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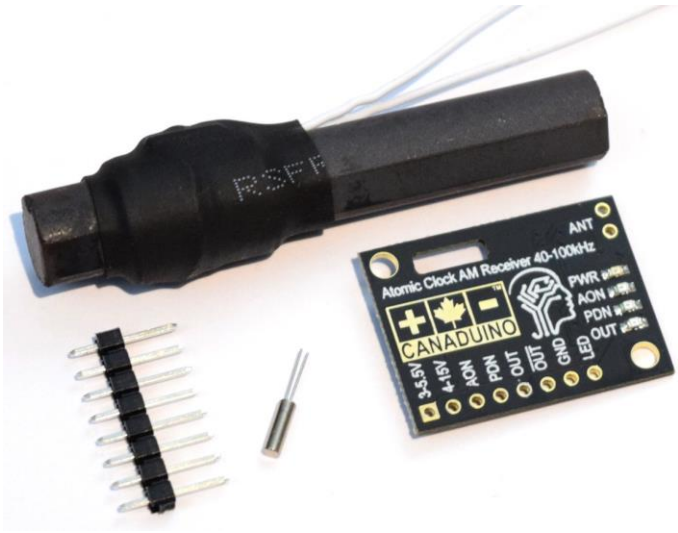
CANADUINO Time Signal AM Receiver Kit (SMD)



- **Fine tuned ferrite antenna**
- **Receiver module:**
  - 2-15V operating voltage
  - 20mA (+/-) outputs
  - 3.3/5V logic level
  - Status LEDs
  - extra inverted output
- **Reception of (examples):**
  - US/Canada WWVB
  - British MSF
  - Japanese JJY60
  - German DCF77

INTRODUCTION

The receiver kit includes an AM receiver module, fine-tuned ferrite antenna and a matching crystal. The module comes with the superior MAS6180C AM receiver IC, a few status LEDs, and a super-low-noise voltage regulator (5V). The high-current outputs (inverted and non-inverted) can sink or source high-currents of up to 20mA which allows to place the receiver up to 1000m apart from the following decoder circuit (e.g. microcontroller).

The status LEDs have their own GND connection; leaving it open keeps the LEDs turned off to preserve power.

The 60mm loop stick antenna has a Q-factor of over 100 and provides high gain for best-in-class reception.

A power supply pin for 3V* to 5.5V bypasses the 3.3V voltage regulator. The output logic level follows this voltage. If you require 3.3V logic level, you need to supply 3.3V power to that pin.

The pin marked “4-15V” is connected to the 5V voltage regulator and can be used for applications that require 5V logic level.

The table on the next page explains the pin functions. Read it carefully to understand the use of AON and PDN: These signals are HIGH by default. Pulling PDN to GND tuns the “power down mode” off, which will turn the receiver on.

To develop a decoder program, you need to understand how the information is encoded in the radio signal. The Wikipedia articles about DCF77 and WWVB explain it very well. Or you recycle one of the many examples codes you can find online, for example in GitHub.

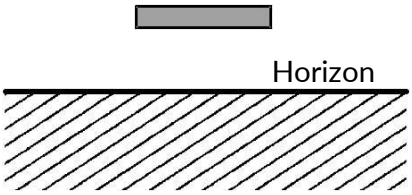
PIN DESCRIPTION

Pin Name	Function	Note
3-5.5V	Operating voltage bypassing regulation	*Min. 2V if status LEDs are not used
4-15V	Operating voltage, passing regulation	
AON	Auto Gain Control on/off	High = on (open = high)
PDN	Power Down	High = on (open = high)
OUT	Non-inverted output signal	Push-pull 20mA max.
/OUT	Inverted output signal	Puch-pull 20mA max.
GND	Ground level for receiver and control	
LED	Ground level for status LEDs	Low = LEDs activated. Max. current 10mA.
ANT	Antenna input pins	

Note: For detailed information about the receiver IC please see MAS6180C AM receiver IC datasheet

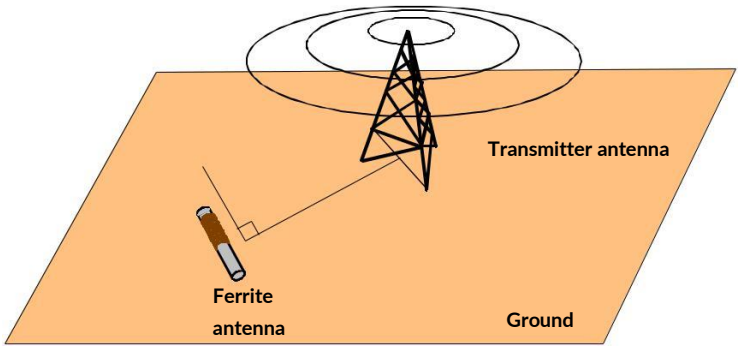
APPLICATION INFORMATION

Antenna orientation



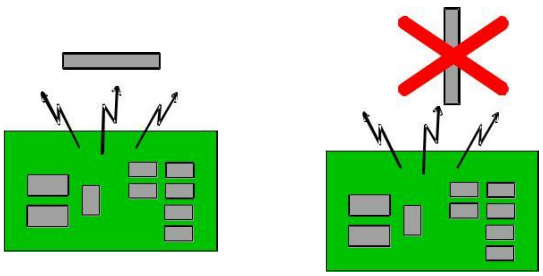
The magnetic field component of the propagating long wave time signal transmission has a horizontal polarization thus the ferrite antenna should be oriented horizontally to maximize the signal (see figure 1).

Figure 1. Antenna orientation relative to ground



The ferrite antenna should also be pointing orthogonally relative to the transmitter.

Figure 2. Antenna orientation relative to transmitter station



The ferrite bar antenna should be located as far as possible from conductive metal walls, PCB ground plane or ferromagnetic objects (speakers). All those objects affect the antenna tuning and can attenuate the received signal. To avoid noise coupling the ferrite antenna should also not be pointing towards noisy electronic circuits (figure 3). It is a good practice to turn off all unnecessary electronic circuits when receiving the weak radio transmission.

Figure 3. Antenna orientation relative to noisy electric circuits

Getting a signal

The antenna is sensitive for magnetic and electric disturbances. As an example, in digital radio-controlled clocks it is known that LCD displays, refreshed using a 32Hz signal, has a1875th odd harmonic hitting exactly at 60kHz and its amplitude can be strong enough (µVrms level) to reduce the sensitivity. The antenna and module placement are critical, and one should maximize distance to other disturbing electronics and metal/ferrous parts which might affect the antenna and the reception.

It is recommended to keep the antenna wires as short as possible (do not extend them) and place receiver and antenna as far away as possible from any possible source of electromagnetic noise. To reduce the risk of noise in the power supply, use either a battery with short wires connected to the 3-5.5V power supply pin or any regulated and filtered power supply between 6 and 15V connected to the 4-15V power supply pin. The data line to your encoder circuit can be up to 1000m long, using a shielded cable like network cable, for example.

If you want to operate the receiver inside a building, then a good place to start is to put the module close to a window and turn the antenna to an optimal position relative the transmitter (see the figure 2 above). As the second step trigger the fast start-up by moving PDN control from power down (high or floating) to power up (PDN = GND) which will make the AGC find its level within a few seconds if the receiving conditions are good enough. Initially the OUT signal should be high but soon after finding a signal (or disturbance in case of poor SNR) the output goes low and after a few seconds it should start receiving pulses. If the output stays low all the time, there is probably some disturbance stronger than the signal. If the signal is bad, change location and repeat the fast start-up by setting PDN = GND (power down) to PDN = HIGH (logic high or open).

Please note that if PDN control is not used the PDN pin must be permanently tied to GND. The start-up time before the receiver finds the signal then can take a few minutes.

MECHANICAL DIMENSIONS

Antenna:	60mm long, 10mm diameter core, max. 15mm diameter with coil and capacitor
PCB:	28mm long, 21mm wide

ORDER INFORMATION

EAN 4260474030200 for 77.5kHz version
EAN 4260474030194 for 60kHz version