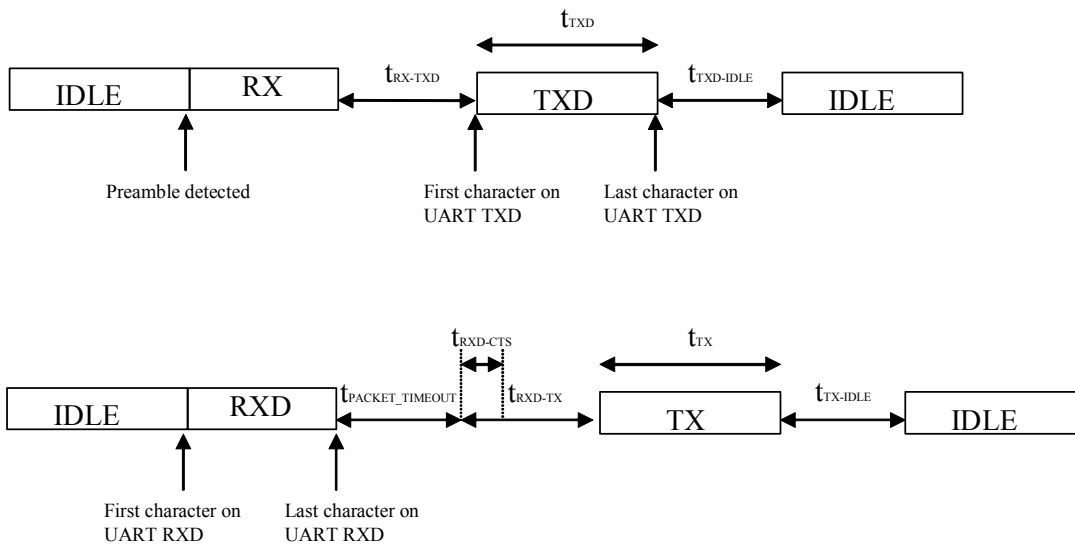
PA_OFF: This input signal forces internal PA off and fixes the position of the internal RF switches in a low-power mode for shorter range communication with lowered current consumption during RF transmissions.

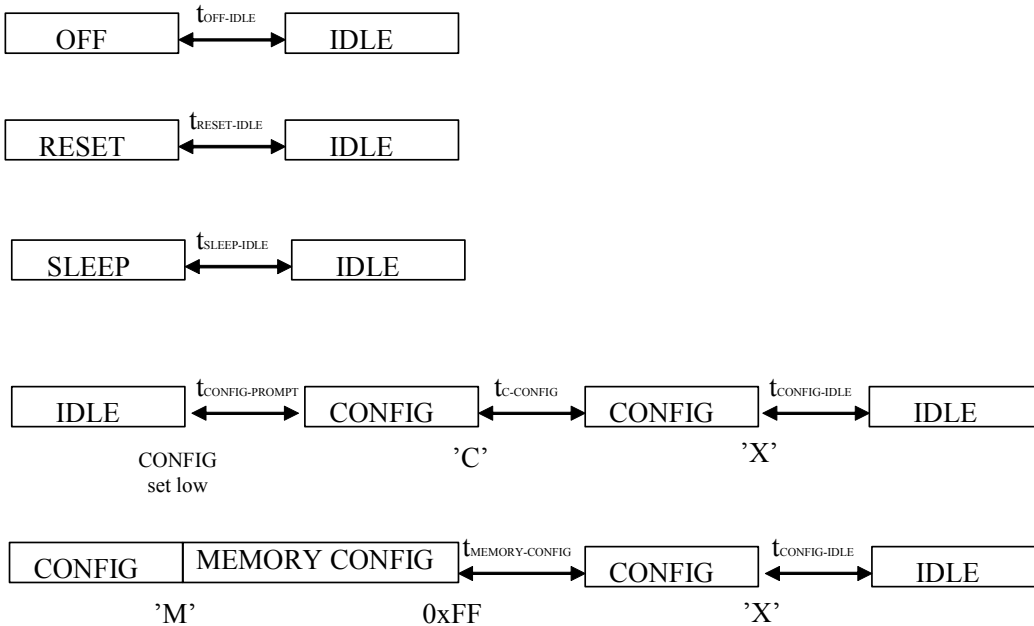
Timing Information

The figure and table below shows the timing information for the module when changing between different operating states.

The IDLE state is the normal state where the module search for preamble on the air and wait for a character to be received on the UART. RX is the state when receiving characters from the host filling up the internal buffer. TX state is when the data is transmitted on the air. RX state is when data is received from the air after preamble detection. TXD is the state where the received data is sent to the host on the UART.

CONFIG is the state entered by asserting the CONFIG pin and used during parameter configuration, while MEMORY CONFIG is the sub-state entered by the 'M' command where the configuration memory is being programmed. Note the limitation on maximum number of write cycles using the 'M' command, see Electrical Specifications.





Symbol	Value	Description / Note
t_{RX-TXD}	500 us	Time from last byte is received from the air until first character is sent on the UART
t_{TXD}	Min 621 us	$t_{TXD} = \# \text{ bytes received} \times 621 \text{ us/char}$ (10 bits at 19.2 kBd + 100 us delay per character)
$t_{TXD-IDLE}$	5 ms	Time from last character is sent on the UART until module is in IDLE mode (ready for RXD and RX)
$t_{PACKET-TIMEOUT}$	Programmable	If enabled, the packet timeout can be configured from 32 ms to 4.08 s. If end character or fixed packet length is used, the timeout is 0
$T_{RXD-CTS}$	25 us	Time from last character is received by the UART (including any timeout) until CTS is activated
t_{RXD-TX}	1.3 ms	Time from last character is received by the UART (including any timeout) until the module sends the first byte on the air
$T_{TX-IDLE}$	5 ms	Time from last character is sent on the air until module is in IDLE mode (ready for RXD and RX)
$t_{OFF-IDLE}$	160 ms	
$t_{RESET-IDLE}$	160 ms	
$t_{SLEEP-IDLE}$	55 ms	
$t_{CONFIG-PROMPT}$	1.7 ms	Time from CONFIG pin is set low until prompt (">")
$t_{C-CONFIG}$	43 ms	Delay after channel-byte is sent. Other commands configuring volatile memory takes immediate action
$t_{MEMORY-CONFIG}$	66 ms	In this period the internal flash is programmed. <i>Do not reset, turn the module off, or allow any power supply dips in this period as it may cause permanent error in the Flash configuration memory. After 0xFF the host should wait for the '>' prompt before any further action is done to ensure correct re-configuration</i>
$T_{CONFIG-IDLE}$	5 ms	
t_{TX}	Min 21.7 ms	$t_{TX} = \# \text{ bytes to send} \times 1.67 \text{ ms/byte}$ (at 4.8 kbit/s). Add 13 overhead bytes if addressing and CRC is not used. Add additionally 2 extra bytes for addressing and 2 extra bytes for CRC if enabled.

Note also that in IDLE mode every 13 seconds the module recalibrates its internal UART clock reference in order to compensate for temperature drift. The recalibration takes approximately 500 us. There is no recalibration in CONFIG mode, therefore the module should not be left in CONFIG mode for an extended time if the temperature is likely to change by more than +/- 5 degrees.

RF Frequency and Maximum Output Power Level settings

The following table shows the available RF channels and their corresponding frequencies and nominal output power levels versus RF_POWER settings.

RF channels	PA_OFF setting	Output Power Mode	Applicable channels	Output power, nominal
1-80: $f_{RF}=868.0125+(N-1)*0.025$ MHz where N is the channel number	Pulled low, GND	Low Power (Max 10mW)	1-80 (0x01-0x50)	1: -17 dBm 2: -12 dBm 3: -7 dBm 4: -2 dBm 5: +2 dBm
Factory setting: 61 (0x3D): 869.5125 MHz	Floating	High Power (10-500mW)	1-80 (0x01-0x50)	1: +2 dBm Max setting: 2: +10 dBm
			Highest power channels only at: Channel 59-63 (0x3B – 0x3F)	1: +2 dBm 2: +10 dBm 3: +15 dBm 4: +23 dBm Max setting: 5: +26 dBm

RF channel and output power level can be set using the configuration commands 'C' and 'P' respectively. The *default* RF channel and output power level can be set in the configuration memory by using the 'M' command setting RF_CHANNEL and RF_POWER. The default values are used after power ON and RESET. The default factory settings are shown in **bold** in the table above.

For more details on changing the RF channel, or output power, refer to the RC232™ User Manual describing the configuration commands.

The use of RF frequencies and maximum allowed RF power is limited by national regulations. The RC1280HP is complying with the applicable directives within the European Union. For more information see section *Regulatory Compliance Information* page 21.

RSSI Reading

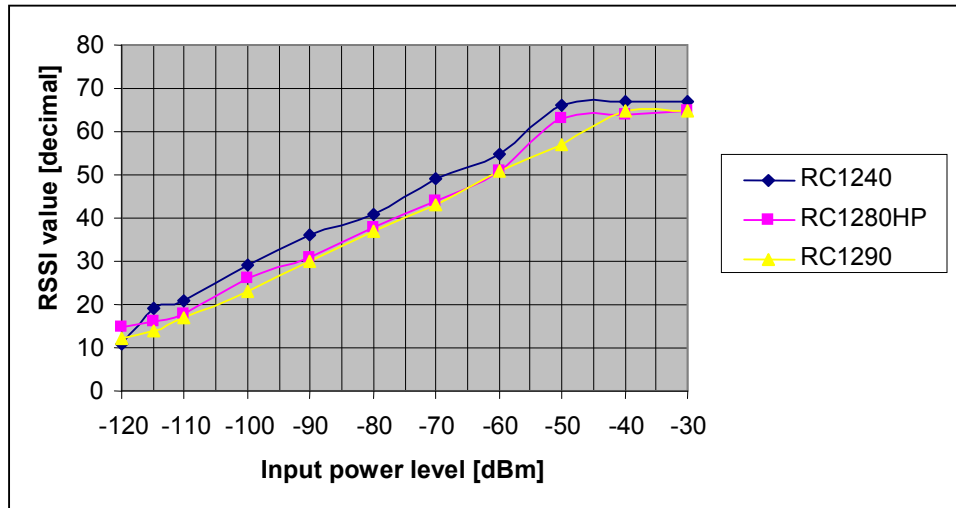
The module provide a digital Received Signal Strength Indicator (RSSI) through the 'S' command. The module returns an 8 bit character (one byte) indicating the current input signal strength (followed immediately by a second character which is a prompt '>'). The signal strength can be used as an indication of fading margin, or as a carrier sense signal to avoid collisions.

Do note that if the signal strength for an incoming packet is to be measured, the 'S' command must be performed while the packet is being received. To simplify the test of a link, and avoid timing problems, the transmitter can be set to continuous transmission using the '2' test command, while the receiver use the 'S' command to read the signal strength.

The RSSI value increases with increased input signal strength. Input signal strength is given by (typ.):

$$P = 1.5 \times \text{RSSI} - 137 \text{ [dBm]} \text{ for RC1280HP}$$

Typical RSSI value as a function of input signal strength is shown in the figure below.



Antenna Connection

The antenna should be connected to the RF pin. The RF pin is matched to 50 Ohm. If the antenna connector is placed away from the module at the motherboard, the track between the RF pin and the connector should be a 50 Ohm transmission line.

On a two layer board made of FR4 the width of a microstrip transmission line should be 1.8 times the thickness of the board, assuming a dielectric constant of 4.8. The line should be run at the top of the board, and the bottom side should be a ground plane.

Example: For a 1.6 mm thick FR4 board, the width of the trace on the top side should be $1.8 \times 1.6 \text{ mm} = 2.88 \text{ mm}$.

The simplest antenna to use is the quarter wave whip antenna. A quarter wave whip antenna above a ground plane yields 37 Ohm impedance and a matching circuit for 50 Ohm is not required.

A PCB antenna can be made as a copper track where the ground plane is removed on the back side. The rest of the PCB board should have a ground plane as large as possible, preferably as large as the antenna itself, to make it act as a counterweight to the antenna. If the track is shorter than a quarter of a wavelength, the antenna should be matched to 50 ohms.

The length of a quarter wave antenna is given in the table below.

Frequency [MHz]	Length [cm]
868-870	8.2

PCB Layout Recommendations

The module is designed for mating with two 2.00 mm pitch connectors. All electrical connections are via the two 2x5 pin connectors, one connector in each end of the module.

For minimum height and best RF performance the following mating SMD-connectors are recommended (2.00 mm pitch);

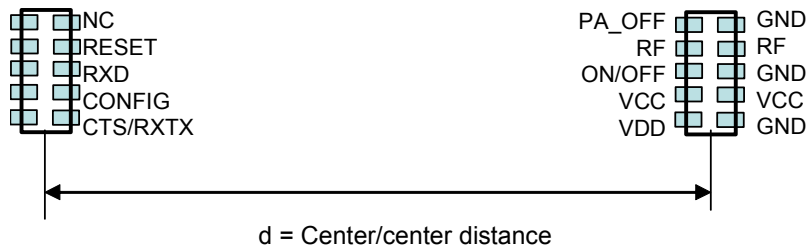
1. GEN Link Co., Ltd, ZSTPS2A-D-SM-10-GA
2. AMTEK PS2M21-205GBOPT-U

For all orders of the module, mating female connectors of one of the types described above is supplied together with the modules and are included in the pricing. Please visit our website for datasheet CON_2x5_SMD_FEMALE_2MM_Datasheet_x_x.pdf (x_x=revision) showing the measures fitting both connectors. Note that female connectors might be delivered with studs/pegs for improved alignment. This requires corresponding holes in the carrier PCB.

Other connectors, for instance through-hole versions with same pitch can be used, but ensure lowest possible building height for best RF-performance.

The recommended distance between connectors are shown in the figure below. All dimensions are in mm.

Connectors are horizontally aligned



Module / pitch	d = c/c [mm]	d = c/c [mil]
RC1280HP-2.00	54.00	2 125.98

A PCB with two or more layers and with a solid ground plane in one of the inner- or bottom layer(s) is recommended. All GND-pins of the module (female connector) shall be connected to this ground plane with vias with shortest possible routing, minimum one via per GND-pin.

If any routing or vias is required under the module in the area between the two connectors, the routing and vias should be covered with solder resist to prevent short circuiting from the shielding if shielding comes too close to the PCB. It is recommended that vias are tented. Reserved pins (NC) should be soldered to the pads but the pads must be left floating.

Supply Voltage and I/O Signals Decoupling

The supply voltage VCC must be stable during the TX-period. Ensure that the DC-source, being battery or DC from a voltage converter, is able to deliver the specified current at all times.

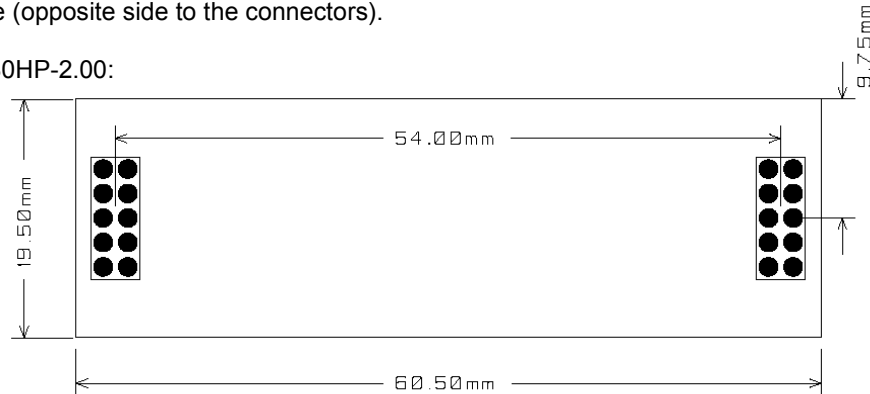
The RC1280HP itself does not require any external decoupling capacitors. However, as the emitted high power RF signal might be picked up by external circuitry and might cause distortion, decoupling of the supply voltage and control signals is recommended. Add a 100pF NPO quality capacitor as close as possible to the modules VCC, VDD (if connected), PA_OFF

(if connected) and ON/OFF pins. See also reference design for RC1280HP Demo Board with schematics and layout found in RC12x0HPDB_x_x.zip on Radiocrafts homepage.

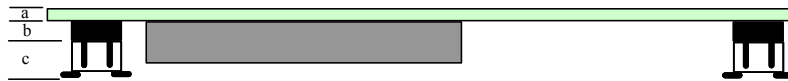
Mechanical Drawing

Pin 1 on the module is marked with an astrix or a cut corner in the GND-layer on top of the module (opposite side to the connectors).

RC1280HP-2.00:



View from bottom / connector-side



Side view with female connectors

Total height:

Female connector	PCB with Pin Header Measures	Total height
1, c=2.40 mm	a = 1.0 mm b = 1.5 mm	4.9 mm
2, c=2.40 mm		4.9 mm

With tolerances, allow for **minimum 6.0 mm** building height. Please check the latest datasheet from the connector manufacturer for exact height.

Ordering information

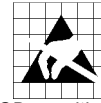
RF modules and corresponding numbers of female connectors are both supplied in separate sticks or trays.

Article no.	Description
RC1280HP-2.00	19.5 x 60.5 x 6.0* mm, 2.00 mm pitch pin-rows

*Height is total height with recommended mating SMD-connectors

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply voltage, VCC	0	5.5	V
Voltage on any pin	0	5.5	V
Input RF level		10	dBm
Storage temperature	-50	150	°C
Operating temperature	-20	55	°C
Maximum continuous transmission period ("TX")*		3	seconds



Caution ! ESD sensitive device.
Precaution should be used when handling the device in order to prevent permanent damage.

*When operated in testmode "1" or unbuffered mode (see RC232 User Manual) the maximum transmission period ("TX-time") applies

Under no circumstances the absolute maximum ratings given above should be violated. Stress exceeding one or more of the limiting values may cause permanent damage to the device.

Electrical Specifications

T=25°C, VCC = 3.3V if nothing else stated.

Parameter	Min	Typ.	Max	Unit	Condition / Note
Operating frequency	869.400		869.650	MHz	500 mW max output power
	868.000		870.00		10 mW max output power
Number of channels		5			500 mW max output power
		80			10 mW max output power
Channel spacing		25		kHz	
Input/output impedance		50		Ohm	
Data rate		4.8		kbit/s	
Frequency stability			+/-2.5	ppm	
Transmit power RC1280HP	-20	+26	+27	dBm	Typical values are for default settings
FSK deviation		+/- 2.4		kHz	
Adjacent channel power		-55	-45	dBc	See Note 1 below
Occupied bandwidth		14	16	kHz	99.5%
Spurious emission, TX < 1 GHz > 1 GHz			-37 -30	dBm	> 1 GHz: Radiated emission measured with quarterwave antenna
Sensitivity		-108		dBm	
Adjacent channel rejection		30		dB	
Alternate channel selectivity		40		dB	
Image channel rejection		40		dB	
Blocking / Interferer rejection / desensitization	40	60		dB	Wanted signal 3 dB above sensitivity level, CW interferer.

+/- 1 MHz	40	60			Minimum numbers corresponds to class 2 receiver requirements in EN300220.
+/- 2 MHz	50	70			
+/- 5 MHz	60	75			
+/- 10 MHz					
Saturation		10		dBm	
Input IP3		-18		dBm	
Spurious emission, RX			-57	dBm	
Supply voltage	3.2	3.3	4.2	V	
Supply voltage rise time			150	us	If appropriate rise time can not be guaranteed, the RESET pin should be activated after supply voltage is stable.
Current consumption, RX/IDLE		20.7		mA	Apply over entire supply voltage range
Current consumption, TX High Power Mode		650	800	mA	Apply at +3.3 V supply voltage
Current consumption, TX Low Power Mode		28		mA	
Current consumption, SLEEP		0.9	1.5	mA	Max value in bold apply over the entire temperature and supply voltage range
Current consumption, OFF (Same for PA_OFF=GND or PA_OFF = open)		0.500	6.5	µA	Max value in bold apply over the entire temperature and supply voltage range
Digital I/O Input logic level, low Input logic level, high Output logic level, low (1µA) Output logic level, high(-1µA)	1.7 0 2.6		0.7 5.5 0.1 2.7	V	RXEN, TXEN, CONFIG, TXD, RXD and PA_OFF have internal 100 kΩ series resistors. No internal pull-ups. Outputs should not be loaded resistively.
RESET pin Input logic level, low Input logic level, high	1.7		0.7 2.7	V	Internal 100 kΩ pull-up resistor to VDD. 10k series resistor
ON/OFF pin Input logic level, low Input logic level, high	1.4		0.4 VCC	V	No internal pull-up resistor
UART Baud Rate tolerance		+/- 2		%	UART receiver and transmitter
Configuration memory write cycles	10 000	100 000			The guaranteed number of write cycles using the 'M' command is limited*

* It is recommended to write to the configuration memory using the 'M' command on a strictly "need-to-do" basis only

Note 1: The RC1280HP module is characterized as a wideband system under EN300-220-2 V2.4.1. The 25 kHz ACP is for information only.

Regulatory Compliance Information

The use of RF frequencies and maximum allowed RF power is limited by national regulations. The RC1280HP has been designed to comply with the R&TTE directive 1999/5/EC where a TX/RX-ratio of 10% applies for 500mW operation.

According to R&TTE directives, it is the responsibility of Radiocrafts' customers to check that the host product (i.e. final product) is compliant with R&TTE essential requirements. The use of a CE marked radio module can avoid re-certification of the final product, provided that the end user respects the recommendations established by Radiocrafts. A Declaration of Conformity is available from Radiocrafts on request.

The relevant regulations are subject to change. Radiocrafts AS do not take responsibility for the validity and accuracy of the understanding of the regulations referred above. Radiocrafts only guarantee that this product meets the specifications in this document. Radiocrafts is exempt from any responsibilities related to regulatory compliance.

Document Revision History

Document Revision	Changes
1.0	First edition
1.1	Number of high power channels changed from 3 to 5 and all with nominal +26 dBm output power. Current consumption in high power mode changed from 550 mA to 600 mA (Typ) and to 700 mA (Max)
1.2	Added new 2.00 mm SMD connector "Harwin" in "PCB layout recommendations"
1.3	Corrected misprint in timing table in chapter "Timing Information" for t_{TX} . Value corrected to Min 21.7 ms Updated figure on page 2 Added pin description equivalent circuits Added UART baud rate tolerance specification Added soldering profile recommendation Added note on 2 stop-bits if CTS is used Added note on RSSI measurement is followed by a new prompt Added note on delay after channel-byte in timing information Added configuration memory write cycle specification, and note in the text Added new section and more information on Power on Reset and reset circuits Added new section and more information on I/O pin interfaces Added more info on ON/OFF in pin description Added note on digital signal output level and level translators Added new section on regulatory compliance information Clarified awakening from SLEEP mode using RXEN and TXEN Clarified Product Status and Definition Clarified layout recommendations Removed RC1280HP-2.54 in PCB Layout recommendations Added mechanical Drawing side view and table with heights Added chapter "Regulatory Compliance Information" and "Supply Voltage and I/O decoupling"
1.4	Increased quality on some drawings Added PA_OFF notes Improved description on mating 2.0 mm female connectors Changed typical and max current consumption in OFF mode Transferred Product Status to Full Production
1.41	Added "UART Baud Rate tolerance" and "Configuration memory write cycles" in "Electrical Specifications" table
1.42	Note added for ACP in Electrical Specification. Current consumption at 500mW output power change to 650 mA typical and 800 mA max Removed one of the alternatives for female mating connectors, 2x5 pin

Product Status and Definitions

Current Status	Data Sheet Identification	Product Status	Definition
	Advance Information	Planned or under development	This data sheet contains the design specifications for product development. Specifications may change in any manner without notice.
	Preliminary	Engineering Samples and First Production	This data sheet contains preliminary data, and supplementary data will be published at a later date. Radiocrafts reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
X	No Identification Noted	Full Production	This data sheet contains final specifications. Radiocrafts reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

Current Status	Data Sheet Identification	Product Status	Definition
	Obsolete	Not in Production	This data sheet contains specifications on a product that has been discontinued by Radiocrafts. The data sheet is printed for reference information only.

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As far as possible, major changes of product specifications and functionality, will be stated in product specific Errata Notes published at the Radiocrafts website. Customers are encouraged to check regularly for the most recent updates on products and support tools.

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Contact Information

Web site: www.radiocrafts.com

Address:

Radiocrafts AS
Sandakerveien 64
NO-0484 OSLO
NORWAY

Tel: +47 4000 5195

Fax: +47 22 71 29 15

E-mail: sales@radiocrafts.com
support@radiocrafts.com