/////////////////////////////////////

// Time & Date conversion

/////////////////////////////////////

struct Timestamp {

byte hh, mm, ss, DD, MM, YY;

}; // BCD coded Time & Date info, these are updated in the time routine

struct Logvalue { // The way the logged values are stored

unsigned int Dnumber; // Day number assuming 1-1-1900 = 0

unsigned int Snumber; // Second number assuming 00:00:00 is 0 and 23:59:59 is 86399

int WL; // measured WaterLevel in mm

};

Timestamp Tstmp1;

Timestamp Tstamp;

Logvalue LVal\_1;

Logvalue LV;

long DD;

byte MM;

byte YY;

byte decToBcd(byte val){

return (val/10\*16 + val%10);

}

byte BCDTodec(byte val){

return ((val/16)\*10 + val%16);

}

void ConvertLV2TSTMP(){

Tstmp1.hh = decToBcd((byte)(LVal\_1.Snumber / 3600));

Tstmp1.mm = decToBcd((byte)((LVal\_1.Snumber % 3600) / 60));

Tstmp1.ss = decToBcd((byte)((LVal\_1.Snumber % 3600) % 60));

DD = (LVal\_1.Dnumber-36525); // # days since 01-01-2000 (a leap year)

int YY = 00; // first assume it is 1-1-2000

while (DD > 1461){ // if there are more than 1461 days left a full series of 4 years has passed, one of which is a leap year

YY = YY + 4;

DD = DD - 1461;

} // DD <= 1461

if (DD > 1096) { // The first year of the group is a leap year with 366 days

YY = YY + 3;

DD = DD - 1096; // DD <= 365

} // DD <= 1096

if (DD > 731) { // The first year of the group is a leap year with 366 days

YY = YY + 2;

DD = DD - 731;// DD <= 365

} // DD <= 731

if (DD > 366) { // The first year of the group is a leap year with 366 days

YY = YY + 1;

DD = DD - 366;// DD <= 366

} // DD <= 366

// DD is now the day number in the year YY

MM = 1 ; // This is the first month of the year

if ((DD>31)&&(MM==1)){ // It is not January

DD = DD - 31;

MM++; // it might be February

}

if (((YY%4)==0)&&(MM==2)) {// it is a Leap Year

if ((DD>29)&&(MM==2)){ // It is not February in a Leap Year

DD = DD - 29;

MM++; // it might be March

}

}

else { // it is not a Leap Year

if ((DD>28)&&(MM==2)){ // It is not February in a non Leap Year

DD = DD - 28;

MM++; // it might be March

}

}

if ((DD>31)&&(MM==3)){

DD = DD - 31; // It is not March

MM++; // it might be April

}

if ((DD>30)&&(MM==4)){

DD = DD - 30; // It is not April

MM++; // it might be May

}

if ((DD>31)&&(MM==5)){

DD = DD - 31; // It is not May

MM++; // it might be June

}

if ((DD>30)&&(MM==6)){

DD = DD - 30; // It is not June

MM++; // it might be July

}

if ((DD>31)&&(MM==7)){

DD = DD - 31; // It is not July

MM++; // it might be Aug

}

if ((DD>31)&&(MM==8)){

DD = DD - 31; // It is not Aug

MM++; // it might be Sept

}

if ((DD>30)&&(MM==9)){

DD = DD - 30; // It is not Sept

MM++; // it might be Oct

}

if ((DD>31)&&(MM==10)){

DD = DD - 31; // It is not Oct

MM++; // it might be Nov

}

if ((DD>30)&&(MM==11)){

DD = DD - 30; // It is not Nov

MM++; // it must be December

}

Tstmp1.DD = decToBcd((byte)(DD));

Tstmp1.MM = decToBcd((byte)(MM));

Tstmp1.YY = decToBcd((byte)(YY));

}

void ConvertTSTMP2LV(){

LV.Snumber = BCDTodec(Tstamp.ss) + BCDTodec(Tstamp.mm)\*60 + BCDTodec(Tstamp.hh)\*3600;

LV.Dnumber = 36526; // 1-1-2000

LV.Dnumber = LV.Dnumber + (BCDTodec(Tstamp.YY)/4)\*1461; // There are 1461 days in 4 years, one of which is a leap day

LV.Dnumber = LV.Dnumber + (BCDTodec(Tstamp.YY)%4)\*365; // all remaining full years have 365 days

if ((BCDTodec(Tstamp.YY)%4) == 0) LV.Dnumber--;

switch (Tstamp.MM) {

case (0x01): // It's Januari

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD);

break;

case (0x02): // It's Februari

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 ;

break;

case (0x03): // It's March

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x04): // It's April

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x05): // It's May

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x06): // It's June

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x07): // It's July

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x08): // It's August

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30 + 31;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x09): // It's September

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30 + 31 + 31;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x10): // It's October

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x11): // It's November

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30 + 31;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

case (0x12): // It's December

LV.Dnumber = LV.Dnumber + BCDTodec(Tstamp.DD) + 31 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30 + 31 + 30;

if (BCDTodec(Tstamp.YY)%4 == 0) LV.Dnumber++;

break;

} // end switch on months

} // End ConvertTSTMP2LV

void setup(){

Serial.begin(115200);

LVal\_1.Dnumber = 42000U;

LVal\_1.Snumber = 0U;

LVal\_1.WL = 0U;

}

void loop(){

delay(150);

LVal\_1.Dnumber = LVal\_1.Dnumber + 1;

// if (LVal\_1.DN > 43909U) LVal\_1.DN = LVal\_1.DN - 1904U; // to keep dates in relevant time period

LVal\_1.Snumber = LVal\_1.Snumber + 771;

if (LVal\_1.Snumber > 86399U) LVal\_1.Snumber = LVal\_1.Snumber - 86400U; // to keep seconds within the allowed range 0..86399

Serial.print("Snumber: ");

Serial.print(LVal\_1.Snumber);

Serial.print(", ");

Serial.print("Dnumber: ");

Serial.print(LVal\_1.Dnumber);

Serial.print(", ");

ConvertLV2TSTMP();

if (Tstmp1.hh < 0x10) Serial.print("0");

Serial.print(Tstmp1.hh,HEX);

Serial.print(":");

if (Tstmp1.mm < 0x10) Serial.print("0");

Serial.print(Tstmp1.mm,HEX);

Serial.print(":");

if (Tstmp1.ss < 0x10) Serial.print("0");

Serial.print(Tstmp1.ss,HEX);

Serial.print(" ");

if (Tstmp1.DD < 10) Serial.print("0");

Serial.print(Tstmp1.DD,HEX);

Serial.print("-");

if (Tstmp1.MM < 10) Serial.print("0");

Serial.print(Tstmp1.MM,HEX);

Serial.print("-");

if (Tstmp1.YY < 10) Serial.print("0");

Serial.print(Tstmp1.YY,HEX);

Serial.print(", ");

Tstamp = Tstmp1;

ConvertTSTMP2LV();

Serial.print("Snumber: ");

Serial.print(LV.Snumber);

Serial.print(", ");

Serial.print("Dnumber: ");

Serial.print(LV.Dnumber);

Serial.println();

}