

# Kit 176. RF Data Link Receiver – Parallel Output - 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](http://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

K176 will receive any messages sent by K173 or K175 and output the data via its parallel port. The pinout of the output connector is the same as a PC printer port, allowing direct connection to a printer. Optional features are included to control a Centronics type printer.

## 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](http://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](http://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	OFF	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.

## SWITCH SETTINGS

A number of operating features are set by the 4-way DIP switch SW1 and slide switch SW2. Full details available in the technical manual.

### SW1:1 - SW1:4 Receiver address

Sets the address of the receiver. The address is 4-bits wide meaning that up to 16 receivers can be used together, each with their own unique address. The kit will respond to any messages containing a matching address.

**Note:** It is possible for a message to contain no address. This is known as a ‘broadcast’ message and all receivers will respond to it. For details refer to the ‘RF Data Link Protocol’ document mentioned previously.

### SW2 Busy Signal Enable/Disable

Used when connected to a Centronics printer. Disabling BUSY blocks the BUSY signal from the printer and forces output. Should be enabled normally.

### A note about IC3 (octal inverter/buffer)

IC3 is included so that the normal ‘power up’ state of the output pins is low. It was needed because the ‘power up’ state of the outputs from IC1 is high so, for example, when this kit is used with K74 ALL the relays would operate on power up – not good. IC3 inverts the IC1 outputs and prevents that.

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IC3 is also a buffer so it provides extra output drive for use with cables. The maximum cable length used should be the same as for PCs.

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## 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. R3 fits inside the IC1 socket so make sure it sits down flat and straight.
2. IC sockets
3. Capacitors C1,4,5
4. Resistor network RP1. There is a small dot at one end, this end towards D1
5. 5V regulator IC2
6. LED. The flat spot on the body lines up with the 'line' on the component overlay
7. DIP and slide switches
8. Electrolytic capacitors C2,3. 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](mailto:frank2005@ozitronics.com).

## PARTS LIST – K176

### Resistors (0.25W carbon film unless specified)

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

### Capacitors

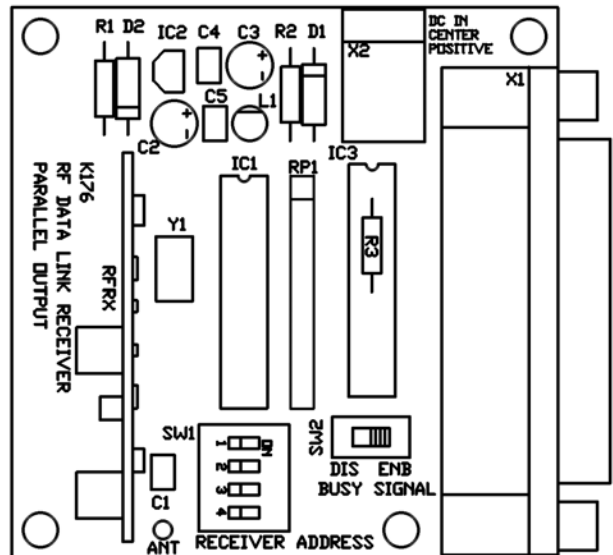
100nF mono, 0.1".....	C1,4,5.....	3
10uF 16V electrolytic.....	C2.....	1
100uF 25V electrolytic.....	C3.....	1

### Semiconductors

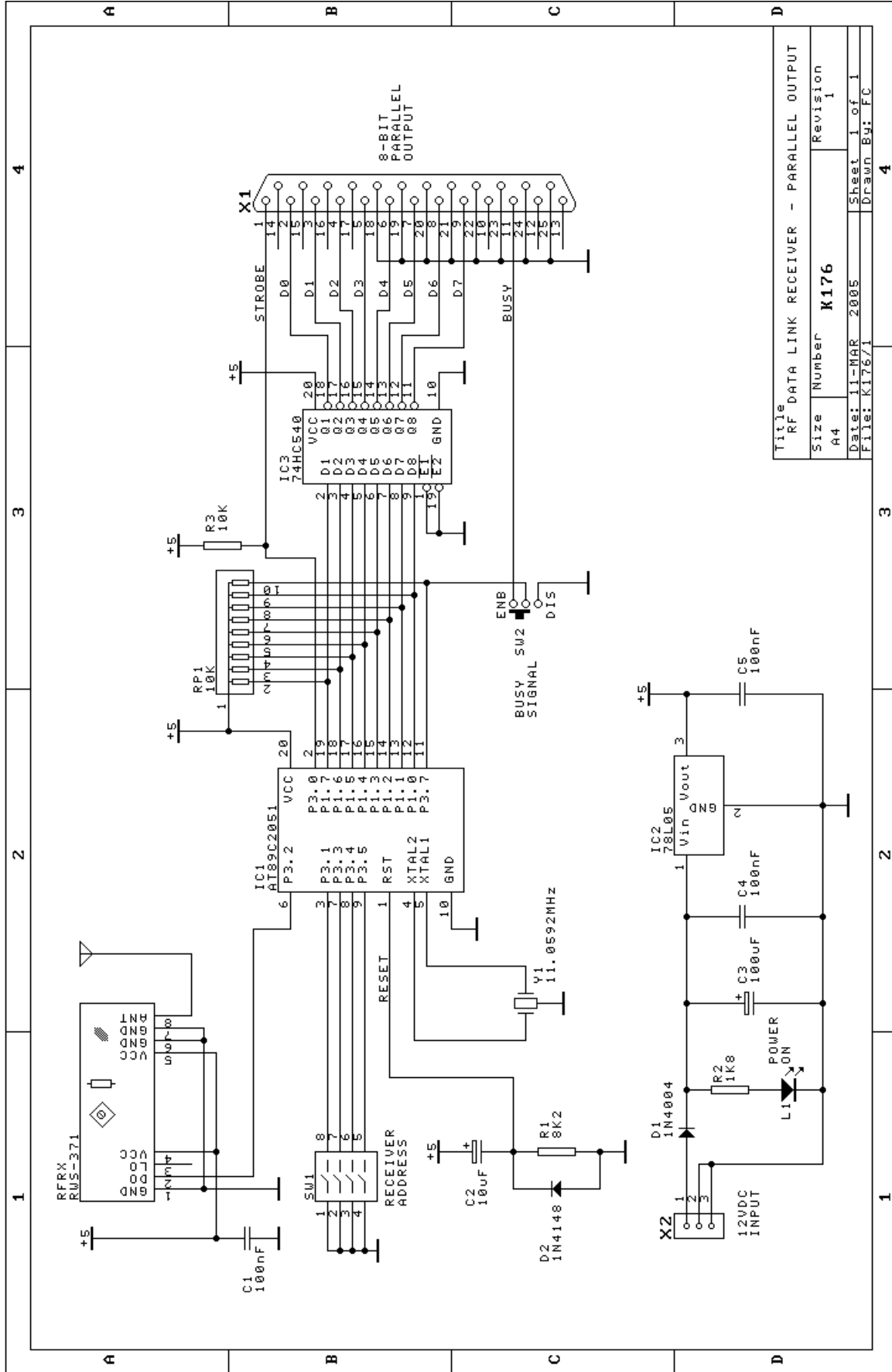
1N4004.....	D1.....	1
1N4148.....	D2.....	1
LED, red, 3mm.....	L1.....	1
AT89C2051 micro.....	IC1.....	1
(programmed)		
78L05, 5V regulator.....	IC2.....	1
74HC540.....	IC3.....	1
octal inverter/buffer		

### Miscellaneous

Ceramic resonator, 3 pin..	Y1.....	1
11.0592MHz		
DIP switch, 4 way.....	SW1.....	1
Slide switch, SPDT.....	SW2.....	1
D25 connector, female.....	X1.....	1
right angle, PCB mtg		
DC jack, 2.5mm.....	X2.....	1
RF transmitter module.....	RFRX.....	1
433.92MHz, 'Wenshing' RWS-371-6		
IC socket, 20 pin, for IC1,2.....		2
Hookup wire for antenna, 20cm.....		1
K176 PCB.....		1



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Title		RF DATA LINK RECEIVER - PARALLEL OUTPUT	
Size	Number	Revision	
A4	K176	1	
Date:	11-MAR 2005	Sheet 1 of 1	
File:	K176/1	Drawn By:	FC