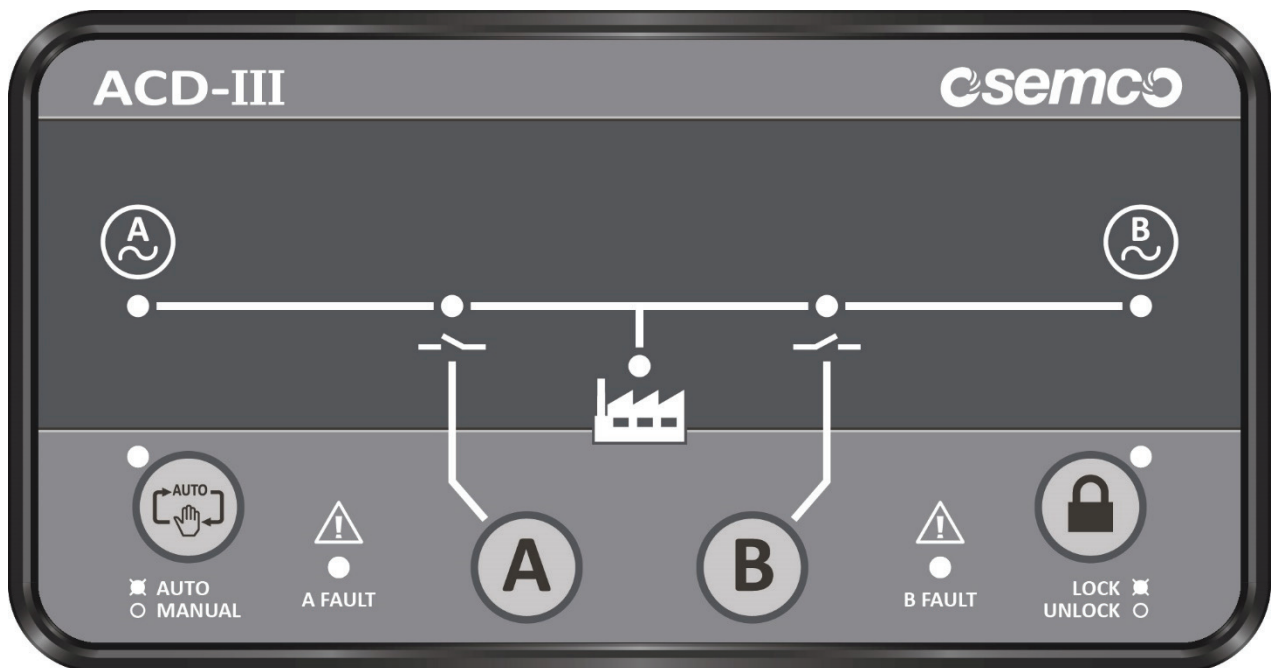


ATS CONTROLLER

[ACD-III], [ACD-III-C]

User's Manual



O-Sung Electric Machinery Co., Ltd.

136, Hataemal-gil, Wollong-Myeon Paju-si, Gyeonggi-do, Korea

Tel : (031) 944-3521 / Fax : (031) 944-3525

<http://www.osemco.com> / ousung@chol.com

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1. Safety Notice

These Safety Notice describes the important information for operator's safety. Before commencing installation or operation of this equipment, please read all notices carefully and note the details.

These safety notice are classified as "Danger" and "Caution" according to the hazard level.



Danger

Emergency situation, which may cause death of serious disaster if there is mistake



Caution

A potentially problematic situation, which may cause slight personal injury and/or damage

1.1 Transportation Precaution



Caution

- Do not throw controller or put heavy weight things on the box.
- Do not use knife or sharp tools once open the box.

1.2 Installation Precaution



Caution

- Installation should be performed by qualified persons.
- Prior to commencing any installation, make open the circuit breaker of upstream to isolate all power/voltage sources.
Otherwise, electric shock may occur.
- Screws of terminal should be tighten as strong as specified torque.
Otherwise, fire may occur.
- Controller should be installed solidly on the flat surface.
- Do not install where environmental conditions of high tempered, humid, dusty, noxious gas, vibration, impact.
Otherwise, fire and malfunction may occur.
- Be careful to prevent foreign materials of dust, concrete powder, iron powder and rainwater, salinity from entering into the controller.
Otherwise, fire and malfunction may occur.

1.3 Operation Precaution

- Do not touch the main circuit and control terminal while power activated.

Otherwise, electric shock may occur.



Danger

- Do not store at outdoor non-controlled.

This can cause the electric shock, damage or fire due to penetration of water or water vapor.

1.4 Precaution of Maintenance, Inspection and Replacement.

- Maintenance, inspection or replacement of components should be performed by qualified persons



Caution

- Prior to commencing any works, make open the circuit breaker of upstream to isolate main circuit and control circuit from all power/voltage sources.

Otherwise, electric shock may occur.

- Retighten the terminal screws of main and wiring periodically according to specified torque.

Otherwise, malfunction or fire may occur.

2. Construction of Controller

2.1 Specifications

- 1) Overall dimensions : (W) 169.3mm x (H) 88.7mm X (D) 56.8mm
- 2) Weight : 1.0 kg
- 3) Ambient temperature : -25°C ~ 70°C
- 4) LED display : High brightness LED
- 5) Voltage input : A-POWER 3P4W 380/220V / L-N 110[V] ~ 270[V] / 50[Hz] ~ 60[Hz].
B-POWER 2P / L-N 110[V] ~ 270[V] / 50[Hz] ~ 60[Hz].
- 6) ATS control relay : 250[VAC] 16[A] 2a, 250[VAC] 10[A] 1c
- 7) Contacts input : (2) contacts for ATS status
- 8) Communication protocol : RS485 (ACD-III-C)

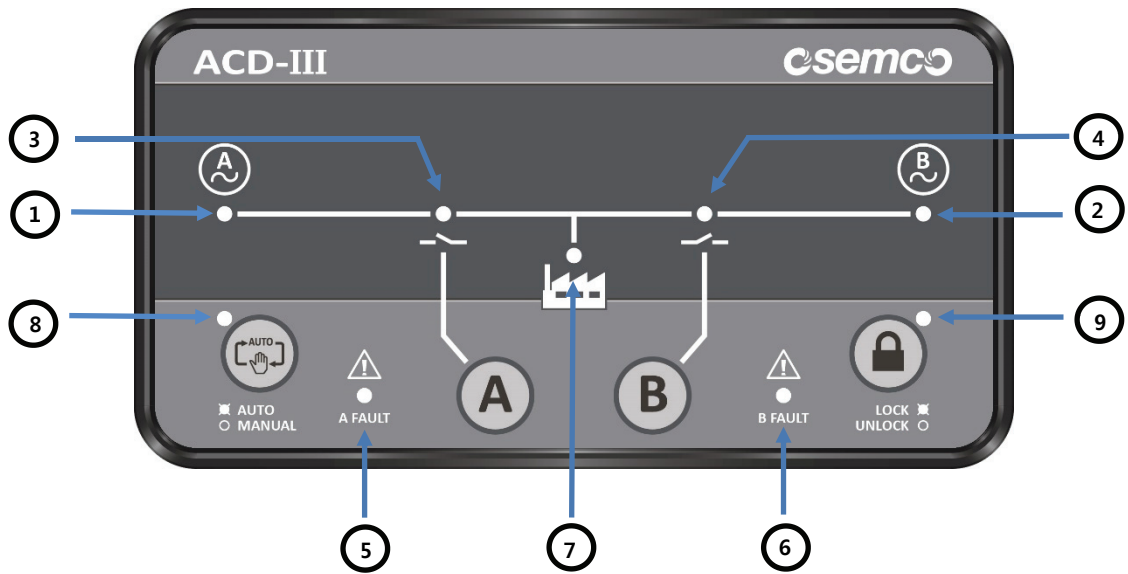
2.2 Optional specification

- 1) **ACD-III** : Basic function (ATS A <-> B control)

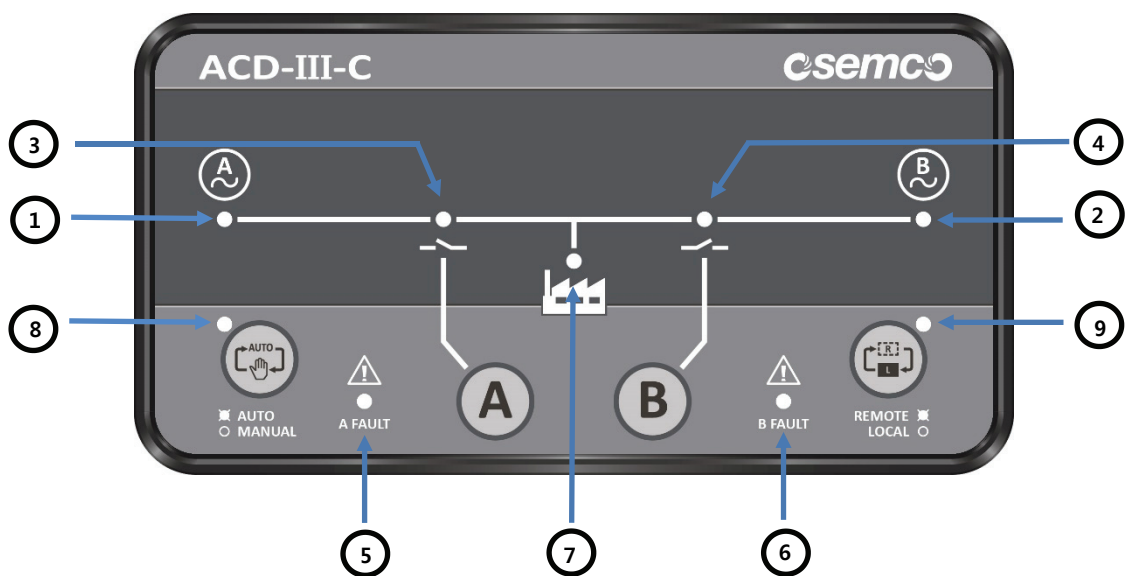
2) **ACD-III-C** : Basic function + RS485 communication protocol

2.3 External view

2.3.1 ACD-III (Basic)








2.3.2 ACD-III-C (RS485 protocol)



2.4 LED Display

No	LED	Color	Functions
①	A-POWER	Green	Indicating lamp lights while A-Power is normal Indicating lamp off when A-Power is blackout Indicating lamp flickering in 0.1sec interval when A-Power is abnormal(Over/under voltage, Over/under frequency)
②	B-POWER	Red	Indicating lamp lights while B-Power is normal Indicating lamp off when B-Power is blackout Indicating lamp flickering in 0.1sec interval when B-Power is abnormal(Over/under voltage, Over/under frequency)
③	A ON	Green	Lamp lights while A-Power of ATS is closed, and lamp off when B-Power is closed. Lamp flickering in 0.25sec interval when ATS is synchronized transferring from B-Power to A-Power.
④	B ON	Red	Lamp lights while B-Power of ATS is closed, and lamp off when A-Power is closed. Lamp flickering in 0.25sec interval when ATS is synchronized transferring from A-Power to B-Power.
⑤	A FAULT	Red	Lamps lights under A-Power is abnormal condition(Over/under voltage, Over/under frequency) Lamp flickering once failure of closing or open A-Power.
⑥	B FAULT	Red	Lamps lights under B-Power is abnormal condition(Over/under voltage, Over/under frequency) Lamp flickering once failure of closing or open B-Power.
⑦	LOAD	White	Lamp lights while ATS is closed to normal power source.
⑧	AUTO / MANUAL	Green	Lamp lights under auto operation mode [AUTO], and lamp off under manual operation mode [MANUAL]
⑨	LOCK / UNLOCK (ACD-III)	White	Lamp lights under control lock status [LOCK], and lamp off under control unlock status [UNLOCK]
	LOCAL / REMOTE (ACD-III-C)	White	Under local control status lamp lights [LOCAL], and lamp off while remote control selected [REMOTE]

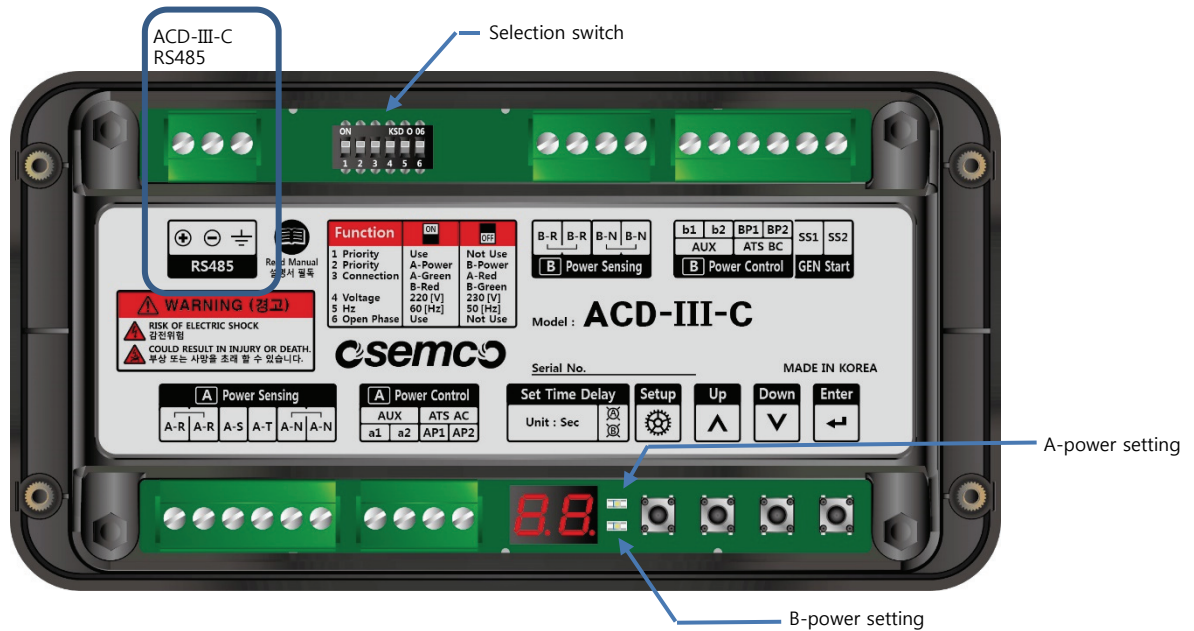
2.5 Function Button

Button Symbol	Function	Decription
	A-POWER ON	A-power Closing Note 1)
	B-POWER ON	B-power Closing Note 1)
	AUTO/MANUAL	Auto/Manual operation mode change
	LOCK/UNLOCK	Lock/Unlock selection (ACD-III)
	LOCAL/REMOTE (communication option C)	Local/Remote changing Note 2) (ACD-III-C)

Note 1) Button should be pressed for 0.5sec in minimum.

Note 2) If Remote selected, control and set up shall be available over the remote control while RS485 protocol activated. The communication protocol is optional parts, and option C should be marked once ordered.

2.6 Rear view



2.7 Terminal configuration

A Power Sensing			
	A-R, A-R	A-power voltage input* 3P4W 380/220V	A-power sensed input voltage (AC 380/220V or 400/230V)
	A-S		
	A-T		
	A-N, A-N		

* Please do not test for voltage withstand because surge protective varistor is built.

A Power Control			
	a1	Contact input	Connect auxiliary contacts of ATS under A power closing status*
	a2	A-power closing output	A-power Closing signal output. (dry contact)
	AP1		
	AP2		

* Do not connect other circuit than ATS AUX because self-power is generated. Otherwise malfunction or damage may occur.

B Power Sensing			
	B-R, B-R	B-power voltage input* 3P, 220V	B-power sensed input voltage (AC 220V or 230V)
	B-N, B-N		

* Please do not test for voltage withstand because surge protective varistor is built.

B Power Control			
	b1	Contact input	Connect auxiliary contacts of ATS under B power closing status※
	b2		
	BP1	B-power closing output	B-power Closing signal output. (dry contact)
	BP2		
	SS1	Output generator start	Signal output once A-power abnormal (dry contact)
	SS2		

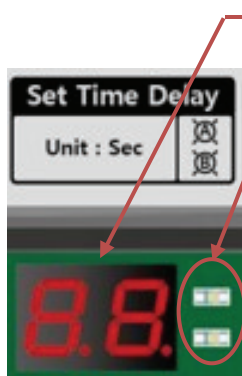
※ Do not connect other circuit than ATS AUX because self-power is generated. Otherwise malfunction or damage may occur.

2.8 Setting switches

No	PARAMETER SETTING		
1	Priority use	Use ※	Use power priority or not
		Not Use	
2	Priority power	A-Power※	What power priority, A-power or B-power
		B-Power	
3	Connection of ATS main circuit	A-Green / B-Red※	ATS bus-bar: A-Utility(Green), B-Emergency(Red)
		A-Red / B-Green	ATS bus-bar: A-Emergency(Red), B-Utility(Green)
4	Voltage	220[V] ※	Input voltage
		230[V]	
5	Frequency, Hz	60[Hz] ※	Input frequency
		50[Hz]	
6	Open phase	Use ※	A-power open phase
		Not Use	

Note. ※ is factory configured default

2.9 Setting Time Delay



FND function

- At normal mode [--] shall be shown, and when setting is begin the set time be shown with sec unit.



LED function

- Consist with A power set and B power set, and lamp offed at normal mode, and when setting is begin lamp shall lights as below.

- > A power time delay setting: A lamp lights
- > B power time delay setting: B lamp lights
- > Communication ID setting: A lamp lights
- > Communication speed setting: B lamp lights

2.10 Function of setting button

No	Button		
1		Normal status	When you press manual operation button for 1sec then you may enter setting status note 1)
		Setting status	Go to next menu without record a set value
2			Increase value (99sec max)

3		Decrease value (0sec min)	
4		Normal status	Lamp test will be done when button pressed for 1set under manual operation mode
		Setting status	Go to next menu after record a set value

Note 1) When you press Setup + Down button for 1sec, you may go to setting of communication function.

3. Time switch setting

3.1 Enter menu and setting

- 1) With pressing [Setup] for 1sec under manual operation mode then you may enter time delay menu.
- 2) If you want to record data and go to next menu please press [Enter] button, and you will go to normal mode at last menu.
- 3) If you press [Setup] button while setting, you may go to next menu without data record.
- 4) Order of menu: [Local Manual mode] → [A-power closing time delay] → [B-power closing time delay] → [Local Manual mode]

3.2 A-power closing time delay

- 1) Light A power lamp, B power lamp if off, and current set value shown on FND window.
- 2) Make increase/decrease time set using by [Up], [Down] button.
- 3) By pressing [Enter] button, data is recorded and go to next menu.
- 4) If you press [Setup] button, you will go to next menu without data record.
- 5) Time range settable is 0sec to 99sec.
- 6) Factory configured default is 5sec.

3.3 B-power closing time delay

- 1) A power lamp if off, B power lamp lights, and current set value shown on FND window.
- 2) Make increase/decrease time set using by [Up], [Down] button.
- 3) By pressing [Enter] button, data is recorded and go to next menu.
- 4) If you press [Setup] button, you will go to next menu without data record.
- 5) Time range settable is 0sec to 99sec.
- 6) Factory configured default is 5sec.

4. Communication setting. (ACD-III-C)

4.1 Enter menu and setting

- 1) By pressing [Setup]+[Down] button at manual operation mode you may go to menu.
- 2) If you press [Enter] button while value setting, data will be recorded and move to next menu. At last menu you will go to normal (initial) mode.
- 3) When press [Setup] button, the data did not record and move to next menu.
- 4) Order of menu: [Local manual mode] → [Communication ID setting] → [Communication speed setting] → [Local manual mode]

4.2 Communication ID setting (MODBUS)

- 1) ID will be shown on FND window as in code while A power lamp lights, and B power lamp off.
- 2) Make increase and decrease ID value using by [Up] & [Down] button.
- 3) If you press [Enter] button, set value will be recorded and move to next menu.
- 4) You may go to next menu without data recording once you press [Setup] button.
- 5) Setting range is 1 and 99 in maximum.
- 6) Factory default is 1.

4.3 Communication speed setting (MODBUS Baud rate)

- 1) Set value will be shown on FND window while A power off, and B power lights.
- 2) Make increase and decrease number by [Up] & [Down] button.
- 3) If you press [Enter] button, set value will be recorded and move to next menu.
- 4) You may go to next menu without data recording once you press [Setup] button.
- 5) Set value shall be indicated with code of b1 = 9,600 bps, b2 = 19,200 bps, b3 = 38,400 bps.
- 6) Factory default is b1 = 9,600 bps.

5. Control of ATS

5.1 Local/Remote mode

- 1) You may select by [**Local/Remote**] button.
- 2) Current selected mode shall be recorded on EEP of inter controller. Keep current selected mode once you make re-booting controller again.

5.1.1 Local mode

- 1) LOCAL/REMOTE LED is off.
- 2) Using by ACD-III controller, you may control and operate ATS.

5.1.2 Remote mode

- 1) White color of LOCAL/REMOTE LED lights.
- 2) ACD-III control may not control and operate ATS. (Remote control over RS485 is available)

5.2 LOCK / UNLOCK mode (ACD-III)

- 1) You may change mode using by [**LOCK/UNLOCK**] button.
- 2) Current selected mode shall be recorded on EEP of inter controller. Keep current selected mode once you make re-booting controller again.

5.2.1 UNLOCK mode

- 1) White color of LOCK/UNLOCK LED shall off.
- 2) You may control and operate ATS using by ACD-III controller.

5.2.2 LOCK mode

- 1) White color of LOCK/UNLOCK LED shall lights
- 2) ACD-III control may not control and operate ATS.

5.3 Manual operation

5.3.1 Availability of manual operation

1) Available to control ATS by button operation or RS485 communication.

5.3.2 Manual control

1) A power ON

- ① A power ON is available once only A power is normal status.
- ② While **[A-POWER ON]** button pressed over 0.5sec, ATS transfer power from B-power to A-power.

2) B power ON

- ① B power ON is available once only B power is normal status.
- ② While **[B-POWER ON]** button pressed over 0.5sec, ATS transfer power from A-power to B-power.

5.4 Automatic operation

1) The controller make ATS A-power or B-power ON after time delay while sensing of power condition.

2) Automatic operation:

- ① According to **[Power Priority]** set, ATS will make switching when both power is normal condition.
- ② Once serviced power line is abnormal, and standby power is normal condition, ATS shall be switched to standby line after time delay set.
- ③ If fail to switch, output command again 3times every 3sec, after this controller judge that ATS is failure (FAULT lamp lights)
- ④ Output of closing command shall be kept for 0.5sec.

3) Operation on **[Power Priority]** set

① **[Power Priority] A power selected**

: During B power closed, if A power become a normal condition, ATS will switch to A power from B power.

② **[Power Priority] B power selected**

: During A power closed, if B power become a normal condition, ATS will switch to B power from A power

5.5 Signal output for Generator starting (SS1, SS2)

- 1) Either automatic or manual operation mode, generator starting signal will output when abnormal condition happen on priority source.
- 2) Generator starting signal shall have 3 sec time delay when control power serviced.
- 3) Generator will stop engine after 3 sec once utility power recovered, and if automatic operation mode, shall be switched to priority power before 3 sec time delay.
- 4) Abnormal condition of priority power is failure, over voltage, under voltage, over frequency, under voltage and phase open.
- 5) If no priority power selected, A-power is preferred.

5.6 Voltage & Frequency protection function

1) Voltage protection range

220V basis (tolerance $\pm 2V$)	
Over voltage	Pick up 242V, Return 237V
Under voltage	Pick up 187V, Return 191V

230V basis (tolerance $\pm 2V$)	
Over voltage	Pick up 253V, Return 248V
Under voltage	Pick up 187V, Return 191V

2) Frequency protection range

60Hz basis (tolerance $\pm 0.2Hz$)	
Over frequency	Pick up 65.0Hz, Return 64.0Hz
Under frequency	Pick up 55.0Hz, Return 56.0Hz

50Hz basis (tolerance $\pm 0.2Hz$)	
Over frequency	Pick up 55.0Hz, Return 54.0Hz
Under frequency	Pick up 45.0Hz, Return 46.0Hz

5.7 Open phase protection of A-power

- 1) For protection of S or T of A power, ATS will switch to normal power after generator started under automatic operation mode.
- 2) If open phase on R or N, controller will identify failure of A power, ATS will switch to normal power after generator started under automatic operation mode.
- 3) You may not use open phase protection if you make off of setting switch no. 6

6. Communication protocol

6.1 Specifications for communication

- 1) Type : 2-WIRE RS485 1port
- 2) Protocol : MODBUS / RTU
- 3) Function : REQUEST(04h), COMMAND(05h)
- 4) Channel : 0~99

- 5) Baud rate : 9600[bps], 19200[bps], 38,400[bps]
- 6) Parity : NONE
- 7) Data bit : 8[Bit]
- 8) Stop bit : 1[Bit]
- 9) Minimum communication interval : 250[ms]
- 10) Packet termination time : 5[ms]

6.2 REQUEST(04h)

TX Example: 01 04 00 00 00 14 CRC16 → (20) data from the address 30001.

Address	Item/Description	Data indicate	Data type
30001	ACD controller model 4 : ACD-III-C	4	16bit UNSIGNED INT
30002	A-power voltage	XXX [V]	16bit UNSIGNED INT
30003	B-power voltage	XXX [V]	16bit UNSIGNED INT
30004	A-power frequency	XX.X [Hz]	16bit UNSIGNED INT
30005	B-power frequency	XX.X [Hz]	16bit UNSIGNED INT
30007	ACD status	-	16bit UNSIGNED INT
	Bit 0 : AUTO MODE Bit 1 : REMOTE STATUS Bit 2 : A-power status Bit 3 : B-power status Bit 4 : A power closing status Bit 5 : B power closing status Bit 6 : A power failure status Bit 7 : B power failure status Bit 8 : A power By-Pass status Bit 9 : B power By-Pass status Bit 10 : A protective relay contact input Bit 11 : B protective relay contact input Bit 12 : Reserved Bit 13 : Reserved Bit 14 : Reserved Bit 15 : Reserved		
30008	고장 상태	-	16bit UNSIGNED INT
	Bit 0 : A-power under voltage Bit 1 : A-power over voltage Bit 2 : A-power under frequency Bit 3 : A-power over frequency Bit 4 : A-power relay contact input Bit 5 : A power closing failure Bit 6 : A power open failure Bit 7 : B→A synchronizing failure Bit 8 : B-power under voltage Bit 9 : B-power over voltage Bit 10 : B-power under frequency Bit 11 : B-power over frequency Bit 12 : B-power relay contact input Bit 13 : B power closing failure Bit 14 : B power open failure Bit 15 : A→B synchronizing failure		
30009	A-power closing time delay set value	XX [sec]	16bit SIGNED INT
30010	B-power closing time delay set value	XX [sec]	16bit SIGNED INT
30011	A-power open time delay set value	XX [sec]	16bit SIGNED INT
30012	B-power open time delay set value	XX [sec]	16bit SIGNED INT
30013	Synchronized switching time delay set value	XX [sec]	16bit SIGNED INT
30014	DIP S/W status	-	16bit UNSIGNED INT

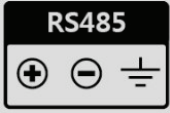



	Bit 0 : PRIORITY USE Bit 1 : PRORITY SET Bit 2 : CONNECTION SET Bit 3 : VOLTAGE Bit 4 : FREQUENCY Bit 5 : SYNC USE Bit 6 : Reserved Bit 7 : Reserved	Bit 8 : Reserved Bit 9 : Reserved Bit 10 : Reserved Bit 11 : Reserved Bit 12 : Reserved Bit 13 : Reserved Bit 14 : Reserved Bit 15 : Reserved		
30015	Over voltage pick up set value		XXX [V]	16bit SIGNED INT
30016	Over voltage return set value		XXX [V]	16bit SIGNED INT
30017	Under voltage pick up set value		XXX [V]	16bit SIGNED INT
30018	Under voltage return set value		XXX [V]	16bit SIGNED INT
30019	Over frequency pick up set value		XX.X [Hz]	16bit SIGNED INT
30020	Over frequency return value		XX.X [Hz]	16bit SIGNED INT
30021	Under frequency pick up set value		XX.X [Hz]	16bit SIGNED INT
30022	Under frequency return set value		XX.X [Hz]	16bit SIGNED INT

6.3 COMMAND(05h)

TX EXAMPLE : 01 05 00 02 FF 00 CRC16 → 0003번지 ATS A측 수동절체 신호

Address	Item	Data
0001	Manual operation mode	0xFF00 Auto clear
0002	Auto operation mode	
0003	A power manual transferring	
0004	B power manual transferring	

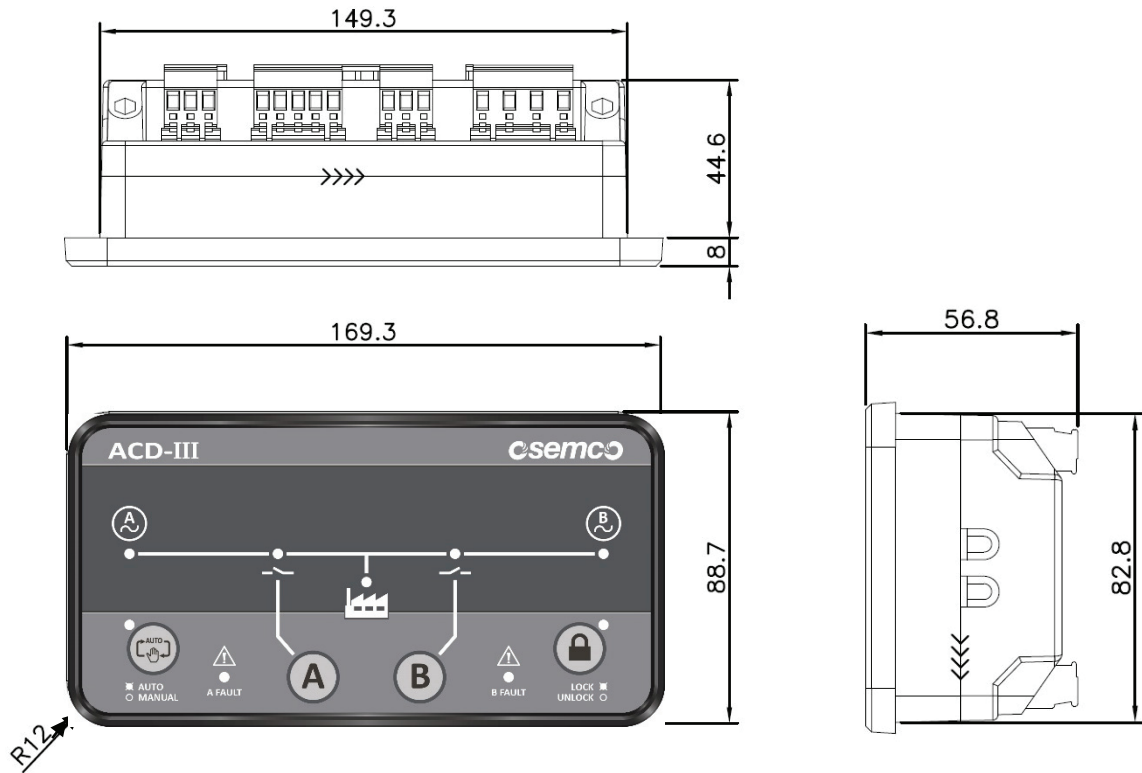
6.3 Terminal for RS485 communication

RS485 (Communication option C)	
	 RS 485 + communication terminal
	 RS 485 - communication terminal
	 System grounding terminal (Shielded cable grounding)

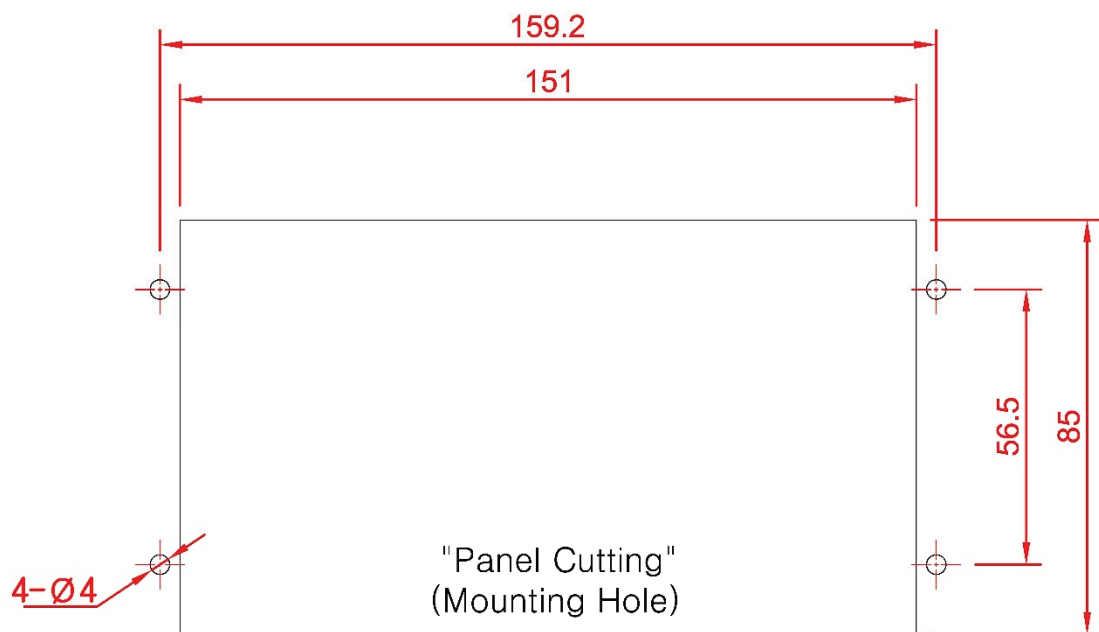
※ Shielded cable shall be used for RS485 communication, and shall be installed at place 1.2m distance from the power cable.

7. Outline dimensions

7.1 Physical size

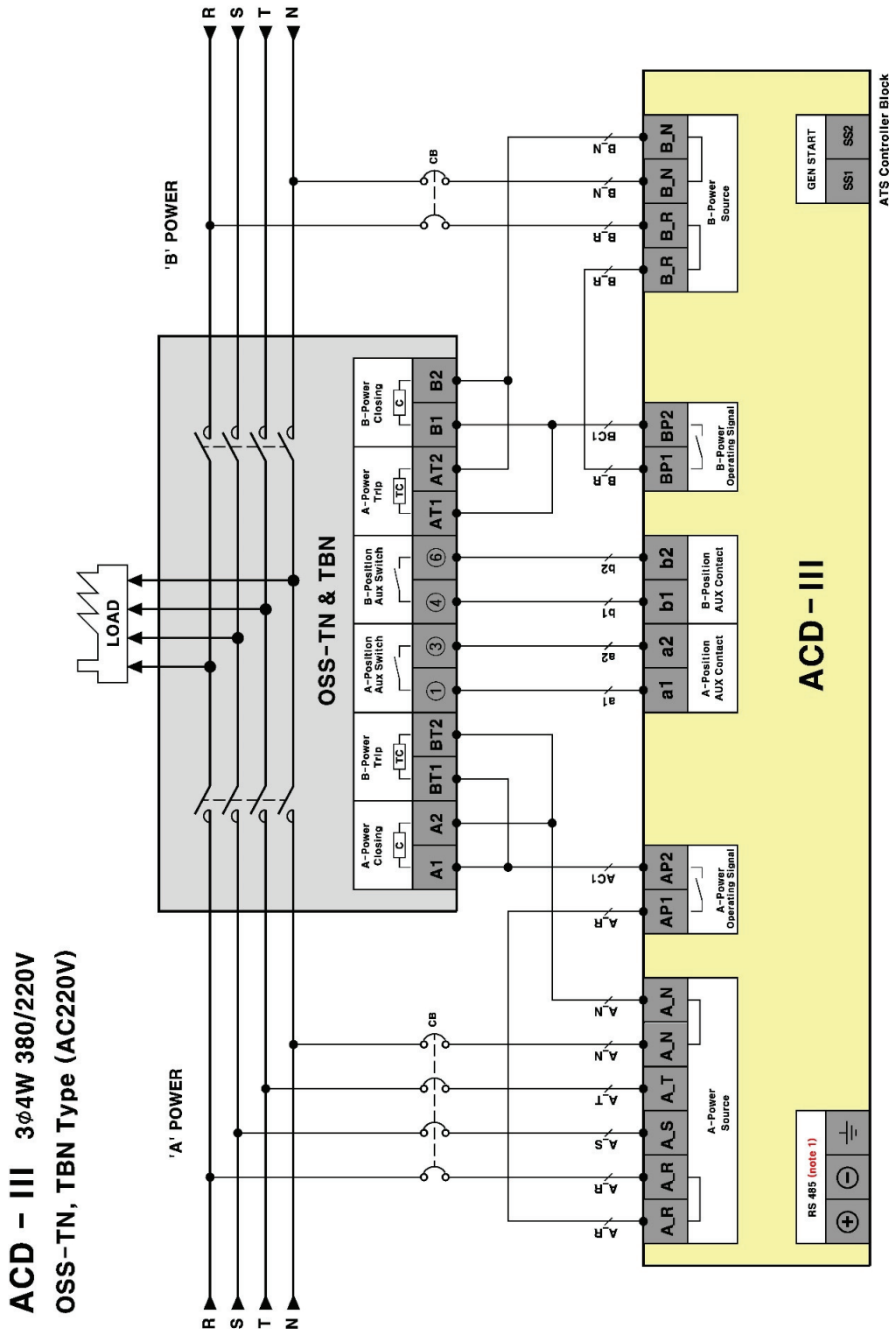


7.2 Panel cutting

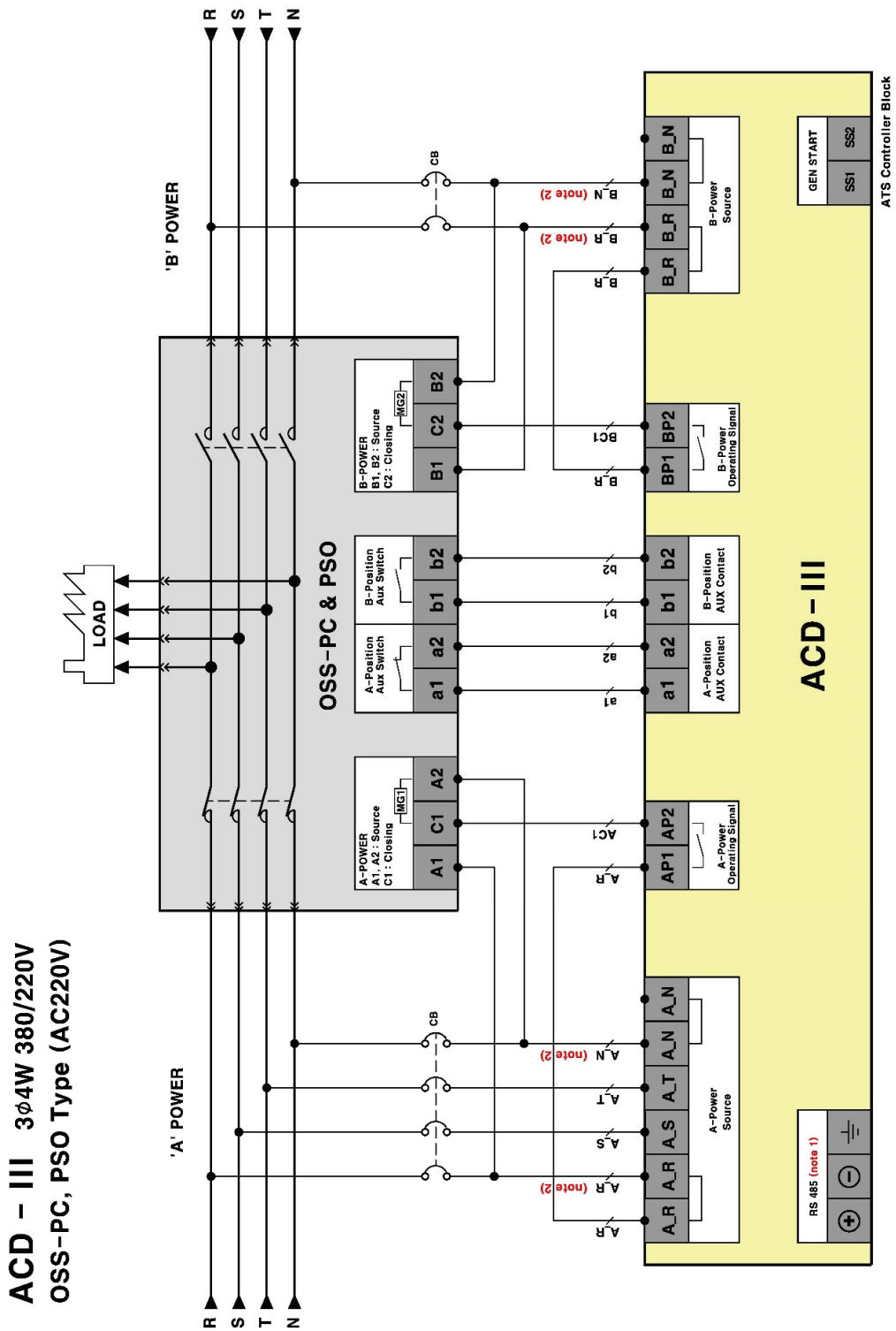


8. Wiring diagram

8.1 T3 & TB3



Note 1) RS485 terminal is for ACD-III-C.



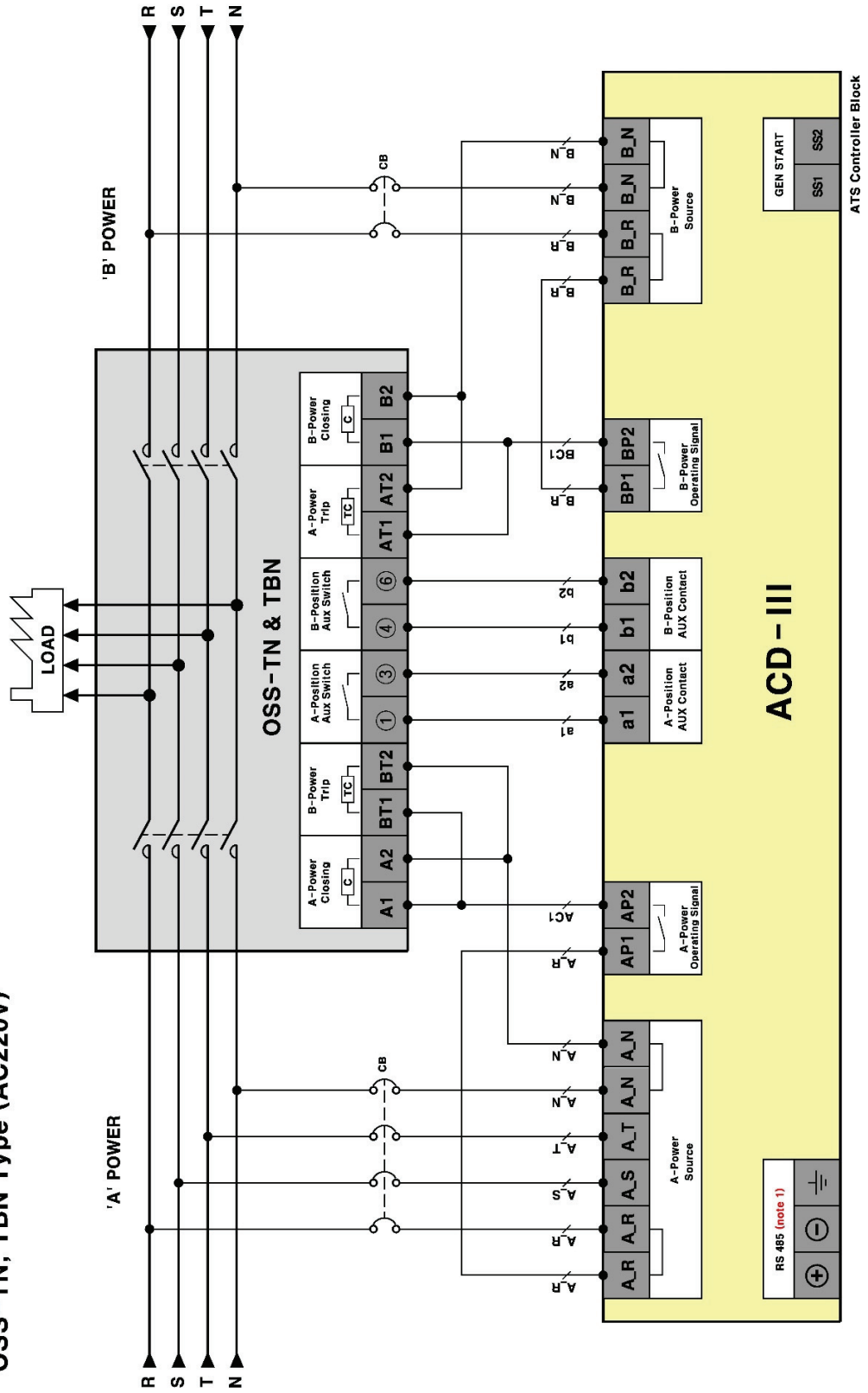
Note 1) RS485 terminal is for ACD-III-C.

Note 2) Please use cable over 2.5mm² for 1600A or lower ATS capacity.

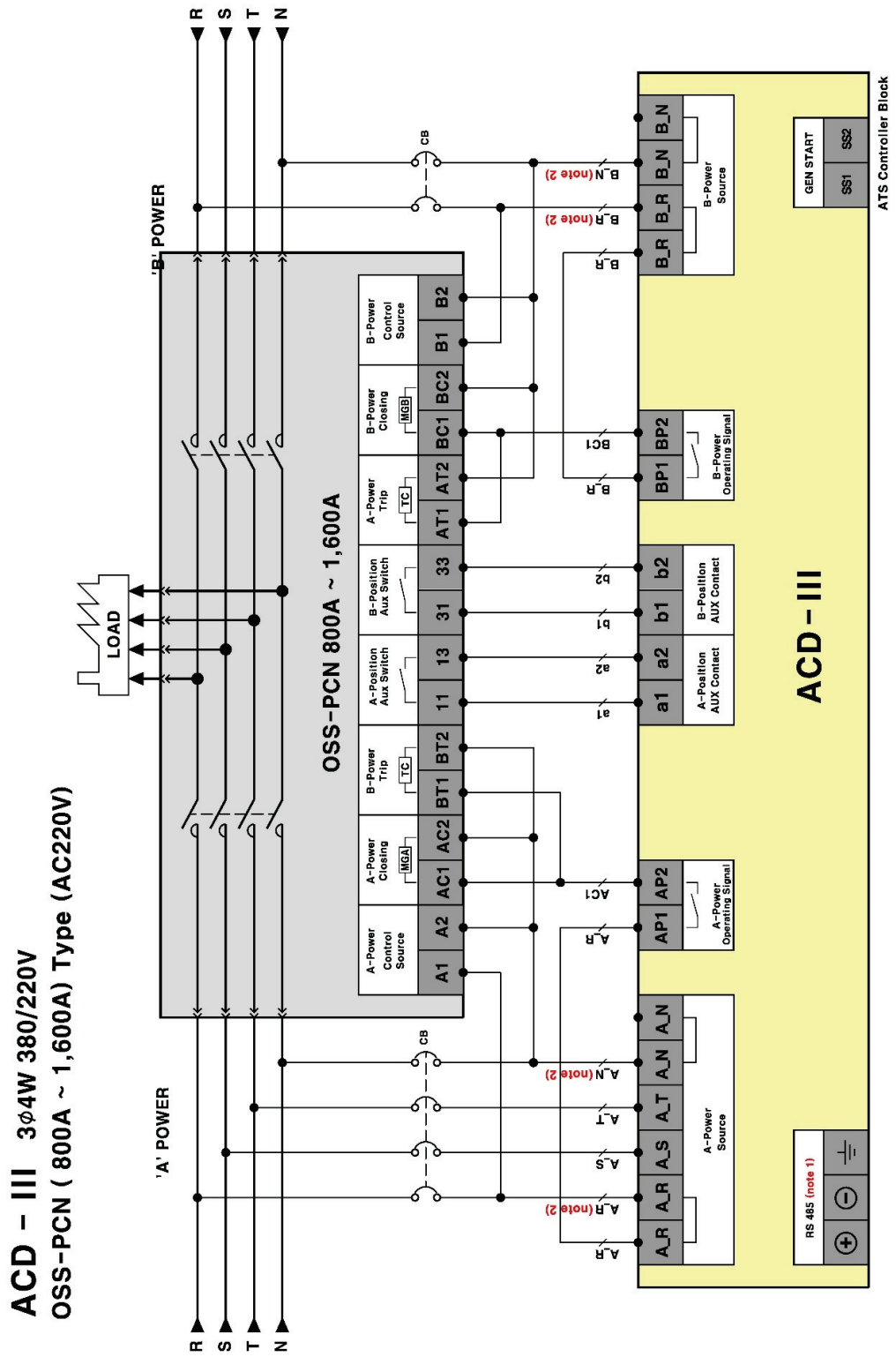
Please use cable over 4.0mm² for 2000A or over ATS capacity.

Please use cable over 6.0mm² for 4000A or over ATS capacity.

**ACD - III 3 ϕ 4W 380/220V
OSS-TN, TBN Type (AC220V)**



Note 1) Terminal is for ACD-III-C.



Note 1) RS#85 terminal is for ACD-III-C.

Note 2) Please use cable over 2.5mm² for 1600A or lower ATS capacity.