

Kit 173. RF Data Link Transmitter – Serial 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

K173 can receive up to 64 characters via its serial port and transmit the message. The serial port baudrate is selectable from 300, 1200, 2400 and 9600. The data format is fixed at **8N1** (8 data bits, no parity, 1 stop bit). Two input modes are available as well as input echo if required. An optional destination address can be automatically inserted into the message before transmitting.

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 K145 (Temperature Logger kit) with K173 and K174 to create a remote wireless connection to a PC.

K145 can monitor up to 4 x DS1820 temperature sensors. The kit automatically detects how many sensors are connected and outputs the reading from each sensor to the serial port. It is powered from the serial port as well.

When connected to a PC each sensor’s readings can be displayed on the screen using a simple terminal program such as Hyperterminal (which comes with Windows). You can download a PDF on how to set up Hyperterminal from “www.kitsrus.com/pdf/hyperterminal.pdf”. When using with K145 set the baud rate to 2400 - everything else is the same.

Normally K145 is connected to the PC using a serial cable. This limits the distance of the kit from the PC to around 30m (100ft). Using K173 and K174 we can extend that distance to around 100m (300ft) and it’s all done without wires!

Before using K173 and K174, let’s make sure the ‘normal’ connection is working. Connect K145 to the PC’s serial port and run Hyperterminal. If the kit is working normally and Hyperterminal is set up correctly the temperature readings should be displayed on the screen. If so we can now replace the ‘wired’ connection with the K173/K174 combination.

First, set the DIP switches and jumpers on K173 and K174 as follows:

K173		K174	
SW1:1	OFF	SW1:1	ON
SW1:2	ON	SW1:4	OFF
SW1:3	ON	SW1:3	OFF
SW1:4	OFF	SW1:4	OFF
SW1:5	ON		
SW1:6	OFF	J1	OFF
SW1:7	OFF	J2	ON
SW1:8	OFF	J3	ON
J1	ON		

Disconnect K145 from the PC and connect it to K173. Connect K174 to the PC’s serial port. You will need to power both K173 and K174 with a suitable DC supply - 12VDC is just fine.

You should see the temperature data on the screen just as before except now it is coming in via the wireless connection! You can experiment with the range by simply picking up the K145/K173 combination and moving it away from the PC.

DIP SWITCH and JUMPER SETTINGS

A number of operating features are set by the 8-way DIP switch SW1 and jumper J1. Full details available in the technical manual.

SW1:2	SW1:1	Baud Rate
OFF	OFF	300
OFF	ON	1200
ON	OFF	2400
ON	ON	9600

Sets the serial port baud rate. These switches are only read at power up so the kit should be powered down before changing to a different baud rate.

Serial data format: 8N1 (8 data bits, no parity, 1 stop bit)

SW1:3	Transmit Mode
OFF	BINARY mode
ON	ASCII mode

Specifies the method of starting the data transmission.

Note: Data bytes are stored in a buffer as they are entered. Transmission only occurs if there is data in the buffer ie. no data, no transmission!

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BINARY mode

Data bytes are entered as normal and can be anything in the range 00h - FFh. The **SEND** line is used to start the data transmission. The **SEND** line should be held high and pulsed low to start.

The **BUSY** line is normally low and indicates that the kit is ready to receive data. **BUSY** goes high while data is being transmitted or if more than 64 bytes are input (all extra bytes are ignored). The **BUSY** line should be checked when entering data.

The RS232 signal **DTR** is used for **BUSY** and **DSR** is used for **SEND**.

A note about RS232 voltage levels

In the RS232 world logic levels are specified as follows:

High -3 to -15 volts
Low +3 to +15 volts

Please bear this in mind when we talk about **SEND** or **BUSY** being high or low.

ASCII mode

Data is transmitted when the <cr> character is entered. Only ASCII characters in the range 20h - 7Eh are allowed; all others are ignored.

BUSY is set low and stays low; **SEND** not used.

The data bytes can be echoed back (see SW1:4).

SW1:4 Echo ON/OFF

This option only works in ASCII mode. If ON each data byte is echoed back to the serial port as it is received. This can be useful when manually inputting data using a comms program because the character will appear on the screen as it is typed.

SW1:5 - SW1:8 Destination address J1 Destination address enable

The destination address is normally entered as part of the data. However if this is not possible then it can be added automatically using the address set by these switches.

Automatic addressing is controlled by jumper J1 – if inserted then the address is added.

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.

SENDING LED L2

The LED L2 lights while the kit is actually transmitting the message.

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 the right way around.
2. IC sockets
3. Capacitors C7,8,9
4. Resistor network RP1. There is a small dot at one end, this end towards C5
5. 5V regulator IC3 and jumper J1
6. LEDs. The flat spot on the body lines up with the ‘line’ on the component overlay
7. DIP switch
8. D9 connector and DC jack
9. Electrolytic capacitors C1,2,3,4,5,6. These are polarized – the negative lead is indicated on the capacitor but the PCB indicates the ‘+’ lead.
10. Ceramic resonator Y1
11. RF transmitter module

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 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). The voltage should be approximately 5 volts. If OK 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 – K173

Resistors (0.25W carbon film unless specified)

560R.....	R2	1
1K8.....	R3	1
8K2.....	R1	1
10K resistor network.....	RP1	1
SIL, 9 resistors, 10 pins		

Capacitors

100nF mono, 0.1”	C7,8,9	3
10uF 16V electrolytic.....	C1,2,3,4,5	5
100uF 25V electrolytic.....	C6	1

Semiconductors

1N4004.....	D1	1
1N4148.....	D2	1
LED, red, 3mm.....	L1,2	2
AT89C2051 micro	IC1	1
(programmed)		

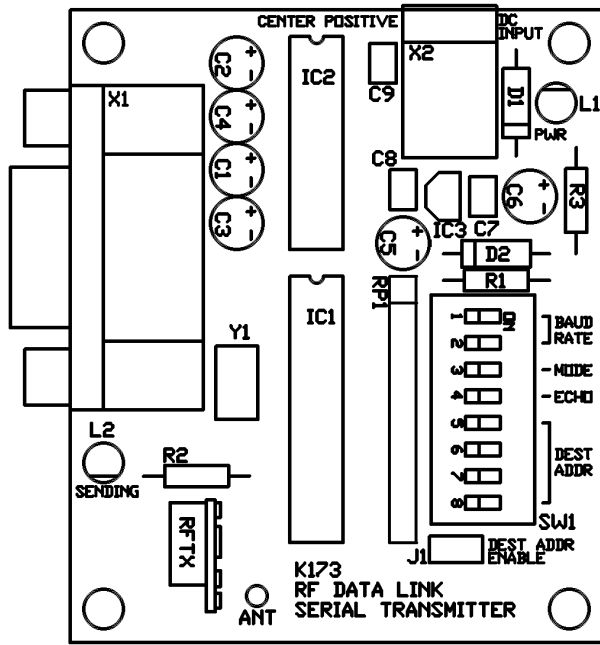
MAX232	IC2	1
78L05, 5V regulator	IC3	1

Miscellaneous

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Ceramic resonator, 3 pin .. Y1 .. 11.0592MHz	1
DIP switch, 8 way SW1	1
Header & shunt, 2 pin J1	1
D9 connector, male X1 right angle, PCB mtg	1
DC jack, 2.5mm X2	1
RF transmitter module..... RFTX 433.92MHz, 'Wenshing' TWS-BS3	1
IC socket, 20 pin, for IC1	1
IC socket, 16 pin, for IC2	1
Hookup wire for antenna, 20cm	1
K173 PCB	1

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