Kit 175. RF Data Link Transmitter – Parallel Input - DRAFT

This kit is one in a series of four kits that implement an RF data link. The kits in the series are:

1. K173 – Serial Input transmitter
2. K174 - Serial Output receiver
3. K175 - Parallel Input transmitter
4. K176 - Parallel Output receiver

Each receiver has a 4-bit address set by an onboard 4-way DIP switch. This allows a total of 16 receivers to be used in a 'network' with each one being uniquely addressable.

The RF modules operate at 433.92MHz and use "amplitude modulation" to transmit data. This transmission method, also known as 'On-Off Keying (OOK)', transmits data by simply switching the carrier signal on and off. They are produced by 'WenShing' of Taiwan – datasheets can be downloaded from their website at "www.wenshing.com.tw".

Each kit contains an Atmel 89C2051 microcontroller that handles all I/O as well as encoding and decoding the data.

OVERVIEW
K175 monitors 8 digital inputs for change. If change is detected on any input the state of all the inputs is transmitted. An optional destination address can be added to the message before transmitting. The pinout of the input connector allows direct connection to a PC printer port.

TECHNICAL MANUAL
A PDF document detailing the technical features and operating guidelines of this and the other 3 kits is available for download from:

"www.kitsrus.com/pdf/rfdatalinktechmanual.pdf".

You will need to download and read this document to be able to use all the features and options of these kits in your own application.

QUICK START – HOW TO USE THIS KIT
We will now show you how easy it is to use these kits. We will combine K74 (PC Printer Port Relay Board) with K175 and K176 to create a remote wireless connection to a PC.

K74 is a kit designed to be plugged into the PC's printer port. It has 8 onboard relays. When connected to a PC each relay is controlled by one bit of the output byte from the printer port. Bit high = relay ON; bit low = relay OFF.

Normally K74 is connected to the PC using a parallel cable. This limits the distance of the kit from the PC to a few metres. Using K175 and K176 we can extend that distance to around 100m (300ft) and it's all done without wires!

Before using K175 and K176, let's make sure the 'normal' connection is working. Connect K74 to the PC's parallel port and connect 12VDC to the kit.

Now go to "www.beyond-designs.com/PC_ports.htm" and download 'VBPortTest', a freeware Windows program that allows you to set parallel port bits directly from your screen. Install the software and run it. Make sure the correct LPT

port is selected and the I/O mode is set to "Bit (Output on LED Click only)".

Click on one of the one of the LEDs on the top line and the corresponding relay and LED should operate on the K74.

If this works you can now replace the 'wired' connection with the K175/K176 combination.

Set the switches and jumpers on K175/K176 as follows:

K175		K176	
SW1:1	ON	SW1:1	ON
SW1:2	OFF	SW1:4	OFF
SW1:3	OFF	SW1:3	OFF
SW1:4	OFFF	SW1:4	OFF
J1	ON	SW2	DIS

Disconnect K74 from the PC and connect it to K175. Connect K176 to the PC's parallel port. You will need to power both K175 and K176 with a suitable DC supply - 12VDC is just fine.

Now click on the LEDs as before and you should see the relays operate just as before except now it is coming in via the wireless connection! You can experiment with the range by simply picking up the K74/K175 combination and moving it away from the PC.

DIP SWITCH and JUMPER SETTINGS
A number of operating features are set by the 4-way DIP switch SW1 and jumper J1. Full details available in the technical manual.

SW1:1 - SW1:4 Destination address
J1   Destination address enable
An optional destination address can be added to the message before transmitted. The address is set by the DIP switch and is enabled by inserting a link on jumper J1.

Please refer to the 'RF Data Link Protocol' document for details on the format of the destination address and how it is inserted into the message.

LED L2
The LED L2 lights while the kit is actually transmitting the the new byte data.

KIT ASSEMBLY
It is recommended that components be inserted and soldered in the following order, using the component overlay on the PCB as a guide.

1. All the resistors and diodes. Make sure diodes are right way around.
2. IC socket
3. Capacitors C2,4,5
4. Resistor network RP1. There is a small dot at one end, this end towards C1
5. 5V regulator IC2 and jumper J1

Kit 175. RF Data Link Transmitter – Parallel Input - DRAFT

6. LEDs. The flat spot on the body lines up with the 'line' on the component overlay
7. DIP switch
8. Electrolytic capacitors C1,3. These are polarized – the negative lead is indicated on the capacitor but the PCB indicates the '+' lead.
9. Ceramic resonator Y1
10. RF transmitter module
11. D25 connector and DC jack

A length of wire is supplied for the antenna. This needs to be trimmed to a length of **17.3cm** (1/4 wavelength). Strip one end and solder into the ANT hole on the PCB.

Before inserting any ICs in their sockets we need to check the 5V supply. Power up the kit using a suitable DC power supply eg. 12V and measure the voltage on pins 10 and 20 of the IC1 socket (positive on pin 20). Should be approximately 5 volts.

If OK then remove power and insert the ICs.

TROUBLESHOOTING
Most faults are due to assembly or soldering errors. Verify that you have the right components in the right place.

Inspect your work carefully under a bright light. The solder joints should have a 'shiny' look about them. Check that there are no solder bridges between adjacent pads.

Check that no IC pins are bent up under the body of the IC. This can sometimes happen when inserting ICs into sockets.

CONTACT DETAILS
Full range of kits on our website at http://www.kitsrus.com.
Kit developer - frank2005@ozitronics.com.
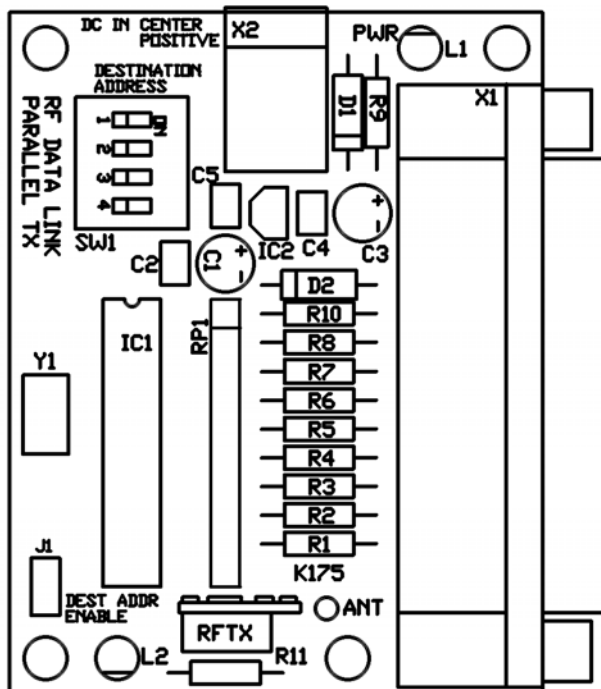
PARTS LIST – K175

Resistors (0.25W carbon film unless specified)

33R	R1,2,3,4,5,6,7,8	8
560R	R11	1
1K8	R9	1
8K2	R10	1
10K resistor network SIL, 9 resistors, 10 pins	RP1	1

Capacitors

100nF mono, 0.1"	C2,4,5	3
10uF 16V electrolytic	C1	1
100uF 25V electrolytic	C3	1

Semiconductors

1N4004	D1	1
1N4148	D2	1
LED, red, 3mm	L1,2	2
AT89C2051 micro (programmed)	IC1	1
78L05, 5V regulator	IC2	1

Miscellaneous

Ceramic resonator, 3 pin 11.0592MHz	Y1	1
DIP switch, 4 way	SW1	1
Header & shunt, 2 pin	J1	1
D25 connector, male right angle, PCB mtg	X1	1
DC jack, 2.5mm	X2	1
RF transmitter module 433.92MHz, 'Wenshing' TWS-BS3	RFTX	1
IC socket, 20 pin, for IC1		1
Hookup wire for antenna, 20cm		1
K175 PCB		1

Kit 175. RF Data Link Transmitter – Parallel Input

Schematic: RF Data Link Transmitter – Parallel Input

Title block:
Title: RF DATA LINK TRANSMITTER – PARALLEL INPUT
Size: A4
Number: K175
Revision: 1
Date: 11-MAR-2005
File: K175/1
Sheet 1 of 1
Drawn By: FC

Key components:
- X1 — 8-BIT PARALLEL INPUT (25-pin connector)
- R1 33, R2 33, R3 33, R4 33, R5 33, R6 33, R7 33, R8 33
- RP1 10K
- IC1 AT89C2051
- C2 100nF
- RFTX TWS-BS3 (ANT, VCC, DAT, GND)
- Y1 11.0592MHz
- L2 SENDING
- R11 560
- SW1 DESTINATION ADDRESS (1,2,3,4)
- J1 DESTINATION ADDRESS ON – ENABLED / OFF – DISABLED
- C1 10uF
- R10 8K2
- D2 1N4148
- IC2 78L05 (Vin, Vout, GND)
- C3 100uF, C4 100nF, C5 100nF
- D1 1N4004
- R9 1K8
- L1 POWER ON
- X2 12VDC INPUT