Hardware

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COLLABORATORS

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Hardware

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InfraJoy v3.1 © 1994 by Jeroen Steenblik
                    and Leon Woestenberg (Digital Disturbance)

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1.2 InfraJoy Copyrights and Disclaimers

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InfraJoy Copyrights

Copyrights © 1994 by Jeroen Steenblik and Leon Woestenberg. The
hardware design is freely distributable and may be used to build a copy
of the InfraJoy interface hardware. A copy of the hardware itself may
not be sold with a profit, nor included in any commercial product
without the written conscent of (one of) the  authors .

InfraJoy Disclaimers

The authors do not take responsibility for the InfraJoy hardware
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damaging your Amiga computer, infrared controlled devices or data stored on these machines. The authors can not guarantee that InfraJoy works correctly on your configuration.

All hardware we designed has been tried out on my Amiga, and since I'm now typing this guide on this very machine this implies it didn't blow up in my face. To put it very short: if you blow up your Amiga while using/looking at/thinking of/pointing to/etcetera, the InfraJoy hardware, it's NOT our fault.

More, more, more legal mush!

1.3 You found the secret part of this guide!

More legal mush

Since only very smart people read this section: we think you should know that this guide contains hypnotic encoded messages which force you to send over any pretty daughters/nieces/sisters/girlfriends (only 18+) ;-) to us without you even realising it. (If you haven't got any, A4000's will suffice too) =8^).

Back to reality :(

1.4 InfraJoy Introduction

InfraJoy Introduction

The InfraJoy hardware is an infrared (IR) transmitter and/or receiver that connects to the joystickport of your Amiga. In combination with the InfraRexx software it enables you to receive and/or transmit IR remote control codes, so it's possible to control most modern equipment with your Amiga AND, vice versa, use IR remote controllers to control your Amiga software.

Since the original design was released, some (minor) improvements have been made, so at this point in time there are several versions of the InfraJoy hardware around. Have a look at the history to find out more about this, especially if you ordered the hardware directly from the authors .

1.5 InfraJoy Features

InfraJoy v3.x Features

· Uses (and therefore needs) any Amiga model :)

· Lowcost design, so that you save some money to register the software.
· Large detection range of over 15 metres (50 feet).
· Working distance (from Amiga to device) can be extended to about 20 metres by using 10 metres wire and an extra IRLED.

· Seperate indication LEDs for both transmission and reception.
· Fine-tunable modulation frequency for different electronic brands.
· Modular design; throughput, transmitter and receiver are optional.
· Multi-directional placement for the receiver unit for the different
  Amiga models. (Compare the joystickport position on A2000/A3000/A4000).
· Small size of about 5 x 2.5 cm (2 x 1 inch).

1.6 InfraJoy History

InfraJoy History

Version 1
  · Initial design, based around the SFH505A receiver.
  · Uses pin 6 for both transmission and reception of IR signals.

Version 1.1
  · Interim version for registered InfraJoy users only.
  · This is actually a patch of the version 1 design to version 2;
    As the SFH505A receivers were becoming obsolete, we switched to
    the more sensitive SFH506-xx receivers.
  · Needs at least v1.1 of the software.

Version 2
  · Interim version for registered InfraJoy users only.
  · Based around the more sensitive SFH506-xx receiver. Therefore
    needed seperation of transmit/receive signals.
  · Uses pin 5 for transmission and pin 6 for reception of IR signals,
    so that the software could be made transparantly compatible.
  · Needs at least v1.1 of the software.

Version 3
  · Second publicly released hardware design with nice building plans.
  · Due to the negative influence of the potentiometer circuitry
    connected to pin 5, in certain circumstances, transmission was poor.
  · InfraJoy v3.x therefore uses digital lines only, that is pin 6 for
    transmission, and pin 3 for reception.
  · Needs at least v1.2 of the software.

Revision 3.1
  · Fixed a missing track on the solder side PCB layouts, that caused the
    receiver not to work at all. The schematics were alright, though.

1.7 How does it work?

(How) Does it work?

Before building something, you may wonder how it actually works. For
those of you who wonder, we present:

Everything about the InfraJoy hardware you always wanted to know,
but were afraid to ask...:-)

The receiver

To receive the IR codes, we use a hybrid IR receiver from Siemens, the SFH506-xx series. xx represents the modulation frequency it is optimised for. This IC is an integrated IR receiver with an amplifier, a filter, a demodulator and a TTL driver. It produces clean, digital data streams when it receives IR information and it is very insensitive to ambient light. The output of this IC is fed directly into the Amiga, where it is analyzed by the InfraRexx software.

The transmitter

This is just a bit more complicated (just a bit ;-). To get reasonable working distances (without interference), it's necessary to modulate the binary information that's fed into the IRLED(s). By modulating, it is possible to use the LEDs without a serial resistor because they will simply not have time enough to overheat. This way the IRLED operates at maximum performance all the time. The signal is modulated using two Schmitt-trigger NAND ports with an adjustable RC circuit inbetween.

1.8 Building Instructions

Building Instructions

This section helps you building the InfraJoy v3.1 hardware. We assume that you are familiar with electronics, print circuit board layouts and schematics. If not, ask someone to assist you in this.

Before proceeding, first consider what you actually want: Do you need to transmit codes only? Do you want to learn or receive codes from remote control units? Do you need connector throughput? Consult the InfraRexx guide for more info on the specific options.

Then proceed through the steps below. Have fun building the hardware!

1. Hardware requirements
2. Making the print circuit board
3. Drilling the pad holes
4. Soldering the components
5. Fine-tuning the hardware
6. Last but not least...

The picture links in the above sections are only valid using Multiview (available under AmigaOS 3.x). AmigaGuide users (AmigaOS 2.x) will have to use another picture viewer, like Viewtek by Thomas Krehbiel.

1.9 Hardware Requirements

Hardware Requirements

For all designs:

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- Sub-D connector, female, 9 pins.
  Note: the print circuit board must fit inbetween the pin rows.
- Double sided print circuit board.
  (Or single sided when building transmitter-only without throughput)

Transmitter components:

- HEF 4093 (Schmitt-Trigger NAND)
- BC547 (NPN transistor)
- 5 kiloOhms potentiometer by Bournes (see @{ "fine-tuning " LINK tuning 15})
- 1 kiloOhms resistor
- 10 kiloOhms resistor
- 10 nanoFarad (nF) capacitor
- 100 nanoFarad (nF) capacitor
- red 5mm LED
- 2-wired cable (for transmission IRLED, up to 10 meters or 35 feet)
- LD271 IRLED (or similar)

Receiver components:

- SFH506-38 or SFH506-xx (see  fine-tuning )
- BC547 (NPN transistor)
- 10 kiloOhms resistor
- 150 Ohms resistor
- 4.7 microFarad ($\mathrm{\mu}$F) Elco
- green 5mm LED

Throughput components:

- Sub-D connector, male, 9 pins.
  Note: the print circuit board must fit inbetween the pin rows.
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1.10 Making the Print Circuit Board

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Making the Print Circuit Board

The print circuit board consists of a double sided layout, which is
shown in the BothSides.iff picture in this package.
The green parts in this picture correspond to the solderside, the red
parts correspond to the componentside of the print.

First print out the "SolderSide.ps" and "ComponentSide.ps" layouts on a
PostScript supporting printer. If you don't have access to such a nice
device, you can also use the iff files for printing. Be sure you scale
them to a size of 42 mm (millimeters) x 28 mm, or 1.65 inch x 1.10 inch.

Use the printouts to either make the print circuit board yourself, or
have it made by an electronics company/service or someone else.

The print circuit board can also be ordered from the  authors . Read the
InfraRexx User Guide for more info on this.

If you have problems making a double-sided board, you can also
make it single sided, by using the solderside layout only, and then use
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a wire to connect pins 1 and 2 of the HEF 4093 to pin 6 of the female Sub-D connector. Making a throughput version is somewhat trickier, as this needs wires to connect the upper 5 pins of the Sub-D connectors.

1.11 Drilling the pad holes

Drilling the pad holes

After you managed to make the print circuit board, you are now able to destroy it within seconds: just use a drill machine. But as you are probably not after this, proceed carefully.

You really need the drill machine to be mounted on a stand, because drilling with a hand-held machine is very tricky. Use a small drill diameter size, preferably 0.8 millimeters (mm). Drill every pad, except the pads that are meant to mount the connectors.

1.12 Soldering the components

Soldering the components

We assume there exists a hot relationship between you and your soldering iron, or at least you know how to handle it.

Use the BothSides.iff and Schematic.iff pictures to place and solder the components into place. The blue parts in the "BothSides.iff" picture represent the components. Please take a closer look at this picture before reading on, or even better: make a (draft) printout of it.

The IRLED is attached, using the 2-wire cable, to the two pads in the left-top corner. The left pad is ground (GND).

One wire-jumper has to be made on throughput versions. Pin 7 of the male Sub-D connector has te be attached to a nearby pad.

Do not mix up the two LED circuitries. The one in the right-bottom of the "BothSides.iff" picture represents the receiver circuitry, the top-left one is the transmitter circuitry. We use the green LED for reception indication, the red LED for transmission indication.

Also, pay attention to the place of the Sub-D connectors. On the iff layout pictures, the left connector is the female connector, the one that connects with your Amiga joystickport.

The SFH can be placed in three directions, needed for A2000/A3000/A4000 models, which each have a different joystickport position/direction. A500(+) and A1200 users are advised to use an extension cable, as the receiver must be able to receive infrared light.

Don’t heaten up the HEF4093 and SFH506 components for too long; you don’t want to destroy it after you saw the price of a SFH.

Solder the female connector first, as you can't get near it after you placed the other components.

1.13 Fine-tuning the hardware

Fine-tuning the hardware

Remote controllers send infrared light as a modulated signal, so that other lightsources (sun, lamps) don't interfere with the signal. Every manufacturer uses a slighty different modulation frequency.

Fine-tuning the receiver

The SFH506-xx receiver is available in different versions, optimised for different modulation frequencies, where xx stands for this frequency in kiloHertz (kHz). Currently available are 30, 33, 36, 38, 40 and 56 kHz versions. Choose the best fit, or use an average value, like 36 or 38. Although the receiver is now optimised for your brand(s), you are still able to use different brands, as this is just a fine-tune.

Fine-tuning the transmitter

On the InfraJoy v3.x hardware the factory setting modulation frequency is about 37 Khz, and this will work with most brands. You can however, fine-tune the modulation frequency using the potentiometer that is on the board. To fine-tune this, use a small screwdriver with the blue potentiometer by Bournes.

Users that built the hardware theirselves, using a different type/brand or potentiometer, should either measure the resistance over it, or try out several settings.

1) Turn the potentiometer fully left (anticlockwise). The arrow in the meter will now (more or less) point to the B of the word BOURNES.
2) Use the following table to set the modulation frequency:

#arrow is pointing to:	light modulation frequency	resistance over meter	used by these manufacturers
R	\ensuremath{\pm}40 kHz	\ensuremath{\pm}1.49 kOhm	Sony, Pioneer, Akai, NEC,
inbetween R & N	\ensuremath{\pm}37 kHz	\ensuremath{\pm}1.68 kOhm	Goldstar, Hitachi, Kenwood, Onkyo, Teac, Pioneer, Yamaha Canon
N	\ensuremath{\pm}35 kHz	\ensuremath{\pm}1.86 kOhm	Philips, JVC,Denon, Finlux, Funai,Panasonic, Technics, Sharp

1.14 Last But Not Least...

Last But Not Least...

The authors devoted lots of time to this project, and would like to see their work rewarded. If you like InfraRexx and InfraJoy, consider to pay the registration fee of USD10. You will support the future development (read: improvement) of InfraRexx. Read the InfraRexx User Guide for how to register.

1.15 Ordering the hardware

Ordering the hardware

If you are not familiar with electronics, you can also order the hardware directly from the authors . Just throw away the hardware subdirectory and read the InfraRexx User Guide about this.

Also, if you are having difficulties obtaining components or making the double sided print circuit board, these can be ordered via the authors . Read the InfraRexx User Guide for more info or contact us about specific problems.

1.16 Patch Instructions

Patch Instructions

Users of pre-v3.1 hardware may wish to upgrade their hardware to the current v3.1 hardware design. Read and understand all the instructions before proceeding. If you have problems or questions concerning this, feel free to contact the authors .

If you built the hardware yourself from the InfraRexx 1.0 release archive, you built a v1 design. To patch this, follow these patch instructions:

Patching InfraJoy v1

If you ordered the hardware directly from the authors, you received either a v1 design, a patched v1 design or a v2 design. Look on the print circuit board for a version number;

- If no version is printed or written, you have a v1 design. To patch this, follow the patch instructions for InfraJoy v1 (see above).

- If there is *written* v2 you have a patched v1 design, which functions equal to v2. Follow these instructions to upgrade:

  Patching InfraJoy v1.1

- If there is *printed* v2, follow these guidlines:

  Patching InfraJoy v2

- If there is *printed* v3, follow these guidlines:

   Patching InfraJoy v3

1.17 Patching InfraJoy v1

Patching InfraJoy v1

To upgrade InfraJoy v1 to v3.1 carefully do this:

1. Find the track coming from pin 3 of the SFH505A or SFH506 and cut
   this track using a sharp knife. Be sure to not hurt yourself, it is
   not worth it.

2. Heaten up your soldering iron and connect pin 3 of the SFH to pin 3
   of the (female) Sub-D connector using a wire-jumper.

3. Read the disclaimers and test it.

4. Last but not least .

1.18 Patching InfraJoy v1.1

Patching InfraJoy v1.1

To upgrade InfraJoy v1.1 to v3.1 carefully do this:

1. Find the track coming from pin 3 of the SFH505A or SFH506 and cut
   this track using a sharp knife. Be sure to not hurt yourself, it is
   not worth it.

2. Heaten up your soldering iron and connect pin 3 of the SFH to pin 3
   of the (female) Sub-D connector.

3. Cut the wire-jumper from pin 5 of the (female) Sub-D connector.
   Remember the pad where the wire-jumper was going to.

4. Connect the pad you remembered (see point 3) with pin 6 of the
   (female) Sub-D connector using a wire-jumper.

5. Read the disclaimers and test it.

1.19 Patching InfraJoy v2

Patching InfraJoy v2

To upgrade InfraJoy v2 to v3.1 carefully do this:

1. On the component side find the track coming from pin 5 of any Sub-D

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   connector and leading towards pin 5 and 6 of the HEF 4093. Cut this
   track using a sharp knife between the T-junction and the IC pins, to
   prevend damage to the throughput track. Also, prevend damaging done
   to yourself, as we cannot be kept responsible for your actions.

The rest of the patching is performed on the solderside:

2. Cut the track attached to pin 6 of the Sub-D connector, as close as
   possible to this pin 6. If you have a throughput version, do this
   on both Sub-D connectors.

2. Heaten up your soldering iron and connect pins 1 and 2 of the HEF 4093
   to pin 3 of any Sub-D connector.

4. Connect pins 5 and 6 of the HEF 4093 with pin 6 of any Sub-D
   connector.

5. If you have a throughput version, reconnect pins 6 of both Sub-D
   connectors together using a wire jumper.

6. Read the  disclaimers  and test it.
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1.20 Patching InfraJoy v3

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Patching InfraJoy v3

To fix InfraJoy v3 to v3.1 only do this:

1. Compare your PCB with the new SolderSide.iff layout and add a
   jumper wire that matches the missing track. (Hint: The missing track
   is located near pin 1 of the IC, and is connected to GND and the 100nF
   capacitor). Happy searching!
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1.21 Reaching the authors...

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Reaching the authors...

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