

SIGNUX PAN01

Accessories



SX-PAN01



DESCRIPTION

Foldable solar kit with battery and pole bracket, to power field equipment where there is no mains supply. Three sizes, 12 V output, IP67 and status readout over RS485.

The PAN01 is a solar kit with a built-in battery, meant to power a piece of field equipment where the mains does not reach. It arrives as one assembly — panel, battery, electronics and bracket — and is unfolded and clamped to a pole.

The battery carries auxiliary heating that draws its current from the panel rather than from the reserve, so it works in the cold without spending autonomy on warming itself. The state of charge is worked out by an algorithm that recalibrates itself according to how the panel has been charging, and the whole unit is read over RS485.

It clamps to a vertical pole with two U bolts: no civil works, no trench and one person. When one kit does not cover the load, several can be put in parallel on the same equipment.

FEATURES

- 60, 80 or 100 W with 30, 40 or 50 Ah: Three sizes. Output of 9 to 12.6 V at 10 A, 90 % discharge depth, and 24, 36 or 48 V customised at 95 % efficiency.
- -30 to 60 °C: Charges at -20 °C and discharges at -30 °C, keeping 95 % of its discharge in the cold thanks to the auxiliary heating.
- IP67, and a panel for over 25 years: Class A monocrystalline at 21.6 % efficiency, on an SGCC galvanised steel and polycarbonate resin bracket.
- Up to 8 kits in parallel: On the same equipment, when one alone does not cover the load. Status is read over RS485.

AT A GLANCE

Output voltage	9 to 12.6 V
Maximum output current	10 A
Protection	IP67
Operating	-30 to 60 °C

CONTENTS

01	Introduction	3
02	What comes in the box	3
03	Mounting	4
3.1	Laying the kit flat	4
3.2	Unfolding the bracket	5
3.3	Fastening the plates	6
3.4	Connecting the panel to the battery	6
3.5	Clamping to the pole	7
3.6	Mounting finished, and orientation	8
3.7	Connecting the equipment and dressing the cable	9
04	The indicator lights	10
05	Reading the unit over RS485	11
5.1	How to talk to it	11
5.2	What can be read	12
5.3	Extended cells and probes	13
5.4	Counters and miscellaneous parameters	13
5.5	General parameters	14
5.6	Master-slave control	15
5.7	Factory information	16
5.8	The bit fields	16
5.9	Knowing what is going on	17
06	Writing parameters	18

1 Introduction

The PAN01 powers a piece of field equipment where the mains does not reach. It is a closed assembly: solar panel, battery, charging electronics and folding bracket, all in one piece that is unfolded, clamped to a pole and working.

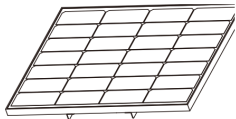
There are three sizes. They are chosen by the load of the equipment they will power and by how many days they have to last without sun.

MODEL	PAN01-30	PAN01-40	PAN01-50
Panel	60 W / 18 V	80 W / 18 V	100 W / 18 V
Battery	30 Ah	40 Ah	50 Ah
Dimensions	580 × 480 × 70 mm	765 × 480 × 70 mm	765 × 630 × 70 mm
Weight	6.5 kg	10.5 kg	11.5 kg

The rest is common to all three: output of 9 to 12.6 V at up to 10 A, 90 % discharge depth, service from -30 to 60 °C, IP67 protection, a 1.5 m output cable and status readout over RS485.

2 What comes in the box

- Solar kit with its bracket
- Two U bolts
- Two bracket fastening plates
- One DC cable
- One hex wrench
- Six M6 screws
- Four nuts, four washers and four spring washers
- One installation guide



Solar Kit with
Bracket × 1



U-Type Hoop × 2



Bracket Fasteners × 2



DC Cable × 1



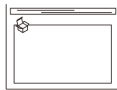
Hex Wrench × 1



M6 Screws × 6



Nuts × 4
Washers × 4
Spring Washers × 4



Installation Guidebook × 1

What comes in the box.

The box does not include the spanner for the U bolt nuts: they are M10 and take a 17 mm spanner. The hex wrench that is included is only for the M6 screws of the fastening plates.

3 Mounting

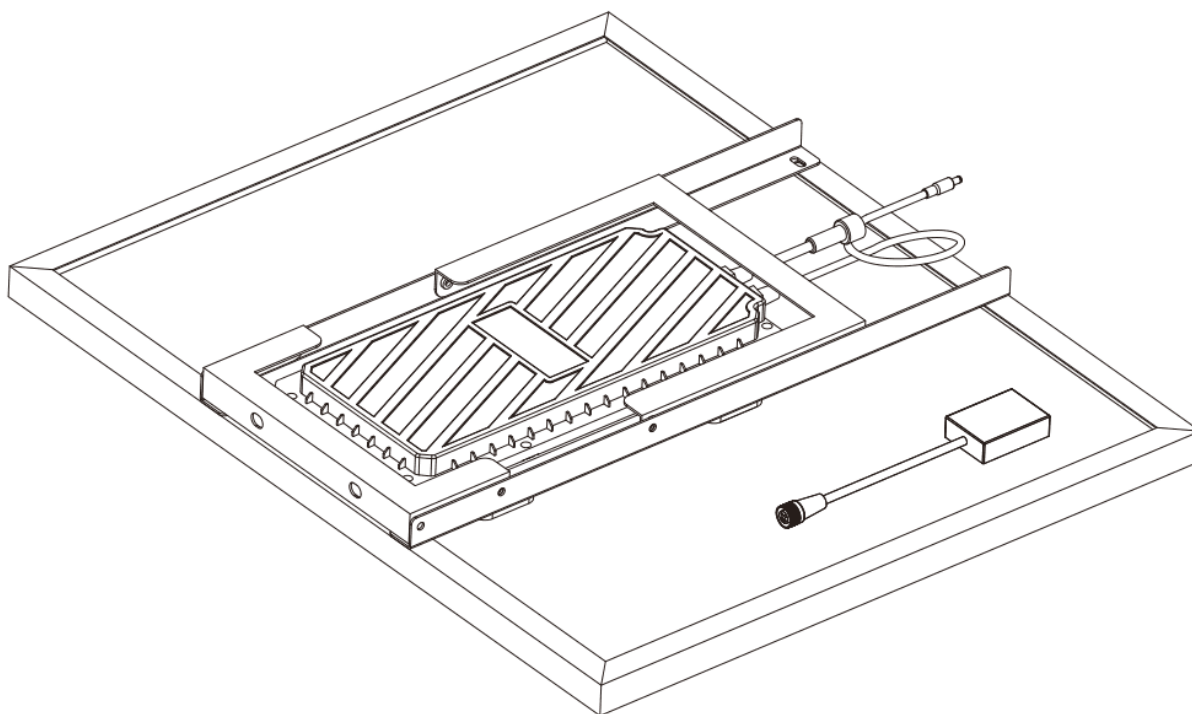
One person can do the mounting and it needs no civil works: no trench, no buried cable, nothing to switch off. A vertical pole 80 to 114 mm in diameter is required, along with a 17 mm spanner and zip ties to gather the spare cable.

It takes seven steps, and the order matters: the bracket is assembled with the kit lying flat, not once it is up on the pole. The circled numbers in the drawings — ①, ②, ③ — mark movements, not parts.

3.1 Laying the kit flat

Lay the kit flat and face down, with the panel against the ground and the folded bracket in view, on a flat and clean surface. It is advisable to put the box itself or a blanket underneath, because the panel will be resting on its good face and any grit will scratch it.

Before going on, check that the output cable is clear and that it will not be trapped between the bracket and the frame when unfolding.

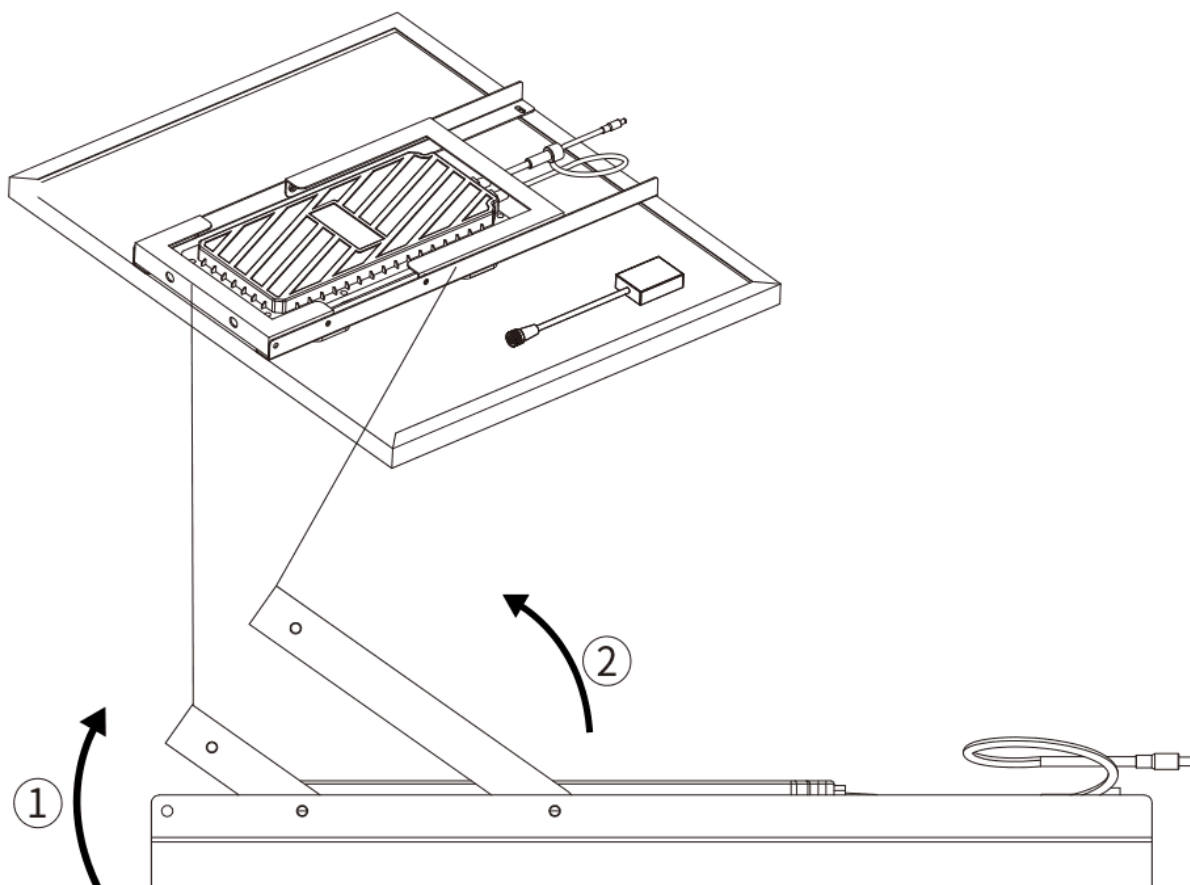


The kit laid flat and face down, with the folded bracket in view.

3.2 Unfolding the bracket

The bracket opens in two movements, in this order:

- ① Lift the anchor frame by pulling it upwards: it turns on the hinge along the lower edge.
- ② Swing the triangular arm outwards until it stops.

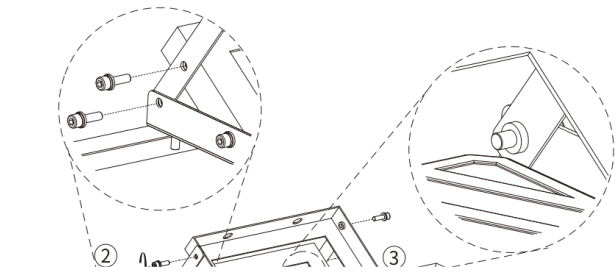
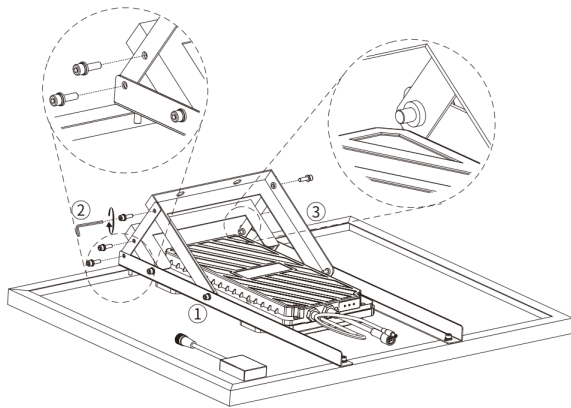


The bracket unfolded in two movements.

3.3 Fastening the plates

The two plates are what make the bracket rigid: until they are in place, the arm folds back on its own. One goes on each side.

- Line up the holes at the top of the plate with the inner holes of the bracket arm.
- Put in the six M6 screws.
- Tighten with the supplied hex wrench.
- Repeat on the opposite side and check that both arms are left at the same angle.



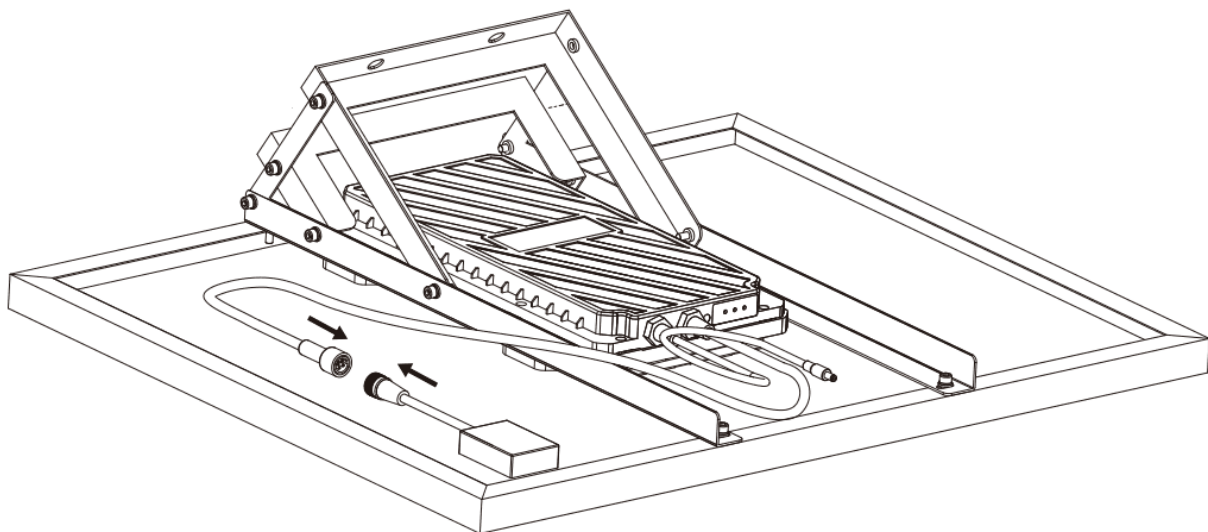
The M6 screws and the hex wrench, close up.

The fastening plates, one on each side.

3.4 Connecting the panel to the battery

Panel and battery are joined by a sealed connector that cannot be got wrong: it has an orientation key and goes in one way only. Do not force it if it will not go in; turn it until the key lines up.

Screw the outer collar fully home. That is what compresses the seal and what keeps the IP67: half screwed in, the joint is not sealed even though it makes contact.



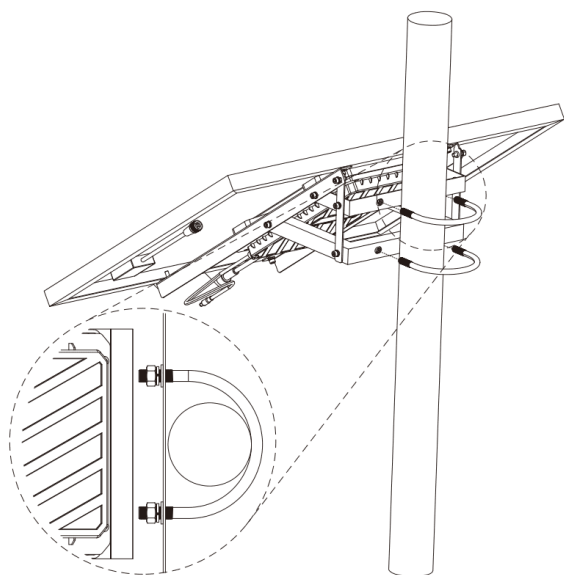
The connection between panel and battery.

3.5 Clamping to the pole

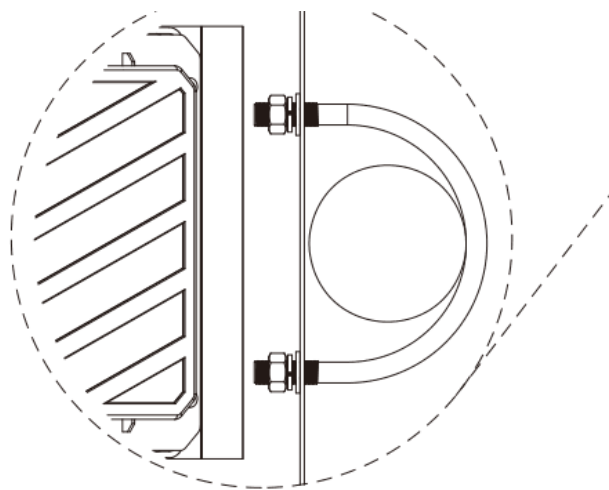
With the bracket assembled, lift the unit onto the pole. It takes tubes 80 to 114 mm in diameter.

- Wrap the tube with the two U bolts.
- Put the threaded ends through the holes in the bracket plate.
- On each stud, in this order: flat washer, spring washer and M10 nut.
- Tighten the four nuts with the 17 mm spanner.

It is advisable to tighten crosswise and gradually, giving each nut one turn in sequence. If one is tightened fully before the others, the bracket ends up skewed on the tube and there is then no way to straighten it.



The assembly clamped to the pole.

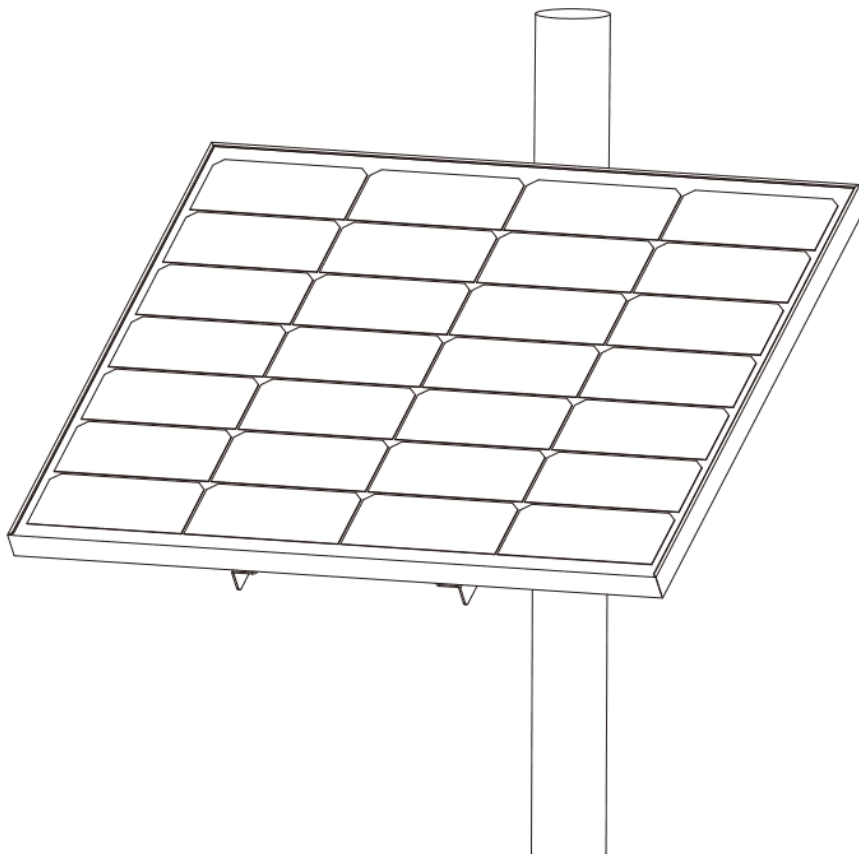


The U bolt, with its washers and its nut.

3.6 Mounting finished, and orientation

This is where the mechanical mounting ends. Before the final tightening, turn the unit on the pole and leave it facing the right way.

The same as for any other photovoltaic installation: facing the midday sun and with no shade over it at any time of day — not from trees, not from a building, and not from the mast itself if something is mounted higher up. A shadow crossing the panel for a few hours a day costs far more autonomy than it looks.



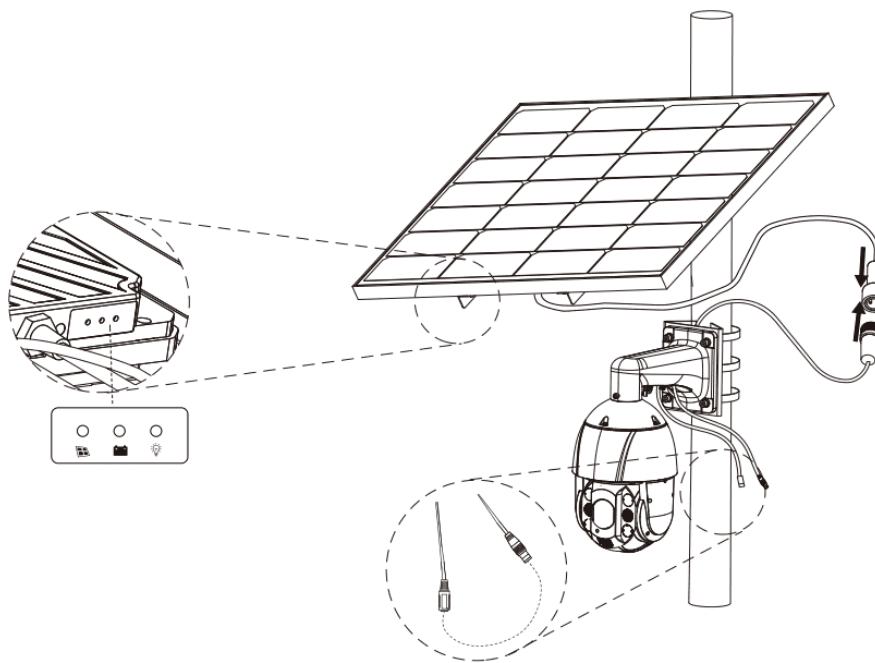
The mechanical mounting, finished.

3.7 Connecting the equipment and dressing the cable

Fix the equipment to be powered to the same pole, below the kit, and connect it to the DC output cable, which is 1.5 m long.

If there is spare cable, gather it with zip ties against the mast rather than leaving it hanging: a loose cable in the wind eventually breaks at the gland, and that is a fault nobody sees until the equipment loses its supply.

With everything connected, look at the three indicator lights. What each one says is in the next section.



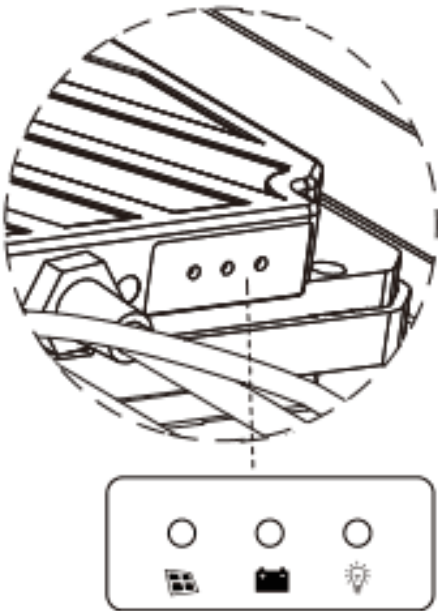
The equipment connected and the cable gathered.

If one kit does not cover the load, several can be put in parallel on the same equipment, up to eight.

4 The indicator lights

The unit carries three indicator lights together, under the panel. They say, in this order, whether the panel is charging, how the battery is, and whether output is available.

LIGHT	COLOUR	WHAT IT MEANS
Solar panel	Green	On: the panel is charging · Off: the panel is not charging
Battery	Green	On: the battery is normal · Flashing slowly: battery low · Flashing quickly: battery exhausted
Load	Red	On: output is available, which does not mean it is being drawn · Off: output is not available



The three indicator lights, under the panel.

5 Reading the unit over RS485

The unit speaks Modbus RTU over RS485. Reading it tells you live what comes in from the panel, what goes out to the load, how the battery is doing and what voltage each cell is at.

The measurement areas are read with function 04, and the counter and parameter areas with 03. The unit also lets the parameter areas be written.

5.1 How to talk to it

SETTING	VALUE
Protocol	Modbus RTU
Speed	9600 bps
Format	8 data bits, no parity, 1 stop bit
Factory address	1
Function	04 for the measurements · 03 for the counters
Reply	Under half a second

The measurements live from 0x0200 to 0x0221 and in the 0x0300 block; the cumulative counters, in the 0x0400 area.

Two things are worth knowing before programming anything. First: if you ask for more registers than the block holds, the unit returns the ones it has and says nothing — asking for forty from 0x0200 returns thirty-four. Second: past 0x0303 the cell block returns leftover memory that looks like data and is not.

If it answers nothing at all, before doubting the baud rate it is worth swapping the A and B wires.

5.2 What can be read

REGISTER	WHAT IT IS	SCALE	UNIT
0x0200	Control information	bit field	—
0x0201	Alarm message	bit field	—
0x0202	Alarm message	bit field	—
0x0203	Remaining capacity	÷ 10	Ah
0x0204	Charge (SOC) and PWM duty	one byte each	%
0x0205	Battery power	no scale	W
0x0206	Battery total voltage	÷ 10	V
0x0207	Battery total current	÷ 10	A
0x0208	Battery charging current, photovoltaic side	÷ 100	A
0x0209	Discharge current, load side	÷ 100	A
0x020A	Temperatures 1 and 2	one signed byte each	°C
0x020B	Temperatures 3 and 4	one signed byte each	°C
0x020C	Temperatures 5 and 6	one signed byte each	°C
0x020D	Temperatures 7 and 8	one signed byte each	°C
0x020E	Temperatures 9 and 10	one signed byte each	°C
0x020F	Temperatures 11 and 12	one signed byte each	°C
0x0210	Temperatures 13 and 14	one signed byte each	°C
0x0211	Temperatures 15 and 16	one signed byte each	°C
0x0212	Clamp voltage of the discharge protection	÷ 10	V
0x0213 and 0x0214	Internal timestamp, 32 bits	no scale	s UTC
0x0215	Days remaining	no scale	days
0x0216	Health (SOH) and PWM duty	one byte each	%
0x0217	Photovoltaic voltage	÷ 10	V
0x0218	Photovoltaic current	÷ 100	A
0x0219	Mains current	÷ 100	A
0x021A to 0x021E	Reserved	—	—
0x021F	Temperature protection, charging and discharging	one byte each	—
0x0220 and 0x0221	Reserved	—	—

The signs: in 0x0207 and 0x0209 discharge is positive and charging negative; in 0x0208 and 0x0218 photovoltaic discharge is positive, and in 0x0219 it is the mains discharge.

The sixteen temperatures go in pairs, one signed byte each, from -50 to 125 °C. A channel with no sensor fitted reads -50.

The timestamp in 0x0213 and 0x0214 is a 32-bit integer in UTC seconds: the first is the high half and the second the low half.

In 0x021F the value 0 is normal. The highest bit marks temperature protection, the next marks discharge protection and the lowest, charging protection; each number from 0 to 127 identifies a cause.

5.3 Extended cells and probes

Cells and temperature probes have their own areas. The origin documents them as ranges, because how many there are depends on the unit: the last address to read is worked out from the count given by the first register of each area.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0300	Number of cells	no scale	—
0x0301 to 0x03FF	Voltage of cells 1 to 255	÷ 10000	V

When the number of cells exceeds what fits in one reply, they are asked for in several packets. Cells above 255 are in the 0x07xx area.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0280	Number of temperature probes	no scale	—
0x0281 to 0x02FF	Temperatures 1 to 254, in pairs	one signed byte each	°C

The probes from 0x020A to 0x0211 are the board ones. In this area, as there, the range is −50 to 125 °C and a probe that is not fitted reads −50.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0700 to 0x07FF	Voltage of cells 256 to 511	÷ 10000	V

This area is only used when the total number of cells exceeds 255.

5.4 Counters and miscellaneous parameters

The 0x04xx area is read with function 03. It gathers the battery totals, the energy counters, the rental clock and the encoding registers.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0400 and 0x0401	Internal battery timestamp, 32 bits	no scale	s
0x0402 and 0x0403	Rental start timestamp, 32 bits	no scale	s
0x0404	Rental days	no scale	days
0x0405 and 0x0406	Cumulative discharge Ah, 32 bits	÷ 100	Ah
0x0407 and 0x0408	Ah value calibration, 32 bits	÷ 10	Ah
0x0409 and 0x040A	Remaining capacity, 32 bits	× 2	mAs
0x040B to 0x040D	Registered phone number, 48 bits	no scale	—
0x040E and 0x040F	Cumulative charge Ah, 32 bits	÷ 100	Ah
0x0410 to 0x041C	Encoding registers 1 to 13	one byte each	—
0x041D and 0x041E	Photovoltaic generation of the day, 32 bits	no scale	Wh
0x041F and 0x0420	Cumulative photovoltaic generation, 32 bits	no scale	Wh
0x0421 and 0x0422	Consumption of the day, 32 bits	no scale	Wh
0x0423 and 0x0424	Cumulative consumption, 32 bits	no scale	Wh
0x0425	Forced charge and discharge switch	bit field	—
0x0426	Reserved and protocol version	one byte each	—

All 32-bit values go in pairs and in network order: the first register is the high half and the second the low half.

Rental days accept 0 to 3000. The thirteen encoding registers hold 26 bytes, two per register.

The four energy counters are updated once a day, at 00:00: the daily one holds the previous day and the cumulative one everything before that cut.

In 0x0425, the value 1 is automatic and 0 is forced shutdown.

5.5 General parameters

The 0x08xx area holds the battery management system parameters: protection thresholds, calibrations and identity data. They are read with function 03.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0800	Discharge overcurrent, level 1	÷ 100	A
0x0801	Level 1 delay	÷ 5	s
0x0802	Discharge overcurrent, level 2	÷ 100	A
0x0803	Level 2 delay	÷ 5	s
0x0804	Cell overvoltage	÷ 10000	V
0x0805	Cell over-discharge recovery	÷ 10000	V
0x0806	Cell overcharge recovery	÷ 10000	V
0x0807	Cell charge voltage	÷ 10000	V
0x0808	Battery: heat alarm and protection	one signed byte each	°C
0x0809	System: heat alarm and protection	one signed byte each	°C
0x080A	Number of cells	no scale	—
0x080B	Rated capacity	no scale	Ah
0x080C	Current range	no scale	A
0x080D	Current zero offset	÷ 100	A
0x080E	Voltage calibration and charge current zero offset	one byte each	—
0x080F	Current false alarm threshold	÷ 100	A
0x0810	Overcurrent threshold	÷ 100	A
0x0811	Full cell voltage	÷ 10000	V
0x0812	Cell float voltage	÷ 10000	V
0x0813	Equalisation turn-on voltage	÷ 10000	V
0x0814	Low temperature protection, charging and discharging	one signed byte each	°C
0x0815	Heating: turn-on and turn-off	one signed byte each	°C
0x0816	Low temperature recovery, charging and discharging	one signed byte each	°C
0x0817	Temperature probe enable	bit field	—
0x0818	Program function switches	bit field	—
0x0819	Segment voltage for the differential alarm	÷ 10000	V
0x081A	High differential alarm	÷ 10000	V
0x081B	Low differential alarm	÷ 10000	V
0x081C	Mains switching voltage	÷ 10000	V
0x081D	High voltage differential alarm	÷ 10000	V
0x081E to 0x0820	Device identifier, 48 bits	no scale	—
0x0821	Total undervoltage protection	÷ 10	V
0x0822	Total overvoltage protection	÷ 10	V
0x0823	Probe enable and discharge heat protection	one byte each	—
0x0824	Overcharge recovery SOC and mains current offset	one byte each	—
0x0825	Low voltage differential alarm	÷ 10000	V
0x0826	Mains and load current range	one byte each	—

Temperatures in this area go as everywhere else in the unit: two signed bytes in one register, from –50 to 106 °C.

The ranges each parameter accepts: 1.00 to 655.00 A for currents, 1.5000 to 4.4000 V for cell voltages, 2.0 to 2000.0 V for total voltages and 1.0 to 100.0 s for delays.

The device identifier is 48 bits across three registers, meant to carry a MAC address.

5.6 Master-slave control

The 0x089x area configures the up to thirty-two chained controls. It is read with function 03.

REGISTER	WHAT IT IS	SCALE	UNIT
0x0890	Serial control number	one byte each	—
0x0891 to 0x08B0	Control 1 to 32: enabled probes and number of cells	four groups of 4 bits	—

In each register, the eight high bits enable probes 1 to 8, from lowest to highest. Of the eight low bits, the upper four give the number of cells of the first sampling block and the lower four, that of the second.

5.7 Factory information

The 0x06xx area is factory data. The origin documents it like this:

REGISTER	WHAT IT IS	SCALE	UNIT
0x0600 to 0x0607	Internal use, not implemented	—	—
0x0608	Modbus address, parity and baud rate	one byte each	—

In 0x0608 the high byte is the address, from 1 to 247. Of the low bits, two give the parity — 0 none, 1 odd, 2 even — and the remaining six the baud rate in multiples of 2400 bps: a 4 is 9600. The change does not take effect until the unit is restarted.

5.8 The bit fields

Four registers are not a number but one bit per thing. The origin breaks them down like this.

BIT	WHAT IT SAYS WHEN IT IS 1
2	Heating on
3	Heat dissipation on
4	Buzzer silent
5	Heat protection triggered
6	Discharge enabled
7	Charging enabled
10	Mains charging enabled
11	Mains connected
0, 1, 8 and 9	Reserved

In 0x0200 the normal value is 0x00D0.

BIT	WHAT IT SAYS WHEN IT IS 1
0	Heat protection: the protection threshold has been passed
1	Severe overcurrent: the level 2 threshold has been passed
2	Charging overcurrent
3	Overcharge: a cell above the overcharge voltage
4	Battery exhausted: a cell below the over-discharge voltage
5	Heat alarm: the alarm threshold has been passed
6	Discharge overcurrent: the level 1 threshold has been passed
7	Battery low: a cell below the recovery voltage

BIT	WHAT IT SAYS WHEN IT IS 1
8	Difference between cells above the threshold
9	Cold while charging: below the low temperature protection
10	Cold while discharging: below the low temperature protection
11	Charging voltage difference too high
12	Short circuit
13	Humidity above the alarm threshold
14	Insulation measurement alarm
15	Charger not compatible

In 0x0201 the normal value is 0x0000: with the battery in order, not one bit.

The 0x0202 is not a bit field but two bytes: the high one is the fault code and the low one its level, from 1 to 3, where 3 is the most serious. A code of 0 is "no fault". If several coincide, only the most serious is reported.

BIT	WHAT IT DOES	DEFAULT
0	Priority: 0 the battery, 1 the mains	0
1	Data sending: 1 on its own initiative, 0 when the master asks	1
2 and 6	Cell type, with 6 as the high bit: 0 lithium iron, 1 ternary, 2 Xingying ternary	1 and 0
11	Short circuit protection	0
3 to 5, 7 to 10 and 12 to 15	Reserved	0

In 0x0818 the default value is 0x07.

5.9 Knowing what is going on

Which way the current is flowing cannot be worked out from which register reads zero: panel current and load current are measured separately and can both be non-zero at once. What tells you is the sign of the net battery current.

- 0x0207 positive: the battery is discharging.
- 0x0207 negative: the battery is charging.
- And always, 0x0207 is the load current minus the panel current.

The power in 0x0205 is the battery power, not the panel power: it is the absolute net current times the voltage, in whole watts. The power the panel delivers has no register of its own and is worked out by multiplying 0x0217 by 0x0218.

The cycles the battery has done come from the cumulative charge Ah divided by the nominal capacity of the model.

6 Writing parameters

The parameters in the 0x04xx, 0x06xx and 0x08xx areas can be written, but they are not usage settings: they are the thresholds the management system protects the battery with. A wrong write moves a safety threshold, the unit accepts it without warning and there is no comfortable way back.