WeatherDuino Logger
for
WeatherDuino Pro2 Plus

by engolling

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Get all the data captured by the WeatherDuino Pro2 Plus system and its modules to an additional serial interface with full precision for logging or further processing.

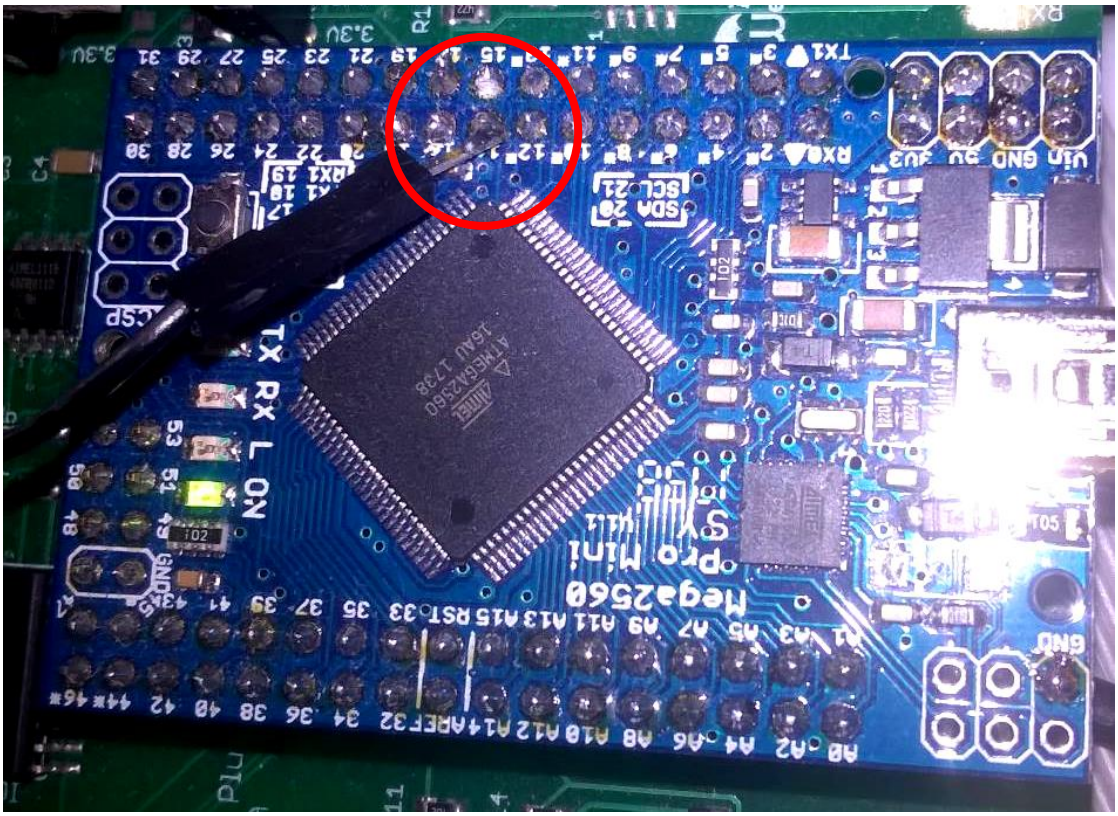
- The sampling rate is one sample per minute.
- Reports via E-Mail if data transmission stops.
- Data is exported in metric units.

Since the data is written to the serial 3 interface of the meduino there is a corresponding logging script written in python since it is platform independent.
This script logs all selected data to CSV. The script can also export selected signals to a text file. From there you can import additional weather data like the snow height into WeeWx weather software.
See: https://www.meteocercal.info/forum/Thread-WeeWx-extra-data-plugin

Hardware setup

First, the communication wire has to be soldered to pin 14 of the Meduino, carrying the UART3. We only need pin 14 (TX) since this will be a one-way communication.

Take care to get a proper ground connection; you can get this from one of the I2C connectors on the RX board.



Be aware that the output logic level is at 5V and hence not suitable for direct communication with a PC or a Raspberry Pi. You may use some level shifters to obtain a proper function.

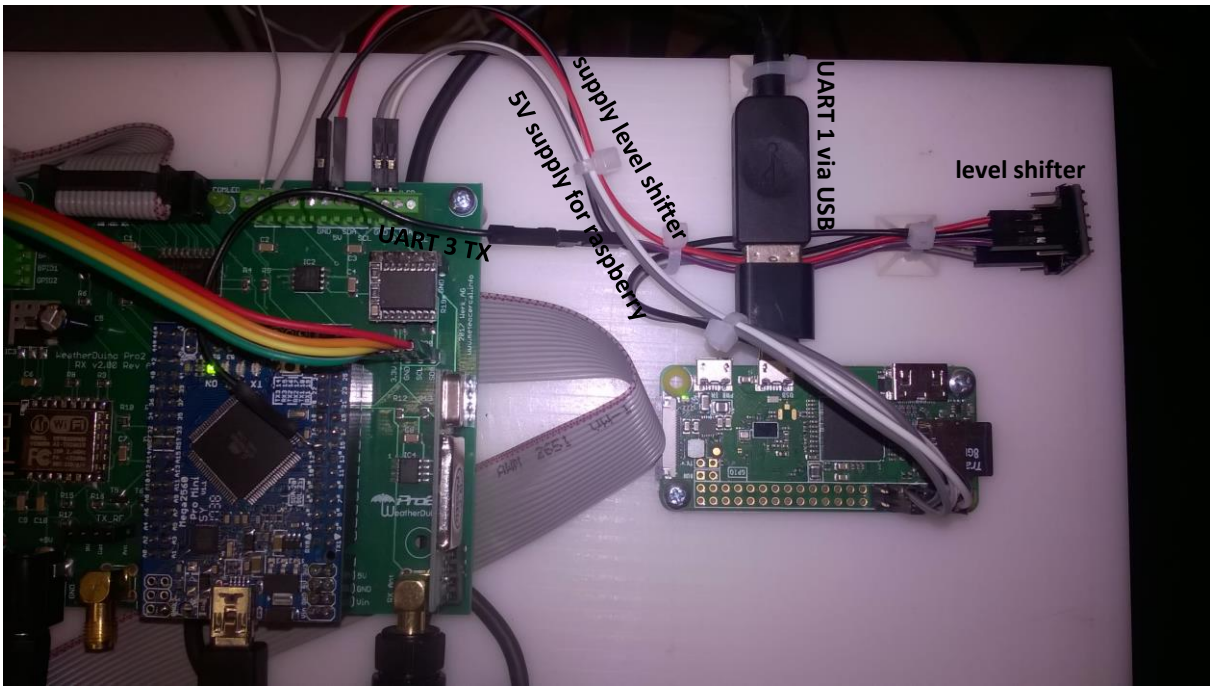
The baud rate of the receiving device has to be set to 115200. Data bits 8, stop bit 1 and parity none.

Additional setup for use with a Raspberry Pi Zero W

I suggest using a Raspberry Pi Zero W for data logging and running the provided logging script. In this case you can use the Raspberry to run a weather software like WeeWx or Cumulus and additionally log all of your captured data in full precision or import some extra data into WeeWx.

Attention: Since the 5V linear regulator on the Meduino gets warm when the Raspberry Zero W is connected, I do not recommend suppling the Raspberry any longer via the WeahterDuino.

Be aware that the ground potentials of the Raspberry and the WeatherDuino have to be connected for a working communication.



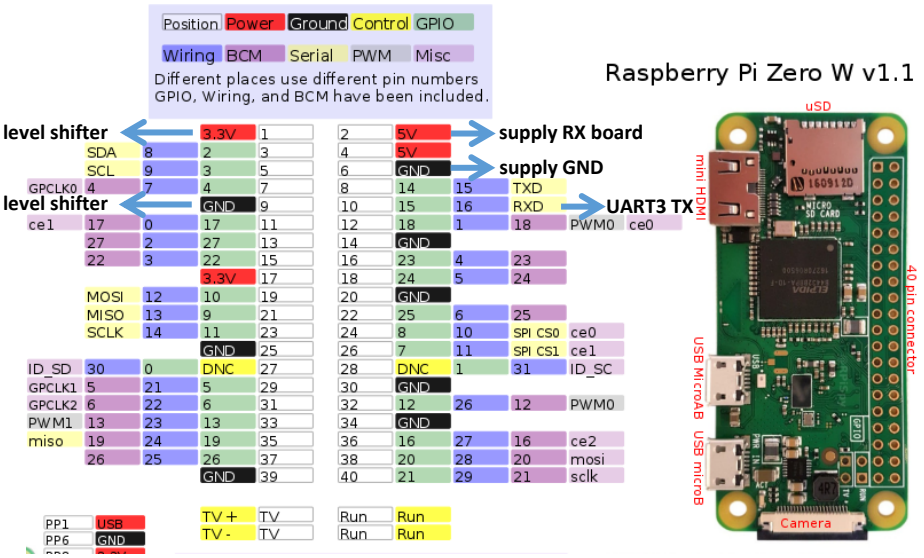


Image source: https://cdn.sparkfun.com/assets/learn_tutorials/6/7/6/PiZero_1.pdf by Sparkfun, retrieved on 27.08.2018

I used a bidirectional level shifter based on a BSS138, those can be found in almost any online shop. Since the level conversion has only to be unidirectional, a resistor divider or the usage of a zener diode would also be possible.

Software setup

The original WeatherDuino source code has to be modified as following in order to retrieve all the stored sensor data each minute.

First init serial 3 on the Meduino:

In WeatherDuino_P2AT2560_RX_[Version].ino line 453 find:

```
//------------------------------------------------------
//    Setup Things
//------------------------------------------------------
void setup()
{
  Serial.begin(19200);
```

Change to:

```
//------------------------------------------------------
//    Setup Things
//------------------------------------------------------
void setup()
{
  Serial.begin(19200);
  Serial3.begin(115200);
```

Next, insert the sending routine in the 1-minute timer:

In Routines.ino line 333 find:

```
  float conv_factor = 1.0;
  #if (RAIN_DISPLAY_UNIT == 1)
    conv_factor = 0.03937;
  #endif
  Rain_LastHour = RainTips_LastHour * (COLLECTOR_TYPE[RAIN_SOURCE] / 1000.0) * conv_factor;
  //Serial.print("Rain Last Hour :"); Serial.println(Rain_LastHour);
  Rain_Last24Hours = RainTips_Last24Hours * (COLLECTOR_TYPE[RAIN_SOURCE] / 1000.0) *
conv_factor;
  //Serial.print("Rain last 24 hours :"); Serial.println(Rain_Last24Hours);
```

Change to:

```
  float conv_factor = 1.0;
  #if (RAIN_DISPLAY_UNIT == 1)
    conv_factor = 0.03937;
  #endif
  Rain_LastHour = RainTips_LastHour * (COLLECTOR_TYPE[RAIN_SOURCE] / 1000.0) * conv_factor;
  //Serial.print("Rain Last Hour :"); Serial.println(Rain_LastHour);
  Rain_Last24Hours = RainTips_Last24Hours * (COLLECTOR_TYPE[RAIN_SOURCE] / 1000.0) *
conv_factor;
  //Serial.print("Rain last 24 hours :"); Serial.println(Rain_Last24Hours);

    // --- Transmit raw data via Serial 3
    Com_Transmit();
```

Modify the receiving routine that wind values of each TX-Module are buffered:

In RX_TX.ino find line 137 – 157:

```
  if (TX_UnitID == WIND_SOURCE)
  {
   uint32_t gust;
   gust = RX_Data[2];
   if (gust <= 67000)                          // - First step Spike Removal - Process if Gust <= 241 Km/h
   {
    #if (WIND_SPIKECONTROL == 1)
     static uint32_t last_gust;
     uint16_t spike_limit;
     if     (last_gust < 11111 ) spike_limit = 8333;   // < 40 Km/h -> Spike Limit 30 Km/h
     else if (last_gust < 18055 ) spike_limit = 15277;  // < 65 Km/h -> Spike Limit 55 Km/h
     else spike_limit = 50000;                  // > 65 Km/h -> Spike Limit 180 Km/h
     if (gust > last_gust + spike_limit) gust = last_gust;
     last_gust = gust;
    #endif

    RX_WindPackets = RX_WindPackets + 1;

    TX_Unit[TX_UnitID].Wind_average   = RX_Data[1];
    TX_Unit[TX_UnitID].Wind_gust      = gust;
    TX_Unit[TX_UnitID].Wind_dir       = RX_Data[3];
```

Change to:

```
    uint32_t gust;
    gust = RX_Data[2];
    if (gust <= 67000)                          // - First step Spike Removal - Process if Gust <= 241 Km/h
    {
#if (WIND_SPIKECONTROL == 1)
     static uint32_t last_gust;
     uint16_t spike_limit;
     if     (last_gust < 11111 ) spike_limit = 8333;   // < 40 Km/h -> Spike Limit 30 Km/h
     else if (last_gust < 18055 ) spike_limit = 15277;  // < 65 Km/h -> Spike Limit 55 Km/h
     else spike_limit = 50000;                  // > 65 Km/h -> Spike Limit 180 Km/h
     if (gust > last_gust + spike_limit) gust = last_gust;
     last_gust = gust;
#endif

     TX_Unit[TX_UnitID].Wind_average   = RX_Data[1];
     TX_Unit[TX_UnitID].Wind_gust      = gust;
     TX_Unit[TX_UnitID].Wind_dir       = RX_Data[3];

     if (TX_UnitID == WIND_SOURCE)
     {
      RX_WindPackets = RX_WindPackets + 1;
```

Modify the receiving routine that rain values of each TX-Module are buffered:

In RX_TX.ino find line 228 – 237:

```
#if (RAIN_SOURCE != 3)
  if (TX_UnitID == RAIN_SOURCE)
   {
    COLLECTOR_TYPE[TX_UnitID]       = RX_Data[1];          // Collector tip value * 1000
    TX_Unit[TX_UnitID].Rainftipshour  = RX_Data[2];
    TX_Unit[TX_UnitID].TotalRain_tips = RX_Data[3];
    //Serial.print("TotalRain_tips :"); Serial.println(TX_Unit[TX_UnitID].TotalRain_tips);

    MainSensors_lastTimeRX[2] = now_millis;
    bitWrite(MainSensorsRX, 2, 1);
```

Change to:

```
#if (RAIN_SOURCE != 3)
    COLLECTOR_TYPE[TX_UnitID]       = RX_Data[1];          // Collector tip value * 1000
    TX_Unit[TX_UnitID].Rainftipshour  = RX_Data[2];
    TX_Unit[TX_UnitID].TotalRain_tips = RX_Data[3];
    //Serial.print("TotalRain_tips :"); Serial.println(TX_Unit[TX_UnitID].TotalRain_tips);

    if (TX_UnitID == RAIN_SOURCE)
    {
     MainSensors_lastTimeRX[2] = now_millis;
     bitWrite(MainSensorsRX, 2, 1);
```

Modify the receiving routine that the temperature and humidity values of the AQM are buffered:

In RX_TX.ino line 417 - 420 find:

```
case 12:
{
 AQI_Monitor.GAS_1 = RX_Data[3];  // GAS_1 from AQI Monitor
 AQI_Monitor.GAS_2 = RX_Data[4];  // GAS_1 from AQI Monitor
```

Change to:

```
case 12:
{
 AQI_Monitor.GAS_1 = RX_Data[3];  // GAS_1 from AQI Monitor
 AQI_Monitor.GAS_2 = RX_Data[4];  // GAS_1 from AQI Monitor
 AQI_Monitor.AQI_Temp = RX_Data[1]/10;  // Temp from AQI Monitor
 AQI_Monitor.AQI_Hum = RX_Data[2]/10;  // Humidity from AQI Monitor
```

to provide temperature and humidity data in your extra logging.

In data_structs.h line 49 find:

```
uint16_t AQI_Temp;
```

Change to:

```
int16_t AQI_Temp;
```

Finally copy the new provided file “COM_Transmit_v.ino” into the project folder. This file contains the sending function that starts a data stream according to the enclosed pattern. The data layout can be found in the file “Transmission_Layout_[Version]”.

Evaluation and further processing

The python script “Weatherduino_Logger_.py” can display and log all of the WeatherDuino Pro2 Plus data to a *.csv file. This data can be easily displayed with any csv viewer. Moreover, it can generate a dataset for import into WeeWx.

In the upper part of the logging script you can make some settings for debugging, logging and mail notifications.

Be sure the path to the “Transmission_Layout_xx” file is correct. I had some trouble with relative paths, so I suggest to use an absolute path pointing to that file.

The main settings concerning signal preparation and logging are made in the “Transmission_Layout_” csv file. The columns separator must be ‘;’.

Line 1 is the signal line, I tried to name it like in the WeatherDuino software of Werk_AG.

In line 2 you can give a alias name, overwriting the name in line 1 in the log file and in the WeeWx export file.

In line 3 you can choose which signals should be logged to the logfile.

Line 4 might overwrite the signal name again just for the WeeWx export file.

Line 5 defines which signals should be exported to WeeWx.

You should not change line 6 – 9 unless you know what you are doing. Line 6 defines the unit group in WeeWx and line 7 the variable type of the signals coming from the WeatherDuino. This is needed for decoding the string. Line 9 defines the unit of the exported signal.

Sine WeeWx does not like signal names with a space ‘ ‘ in it I suggest not to use spaces in any of the names in the Transmission_Layout file. Better use underscores ‘_’ instead.