NEW

Radiometrix

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Issue 1, 22 June 2004

CTR44 Eval Kit

Control44 Evaluation Kit

4 relay output with RF remote control

Control44 Evaluation Kit enables user to evaluate Control44 Encoder/Decoder and appropriate single frequency Radiometrix module for a wireless remote control system. Radio modules can be assessed for their suitability in terms of range, price and operating frequency band.

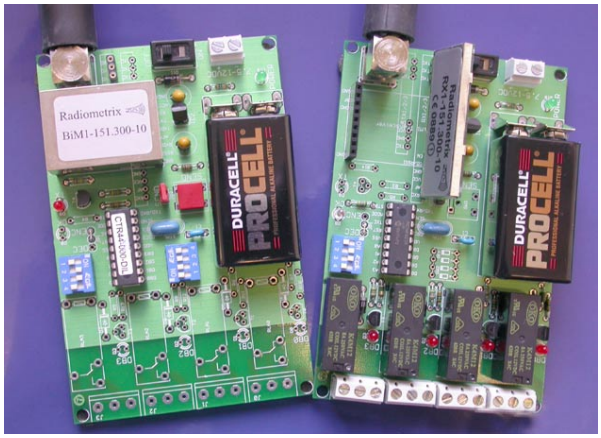

Figure 1: Control44 Encoder (left) and Decoder (right) Evaluation Kits

Range of Features

- 4-bit address, 4 bit data select switches
- 4 relays to control mains powered devices rated up to 8A, 250VAC/30VDC
- Visual indication of valid code received and active relays
- RF module range testing
- Push button for momentary control of relays
- Momentary, Latched outputs
- Dynamic relay state changes
- Setup is simple as Plug-and-Play
- RF Remote Control Demonstration
- PP3 9V battery powered. Terminal block to prolong use with external power supply

Kit Contents

The CTR44 Evaluation Kit is supplied with the following contents:

2	CTR44-000-DIL
1	CTR44 Eval Kit PCB populated as Encoder (ENC)
1	CTR44 Eval Kit PCB populated as Decoder (DEC)
1	Single frequency Radiometrix Transmitter module *(ordered separately)*
1	Single frequency Radiometrix Receiver module *(ordered separately)*
2	9V alkaline battery (PP3)
2	1/4 wavelength monopole antenna for 433/869/914MHz, helical antenna for 151/173MHz
2	Jumpers
1	CTR44 data sheet
1	CTR44 Evaluation Kit manual
1	Data sheet of Radio module ordered

Additional optional requirements

- External power supply or 12V DC power adaptor for prolonged use
- Electrical device to be controlled with a maximum rating of 8A, 30VDC or 250VAC
- Electric Tester Screwdriver

General Description

Evaluation Kit uses a common PCB for both Encoder and Decoder just like CTR44-000 IC can be used as either Encoder or Decoder. However, the modes cannot be changed on the evaluation kit as PCBs are populated with necessary components for respective mode. Decoder PCB can be easily identified by the noticeable presence of relays.

Visual Indication

The following status LEDs will be activated depending on the status of CTR44.

LED	Function	Description
D9	TX (Red)	Transmitter Enabled;
D3:D0	DB3:DB0 (Red)	Relay Activated, Data bit High received
D8	OK (bright Yellow)	Valid code (data packet) received
D10	POWER (Green)	Power Supply Switched ON

Quick Functionality Guide

Component	Encoder Function	Decoder Function
J3:J0	-	1 – CO (Common) 2 – NC (Normally Closed) 3 – NO (Normally Opened) Relay OFF: Terminal 1 – 2 linked Relay ON: Terminal 1 – 3 linked
JP1	Encoder=5V	Decoder=0V
JP2	Continuously encode and SEND	LATCH received data until next valid reception
J5	7.5V-16V	9V-12V
RLA3:RLA0	-	Relay Switch with rating of 8A 250VAC Relay Switch with rating of 8A 30VDC
SW1	Address Switches (A3:A0) ON=0V=0 OFF=5V=1	Address Switches (A3:A0) ON=0V=0 OFF=5V=1
SW2	Data Switches (DB3:DB0) ON=0V=0 OFF=5V=1	-
SW3	Momentary SEND	-
SW4	Power Switch	Power Switch

On-board low drop out regulator (LE50CZ) provides clean regulated 5V supply to the radio modules and microcontroller. However, the relay coils are powered from the external power supply or on-board 9V alkaline battery via 1N4001 diode ($0.7<V_F<1.1V$) for protection against accidental reverse supply connection. Although 12V relays are used, the minimum pull-in voltage for relay coil is 8.4V.

Copper on all unused PCB area connected to 0V, provides ground plane necessary for the ¼ wavelength monopole antenna to perform efficiently. At VHF frequencies, the ground plane dimension is not sufficient for a ¼ wavelength whip antenna. A helical antenna would perform better compared to a ¼ wavelength monopole antenna without proper ground plane as it does not rely on ground plane as much as a monopole.

Sockets are provided for easy insertion of radio modules. However, long pins and the large gap between ground plane of the Evaluation Kit PCB and ground plane of the module will degrade the range performance of the module. In a finished product, the SIL type modules should be mounted flat on the PCB with their pins trimmed to bare minimum. Can lugs, which are pre-soldered to ground plane of the module, should also be soldered to ground plane pads on the main PCB of the product.

Frequency of the ceramic resonator (RES) can be decreased (e.g. 2MHz) to reduce the bit rate (1200bps) through radio when using radio receiver with reduced bandwidth optimised for longer range. For fast activation, it can also be increased up to 20MHz, however, the CTR44-000-DIL should be replaced with CTR44H-000-DIL which provides higher drive level for >4MHz resonator to oscillate.

Resonator	Bit Rate through radio	IC	Module
2MHz	1.1kbps	CTR44-000-DIL	BiM1T, RX1-XXX.XXX-1.2
3.58MHz	2kbps (55ms power-up preamble)	CTR44-000-DIL	TX1, RX1
≤20MHz	11.2kbps	CTR44H-000-DIL	TX2, RX2, TX3A, RX3A

CTR44 Encoder Board

In this mode, jumper link (JP1) connects the MODE pin of the CTR44-000-DIL to 5V supply line. RST pin is also tied to 5V. 5V supply to CTR44 IC is decoupled close to its VCC pin via 100nF Ceramic capacitor (C1).

CTR44 has an internal weak pull-up to 5V on its Address and Data pins. Therefore the DIL switches when switched ON shorts the respective pin to 0V. Therefore, address/data bit values are inverted relative to switch positions. Address and Data Switch number starts from 1 instead of 0. (SW2 No 2=DB1)

PNP transistor (T4) is used to Enable and supply power to SIL type transmitters. It inverts the Active Low TXE from CTR44 to Active High Enable for TX1/TX3A and connects supply to module when switched ON.

Setup

1) Insert the supplied Radiometrix Transmitter module into the appropriate slot with RF pins towards BNC connector
   SIL slots marked TX1/2/3 are for TX1/TX2/TX3A modules
   DIL slot is for BiM1T module (*Note: on-board legend orientation is upside down*)
2) Connect the supplied antenna to BNC connector according to module frequency
3) Set desired Address Bits by sliding each switch (ON=0=5V, OFF=1=5V)
4) Set Data Switch position to OFF (=1=5V) for relays which need to be activated
5) Insert the supplied 9V battery or connect an external 7.5V-16V supply.
6) Go to Decoder Setup
7) Slide the Power Switch to ON
8) Press the RED SEND button to momentarily activate the relays
   Insert the supplied JP2 jumper across both pins to continuously SEND.

CTR44 will execute a power-up transmission when switched ON just after procedure 7. TX LED will be momentarily lit followed by DB LEDs for which Data Switch was set to OFF position. Relay will make a 'clicking sound' when the internal relay switch positions are changed. This power-up transmission feature can be used for low cost remote control which requires a single switch/button operation with default address and data.

If the SEND button switch (SW3) is pressed intermittently, the Encoder PCB will transmit a short bursts of Address and Data switch settings to decoder PCB. Instead of holding the depressed SEND button, the Jumper JP2 can be used for continuous transmission which allows user to dynamically change data switches.

When performing range test, the SEND Jumper (JP2) should be inserted on the Encoder PCB to transmit continuously from a fixed location. User can walk around with the Decoder PCB and monitor the status of OK and DB3:DB0 LEDs.

CTR44 Decoder Board

It is populated with additional components to drive the Relay and provide visual indication of received data bits. NPN transistors (T3:T0) will provide the required drive current and voltage drop to activate relay coil to pull-in the internal relay switch and to activate the LEDs if the received data bit is '1'. Diodes (D7:D4) provide protection against back EMF developed by the relay coil when switching OFF.

Since the STROBE pulse signal generated by the CTR44 is 10µs long, OK LED output may not be visible in bright sunlight.

Setup

1) Insert the supplied Radiometrix Receiver module into the appropriate slot with RF pins towards BNC connector
   SIL slots marked RX1/2/3 are for RX1/RX2/RX2A/RX3/RX3A modules
   DIL slot is for BiM1R module (*Note: on-board legend orientation is upside down*)
2) Connect the supplied antenna to BNC connector according to module frequency
3) Set Decoder PCB Address Bits to match Encoder PCB Address Bits
4) Insert the JP2 jumper to latch (hold) received data (relay) position until next valid change
   Remove JP2 to keep relay active only while reception is valid (*Useful for range test*)
5) Connect 250VAC device(s) to the 3-way terminal block(s). *[Observe Safety Procedure]*
6) Insert the supplied 9V battery or connect an external 9V-12V supply.
7) Slide the Power Switch to ON
8) Return to Encoder Setup Procedure 7.

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.*

LATCH Jumper (JP2) can be used to hold the received data bit value (Relay Position) without continuously transmitting the same data bit values. Relay position can be updated and maintained with a momentary update transmission after adjusting Data Switch positions on the Encoder PCB.

When performing range test, the Latch Jumper (JP2) should be removed to notice loss of reception when the DB3:DB0 LED starts to flicker. Flickering indicates that the receiver is beyond its maximum reliable operating range or in weak RF signal reception area where some of the packets are correctly received while others are lost. In building environment, DB LED may stop working even though receiver may be within its operating range due to 'null-spot'. Moving the position or orientation the decoder (antenna) will enable receiver to continue to receive sufficient RF signal level for decoder to correctly decode the transmitted data.

The above procedures can be used in a site survey to identify areas of weak RF signal reception, null-spots and to find best position for antenna placement to maximise coverage.

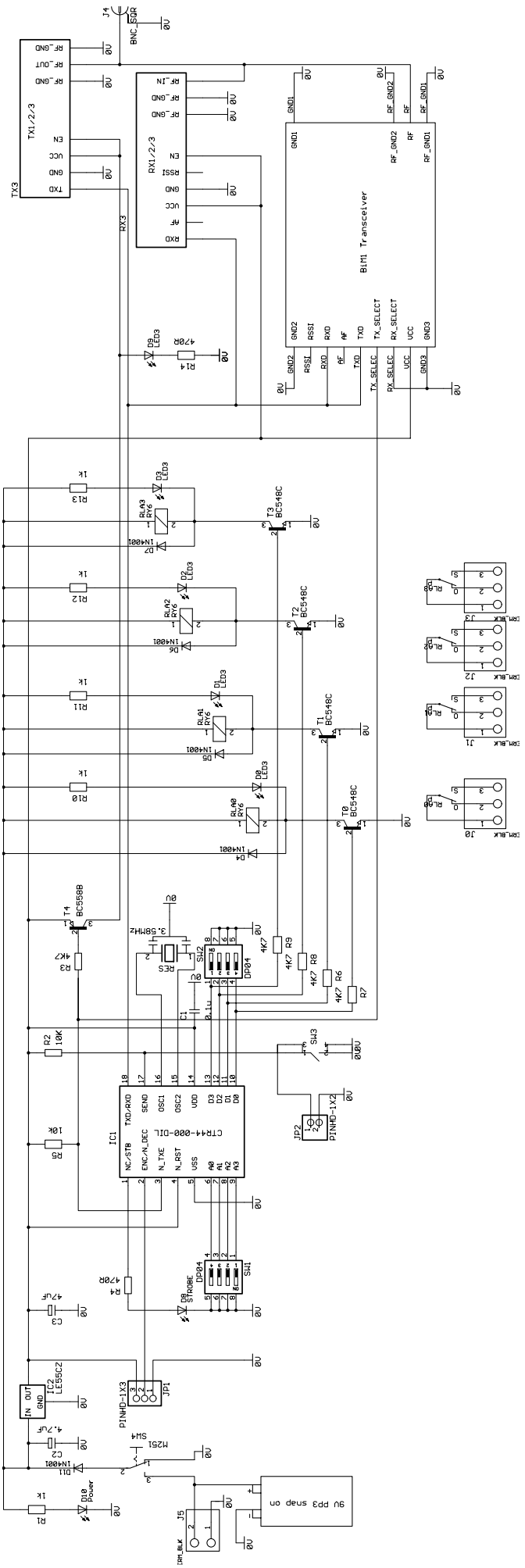

Figure 2: Schematic of CTR44 Evaluation Kit

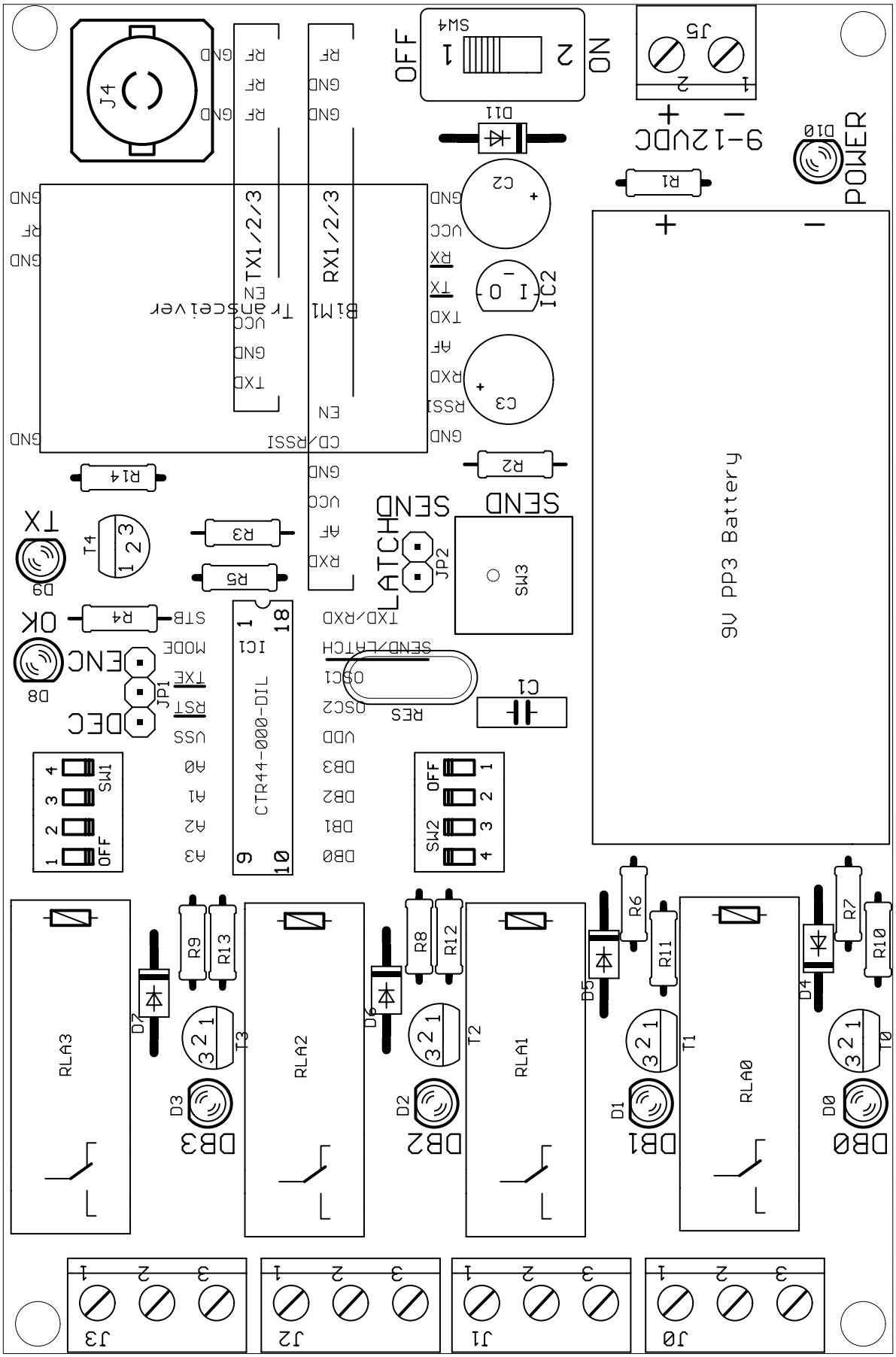

Figure 3: Component layout of CTR44 Evaluation Kit PCB

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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.
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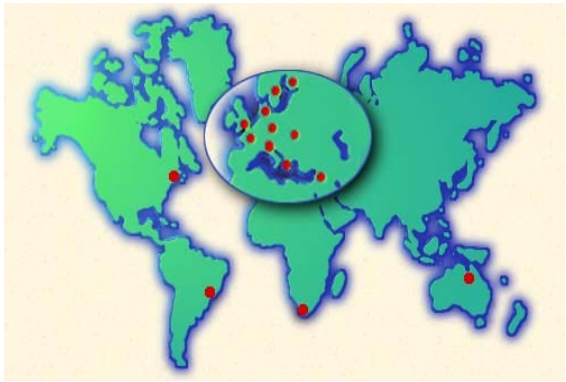

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