CHICKEN-DE-COOP

Cluckingham Palace | Solar electrical and automation plan

Prepared October 24, 2026 | Preliminary design, revision 1

Reuse the equipment you already own

A 12 V solar system powers ventilation, a motorized chicken door, lights, a Raspberry Pi web server, and an ESP32 controller. Water uses low/full floats and an independent overflow cutoff; feed is monitored by weight.

Amazon wish list

Open the private chicken-de-coop wish list

The list contains a float-kit product candidate and specification-based planning entries for missing parts. Those entries are requirements, not fully selected or approved product models. The float kit is an alternative to the low/full float requirement, not an additional quantity to buy. No purchases were made.

Design status

• Solar array stated by owner: 3 x 160 W = 480 W. Purchased solar kits do not confirm which panels/controller are installed.

• Battery candidate from orders: Renogy 12 V 200 Ah AGM. Confirm the installed battery label and condition.

• GPIO pins, cable gauges, fuse amperages, relay suitability and actuator wire colors remain unassigned pending hardware verification.

• Water supply pressure, tank dimensions, full feeder weight and door geometry are still needed.

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Existing parts | reuse inventory

Order history establishes purchases, not current availability, condition, or final compatibility. Click item names to open their listings. Raspberry Pi 4 and ESP32 are owner-provided.

Existing part	Intended use / check
24-inch Progressive Automations actuator	Door; listed as 12 V, 169 lb force with potentiometer feedback. Confirm model, motor leads, end limits, stall current and duty cycle.
JBtek four-channel 5 V relay board	Channels 1-2: door reversing, only if motor-rated. Channel 3: lights. Channel 4: spare. Verify 3.3 V input interface and safe boot behavior.
MERICDA two-channel 12 V relays	Alternative relay hardware; verify coil/input voltages, DC ratings and wiring before use.
ANMBEST MOSFET modules, five-pack	Three candidate switches: one per fan and one for the valve. Not a reversing H-bridge; confirm input compatibility, cooling and actual current capacity.
DWEII 12/24 V to 5 V converters	Use two: Pi supply and control supply. Advertised 10 A each; measure voltage, ripple and voltage drop under load.
DIGITEN normally closed water valve	1/4-inch quick-connect; current listing: 12 V, 4.8 W, 0.02-0.8 MPa (~3-116 PSI). Confirm actual unit; avoid prolonged energizing.
NOYITO 20 kg load cell + HX711	Primary feeder scale candidate. Total hopper plus feed must remain below rated load with overload margin.
ShangHJ 10 kg cell/HX711 kits	Alternatives for smaller feeders or an engineered multi-cell scale; capacities cannot simply be added without suitable mechanics/electronics.
Six-way DC fuse block	Six load branches; confirm per-circuit and total ratings, terminal integrity and fuse type.
Renogy 12 V 200 Ah AGM battery	Candidate battery purchased Dec. 2023. Confirm battery health, charging settings and terminal style.
120 mm IP68 four-pin 12 V fans	Two-pack found in orders; 120 mm is about 4.7 inches, not the stated 6 inches. Confirm actual installed fans and currents.
GREDIA 1/4-inch flow sensors	Optional later refill-flow monitoring. Verify sensor supply and output levels; never apply 5/12 V directly to ESP32 GPIO.

Also available in reviewed orders: resistor assortments, 6 AWG cable, 10 AWG PV cable, K-type probes and MAX31856 boards, DHT22 air sensors. Water immersion suitability of the thermocouples is unverified. Existing 100/300 A breakers are not assigned to small branches.

Power distribution | functional sketch

```
OWNER-STATED SOLAR: 3 x 160 W
             |
      PV protection / disconnect
             |
      CHARGE CONTROLLER
             |
      battery-side protection
             |
     12 V / 200 Ah AGM BATTERY
             | positive
      MAIN FUSE near battery
             |
      MASTER DISCONNECT
             |
      LOW-VOLTAGE DISCONNECT
             |
      EXISTING SIX-WAY FUSE BLOCK
             +-- F1 -> door reversing relays -> actuator
             +-- F2 -> two fan MOSFET modules -> fans
             +-- F3 -> relay 3 -> lights
             +-- F4 -> high-high cutoff -> valve/MOSFET
             +-- F5 -> DWEII A -> USB-C -> Raspberry Pi
             +-- F6 -> DWEII B -> ESP32 / controls

BATTERY NEGATIVE -> covered negative bus -> returns
```

Branch	Load	Sizing information needed
F1	Door actuator	Stall/start current, motor driver rating and cable run.
F2	Two fans	Sum of maximum/start currents; individual protection if branch splits to smaller wires.
F3	Lights	Total LED wattage, inrush and cable run.
F4	Valve + safety circuit	Valve label, driver and relay currents; approx. 0.4 A valve at rated 12 V.
F5	Pi converter input	Input current at lowest supply voltage, losses, cable and protection.
F6	Controls converter input	ESP32, relay coils, HX711, sensors and supply losses.

Installation notes

Fuse positive conductors to protect the downstream wire. Protect any smaller sub-branch as needed. The controller-to-battery circuit has its own manufacturer-specified protection; do not route solar charging through a load-only low-voltage disconnect. Bond non-isolated control grounds at the distribution point; motor returns must not pass through sensor ground wiring.

The battery bus rises above nominal 12 V while charging. Verify all direct-connected loads over the full operating range. Keep the battery ventilated and separated from switching electronics. An orderly Pi shutdown must precede power cutoff, with adequate hold-up and a defined restart sequence.

Control wiring | door, fans and lights

The Pi hosts the web interface, MQTT service, history and alerts. ESP32 performs local control and safety timeouts even if Wi-Fi or the Pi is unavailable. All output interfaces must default off during boot and reset.

Conditional two-SPDT-relay motor reversing circuit

Use only after confirming that the actuator has a polarity-reversing two-wire motor circuit, both relays are SPDT, and contacts can handle DC motor startup/stall duty. Feedback wires are separate and remain insulated until their pinout is confirmed.

```
Relay 1:  COM -> actuator MOTOR A
          NC  -> negative bus
          NO  -> F1 fused positive

Relay 2:  COM -> actuator MOTOR B
          NC  -> negative bus
          NO  -> same F1 fused positive

ESP32 -> verified input interface -> relay IN1/IN2
5 V control supply -> JBtek relay supply as documented
```

Relay 1	Relay 2	State
OFF	OFF	Stop / motor terminals shorted for braking
ON	OFF	Direction A
OFF	ON	Direction B
ON	ON	Stop / motor terminals at same positive potential

A and B become OPEN and CLOSE only after a controlled test. Stop before reversing, use break-before-make contacts and suitable suppression, and enforce a maximum travel time. Use a bidirectional suppression arrangement for a reversing motor, not a single flyback diode across it.

Door safety and local controls

Provide open/closed position switches, guarded pinch points, obstruction protection, a manual release, and local OPEN / STOP / CLOSE controls. High force can injure a bird before software current detection responds. If relay ratings are unsuitable, replace this reversing section with a correctly rated motor driver; do not assume a 10 A resistive contact rating means a 10 A motor rating.

Fans and lights

MOSFET 1 switches fan 1; MOSFET 2 switches fan 2. Wire supply/load terminals according to the actual modules, preserving their documented common-ground arrangement. Four-pin fan tach/PWM leads remain insulated until verified. Do not parallel tach outputs. Each advertised dual-MOSFET module is treated as one switch channel.

Relay 3 COM receives F3 positive; NO feeds light positive; light negative returns to the bus. Relay 4 remains spare. Use verified input interfaces; never connect 5 V or 12 V signals directly to ESP32 GPIO.

Water and sensors | connection sketch

```
LOW float:   GPIO -- dry contact -- GND
             GPIO -- external pull-up -- 3.3 V
FULL float:  GPIO -- dry contact -- GND
             GPIO -- external pull-up -- 3.3 V

DS18B20:     VDD -> 3.3 V     GND -> GND
             DATA -> GPIO
             4.7k resistor from DATA to 3.3 V

LOAD CELL:   excitation -> HX711 E+ / E-
             bridge signal -> HX711 A+ / A-
HX711:       DOUT -> GPIO    SCK -> GPIO
             GND -> control GND
             supply / digital levels: verify board

VALVE:       F4 + -> independent cutoff contact -> coil +
             coil - -> valve MOSFET -> negative bus
             ESP32 -> MOSFET control input
             flyback diode across coil:
               stripe/cathode to coil +, anode to coil -
```

Independent high-high cutoff

Use a separate third float and hardware circuit, independent of firmware. A normally energized, suppressed safety relay permits filling only below high-high level; its NO power contact opens on high water, broken sensor wire or loss of safety-control power. Float switches control a suitable low-current interface, not the valve coil directly. Confirm float DC switching limits, relay coil current, continuous duty and valve-contact inductive rating. This circuit still requires component selection and terminal design.

Refill sequence and plumbing

Debounce LOW, then open the normally closed valve. FULL, high-high, a movement/sensor fault, or maximum fill time stops filling. Contradictory float readings inhibit filling; timeout requires inspection/reset. Configure FULL closed below full so an open wire inhibits filling. A broken LOW wire can resemble a refill request, so FULL and high-high remain essential.

Supply -> manual shutoff -> strainer -> regulator if required -> existing DIGITEN valve -> air-gap outlet above overflow rim -> tank. Provide safe overflow routing. Electrical shutoff cannot close a mechanically stuck valve. The valve needs inlet pressure; a low gravity tank may require a zero-pressure valve or a pump. Keep wet components protected from freezing.

Mounting and signal integrity

Use three-wire powered mode for DS18B20; verify probe wire functions. Keep HX711 beside the load cell with short shielded/twisted signal wiring away from motors. Verify HX711 digital levels at 3.3 V; generic boards differ. Calibrate with empty hopper and known weights. Restrict feed plus hopper to the 20 kg cell rating with margin and fit overload stops.

Missing parts | wish-list requirements

Amazon destination: chicken-de-coop (private). Quantities below describe required components, not necessarily package quantities. Check existing supplies before purchasing. Product candidate: Ximimark three-float PP side-mount kit, B0B7WPBPBC. Potable-water approval and mounting suitability are not established; its listed contact rating must not be used as a valve-coil rating.

Qty	Requirement	Selection / purchase status
2	LOW and FULL floats	Specification entry; candidate three-pack can cover these plus high-high if suitable.
1 set	Independent HIGH-HIGH cutoff	Third float, fail-safe 12 V relay/interface and suppression; verify potable materials and low-current float interface.
1	Sealed DS18B20 probe	Continuous immersion and drinking-water-safe wetted materials; verify genuine sensor and 3.3 V operation.
2	Door position switches	Weather-resistant wired dry contacts; mounting geometry to be measured.
1 set	Door safety + manual controls	Obstruction protection, manual release and OPEN/STOP/CLOSE controls; exact devices await door design.
1	Main fuse + covered holder	DC battery fault interrupt rating; amperage awaits cable/load sizing.
1 set	ATC/ATO branch fuses	Match existing block; final values after current and cable checks.
1	Master disconnect	DC-rated for system voltage/current.
1	AGM low-voltage disconnect	Configurable threshold/hysteresis; adequate start current.
1 set	Pi shutdown supervisor	Warns Pi before cutoff; hold-up/delay and restart design required.
1	Covered negative bus	Enough terminals and adequate current capacity.
1	Pi USB-C power interface	Proper source wiring and short 3 A-capable cable; verify under load.
1 set	Transient suppression	Valve diode and bidirectional actuator protection; component ratings pending.
1 set	Enclosure + glands	Weather-resistant enclosure, mounting plate, strain relief and terminal protection; size after layout.
1 set	Cable + terminations	Stranded copper wire, crimp lugs, ferrules, connectors and adhesive heat-shrink; lengths/gauges pending.
1 set	Scale mechanics	Rigid platform, spacers, mounting and overload stops.
1 set	Refill plumbing	Potable shutoff/strainer, compatible tubing/fittings, air-gap bracket and overflow route; source pressure pending.

Existing resistor assortments may supply the 4.7k temperature pull-up and float input pull-ups. New floats are not the existing mechanical drinking cups. Do not buy both the generic float requirement and the three-pack as separate sets.

Decisions before ordering and commissioning

Conditional purchases - resolve specifications first

Possible addition	Buy only if...
Reversing actuator driver	Existing relay contacts cannot safely handle the motor or needed safety controls.
ESP32 output/input interface	Relay inputs or HX711 digital levels are incompatible with 3.3 V.
Higher-capacity load cell	Full feeder plus contents approach/exceed 20 kg, including impact/overload margin.
Solar controller upgrade	Installed controller cannot accept actual panel Voc/Isc/power and charge the AGM correctly.
Regulated 12 V power	Fans, valve or actuator cannot tolerate battery charging voltage.
Pump / different valve / regulator	Supply pressure, flow and fill duration do not suit the existing DIGITEN valve.

Illustrative daily energy budget

Load assumption	Wh/day
Two 10 W fans for 12 hours	240
Pi + ESP32 + supplies/controls: 7 W average for 24 hours	168
60 W actuator, two minutes total	2
10 W lights for two hours	20
Total before additional losses/refill operation	430

Battery: 12 V x 200 Ah = 2,400 Wh nominal; initial 50% discharge planning allowance = 1,200 Wh before losses, aging and temperature effects. About 2-3 days at the illustrative load is possible, not guaranteed. Fans running continuously raise that example to about 670 Wh/day. Relay/safety coil consumption must be included in measured control power. Valve energy at rated 4.8 W is 4.8 x energized hours.

Solar illustration only: 480 W x 4 peak-sun-hours x 0.75 yield = 1,440 Wh/day. This is not a site-specific winter forecast. Measure actual load and charging before claiming autonomy.

Commissioning checklist

1. Record panel/controller/battery labels, fan and actuator currents, cable lengths, supply pressure and full feeder weight.
2. Bench-test converters and interfaces. Confirm safe GPIO levels and outputs OFF during reset.
3. With birds excluded, test door direction, limits, timeout, obstruction stop and manual release.
4. Test floats, broken wires, valve timeout, overflow path and high-high cutoff with ESP32 disconnected.
5. Calibrate feed scale; verify mounting and overload stops.
6. Test orderly Pi shutdown, restart, Wi-Fi loss and overnight motor starts. Log actual load and charging energy.

References and verification record

The purchase inventory was compiled from the signed-in Amazon order history in this chat. Only relevant product identities are recorded here; no order numbers, delivery addresses, payment details or credentials are included.

Primary technical references

Raspberry Pi power supply requirements
https://www.raspberrypi.com/documentation/computers/getting-started.html

HX711 load-cell hookup and digital supply levels
https://learn.sparkfun.com/tutorials/load-cell-amplifier-hx711-breakout-hookup-guide

DS18B20 manufacturer data
https://www.analog.com/en/products/ds18b20.html

Lead-acid planning discharge floor
https://www.victronenergy.com/media/pg/BMV-700/en/configuration.html

EPA cross-connection / air-gap guidance
https://www.epa.gov/sites/default/files/2015-09/documents/2007_05_18_disinfection_tcr_issuepaper_tcr_crossconnection-backflow.pdf

Existing DIGITEN valve listing
https://www.amazon.com/dp/B016MP1HX0

Confirmed versus pending

Confirmed in this session: relevant order descriptions, private list name and URL, and current DIGITEN listing pressure/power information. All installation-specific ratings, wiring colors, controller settings, remaining stock, potable certifications and hardware safety behavior remain to be verified. Current listings can change and may differ from the delivered variant.

The wiring sketches describe circuit functions. They are not a pin-for-pin installation drawing. No GPIO numbering, final wire gauge, main fuse amperage or branch fuse amperage is specified. This avoids assigning ratings without the missing hardware data.

Design notes carried forward

Water filling uses an existing normally closed valve, two control floats and an independent high-high cutoff. Mechanical float drinking cups do not provide electronic level signals. K-type probes and DHT22 air sensors are not assumed suitable for immersion. The optional flow sensors can be added later after electrical-level checks. The Pi remains supervisory while ESP32 executes local controls.

Wish-list specification entries represent the remaining procurement work. The float product is a candidate, not a certified drinking-water selection. Conditional parts remain on hold until the decision table on page 7 is resolved.