

# CONTROLLING IR DEVICES

## 1 Introduction

So far we have been using a slightly modified NEC IR protocol to communicate classical messages between two parties. In this exercise, we will try to communicate directly with (i.e. to control) the projector in this room by switching it ON/OFF.

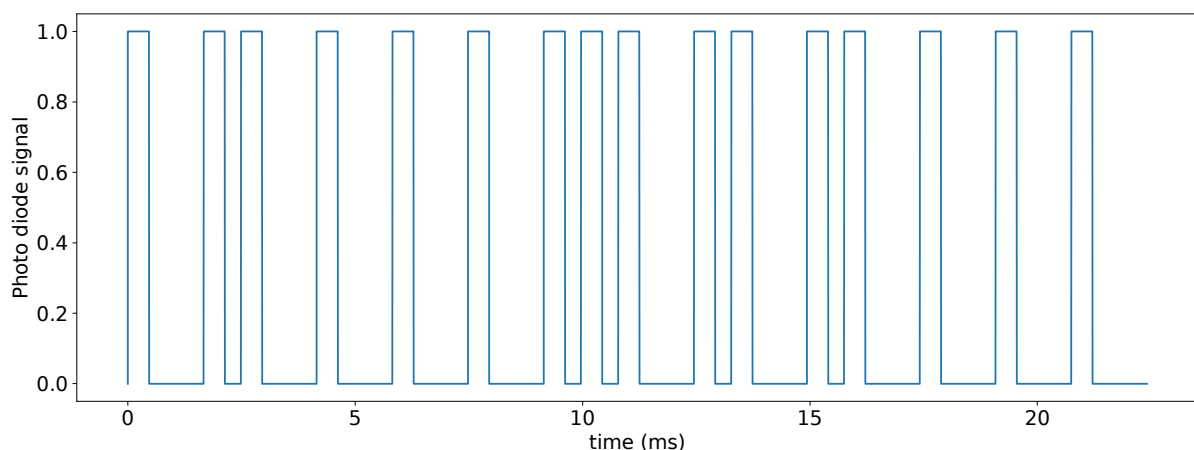
### 1.1 Main Idea

NEC is a protocol that used to be very popular. However, as there are much more manufactured devices nowadays, the address byte allocation starts to fill up. Nowadays, a lot of devices use NEC-extended protocol, which use 2 bytes for address and 1 byte for command.

The projector in this room, however, does not use NEC-type protocol. It is a Panasonic device anyway, with model number PT-AE900U (LCD projector) and uses remote control with serial number EUR7914Z20. The protocol has 5 address bytes (40 bit) and 2 command bytes (16 bit), with a more detailed description as follows:

- Header: ON for 3.35ms, and OFF for 1.80ms
- Logical one: ON for 0.35ms, and OFF for 1.40ms
- Logical zero: ON for 0.35ms, and OFF for 0.55ms
- Stop pulse: ON for 0.35ms
- Address bytes: 0x4004011200
- The command bytes for the ON/OFF function is given in Figure 1 as an oscilloscope <sup>1</sup> trace.

<sup>1</sup>Oscilloscope is a device that measures the voltage of a signal versus time.



## 2 Assignment

**Task 1 [4 pts]** Write down the command bytes for ON/OFF in binary sequence, i.e. 0010...

**Task 2 [2 pts]** Write down the command bytes for ON/OFF in HEX representation, i.e. 0xFFFF.

**Task 3 [4 pts]** Try to switch ON/OFF the projector in the room by writing the command sequences into the Arduino program “IRsendPanasonic.ino” (inside the folder “4\_HackTools”), and upload the program to the Arduino board.