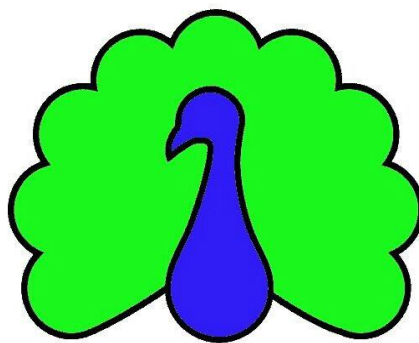Ross Works Automatic Information Department

AUTOMATIC LIGHTHOUSE SYSTEM OWNER MANUAL

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INTRODUCTION

COMPOSITION

The Automatic Lighthouse System (ALS) is an autonomous unit powered by an Arduino Mega2560. Along with this central micro controller, comes a variety of complementary hardware: a GPS module, for time syncing and Geo-localization, a Real Time Clock for keeping a precise track of current time, a Bluetooth module serving as a wireless interface, a SD card slot for storing information, an LCD to visually report relevant data, a temperature and pressure sensor (type BMP180), a temperature and humidity sensor (type DHT22) and a RGB Light Emitting Diode. Everything is powered via a DC-DC converter which ensure a stable 5 Volts energy supply.

WIRING DIAGRAM

NORMAL OPERATIONS

Upon startup, the ALS starts with displaying a splash screen reporting the name of the current unit. It then proceeds in waiting for the GPS receiver to get a valid fix within 3 minutes. If the GPS succeeds in acquiring a fix, the RTC module is synchronized with the UTC time supplied by the GPS module. In the event of the GPS failing to acquire a valid fix, the user will be notified whether the RTC has been already set in a previous startup or it has lost track of time due to power shortage via the LCD.

SENDING COMMANDS

The units is usually operated via a serial interface, bridged to external environment via a Bluetooth module. Any device capable of establishing a serial communication via Bluetooth is suitable for interfacing with the ALS. The access to the Bluetooth module is passcode protected. For setting your own code, please refer to HC-05 data sheet, in particular to the AT-code mode.

Commands are issued by sending up to 64 bytes to the ALS via the serial interface. Most commands only require a single byte, while the replies from the ALS never exceed 64 byte in length. The program mode commands are detailed strings transmitting lots of information to the ALS.

NORMAL COMMANDS

Normal commands consist mostly in interrogation to which the ALS replies. Refer to the Commands Table for a quick description of each code.

The **A** command asks the ALS with the current weather situation. The response, arranged in a manner similar to aeronautical METAR, is called Automatic Weather Report (AWR): the first string reports the unit hard-coded name. The subsequent group of number reports (without spacing and padding to two digits with zeros): current day number, hour (24H format) and minute of creation of the report. Followed by another space ALS adds wind direction (preceded by a capital W) and speed (preceded by a capital S) in km/h. another space is inserted before reporting temperature (in °C) and relative humidity. The temperature is always signed and it's separated from the humidity reading by a slash. A final space separates humidity reading from pressure reading. The pressure is reported in hundreds of Pascals. An example AWR string is reported:

```
YAGAMI 091650 W138S10 -06/74 959
```

The previous strings states that: a station called "YAGAMI" is reporting on the 9th day of current month, at 16:50 (4:50 PM) that the wind is blowing from 138° (South-East) at 10 km/h. Temperature is 6 degrees below zero and humidity is at 74%. The pressure is 959 hPa.

The **D** command asks the ALS to return current date and time as stored in the Real Time Clock. The return tring will state current date and time including the day of the week. An example is reported below.

<div align="center">

`Today is Sun 09 May 2021 12:51:35`

</div>

The **F** command asks the ALS to report the position (estimated by the GPS) of the unit. The return string carries latitude, longitude and height above sea level. Both latitude and longitude are reported in sessagesimal format with minutes and seconds of arc. Should the GPS be unable to locate the unit, the **F** command will return the same default position shown in the LCD during normal operation.

PROGRAM MODE

Program mode is entered when reading an initial char P, or 50 in Hexadecimal. Program mode then reads the subsequent bytes to execute various tasks. A typical program mode command is:

<div align="center">

PLNNEWFILE.LNT;

50 4C 4E 4E 45 57 46 49 4C 45 2E 4C 4E 54 3B

</div>

In this example line the ALS is instructed to read a new lantern activation pattern from a stored file called "NEWFILE.LNT". A semicolon delimits the end of the file name.

When called upon, the program mode begins with reading the second byte in the Serial message. The second char can lead to different paths, according to .

Char	Hex	Effect
D	**44**	Modify DST settings
L	**4C**	Modify Lantern Settings

Table 1: List of available program mode arguments

COMMANDS TABLE

Char	Hex	Effect
A	**41**	Weather report
D	**44**	Date & Time report
F	**46**	GPS Fix report
G	**47**	Update GPS fix
P	**50**	Program mode; see Program mode chapter for further details
S	**53**	Status report

T	**54**	Reserved
Z	**5A**	Prepare unit for safe shutdown