RADIOMETRIX

KDEC

Code-hopping receiver with up to 5 relay outputs

KDEC is designed to provide the user with a complete receiver interface for Radiometrix transmitters such as KTX2 and KFX2. No additional parts needed to implement a complete system suitable for applications requiring high security RF remote control.
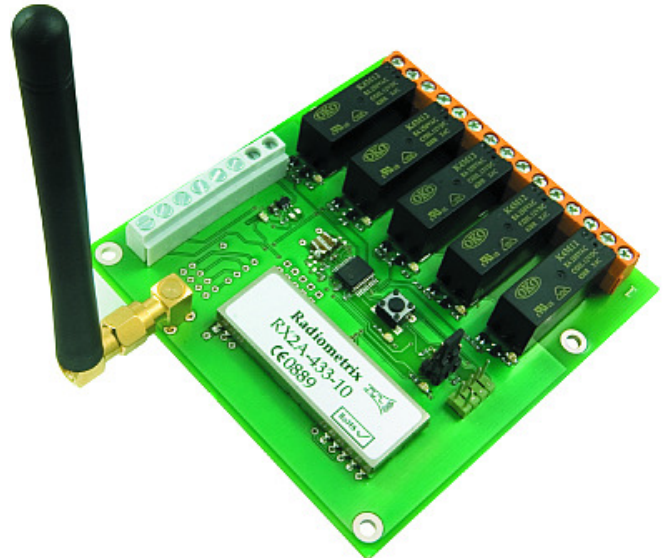

Figure 1: KDEC board

Features

- Up to 5 relays to control mains powered devices rated up to 8A, 250VAC/30VDC
- Volt-free changeover contacts
- Learn button - remembers up to 16 different transmitters
- Remembers transmitters when switched off
- Visual indication of Learn function
- Visual indication of low supply voltage at the Transmitter
- Visual indication of activated relays
- Momentary or Latched outputs
- Basic antenna included - setup is simple as Plug-and-Play
- Receiver module on-board
- Terminal block to connect external power supply
- SMA RF connection
- 9 – 16VDC supply
- Quiescent current consumption: 20 to 25mA @ 12V
- Current consumption (with all LEDs and relays active): 180- 185mA @ 12V

Applications

- RF interface for Security and Alarm systems
- Status reporting and monitoring secure systems
- Industrial controls
- HVAC controls
- Wireless door entry systems
- Simple On/Off switching

General Description

KDEC is optimised for use with the KFX2 (Key-fob transmitter) or KTX2 modules by means of a jumper link on the PCB, according to the preference of the user.

When optimised for KFX2 it is not possible to activate more than one output per transmission and up to 5 relay outputs are available, matching the number of button inputs on the KFX2.

Alternatively, when optimised for use with the KTX2 module, the KDEC has simple output functionality. New function-codes are fed to the relays as they are received, e.g. reception of a function-code (S0, S2) will activate relays 1 and 3 simultaneously. For both versions, momentary/latched relay action is also selected by means of a jumper link on the board.

Visual Indications

The following status LEDs will light, depending on the status of KDEC.

LED	Function	Description
1 - 5	Relay active (Red)	Relay energised; S0-S3 Function-code output
LOW-BATT	TX Low Battery (Red)	Transmitter supply voltage <3.8V (approx.)
LEARN	Learn/Learnt (Orange)	Multi-function indicator – see below
POWER	POWER (Green)	Power supply present

Using KDEC

Learning a transmitter
The Learn button is pressed momentarily (<1s) and a 6-second (approx.) window follows, during which the Learn LED is lit and a message received from a Radiometrix code-hopped transmitter during this period is used to Learn that transmitter into the KDEC memory. The function code used to activate the transmitter during learning is also stored in memory and when the same function code is used again from that transmitter during normal operation the Learn LED lights to indicate this. Note: if a transmitter has already been stored it is simply re-learned (with the function code updated if this is different). Upon learning a transmitter the Learn LED flashes several times to indicate success.

Activating output relays
Once a transmitter has been learned its transmissions will be acted upon, i.e. the function code contained within the transmission is fed to the output relays. When optimised for use with KFX2, extra processing ensures that only one relay at a time is energised.

Either momentary or toggled/latching outputs can be used. Note that this distinction applies to <u>all</u> the outputs, not individual relays. When Momentary Output mode is selected the output is activated for a short period (470 – 570ms) for reception of a single message. If the same message is received repeatedly the output status is refreshed during this period: in effect, the output is "held-on" whilst a user keeps the relevant function line enabled at the transmitter. When Latched Output mode is selected the decoding of a single message causes the function-code within the message to toggle the output(s).

Care should be exercised when using Latched (or more accurately 'toggled') mode with KDEC optimised for use with KTX2; consider the following example: one function-line (S0) is taken high and held high at the transmitter. On reception of the message, Relay 1 will change state. Whilst the same message is being decoded the relay will not change state again. However, if another function-line (e.g. S1) is taken high whilst S0 is still held high, it will cause a new transmission with new hop-code and new function code (S0, S1). On reception of this message Relay 2 will change state *but so will Relay 1*, since the *new* message contains S0 and S1, which toggles Relays 1 and 2 of the KDEC.

KDEC optimised for KFX2 (being a key-fob transmitter with up to 5 buttons) deals with this issue by not responding to additional button-presses whilst one button is already pressed. However, this is at the expense of removing transparency to the function-code being received. The user may require more than one relay to be activated at once: in this case, KFX2 optimised mode should be used.

Clearing the memory

When the memory is full, no new transmitters can be learned. To clear the memory of *all* stored transmitters, the Learn button is pressed and held for more than 6s approx. The Learn LED will go out and upon releasing the button it will flash once to indicate that the memory has been cleared. It is not possible to remove individual transmitters from the memory.

Jumper settings

Jumper	Function	Position A (or not fitted at all)	Position B
T	KDEC Type	KFX Keyfob optimised	KTX Module optimised
M	Relay Mode	Momentary	Latching / Toggled

Jumper T position is only read at power-up and should be set before power is applied.
Jumper M position is read repeatedly during operation and can be changed at any time.
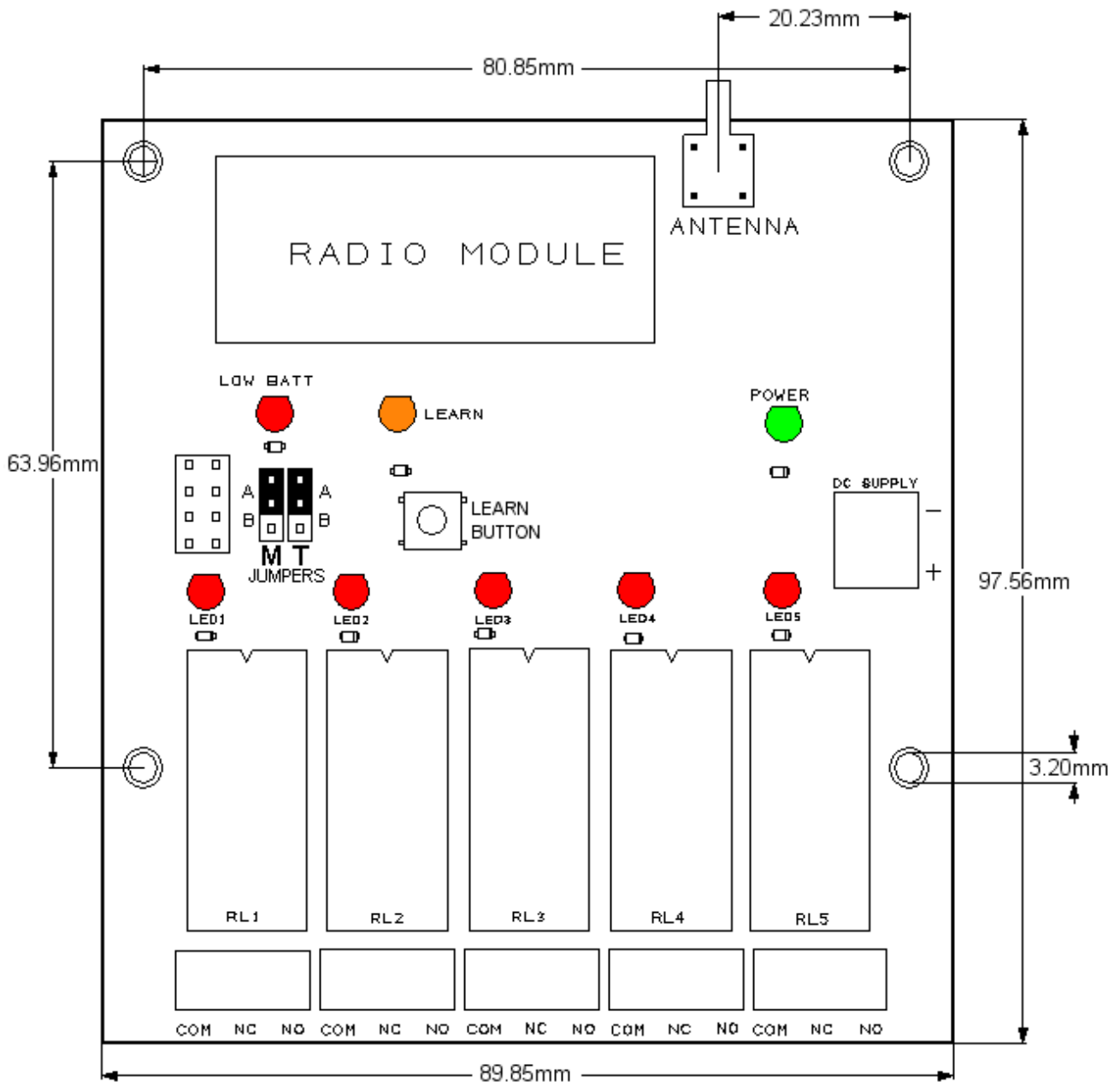

Figure 2: Component layout and Dimensions

SAFETY WARNING: *Extra care should be taken when handling the electrical connection from relay to 250AC device. Mains power should be disconnected before connecting the wires to 3-way terminal blocks to prevent electric shock. Exposed wires or terminal block should not be touched during evaluation.*

Code-hopped messages – technical brief

Transmission format is 1250bps (nominal rate) Manchester encoding. Although the function-code is only 4 bits, total message length is 67 bits. This includes a 28-bit serial number and a 32-bit encrypted hop-code. Note that the serial number and function code data is <u>not</u> encrypted. The correct status of the transmission is used to validate the data. This is achieved through use of the ever changing hop-code (changes for every new message) and by synchronising the KDEC to the transmitter(s) in use. Put another way: KDEC "Learns" individual unique transmitters, as required by the user.

The hop-code is encrypted using the serial number of the transmitter plus the manufacturer code (64- bit), which is kept secret and is not transmitted. The function-code (S0-S3) appears twice in the message and forms a part of the hop-code encryption process.

If KDEC loses synchronisation with the transmitter (e.g. repeated transmitter activation whilst out of range) then the transmitter must be activated twice with valid and sequential hop-codes before KDEC will allow the control to be processed. The hop-code is only valid if it is within a *forward* window of +32768 activations. This mechanism prevents "code-grabbers" from breaking the security of the system by recording and re-broadcasting old codes. Additionally, KDEC allows up to 14 transmissions to occur whilst the transmitter is out of range before two valid sequential transmissions are required to use the system. In practice a user may not notice the latter, since human reaction to the unsuccessful attempt is simply to "press the button again".

The level of redundancy and encryption in a message mean that, in simple terms, KDEC will <u>only</u> output a function-code that has been received from a properly recognised and synchronised transmitter.
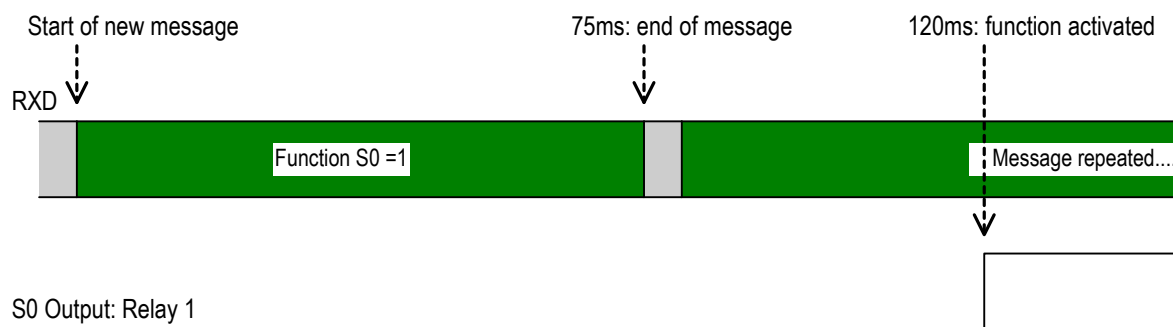

Figure 3: Timing diagram – showing action upon receiving a message with S0 = 1

The typical time delay between a "button-press" at the transmitter and relay activation by the KDEC board is 140ms.

Ordering Information

KDEC-xxx-000   Where "xxx" is frequency band in MHz – 433 is standard.

Please contact sales for other requirements.

Note:

Whilst the KDEC will operate with both KFX and KTX transmitters regardless of Jumper settings, it is recommended that Jumper T be placed in position A (or not fitted at all) when KDEC is used with 4 and 5 button Key-fobs. For these key-fobs, a combined function-code (S0, S2) is used as the code for one of the buttons.

Radiometrix Ltd

Hartcran House
231 Kenton Lane
Harrow, Middlesex
HA3 8RP
ENGLAND
Tel: +44 (0) 20 8909 9595
Fax: +44 (0) 20 8909 2233
sales@radiometrix.com
www.radiometrix.com

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/

Information Requests	*European Communications Office (ECO)*
Ofcom	*Peblingehus*
Riverside House	*Nansensgade 19*
2a Southwark Bridge Road	*DK 1366 Copenhagen*
London SE1 9HA	*Tel. +45 33896300*
Tel: +44 (0)300 123 3333 or 020 7981 3040	*Fax +45 33896330*
Fax: +44 (0)20 7981 3333	*ero@ero.dk*
information.requests@ofcom.org.uk	*www.ero.dk*