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NTX2B /NRX2B

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UHF Narrow Band FM Transmitter & Receiver

The NTX2B transmitter and NRX2B receiver offer a low power, reliable data link in a Radiometrix SIL standard pin out and foot print. This makes the NTX2/NRX2B pair ideally suited to those low power applications where existing single frequency wideband UHF modules have insufficient range.

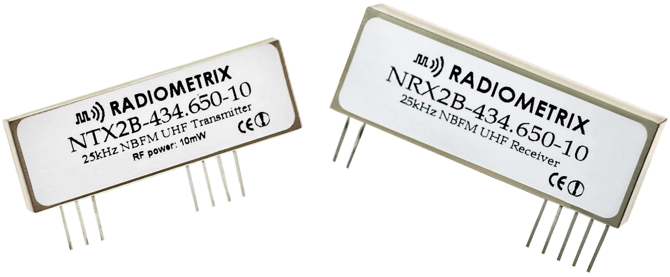

Figure 1: NTX2B & NRX2B

Features

- Conforms to ETSI EN 300 220-2 (radio) and EN 301 489-3 (EMC)
- Standard frequencies - 434.075MHz, 434.650MHz and 458.700MHz
- Factory programmable custom frequency (425 - 470MHz). No crystal lead-times
- User programmable custom frequencies on 433MHz (EU) and 458MHz (UK) bands
- Data rates up to 10kbps
- Usable range over 500m
- 12.5kHz / 20kHz / 25kHz Channel spacing (factory set)
- Feature-rich interface (true analogue and/or digital baseband)
- Longer range compared to Wide Band FM modules

Applications

- EPOS equipment, barcode scanners
- Data loggers
- Industrial telemetry and telecommand
- In-building environmental monitoring and control
- High-end security and fire alarms
- DGPS systems
- Vehicle data up/download.

Technical Summary

Transmitter – NTX2B

- Fully integrated sigma-delta PLL synthesizer based design
- High stability TCXO reference
- Supply 2.9V - 15V @ 18mA (internal 3.0V LDO voltage regulator)
- Data bit rate: 10kbps max.
- Transmit power: +10dBm (10mW)
- Dimensions 43 x 15 x 5mm (fully screened)

Receiver – NRX2B

- Fully integrated sigma-delta PLL synthesizer based design
- SAW front-end band pass filter, image rejection: >60dB
- Supply range: 2.9V - 15V @ 17mA (internal 2.8V LDO voltage regulator)
- Data bit rate: 10kbps max.
- Receiver sensitivity: -118dBm (for 12dB SINAD) / -112dBm (for 1ppm BER)
- Dimensions 47 x 17 x 8mm (fully screened)

Evaluation platforms: Uni-Eval or NBEK + SIL carrier

Functional description

The NTX2B transmitter consists of a highly integrated sigma delta (fractional N) synthesizer based single chip RF device, configured over an SPI serial bus by an on-board microcontroller. The primary frequency reference for the transmitter is a 26MHz VC-TCXO. Modulation is applied directly to this reference via an AF baseband filter (rather than using the chip's internal modulator) to permit a wider range of baseband data rates and waveforms. Operation is controlled by the EN (Enable) line, the transmitter achieving full RF output typically within 5ms of this line being pulled high. The RF output is filtered to ensure compliance with the appropriate radio regulations and fed to the 50Ω antenna pin.

NTX2B Transmitter

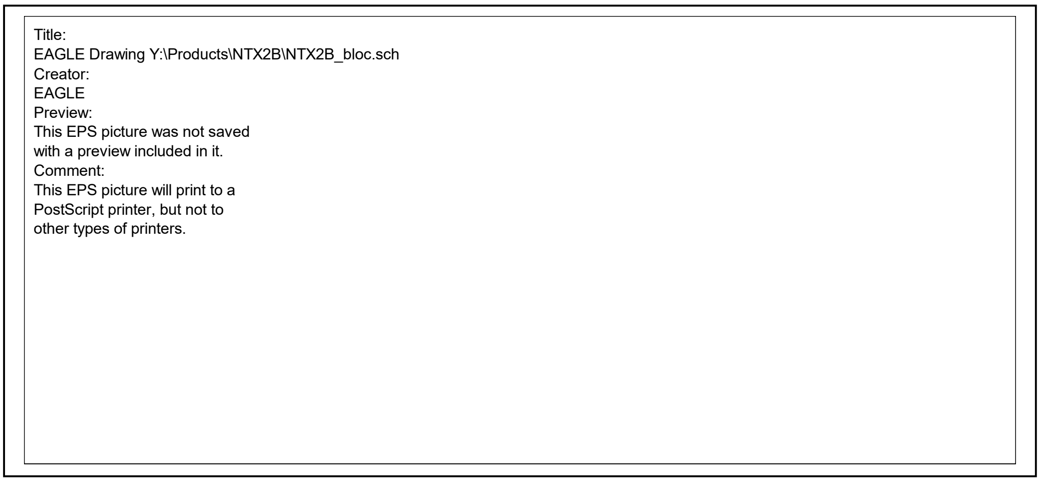

Figure 2: NTX2B block diagram

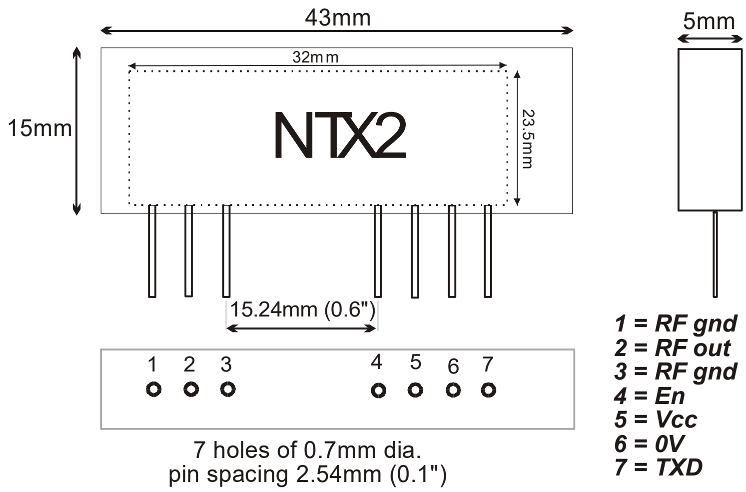

Figure 3: NTX2B pin-out and dimension

User interface

NTX2B pin	Name	Function
1, 3	RF GND	RF ground is internally connected to the module screen and pin 6 (0V). These pins should be directly connected to the RF return path - e.g. coax braid, main PCB ground plane etc.
2	RF out	50Ω RF output to the antenna
4	EN/PGM	Pull high to enable Transmitter (3V CMOS logic) 9600 baud 0V-3V Inverted RS232 (UART) Programming command input
5	VCC	2.9V – 15V DC power supply
6	0V	Ground
7	TXD	DC coupled input for 3V CMOS logic. R_{in} = 100kΩ

Notes:

1. Pinout and footprint is as TX1H and NTX2.
2. Compatible with RX2M, RLC2H, LMR2 and NRX2B receivers

Absolute maximum ratings

Exceeding the values given below may cause permanent damage to the module.

Operating temperature	-20°C to +70°C
Storage temperature	-30°C to +70°C

NTX2B

Vcc, TXD (pins 5,7)	-0.3V to +16.0V
En (pin 4)	-0.3V to +VCC V
RF out (pin 2)	±50V @ <10MHz, +20dBm @ >10MHz

Performance specifications: NTX2B transmitter
(Vcc = 3.3V / temperature = 20°C unless stated)

General	pin	min.	typ.	max.	units	notes
DC supply						
Supply voltage	5	2.9	3.3	15	V	
TX Supply current (10mW)	5		18	-	mA	
Power down mode	4			3	μA	5
Antenna pin impedance	2	-	50	-	Ω	
RF						
RF centre frequency		-		-	MHz	1
NTX2B-434.650-10			434.650			
NTX2B-434.075-10			434.075			
NTX2B-458.700-10			458.700			
	User programmable to any custom frequency within 425MHz - 470MHz band					
Channel spacing		-	12.5 / 20 / 25	-	kHz	2
Number of channels		-	1	-		3
RF power output (10mW)	2	9	10	11	dBm	
Spurious emissions	2	-	-	-40	dBm	
Adjacent channel TX power		-	-	-37	dBm	
Frequency accuracy			±1.5		kHz	
Peak FM deviation (25kHz channel)		±2.5	±3.0	±3.5	kHz	
Baseband						
Modulation type		-	FSK	-		F3D
Modulation bandwidth @ -3dB		0	-	5	kHz	
TXD input level (logic low)	7	-	0	-	V	
TXD input level (logic high)	7	-	3.0	-	V	
Distortion			5		%	4
Dynamic timing						
TX Enable to full RF		-	2.5	5	ms	5
Power on to full RF				25	ms	6

Notes:

1. User programmable to any custom frequency within 425MHz - 470MHz band
2. Channel spacing is factory preset
3. Serial programming is by the application of a logic level inverted RS232 datastream at 9600 baud to the EN/PGM pin. The unit must be fully enabled (5ms after the rising edge of the EN signal) before a programming burst can be properly decoded.
4. adjusted for 3V peak-to-peak sinewave signal
5. When EN pin is used to control transmitter while VCC pin is connected to supply
6. When both EN and VCC are tied together and switched ON/OFF

NRX2B receiver

The NRX2B receiver consists of a highly integrated sigma delta (fractional N) synthesizer based Local Oscillator (LO), configured over an SPI serial bus by an on-board microcontroller. The primary frequency reference for the LO is a 26MHz VC-TCXO. The RF input is filtered using SAW front-end filter to improve image rejection and blocking performance. SAW filter reduces user programmable frequency range to passband, but factory programmable frequency bands are determined by SAW filter availability.

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EAGLE Drawing Y:/Products/NRX2B/NRX2B_bloc.sch
Creator:
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Preview:
This EPS picture was not saved
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Comment:
This EPS picture will print to a
PostScript printer, but not to
other types of printers.

Figure 4: NRX2B block diagram

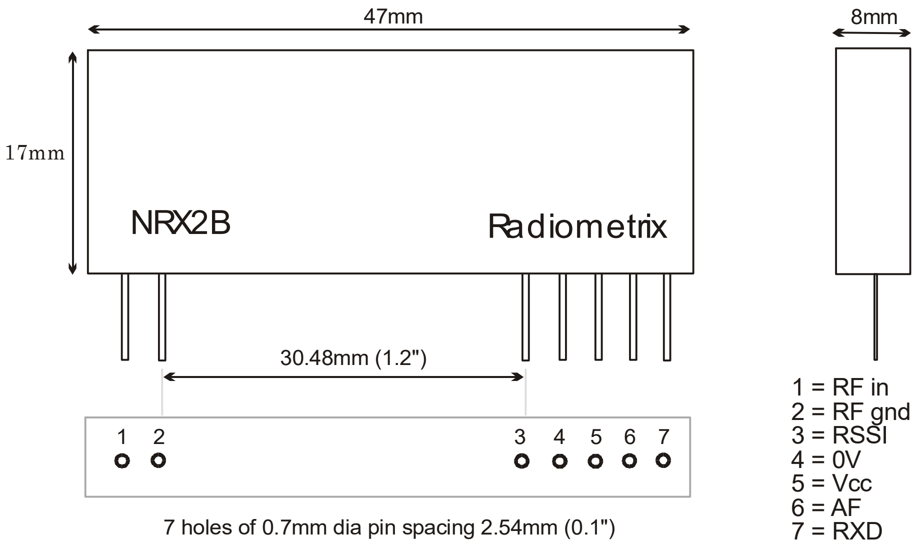

Figure 5: NRX2B pin-out and dimension

User interface – NRX2B

NRX2B pin	Name	Function
1	RF in	50Ω RF input from the antenna
2	RF gnd	RF Ground is internally connected to the module screen and pin 4 (0V). These pins should be directly connected to the RF return path - e.g. coax braid, main PCB ground plane etc.
3	RSSI	Received Signal Strength Indicator with >60dB range. DC level between 0.5V and 2V
4	0V	Ground
5	Vcc	2.9V – 15V DC power supply
6	AF/PGM	500mV$_{pk\text{-}pk}$ audio. DC coupled, approx 1.5V bias 9600 baud 0V-5V RS232 (inverted UART) Programming command input
7	RXD	Received Data output from the internal data slicer. The data is squared version of the Audio signal on pin 6 and is true data, i.e. as fed to the transmitter. Output is "open-collector" format with internal 10kΩpull-up to VCC (pin 5). Suitable for bi-phase codes

***Notes**:*

1. Pinout is as our wideband RX2A receiver, or older NRX2
2. Unit is reprogrammed by applying a 0V-5V level RS232 (inverted UART) polarity command stream into AF/PGM pin 6

Absolute maximum ratings

Exceeding the values given below may cause permanent damage to the module.

Operating temperature	-20°C to +70°C
Storage temperature	-30°C to +70°C

NRX2B

Vcc, RXD (pins 7,9)	-0.3V to +16.0V
En, RSSI, AF (pins 4,5,8)	-0.3V to +Vcc V
RF in (pin 1)	±50V @ <10MHz, +13dBm @ >10MHz

Performance specifications: NRX2B receiver

(Vcc = 3V / temperature = 20°C unless stated)

	pin	min.	typ.	max.	units	notes
DC supply						
Supply voltage	7	2.9	3.0	15	V	
Supply current	7	-	17	-	mA	
RF/IF						
RF centre frequency	1,6				MHz	1
NRX2B-434.650-10			434.650			
NRX2B-434.075-10			434.075			
NRX2B-458.700-10			458.700			
		Factory Programmable to custom frequency by special order subject to SAW front-end filter availability on the band				
Frequency stability			+/-1.5		kHz	+/-2.5ppm TCXO
Number of channels			1			Freq. Programmable
RF sensitivity @ 12dB SINAD	1, 6	-	-118	-	dBm	
RF sensitivity @ 1ppm BER	1, 7	-	-112	-	dBm	
RSSI threshold	1, 3	-	-127	-	dBm	2
RSSI range	1, 4	-	>50	-	dB	2
IF bandwidth		-	±7.5	-	kHz	25kHz ver.
Blocking	1	-	80	-	dB	
Image rejection	1	-	>60	-	dB	
Adjacent channel rejection	1	-	>60	-	dB	
Spurious response rejection	1	-	>60	-	dB	
LO re-radiation	1	-	-	-60	dBm	3
Baseband						
Baseband bandwidth @ -3dB	6	0	-	5	kHz	2
AF level	6	-	500	-	mV_{P-P}	4
DC offset on AF out	6	-	1.5	-	V	
Distortion on recovered AF	6	-	5	-	%	
Dynamic timing						
Power up with signal present						
Power up to valid RSSI	5, 3	-		25	ms	
Power up to valid AF	5,6			25	ms	
Power up to stable data	5, 7	-		50	ms	
Signal applied with supply on						
Signal to valid RSSI	1, 3	-		2.5	ms	
Signal to valid AF	1,6			2.5	ms	
Signal to stable data	1, 7	-		10	ms	5
Time between data transitions	7	0.1	-	TBA	ms	

Notes:

1. User programmable to any channel frequency within 432-435MHz or 455.5-462.5MHz
2. See applications information for further details.
3. Exceeds EN/EMC requirements at all frequencies.
4. For received signal with ±3kHz FM deviation. AF is inverted with respect to TXD input above 446MHz.
5. For 50:50 mark to space ratio (i.e. squarewave).

Channel Programming

At the heart of the device is a fractional N synthesizer locked to a high stability VCXO. The minimum step size of this PLL is (approximately) 12.4Hz

The data required by the PLL consists of two coefficients: the integer (INTE) and the fraction (FRAC). Output frequency relates to these values thus:

$$Freq = \left(INTE + \frac{FRAC}{2^{19}} \right) \times \frac{2 \times VCTCXO}{Outdiv} \qquad \text{where } \frac{2 \times 26MHz}{8} = 6.5MHz$$

NTX2B, NRX2B uses 26MHz VCTCXO and Output Divider (Outdiv) value for 425MHz-525MHz band is 8. For correct operation, the component (FRAC / 2^{19}) must have a value between 1 and 2

$$Freq = \left(INTE + \frac{FRAC}{2^{19}} \right) \times 6.5 \qquad 1 \le \frac{FRAC}{2^{19}} \le 2 \qquad 524{,}288 \le FRAC \le 1{,}048{,}576$$

$$INTE = WholeNum\left[\frac{Freq}{6.5} \right] - 1 \qquad FRAC = \left(DecimalNum\left[\frac{Freq}{6.5} \right] + 1 \right) \times 524288$$

In interface terms, these coefficients are expressed as a 32-bit binary word (eight hexadecimal digits) where the most significant byte comprises the integer value, and the remaining three bytes (24 bits) make up "fraction"

NTX2B Example: $\frac{434.650MHz}{6.5MHz} = 66.8692307692$

INTE = 66-1 = 65 (0x41)
FRAC = (0.8692307692 +1) × 524288 = 980015 (0x0EF42F)
FRAC2 = 0x0E
FRAC1 = 0xF4
FRAC0 = 0x2F

Freq = $\left(65 + \frac{980015}{524288} \right) \times 6.5 = 434.649998MHz = 434.650MHz - 3.2Hz$

However, the frequency programmed into the NRX2B is the LOCAL OSCILLATOR (LO) frequency, not the actual channel frequency.

For unit operating on a channel frequency of 446MHz or higher, the local oscillator is 21.4MHz below the carrier (so subtract 21.4MHz). AF output will be inverted on higher receive frequency units.

$$LO = RF - IF = 458.700MHz - 21.4MHz = 437.3MHz \qquad \text{for } RF \ge 446MHz$$

For units operating on frequencies below 446MHz, the local oscillator is 21.4MHz above the channel.

$$LO = RF + IF = 434.650MHz + 21.4MHz = 456.05MHz \qquad \text{for } RF < 446MHz$$

NRX2B Example: $\frac{434.650MHz + 21.4MHz}{6.5MHz} = 70.1615384615$

INTE = 70-1 = 69 (0x45)
FRAC = (0.1615384615 +1) × 524288 = 608980 (0x094AD4)
FRAC2 = 0x09
FRAC1 = 0x4A
FRAC0 = 0xD4

Freq = $\left(65 + \frac{608980}{524288} \right) \times 6.5 = 456.0499992MHz = 456.050MHz - 8.4Hz$

When programming the NTX2B/NRX2B, keep in mind that the unit maintains in SRAM the current values of all programmable values (frequency, band of operation, RF power and frequency offset adjustments values) and that toggling the NTX2B EN/PGM pin does NOT erase or corrupt them.

These values are only loaded from EEPROM at cold start power-up (but not when the NTX2B EN/PGM pin is cycled)

There is one "write all values to EEPROM" command. It is usually necessary to load the relevant current operating RAM value(s) and THEN issue a suitable command to write the RAM value to EEPROM.

The NTX2B and NRX2B EEPROM stores Frequency coefficients, RF Power level, Frequency Offset and the Band select constants. For NRX2B, power level should always be set to 3.

Programming a value or coefficient over the serial bus over-writes the previous value and implements this change on the PLL immediately, but does not change the EEPROM contents until a relevant "program EEPROM" command is issued

In general, the most recent stimulus received by the unit will decide the operating frequency.
Whenever a frequency coefficient is programmed into the unit, the frequency will change immediately to this new value regardless of other modes or operation. This is the simplest and most flexible means of controlling the unit.

Serial interface commands

NTX2B PGM serial interface consists of an 9600bps, 8 data bits, No Parity, 1 Stop bit, 0V-3V level Inverted RS232 (UART) datastream applied to the EN/PGM pin (the idle state of the interface will turn the transmitter on)

NRX2B PGM serial interface consists of an 9600bps, 8 data bits, No Parity, 1 Stop bit, 0V-5V level RS232 (Inverted UART) datastream applied to the AF/PGM pin (if a PNP open collector drivers is used then the idle state of the interface will not affect the AF output levels)

Every command string starts with the phrase "@PRG_" and terminated with Carriage Return <cr>.

The characters in a command string must not be separated by more than 5ms (so typing individual characters on a terminal keyboard will NOT work), but a pause of at least 10ms is required between commands (more following a BURN_ROM command. In this case a much longer idle period, of 50mS at least, is needed for EEPROM programming)

User commands

Commands	Function
@PRG_iif2f1f0<cr>	sets the transmitter frequency iif2f1f0 is an 8 digit hexadecimal number, coding 4 bytes: ii is the "integer" value f2 most significant FRAC2 byte in the 24 bit FRAC word f1 bits 8 through 15 of the fraction word (FRAC1) f0 least significant FRAC0 byte e.g. @PRG_410EF42F<cr> to program 434.650MHz
@PRG_BURN_ROM<cr>	write current setup into EEPROM
@PRG_POWER 00<cr> @PRG_POWER FF<cr>	Turn the unit completely OFF (power down) Turn the unit ON (power up) EN pin can also be cycled
@PRG_00000000<cr>	Re-sets itself to the values currently stored in EEPROM (this usually only happens at power-up)

Factory alignment commands

Commands	Function
@PRG_POWER pp <cr>	Sets the RF Power output pp is a 2 digit hexadecimal number (in the range 00 to 3F) 00 - power OFF, FF – power ON e.g. @PRG_POWER 32<cr>
@PRG_TRIM+ aa <cr>	set an "up" offset aa is 00 (0Hz) to 7F (+1574.8Hz) at 12.4Hz per bit @PRG_TRIM+1E<cr>
@PRG_TRIM- aa <cr>	sets a "down" offset aa is 00 (0Hz) to 7F (-1574.8Hz) at 12.4Hz per bit
@PRG_BAND# bb	band divider value (bb) 08 850-1050MHz 0A 425-520MHz 0B 280-350MHz 0D 140-175MHz e.g. PRG_BAND# 0A<cr>
@PRG_BURN_ROM<cr>	write current setup into EEPROM

Applications information

Power supply requirements

NTX2B transmitter module has a built-in regulator which deliver a constant 3.0V to the module circuitry when the external supply voltage is 3.1V or greater, with 40dB or more of supply ripple rejection.

NRX2B receiver module has a built-in regulator which deliver a constant 2.8V to the module circuitry when the external supply voltage is 2.9V or greater, with 40dB or more of supply ripple rejection.

These regulators ensure constant performance up to the maximum permitted rail, and remove the need for external supply decoupling except in cases where the supply rail is extremely poor (ripple/noise content >100mVpk-pk).

Below 3.1v the NTX2B transmitter continues to function (down to at least 2.8V), although at this point the regulator is no longer functional and ripple rejection is dependant on internal decouplers. Below 2.9V the power output will reduce slightly.

The Enable pin allows the NTX2B transmitter module to be turned on or off under 3V logic control with a constant DC supply to the VCC pin. The module current in power-down mode (VCC present, EN pin low) is less than 3μA.

If the rail is switch instead of using the enable pin, then EN should be tied directly to the VCC pin.
In this mode the fastest (<5ms) switching speed is NOT obtained

TX modulation requirements

The module is factory-set to produce the specified FM deviation with a TXD input to pin 7of 3V amplitude, i.e. 0V "low", 3V "high"

If the data input level is greater than 3V, a resistor must be added in series with the TXD input to limit the modulating input voltage to a maximum of 3V on pin 7. TXD input resistance is 100K to ground, giving typical required resistor values as follows:

Vcc	Series resistor
≤3V	-
3.3V	10 kΩ
5V	68kΩ
9V	220kΩ

Data formats and range extension

The NTX2B's TXD input is normally driven directly by logic levels but will also accept analogue drive (e.g. 2-tone signalling). In this case it is recommended that the modulation ac-coupled onto TXD (pin 7), and limited to a maximum of 3Vp-p to minimise distortion over the link. The modulator in the NTX2B is considerably more linear than that used in the older NTX2

The NTX2B in standard form incorporates a low pass filter with a 5kHz nominal bandwidth. In conjunction with similar filtering in the receiver an overall system bandwidth of 5kHz is obtained. This is suitable for transmission of data at raw bit rates up to 10kbps.

NRX2B Received Signal Strength Indicator (RSSI)

The NRX2B receiver incorporates a wide range RSSI which measures the strength of an incoming signal over a range of 55dB or more. This allows assessment of link quality and available margin and is useful when performing range tests.

The output on pin 3 of the module has a standing DC bias of <0.8V with no signal, rising to around 2V at maximum indication.

Typical RSSI characteristic is as shown below:

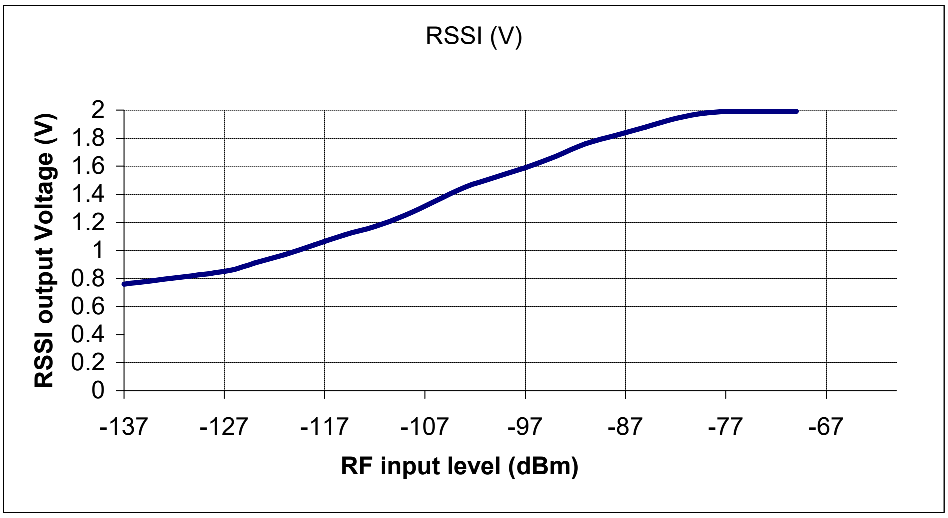

Figure 6: RSSI response curve

Expected range

Predicting the range obtainable in any given situation is notoriously difficult since there are many factors involved. The main ones to consider are as follows:

- Type and location of antennas in use
- Type of terrain and degree of obstruction of the link path
- Sources of interference affecting the receiver
- “Dead” spots caused by signal reflections from nearby conductive objects
- Data rate and degree of filtering employed

Antennas

The choice and positioning of transmitter and receiver antennas is of the utmost importance and is the single most significant factor in determining system range. The following notes are intended to assist the user in choosing the most effective antenna type for any given application.

Integral antennas

These are relatively inefficient compared to the larger externally-mounted types and hence tend to be effective only over limited ranges. They do however result in physically compact equipment and for this reason are often preferred for portable applications. Particular care is required with this type of antenna to achieve optimum results and the following should be taken into account:

1. Nearby conducting objects such as a PCB or battery can cause detuning or screening of the antenna which severely reduces efficiency. Ideally the antenna should stick out from the top of the product and be entirely in the clear, however this is often not desirable for practical/ergonomic reasons and a compromise may need to be reached. If an internal antenna must be used try to keep it away from other metal components and pay particular attention to the “hot” end (i.e. the far end) as this is generally the most susceptible to detuning. The space around the antenna is as important as the antenna itself.

2. Microprocessors and microcontrollers tend to radiate significant amounts of radio frequency hash which can cause desensitisation of the receiver if its antenna is in close proximity. The problem becomes worse as logic speeds increase, because fast logic edges generate harmonics across the UHF range which are then radiated effectively by the PCB tracking. In extreme cases system range may be reduced by a factor of 5 or more. To minimise any adverse effects situate antenna and module as far as possible from any such circuitry and keep PCB track lengths to the minimum possible. A ground plane can be highly effective in cutting radiated interference and its use is strongly recommended.

A simple test for interference is to monitor the receiver RSSI output voltage, which should be the same regardless of whether the microcontroller or other logic circuitry is running or in reset.

The following types of integral antenna are in common use:

Quarter-wave whip. This consists simply of a piece of wire or rod connected to the module at one end. At 434MHz the total length should be 164mm from module pin to antenna tip including any interconnecting wire or tracking. Because of the length of this antenna it is almost always external to the product casing.

Helical. This is a more compact but slightly less effective antenna formed from a coil of wire. It is very efficient for its size, but because of its high Q it suffers badly from detuning caused by proximity to nearby conductive objects and needs to be carefully trimmed for best performance in a given situation. The size shown is about the maximum commonly used at 434MHz and appropriate scaling of length, diameter and number of turns can make individual designs much smaller.

Loop. A loop of PCB track having an inside area as large as possible (minimum about 4cm^2), tuned and matched with 2 capacitors. Loops are relatively inefficient but have good immunity to proximity detuning, so may be preferred in shorter range applications where high component packing density is necessary.

Integral antenna summary:

Feature	whip	helical	loop
Ultimate performance	***	**	*
Ease of design set-up	***	**	*
Size	*	***	**
Immunity to proximity effects	**	*	***

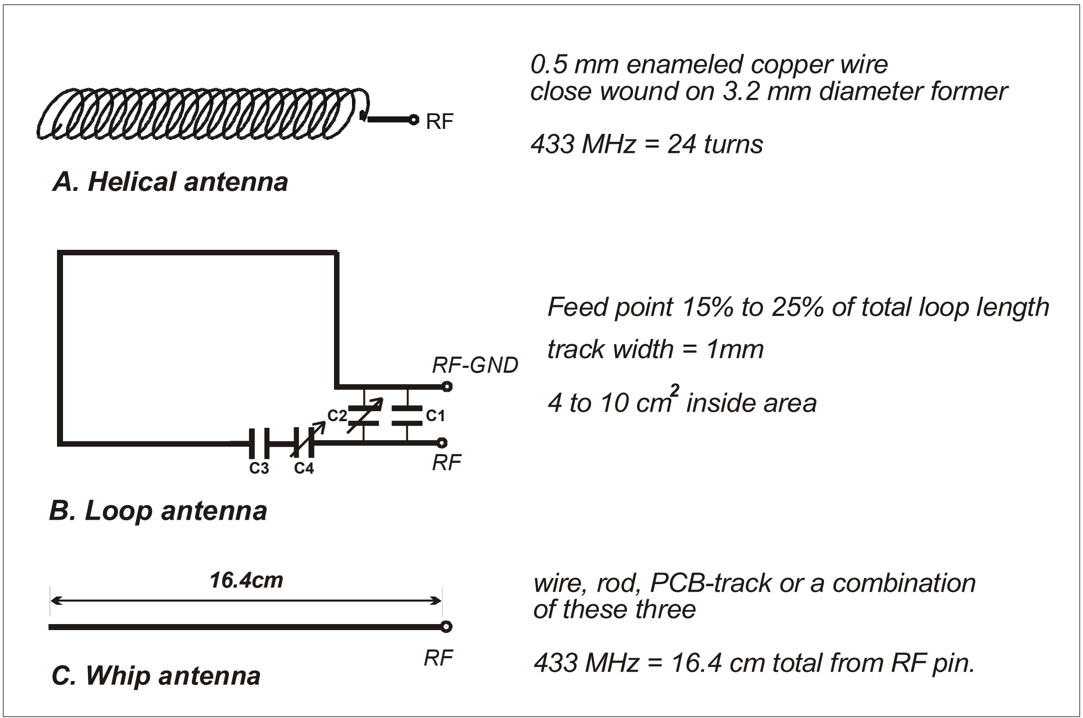

Figure 7: integral antenna configurations

External antennas

These have several advantages if portability is not an issue, and are essential for long range links. External antennas can be optimised for individual circumstances and may be mounted in relatively good RF locations away from sources of interference, being connected to the equipment by coax feeder.

Helical. Of similar dimensions and performance to the integral type mentioned above, commercially-available helical antennas normally have the coil element protected by a plastic moulding or sleeve and incorporate a coax connector at one end (usually a straight or right-angle BNC/SMA type). These are compact and simple to use as they come pre-tuned for a given application, but are relatively inefficient and are best suited to shorter ranges.

Quarter-wave whip. Again similar to the integral type, the element usually consists of a stainless steel rod or a wire contained within a semi-flexible moulded plastic jacket. Various mounting options are available, from a simple BNC/SMA connector to wall brackets, through-panel fixings and magnetic mounts for temporary attachment to steel surfaces.

A significant improvement in performance is obtainable if the whip is used in conjunction with a metal ground plane. For best results this should extend all round the base of the whip out to a radius of the length of the whip used (under these conditions performance approaches that of a half-wave dipole) but even relatively small metal areas will produce a worthwhile improvement over the whip alone. The ground plane should be electrically connected to the coax outer at the base of the whip. Magnetic mounts are slightly different in that they rely on capacitance between the mount and the metal surface to achieve the same result.

A ground plane can also be simulated by using 3 or 4 quarter-wave radials equally spaced around the base of the whip, connected at their inner ends to the outer of the coax feed. A better match to a 50Ω coax feed can be achieved if the elements are angled downwards at approximately 30-40° to the horizontal.

Module mounting considerations

The modules may be mounted vertically or bent horizontal to the motherboard. Note that the components mounted on the underside of the NTX2B are relatively fragile - avoid direct mechanical contact between these and other parts of the equipment if possible, particularly in situations where extreme mechanical stresses could routinely occur (as a result of equipment being dropped onto the floor, etc).

Good RF layout practice should be observed. If the connection between module and antenna is more than about 20mm long use 50 ohm microstrip line or coax or a combination of both. It is desirable (but not essential) to fill all unused PCB area around the module with ground plane.

Variants and ordering information

The NTX2B and NRX2BB are manufactured in the following variants as standard:

Part No.	Frequency (MHz)	RF Power (mW)	Duty Cycle	Country
NTX2B-434.075-10	434.075	10	<100%	EU
NTX2B-434.650-10	434.650	10	<100%	EU
NTX2B-458.700-10	458.700	10	<100%	UK
NRX2B-434.075-10	434.075	-	<100%	EU
NRX2B-434.650-10	434.650	-	<100%	EU
NRX2B-458.700-10	458.700	-	<100%	UK

25kHz channel spacing Narrow Band FM NTX2B transmitters can be operated without duty cycle restriction on 10mW e.r.p 434.040-434.790MHz sub-band.

http://www.erodocdb.dk/Docs/doc98/official/pdf/REC7003e.pdf
Annex 1 Band f2

Other frequency variants can be programmed to individual customer requirements in the range 425MHz to 470MHz.

Versions operating on other frequency bands may also be available. Contact Radiometrix for details

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Limitation of liability

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The Intrastat commodity code for all our modules is: 8542 6000

R&TTE Directive

After 7 April 2001 the manufacturer can only place finished product on the market under the provisions of the R&TTE Directive. Equipment within the scope of the R&TTE Directive may demonstrate compliance to the essential requirements specified in Article 3 of the Directive, as appropriate to the particular equipment.
Further details are available on The Office of Communications (Ofcom) web site:
http://www.ofcom.org.uk/

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