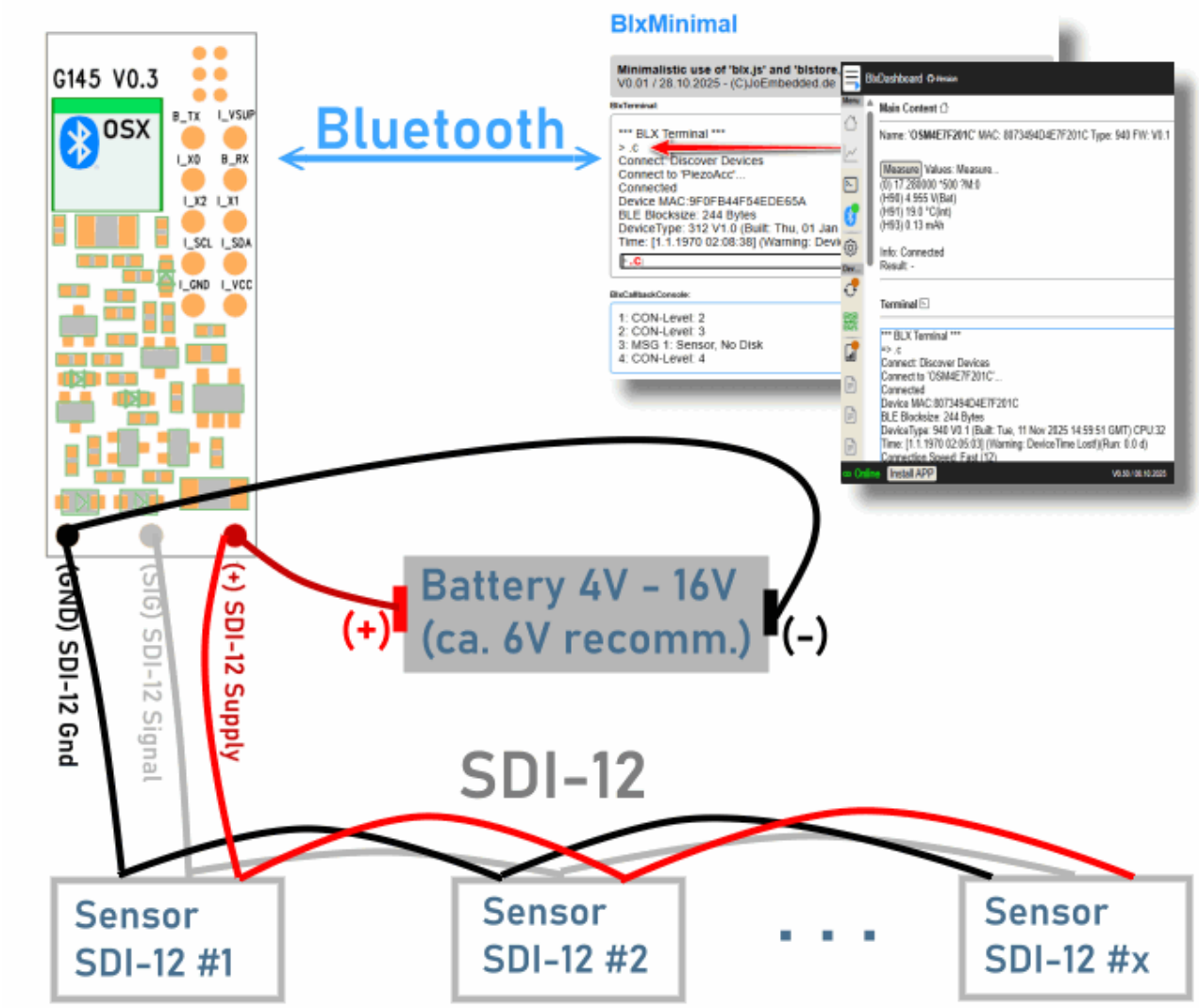
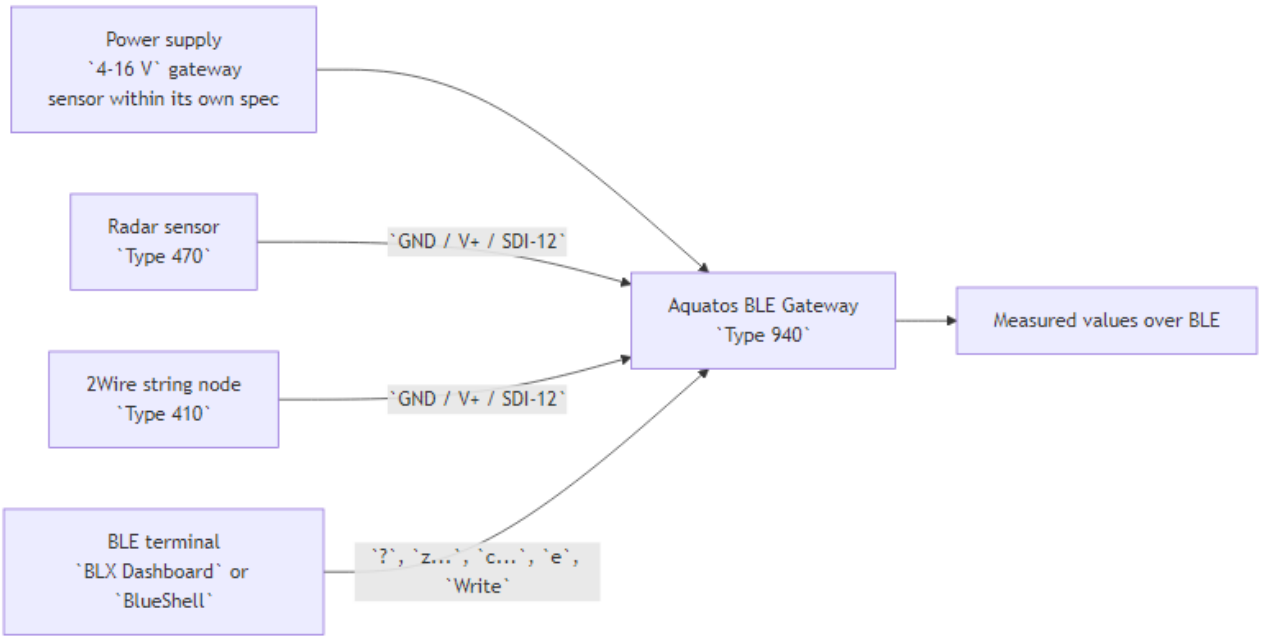
Aquatos BLE Gateway Quick Handbook

Connect SDI-12 sensors fast, read values over BLE, and reuse the same workflow for additional sensors.



Overview diagram:



What this guide covers

This handbook shows how to connect:

- `Aquatos BLE Gateway`, `Type 940`
- `OSX Radar Distance 60 GHz`, `Type 470`
- `OSX 2Wire String Node`, `Type 410`

It also gives a reusable setup pattern for `other SDI-12 sensors`.

> ! **- Important**
>
> `Aquatos BLE` is the `SDI-12 master`. You connect the sensor to the gateway, then operate the whole setup over `BLE` with `BLX Dashboard` (preferred) (or `BlueShell`).

> ! **- Important**
>
> The gateway itself has `no SDI-12 address`. It addresses the connected `sensors` by their own SDI-12 addresses such as `0`, `1`, `2`, ... or by broadcast `?`.

Addressing multiple sensors

> ! **- Important**
>
> Broadcast `?` is safe only if there is `exactly one sensor` on the SDI-12 bus. With multiple sensors, it can cause `collisions`, `garbled replies`, or `bad CRC`.

Simple setup procedure:

1. Connect each new sensor `one by one`
2. Assume a newly connected sensor is usually at address `0`
3. If only this one sensor is on the bus, you may use `z?!` to discover its current address quickly
4. Verify or recheck it with `z0I!` if you expect the default address `0`
5. Change it immediately to its own address with `z0?X!`, where `X` is the new address > `0`
6. In this handbook, use address `1` for the radar sensor and address `2` for the 2Wire node

7. Test the appropriate `M` commands
8. Reconnect the next sensor and repeat
9. Finally edit the `c...` command on the gateway to poll all sensors with their real addresses, for example `c1MC:0-1 2MC` for a radar at address `1` and a 2Wire node at address `2`.

> ℹ️ **- Info**
>
> `?` is useful if the sensor address is unknown, but only when `exactly one sensor` is connected to the bus. If you are unsure about SDI-12 addressing, address changes, or broadcast behavior, check `https://SDI-12.org`.

1. Wiring and power

Shared SDI-12 wiring

For the gateway and both OSX sensors, the SDI-12 cable mapping is effectively:

Function	Aquatos BLE	Sensor side
GND	black	black
V+	red/brown	brown
SDI-12 data	white	white or blue

Power limits

- Gateway and sensor supply: `4-16 V`, recommended `6 V` (e.g. 4 * 1.5V AA batteries)

> ✋ **- Caution**
>
> Check polarity before power-up. The documentation explicitly warns that most sensors are `not reverse-polarity protected`.

> 💡 **- Tip**
>
> Start with a single shared supply around `6 V`. That fits the gateway and both sensor types and keeps field setup simple.

2. BLE quick start

Connect to the gateway with `BLX Dashboard` or `BlueShell`, then use this baseline sequence (examples):

```
?
z0I!
z0?1!
z2I!
c1MC:0-1 2MC
e
Write
```

What each command does (commands on the **gateway**):

- `?` shows the current gateway status and stored `CMD`
- `z0I!` reads the ID string of sensor address `0`
- `z1I!` reads the ID string of sensor address `1`

- `z?!` sends the SDI-12 broadcast address query and is useful if the address is unknown, but only works safely if **exactly one** sensor is on the bus
- `z0?1!` changes a newly connected sensor from address `0` to address `1`
- ... and so on for other addresses
- `c...` sets the gateway measurement command line, but does not store it permanently. Test first, then save it with `Write`. `*1000` would set a timeout of `1000 ms`; the default is already `500 ms`, so use a longer timeout only if a sensor needs more time to wake up.
- `e` runs a measurement and prints values over BLE
- `Write` saves the configuration permanently (on the gateway's flash memory)

✋ - Caution

Do **not** use broadcast `?` on a multi-sensor bus. With more than one sensor, broadcast can cause `collisions`, `garbled data`, or `bad CRC` because multiple sensors may answer at the same time.

💡 - Tip

Top Tip for Debugging the `c` command on the gateway Enable raw SDI-12 logging in the gateway terminal before testing `e` so you can see exactly which SDI-12 commands the stored `c...` sequence triggers.

```
z dbg 1
e
z dbg 0
```

3. Recommended setup workflow

1. Wire `GND`, `V+`, and `SDI-12 data`
2. Power the gateway and sensor
3. Open a BLE terminal and send `?`
4. If only one sensor is connected and its address is unknown, detect it with `z?!`. If multiple sensors are on the bus, use only known addresses such as `z0I!`, `z1I!`, and so on.
5. Store the correct gateway command with `c...`
6. Test with `e`
7. Save with `Write`

ℹ️ - Info

The gateway command stored with `c...` must be entered `without` the final SDI-12 `!`.

💡 - Tip

Simple commissioning workflow for multiple sensors: newly connected sensors are usually at address `0`, so connect them `one by one`, verify them with `z0I!` or, if the address is unknown, with `z?!` while only one sensor is on the bus, then change them immediately to their own address with `z0?X!`. In this guide, the radar uses address `1` and the 2Wire node uses address `2`.

❗ - Important

You can communicate either with the gateway or also with the SDI-12 nodes directly via BLE. Here **only** communication via Gateway is covered. For direct communication with the sensors see their appropriate documentation.

4. Sensor profile: Radar sensor `Type 470`

Use this profile if you want `distance` and `signal strength` from the radar node.

Identification

Typical direct check:

```
z0I!
```

Or if there is only `one` sensor connected to the bus and its address is unknown, you can use `?` as broadcast address:

```
z?!
```

You should receive an ID string containing `Radar` and `0470`. In any case, the sensor will reply with its real address.

Recommended gateway command

It depends how many data to read from the sensor. Here 2 values are read: (main) distance and signal strength. The command is:

Without CRC:

```
c1M:0-1
```

With CRC:

```
c1MC:0-1
```

These commands give exactly `2` values. To read all values from the radar at address `1`, omit the `:` block in the `c` command. For the radar, that gives `6` values: `3` distances and `3` signal-strength values.

```
c1M
```

Newly connected sensors are usually at address `0`. Change the radar to address `1` immediately after identification with the `Address Change` command:

```
z0A1!
```

Why this works:

- `1M` or `1MC` starts the radar measurement on address `1`
- `:0-1` keeps only the first two returned values

> ❗ **- Important**
>
> This example assumes the radar sensor is at address `1`. On a bus with multiple sensors, use the real sensor address, for example `1M:0-1` for address `1`. Do not rely on broadcast once more than one sensor is connected.

Test

`e` runs the measurement and prints values over BLE. If the output looks correct, note it:

```
e
```

> **- Info**
>
> The setup command `c...` is not stored permanently until you run `Write`. This allows you to test different commands first and only save the one that works best for your setup.

> **- Tip**
>
> For first setup, start with `c1M` or `c1M:0-1`. Add CRC later for stricter bus validation (not necessary for quick tests).

5. Sensor profile: 2Wire string node `Type 410`

Next a 2Wire node is added (physically connected) to the same bus (e.g. a thermistor string).

The 2Wire node can return up to 8 values for `M`.

Identification

> **- Info**
>
> A newly connected node will **often** (if not already changed) be at address `0`. If you plan to use multiple sensors on one bus, give each sensor its own address before combining them on the same cable. In this guide, the radar sensor's address was moved to address `1`, so the new 2Wire node can still be found at address `0` and then changed to address `2`.

Test:

```
z0I!
```

You should see an ID string containing `TN_2W_0410` or `Type 410`.

Change its address if needed, for example to `2`:

```
z0?2!
```

What the node returns

- `M` or `MC` returns the first measurement block
- (`M1`, `M2`, ... return additional blocks **if more than `9` values exist**)
- `M9` can return the node supply voltage

Recommended gateway command

For 1-8 temperature nodes (short temperature list), start with e.g. for SDI-12 address `2`:

```
c2MC
```

```
Additional info: If the chain is longer than one output block, extend it explicitly,
    for example:

```
c2MC 2MC1 2MC2
```
This lets the gateway poll when the sensor address is `2`:

- first block with `2MC`
- second block with `2MC1`
- third block with `2MC2`
```

Test

```
e
```

> **! - Important**
>
> A `Type 410` installation may contain many sensors. If you expect more than `9` returned values, add further blocks such as `2MC1`, `2MC2`, and so on.

6. Final combined `c` command

Assemble the final `c...` command for the gateway to poll both the radar and the 2Wire node, for this example:

```
c1MC:0-1 2MC
```

Run and save

```
e
Write
```

> **! - Important**
>
> Only after running `Write` is the current `c...` command stored permanently on the gateway. You can change it later if needed, but make sure to test new commands first before saving them.

7. Troubleshooting

Quick checks:

- If `z?!` returns nothing, verify `GND`, `V+`, and `data`, or remember that broadcast only works safely with a single sensor on the bus
- If `z0I!` fails, the sensor address is probably not `0`
- If you have multiple sensors and do not know their addresses, disconnect them and reconnect them `one by one` to assign unique addresses first

- If sensors power up slowly, increase the delay to e.g. `c*1500 ...`
- If you need line-level diagnostics, use `z dbg 1`

> **i - Info**
>
> If you are unsure about SDI-12 addressing rules, address changes, or broadcast behavior, remember that `?` is only for a single-sensor bus and check `https://SDI-12.org`.

8. Minimal field checklist

- Supply connected and polarity checked
- `black`, `brown`, `white/blue` wired correctly
- BLE connected
- Each sensor has a unique address; newly connected sensors usually start at `0` and should be moved quickly to addresses such as `1`, `2`, ...
- Broadcast `z?!` used only on a single-sensor bus
- Address verified with `z0I!`, `z1I!`, or similar
- Correct `c...` command stored
- Measurement checked with `e`
- Configuration saved with `Write`

9. Command cheat sheet (for the gateway)

```
?               -> show gateway status
z?!             -> broadcast address query if the address is unknown,
                   only for a single-sensor bus
z0I!            -> read sensor ID at address 0
z1I!            -> read sensor ID at address 1
z0?1!           -> move a newly connected radar sensor from address 0 to address 1
z0?2!           -> move a newly connected 2Wire node from address 0 to address 2
z0?X!           -> change sensor from address 0 to a ddress X > 0
c1MC:0-1        -> radar quick setup if the sensor is at address 1
c2MC            -> 2Wire first block with CRC, address 2
c2MC 2MC1 2MC2 -> 2Wire multi-block example if the sensor is at address 2
e               -> run measurement and print values
Write           -> save permanently
z dbg 1         -> enable SDI-12 debug output
z dbg 0         -> disable SDI-12 debug output
```