eco Hybrid Solar Contoller CA5J

User's Manual





Thank you for purchasing the eco Hybrid Solar Controller CA5-J. Please read through this manual carefully and completely in order to operate this controller at its best possible performance.

CONTENTS

1. General Instructions	3
2. Technical Data	3
3. Installation and Wiring	4
4. Touch Screen	5
5. System Function 1	7
6. System Function 2	613
7. System Function 3	206
8. System Function 4	276

1. General Instructions

These Installation and operating instructions contain important information and basic instructions .Please read the following information carefully before installing and operating the controller.

- Only qualified technicians are recommended to install and operate this controller. Please get familiar with all the safety regulations and operating instructions before commissioning the controller into service.

- This controller shall be operated with the correct power supply.
- This controller shall work within the scope of the technical data provided.

- Do not mount the controller in a location of high humidity or the possibility of water infiltration.

- Do not mount the controller in the vicinity of hazardous or corrosive material.

- The controller can only be used as per the listed functions; unauthorized modifications or installing additional components not provided or recommended may cause damage to the controller.

- The wiring connections need to be followed as per the diagrams in this manual, incorrect wiring connections may cause damage to the controller and the devices driven by this controller.

- Any modifications to the unit are not permitted without the written permission from eco Hybrid Solar, LLC.

2. Technical Data

- 1) Power Supply: 24VAC, 60Hz
- 2) Self-Consumption: < 20W
- 3) Temp. Sensor Precision:±1°F
- 4) Temp. Sensor Type:PT100
- 5) Total Output Power: 8kW
- 6) 5 Relays Designated : 24VAC, 200W
- 7) 1 Relay Undesignated : 24VAC, 200W
- 8) Rated Operating Leakage Current: 30mA/0.1S
- 9) Dimensions: 500×400×155mm
- 10) Installation Location: Indoors
- 11) Ambient Temperature: $32 \sim 130^{\circ}$ F
- 12) Humidity: <85%

3. Installation and Wiring

The controller shall be wall-mounted in a location not susceptible to water damage and high humidity.

3.1 Mounting

The controller must be located indoors.

1. Locate the controller where it can be safely operated, drill four holes and attach M8 expansion bolts with a length of 17.7 inches and a width of 13 inches, see Fig.1.

2. Attach the controller with the enclosed screws (M6) and hangers



3.2 Wire Connections

N1 L11 N1 L12 N1 L13 N1 L14 N1 L15 N1 L16 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 3 4 6 7





Inputs:

- 5 temperature sensors to be connected as Fig. 2.

- use 0.2~0.5mm² thick 3-wire shielded cable to connect all temperature sensors;

- thermometer power: use 0.5mm² thick 2-wire armored cable

- Thermometer COM: communication between thermometer and controller, use $0.2{\sim}0.5\text{mm}^2$ thick 2-wire shielded cable.

Note: attention on the wire color when connecting temp. sensors on terminals, it is White, Red and White color cable from left to right, do not reverse.

Outputs:

- use $1 \mathrm{mm}^2$ 2-wire armored cable to connect pump P1 and/or valves R1, R2, R3 and R4 at 24VAC;

- if pump and/or valves are not 24V powered, use a relay between controller and loads;
- make water proof treatment for all cables.

3.3 Installation of Ultrasonic Flow Meter

Flow Meter:

- Working pressure <1.0Mpa
- Working temperature:39~203°F
- Connector: 1"
- Flow rate range: 0.3~30gal/min, rated flow rate: 15.4gal/min
- Battery: 3.6V lithium battery

- Remove any contaminants from the surface of the copper pipes where the meter is to be located in order to avoid inaccurate readings.

- Install the ultrasonic flow meter, including all the components where no exposure to water, frost, chemicals and EMC interference can occur.

- Ensure the arrow direction on the flow meter is the same as the water flows; make sure there is 6-12 inches of straight pipe before the flow meter and 4-6inch after the flow meter



Fig. 3 Installation of the Flow Meter

BTU calculation

Use the Flow meter (with 2 extra temp. sensors T6 & T7) to calculate the heat gain of the whole system.

Flow meter is a DN25 connector;

Controller reads the heat gain from the Flow meter and will display the final accumulative heat gain.

4. Touch Screen

Start Page



System selection: Click the system schematics to choose the system; Only one system can be selected; The system with a green lamp is the selected one

5. System 1 Function Survey

Inputs: 5 Temperature Sensors T1, T2

Outputs: 4 Relays @ 24VAC 200W, 60HZ (relays for solenoid valves) R1, R2 (L, N terminal)

- 1 Relay @ 24VAC 200W, 60HZ (relays for pump) P1 (L,N terminal)
- 1 Relay @ 24VAC 200W, 60HZ undesignated

Temperature Differential Control:

SOLAR T1-T2>45°F (Adjustable), Switch On R1 & P1; T1-T2<37°F (Adjustable), Switch Off R1 & P1;

Switch off P1 when R1, R2, R3 and R4 are all switched Off.

Collector Protection:High-Temp.:T1 \ge 230°F, R1 Off; if T1 \le 210°F, P1 & R1 resume to Normal

Switch Off P1 when R1, R2, R3 and R4 are all switched Off

Storage Tank Protection: High-Temp. T2 \geq 140°F, R1, R2, R3, R4 and P1 Off; if T2 \leq 130°F, R1, R2, R3, R4 and P1 resume to Normal

Syster	m 1	
Manual Operation	Status Table	P
Parameter Settings	System Diagram	R
06-05-12 09:37	:52 Tuesday	c

Menu for System 1

Syste	m 1	
Manual Operation	Status Table	PWI
Parameter Settings	System Diagram	RUI
06-05-12 10:21	:11 Tuesday	co

Click the "Manual Operation" button to enter the system operation in manual mode.



The Controller is now in manual mode once this page is shown. Click the load symbol on the schematic to activate/deactivate pump or valve. When the device is on, the light displays a green color, and then changes to a red color when the device is off.

Upon exit of the Manual Mode the controller will activate the Auto Mode.

Manual Operation	Status Table	PW
Parameter Settings	System Diagram	RUI
06-05-12 10:21:	:11 Tuesday	col

Click "Status Table" button to show as below:

		Status T	able 1		
T1	0 °F	T6) [°] F	R1 🔴	
Т2	0 °F	T7 () [°] F	P1 🔴	F
Hea	it Gain	0.0000	MBTU		Back

The actual system temperature, valve, pump status, and the accumulative heat gain will be displayed.

Note: When the lamp is a green color, the valve or pump is on; When the Lamp is a red color, the valve or pump is off.

Syste	m 1	
Manual Operation	Status Table	P
Parameter Settings	System Diagram	R
06-05-12 10:21	:11 Tuesday	c

Click the "Parameter Settings" button to show the status:

SOLAR Temper	ature Differential Control	
T1-T2> 45	°F Switch on R1 & P1	
T1-T2< 37	°F Switch off R1 & P1	PWR
Collector Protec	tion :High Temperature	O RUN
T1> 230 °F	R1 Off	
T1< 210 °F	R1 Resume to Normal	com
	Novt Back	

The default value of the parameter setting is displayed here. To change the setting, click the cell to input the desired value. To cancel one function, such as "Collector Protection: High Temperature", T1>230F change into T1>999F; To resume this function, input the desired value.



Stora	ge Tar	n <mark>k Pro</mark>	o <mark>tecti</mark> 35	on :Hi	<mark>gh T</mark> : 0	emper	ature	
T20 T2<						140	to Normal	e e e e e e e e e e e e e e e e e e e
	1	2	3	4	5	-		0
	6	7	8	9	0	Esc		RUN
	00	-	_	Clr	En	ter		co
<u> </u>	1						Back	

Input the value and click "Enter"

System 1		
Manual Operation	Status Table	
Parameter Settings	System Diagram	R
06-05-12 13:32:57	Tuesday	c

Click "System Diagram" to show the system schematics and real-time operation status.



6. System 2 Function Survey

Inputs: 5 Temperature Sensors T1, T2,T3

Outputs: 4 Relays @ 24VAC 200W, 60HZ (relays for solenoid valves) R1, R2, (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ (relays for pump) P1 (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ undesignated

Temperature Differential Control:

SOLAR T1-T2>45°F (Adjustable), Switch On R1 & P1; T1-T2<37°F (Adjustable),

Switch Off R1 & P1;

HRU 1 T3-T2>45°F (Adjustable), Switch On R1 & R2 & P1; T3-T2<37°F (Adjustable),

Switch Off R1 & R2 & P1;

Collector Protection:High-Temp.:T1 \ge 230°F, R1 Off; if T1 \le 210°F, P1 & R1 resume to Normal

HRU 1 Protection: High-Temp.: T3≥230°F, R2 Off; if T3≤210°F, P1 & R2 resume to Normal

Switch Off P1 when R1, R2, R3 and R4 are all switched Off

Storage Tank Protection: High-Temp. T2≥**140**°F, R1, R2, and P1 Off; if T2≤130°F, R1, R2, R3, R4 and P1 resume to Normal

Syste	em2	
Manual Operation	Status Table	
Parameter Settings	System Diagram	F
06-12-12 00:21	:01 Tuesday	(

Menu for System 2

Click System	12	
Manual Operation	Status Table	PW
Parameter Settings	System Diagram	RL
06-12-12 00:22:4	8 Tuesday	co

Click the "Manual Operation" button to enter the system operation in manual mode



The Controller is now in manual mode once this page is shown. Click the load symbol on the schematic to activate/deactivate pump or valve. When the device is on, the light displays a green color, and then changes to a red color when the device is off.

Upon exit of the Manual Mode the controller will activate the Auto Mode.

System2	Click	
Manual Operation	Status Table	P
Parameter Settings	System Diagram	R
06-12-12 00:25:42	Tuesday	c

Click "Status Table" button to show as below:

Status Table 2		
T1 0 °F T6 0 °F	R1 🔴	
T2 0 °F T7 0 °F	R2 🔴	PW
T3 0 °F	P1 🛑	RL
Heat Gain 0. 0000 MBTU		cc
	Deale	

The actual system temperature, valve, pump status, and the accumulative heat gain will be displayed.

Note: When the lamp is a green color, the value or pump is on; When the Lamp is a red color, the value or pump is off.

	System2	2	
Manual Operatic	on	Status Table	P
Parameter Settin	igs	System Diagram	RI
06-12-12	00:30:28	Tuesday	C

Click the "Parameter Settings" button to show the status:

SOLAR Temper	ature	e Differential Control	
T1-T2> 45	°F	Switch on R1 & P1	
T1-T2< 37	°F	Switch off R1 & P1	PWR
HRU1 Tempera	ture	Differential Control	RUN
T3-T2> 45	°F	Switch on R2 & P1	
T3-T2< 37	°F	Switch off R2 & P1	COM
		Next Back	

The default value of the parameter setting is displayed here. To change the setting, click the cell to input the desired value. To cancel one function, such as "SOLAR Temperature Differential Control", T1-T2>45F change into T1-T2>999F; To resume this function, input the desired value.



Stora C	lick	ction :High Temperatu	re
T2>	140 °F	P1 & R1 & R2 Off	
T2<	130 °F	P1 & R1 & R2 Resu Normal	me to

Storac	ie Tan	k Pro	otecti	on :Hi	gh T ∵n	emper	ature	
T2> T2<				III de Al		140	to Normal	e PWR
	1	2	3	4	5	-		0
	6	7	8	9	0	Esc		RUN
	00	-	-	Clr	En	ter		COM

Input the value and click "Enter"

Samkoon	System	12]
	Manual Operation	Status Table Click	e PWR
	Parameter Settings	System Diagram	O RUN
	06-12-12 00:42:2	1 Tuesday	o co™
		Back	J

Click "System Diagram" to show the system schematics and real-time operation status.



7. System 3 Function Survey

Inputs: 5 Temperature Sensors T1, T2,T3,T4 Outputs: 4 Relays @ 24VAC 200W, 60HZ (relays for solenoid valves) R1, R2, R3, (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ (relays for pump) P1 (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ undesignated

Temperature Differential Control:

SOLAR T1-T2>45°F (Adjustable), Switch On R1 & P1; T1-T2<37°F (Adjustable), Switch Off R1 & P1; HRU 1 T3-T2>45°F (Adjustable), Switch On R1 & R2 & P1; T3-T2<37°F (Adjustable), Switch Off R1 & R2 & P1; HRU 2 T4-T2>45°F (Adjustable), Switch On R1 & R3 & P1; T4-T2<37°F (Adjustable), Switch Off R1 & R3 & P1;

Switch Off P1 when R1, R2, R3 and R4 are all switched Off.

Collector Protection:High-Temp.:T1 \ge 230°F, R1 Off; if T1 \le 210°F, P1 & R1 resume to Normal

HRU 1 Protection: High-Temp.: T3≥230°F, R2 Off; if T3≤210°F, P1 & R2 resume to Normal

HRU 2 Protection: High-Temp.: T4≥230°F, R3 Off; if T4≤210°F, P1 & R3 resume to Normal

Switch Off P1 when R1, R2, R3 and R4 are all switched Off

Storage Tank Protection: High-Temp. $T2 \ge 140^{\circ}F$, R1, R2, R3, R4 and P1 Off; if $T2 \le 130^{\circ}F$, R1, R2, R3, R4 and P1 resume to Normal

System	n 3	
Manual Operation	Status Table	P
Parameter Settings	System Diagram	RI
06-12-12 00:45:1	2 Tuesday	CI

Menu for System 3

Click System 3	}	
Manual Operation	Status Table	PWI
Parameter Settings	System Diagram	RUI
06-12-12 00:45:12	Tuesday	co

Click the "Manual Operation" button to enter the system operation in manual mode

Samkoon R1	T1 0 °F		Back	PWR
Press P1	TANK T2 0°F	HRU 1 T3 0 °F	HRU 2 T4 0°F	RUN
		R2	R3	

The Controller is now in manual mode once this page is shown. Click the load symbol on the schematic to activate/deactivate pump or valve. When the device is on, the light displays a green color, and then changes to a red color when the device is off.

U	oon	exit	of the	Manual	Mode	the	controller	will	activate	the	Auto	Mode.
-	2011	0/11	01 1110	manaai	111000		00110101101	*****	aouvato		/ 1010	mouo.

Manual Operation	Status Table	PV
Parameter Settings	System Diagram	RU
06-12-12 00:4	9:59 Tuesday	co

Click "Status Table" button to show as below:

		Status 1	Table 3		
T1	0 °F	Т6	0 °F	R1 🛑	
T2	0 °F	T7	0 °F	R2 🔴	
Т3	0 °F			R3 🔴	
T4	0 °F			P1 🔴	
Heat (Gain	0.0000	MBTU		
				Back	

The actual system temperature, valve, pump status, and the accumulative heat gain will be displayed.

Note: When the lamp is a green color, the valve or pump is on; When the Lamp is a red color, the valve or pump is off.

Samkoon	System	า 3	
СІ	Manual Operation	Status Table	PWR
	Parameter Settings	System Diagram	RUN
	06-12-12 00:51:3	1 Tuesday	COM
		Back	

Click the "Parameter Settings" button to show the status:

Samkoon				\neg
SOLAR	Temper	ratur	e Differential Control	
T1-T2>	45	°F	Switch on P1 & R1	
T1-T2<	37	°F	Switch off P1 & R1	PWR
HRU1 T	empera	ature	Differential Control	RUN
Т3-Т2>	45	°F	Switch on P1 & R2	
Т3-Т2<	37	°F	Switch off P1 & R2	COM
			Next Bac	<
Samkoon				
	_			
Samkoon HRU2	Fempera	ature	Differential Control	
Samkoon HRU2 T T4-T2>	Fempera 45	ature °F	Differential Control Switch on P1 & R3	
Samkoon HRU2 T T4-T2> T4-T2<	Fempera 45 37	ature °F °F	Differential Control Switch on P1 & R3 Switch off P1 & R3	PWR
Samkoon HRU2 T T4-T2> T4-T2< Collect	Fempera 45 37 or Prote	°F °F °F	Differential Control Switch on P1 & R3 Switch off P1 & R3	PWR
Samkoon HRU2 T T4-T2> T4-T2< Collect T1> 2	Tempera 45 37 or Prote 30 °F	°F °F ction	Differential Control Switch on P1 & R3 Switch off P1 & R3 :High Temperature R1 Off	PWR RUN
Samkoon HRU2 T T4-T2> T4-T2< Collect T1> 2 T1< 2	Gempera 45 37 or Prote 30 °F 10 °F	ature °F °F ection	Differential Control Switch on P1 & R3 Switch off P1 & R3 High Temperature R1 Off R1 Resume to Normal	PWR PWR RUN COM
Samkoon HRU2 T T4-T2> T4-T2< Collect T1> 2 T1< 2	Cempera 45 37 or Prote 30 °F 10 °F	°F °F ction	Differential Control Switch on P1 & R3 Switch off P1 & R3 High Temperature R1 Off R1 Resume to Normal Next Back	PWR PWR RUN COM

The default value of the parameter setting is displayed here. To change the setting, click the cell to input the desired value. To cancel one function, such as "Collector Protection: High Temperature", T1>230F change into T1>999F; To resume this function, input the desired value.



HR	U 2 Pr	otect	ion :	High T	emp	eratur	e	
T4 T4	. MA	<u>4</u> 1: 655	35	MTN	: U	230	Normal	e Pwr
	1	2	3	4	5	-		0
	6	7	8	9	0	Esc		KUN
	00	-	-	Clr	En	ter		COM
							Beak	

Input the value and click "Enter"

System	13	
Manual Operation	Status Table Click	P
Parameter Settings	System Diagram	RI
06-12-12 01:02:2	6 Tuesday	C

	T1 0 °F		Баск	
R1				e Pwr
	TANK	HRU 1	HRU 2	RUN
	T2 0°F	T3 0 °F	T4 0 °F	
P1		R2	R3	COL

7. System 4 Function Survey

Inputs: 5 Temperature Sensors T1, T2, T3, T4, T5

Outputs: 4 Relays @ 24VAC 200W, 60HZ (relays for solenoid valves) R1, R2, R3, R4 (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ (relays for pump) P1 (L,N terminal)

1 Relay @ 24VAC 200W, 60HZ undesignated

Temperature Differential Control:

SOLAR T1-T2>45°F (Adjustable), Switch On R1 & P1; T1-T2<37°F (Adjustable), Switch Off R1 & P1; HRU 1 T3-T2>45°F (Adjustable), Switch On R1 & R2 & P1; T3-T2<37°F (Adjustable), Switch Off R1 & R2 & P1; HRU 2 T4-T2>45°F (Adjustable), Switch On R1 & R3 & P1; T4-T2<37°F (Adjustable), Switch Off R1 & R3 & P1; HRU 3 T5-T2>45°F (Adjustable), Switch On R1 & R4 & P1; T5-T2<37°F (Adjustable), Switch Off R1 & R4 & P1; Switch Off R1 & R4 & P1; Switch Off R1 & R4 & P1;

Collector Protection:High-Temp.:T1 \geq 230°F, R1 Off;if T1 \leq 210°F, P1 & R1 resume to Normal

HRU 1 Protection: High-Temp.: T3≥230°F, R2 Off; if T3≤210°F, P1 & R2 resume to Normal

HRU 2 Protection: High-Temp.: T4≥230°F, R3 Off; if T4≤210°F, P1 & R3 resume to Normal

HRU 3 Protection: High-Temp.: T5 \geq 230°F, R4 =Off; if T5 \leq 210°F, P1 & R4 resume to Normal

Switch Off P1 when R1, R2, R3 and R4 are all switched Off

Storage Tank Protection: High-Temp. T2 \geq 140°F, R1, R2, R3, R4 and P1 Off; if T2 \leq 130°F, R1, R2, R3, R4 and P1 resume to Normal

	Syste	em 4	
F	Manual Operation	Status Table	PW
	Parameter Settings	System Diagram	RUI
	06-12-12 01:04	:31 Tuesday	co

Menu for System 4

Samkoon			h
	Click Syste	em 4	
	V Manual Operation	Status Table	PWR
	Parameter Settings	System Diagram	RUN
	06-12-12 01:05	:58 Tuesday	COM
		Back	

Page 27 of 34 pages



Click the "Manual Operation" button to enter the system operation in manual mode.

The Controller is now in manual mode once this page is shown. Click the load symbol on the schematic to activate/deactivate pump or valve. When the device is on, the light displays a green color, and then changes to a red color when the device is off.

Upon exit of the Manual Mode the controller will activate the Auto Mode.

Manual Operation	Status Table	PWR
Parameter Settings	System Diagram	o Run
06-12-12 01:08	:39 Tuesday	COM

Click "Status Table" button to show as below:



The actual system temperature, valve, pump status, and the accumulative heat gain will be displayed.

Note: When the lamp is a green color, the value or pump is on; When the Lamp is a red color, the value or pump is off.

System	ו 4	
Manı	Status Table	Р
Parameter Settings	System Diagram	RI
06-12-12 01:10:	13 Tuesday	C
	Back	

Click the "Parameter Settings" button to show the status:

SOLAR Temperature	e Differential Control	
T1-T2>= 45 °F	Switch on R1 & P1	
T1-T2< 37 °F	Switch off R1 & P1	PWR
HRU1 Temperature	Differential Control	RUN
T3-T2>= 45 °F	Switch on R2 & P1	•
T3-T2< 37 °F	Switch off R2 & P1	CON

		Contraction of the local division of the loc
T4-T2> 45 °F	Switch on R3 & P1	•
T4-T2< 37 °F	Switch off R3 & P1	PWR
HRU3 Temperature [Differential Control	O RUN
T5-T2> 45 °F	Switch on R4 & P1	•
T5-T2< 37 °F	Switch off R4 & P1	COM
	14-12 45 F T4-T2 37 °F HRU3 Temperature I T5-T2> 45 °F T5-T2<	T4-T245FSwitch off R3 & P1T4-T237°FSwitch off R3 & P1HRU3 Temperature Differential ControlT5-T2>45°FSwitch on R4 & P1T5-T2<



The default value of the parameter setting is displayed here. To change the setting, click the cell to input the desired value. To cancel one function, such as "Collector Protection: High Temperature", T1>230F change into T1>999F; To resume this function, input the desired value.

	High Temperature	tion :F	1 Prote	HRU 1
	R2 Off	F	230	Т3>
Р	R2 Resume to Normal	Ϋ́F	210	тз<
RI	High Temperature	tion :H	2 Prote	HRU 2
	R3 Off	°F	230	T4>
CC	R3 Resume to Normal	°F	210	T4<
	R3 Off R3 Resume to Normal	°F °F	230 210	T4> T4<



HRU	3 Pro	tectio	n :H	iah Te	mpe	rature	al	
T5>	MA	X: 655	35	MIN	: 0	230	lormal	e Pwr
154	1	2	3	4	5	-		0
	6	7	8	9	0	Esc		RUN
	00	-	_	Clr	En	ter		COM
<u> 1</u>			<u></u>				Back	

Input the value and click "Enter"

System 4					
Manual Operation	Status Table Click	e PWR			
Parameter Settings	System Diagram	RUN			
06-12-12 01:17	:41 Tuesday	COM			
	Back				

Click "System Diagram" to show the system schematics and real-time operation status.



System 4		
Manual Operation	Status Table	e PW
Parameter Settings Click	stem Diagram	RUI
06-12-12 01:10:02	Tuesday	co

Click Time to calibrate the Time, Date and Operating Hours

Time ,	Date and	Operati	ng Hou	Irs	
12 Y	'ear 6	Month	5	Day	PW
13 H	lour 34	Minute	10	Second	RUI
Week	2				col