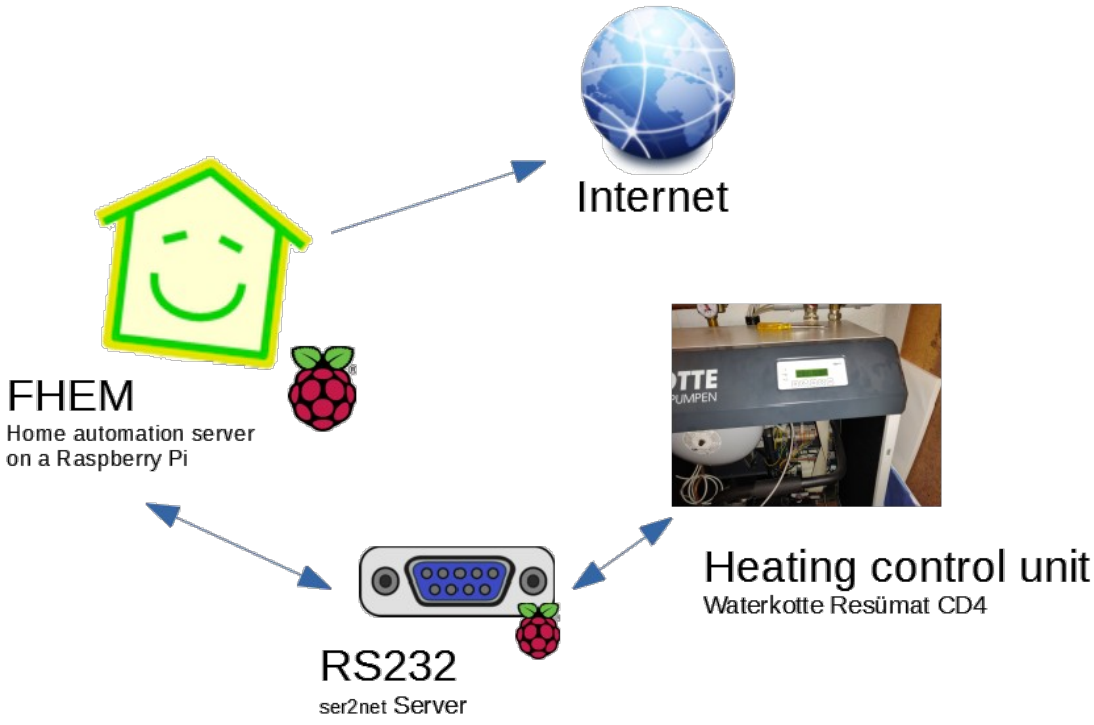
# Internet of Things

## Explanation

- Waterkotte „Resümat CD4“ (2002) as control unit
- RS232 serial port available

- Serial protocol uses hexadecimal data
- Already reverse engineered by people in online forums

- Protocol has read and write options
- Protocol uses a CRC-16 (checksum) with special parameters



10 02 01 15 0000 00FF 10 03 7C1A

START MODE OFFSET BYTES END CRC

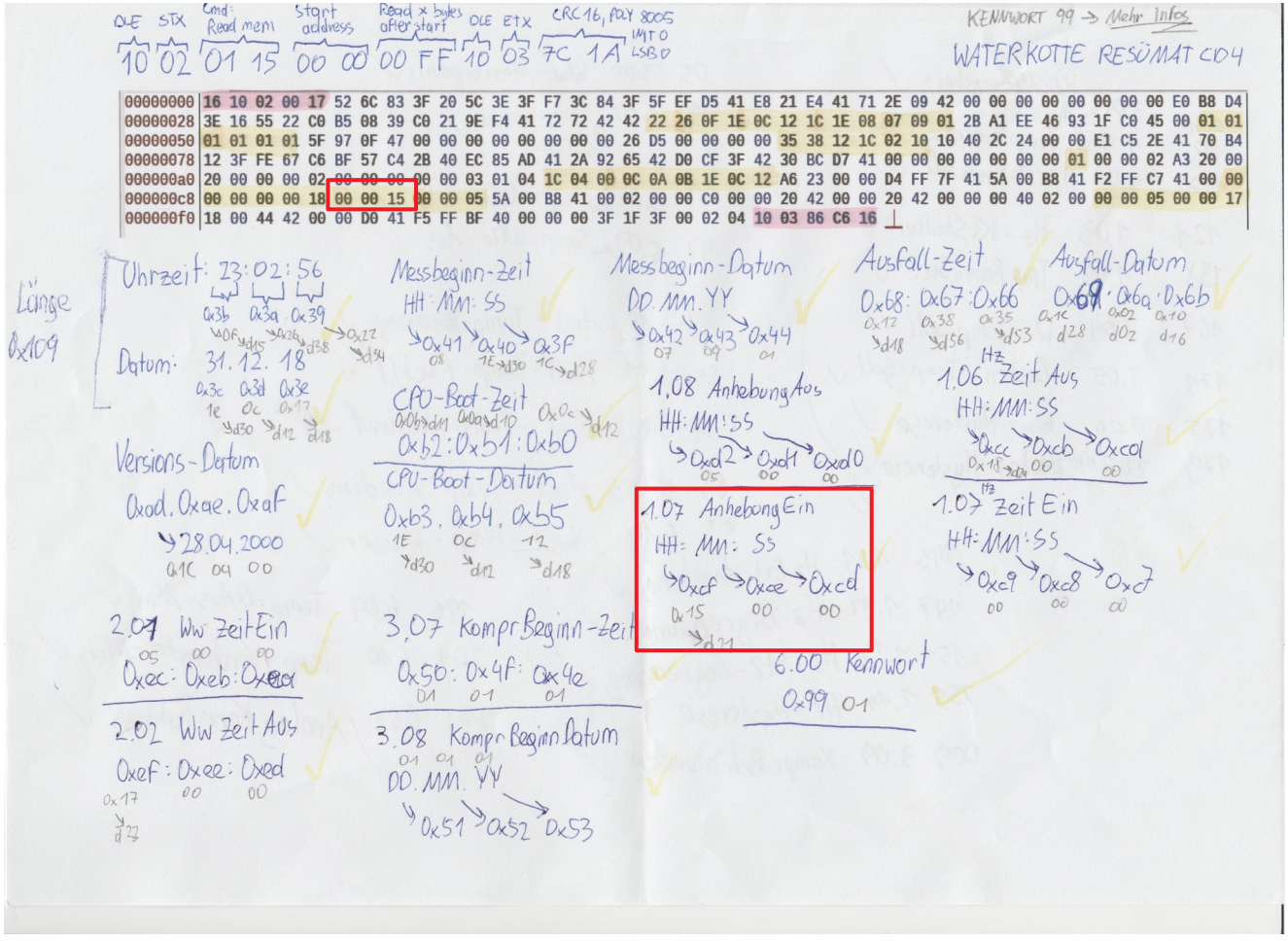
*Read 255 bytes starting from 0x00*

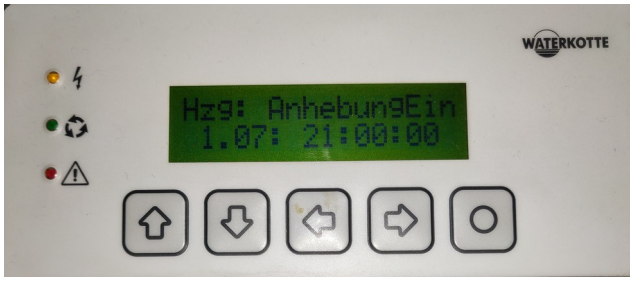
Available modes:

- 01 15 Read
- 01 14 Set clock (time + date)
- 01 13 Write

**CRC-16 (Hex)**
**CRC-16/BUYPASS**

Poly: 0x8005
Init: 0x0000
LSB: 0x0000
Inp. rev: no
Res. rev: no
https://crccalc.com




- Finding out offsets/addresses by comparing hex data with values on the display
- Floats: IEEE 754
  (little endian)
- Used hex editor: Bless

| Feldname | Menünummer | Adresse | Länge | Typ |
|---|---|---|---|---|
| Temp-Aussen | 0.00 | 0 | 4 | f |
| Temp-Aussen-24h | 0.01 | 4 | 4 | f |
| Temp-Aussen-1h | 0.02 | 8 | 4 | f |
| Temp-Ruecklauf-Soll | 0.03 | 0C | 4 | f |
| Temp-Ruecklauf | 0.04 | 10 | 4 | f |
| Temp-Vorlauf | 0.05 | 14 | 4 | f |
| Temp-Raum | 0.06 | 18 | 4 | f |
| Temp-Raum-1h | 0.07 | 1C | 4 | f |
| Temp-WQuelle-Ein | 0.08 | 20 | 4 | f |
| Temp-WQuelle-Aus | 0.09 | 24 | 4 | f |
| Temp-Verdampfer | 0.10 | 28 | 4 | f |
| Temp-Kondensator | 0.11 | 2C | 4 | f |
| Ww-Temp | 2.03 | 30 | 4 | f |
| Uhrzeit | 3.00 | 34 | 3 | t |
| Datum | 3.01 | 37 | 3 | d |
| Messbeginn-Zeit | 3.02 | 3A | 3 | t |
| Messbeginn-Datum | 3.03 | 3D | 3 | d |
| Hz-Messergebnis | 3.04 | 41 | 4 | f |
| Ww-Messergebnis | 3.05 | 44 | 4 | f |
| Mess-Reset | 3.06 | 48 | 1 | c |
| KomprBeginn-Zeit | 3.07 | 49 | 3 | t |
| KomprBeginn-Datum | 3.08 | 4C | 3 | d |
| KomprBetrStunden | 3.09 | 4F | 4 | f |
| Kompr-Mess-Reset | 3.10 | 53 | 1 | c |
| Unterbrechungen | 4.00 | 54 | 1 | b |
| Warnung-Eingang | 4.01 | 55 | 1 | b |
| Warnung-Ausgang | 4.02 | 56 | 1 | b |
| Warnung-Sonstige | 4.03 | 57 | 1 | b |
| Ausfaelle | 4.04 | 58 | 1 | b |
| Fuehler-Ausfall | 4.05 | 59 | 1 | b |
| Fuehler-KurzSchl | 4.06 | 5A | 1 | b |
| FuehlerZaehler0 | 4.07 | 5B | 2 | n |
| FuehlRaum-Ausfall | 4.08 | 5D | 1 | b |
| FuehlRaum-KurzSchl | 4.09 | 5E | 1 | b |
| FuehlRaum-Zaehler0 | 4.10 | 5F | 2 | n |
| Ausfall-Zeit | 5.00 | 61 | 3 | t |
| Ausfall-Datum | 5.01 | 64 | 3 | d |
| Ausfall-Betriebszust. | 5.02 | 67 | 1 | b |
| Ausfall-Do-Buffer | 5.03 | 68 | 1 | b |
| Ausfall-Di-Buffer | 5.04 | 69 | 1 | b |
| Ausfall-FuehlAusfall | 5.05 | 6A | 1 | b |

- Inserting the new addresses into the FHEM plugin (Perl)
- Add some own improvements (writing special fields)

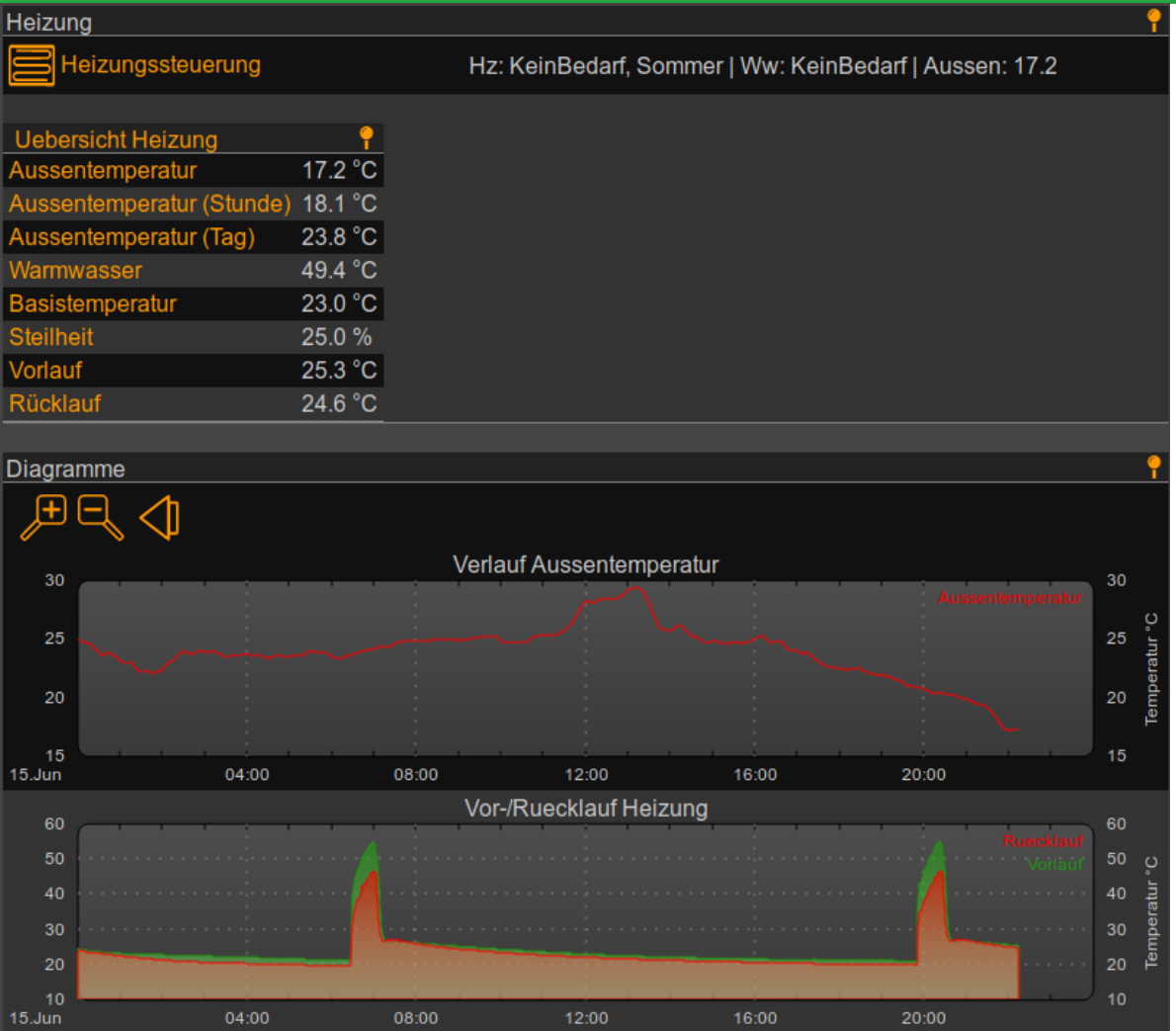
```
my %frameReadings = (
 'Temp-Aussen'           => { addr => 0x000, bytes => 0x004,
                      menu => '0.00', fmat => '%0.1f', unp => 'f<' },

 'Temp-Ruecklauf-Soll‘   => { addr => 0x00C, bytes => 0x004,
                      menu => '0.03', fmat => '%0.1f', unp => 'f<' },

 'Temp-Ruecklauf‘        => { addr => 0x010, bytes => 0x004,
                      menu => '0.04', fmat => '%0.1f', unp => 'f<' },

 'Temp-Vorlauf'          => { addr => 0x014, bytes => 0x004,
                      menu => '0.05', fmat => '%0.1f', unp => 'f<' }
);
```

- FHEM plugin requests and processes heating data every minute




# Thanks for your attention!

**Further questions?**