OVERVIEW

The CWI Performance Fan Controller is a programmable PWM motor controller designed for automotive cooling fans, auxiliary blowers, fuel pumps and other 12V/24V motor applications. It supports both 12V and 24V electrical systems. It reads a temperature sensor (or other input signal) and automatically adjusts fan speed to maintain optimal operating temperature.

Key Features

- Compatible with brushed and brushless fans (with integrated FOC controller)
- Built-in programmable smart fuse
- Operates in standalone mode or via ECU control
- Supports 12V, 16V, and 24V electrical systems
- Two brushless PWM outputs
- CAN communication capability
- Configurable via Windows-based software

Kit Contents

Each kit includes the core components required for a custom installation:
G2 Fan Controller – Part #60011063
12-Pin Deutsch DT/AT + Hardware Connector Kit – Part #60051005

Supporting Products

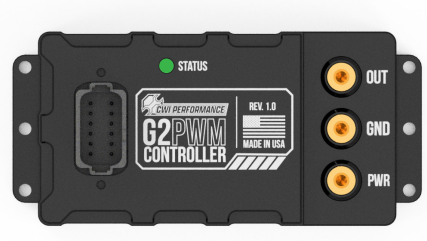
USB to CAN – Part #60051008
G2 PWM Flying Lead Harness – Part #60051007
Find Temp sensors & Radlock connectors on our website at www.creativewerksinc.com

QUICK START

1. **Mount** the controller to a secure location
2. **Connect power and ground** to the screw terminals
3. **Wire motor** (brushed or brushless) according to your setup
4. **Connect ignition enable** (required for operation)
5. Optionally connect sensors or ECU PWM input
6. **Download configuration app** from Creative Werks Inc.
7. **Connect to computer** (via CANable v2.0 Pro)
8. **Power on** and verify LED status
9. Ensure connection is made via com, and **click start**
10. Select motor type and set parameters
11. **Apply setup** to controller via “Write“ button
12. Finalize install by **validating setup** using testing screen

WIRING TABLE

PIN	FUNCTION
1	Ignition Enable(Positive Input)- Must be used
2	Manual Override Switch- Positive input
3	Resistive Temp Sensor input GM style (Optional)
4	Relay control output for secondary fans (Optional) positive or negative selectable output
5	20-150Hz PWM input from ECU (Optional)
6	0-5 Volt VDC sensor input (Optional)
7	5 Volt sensor source / supply
8	100 Hz PWM output for Brushless (Fan 1) Selectable in GUI to invert
9	100 Hz PWM output for Brushless (Fan 2) Selectable in GUI to invert
10	Ground, can be used for sensor ground
11	CAN H
12	CAN L



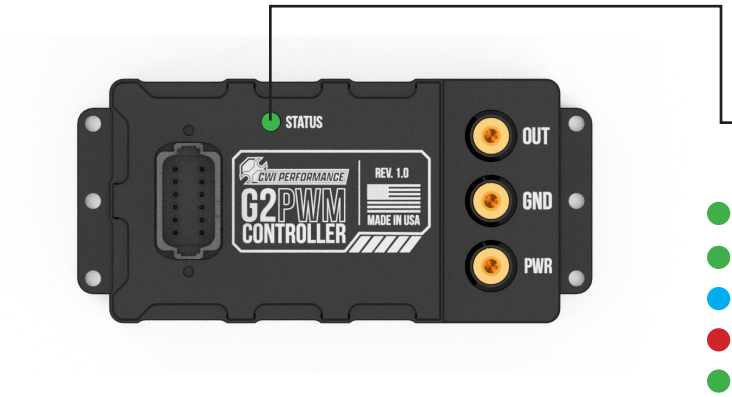
Power & Fan Connections (Screw Terminals)

1. **Fan Output (Brushed)-** Connect to positive terminal of brushed fan
2. **Ground-** Connect to battery negative or ground bus
3. **+12–24V Power Input-**Connect directly to battery or power distribution bus

Important:

- Power must be fused appropriately for your system load
- Install fuse as close to the battery or power source as possible
- Follow proper automotive wiring standards
- Avoid low-quality or unverified circuit breakers/fuses (Amazon no name brands)

STATUS LIGHT



STATUS LED REFERENCE

The controller has one RGB status LED visible on the enclosure. LED status is not available unless ignition input is enabled. This LED tells you the current operating state at a glance.

LED Behavior	Meaning
Solid Green	Standby (waiting for input)
Flashing Green	Motor running under 100%
Alternating Green/Blue	Motor running at 100%
Flashing Blue	Manual override active
Flashing Red	Fault condition
Flashing Green/Red	Updating Firmware

POWER UP SEQUENCE

When the controller receives power, it goes through the following startup sequence

- **Initialization (instant)** – Internal hardware checks, loads saved settings from memory.
- **Normal operation** – The controller enters automatic control mode. The status LED shows the current operating state.

APPLICATION SETUP & USAGE

REQUIREMENTS

- Windows 10/11
- USB port for the CAN adapter

INSTALLATION

The app is provided as a windows based standalone executable (CWI_Fan_Configurator.exe). Download latest version from CWI and run the file.

FIRMWARE UPDATES

The controller supports firmware updates over the CANbus connection.

- **CONNECT** to the controller via the configuration app.
- Switch to the Firmware Update tab.
- Click **GET VERSION** to check the firmware version currently running on the controller.
- Compare the displayed version with the version in the firmware binary filename you intend to upload. Only proceed if you want to update to a different version.
- Click **SELECT FILE** and choose the firmware binary file.
- Click **UPDATE FIRMWARE** to begin the update.
- The controller will restart automatically after a successful update.

NOTE FOR INSTALLER

Due to the wide range of vehicle applications, this product is designed for custom installation environments. Installer knowledge of automotive electrical systems is strongly recommended.

NOTE FOR INSTALLER

Do not disconnect power or the CAN adapter during a firmware update. A failed update may require recovery through the manufacturer.

QUESTIONS?
PLEASE CONTACT US AT: WWW.CREATIVEWERKSINC.COM

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APPLICATION SETUP & USAGE

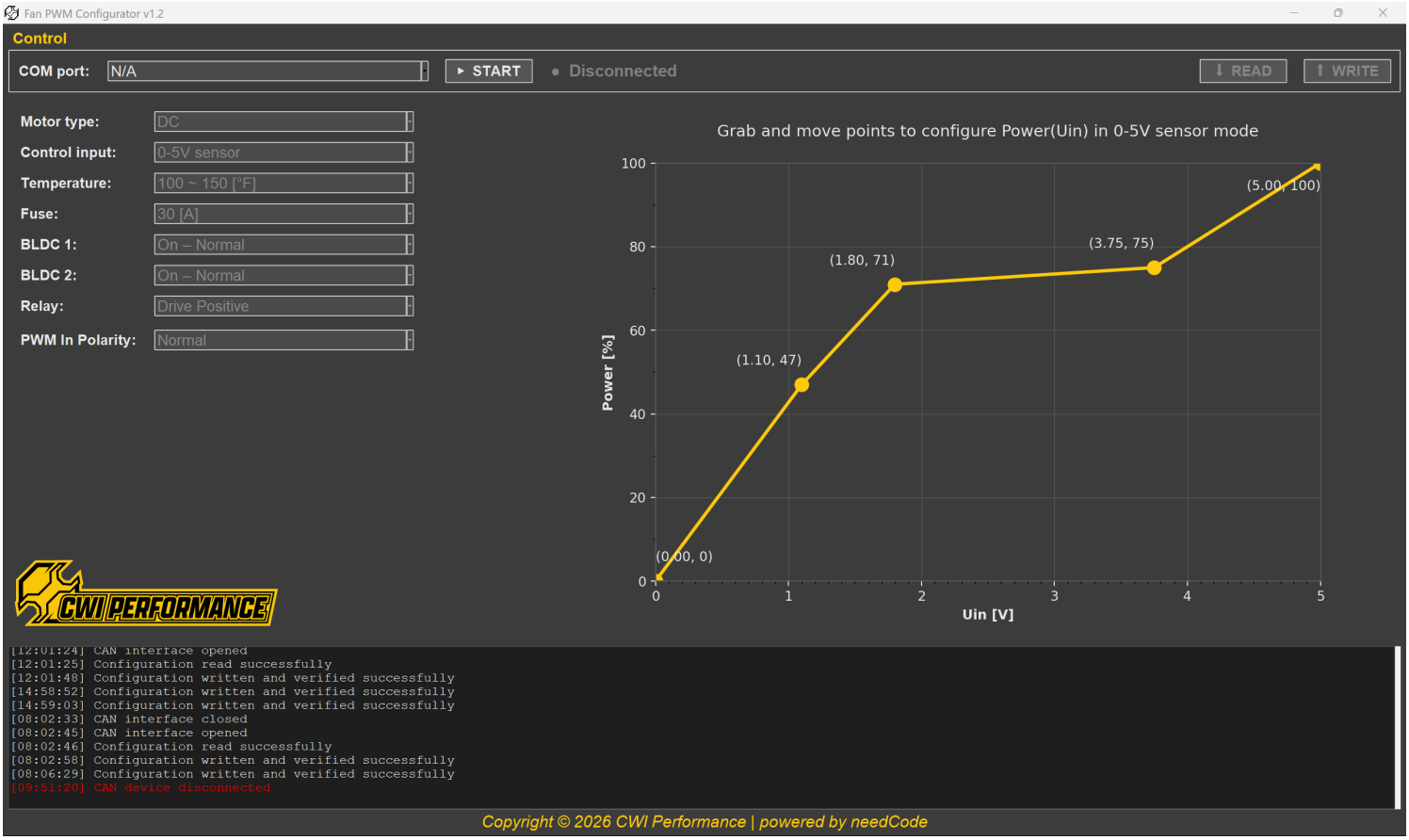
CONNECTION STARTUP

1. **Wire the CANbus** between your USB-to-CAN adapter and the controller's 12-pin connector: adapter **CAN High to pin 11, adapter CAN Low to pin 12**. The 120-ohm termination is built into the controller. If your adapter also has built-in termination, the bus is ready.
2. **Power on** the controller (ignition on).
3. **Plug in** the USB-to-CAN adapter to your PC.
4. **Open** the CWI Fan PWM Configurator app.
5. **Select your COM port** from the dropdown at the top. The app auto-detects available ports. If your adapter has "CAN" in its description, it will be pre-selected.
6. Click **START**. The app will attempt to connect and read the current configuration.
7. If successful, the status indicator changes to **Connected** (yellow dot) and all configuration fields are populated with the current device settings.

CONNECTION TROUBLESHOOTING

No Com Ports Listed	Check that the USB-to-CAN adapter is plugged in and drivers are installed.
"Cannot Open CAN Interface" Error	The COM port may be in use by another application. Close any other CAN tools and try again.
"No Response" from CAN Target	Check CAN wiring: adapter CAN High to Connector pin 11, adapter CAN Low to Connector pin 12. Verify the controller is powered on (green LED). If your adapter does NOT have built-in termination, add a 120-ohm resistor on the adapter side (the controller side is already terminated)
Disconnects Randomly	Check for loose CAN wiring or intermittent USB connections. If it continues, check your computer USB connection.

SETUP & CONTROL OVERVIEW



CONTROL OVERVIEW

Once connected, the configuration tab shows all device settings. Change any values using the dropdown menus. The controller **MUST BE out of test mode to push new configuration**, once in control mode click WRITE to send the new configuration to the controller.

-**Com Port:** Select connection to PWM Controller
-Start: Start connection to PWM Controller

-Read: Click READ at any time to fetch the current configuration from the controller. This is useful to verify settings or to check the configuration of a controller that was previously set up.

-Write: Make your changes using the dropdown menus (and curve editor if applicable). Changed settings are highlighted – the **WRITE** button text turns yellow to indicate unsaved changes. Click **WRITE** to send the configuration to the controller. The app automatically verifies the write by reading back the configuration. The log window at the bottom shows “Configuration written and verified successfully” on success. After a successful write, the controller enters a 10-second startup delay (LED stays green solid), then resumes operation with the new settings.

-Motor Type (DC, BLDC):

(DC): Standard Brushed Motor. The controller varies the motor speed using PWM on the main Motor Output.
(BLDC): Brushless DC fan motor. The main Motor Output provides enable/power. BLDC Output 1 and 2 provide variable-speed PWM signals.

CONTROL OVERVIEW

-Control Input (GM Temp Sensor, 0-5V Sensor, PWM Input):

GM Temp Sensor: GM temperature sensor (default). Fan speed is determined by the selected Temperature preset. Best for direct temperature measurement.

0-5V Sensor: External analog voltage signal (0–5V). Fan speed follows the custom Sensor Curve (see below). Best for ECU-driven control or non-standard sensors.

PWM Input (20-150Hz): External PWM duty-cycle signal. 0% = off, 99% = full speed. Best when another controller is pro viding a PWM fan command.

-Temperature (Range from 100-150F to 160-210F selections): Selects the temperature range for automatic fan control. The fan turns on at the low temperature and reaches full speed at the high temperature. Below the low temperature, the fan is completely off. Above the high temperature, the fan runs at 100% and the relay activates. Between the two values, the fan speed increases linearly from minimum speed (50% PWM) to full speed (100% PWM).

-Fuse (5-80 amps): Sets the electronic fuse threshold. If the motor draws more current than this setting, the controller shuts off the output and enters the Fault state (red blinking LED). Set this to approximately 120–150% of your motor's maximum running current. Setting it too low will cause nuisance trips; setting it too high reduces protection.

-BLDC 1 & 2 (Off, On-Normal, On-Inverted): * Only applies when Motor Type is set to "BLDC"* Configures the two BLDC auxiliary outputs independently.

Off: Output is disabled (always 0V).

On-Normal: Output follows fan speed with normal polarity.

On-Inverted: Output follows fan speed with inverted polarity. Some BLDC motors require inverted PWM.

-Relay (Disabled, Drive Positive, Drive Negative): Configures the relay output behavior. The relay activates automatically when the fan reaches 100% speed and deactivates when the fan drops below 100%.

Disabled: Relay output is not used.

Drive Positive: Output goes HIGH when active (default). Use for relays that activate on a positive signal.

Drive Negative: Output goes LOW when active. Use for relays that activate on a ground signal.

-PWM in Polarity (Normal, Inverted):

Normal: Higher duty cycle = higher fan speed.

Inverted: Lower duty cycle = higher fan speed.

-Power % vs. Uin[V] Table: Only applies when Control Input is set to "0–5V sensor." When you select "0–5V sensor" as the Control Input, the Sensor Curve editor activates on the right side of the Configuration tab. This lets you define a custom 5-point curve that maps input voltage to fan power.

The X axis is input voltage (0V to 5V)
The Y axis is fan power (0% to 100%)
Drag the 5 points to shape the curve
The fan speed is interpolated linearly between points
Default curve: Linear – 0V = 0%, 1.25V = 25%, 2.5V = 50%, 3.75V = 75%, 5V = 100%.

TIP

If your ECU outputs 0V when cold and 5V when hot, the default linear curve works well. If your sensor has a non-linear output, adjust the curve points to match.

CONTROL OVERVIEW

HOW THE CONTROLLER OPERATES- NORMAL AUTOMATIC OPERATION

- Controller powers on and begins reading the configured input.
- **If the input is below the low threshold:** fan stays OFF, LED is green solid.
- **If the input rises above the low threshold:** fan starts at 50% speed and increases proportionally. LED blinks green slowly.
- **If the input rises above the high threshold:** fan runs at 100%, relay activates and turns on. LED alternates green/blue.
- **If the input drops back below the low threshold:** fan turns off, relay deactivates. LED returns to green solid.
- Fan speed changes are gradual (smooth ramp) to reduce mechanical stress and electrical spikes.

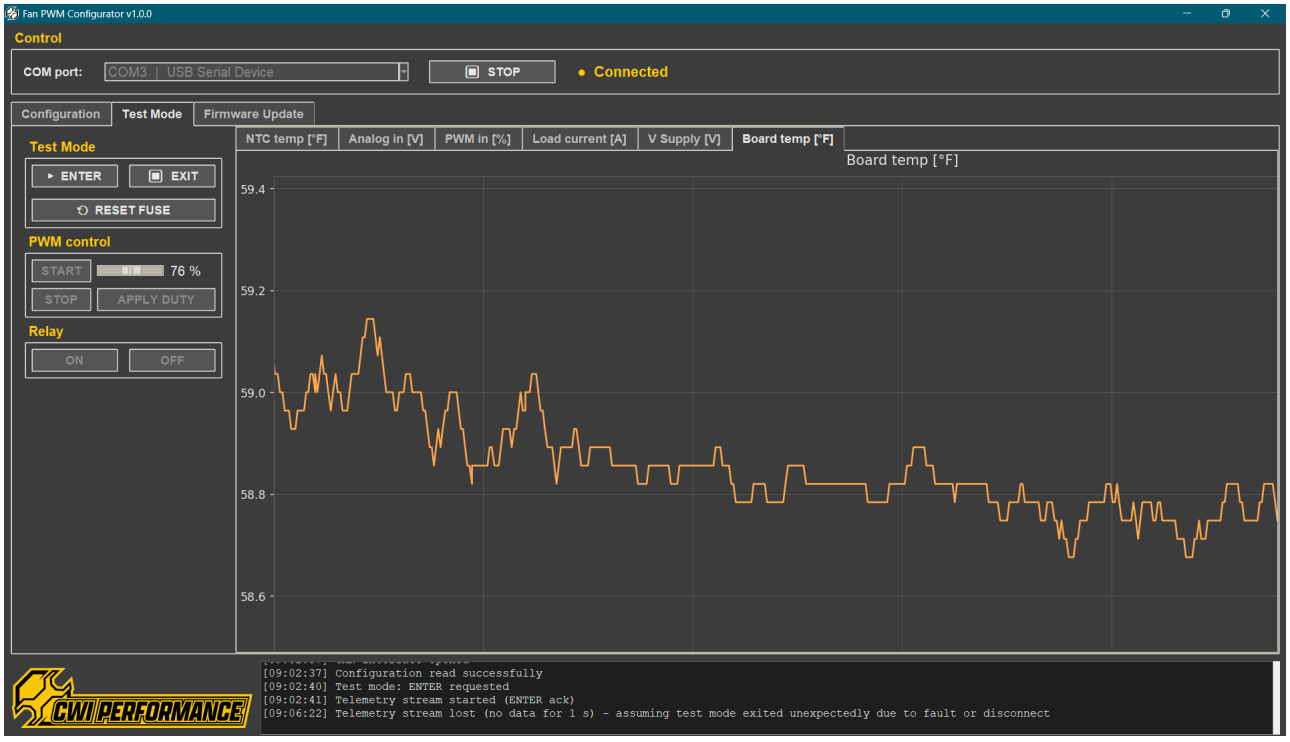
The behavior above applies to all three input sources. What changes is how the input maps to fan speed:

GM temp sensor – fan speed is determined by the selected temperature preset (low/high thresholds in degrees F).
0–5V sensor – fan speed follows the custom sensor curve you define in the app (voltage mapped to fan power percentage).
PWM input – fan speed follows the incoming PWM duty cycle directly (0% = off, 100% = full speed).

Manual Override
When the manual override switch (if wired) is turned ON: - Fan immediately ramps to 100% speed - LED changes to slow blinking blue - Automatic control is suspended - Relay remains linked to its automatic behavior.
When the switch is turned OFF, the controller returns to automatic mode.

Fault Condition
If the motor draws more current than the fuse setting: - Motor output is immediately disabled - LED changes to slow blinking red - The controller remains in fault state until: - Power is cycled (turn ignition off and on), or - The fault is cleared via the configuration app (Test Mode > RESET FUSE)

TEST MODE



TEST MODE

Test Mode lets you manually control the motor output and relay from the configuration app. This is useful for bench testing, verifying wiring, and measuring motor current before finalizing your installation.

IMPORTANT: While in Test Mode, automatic fan control is disabled. The controller ignores all sensor inputs – the fan only runs when you command it from the app. Do not leave the controller in Test Mode during normal vehicle operation.

ENTERING TEST MODE:

- **Connect to the controller** via the configuration app (see Section 7).
- Switch to the **Test Mode tab**.
- The device **must be in standby state (green solid LED, fan OFF)** to enter Test Mode. If the fan is running due to temperature, cool down the sensor first or disconnect it.
- Click **ENTER.** The controller's LED changes to fast-blinking yellow.

-PWM Duty Cycle Control

The PWM control panel lets you drive the motor output directly:

- **START** – Starts the motor at 50% duty cycle.
- **Duty slider (50%–100%)** – Adjusts the target motor speed. Drag to the desired percentage.
- **APPLY DUTY** – Sends the current slider value to the controller. The motor speed changes to match.
- **STOP** – Stops the motor (sets output to 0%).

Use this to verify that the motor runs correctly at different speeds and to observe actual current draw at each speed level.

-Relay Control

The relay panel provides direct ON/OFF control of the relay output:

- **ON –** Activates the relay output immediately.
- **OFF –** Deactivates the relay output.

In Test Mode, the relay does not follow the automatic 100%-speed activation rule. You control it independently, which is useful for verifying that the relay and any connected secondary equipment (pump, louver, auxiliary fan) are wired correctly.

-Fuse Reset

RESET FUSE – Clears a fault condition (red blinking LED) so you can retry. This is available at any time while connected, even outside Test Mode. If the electronic fuse has tripped due to overcurrent, click this instead of power-cycling the controller.

-Live Telemetry

While in Test Mode, the scope display on the right side of the app shows real-time data on six channels, each in its own tab:

- **NTC Temp [F]:** Temperature reading from the GM sensor (Connector pin 3)
- **Analog in [V]:** Voltage on the analog input (Connector pin 6)
- **PWM in [%]:** Duty cycle on the PWM input (Connector pin 5)
- **Load Current [A]:** Current being drawn by the motor through ST3
- **V Supply [V]:** Supply voltage at ST1
- **Board Temp [F]:** Internal board temperature of the controller

Each channel is displayed as a scrolling time-series chart. You can scroll to zoom in/out on the time axis, drag to pan, and double-click to reset the view. The Load current channel is particularly useful for determining the correct fuse setting – run the motor at 100% and read the peak current draw, then set the fuse threshold to 120–150% of that value.

-Exiting Test Mode

Click EXIT to leave Test Mode. All outputs are set to zero and the controller returns to standby (green solid LED). Closing the app or clicking STOP in the connection panel also exits Test Mode automatically.

TECHNICAL SPECS

PARAMETER	VALUE
Input Voltage	12V – 24V DC
Reverse Polarity Protection	Yes, built-in
Motor Output (ST3)	PWM, 10 kHz switching frequency
Motor Output Protection	Yes, built-in
BLDC Outputs (Connector pin 8, 9)	PWM, 100 Hz switching frequency
Maximum Current	Up to 80A continuous, 90A in-rush (configurable smart fuse)
Short Circuit Protection	Yes, built-in
Sensor Input – GM sensor (Connector pin 3)	GM temperature sensor, -40 F to +300 F
Sensor Input – Analog (Connector pin 6)	0–5V, 5-point programmable curve
Sensor Power Output (Connector pin 7)	5V regulated output for external sensors
Sensor Input – PWM (Connector pin 5)	20–150 Hz, duty cycle proportional, electrically isolated
Manual Override (Connector pin 2)	Active HIGH or LOW (connect to +- 12V/24V to activate)
Relay Output (Connector pin 4)	Positive or negative drive selectable
CANbus (Connector pin 11, 12)	250 kbps, 120-ohm termination built in
Signal Connector	Amphenol AT series, 12-pin
Configuration Interface	CANbus via USB-to-CAN adapter (CANable 2.0 Pro)
Settings Storage	Non-volatile (retained through power cycles)
Fan Speed Range	0% (off) or 50%–100% (running)
Temperature Presets	7 ranges from 100–150 F to 160–210 F
Fuse Settings	5 - 80A incremental settings
Firmware	Field-updatable over CANbus

FACTORY DEFAULT SETTINGS

SETTING	DEFAULT VALUE
Motor Type	DC
Control Input	GM temp sensor
Temperature Preset	100 ~ 150 [F]
Fuse	60 [A]
Startup Test Fuse	70 [A]
BLDC 1	OFF
BLDC 2	OFF
Relay	Drive Positive
PWM In Polarity	Normal
Sensor Curve	Linear (0V=0%, 1.25V=25%, 2.5V=50%, 3.75V=75%, 5V=100%)

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TROUBLESHOOTING

TROUBLE SHOOTING

LED is red (blinking) – Fault

Cause: The electronic fuse tripped due to overcurrent or short circuit.

Steps: 1. Turn off the ignition (remove power). 2. Check motor wiring for short circuits, damaged insulation, or pinched wires. 3. Check that the motor spins freely (no mechanical binding). 4. Verify the fuse setting is appropriate for your motor. 5. Turn the ignition back on. The controller will restart normally. 6. If the fault occurs repeatedly, the motor may be drawing too much current. Use Test Mode to measure actual current and adjust the fuse setting accordingly.

LED is off – No Power

Steps: 1. Check the inline fuse on the power supply wire to ST1. 2. Verify +12V/24V is present at ST1 and Connector pin 1 (Ignition/Enable). 3. Verify ground connection at ST2 (GND) and Connector pin 10 (GND). 4. Confirm the ignition is on (if wired to switched power).

Fan does not turn on

Steps: 1. Verify the LED is green solid (controller is powered and in standby). 2. Check that the sensor or signal source is properly connected to the correct Connector pin and that the input is above the low threshold. 4. Connect the configuration app and verify the Control Input setting matches your wiring (GM temp sensor on pin 3, 0–5V on pin 6, or PWM on pin 5). 5. Use Test Mode to verify the motor output on ST3 works independently of the sensor. 6. If using GM temp sensor, try heating the sensor (e.g., with a heat gun or hot water) to confirm it triggers the fan.

Fan runs at full speed all the time

Steps: 1. Check if the manual override switch on Connector pin 2 is ON (+- 12V/24V applied – LED would be blue blinking). Turn it OFF. 2. If using GM temp sensor, the temperature may be above the high threshold. Verify with the app in Test Mode (telemetry shows current temperature). 3. If using analog input, the input voltage may be at 5V. Check the signal source. 4. Check that the sensor wiring on Connector pin 3 is not shorted to ground (GM sensor reads as very high temperature when shorted).

Fan runs but does not change speed

Steps: 1. The fan speed range is 50% to 100% during automatic operation. Speed changes may be subtle. 2. Temperature may be within a narrow part of the range. Check your temperature preset selection. 3. Fan speed ramps gradually. Wait for the ramp to complete.

Configuration app shows “Write failed: verification mismatch”

Steps: 1. Try the write operation again. 2. If it persists, power-cycle the controller and reconnect.

Configuration app shows “The device is busy”

The controller is temporarily unable to accept settings. Confirm the unit is out of test mode. This can happen during programming mode transitions. Wait a few seconds and try again.

CAN adapter not detected

Steps: 1. Unplug and replug the USB-to-CAN adapter. 2. Try a different USB port or cable. 3. Click on the COM port dropdown to refresh the list.

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ECU PWM SIGNAL COMPATIBILITY

Early production G2 PWM Controllers require a positive-going PWM signal from the ECU. This will be corrected in Rev. 2 of our production in July of 26'.Some ECU manufacturers use an open-collector or ground-switching PWM output that may not provide the required voltage level for the G2 controller to properly detect the signal.

To correct this, a 3.3Kohm's pull-up resistor is included with your controller.

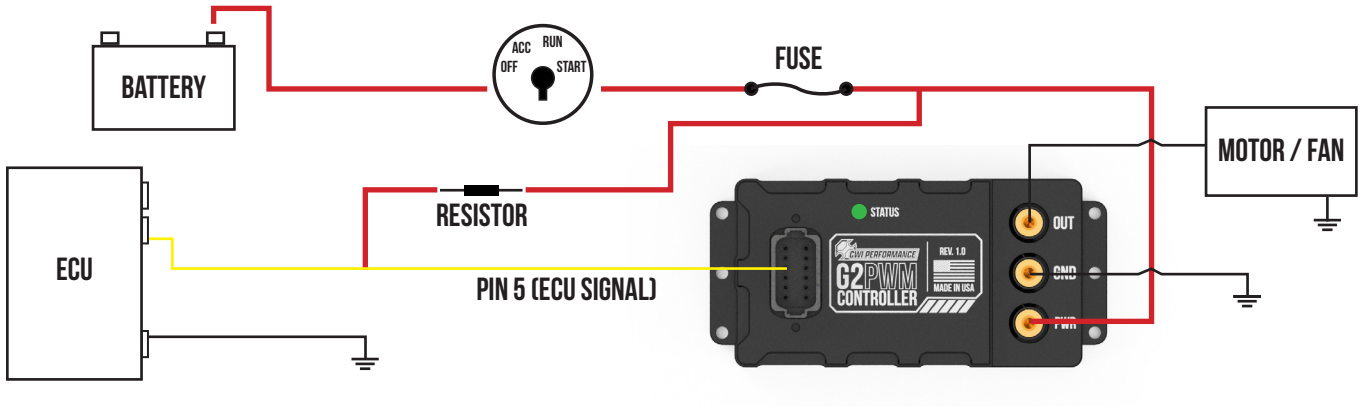
When Is the Pull-Up Resistor Required?

- The G2 controller does not respond to the ECU PWM command.
- The ECU PWM output switches to ground rather than supplying a positive voltage signal.
- Directed by Creative Werks technical support.

Installation

The resistor must be connected between:
Switched +12V Power Source and PWM Signal Wire between the ECU and G2 Controller

Wiring Diagram



Installation Steps

- **Disconnect vehicle power.**
- **Locate the PWM signal wire running from the ECU to the G2 PWM Controller.**
- **Solder one end of the supplied resistor to a switched +12V source.**
- **Solder the other end of the resistor to the PWM signal wire.**
- **Insulate all connections using heat shrink tubing.**
- **Reconnect power and verify proper controller operation.**

Notes

The resistor only provides a voltage reference for the PWM signal and does not affect normal ECU operation. Use a switched ignition source, not constant battery power. If you are unsure whether your ECU requires a pull-up resistor, contact Creative Werks technical support before installation.