

Build it in stages

A practical buying guide for users who want options, fewer duplicate boards and room to upgrade.

Start with the Watcher you already own. Its camera is working in normal and full-screen POV. It also has a microphone, battery readings and an RGB status light. Do not buy those features again unless you need a second viewpoint or a true headlight.

The four packages below are suggested sensor additions to an existing droid, not complete robot kits. Motors, motor drivers, drive battery, chassis and the Watcher are excluded. None of these new sensors is required simply to use the existing camera.

3D-print files are not included. Obtain the selected body and dome files separately through [Michael \(Mr. Baddeley\) on Patreon](#). Check his current membership options and model instructions. Printer, filament, printed parts and Patreon access are excluded.

Package	Verified sensor subtotal	Planning budget*	Best for
LOW / Starter	\$32.85	\$50-\$80	Basic forward distance and real body tilt
MID / Practical	\$63.60	\$100-\$150	Three-direction distance, tilt and droid power
HIGH / Best value	\$136.53	\$180-\$250	Mid plus combined air quality and automatic light/water alerts
EXTREME / Explorer	\$285.43	\$420-\$650	High plus 360-degree scanning and thermal view

*Planning budgets include allowances for controller, wiring, mounts and regulated power; these are estimates, not supplier quotes. The extreme budget also allows for host-computer hardware. All totals exclude tax, shipping, possible tariffs and labor/software-development cost.

Best bang for the buck: choose MID for driving-focused telemetry. Choose HIGH if you want environmental sensing: SEN66 replaces several overlapping air-quality boards and adds NOx. Buy optional sensors for a purpose, rather than just to increase the sensor count.

LOW & MID packages

Keep the expensive parts you buy first, then expand their coverage.

LOW: sensor	Qty	Each	Total
VL53L0X distance - forward	1	\$7.90	\$7.90
BNO085 tilt/orientation	1	\$24.95	\$24.95
LOW subtotal			\$32.85

LOW adds: a forward distance display and real body tilt. BNO085 is kept even at entry level because its onboard processing combines accelerometer, gyro and compass data. One forward sensor leaves side and rear blind spots.

MID: sensor	Qty	Each	Total
VL53L0X - front, left, right	3	\$7.90	\$23.70
BNO085 tilt/orientation	1	\$24.95	\$24.95
INA228 droid power monitor	1	\$14.95	\$14.95
MID subtotal			\$63.60

LOW to MID: keep the first distance sensor and BNO085. Add two distance sensors (\$15.80) and INA228 (\$14.95): **\$30.75 incremental sensor cost**. Use a controller with enough spare pins and a plan for repeated I2C addresses.

INA228 is for the separate droid drive battery. Watcher battery readings already exist. Final shunt and wiring must match motor current; the breakout should not carry an unsuitable motor load.

HIGH & EXTREME packages

More useful information without buying all of the overlapping alternatives.

HIGH: keep MID, add	Qty	Each	Total
SEN66 combined environment	1	\$62.03	\$62.03
SEN6x adapter board (6331)	1	\$4.50	\$4.50
Ambient light sensor	1	\$3.20	\$3.20
Water-ingress sensor	1	\$3.20	\$3.20
Additions subtotal			\$72.93
HIGH cumulative subtotal			\$136.53

HIGH adds: air-quality/climate readings, automatic-light input and a wet-base warning. SEN66 combines actual CO2, particles, temperature, humidity and VOC/NOx indices. Its cable and correct power supply are additional. It is not a stock-Watcher plug-in.

EXTREME: keep HIGH, add	Qty	Each	Total
RPLIDAR A1M8-R6 scanner	1	\$99.00	\$99.00
MLX90640 thermal array	1	\$49.90	\$49.90
Additions subtotal			\$148.90
EXTREME cumulative subtotal			\$285.43

EXTREME adds: a 360-degree horizontal scan that can support room mapping, plus a coarse heat view. A host computer, suitable software and tested localization are needed for navigation. A scanner alone does not make the droid autonomous.

The thermal module was listed out of stock during research. Keep close-range sensors: the horizontal scanner cannot see every low object, stair or overhead hazard. The two sensor types provide different coverage.

Your upgrade path

Each arrow adds a capability. Package totals are cumulative, not costs to add together.

01 LOW - \$32.85

Buy one distance board and the BNO085. Allocate spare wiring and controller pins for later sensors.

02 MID - add \$30.75

Keep both LOW modules. Add left/right distance and a properly sized droid power monitor.

03 HIGH - add \$72.93

Keep MID. Add SEN66, adapter, light and water sensors. This avoids buying separate SHT41 + SCD41 + SEN54 + SGP41.

04 EXTREME - add \$148.90

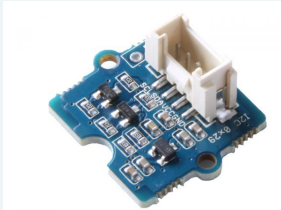
Keep HIGH. Add scanner and thermal array, plus a host computer if needed. Move local distance boards toward close-range blind spots.

If you already bought an SHT41 or SCD41: it can stay as a separate Watcher extension or be moved to another room. When installing SEN66, remove redundant dashboard channels and prefer a single climate source. Existing parts are not useless, but do not buy them solely as stepping stones to SEN66.

Design for swaps: use labeled connectors, removable mounts and a shared sensor-data format. Publish named readings such as distance/front, body/tilt, battery/droid and environment/co2, so the interface can accept upgraded hardware without redesigning every page.

Core motion & power

Option catalog: choose for its purpose. Do not buy every alternative together.



Manufacturer product photo

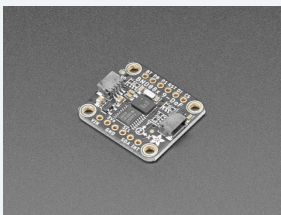
Grove VL53L0X — SKU 101020532 | \$7.90 each

What it does: Front/left/right obstacle distance

Adds to the droid: Three is a suggested layout. Identical default addresses require shutdown-pin sequencing or an I2C multiplexer; validate placement and surfaces.

Connection: Separate controller / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

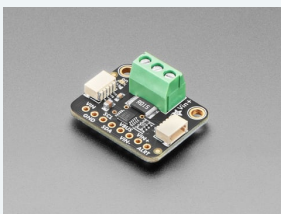
BNO085 orientation breakout | \$24.95 each

What it does: Real body tilt, rotation and heading

Adds to the droid: Replaces simulated body tilt. Check controller compatibility; motor magnets can disturb heading.

Connection: Separate controller / SPI or supported serial bus

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

INA228 power-monitor breakout | \$14.95 each

What it does: Droid battery voltage, current and power

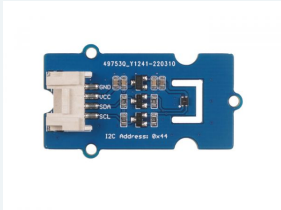
Adds to the droid: Watcher battery is separate from the droid drive battery. Select shunt/current capacity for actual motors; do not route high motor current through an undersized breakout.

Connection: Separate controller / I2C plus power wiring

[Find this part on Amazon \(affiliate\)](#)

Climate & air-quality choices

Option catalog: choose for its purpose. Do not buy every alternative together.



Manufacturer product photo

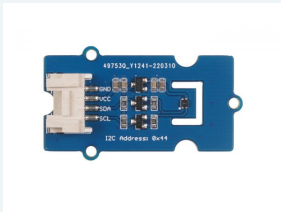
Grove SHT40 — SKU 101021032 | \$5.50 each

What it does: Ambient temperature and humidity

Adds to the droid: Lowest-cost climate option; alternative to SHT41/SCD41.

Connection: Watcher Grove / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

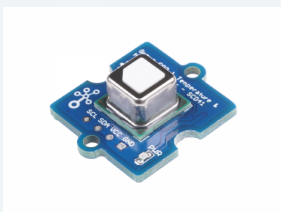
Grove SHT41 — SKU 101021033 | \$6.50 each

What it does: Ambient temperature and humidity

Adds to the droid: Better humidity specification than SHT40; recommended simple climate option.

Connection: Watcher Grove / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

Grove SCD41 — SKU 101020952 | \$52.90 each

What it does: Actual CO₂, temperature and humidity

Adds to the droid: Choose instead of SHT40/SHT41 when CO₂ is wanted. Does not measure pressure.

Connection: Watcher Grove / I2C

[Find this part on Amazon \(affiliate\)](#)

Climate & air-quality choices

Option catalog: choose for its purpose. Do not buy every alternative together.

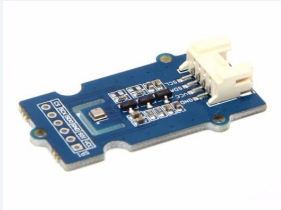
Grove BME280 | \$18.70 each

What it does: Temperature, humidity and air pressure

Adds to the droid: Alternative climate module when pressure is desired; no actual CO2 measurement.

Connection: Separate controller / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

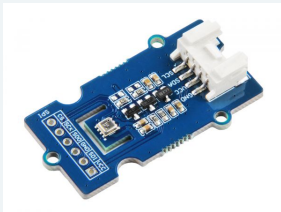
Grove BME680 | \$22.60 each

What it does: Temperature, humidity, pressure and gas resistance

Adds to the droid: Gas resistance/derived air quality is not direct CO2 or identification of individual gases.

Connection: Separate controller / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

Grove SGP41 | Price not verified

What it does: VOC and NOx air-quality trends

Adds to the droid: Use appropriate algorithms and humidity compensation; display indices rather than unverified gas ppm.

Connection: Separate controller / I2C

[Find this part on Amazon \(affiliate\)](#)

Climate & air-quality choices

Option catalog: choose for its purpose. Do not buy every alternative together.



Manufacturer product photo

Grove SEN54 — SKU 101021013 | \$49.00 each

What it does: Particle levels, VOC, humidity and temperature

Adds to the droid: PM1/2.5/4/10; SEN54 does not provide NOx or actual CO2. Needs unobstructed airflow.

Connection: Separate controller / I2C

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

SEN66 all-in-one environmental sensor | \$62.03 each

What it does: Actual CO2, particles, temperature, humidity, VOC and NOx indices

Adds to the droid: Best combined air-quality choice. Replaces SCD41 plus SEN54/SGP41. Separate controller and adapter/cable required; stock Watcher firmware does not support it.

Connection: Separate controller / integration required

[Find this part on Amazon \(affiliate\)](#)

Distance alternatives & mapping

Option catalog: choose for its purpose. Do not buy every alternative together.



Manufacturer product photo

Grove ultrasonic ranger — SKU 101020010 | \$4.50 each

What it does: Front/rear obstacle distance

Adds to the droid: Alternative to optical ranging; fire sensors sequentially to reduce interference.

Connection: Separate controller / digital

[Find this part on Amazon \(affiliate\)](#)

TF-Luna LiDAR — SKU 101990656 | \$28.90 each

What it does: Longer-range forward distance

Adds to the droid: Confirm exact module interface and supply before wiring.

Connection: Separate controller / module interface

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

RPLIDAR A1M8-R6 360-degree scanner | \$99.00 each

What it does: Scan a horizontal slice of the room for mapping

Adds to the droid: Extreme upgrade. Needs an unobstructed view and mapping software on a host computer. Keep near-floor sensors for hazards outside the scan plane.

Connection: Separate controller / integration required

[Find this part on Amazon \(affiliate\)](#)

Optional sensing & protection

Option catalog: choose for its purpose. Do not buy every alternative together.



Manufacturer product photo

Grove PIR motion sensor | \$8.70 each

What it does: Motion/activity trigger

Adds to the droid: Useful while parked; movement of the droid can create misleading activity triggers.

Connection: Separate controller / digital

[Find this part on Amazon \(affiliate\)](#)

Grove Doppler radar | Price not verified

What it does: Movement/speed detection

Adds to the droid: More integration effort; confirm exact model output and interpret motion of the droid itself.

Connection: Separate controller / module interface

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

Grove light sensor | \$3.20 each

What it does: Ambient brightness for automatic headlight behavior

Adds to the droid: Choose exact model before wiring; an RGB indicator is not a headlight.

Connection: Separate controller / analog or digital model

[Find this part on Amazon \(affiliate\)](#)

Optional sensing & protection

Option catalog: choose for its purpose. Do not buy every alternative together.

Grove SW-420 vibration sensor | Price not verified

What it does: Shock/vibration event flag

Adds to the droid: Binary event sensor; not a substitute for an orientation IMU.

Connection: Separate controller / digital

[Find this part on Amazon \(affiliate\)](#)

Grove piezo vibration sensor | Price not verified

What it does: Impact/touch detection

Adds to the droid: Alternative to SW-420; mounting strongly affects readings.

Connection: Separate controller / model-dependent input

[Find this part on Amazon \(affiliate\)](#)

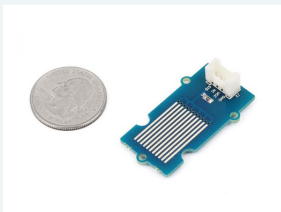
Grove water sensor | \$3.20 each

What it does: Water ingress detection in base

Adds to the droid: Detects damp/wet conditions; mount away from exposed power connections.

Connection: Separate controller / sensor input

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

Optional sensing & protection

Option catalog: choose for its purpose. Do not buy every alternative together.

Grove water-level sensor | Price not verified

What it does: Reservoir/liquid level

Adds to the droid: Only useful if the build has a liquid reservoir; optional specialist sensor.

Connection: Separate controller / module interface

[Find this part on Amazon \(affiliate\)](#)

Grove flame sensor | Price not verified

What it does: Infrared flame-like light detection

Adds to the droid: Experimental indicator only; not a certified fire alarm.

Connection: Separate controller / digital

[Find this part on Amazon \(affiliate\)](#)

Grove MLX90640 thermal array | \$49.90 each

What it does: Show a coarse heat map even when visible light is low

Adds to the droid: Extreme optional upgrade. Adds heat information rather than replacing the Watcher image. Not a detailed night-vision camera; listing was out of stock.

Connection: Separate controller / integration required

[Find this part on Amazon \(affiliate\)](#)



Manufacturer product photo

Fit it into the droid

Suggested interface features - integration work is still required.

Controls page 1 / Driving

Dome and camera controls plus front/side distance feedback. Make proximity alerts visible during POV operation.

Controls page 2 / Devices

Watcher RGB, actual headlight controls, water status and optional sensor toggles. Ambient light is an input; a true headlight needs a separate lamp and driver.

Controls page 3 / Telemetry

Show Watcher battery separately from droid battery. Add body tilt, distance, air quality and optional thermal/map views. Keep simulated values clearly labeled until their real sensors are connected.

What must be built

Controller firmware must read sensors and send live values to the dashboard. Calibration, reconnection handling and stale-data indicators need testing. Buying a module does not automatically enable its dashboard feature.

Preserve the Watcher: use its existing camera/microphone and visual AI where suitable. Its documented stock external-sensor support is SHT40, SHT41 or SCD41, one at a time. SEN66 and other expansion options should use a separate controller rather than replacing the working Watcher firmware.

Parts to select after layout: controller (reuse existing if suitable), matching connector cables, I2C multiplexer or shutdown wiring for multiple ToF boards, regulated supplies, sensor mounts and airflow clearance. Passive I2C hubs do not resolve identical addresses.

Price & photo references

Research attribution and Amazon affiliate buying links.

Watcher supported sensors

SEN66 capabilities

SEN66 \$62.03

SEN6x adapter \$4.50

BNO085 \$24.95

INA228 \$14.95

Distance sensor price comparisons

Thermal array \$49.90 / out-of-stock listing

SHT41 \$6.50

Research and photos are attributed to Seeed Studio, Adafruit, Sensirion and Digi-Key. Product-card buying links use Amazon affiliate links; the SEN66 uses a selected listing and other parts use exact-part searches. Photos are identification references, not proof of kit contents. Check exact part number, included sensor, connector, cable and supply before ordering.

Amazon links in the accompanying shopping list include a selected SEN66 listing and exact-part searches for other items; displayed reference prices are not Amazon quotes. As an Amazon Associate I earn from qualifying purchases. Verify availability, exact model and kit contents before buying.