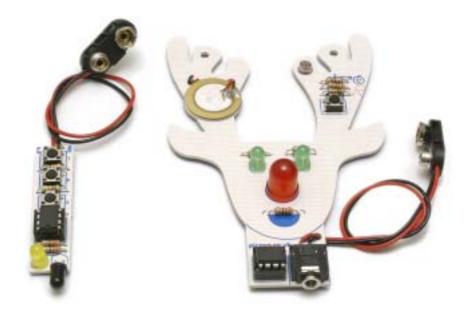# APPENDIX A - INFRA-RED UPGRADE (AXE108K)

The Rudolf project PCB is supplied with a small optional 'infra-red' upgrade PCB. When populated with components, this infra-red PCB can be used to remotely control the Rudolf Cyberpet decoration. The components required are supplied in kit AXE-108K.

Note the small push switch on the main Rudolf PCB shares the same input pin (input3) as the infra-red sensor and so should not be used within the main program after connecting the sensor. It is not necessary to remove the switch from the PCB.

Components for **main** Rudolf PCB

IR	LED020 infra-red receiver
C!	4u7 capacitor

Components for **infra-red** PCB

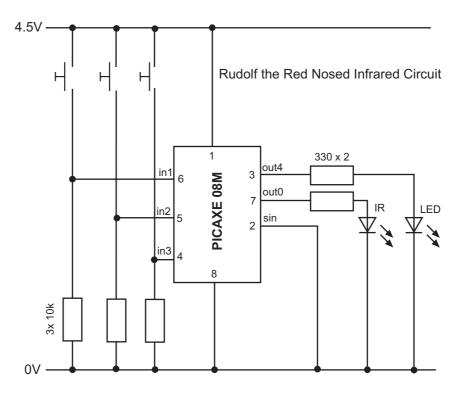|		
R1-3	10k resistor	(brown black orange gold)
R4	330R resistor	(orange orange brown gold)
R-IR	330R resistor	(orange orange brown gold)
LED	5mm yellow LED	
IR	5mm infra-red LED	(may be clear or black in colour)
SW1-3	miniature 6mm switch	
IC1	8 pin IC socket	
IC1	PICAXE-08M microcontroller	
BT1	battery clip	
BT1	4.5V (3xAA) battery box	
PCB	printed circuit board (NB: supplied with main Rudolf Kit)	

Main 'Rudolf PCB' modification

1) Place the IR receiver in position IR. Fold the legs by 90 degrees so the receiver is lying flat on the PCB with the curved side up and facing out. Solder in position.
2) Place the 4u7 capacitor in position C1, ensuring the positive (+) leg is in the top hole. Solder in position.

Infra-red Upgrade PCB

1) Place the infra-red resistor (R-IR) (330 orange orange brown gold) and 330 (orange orange brown gold) resistors in position. Bend the legs to hold the resistors in position and then solder.

2) Place the three 10k (brown black orange gold) resistors in position. Bend the legs to hold the resistors in position and then solder.

3) Use an off-cut resistor leg to make a wire link in the position LK. This link lies under the 8 pin socket so ensure that the link is lying flat on the PCB before soldering in position.

4) Push the IC socket into position. Make sure the notch at one end points up towards the LEDs. Fold the legs over to hold the socket in position and then solder.

5) Solder the yellow LED into position LED. Make sure the flat on one side of the LED aligns with the flat marked on the PCB.

6) Using a pair of pliers, put a 90 degree bend in the infra-red-LED legs so that it points out from the PCB (see photo on previous page). Solder the infra-red LED into position IR. Make sure the flat on one side of the LED aligns with the flat marked on the PCB.

7) Solder the three switches in position (note that they only fit one way around).

8) Thread the battery clip up through the large hole by the bottom switch. Then solder the black wire in the hole marked BLK and the red wire in the hole marked RED.

9) Carefully check the board to make sure there are no missed joints or accidental solder bridges.

10) Note the PICAXE-08M chip will require programming before the project will function. The chip must be programmed on the main rudolf PCB and then moved across to the infra-red PCB, as the infra-red PCB has no programming socket.

11) Insert the microcontroller into the socket, ensuring pin1 faces the stereo socket.

Infra-red Upgrade Circuit

Rudolf the Red Nosed Infrared Circuit

Program Explanation

The infra-red system consists of two programs, one on the infra-red tranmsitter PCB and one on the main Rudolf PCB. The infra-red transmitter program transmits a different infra-red code for each of the three switches. In the sample program the codes 1,2 and 3 are used, but these can be changed to any number between 0 and 127. To increase reliability in the system the infra-red code is transmitted ten times when the switch is pressed. The yellow LED is lit during transmission for user feedback, as the light from the IR LED is invisible to the human eye.

In the infra-red receiver program the main loop simply waits for a valid infra-red signal. If this is signal is one of the three pre-programmed codes, a tune is played. Note that once the infra-red upgrade has been added the push switch on the main Rudolf PCB (input3) should not be used.

Note it is possible to see if the infra-LED is transmitting by looking at the LED 'end-on' through a web-cam or mobile phone camera. These devices will detect infra-red light and so the LED will visually change colour on the camera screen when transmitting.

Infra-red Transmitter Programmer (infra-red PCB)

(note this must be programmed onto PICAXE-08M by moving the chip onto the main Rudolf PCB)

```
' ***** main loop *****
' loop until switch is pressed
main:
     if pin1 = 1 then tx_1
     if pin2 = 1 then tx_2
     if pin3 = 1 then tx_3
     goto main


tx_1:
     let b1 = 1        ' Code 1
     goto tx_ir
tx_2:
     let b1 = 2        ' Code 2
     goto tx_ir
tx_3:
     let b1 = 3        ' Code 3
     goto tx_ir


'transmit code 10 times for increased reliability
tx_ir:
     high 4            ' yellow LED on
     for b2 = 1 to 10  ' send infrared code 10 times
        infraout 1,b1  ' send code
        pause 45       ' wait 45 milliseconds
     next b2
     low 4             ' LED off
     goto main
```

Infra-red Receiver Programmer (main Rudolf PCB)

(note the infra codes used (1,2,3) must match those used in the transmitter program)

```
' ***** main loop *****
' wait until infrared signal is received
main:
      infrain2

' ***** play tune *****

      'debug infra     ' optional display on screen for testing

' play tune depending on light level
      if infra = 3 then play_xmas
      if infra = 2 then play_rudolf
      if infra = 1 then play_jingle
      goto main

play_jingle:              ' internal tune Jingle Bells
      play 1,3
      goto main

play_silent:              ' internal tune Silent Night
      play 2,3
      goto main

play_rudolf:              ' internal tune Rudolf The Red Nosed Reindeer
      play 3,3
      goto main

play_xmas:                ' external ringtone tune (from Tune Wizard)

' We wish you a Merry Xmas
tune 3, 4, ($22,$27,$67,$69,$67,$66,$24,$24,$24,$29,$69,$6B,$69,$67,
$26,$22,$22,$2B,$6B,$40,$6B,$69,$27,$24,$22,$24,$29,$26,$E7,$22,$27,
$67,$69,$67,$66,$24,$24,$24,$29,$69,$6B,$69,$67,$26,$22,$22,$2B,$6B,
$40,$6B,$69,$27,$24,$22,$24,$29,$26,$A7,$22,$27,$27,$27,$E6,$26,$27,
$26,$24,$E2,$29,$2B,$69,$69,$67,$67,$02,$22,$22,$24,$29,$26,$E7)
      goto main
```

Note this must be typed as one long line in the software