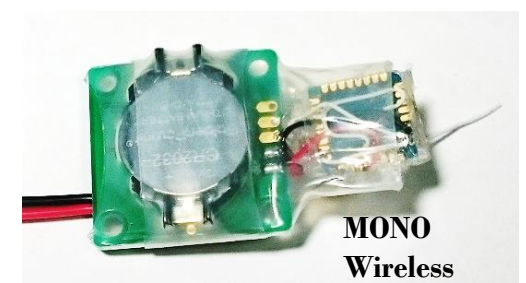
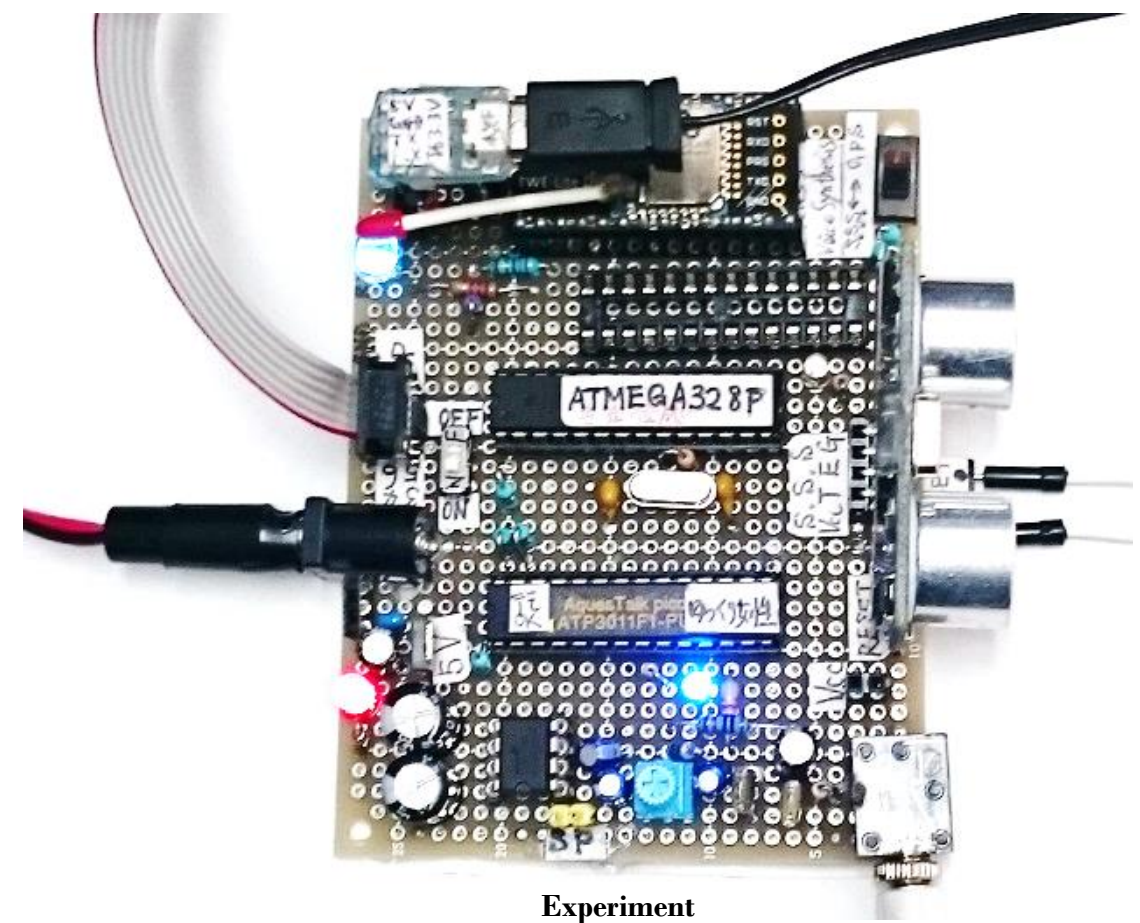
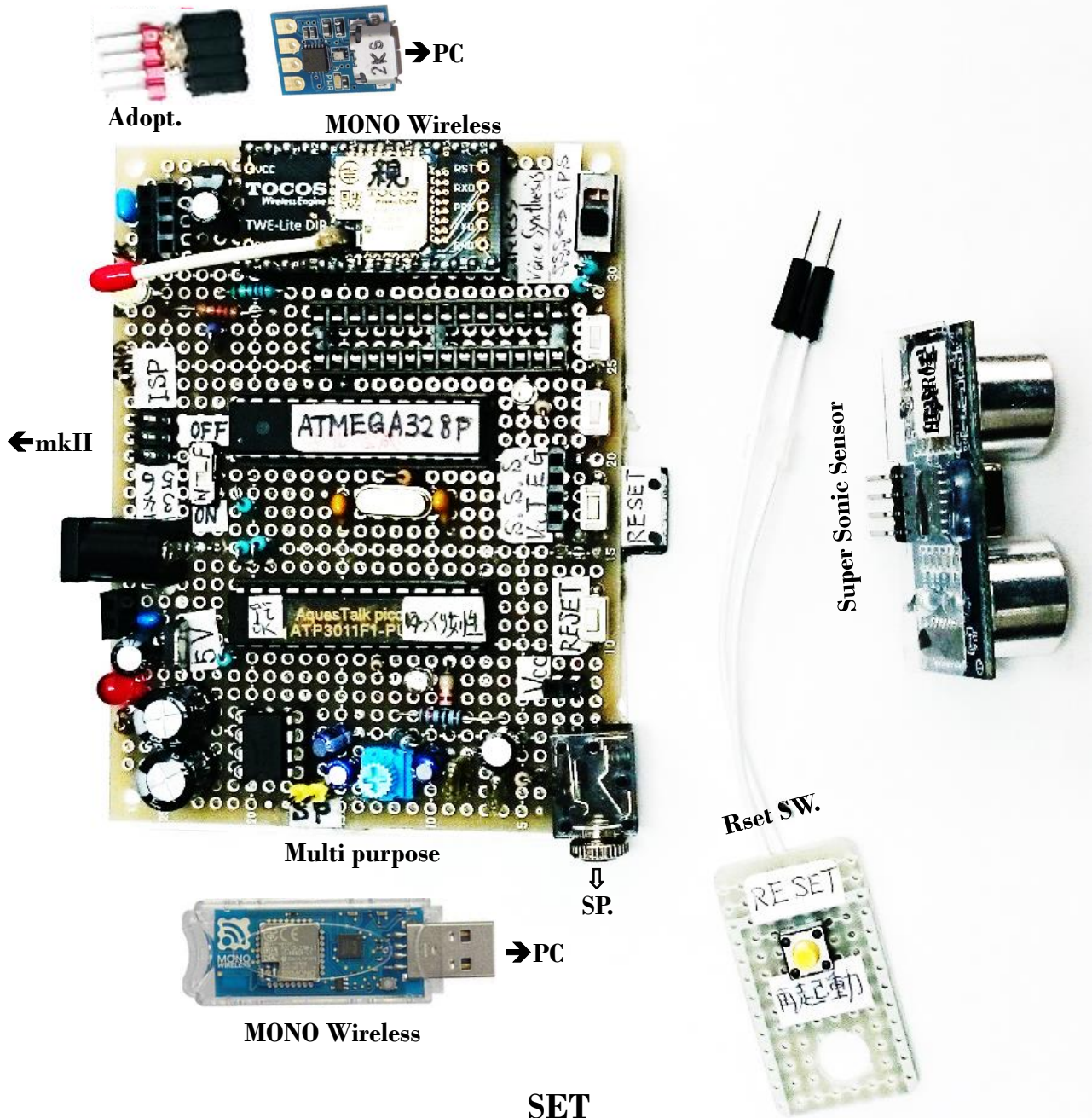


Wireless Monitoring, GPS "Altitude" and Distance by Voice

2017.1.13



GPS(TOP)

GPS(BOTTOM)

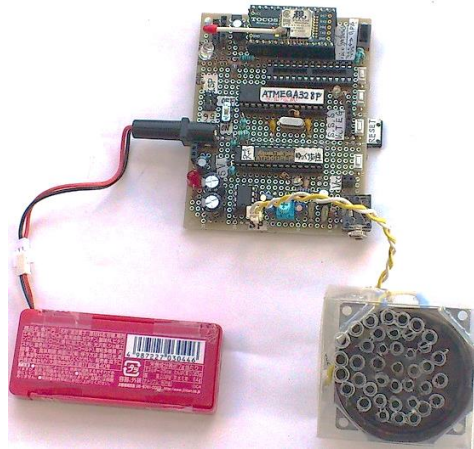
14.5 g

Parabolic antenna sensitivity 33% up



Colander (150yen)

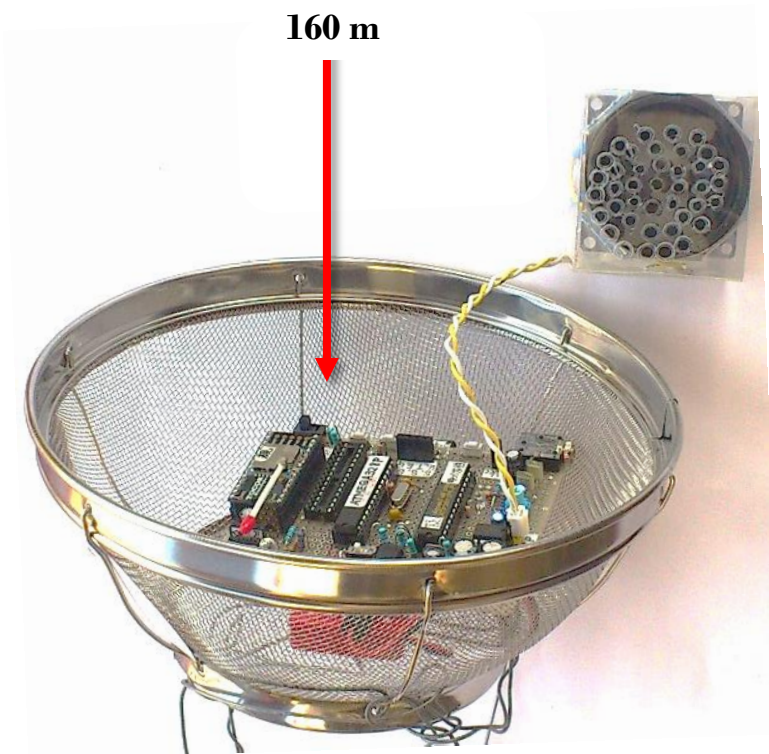
+



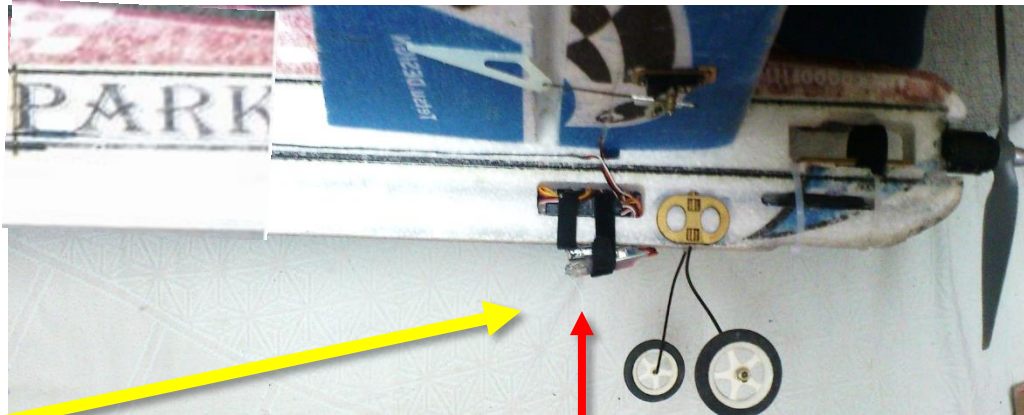
1 Lipo BA.

Speaker

⇒

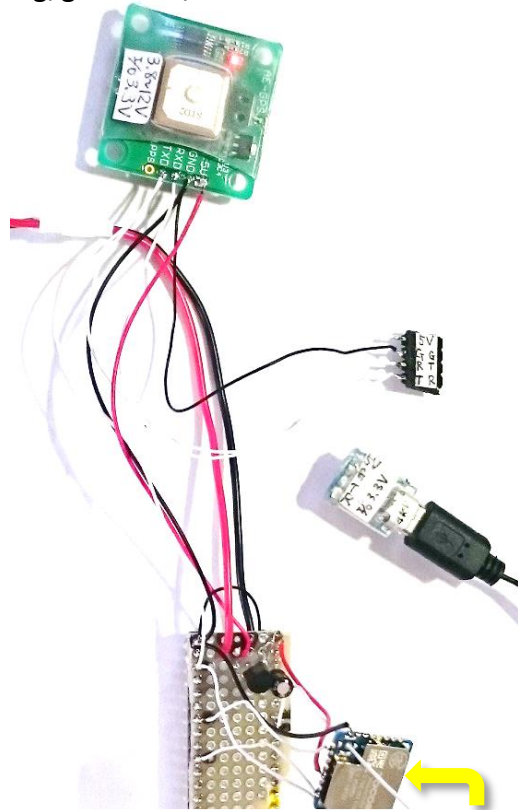


160 m



Setting

<http://akizukidenshi.com/catalog/g/gK-09991/>

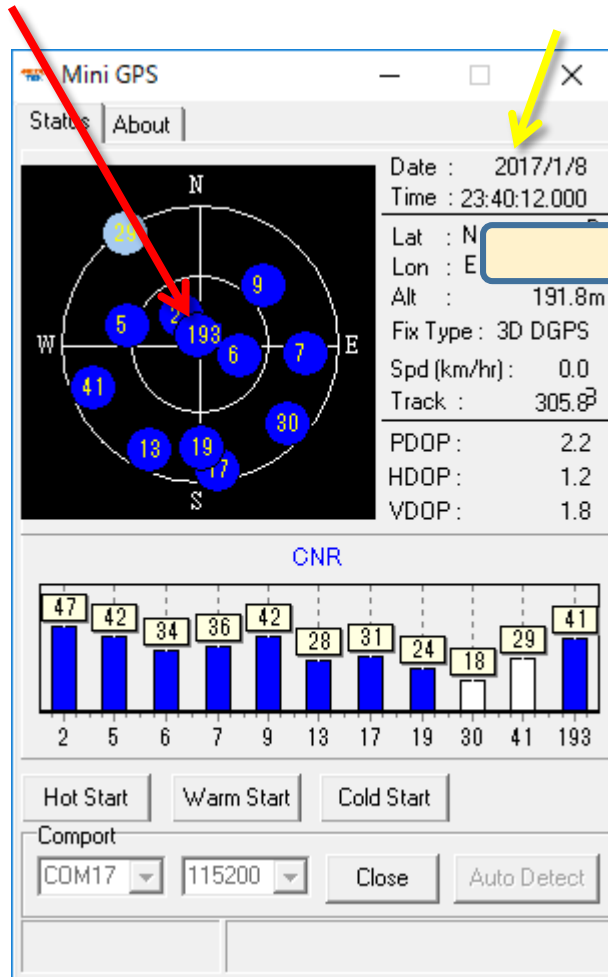


<http://mono-wireless.com/jp/products/TWE-LITE/MNO-PDS-TWE001L-JP.pdf>

Set GPS &
MONO Wireless chip
(ZigBee)

Ref.
http://www.geocities.jp/mtakapii/TWE_Lite_Set.pdf

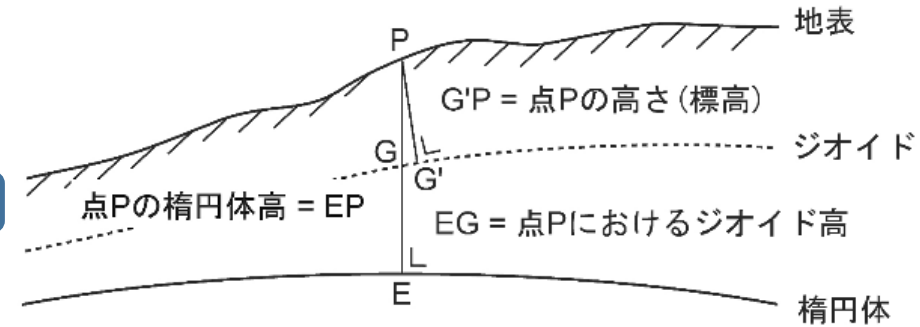
みちびき(天頂衛星)
Surely quausi-zenith
QZSS(Quasi-Zenith Satellite System)



Set Baud rate := Ctrl + Alt + S

http://www.nc.jp/asahi/shared/o-family/ElecRoom/AVRMCOM/GPS_AE-GYSFDMAXB/GPS_AE-GYSFDMAXB.html

Altitude ...



<http://www.geod.jpn.org/web-text/part2/2-1/>

Monitoring State to fly over a “Tama river”
▪ Receivable relative altitude is about 120 meters.
▪ Fine weather , 10 °C, 2017.1.15

Experiment

Altitude + Geoid := 地球楕円体高

Mini GPS

Status | About

Date : 2017/1/8
Time : 23:51:29.000

Lat : N
Lon : E
Alt : 190.5m
Fix Type : 3D DGPS
Spd (km/hr) : 0.0
Track : 305.8°

PDOP : 2.1
HDOP : 1.1
VDOP : 1.8

CNR

2	5	6	7	7	9	13	19	30	41
46	43	19	26	26	41	29	29	22	28

Hot Start | Warm Start | Cold Start

Comport: COM17 | 115200 | Close | Auto Detect

Time (UTC)

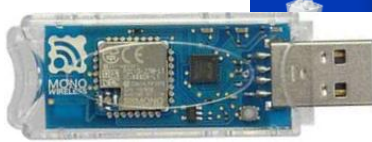
Altitude[m]:="標高"?

Geoid[m]

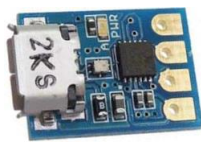
```

COM17:115200baud - Tera Term VT
$GPGSV,3,3,12,30,21,129,30,41,18,248,28,29,09,324,,17,07,171,*7A
$GPRMC,2,35021.000,A,3537.6698,N,13918.7832,E,0.01,305.75,080117,,D*69
$GPVTG,305.75,T,,M,0.01,N,0.01,K,D*3C
$GPZDA,2,35021.000,08,01,2017,,*5C
$GPGGA,235022.000,.,.,E,2,9,1.14,151.4,M,39.2,M,0000,0000*50
$GPGLL,.,.,E,235022.000,A,D*57
$GPGSA,A,3,13,19,09,30,07,193,06,0505,46,290,44*4B
$GPGSV,3,2,12,09,32,046,42,07,25,091,42,19,22,179,26,13,21,207,25*79
$GPGSV,3,3,12,30,21,129,30,41,18,248,28,29,09,324,,17,07,171,*7A
$GPRMC,235022.000,A,.,.,E,0.02,305.75,080117,,D*69
$GPVTG,305.75,T,,M,0.02,N,0.04,K,D*3A
$GPZDA,235022.000,08,01,2017,,*5E
$GPGGA,235023.000,.,.,E,2,9,1.14,151.4,M,39.2,M,0000,0000*51
$GPGLL,.,.,E,235023.000,A,D*56
$GPGSA,A,3,13,19,09,30,07,193,06,05,02,,.,2,12,1.14,1.79*35
$GPGSV,3,1,12,193,84,345,41,02,73,328,46,06,60,114,22,05,46,290,44*4D
$GPGSV,3,2,12,09,32,046,42,07,25,091,42,19,22,179,26,13,21,207,25*79
$GPGSV,3,3,12,30,21,129,30,41,18,248,28,29,09,324,,17,07,171,*7A
$GPRMC,235023.000,A,3.,.,E,0.00,305.75,080117,,D*6A
$GPVTG,305.75,T,,M,0.00,N,0.01,K,D*3D
$GPZDA,235023.000,08,01,2017,,*5E

COM18:115200baud - Tera Term VT
$GPGLL,3537.6698,N,13918
151 -2
$GPGGA,235018.000,.,.,E,2,9,1.14,151.4,M,39.2,M,0000,0000*59
$GPGLL,3537.6698,N,13918
151 -2
$GPGGA,235020.000,.,.,E,2,9,1.14,151.4,M,39.2,M,0000,0000*52
$GPGLL,3537.6698,N,13918
151 -2
$GPGGA,235022.000,.,.,E,2,9,1.14,151.4,M,39.2,M,0000,0000*50
$GPGLL,3537.6698,N,13918
151 -2
    
```



MONO Wireless



USB-Serial

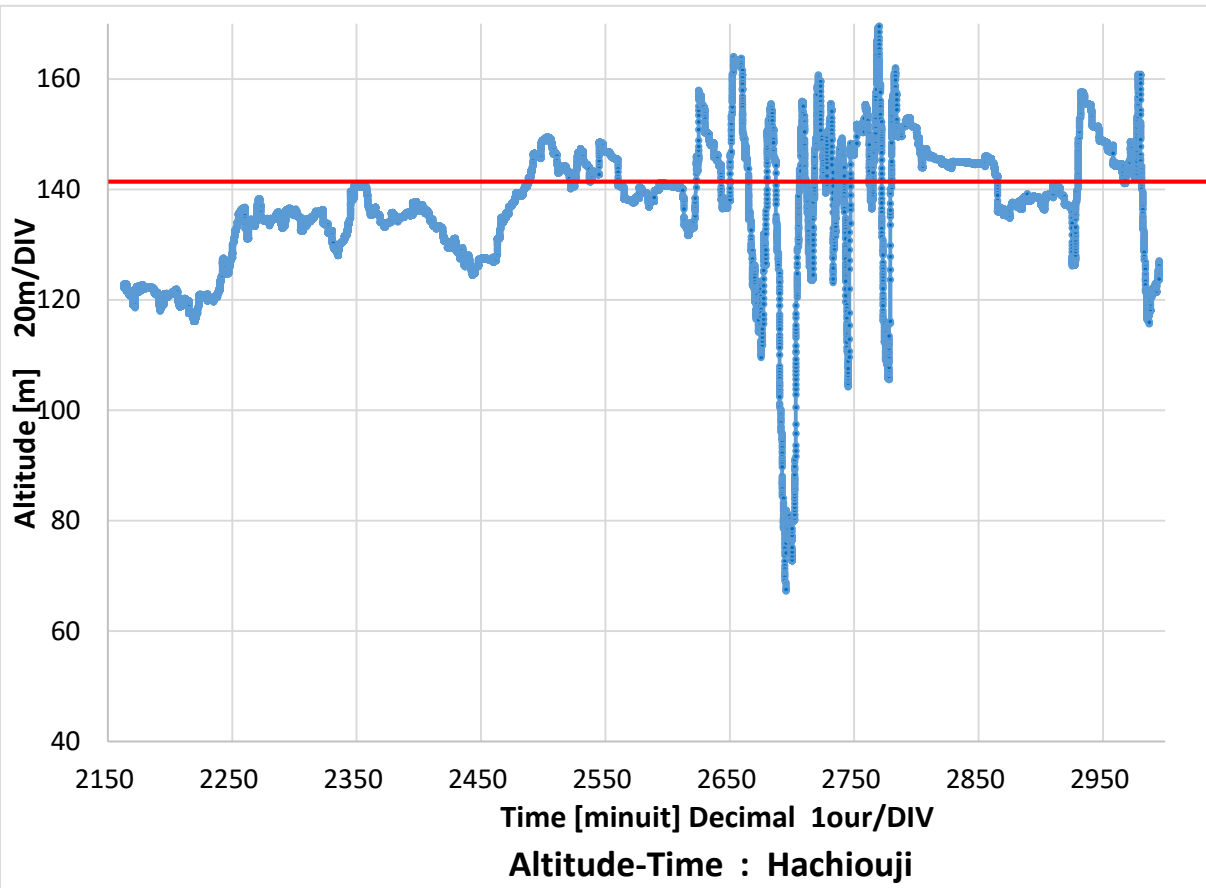
190.5 m

地球楕円体高?
“標高”+ジオイド高

151.4 + 39.2 m = 190.6 m (厳密には標高線と楕円体高線とは角度を持つので左式は成立しない)
 ≒ 137.5m (国土地理院 データソース: DEM5A) 2F Hachiouji TOKYO
 ∴地球楕円体高 ≒ 137.5 + 4(2F)+ 39.2 = 180.7 m ⇒ about 10 meters error

Mini GPS::“Alt” is meaning Earth Ellipsoid

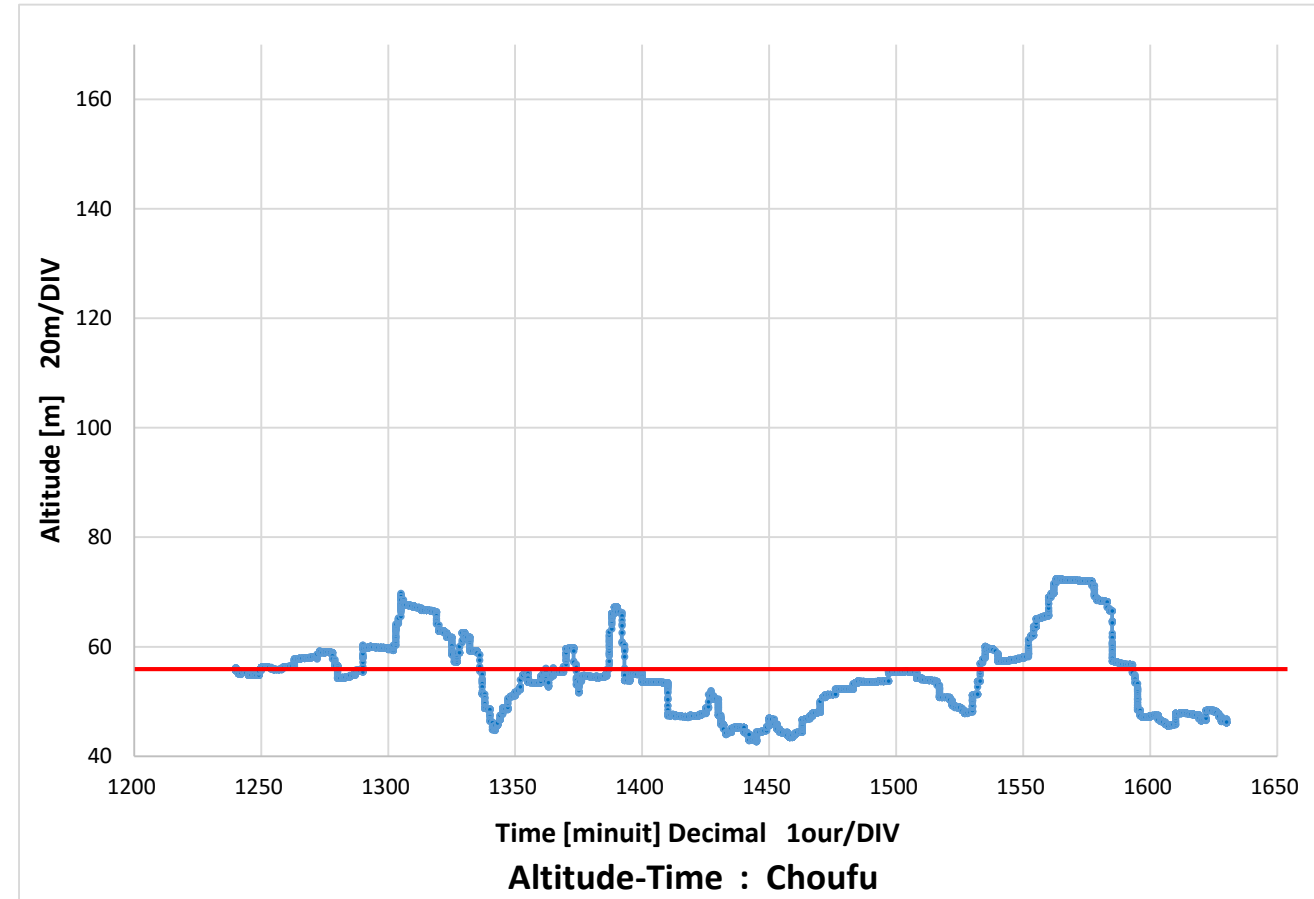
Results



Altitude characteristic in Hachiouji ,TOKYO, JAPAN (2017.1.12~13)

Conditions :

Sunny, Indoor 2F, Wooden house, Facing North



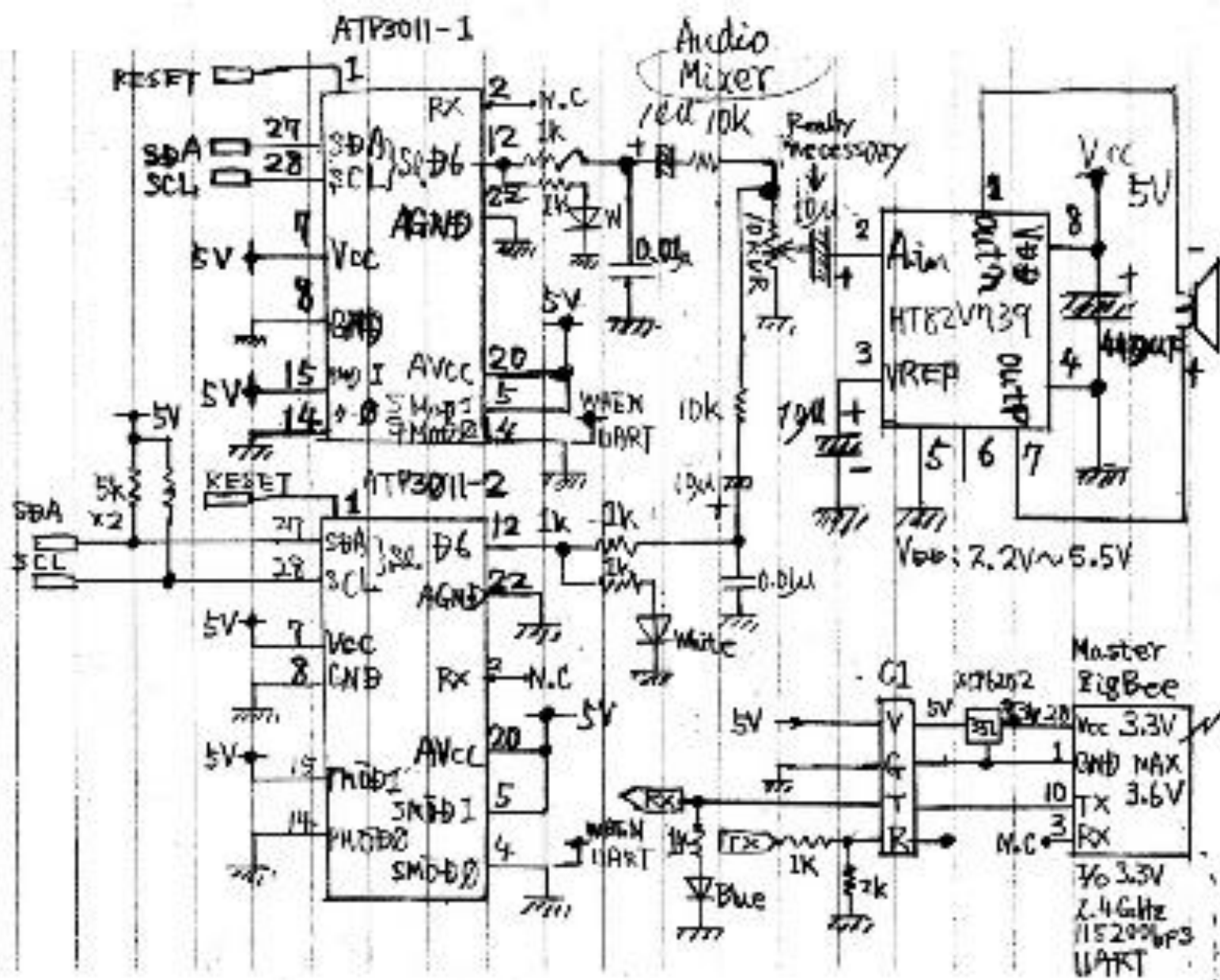
Altitude characteristic in Choufu ,Tokyo, JAPAN (2017.1.12)

Conditions :

Sunny, 4F Building at back, Facing South

Circuit

ZigBee & USB-Serial Concurrent use



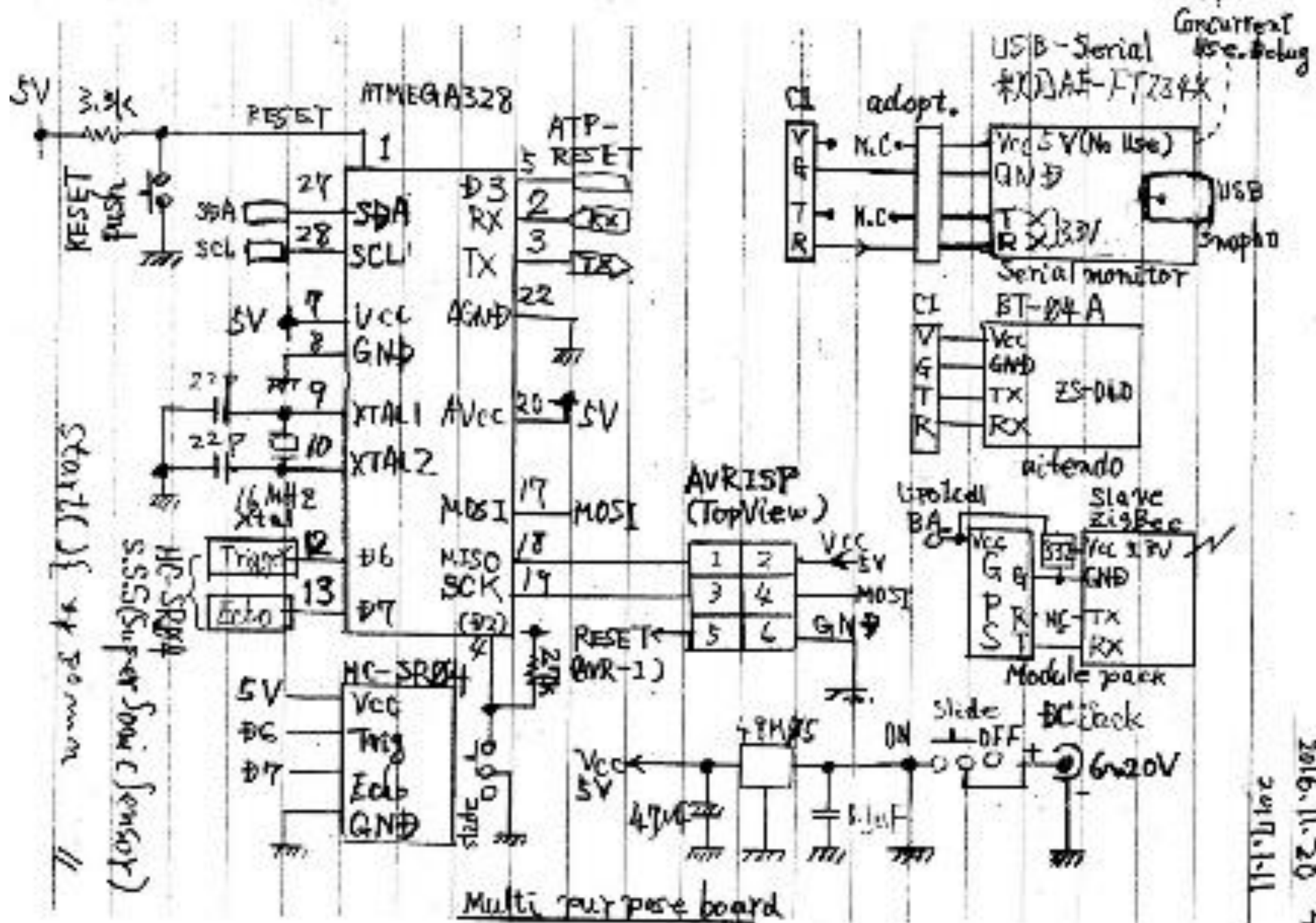
42 ZigBee (GPS Monitoring)
 Bluetooth wireless voice from the S/S 2017.1.4
 2016.11.13

Altitude
 For CPLT

GPFGA Sentence

```
122.20,$GPFGA,123810.000,3537.6607,N,13918.7836,E,1,8,1.03,122.2,M,39.2,M,,*59
122.20,$GPFGA,123811.000,3537.6612,N,13918.7833,E,1,8,1.03,122.3,M,39.2,M,,*58
```

Sorry, my handwriting is so illegible.
 My vision is a very blurry, excuse me.



START [] of program //

2016.11.20 43
2017.1.11

```

/* *****
2017.1.xx      http://www.geocities.jp/mtakapii/
Altimeter by "GPS" & Distance meter by Super Sonic Sensor

multi program mode
(1) GPS Monitoring "Altitude" & "$GPGGA sentence" from NMEA form.
(2) Measurement distance by S.S.S.

0 < Altitude > 999 [m]
0.02 < Distance > 4 [m]

GPGGA Sample of [AE-GYSFDMAXB] NMEA form. Using only sentence
...      http://akizukidenshi.com/catalog/g/gK-09991/
$GPGGA,041411.000,3539.3899,N,13932.4491,E,2,8,1.08,28.9,M,39.3,M,0000,0000*60
at best condition

S.S.S.      ... HC-SR04 http://www.aitendo.com/product/7402
Voice Synthesizer ... ATP-3011 http://akizukidenshi.com/catalog/g/gI-05665/

----- Memo for specialized Key board -----
¥r¥n __ | |
ref. http://garretlab.web.fc2.com/arduino/reverse_lookup/index.html
***** */

#define echo 7 // Echo Pin
#define trigger 6 // Trigger Pin
#define Pin4_D2 2 // Program mode Select Pin 4
// #define Pin5_D3 3 // Program mode Select Pin 5
#define Offset 4 // [mm]
#define setspeed 140 // Speed of Normal Talking

#define MAX_line 100 //
#define ave_times 5

#include <Wire.h> // I2C library
#include <AquesTalk.h> // Voice Synthe. library

AquesTalk atp; // Voice Synthe. instance
String title;

void setup() {
  delay(500);
  Serial.begin( 115200 );
  Serial.println();
  Serial.println("GPS & Distance Monitoring 2017.1.12");
  pinMode(Pin4_D2, INPUT); // Set (D2=pin4) is INPUT
  //pinMode(Pin5_D3, OUTPUT); // Set (D3=pin5) is OUTPUT
  //Reset_ATP();

```

```

delay(500);
pinMode( echo, INPUT );
pinMode( trigger, OUTPUT );

atp.SetSpeed(setspeed);
atp.Synthe("#J");
while (atp.IsBusy());
atp.Synthe("nii'hao.");
atp.Synthe("konnni'chi/wa-");
while (atp.IsBusy());
title = "<NUMK VAL=2017 COUNTER=nenn>";
title += "<NUMK VAL=1 COUNTER=gatsu>";
title += "sei'sakudesu ";
atp.Synthe((const char*)&title[0]);
}

void loop() {
  if (digitalRead(Pin4_D2)) {
    read_GPS();
    while (1);
  }
  else {
    meas_d();
    while (1);
  }
}
/*
void Reset_ATP(){
  digitalWrite(Pin5_D3,LOW);
  delay(1);
  digitalWrite(Pin5_D3,HIGH);
  delay(1);
} */

float ave;
void read_GPS() {
  int i;
  char s[16];
  float altitude;
  average();
  while (1) {
    altitude = get_height();
    if (altitude > 0){
      Serial.print(altitude);
      Serial.print(",");
    }
  }
}
}
}

```



```

/* *****
*/
void average(){
  int i;
  char s[10];
  float tmp1, tmp2;
  tmp1 = 0;
  for(i=0; i<ave_times; i++){
    if((tmp2 = get_height()) < 0){
      i--;
    }
    else{
      Serial.println(tmp2);
      tmp1 += tmp2;
    }
  }
  ave = tmp1 / ave_times;
  Serial.print("\r\nAverage = ");
  Serial.println(ave);
  for(i=0; i < 10 ; i++){
    s[i] = ' ';
  }
  dtostrf(ave, -5, 1, s);
  title = "heikinnwa <NUMK VAL=" + String(s) + ">me-ta.";
  atp.SyntheS(title);
  while (atp.IsBusy());
}

float get_height(){
  char line_buf[MAX_line];
  char line_tmp[MAX_line];
  char *A;
  char A0, A1, A2, A3, A4; // numeric chara.
  int cnt;
  char dim1, dim2; // unit chara. (M)

  for ( cnt=0; cnt < MAX_line - 1;cnt++) {
    line_buf[cnt] = 0x20;
    line_tmp[cnt] = 0x20;
  }
  cnt = 0;
  while(1){ // find "$GPGGA"
    if ( Read_ZigBee() == 'G') { // 0x47 => 'G'
      if ( Read_ZigBee() == 'G') { // 0x47 => 'G'

        /* **** Read data **** */
        while (cnt < MAX_line) {
          line_buf[cnt] = line_tmp[cnt++] = Read_ZigBee();
        }

```

```

A = strtok(line_buf, ","); // Separate with ','
for(cnt=0; cnt < 9; cnt++){ // Proceed Altitude Position
  A = strtok(NULL, ",");
}
A0 = (*A);
A1 = (*(A+1));
A2 = (*(A+2));
A3 = (*(A+3));
A4 = (*(A+4));

A = strtok(NULL, ","); // unit position of Altitude
dim1 = (*A);
A = strtok(NULL, ",");
A = strtok(NULL, ","); // unit position of Geoid
dim2 = (*A);
if( dim1 == 0x4d && dim2 == 0x4d){ // 0x4d ... 'M'
  //Serial.print("\r\n");
  Serial.print("$GPGG");
  for( cnt=0; cnt<MAX_line ; cnt++){
    if( line_tmp[cnt]!='\r' || line_tmp[cnt]!='\n'){
      Serial.print("\r\n");
      break;
    }
    if( line_tmp[cnt]=='*'){
      Serial.print(line_tmp[cnt++]); // *
      Serial.print(line_tmp[cnt++]); // *+1 SUM
      Serial.println(line_tmp[cnt]); // *+2 SUM
      break;
    }
    Serial.print(line_tmp[cnt]);
  }
  if(A0 == 0x2e){
    return float(0);
  }
  if(A1 == 0x2e){
    return float((A1-0x30) + float(A2-0x30)/10);
  }
  if(A2 == 0x2e){
    return float((A0-0x30)*10+(A1-0x30) + float(A3-0x30)/10);
  }
  if(A3 == 0x2e){
    return float((A0-0x30)*100+(A1-0x30)*10+(A2-0x30)+float(A4-0x30)/10);
  }
  else{
    return float(-1);
  }
}
else{
  return float(-1);
}

```

```

}
}
}
}
char Read_ZigBee() {
  char zigbee;
  while (1) {
    if ( Serial.available() > 0 ) {
      zigbee = Serial.read();
      return zigbee;
    }
  }
}

/* ***** S.S.S. ***** */

void meas_d() {
  String str, strtmp;
  float p_width, distance;

  Serial.println("This is meas_d()");
  atp.SetSpeed(setspeed * 1.3);
  while (atp.IsBusy());
  atp.Synthe("cho-onnpasennsade kyorio hakarimasu. ");

  while (atp.IsBusy());
  while (1) {
    digitalWrite(trigger, LOW);
    delayMicroseconds(5);
    digitalWrite(trigger, HIGH);
    delayMicroseconds( 10 );
    digitalWrite(trigger, LOW);
    p_width = pulseIn(echo, HIGH);
    if (p_width > 0) {
      p_width /= 2;
      distance = p_width * 340 * 100 / 100000 + Offset;
      strtmp = String(int(distance));
      str = "<NUMK VAL=" + strtmp + "COUNTER=miri>";
    }
    else { // if error !
      str = "#J";
    }
    while (atp.IsBusy());
    atp.Synthe((const char*)&str[0]);
  }
}

/* ***** End of Sketch ***** */

```