**MODEL WIND TURBINE MOTOR SPEED CONTROLLER SUMMARY SHEET:**

Drive capability: 6 V brushed DC motor, 1.2 A max. continuous current. 10180 max. rotor RPM. Bi-directional.

Drive type: Up to 16-bit PWM drive.

Control type: Velocity-PID on shaft RPM setpoint. Soft-start and stop. Active braking or coast mode.

Interfaces: USB, RS-485 (non-isolated, 3.3 V). LabVIEW 2020 (64-bit) software.

Outputs: 0 … 5 V, 16-bit single-ended analog voltages representing filtered real-time shaft RPM, photo-reflector signal, and motor current. Filter is active 4th order Butterworth low-pass.

Unit dimensions: 52 x 35.5 x 8.5 mm.

Unit mass: 16 g (controller only, excluding connectors and cables).

Supply voltage: 6.0 V nominal. 5.5 V minimum, 7.0 V maximum. Not reverse polarity protected.

Idle power draw: 0.768 W (0.128 A at 6 V supply).

Operating temp.:   -40 … +85 °C (ambient).

SYSTEM CONNECTION ILLUSTRATION:

The following illustration shows the minimum required connections for operation. Analog voltage outputs and RS-485 wires are not shown.
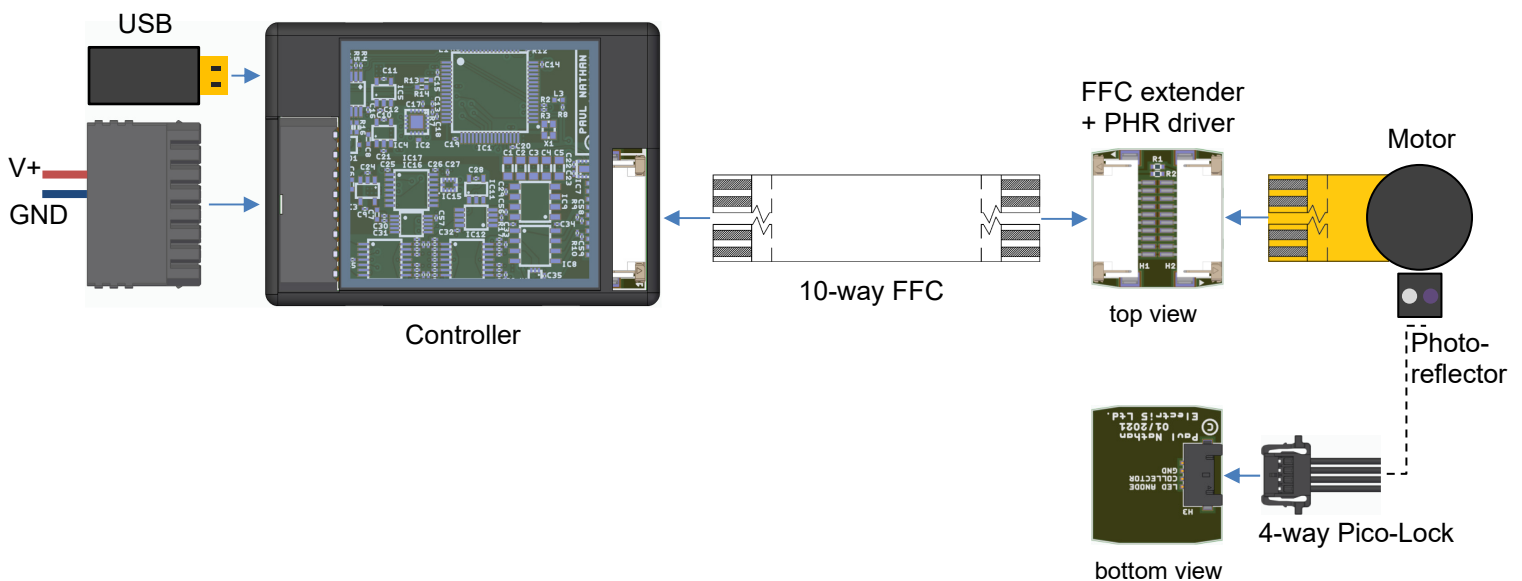
Note that the FFC extender + PHR driver board is _not_ symmetric. Care must be taken to connect the controller and motor to the correct sides. The motor-side FFC connector is the one that has the 4-way Pico-Lock connector beneath it. It is also labelled H2 on the board.

USB interface:

The USB connection does not supply any power and is only used for system configuration and control as well as data monitoring and acquisition. The V+ and GND power terminals must be live for system operation of any kind. The USB interface is not required for operation if the RS-485 interface is used.

RS-485 interface:

The RS-485 interface can be used when multiple units are being employed by sequentially daisy-chaining the D+ and D- connections across all units, ensuring the last unit in the chain has a 120 Ω termination resistor across its D+ and D-terminals. The RS-485 master node must also have a 120 Ω termination resistor. Twisted pair cable with 120 Ω (± 20 %) characteristic impedance should be used. The USB and RS-485 interfaces share the same command packet structure and so the same software can be used for either interface. The RS-485 interface is however not capable of data streaming. Only one-shot data requests are possible, though this can be done rapidly if desired.

FFC and Pico-Lock connector handling:

To insert the FFC cable into the connector, use plastic tweezers to pull out the locking actuator tab at both ends together. Push in the FFC cable with exposed contacts facing upwards. Do <u>not</u> use force when inserting the FFC head into the connector. If it does not go in easily, angle up the tail end to help it slip under the contacts in the connector while pushing gently. Ensure the FFC cable is fully inserted and square, push in the locking actuator tab on both sides together using plastic tweezers. Do not allow any in-line or side force to be exerted on the FFC connector via the FFC cable. Always use appropriate strain relief on all cables. The Pico-Lock connector will only go in one way, do not force.

Important:
The FFC connector is rated to just 30 insertion and removal cycles. It is therefore recommended to not remove the FFC cable after insertion unless absolutely necessary.

General handling and ESD precautions:

The end-user is responsible for ensuring basic ESD precautions such as the use of an anti-static wrist strap or heel strap when handling the device and making wiring connections. Only dry clean the outer surfaces or use anti-static foam cleaner if absolutely necessary. Never allow the device to get wet. The circuit board is conformally coated with a silicone-based coating and is therefore moisture and dust resistant but not waterproof.

The end-user is responsible for ensuring correct power supply voltage, regulation and polarity, and for all external wiring. If a bench power supply is used, a sensible current limit of 2 A per unit should be set. A fast-blow 2 A in-line fuse is recommended per unit.

Do not hot-plug the 8-way connector or any FFC connector or the 4-way Pico-Lock connector. It is okay to hot-plug only the USB connector.

When connecting or disconnecting the 8-way pluggable terminal, hold the unit by the mating connector on the circuit board rather than anywhere on the case so as not to transmit excessive force through the minimal casing structure. It can help to apply a gentle lateral wiggling action to the connector to ease it in or out.

Storage:

When not in use, it is recommended to store the device in a clean, dry and dust-free environment. The use of anti-static bags or foam is also recommended.

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