Metal Detection Pager - Transmitter

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Technical Support:

- support-rs@nedap.com

- H. Hammer
  +31 (0) 544-47 15 19
  hans.hammer@nedap.com

- H. Broekhuis
  +31 (0) 544-47 15 02
  han.broekhuis@nedap.com

Visitor's address:

Nedap Retail Support
Parallelweg 2d
Groenlo
Netherlands

Postal address:

Nedap Retail Support
Postbus 102
7140 AC Groenlo

Fax

+31 (0) 544-46 58 14

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Table of content

General

The Wireless Alarm unit is intended to transmit an alarm, OST or MD, to a small handheld receiver unit. The Transmitter unit is supplied with 24Vdc from the NCC or IQ or EQ unit. One of the alarm relays on the NCC , IQ or EQ unit is then wired tot the input of the transmitter board, for instance connector K3 between GND and input 1. A short pulse of a normally open contact is enough to trigger a short burst of data onto 433Mc. This data consists of an address and alarm number (1, 2, 3 or 4).
In the handheld receiver this burst is detected and the alarm will sound in addition one of the led's will light for a couple of seconds which indicates the alarm input that is triggered.

If necessary an opto coupled input is also available on the transmitter. In this case 24V has to be supplied to the appropriate input.

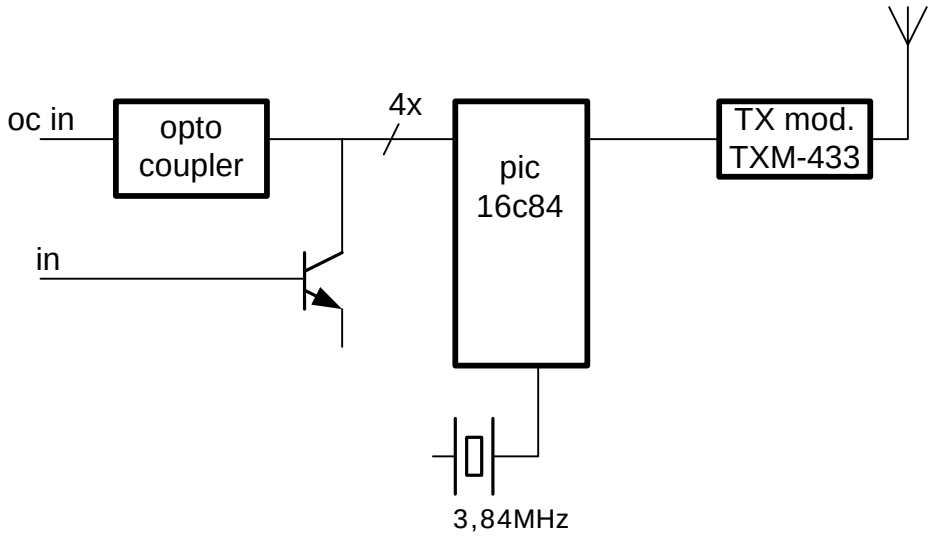
Both, the transmitter and the receiver are equipped with an address switch to its possible to use more than one transmitter receiver combinations in the same "shop".

The battery in the receiver has to be charged regularly, for this purpose the receiver has a battery charge input with charge led. While charging the pager does not function.

The working range depends on the location of the transmitter and the total construction of the building. A range of 10 to 20 meters is practical and must give a sure alarm.

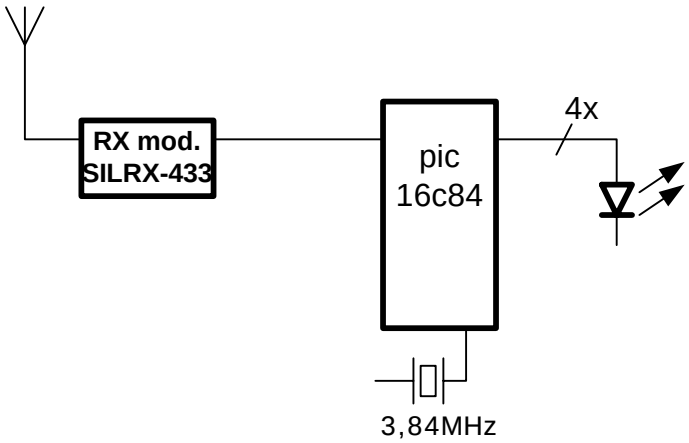
Block diagram

Wireless Alarm Transmitter art. No. 8008272



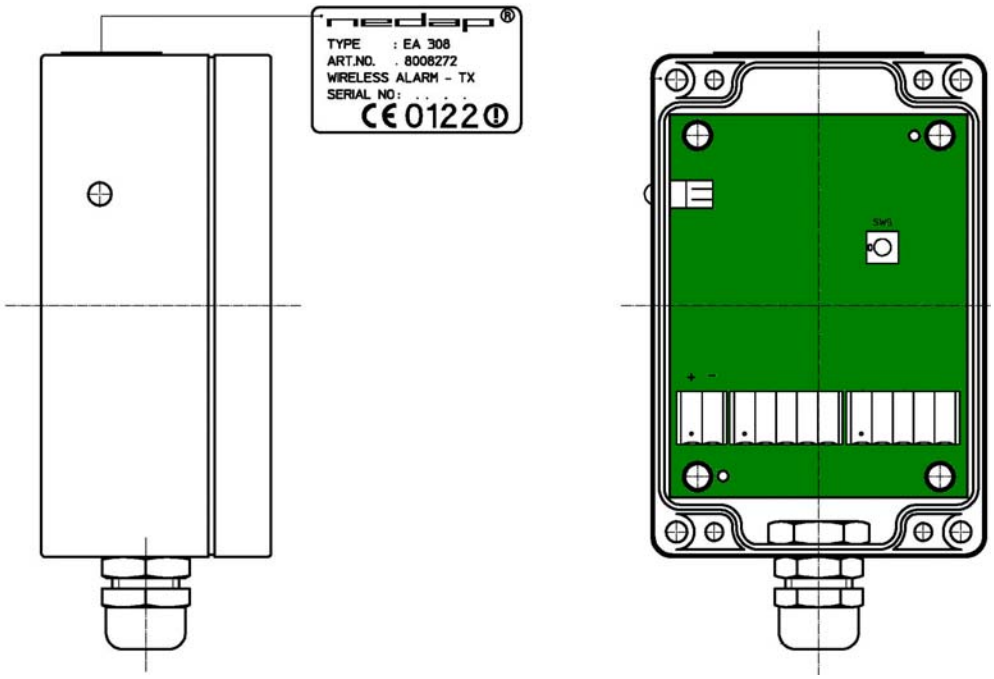
Either an opto coupled or a normal input is triggered and translated in a code by the pic. This code will be transmitted via a standard transmitter module on 433 MHz.

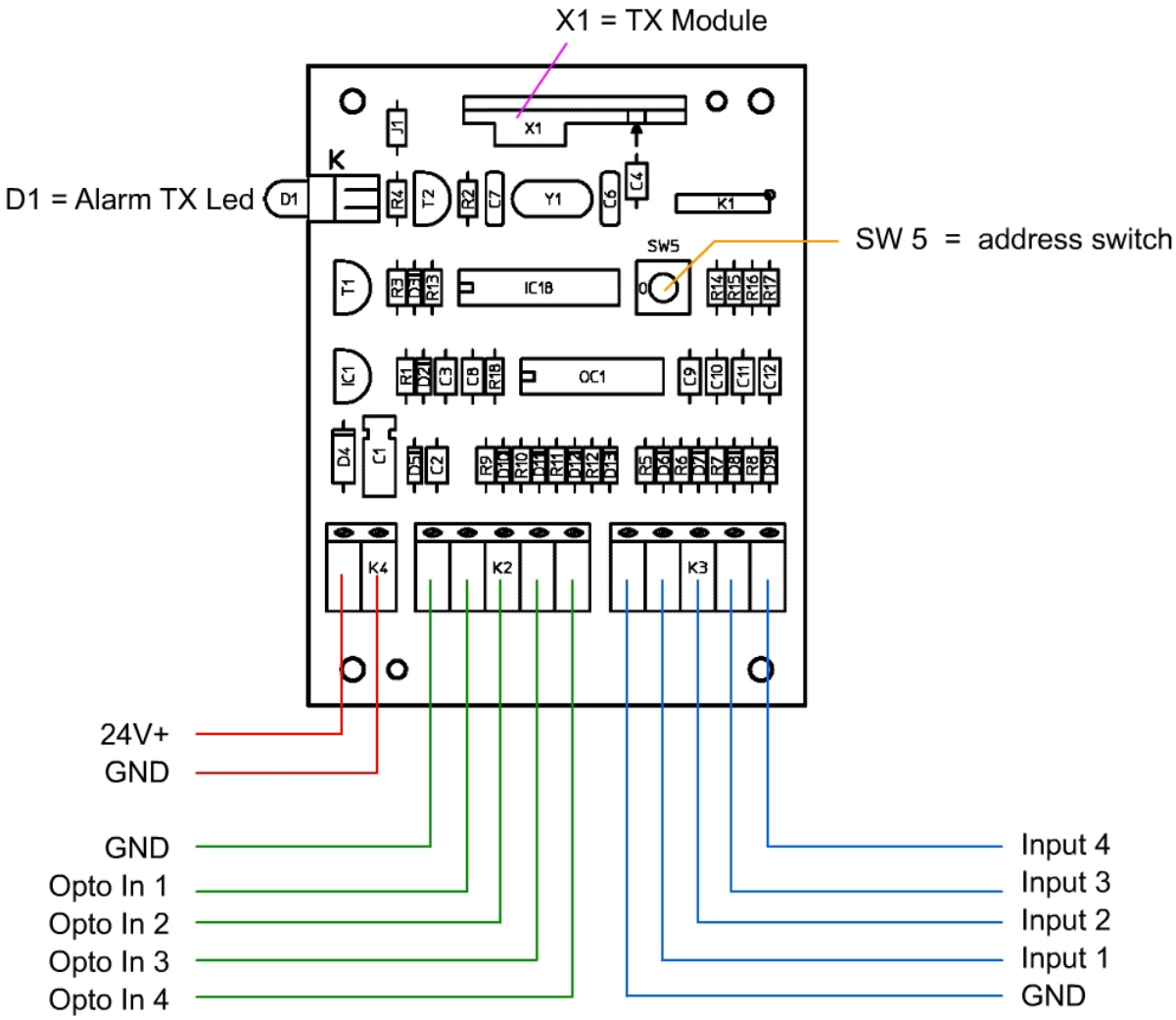
Wireless Alarm Receiver art. No. 8008299



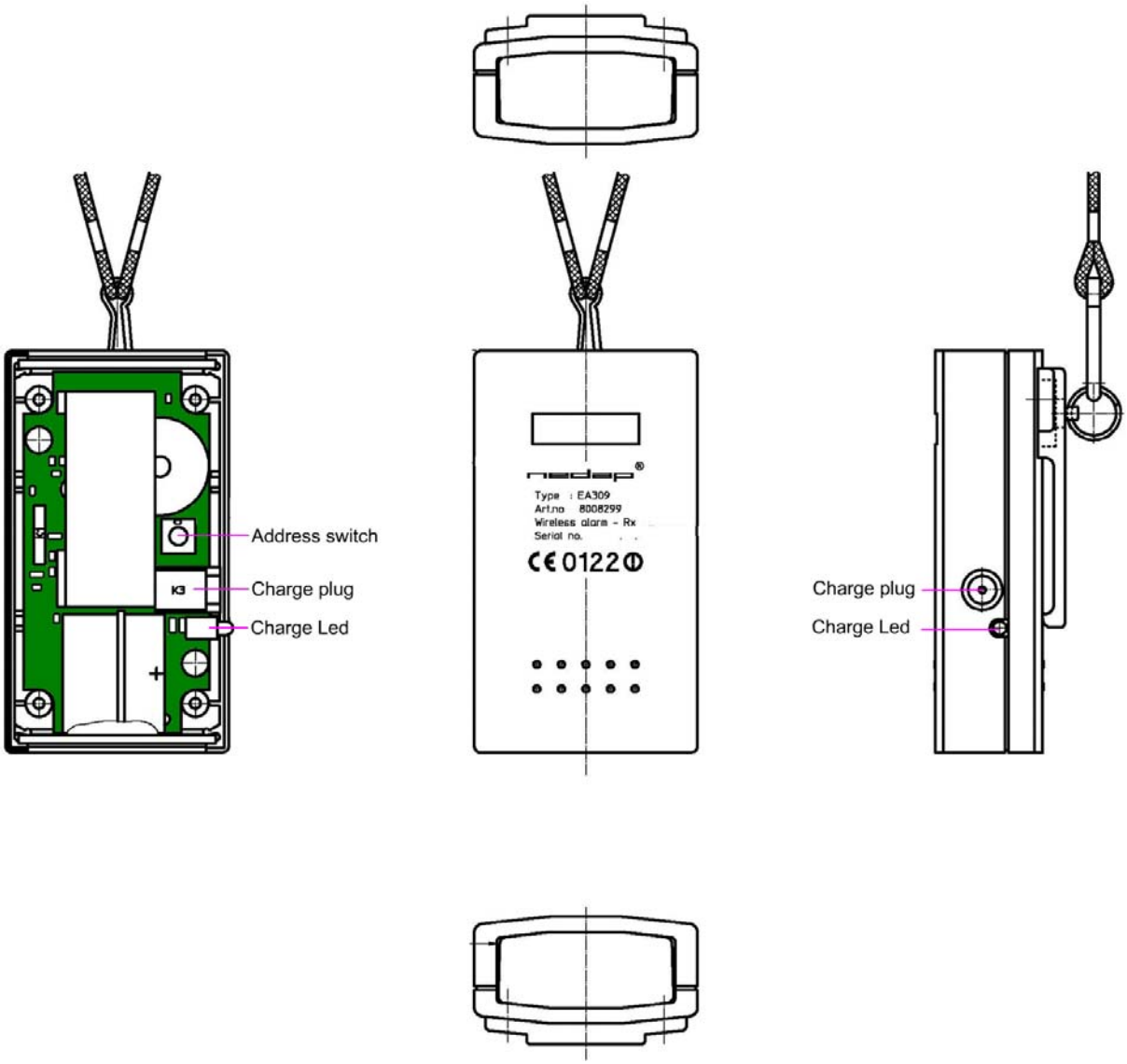
A standard 433 MHz receiver module receives the alarm data and output it to a pic 16c84. The pic will read the code and will turn on the appropriate led and gives audible alarm.

Transmitter Unit and PCB





RX Pager Unit and PCB



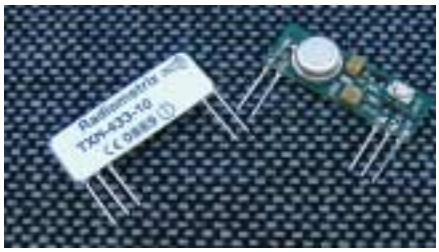
Radiometrix

Hartcran House, Gibbs Couch, Watford, WD19 5EZ, England
Tel: +44 (0) 20 8428 1220, Fax: +44 (0) 20 8428 1221

Issue 5, February 2002 **TXM-433**

UHF Radio Telemetry Transmit Module

The TXM-433-5 and TXM-433-10 integrate a low power FM UHF radio transmitter on a small module. Together with the matching RX2-433-14 or RX2-433-40 receiver a one-way radio data link can be achieved over a distance up to 200 metres on open ground.



TXM-433-10 transmitter (back & front view)

Typical features include:

- CE Certified by independent Notified Body
- Verified to comply with harmonised radio standard ETSI EN 300 220-3 and EMC standard ETSI EN 301 489-3 by accredited Test Laboratory
- PCB Mounting, space saving SIL style
- SAW controlled wide band FM transmission
- High data rates, 5kbps and 10kbps versions
- Analogue or Digital data input
- Wide supply range 2.7V-4.0 or 6.0V-9.0V @ <17mA

The transmitter modules are most commonly employed in Wireless Security systems. The transmitter and the matching receiver (RX2) are approved to harmonised radio standard ETSI EN 300 220-3 and EMC standard ETSI EN 301 489-3. The TXM and RX2 modules will suit one-to-one and multi-node wireless links in applications including car and building security, EPOS and inventory tracking, remote industrial process monitoring and computer networking. Because of their small size and low power requirements, both modules are ideal for use in portable, battery-powered applications such as hand-held terminals.

Typical applications include :-

- Domestic and commercial security
- Guard patrol / lone worker protection
- Medical Alert / Nurse Call systems
- Mobile panic attack
- Computer networking
- Remote industrial process monitoring
- Data transfer through hazardous environments
- Lighting control, Garage door openers
- Fire alarms
- Picture / antique protection alarms
- Remote control, Access control

Brief description

The TXM is designed to work with the matching SILRX receiver. With the addition of simple antenna the pair may be used to transfer serial data up to 200m. The range of the radio link is very variable and depends upon many factors, principally, the type of antenna employed and the operating environment. The 200m quoted range is a reliable operating distance over open ground using 1/4 whip antenna at both ends of the link at 1.5m above ground. Smaller antenna, interference or obstacles (e.g. building etc.) will reduce the reliable working range (down to 30m in extreme cases). Increased antenna height, slow data or a larger receive antenna will increase the range (our best is 3km).

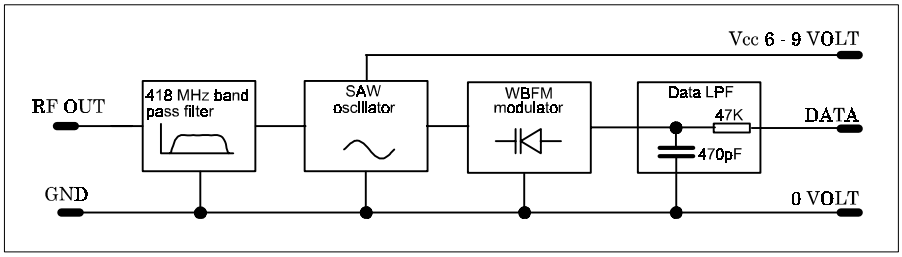


figure 1: TXM's block diagram

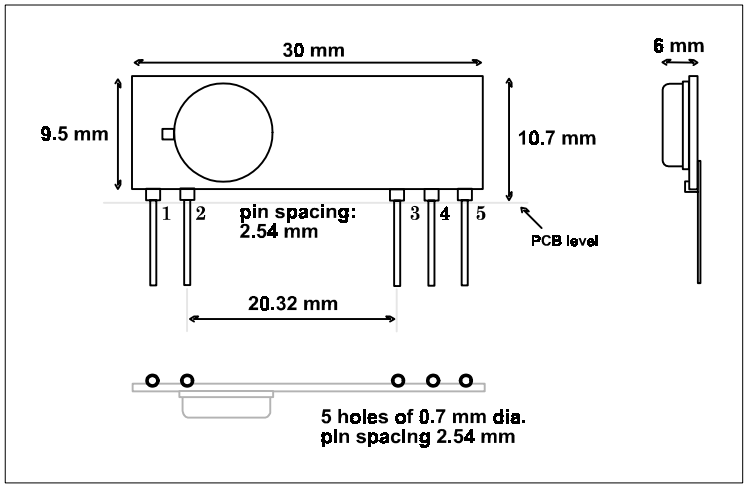


figure 2: mechanical dimensions

Pin Description

pin 1	RF GND	This pin should be connected to the ground plane against which the integral antenna radiates. It is internally connected to pin 4.
pin 2	RF OUT	Connects to the integral antenna. Output impedance is 50Ω.
pin 3	Vcc	Positive supply , supply voltages from +6V to +9V may be used.
pin 4	Vss	0V connection for the modulation and supply.
pin 5	DATA IN	Should be driven directly by a CMOS logic device running on the same supply voltage as the module.

Performance data TXM-433-5

Absolute Maximum Ratings:

Supply voltage Vcc	pin 3	-0.7V	to	+ 12V
Modulation input	pin 5	-0.7V	to	+ 9V
Operating temperature		-10 °C	to	+ 55 °C
Storage temperature		-40 °C	to	+ 100 °C

Performance Data:

ambient temperature:	20°C
supply voltage:	+8.0V, unless noted otherwise
test circuit:	figure 3

Parameter		Min	Typical	Max	Units	Notes
Operating supply range (Vcc)		6.0	-	9.0	V	-
Supply current,	Vcc = 6.0V	3.0	6.0	10.0	mA	-
	Vcc = 9.0V	5.0	10.0	17.0	mA	-
Radiated power (ERP)	Vcc = 6.0V	-16	-10	-7	dBm	1
	Vcc = 9.0V	-13	-8	-5	dBm	1
Transmit frequency (Frf)			418.00 / 433.92		MHz	-
Initial frequency accuracy		-80	-	+80	kHz	-
Overall frequency accuracy		-95	-	+95	kHz	2
Spurious radiation		Meets the EN300 220-1 standard				3
FM deviation (+/-)		15	25	40	kHz	4
Modulation Bandwidth (-3dB) analogue		DC	-	10	kHz	4
Modulation digital pulse width		100	-	-	µs	5

Notes

1. Module on 50mm square ground plane, helical antenna
2. Supply 6V to 9V, temp -10°C to +55°C.
3. <-54 dBm in bands 41-68, 87.5-118, 162-230 & 470-862 MHz
   <-36 dBm else where below 1GHz , <-30dBm above 1GHz
4. Standard modulation: 2kHz square wave, 0 to Vcc
5. High or Low pulse.

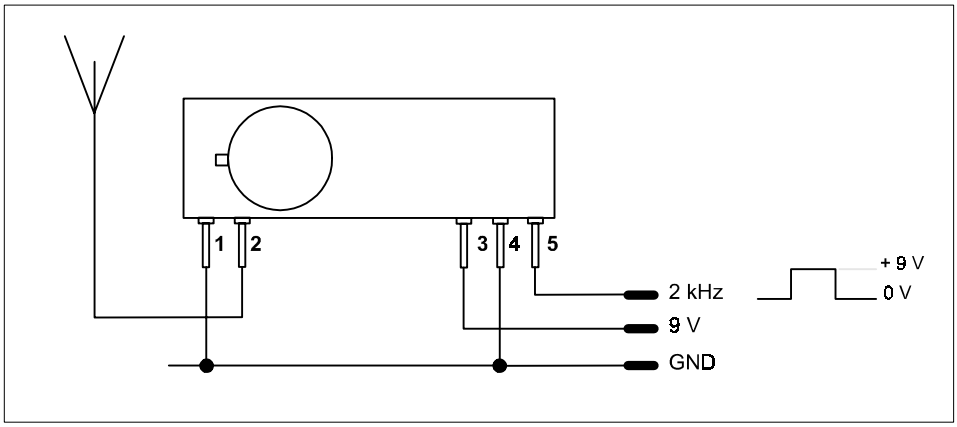


figure 3: TXM 5kbps version test circuit

Performance data TXM-418-10 and TXM-433-10

Absolute Maximum Ratings:

Supply voltage Vcc	pin 3	-0.7	to	+ 6V
Modulation input	pin 5	-0.7	to	+ 13V
Operating temperature		-10°C	to	+ 55°C
Storage temperature		-40°C	to	+ 100°C

Performance Data:

ambient temperature:	20 °C
supply voltage:	3.0V, unless noted otherwise
test circuit:	figure 4

Parameter	Min	Typical	Max	Units	Notes
Operating supply range (Vcc)	2.7	3.2	4	V	-
Supply current,Vcc = 2.7V	3.0	6.0	13.0	mA	-
Vcc = 4.0V	5.0	10.0	17.0	mA	-
Conducted power in to 50 Ω, Vcc = 2.7V	-	-5	-	dBm	1
Vcc = 3.6V	-	0	-	dBm	1
Transmit frequency (Frf)		433.92		MHz	-
Initial frequency accuracy	-85	0	+85	kHz	-
Overall frequency accuracy	-95	0	+95	kHz	1
Spurious radiation					2
FM deviation (+/-)	15	25	40	kHz	3
Modulation Bandwidth (-3dB) analogue	DC	-	20	kHz	3
Modulation digital pulse width	50	-	-	µs	4

Notes

1. Supply 2V to 3.6V, temp -10°C to +55°C.
2. <-54 dBm in bands 41-68, 87.5-118, 162-230 & 470-862 MHz
   <-36 dBm else where below 1GHz , <-30dBm above 1GHz
3. Standard modulation: 2kHz square wave, 0 to Vcc
4. High or Low pulse.

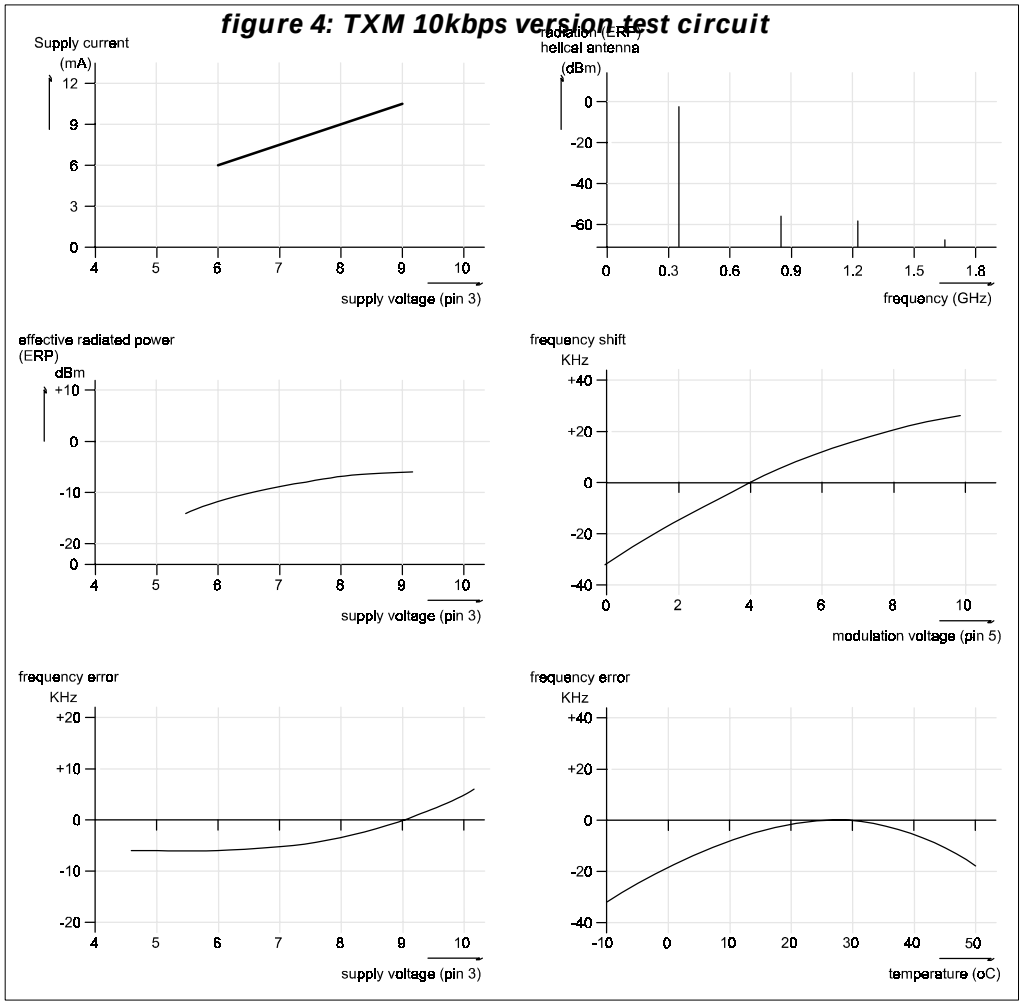


figure 5: Typical performance curves

The TXM-UHF transmitter requires only a data modulation input, supply, ground and an antenna.

Power supply requirements

- The module will operate over the range 6V to 9V and is typically powered by either 9 Volt 'PP3'.
- The module is not reverse polarity protected. Reverse supply voltages higher than 2V will cause damage and must therefor be externally protected against.

Modulation requirements

- The TXM-UHF transmitter has a DC to 10kHz modulation bandwidth and will accept direct analogue (AFSK) or digital data. A modulation low-pass filter (10kHz @ -6dB, 1st order) is use internally.

- Although the modulation bandwidth of the transmitter extends down to DC as does the AF output of the receivers, it is not possible to pass data with a DC component due to frequency errors & drifts between the transmitter and receiver. Frequency differences between the transmitter and receiver will produce a DC offset error which causes the data slicer in the receiver module to give errors on long high or low pulses which exceed the maximum pulse width, see the receiver's data sheet for more detailed information.

- Data Input, pin 5, is normally driven directly by CMOS logic levels from a data encoder IC. There is a wide range of encoder/decoder IC's available which may be used with the modules:

MM57C200, 57410	National Semiconductor
UM3750	UMC
HT12 series	Holtek
MC14026	Motorola
AS2787	Austria Systeme International GmbH

- The encoder normally being run on the same supply voltage as the transmitter. Analogue drive eg. 2 tone FSK, is also possible, the pk to pk level should be between 5V and 9V peak to peak and must not drive pin 5 below 0V. There will be some 2nd harmonic distortion due to the varactor modulator (typ. <15%), this may be reduced if necessary by predistortion of the analogue waveform

Antenna requirements

Three types of integral antenna are recommended and approved for use with the module:

A) Helical: Wire coil, connected directly to pin 2, open circuit at other end. This antenna is very efficient given it's small size (20mm x 4mm dia.). The helical is a high Q antenna, trim the wire length or expand the coil for optimum results. The helical de-tunes badly with proximity to other conductive objects.

B) Loop, A loop of PCB track tuned by a fixed or variable capacitor to ground at the 'hot' end and fed from pin 2 at a point 20% from the ground end. Loops have high immunity to proximity de-tuning.

C) Whip This is a wire, rod ,PCB track or combination connected directly to pin 2 of the module. Optimum total length is 17cm (1/4 wave @ 418MHz) Keep he open circuit (hot) end well away from metal components to prevent serious de-tuning. Whips are ground plane sensitive and will benefit from internal 1/4 wave earthed radial(s) if the product is small and plastic cased

Antenna selection chart

	A	**B**	**C**
	helical	***loop***	***whip***
Ultimate performance	**	*	***
Easy of design set-up	**	*	***
Size	***	**	*
Immunity proximity effects	**	***	*
Range open ground to similar antenna	80m	50m	120m

The antenna choice and position directly controls the system range. Keep it clear of other metal in the system, particularly the 'hot' end. The best position by far, is sticking out the top of the product. This is often not desirable for practical/ergonomic reasons thus a compromise may need to be reached. If an internal antenna must be used try to keep it away from other metal components, particularly large ones like transformers, batteries and PCB tracks/earth plane. The space around the antenna is as important as the antenna itself.

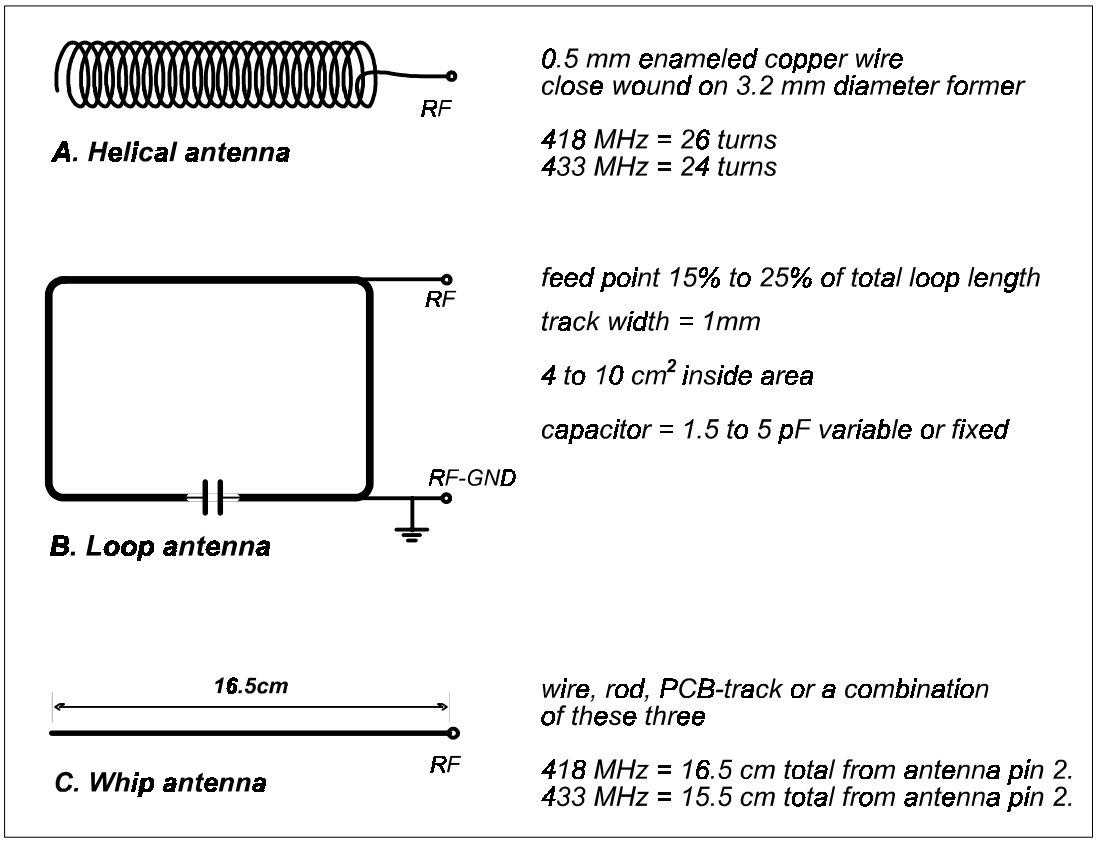


figure 6: Antenna configurations

Duty Cycle requirements

The duty cycle is defined as the ratio, expressed as a percentage, of the maximum transmitter "on" time on one or more carrier frequencies, relative to a one hour period. Where an acknowledgement message is required, the additional transmitter "on" time shall be included.

There is a 10% duty cycle restriction on 433.050-434.790 MHz band in most of the EU member states.

The TXM-433 is a RF module intended to be incorporated into a wide variety of applications and finished products, Radiometrix has no control over the end use of the TXM-433.The harmonised band 433.050 to 434.790 MHz as detailed in Annex 1 Band E of CEPT/ERC Recommendation 70-03 (which can be downloaded at http://www.ero.dk/scripts/docmanag98/dm.dll/QueryDoc?Cat=Recommendation) has list of countries where Duty Cycle restriction apply.

Module users should, therefore, ensure that they comply with the stated Duty Cycle requirements of the version of CEPT/ERC Recommendation 70-03 in place at the time of incorporation of the TXM-433 into their product. It should be noted that the stated Duty Cycle must not be exceeded otherwise any approval granted for the TXM-433 will be invalidated.

Ordering information
The following are standard:

TXM-433-5	5kbps data rate Transmitter
RX2-433-14-5V	14kbps data rate matching Receiver
RX2-433-40-5V	40kbps data rate matching Receiver
SILRX-433-5	5kbps data rate matching Receiver

TXM-433-10	10kbps data rate Transmitter
RX2-433-14-5V	14kbps data rate matching Receiver
RX2-433-40-5V	40kbps data rate matching Receiver
SILRX-433-10	10kbps data rate matching Receiver

3V versions of the RX2 receivers are available and should be ordered with a -3V suffix on the part number. (e.g. RX2-433-14-3V is set-up for 3V to 4V operation)

All modules are available in a 418MHz version for UK use.

CE Certificate of TXM and its variants

Radio Frequency Investigation Ltd

NOTIFIED BODY OPINION
RFI/NBCB2/42627JD01

Applicants Details

Applicant's Company Name: Radiometrix Ltd

Address: Hartcran House, Gibbs Couch, Carpenders Park, Watford, Herts., WD19 5EZ

Contact Name: Mr G Sharples

Manufacturers Details

Manufacturer's Company Name: Radiometrix Ltd

Address: Hartcran House, Gibbs Couch, Carpenders Park, Watford, Herts., WD19 5EZ

Contact Name: Mr G Sharples

Product Details

Product Name: TXM-433

Model Number(s): TXM-433-5
TXM-433-10
TXM-433-TR

TCF Reference Number: RM/TXM/DTD

Standard(s): EN 300 220-1 V1.3.1 (2000-09) according to the requirements of EN 300 220-3 V1.1.1 (2000-09)

Description: UHF Radio Telemetry Transmit Module

In the opinion of RFI, the Technical Construction File demonstrates that the Apparatus to which it relates conforms to the essential requirements of Article 3.2 of Council Directive 1999/5/EC on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Authorised Signatory:

Mr N Cobb

08 - 11 - 01

Date

RADIO FREQUENCY INVESTIGATION LIMITED

Company Seal

Notified Body Number - 0889

Radio Frequency Investigation Ltd, Enhurst Park, Ramsdell, Basingstoke, Hampshire RG26 5RQ, ENGLAND
Tel: +44 (0) 1256 851193 Fax: +44 (0) 1256 851192 E-mail: sales@rfi.co.uk
Registered in England, No. 211 7901

Radiometrix Ltd

Hartcran House, Gibbs Couch,
Watford, WD19 5EZ, ENGLAND
Tel: +44 (0)20 8428 1220,
Fax: +44 (0)20 8428 1221
info@radiometrix.co.uk
www.radiometrix.co.uk

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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 Radiocommunications Agency (RA) web site:
http://www.radio.gov.uk/topics/conformity/conform-index.htm

The Library and Information Service
The Radiocommunications Agency
Wyndham House
189 Marsh Wall
London
United Kingdom
E14 9SX
Tel: +44 (0)20 7211 0502/0505
Fax: +44 (0)20 7211 0507
library@ra.gsi.gov.uk
For further information on radio matters contact the Agency's 24 Hour Telephone Enquiry Point: +44 (0)20 7211 0211

European Radiocommunications Office (ERO)
Midtermolen 1
DK 2100 Copenhagen
Denmark
Tel. +45 35250300
Fax +45 35250330
ero@ero.dk
www.ero.dk

Radiometrix

Hartcran House, Gibbs Couch, Watford, WD19 5EZ, England

Tel: +44 (0) 20 8428 1220, Fax: +44 (0) 20 8428

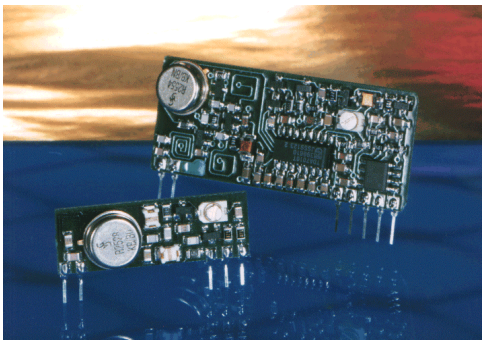
Issue 3, 13 April 2001

SILRX-UHF

UHF Radio Telemetry Receiver Module

UK version: **SILRX-418-5 / SILRX-418-10**
Euro version: **SILRX-433-5 / SILRX-433-10**

The SILRX-418-5 and SILRX-433-5 integrate a complete FM superhet UHF radio receiver on a small module. Together with the matching TXM-418-5 or TXM-433-5 transmitter a one-way radio data link can be achieved over a distance upto 200 metres on open ground



left: TXM-418-5 transmitter right: SILRX-418-5 receiver

Typical features include:

- PCB mounting, space saving SIL style
- 418 MHz SAW controlled wide band FM reception
- Selective double conversion superhet
- Sensitive typ. 0.5µV (-113 dBm) for 20 dB S/N
- High data rates, 5kbps and 10kbps
- Analogue and Digital data outputs
- Carrier detect output
- Fast enable time,< 3ms for duty cycle power save use
- Wide supply range, 4.0V to 9.0V
- Low current, 13 mA continuous, 130µA on power save (100:1)
- The SILRX radio receiver and the matching DTI (RA) approved transmitter (TXM-418-5) are self contained, PCB mounting modules capable of transferring analogue or digital data up to a distance of 200m.

The SILRX receiver module is particularly suitable for battery powered portable applications where it's low power requirements and small size are of advantage. It may also be used as a lower cost option to the RXM-418-10 in fixed applications where the higher data rates and signal strength output of the RXM-418-10 are not required.

Typical applications include:-

Site paging receivers
Line powered telephone auto diallers
Guard patrol/lone worker protection
Mobile panic attack
Battery powered half duplex data networks
Lighting control, Garage door openers
Picture/antique protection alarms
Paging car alarms
Domestic and commercial security
Medical Alert/Nurse Call system
Remote industrial process monitoring
Data transfer through hazardous environments
Fire alarms
Remote control, Access control

Brief description

The SILRX receiver is a double conversion FM superhet with a data slicer driven by the AF output. Additionally a fast acting carrier detect signal is available to indicate to external circuits that a signal is present. This signal is extremely useful when implementing duty cycle power save circuits (see fig 4) or to indicate to external logic that a signal is being received. It is internally derived from the degree of noise quieting due to the presence of a receive carrier.

The SILRX-418 is designed to work with the matching transmitter (TXM-418). With the addition of simple antenna the pair may be used to transfer serial data up to 200m. The range of the radio link is very variable and depends upon many factors, principally, the type of antenna employed and the operating environment. The 200m quoted range is a reliable operating distance over open ground using 1/4 whip antenna at both ends of the link at 1.5m above ground. Smaller antenna, interference or obstacles (e.g. building etc.) will reduce the reliable working range (down to 30m in extreme cases). Increased antenna height, slow data or a larger receive antenna will increase the range (our best is 3km).

We recommend that the module evaluation kit, EVAL-418-A, can be used to assess the reliable working range under the anticipated conditions of use.

The following figure shows the receiver's block diagram.

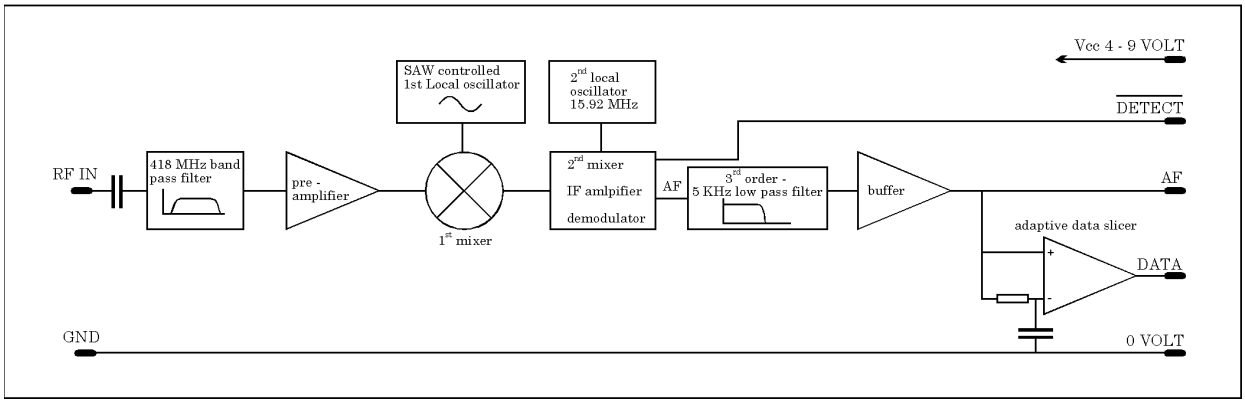


figure 1: Block diagram

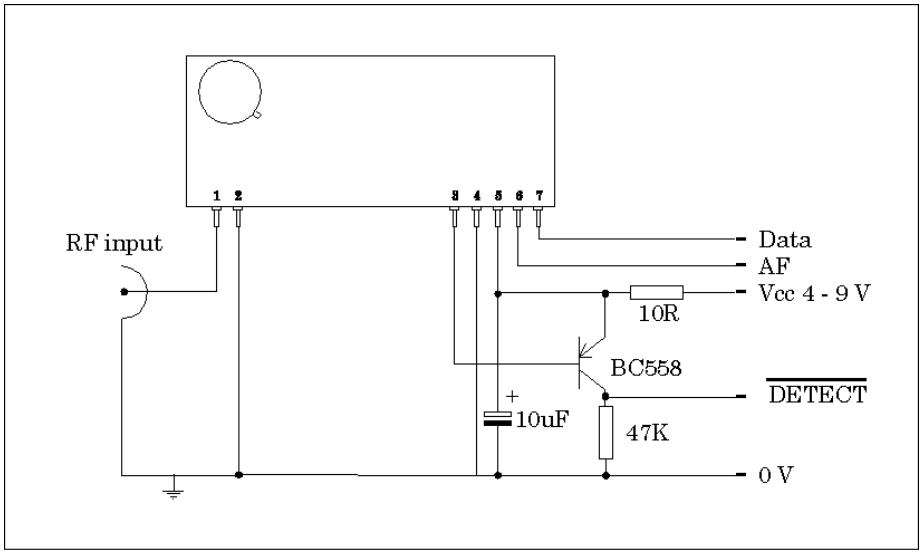


figure 2: Test cicuit

Pin Description

pin	1	RF IN	The receiver antenna connects to this input. It has nominal RF impedance of 50Ω and is capacitively isolated from the internal circuit
pin	2	RF GROUND	This pin should be connected to any ground plane against which the antenna works. It is internally connected to pin 4.
pin	3	DETECT	This pin may be used to derive a carrier detect to enable external circuits when a signal is being received. If the detect function is not being used a 10 kΩ pull-up to pin 5 (Vcc) should be connected. Refer to applications note for further details on the use of this pin.
pin	4	0 volt	Ground for supply.
pin	5	Vcc	Positive supply of 4V to 9V 13 mA. The supply must be clean (<2mV pp) stable and free of high frequency digital noise. A supply filter is recommended unless the module is driven from it's own regulated supply.
pin	6	AF	This is the FM demodulator output. It has an standing DC bias of approximately 1.4V and may be used to drive analogue data detectors such as modem chips or DTMF decoders. Load impedances as low as 2 kΩ and up to 100 pF can be driven
pin	7	DATA	This digital output from the internal data slicer is a squared version of the signal on pin 6 (AF) This signal is used to drive external digital decoders, it is true data (i.e. as fed to the transmitters data input). Load impedances as low as 1 kΩ and up to 1 nF can be driven

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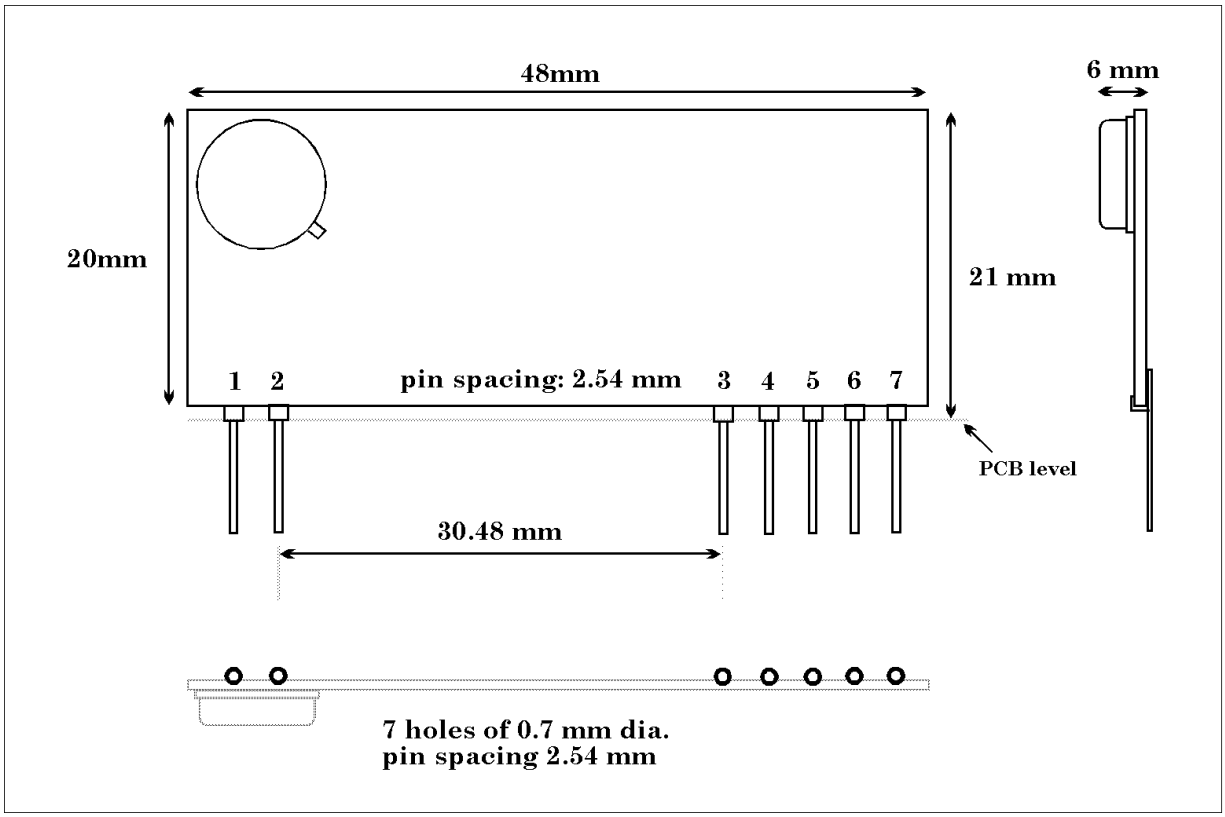

figure 3: Mechanical Dimensions:

Performance data SILRX-418-5 and SILRX-433-5

ambient temperature: 20°C

supply voltage: + 5 Volt

test circuit: fig. 2

Parameter		*Min.*	*Typical*	*Max.*	*Units*	*Notes*
Operating voltage range (Vcc)	pin 5	4.0	5.0	9.0	V	-
Supply current	pin 5	11	14	17	mA	-
Receive frequency		-	433.92	-	MHz	-
Overall frequency accuracy		- 100	0	+ 100	kHz	1
Sensitivity for 20 dB S/N	pin 1	-	0.5	1.0	µV	2
Carrier detect, threshold	pin 1	-	0.5	2.0	µV	-
RF input impedance	pin 1	-	50	-	Ω	-
IF bandwidth		-	250	-	kHz	3
AF output level	pin 6	-	500	-	mV_{pp}	2, 3
AF bandwidth	pin 6	DC	-	5	kHz	3
Frequency/voltage conversion	pin 6	-	10	-	mV/kHz	-
Data output, Logic low	pin 7	0	0.2	0.8	V	4
Logic high	pin 7	4.0	4.5	5	V	5
Data bit duration		0.2	-	20	ms	6
Data Mark:Space		20 %	-	80 %		7
Data settling time	pin 7	-	-	15	ms	8
(minimum preamble duration)						
Enable time	pin 3	-	-	2.5	ms	3, 9
Signal detect time	pin 3	-	-	0.5	ms	3, 9

Notes:

1. over supply and temperature range
2. ±25kHz deviation, 1 kHz tone
3. 3µV input
4. 1mA sink
5. 1mA source
6. time between transitions
7. (time high / time low) * 100 %, averaged over any 20 ms period
8. time from valid carrier detect to stable data output
9. from application of supply to carrier detect low (active)
10. from application of signal to carrier detect low (active)

Absolute maximum ratings:

Supply voltage Vcc, pin 5	- 0.3	to	+ 10	V
Operating temperature	- 10°C	to	+ 50°C	
Storage temperature	- 40°C	to	+ 100°C	
RF input, pin 1		0 dBm		
Any input or output pin	- 0.3	to	Vcc V, ±10 mA	

Performance data SILRX-418-10 and SILRX-433-10

ambient temperature: 20°C

supply voltage: +5V

test circuit: fig. 2

Parameter		*Min.*	*Typical*	*Max.*	*Units*	*Notes*
Operating voltage range (Vcc)	pin 5	4.0	5.0	9.0	V	-
Supply current	pin 5	11	14	17	mA	-
Receive frequency		-	433.92	-	MHz	-
Overall frequency accuracy		- 100	0	+ 100	kHz	1
Sensitivity for 20 dB S/N	pin 1	-	1.0	2.0	µV	2
Carrier detect, threshold	pin 1	-	2.0	4.0	µV	-
RF input impedance	pin 1	-	50	-	Ω	-
IF bandwidth		-	250	-	kHz	3
AF output level	pin 6	-	500	-	mV_{pp}	2, 3
AF bandwidth	pin 6	DC	-	20	kHz	3
Frequency/voltage conversion	pin 6	-	10	-	mV/kHz	-
Data output, Logic low	pin 7	0	0.2	0.8	V	4
Logic high	pin 7	4.0	4.5	5	V	5
Data bit duration		0.05	-	2	ms	6
Data Mark:Space		20 %	-	80 %		7
Data settling time (minimum preamble duration)	pin 7	-	-	5	ms	8
Enable time	pin 3	-	-	1	ms	3, 9
Signal detect time	pin 3	-	-	0.3	ms	3, 10

Notes:

1. over supply and temperature range
2. ±25 kHz deviation, 1 kHz tone
3. 3 µV input
4. 1mA sink
5. 1mA source
6. time between transitions
7. (time high / time low) * 100 %, averaged over any 20 ms period
8. time from valid carrier detect to stable data output
9. from application of supply to carrier detect low (active)
10. from application of signal to carrier detect low (active)

Absolute maximum ratings:

Supply voltage Vcc, pin 5	- 0.3	to	+ 10 V
Operating temperature	- 10°C	to	+ 50°C
Storage temperature	- 40°C	to	+ 100°C
RF input, pin 1		0 dBm	
Any input or output pin	- 0.3	to	Vcc V, ±10 mA

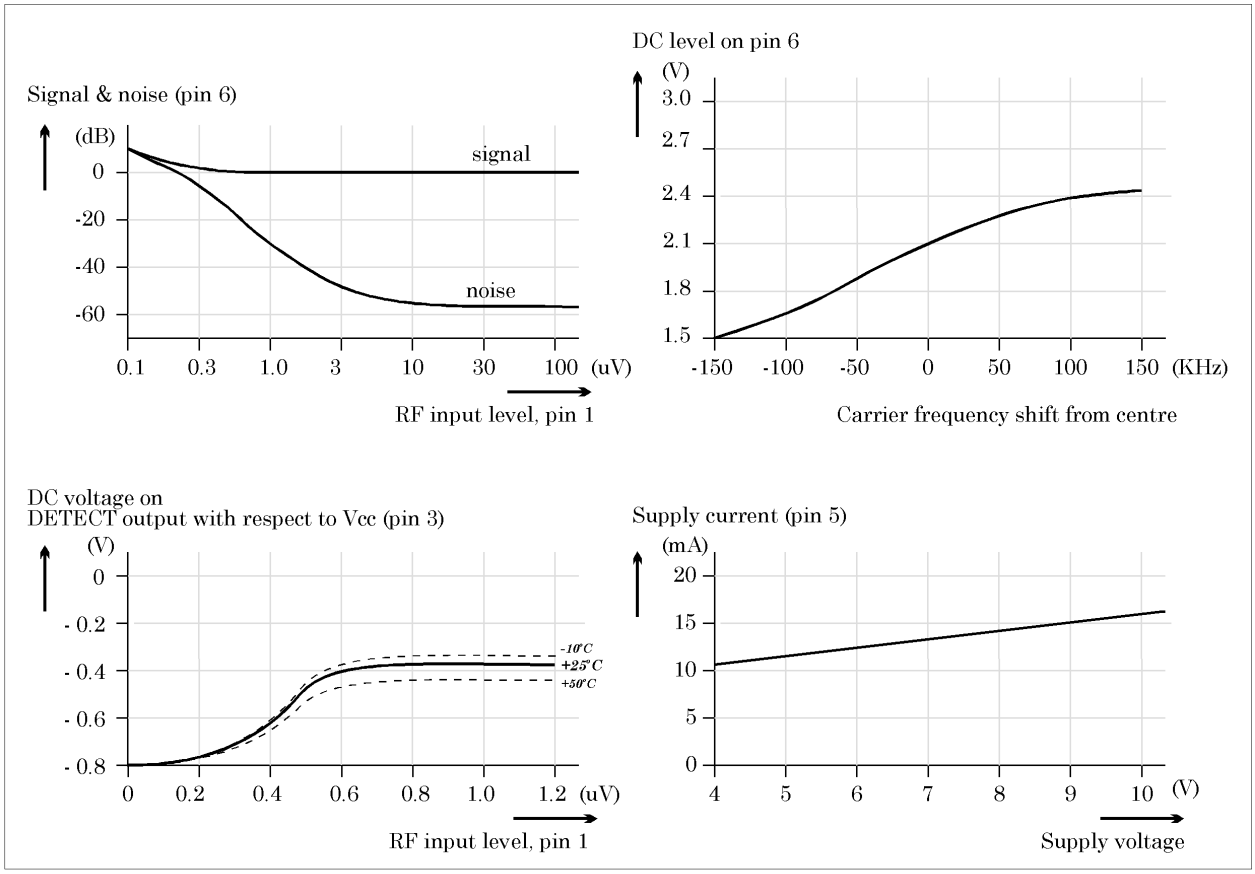

figure 4: Typical performance curves

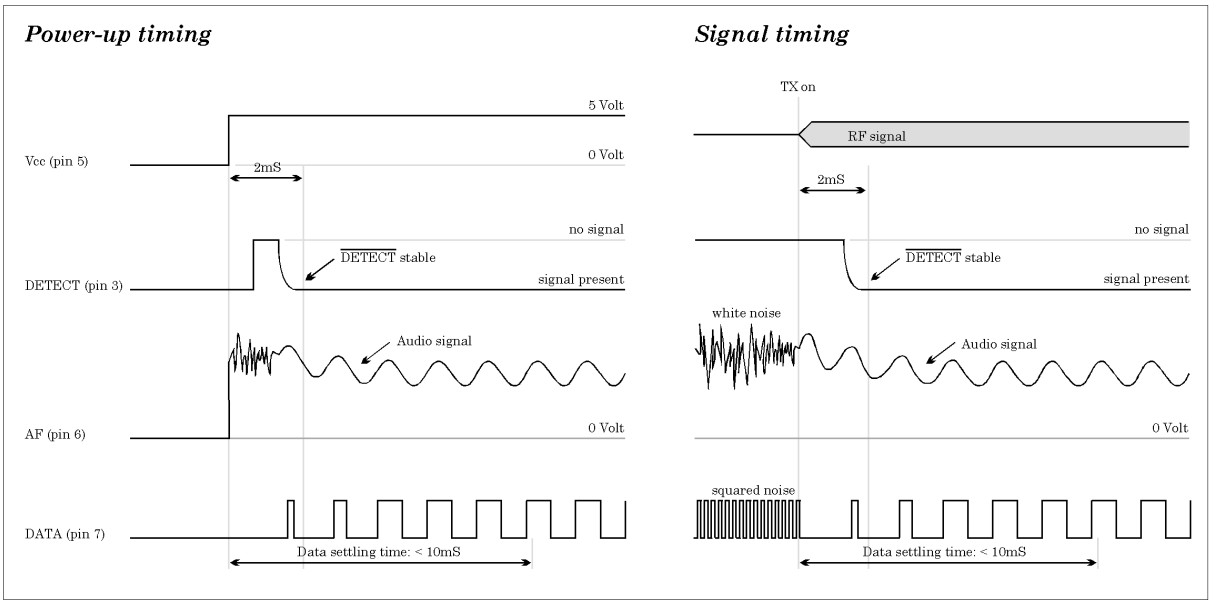

figure 5: Timing wave forms

Antenna configurations

The positioning of the antenna is of the up most importance and is one of the main factors in determining system range.

The following notes should assist in obtaining optimum performance:-

1. Keep it clear of other metal in the system, particularly the 'hot' (top) end.
2. The best position by far, is sticking out the top of the product. This is often not desirable for practical/ergonomic reasons thus a compromise my need to be reached.
3. If an internal antenna must be used try to keep it away from other metal components, particularly large ones like transformers, batteries and PCB tracks/earth plane. The space around the antenna is as important as the antenna itself.
4. Keep it away from interference sources, bad interference can easily reduce system range by a factor of 5. High speed logic is one of the worst in this respect fast logic edges have harmonics which extend into the UHF band and the PCB tracks radiate these harmonics most efficiently. Single chip microprocessors and ground planed logic boards reduce this problem significantly.

The next diagrams (fig 6) show three different antenna configurations which can be used on both the transmitter and the receiver. Additionally a coax fed external dipole or 1/4 wave ground plane antenna may be considered if system range is paramount.

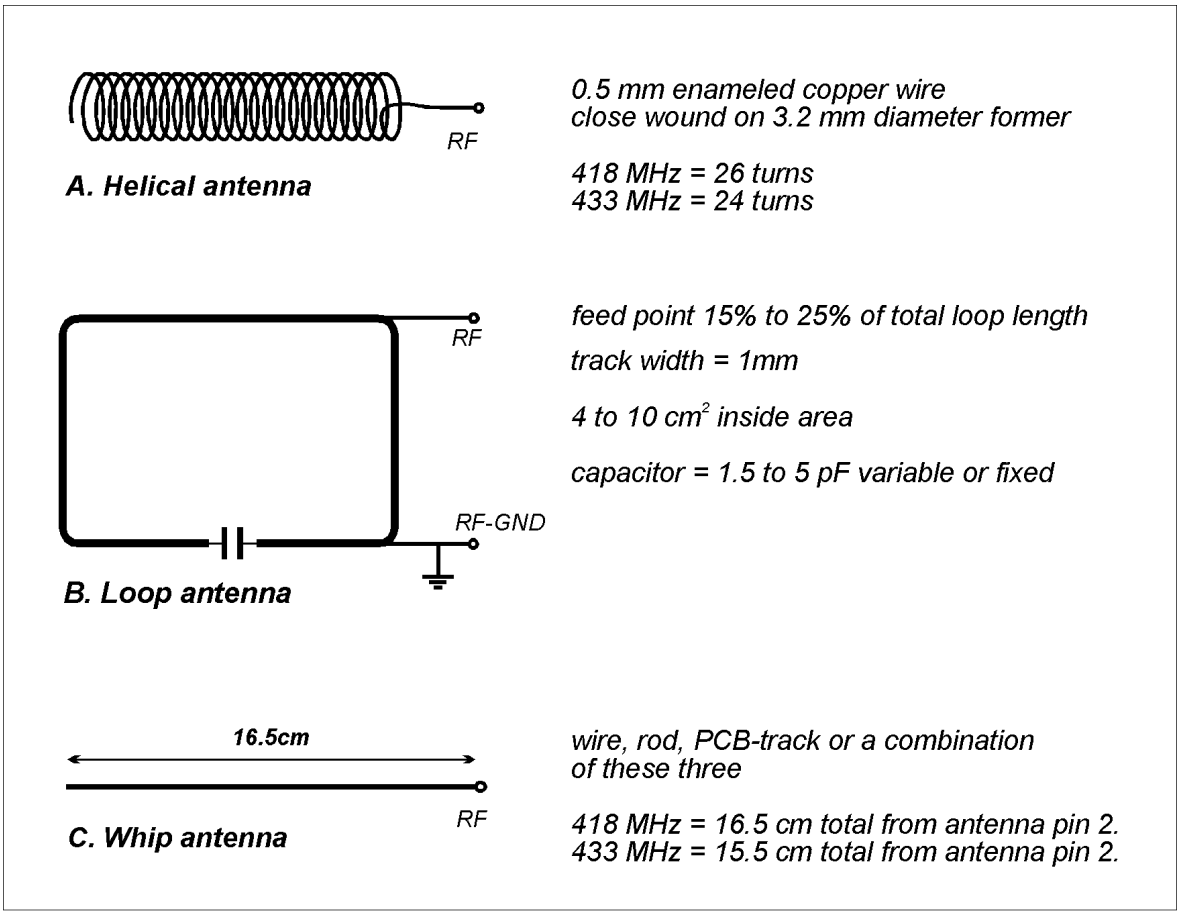

figure 6: Antenna configurations

Module Mounting considerations

1. The module may be mounted vertically or bent horizontal to the motherboard.
2. No conductive items should be placed within 4 mm of the modules' component side to prevent detuning.
3. Observe RF layout practice between the module and it's antenna i.e. < 10 mm unscreened track, use 50Ω microstrip or coax for >10mm
4. It is desirable, but not essential, to earth plane all unused area around the module.
5. Mount as far as possible from high frequency interference sources, Microprocessors with external busses are totally incompatible with sensitive radio receivers and must be keep at least 1 metre from the receive antenna. Single chip micros are not a problem.
6. In some applications it is advantageous to remote the receiver and it's antenna away from the main equipment. This avoids any interference problems and allows flexibility in the sighting of the receive antenna for optimum RF performance.

Using the DETECT output

Pin 3 of the module may be used in several ways:-

1. Pulled up to pin 5 (Vcc) with a 47 kΩ resistor unmutes the AF and DATA outputs for normal operation.
2. Pulled down to 0 Volts with a 47 kΩ mutes the AF and DATA Outputs (both go to 0V).
3. To drive the base of a PNP transistor (see fig 2) to derive a logic compatible carrier detect. The data detect output on pin 3 may be used for duty cycle power saving control in portable equipment where battery life is a problem. By pulsing the receiver on/off the average supply current may often be reduced by a factor of 20 or more depending upon the system requirements the data detect output is valid 1.5 ms (2.5 ms worst case) after application of the supply and is used to inhibit the power saving while data decoding is done.

Internal data slicer

A CMOS compatible data output is available on pin 7, this output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The data slicer in the receive module is designed to accept data with a wide range of pulse widths and mark: space ratio's, see specification table for limiting values. The data slicer has a 10 ms transient response time this is the settling time of the adaptive comparator, i.e. the first 10 ms of signal may be corrupt at the data output.

System coding

The transmit and receive modules have no internal digital coding/decoding thus allowing the flexibility to send many types of data. Encoder and decoder IC's are required to give the system a high degree of protection from false triggers due to noise/interference/neighbouring systems and often for security reasons. There are wide range of suitable encoder/decoder IC's which may be used with the modules, including :-

MM57C200, MM57410,National Semiconductor

UM3750, UMC

HT12 series, Holtek

MC145026 series, Motorola

AS2787, Austria Mikro Systeme International GmbH

Additionally IR. remote control, DTMF, Selcall and modem IC's can be easily interfaced to the modules.

AF output

This output is the FM demodulator's output after buffering and filtering. Since it is taken before the data slicer in the module, it may be used to drive external data slicers / demodulator's in cases where the internal data slicer is not suitable. This is the case where an analogue subcarrier is being employed e.g. 2 tone AFSK or DTMF tones. In these cases the AF output is used to drive the FSK / DTMF decoder directly.

The AF output is also a very useful test point for monitoring signals or interference. The AF output is DC coupled to the FM demodulator thus the DC level Varies with the frequency of the incoming signal.

Supply requirements

The module requires a clean supply. Noise and 'hash' in the 5 to 500 kHz band and 16 MHz ±1 MHz must be less than 2 mV, We recommend a 10 µF capacitor to ground on pin 5 (Vcc) and a 10Ω series feed resistor in cases where the cleanness of the supply is in doubt.

Warning:	***Don't be tempted to adjust the trimmer on the module, it controls the receive frequency and can only be correctly set-up with an accurate RF signal generator!***

Additional Reading

BS 0799	British standard for Wire-free intruder alarm systems
BS 4737	British standard for intruder alarm systems in buildings from British standards institution - Tel. 44 171 629 900
MPT1340	DTI type approval specification for 418 MHz Telemetry from department of
Trade	and Industry - 44 171 211 0502/0505
ARRL Handbook	Excellent radio engineering text
ARRL Antenna Book	Practical antenna design book

Applications note

Four Channel Receiver with battery saver

Fig 7 shows a simple four channel paging receiver with 256 setable codes. The CMOS 555 timer provides a duty cycle power save circuit which latches **ON** when a signal is present. The values used in the example give 4ms **ON**; 400 ms **OFF**, i.e. 1:100 duty cycle. The total quiescent current is less than 200µA, thus a 9V alkaline battery (500 mA/hr) will give a life of over 2000 hours. The **ON** time is determined by the receiver's power up settling time (3 ms worst case) + any tolerance of the duty cycle oscillator. The **OFF** time is controlled by **R8** in the circuit and should be selected to suit the application depending upon the required response time and any limits imposed upon the duration of the transmission. It is recommended that the **OFF** time be no longer than 1/2 for the transmission preamble duration.

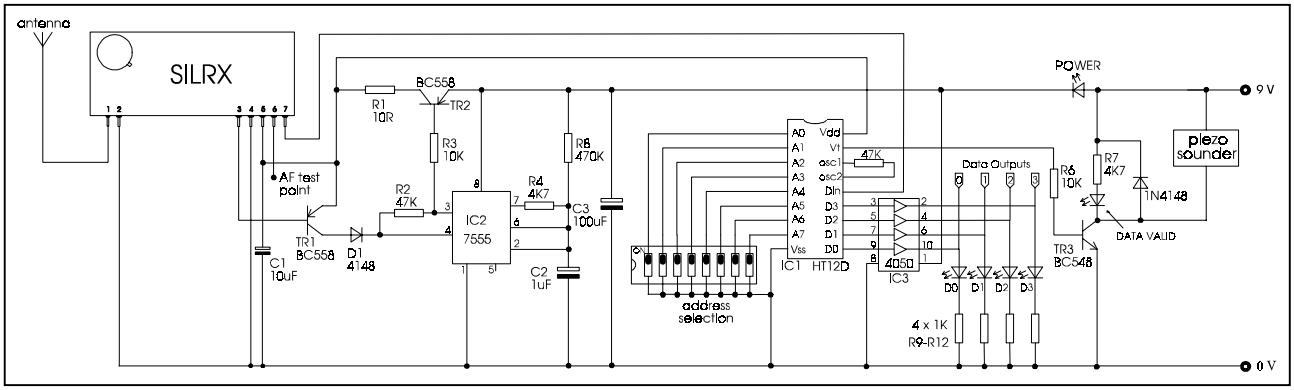

figure 7: Four Channel Receiver with power save

Ordering information

SAW based OEM Transmit and Receive modules.

TXM-418-5	UK Transmitter on 418 MHz, Type approved to MPT1340
TXM-418-10	Fast transmitter on 418 MHz, Type approved to MPT1340
RXM-418-5	matching UK receiver module on 418 MHz
SILRX-418-5	Low current UK receiver module on 418 MHz
BiM-418-10	Bi-directional short range module on 418 MHz
RPC-418-5	Self-contained module wich integrates the BiM transceiver with a Radio Packet Controller
EVAL-418-A	Evaluation kit for TXM & RXM
EVAL-418-B	SILRX supplementary PCB for EVAL-418-A
BiM-KIT	Evaluation kit for BiM-UHF modules.

All modules are available in a 433.92 MHz version for use in other European countries.

Radiometrix Ltd

Hartcran House
Gibbs Couch
Watford
WD19 5EZ
ENGLAND
Tel: +44 (0)20 8428 1220
Fax: +44 (0)20 8428 1221
info@radiometrix.co.uk
www.radiometrix.co.uk

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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 Radiocommunications Agency (RA) web site:
http://www.radio.gov.uk/topics/conformity/conform-index.htm

The Library and Information Service
The Radiocommunications Agency
Wyndham House
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London
United Kingdom
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Tel: +44 (0)20 7211 0502/0505
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library@ra.gsi.gov.uk
For further information on radio matters contact the Agency's 24 Hour Telephone Enquiry Point: +44 (0)20 7211 0211

European Radiocommunications Office (ERO)
Midtermolen 1
DK 2100 Copenhagen
Denmark
Tel. +45 35250300
Fax +45 35250330
ero@ero.dk
www.ero.dk