BEACON SYSTEM DESIGN

17/07/2018 – RICHARD BAMFORD – REDDITSAT

CONTEXT

The beacon system will transmit core information about the satellite to the ground station.

The outputs of this system are to be transmitted to the ground station.

The inputs are sent to the Atmega chip through pins defined below.

This program will require minimal storage since it acts as a relay for the system/battery information and the ground station. The values stored should be held in EEPROM see requirements 2 & 3 for more detail.

OUTPUTS (TRANSMITTED TO GROUND STATION)

- ➢ 9 solar panel voltages – mV - float
- ➢ Battery voltage – mV - float
- ➢ Battery charging current – mA - float
- ➢ Reset count – integer
- ➢ Identification – integer
- ➢ Solar panel deployment state– Boolean

INPUTS (TO ATMEGA CHIP ONBOARD)

- ➢ 9 solar panel voltages – Unknown format
- ➢ Battery voltage – Unknown format
- ➢ Battery charging current – Unknown format
- ➢ Solar panel deployment state – Boolean

DEPLOYMENT TIMER

- ➢ The Beacon will act as a timer upon deployment to deploy the antenna and solar panels, it will only do this for the first cycle, so once it is done with the deployment it will write to the EEPROM to stop enter solar panel deployment state. Since the solar panels and antenna will be deployed using nichrome wire and a mosfet we are able to send emergency uplink commands to the satellite to try and deploy the solar cells.

REQUIREMENTS

1. 11 input channels
   a. 9 solar panel inputs
   b. Battery voltage
   c. Battery charging current
2. Reset counter
   a. Read from EEPROM to RAM on setup and increment value.
3. Identification number
   a. Read from EEPROM to RAM on setup.
   b. Write to EEPROM using function which is deactivated after initial value set.

PIN LAYOUTS

LoRa Module	Arduino / ATmega 328
GND	GND
3.3V	3.3V
DIO0	D2
NSS	D10
SCK	D13
MOSI	D11
MISO	D12

Table 1 - Pins connecting the LoRa module and the Arduino ATMega

FLOW DIAGRAM

Atmega startup sketch
"Setup()"

Read previous reset
counter from
EEPROM into RAM
and INCREMENT.

Set identification
variable from
EEPROM into RAM.

Loop function
"Update()"

Delay the loop to 100
Baud, 100 pulses per
second.

Read 12 pin values
which represent the system infomatio

Transmit the system valu
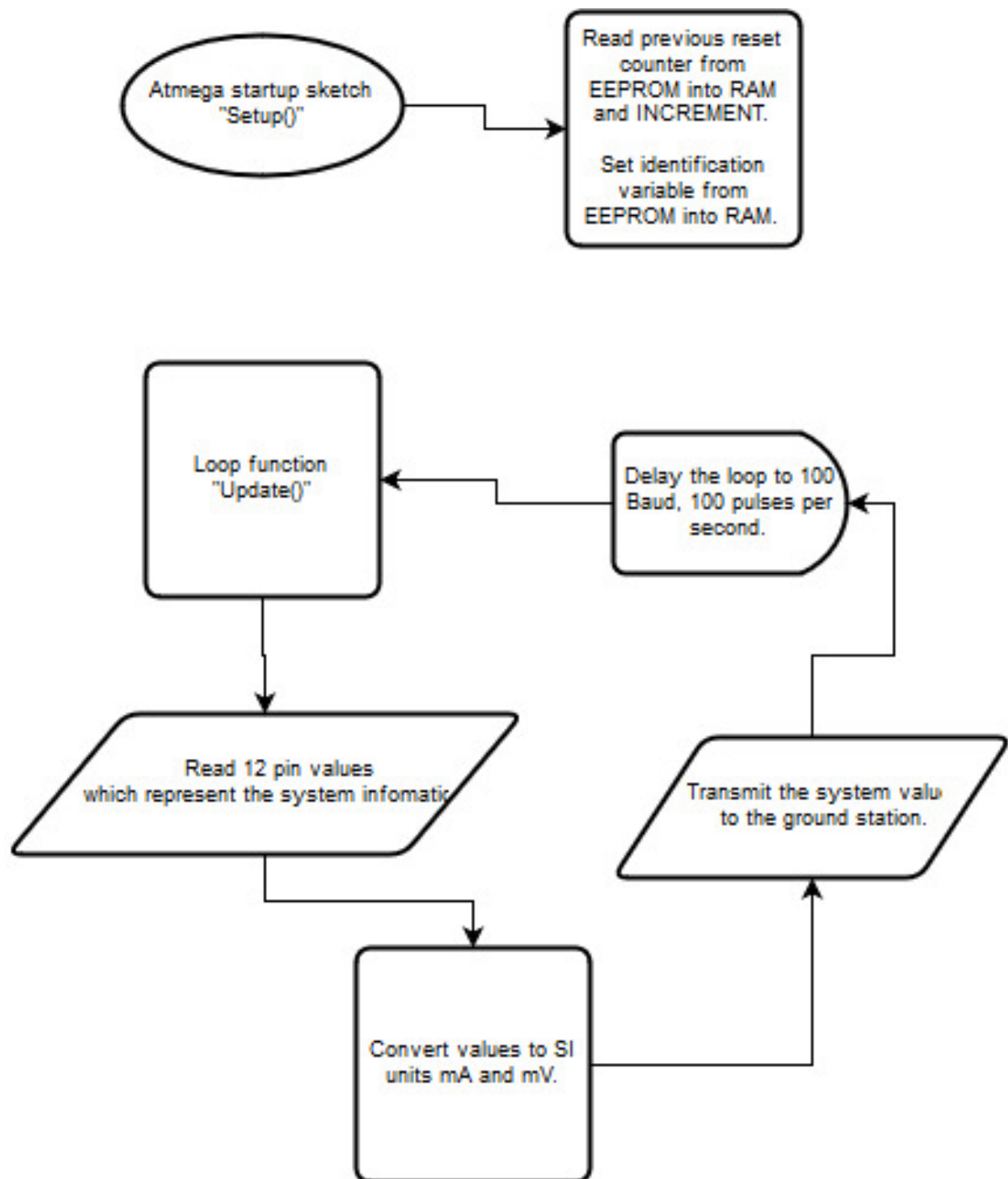to the ground station.

Convert values to SI
units mA and mV.

Figure 1 - Flow chart for the beacon atmega arduino sketch.