# Mercury V1 high-current outputs, GP ports and I2C

Altimeter Cloud

Mercury V1 manual · v1.0

https://www.altimetercloud.com/support/mercuryv1/outputs/

The Mercury altimeter has several hardware interfaces for controlling external devices during flight. This page covers the onboard high-current output, the GP6 and GP7 general purpose pads, and the I2C expansion port.

## Output #1 — high-current output

The Mercury has a single onboard high-current output designed primarily for firing pyrotechnic deployment charges (e-matches, igniters), but it can also drive buzzers, solenoids, or other loads.

### Specifications

| | |
|---|---|
| **Switching device** | VN7140ASTR high-side smart power switch (SO-8) |
| **$R_{ON}$ (on-state resistance)** | 140mΩ typical at 25°C, 280mΩ at 150°C |
| **Input voltage range** | 4V to 18V (external battery required) |
| **Continuous current** | 2–3A |
| **Short burst current** | Up to 12A (hardware limited) |
| **Built-in protection** | Overcurrent, thermal shutdown, ESD, undervoltage |
| **PCB pad pitch** | 2mm |
| **Connection options** | Direct wire, header pins, or PCB terminal block |

### How it works

The output uses an ST Microelectronics VN7140ASTR, which is a high-side intelligent power switch in an SO-8 package. Unlike a simple MOSFET, this device has built-in overcurrent limiting, thermal shutdown protection, undervoltage lockout, and ESD protection. When the output fires, the VN7140A switches the positive side of your external battery through to the load, completing the circuit to ground.

With an on-state resistance of just 140mΩ at 25°C, the voltage drop across the switch is minimal. For example, a typical 2A e-match draw loses only 0.28V across the switch. The output can comfortably handle 2–3A continuously for loads like buzzers or LEDs, and can deliver up to 12A in short bursts for firing igniters and deployment charges.

You connect an external battery (4V to 18V) and your load (e-match, igniter, buzzer, etc.) to the output pads on the Mercury's PCB. The pads are labelled on the board as **IN** (battery positive), **OUT** (to your load), and **GND** (shared ground). There is also a **3V** pad providing 3.3V from the Mercury's regulator. The 2mm pitch connection points allow you to solder on header pins, a PCB terminal block, or direct wires.

### Wiring diagram

*Battery negative connects to both the Mercury GND pad and the igniter return. Battery positive connects to IN. OUT connects to the other igniter lead.*

### Triggering the output

The output can be triggered in two ways:

- **Simple output control** — configure a trigger event (after apogee, after launch, after burnout, etc.) and the output will fire

automatically. See the settings page for the full list of trigger options.

- **Action rules** — use the action rules system for more complex triggering with up to 4 conditions per rule, including latch ON/OFF modes.

Both systems work independently, so you can use either or both. The output also has safety features including altitude lock (prevents firing below a minimum altitude) and tilt angle lock (prevents firing if the rocket is tilted beyond a specified angle from vertical).

> ***Note:*** *If you solder onto the board you will be unable to return the device within the 14 day return period, although this does not affect your warranty for faults.*

## GP6 and GP7 — general purpose pads

The Mercury has two general purpose solder pads on the PCB labelled GP6 and GP7. These are GPIO pins from the microcontroller, each connected through a 100Ω series resistor for protection. Each pad can be configured independently. Requires firmware 2.0 or later.

### Specifications

| | |
|---|---|
| **Signal voltage** | 3.3V logic level |
| **Series protection** | 100Ω resistor per channel (~33mA max current) |
| **Output modes** | ON = HIGH, ON = LOW, or Servo PWM |
| **Servo frequencies** | 50Hz, 200Hz, 333Hz, 560Hz (per channel) |
| **Alternative function** | UART (GP6 = TX, GP7 = RX) at 921600 baud |

### Available modes

**ON = HIGH** — the pad outputs 3.3V when triggered and 0V when idle. The 100Ω series resistor limits the current to approximately 33mA, which is enough to drive a servo signal or trigger an external circuit via a transistor, relay, or MOSFET. These pads are not designed to drive high-current loads directly.

**ON = LOW** — the pad outputs 0V when triggered and 3.3V when idle. The inverse of HIGH mode, useful for circuits that trigger on a low signal.

**Servo** — the pad outputs a standard PWM servo signal. Each channel can have its own frequency (50Hz to 560Hz), min/max pulse width, ON/OFF angles, and hold time. You will need to connect the ground (GND) of the Mercury to your servo's power supply for this to work correctly. See the servo configuration page for full setup instructions.

### Servo wiring example

*Battery positive connects to the servo VCC. GP7 (or GP6) provides the PWM signal. Battery negative connects to both the servo ground and the Mercury GND pad to create a common ground reference.*

**UART** — when enabled in the settings, both pads switch to UART mode and stream sensor data at 50Hz. GP6 becomes TX and GP7 becomes RX. This is a 3.3V UART running at 921600 baud, 8 bits, 1 stop bit. You cannot use the pads for other functions while UART is enabled. See the settings page for the full UART variable reference.

All GP port modes (except UART) are triggered via the action rules system.

> ***Warning:*** *The GP pads operate at 3.3V. Do not send 5V signals to these pads as this could damage your Mercury.*

## I2C expansion port

The Mercury has a 4-pin I2C port accessible on the side of the case. This is the primary connection point for expansion modules and external sensors. The bus runs at 3.3V logic levels.

| Pin | Signal |
|---|---|
| 1 | SDA |
| 2 | SCL |
| 3 | 3V3 |
| 4 | GND |

The I2C bus can support multiple devices simultaneously, so you could for example have a PCA9685 servo board and an MT1 temperature sensor connected at the same time.

## RXP port (CN2) — combined expansion connector

The RXP port is a 10-pin connector on the PCB that brings together the I2C bus and both GP pads in a single connector. This is useful for expansion boards that need access to servos or outputs alongside I2C communication, or for creating a single-cable breakout to all the Mercury's expansion interfaces.

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | G06 | 2 | G07 |
| 3 | SDA | 4 | SCL |
| 5 | 3V3 | 6 | GND |
| 7 | 3V3 | 8 | GND |
| 9 | 3V3 | 10 | GND |

The three pairs of 3V3 and GND pins provide enough power capacity for expansion boards with moderate current draw.

### Compatible expansion modules

#### PCA9685 Servo Board

Up to 6 additional servo channels controlled via the action rules system. Supports configurable pulse widths, frequencies (50–560Hz), and optional external CMOS clock for improved timing accuracy. Requires firmware 2.0+.

**View servo setup guide**

#### ROC2 Port Expander

Dual high-current output channels with independent trigger settings. Each channel supports the same trigger modes as Output #1, and can also be controlled via the action rules. If enabled but not detected at power-on, the status LED will flash red for 5 seconds as a warning.

**View ROC2 settings**

#### MT1 Temperature Sensor

An external high-accuracy temperature probe (0.1°C) that connects to the I2C port. Can be used to log ambient temperature during flight, or to automatically use the external temperature at launch for more accurate altitude calculations.

**View temp sensor settings**

## Summary

| Interface | Type | Typical uses |
|---|---|---|
| **Output #1** | VN7140A high-side switch (4–18V, 2–3A / 12A burst) | Deployment charges, igniters, buzzers |

| | | |
|---|---|---|
| **GP6** / **GP7** | 3.3V logic / servo PWM / UART (33mA max) | Servos, logic signals, data streaming |
| **I2C + PCA9685** | 6-channel servo expansion | Air brakes, fin control, payload deployment |
| **I2C + ROC2** | Dual high-current output expansion | Multi-deploy, staging, dual recovery |
| **I2C + MT1** | High-accuracy temperature probe | Ambient temp logging, altitude accuracy |