



## **SERIES 230 Automatic Transfer Switch C1000 Intelligent Controller User Manual**

Document Version	V2.3
Archive Date	Jan 12 <sup>th</sup> , 2018
BOM Code	31012665

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# Chapter 1 Overview

Series 230 C1000 Intelligent Controller (hereinafter referred to as Controller) is used to control the Series 230 transfer switch. The Controller is designed to control two sources. When either source has over voltage, low voltage, failure, or abnormal frequency, the Controller will instruct the transfer switch to transfer to a better source or transfer to the center-off position in order to protect the load.

Key Controller features include AC voltage & frequency signal acquisition, control signal input/output, user interface (LED indicator lights, DIP switch and push button). The Controller appearance, functions and features, technical parameters, accessory configurations, and size of the Controller will be described in this chapter.

## 1.1 Appearance

Please refer to Fig 1-1 for the appearance of the Controller.

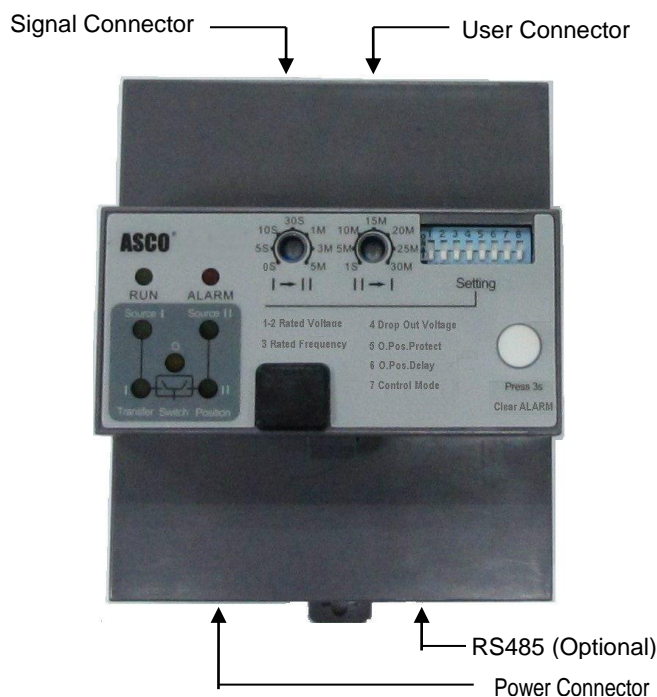


Figure 1-1 Controller Appearance

## 1.2 Functions and Features

- Detecting the voltages, frequencies of two AC input sources, alarming when failures occur as overvoltage, under-voltage, over frequency and under frequency, etc.
- Multiple operating modes: Automatic (Source I Priority, No Source Priority), Remote Control, and Manual.
- Center-off position delay and Center-off position protection.
- Center-off position delay: When the transfer switch transfers the load from one source to another source, the transfer switch should stay in center-off position for a period of time. This center-off position delay time can be settable by user depending on the load characteristics. The default setting is 0 seconds, can be set to 5 seconds, in order to consume the load inertia and protect the load from getting damaged by the inrush current when the load transfers from one source to another source.
- Center-off position protection: When there are abnormalities with both Sources I and Source II, the transfer switch will transfer the load to the center-off position to protect the load from getting damaged.
- Built in abnormal transfer diagnosis capabilities in order to protect the transfer switch.
- Many settable options, including under voltage drop out, over voltage trip, center-off position delay and protection and switching time delays.

- User DI / DO Ports for external monitor and control.
- RS485 Communication Function (Optional).

## 1.3 Technical Parameters

Application condition requirements of C1000 Controller as shown in Table 1-1.

Table 1-1 Application Conditions of C1000

Requirement		Condition	Standards
Temperature	Operating temperature	-20℃ ~ +60℃	IEC61800-1
	Storage temperature	-40℃ ~ +70℃	
	Temperature change	5℃/min	
Humidity		95%, No condensation	IEC60721-3-3 3K3
Altitude		2000m or less	IEC60721-3-3 3K3
Vibration		5~9, 9~200Hz, 3.5mm, 10m/s <sup>2</sup> , 5sweep cycles, 1oct/min	IEC60721-3-3 3M4
Shock		Sinusoidal, 15g, 6ms, 3 times/direction	IEC60721-3-3 3M4

There are 6 part numbers for C1000 controller according to the rating operation voltage as shown in Table 1-2, Technical parameters of C1000 controller are shown in Table 1-3, Ratings Voltage Configuration Description and Number of Poles are shown in Appendix 1.

Table 1-2

		208V C1000 Controller		220V C1000 Controller		380V C1000 Controller	
ENP P/N (With Packaging and Accessories)		02311784	02311790	02311785	02311791	02311786	02311792
Rating Voltage	208V	√	√				
	220V/230V/240V			√	√		
	380V/400V/415V					√	√
With RS485 Communication Function			√		√		√
ENP P/N ( Without Packaging and Accessories)		02311666	02311648	02311647	02311789	02311788	02311787

Table 1-3 Technical Parameters of C1000 controller

Item	Parameter	Notes
Rated Operating Voltage (Ue)	208Vac	208V C1000 Controller
	220Vac: Can setting to 230Vac and 240Vac	220V C1000 Controller
	380Vac: Can setting to 400Vac and 415Vac	380V C1000 Controller
Operating Voltage Range	156~250Vac	208V C1000 Controller
	154~288Vac	220V C1000 Controller
	266~480Vac	380V C1000 Controller
Rated Operation frequency	50Hz / 60Hz	All C1000 Controllers
Rated insulation impulse withstand voltage	6kV for AC circuitry / 1.5kV for DC circuitry	All C1000 Controllers
Protection class of enclosure	IP20	All C1000 Controllers
Pollution degree	3	All C1000 Controllers
Overvoltage class	Distribution level, Industrial conditions.	All C1000 Controllers
Lightning tolerability level	AC input: 8/20us impulse current waveform, 20kA 10 times, 40kA 1 time, L-PE. More than 1 minute between two impulses. <sup>note 1</sup>	All C1000 Controllers
	Signal IO: 8/20us impulse current waveform, differential-mode 3kA, common-mode 5kA, 10 times. <sup>note 2</sup>	All C1000 Controllers

Note 1: Test with class C SPD. No power down, no damage and no performance degradation during test.

Note 2: Only for 485 port, GEN and FIRE port.

Detectable range and accuracy of C1000 controller are shown in Table 1-4.

Table 1-4 Detect Range and Detect Accuracy

Signal to be Detected	Accuracy	Detectable Range	Notes
AC Voltage	±3%	156~250Vac	208V C1000 Controller
		154~288Vac	220V C1000 Controller
		266~480Vac	380V C1000 Controller
AC Frequency	±1%	45Hz ~ 65Hz	All C1000 Controllers

Electromagnetic interference performance parameters of C1000 controller are shown in Table 1-5.

Table 1-5 Electromagnetic Interference Performance Parameters

Item	Requirements	Standard
Conducted disturbance emission	Class A	EN 55022
Radiation disturbance emission	Class A	EN 55022
Harmonic current emission	Class A	EN61000-3-2
Voltage fluctuations and flicker	Class A	EN61000-3-3

Electromagnetic immunity performance parameters of C1000 controller are shown in Table 1-6.

Table 1-6 Electromagnetic Immunity Performance Parameters

Item	Requirements & Criterion	Standard
Surge immunity	Criterion: A Line to Ground: 2kV Line to Line: 1kV	EN 61000-4-5
Immunity to Electrical Fast Transient	Level 3 Criterion: A Power Port: 2kV Signal Port: 1kV	EN 61000-4-4
Immunity to Electrostatic Discharge	Criterion: A Contact discharge: 4kV Air discharge :8kV	EN 61000-4-2
Immunity to Radiated Electric Fields	Criterion: A 10V/m, 80MHz - 1GHz	EN 61000-4-3
Immunity to Continuous Conducted Interference	Criterion: A Power Port: 10V Signal Port: 10V, 150 kHz - 80MHz	EN 61000-4-6
Immunity to Power Frequency Magnetic Field	Criterion: A Enclosure Port: 30A/m	EN 61000-4-8
Immunity to Voltage dips and Short Interruptions	Criterion: B 0% 10ms, 20ms Criterion: C 70% 500ms, 0% 5000ms	EN 61000-4-11
Immunity to Harmonic	Criterion: A Power Port: Class 3	EN 61000-4-13

Certification requirements of C1000 controller are shown in Table 1-7.

Table 1-7 Certification Requirements

Certification Categories	Standard
CE	EN60947-6-1
IEC	IEC60947-6-1

## 1.4 Accessory Information

Please check and make sure you have received all the accessory items in Table 1-8. These are included as standard with your C1000 Controller.

Table 1-8 Accessories included with Standard C1000 Controller

Standard Accessory Description	Model / Specification	Part Number	Quantity	Comments
Grounding Cable	LTSC1000SL1	04110332	1	Length: 200mm

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Note: Controller Power & Signal Cables are included with the ASCO Series 230 Transfer Switch Unit packaging.



## 1.5 C1000 Controller Dimensions

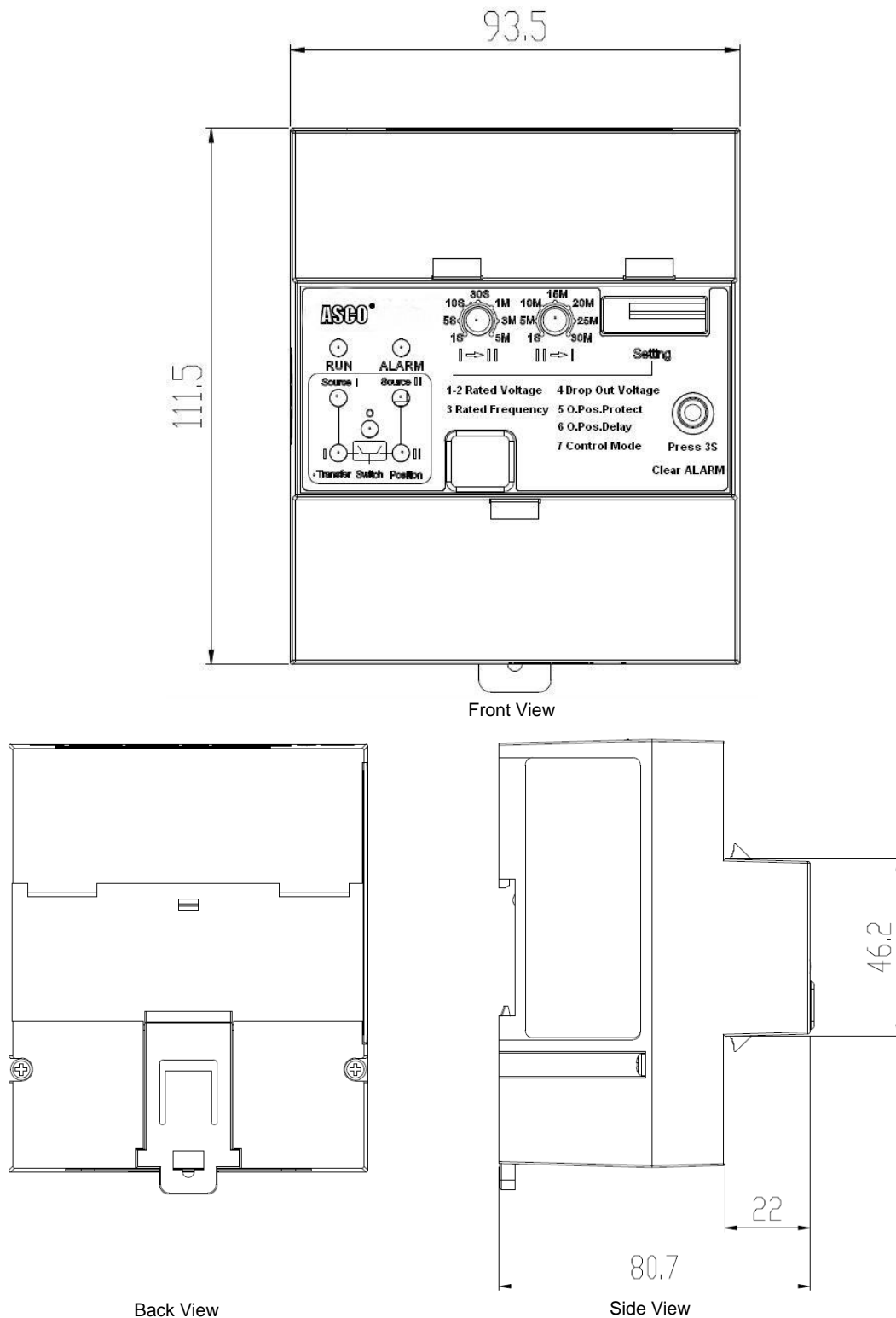


Figure 1-2 Controller Dimensions (mm)

## Chapter 2 Installation and Wiring



### DANGER

DANGER is used in this manual to warn of a hazard situation which, if not avoided, will result in death or serious injury.



### WARNING

WARNING is used in this manual to warn of a hazardous situation which, if not avoided, could result death or serious injury.



### CAUTION

CAUTION is used in this manual to warn of a hazardous situation which, if not avoided, could result in minor or moderate injury.

### NOTICE

NOTICE is used in this manual to comments or suggestion of a fault situation which, if not avoided, could result in fault.

An experienced licensed electrician must install the ATS.

Each automatic transfer switch contains a rating label (Name plate) to define the loads (Ampere rating). Refer to the label on the transfer switch for specific values.



### WARNING

**Do not exceed the values on the rating label.**  
**Exceeding the rating can cause personal injury or serious equipment damage.**

This chapter introduces the installation and wiring of the Controller.



### WARNING

1. The controller should be installed with the faceplate on the outside of the panel.
2. When doing any maintenance, Controller **MUST BE** disconnected from all power sources.
3. Make sure the Controller is properly grounded with the Grounding Cable included with the Controller.
4. In order to avoid static buildup that can damage the controller electronics, the operators should wear an antistatic device.



### WARNING

This is a class A product, In a domestic environment this product may cause radio interference in which case the user may be required to take adequate

## 2.1 Installation

### 2.1.1 Controller Installation in Cabinet Panel

1. Push the Controller into the opening of the cabinet front panel, as shown in Fig. 2-1.

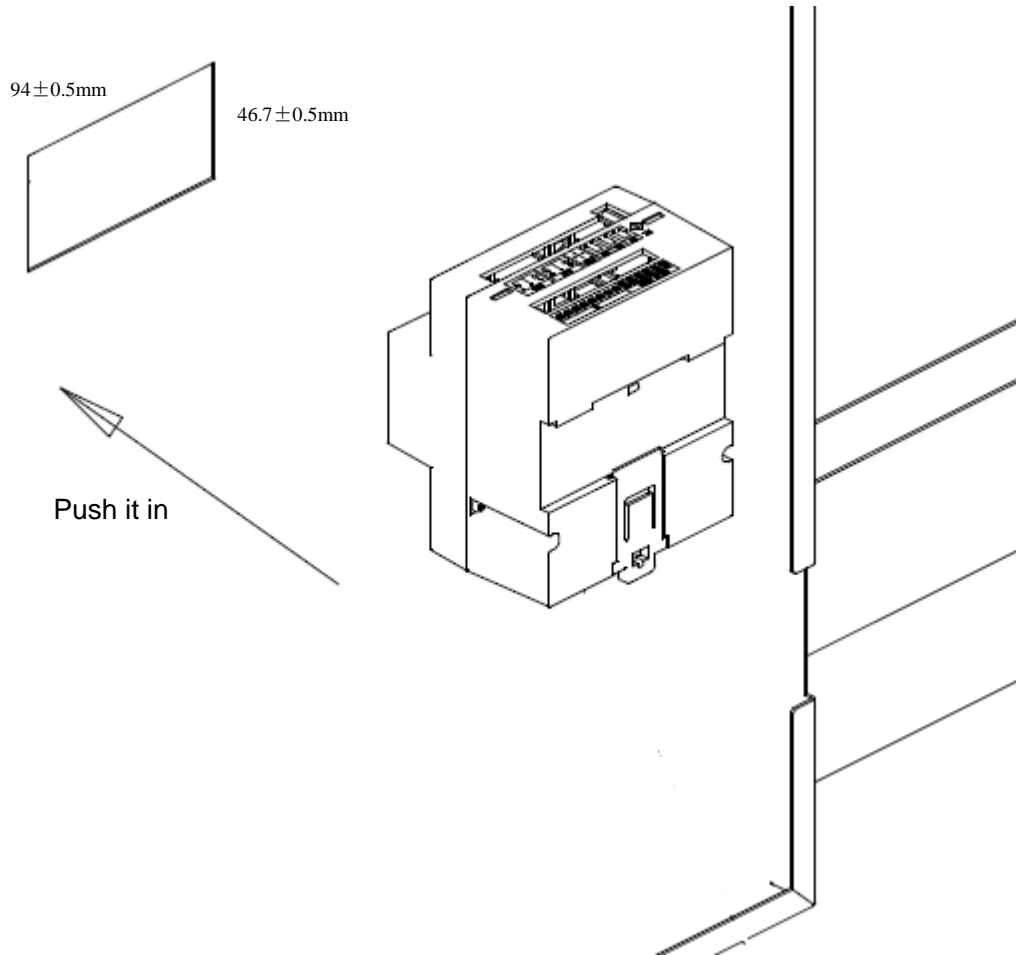


Figure 2-1 Schematic Diagram of Pushing the Controller into the Front Panel

2. Next, make sure the clip on the neck of the Controller is in place and snaps into position while pushing, meanwhile make it tightly connects with the cabinet panel as shown in Fig. 2-2.

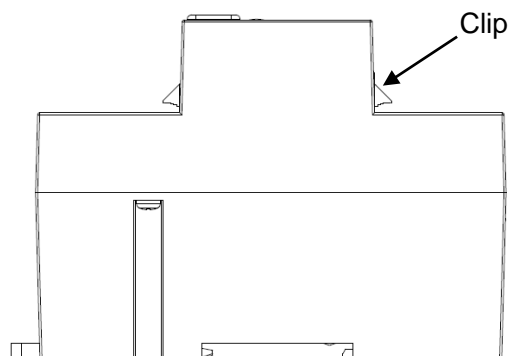


Figure 2-2 Chip on the neck

### 2.1.2 Din Rail Installation

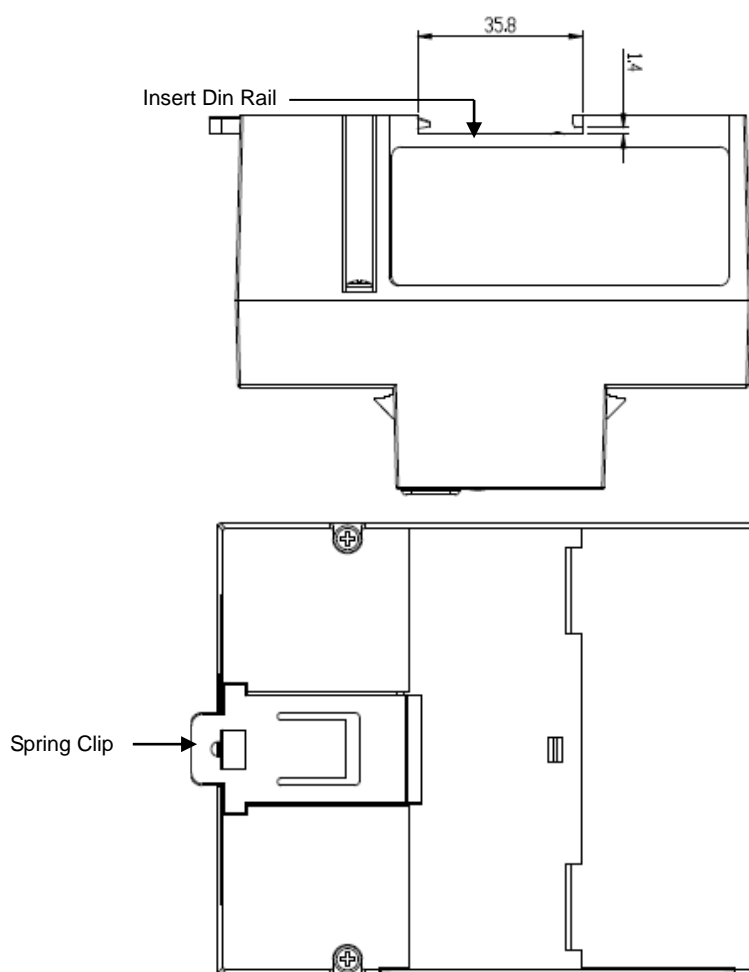


Figure 2-3 Dimensions of Din Rail installation(mm)

### 2.1.3 Controller Wiring

Use the grounding cable provided with the C1000 Controller to connect the grounding port located on the side of the Controller and the grounding port on the cabinet.

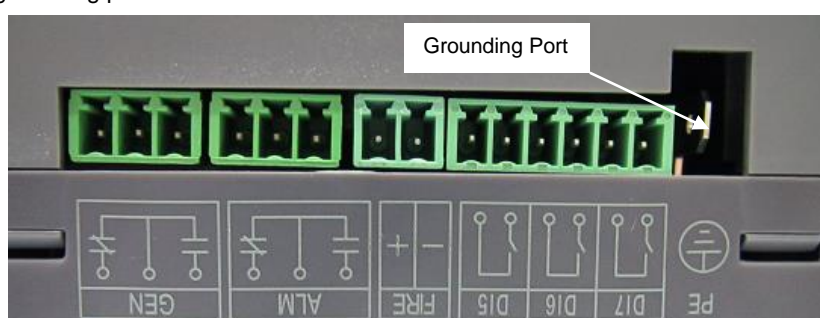


Figure 2-4 Grounding Port on C1000 Controller



#### WARNING

Grounding is very important in order to protect the automatic transfer switch (switch and controller) from electrical disturbances, lightning, electromagnetic disturbances, etc.

Use the two connection cables in the transfer switch package box to connect with the controller and the switch respectively. The 6-core cable connects to the power port, and the other cable connects to the control port, as shown in Figure 2-5.

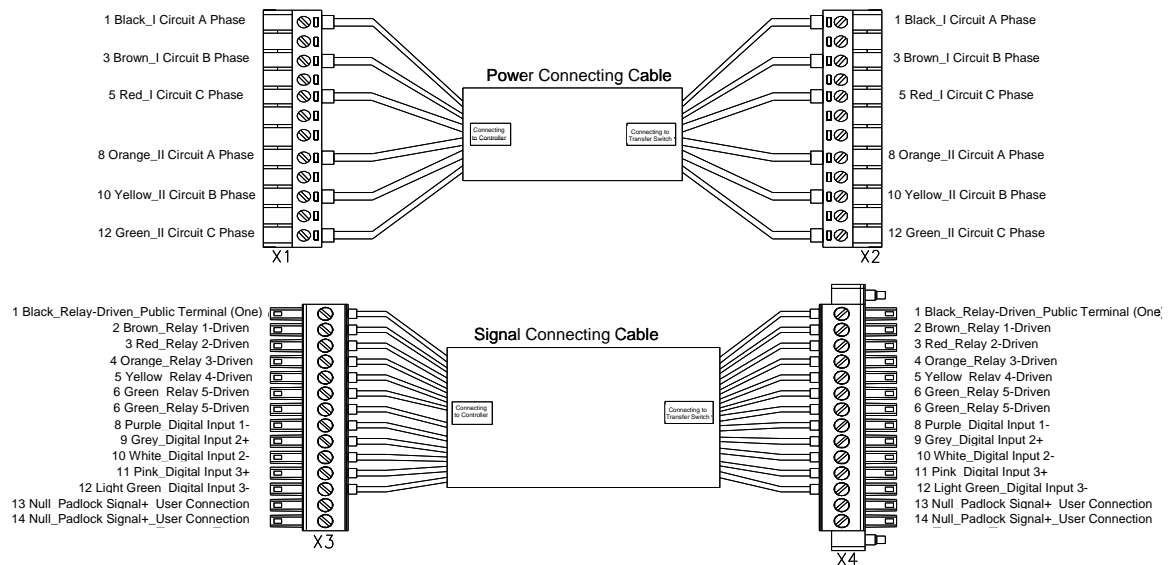


Figure 2-5 Cables for connecting switch and C1000 Controller

## 2.2 Controller Interface

### 2.2.1 Controller Interface

C1000 Connector Labels as shown in Fig 2-6 & Fig 2-7

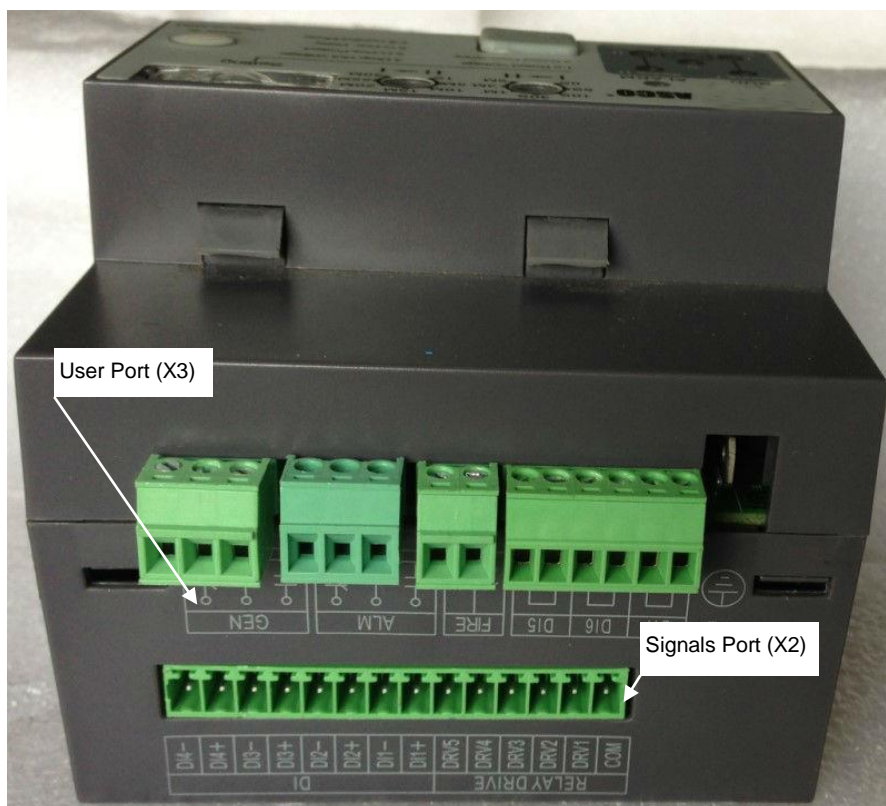


Figure 2-6 C1000 Controller Interfaces 1

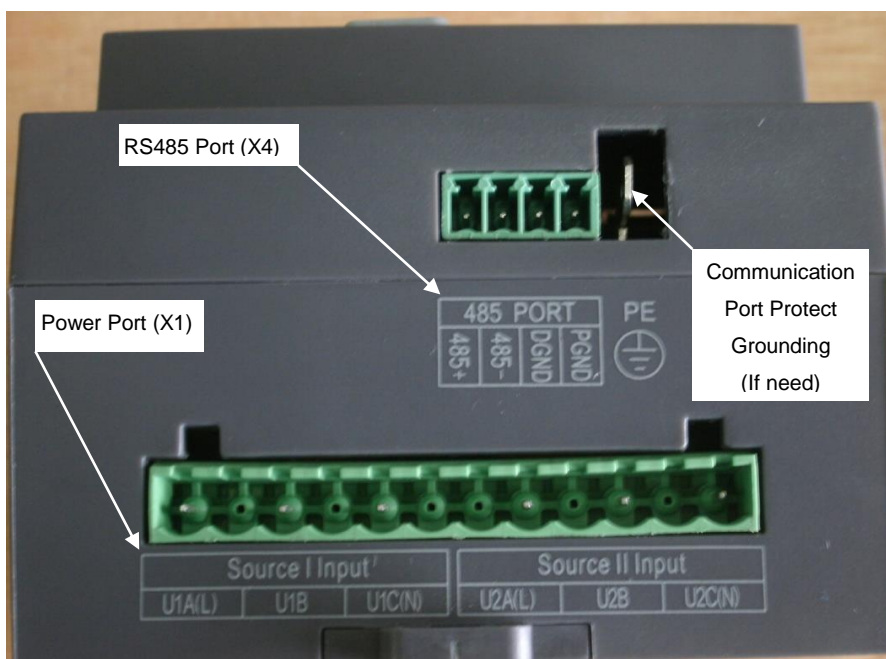


Figure 2-7 C1000 Controller Interfaces 2

Pin definition as table 2-1, table 2-2, table 2-3 and table 2-4

Table 2-1 Power connection Pins definition of C1000 controller

Port	Port Label	Pin Definition
X1	1	U1A(L) A Phase Power of Source I for three phase system . Or L line Power of Source I for single phase system.
	2	Blank
	3	U1B B Phase Power of Source I for three phase system .
	4	Blank
	5	U1C(N) C Phase Power of Source I for three phase system . Or Neutral Power of Source I for single phase system.
	6	Blank
	7	Blank
	8	U2A(L) A Phase Power of Source II for three phase system . Or L line Power of Source II for single phase system.
	9	Blank
	10	U2B B Phase Power of Source II for three phase system.
	11	Blank
	12	U2C(N) C Phase Power of Source II for three phase system . Or Neutral Power of Source II for single phase system.

Table 2-2 Signal Connection Pins Definition of C1000 Controller

Port	Port Label	Pin Definition
X2	1	COM Relay driver Common, 24V.
	2	DRV1
	3	DRV2
	4	DRV3
	5	DRV4
	6	DRV5
	7	DI1+
	8	DI1-
	9	DI2+
	10	DI2-
	11	DI3+
	12	DI3-
	13	DI4+
	14	DI4-

Table 2-3 User Connector Pins Definition of C1000 Controller

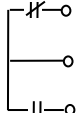
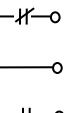



Port		Port label		Attribute	Definition
X3	1		GEN	30VDC, 5A > rating current > 5mA	Normally Closed (NC) & Normally Open (NO) relay outputs. During Source 1 Priority mode, when the controller loses power or Source 1 has some abnormality, the NC changes to closed and the NO changes to open. Engine start up. When Source I and the switch resume , the NC changes to open and NO changes to closed after 2 minutes (engine cool down delay). Engine stop.
	2				
	3				
	4		ALM	30VDC, 0.5A > rating current > 5mA	Alarm relay output, when the controller raise alarm, the relay NO contact closed.
	5				
	6				
	7	+	FIRE	24VDC±30%, the polarity must be clearly identify	Fire signal will force the switch to center-off position.
	8	-			
	9		DI5	Passive digital input	Remote operation mode, short connection, the switch transfer to center-off position
	10				
	11		DI6	Passive digital input	Remote operation mode, short connection, the switch transfer to position I
	12				
	13		DI7	Passive digital input	Remote operation mode, short connection, the switch transfer to position II
	14				

Table 2-4 RS485 Communication Port Pins Definition of C1000 Controller

Port		Port label	Attribute	Definition
X4	1	485+	Communication signal	485A
	2	485-	Communication signal	485B
	3	DGND	Digit GND	Digit GND
	4	PGND	Protect Grounding	Protect Grounding



## Chapter 3 Operation

### 3.1 Panel and Indicator

See Figure 3-1 for the controller panel and see Table 3-1 for the indicator instruction.

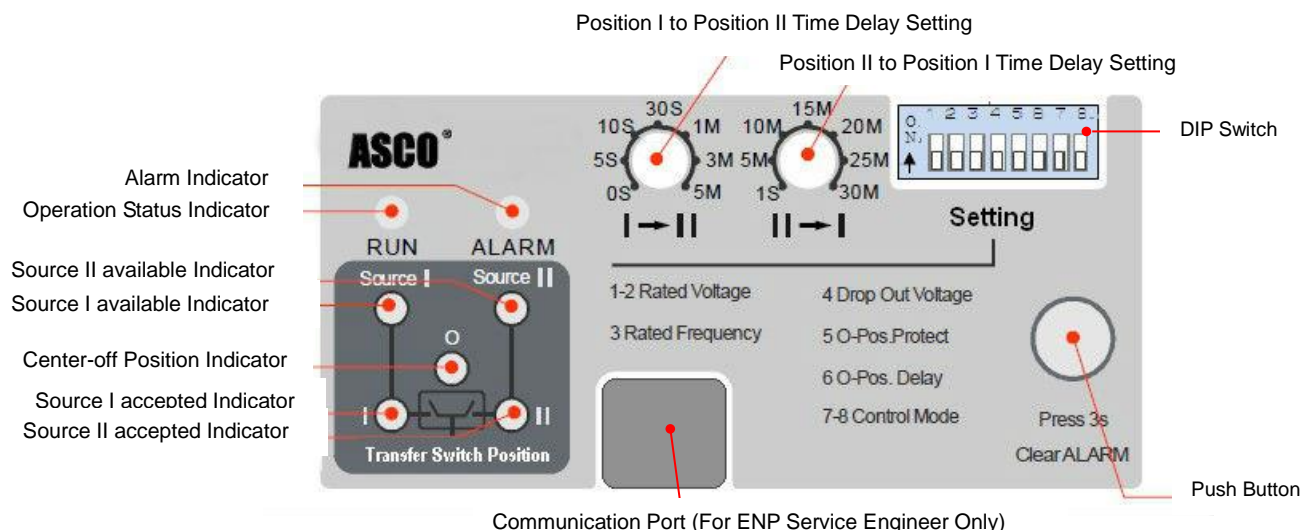


Figure 3-1 C1000 Controller Panel

Table 3-1 Indicator Description

Operation status Indicator (green)	This light indicates the operating status of the Controller. When it is on or flashing, it indicates normal operation; and when it is off, it indicates over voltage setting operation or abnormal operation. When it blinks rapidly it indicates that the Controller is running in manual mode. When it blinks slowly it indicates that the Controller is running in remote mode.
Alarm Indicator (red)	When in Source I Priority Mode, the alarm indicator will be on when the Controller detects such abnormalities as under-voltage, overvoltage, phase loss and power failure on Source I. It ignores the status of Source II. When in the No-Source Priority Mode or the Remote Mode, the alarm will be on when the Controller detects such abnormalities as under-voltage, overvoltage, phase loss and power failure on Source I and Source II. Otherwise, the alarm will flash during any critical failure, such as switch operation failure or fire alarm.
Source I available indicator (green)	When it is on, it indicates normal operation of Source I. When it is off, it indicates that Source I is not connected or loss of power.
Source II available indicator (green)	When it is on, it indicates normal operation of Source II. When it is off, it indicates that Source II is not connected or loss of power.
Source I Accepted indicator (green)	When it is on, it indicates that Source I is connected. When it is off, it indicates that Source I is in the process of switching off or not connected. When it is flashing, it indicates that in manual mode or over voltage setting mode.
Source II Accepted indicator (green)	When it is on, it indicates that Source II is connected. When it is off, it indicates that Source II is in the process of switching off or not connected. When it is flashing, it indicates that in manual mode or over voltage setting mode.
Center-off Position indicator (yellow)	When it is on, it indicates that the load is in OFF status. When it is off, it indicates that the load is not in OFF status and it is supplied by either Source I or Source II. When it is flashing, it indicates that in manual mode.

### 3.2 Push Button

The push button is on the right side of the Controller panel, which can be easily manipulated.

Press it for 3 seconds to clear alarm. When the alarm indicator is on or flashing, press this button for 3 seconds to clear the alarm indication.

#### Manual Operation:

Step 1: Set the DIP Switch bit 7-8 to ON, ON. The RUN indicator starts flashing rapidly. One of three position indicators on the bottom left of the panel starts flashing, as shown in Figure 5.

Step 2: The flashing indicator indicates the target position that ATS would transfer to, press the button quickly (less than 3 seconds) to switch the target, and then three indicators would flash and rotate one at a time.

Step 3: After selecting the target that would be switched to, press the button for 3 seconds, and then ATS would transfer to the target position.

Step 4: Set the DIP Switch bit 7-8 to auto or remote mode to exit from the manual operation mode.

### 3.3 Time Delay Setting

The two knobs are for setting the ATS's time delay. Position I transferring to position II or Position II transferring to position I, as shown in Figure 3-2.

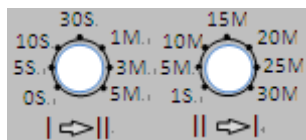


Figure 3-2 Time Delay Setting Knobs

Please use a small flat-ends screwdriver for adjustment.

Time Delay for transferring from Position I to Position II: min. 0 second, max. 5 minutes.

Time Delay for transferring from Position II to Position I: min. 1 second, max. 30 minutes. This Time delay is used to wait for Source I power to recover to stable conditions.

### 3.4 DIP Switch

The DIP switch is on the upper-right corner of the Controller panel, with 8 bits in total. When the white slider of each bit is on the top, it means ON, and when it is at the bottom, it means OFF, as shown in Figure 3-3.

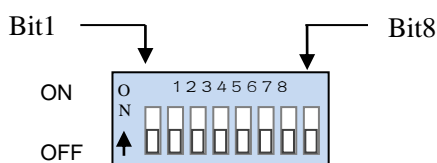


Figure 3-3 DIP Switch

The DIP switch is used for various parameter settings, and the definitions are shown in Table 3-2, Table 3-3 and Table 3-4. "X" in the table means unconcerned.

Table 3-2 DIP Switch Illustration-1

ENP P/N	208V C1000 Controller		220V C1000 Controller		380V C1000 Controller		Rated Voltage	Default	
Setting	Bit1	Bit2	Bit1	Bit2	Bit1	Bit2		Bit1	Bit2
	OFF	OFF					208V	OFF	OFF
			OFF	OFF			220V		
			ON	OFF			230V		
			OFF	ON			240V		
					OFF	OFF	380V		
					ON	OFF	400V		
					OFF	ON	415V		
	ON	ON	ON	ON	ON	ON	<b>*Over Trip Setting</b>		

**\*Over Trip Setting:** Set the DIP Switch bit1-2 to ON, ON. The RUN indicator is OFF and ALARM indicator is ON that means enter over voltage trip setting mode. One of Position I and Position II indicators is flashing. Position I indicator flashing indicates over voltage trip is disabled. Position II indicator flashing indicates over voltage is enabled (Over voltage trip is 120% for rated 208~400Vac. Over voltage trip is 115% for rated 415Vac). Press Key to switch the setting. Set back DIP Switch to Rated Voltage shall exit this setting mode.

Table 3-3 DIP Switch Illustration-2

Setting	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Parameter	Default
Rated Frequency	OFF	X	X	X	X	X	50Hz	OFF
	ON	X	X	X	X	X	60Hz	
Under-Voltage dropout	X	OFF	X	X	X	X	Table 3-4	OFF
	X	ON	X	X	X	X	Table 3-4	
Center Position protection	X	X	OFF	X	X	X	Center position protection disable	OFF
	X	X	ON	X	X	X	Center position protection enable	
Center Position Time Delay	X	X	X	OFF	X	X	Disable	OFF
	X	X	X	ON	X	X	Delay 5 seconds	
Control Mode	X	X	X	X	OFF	OFF	Source I Priority,	OFF OFF
	X	X	X	X	ON	OFF	No Source Priority	
	X	X	X	X	OFF	ON	Remote control mode	
	X	X	X	X	ON	ON	Manual control mode	

Table 3-4 Under-voltage drop out

Rated Voltage Bit4	208V	220V/230V/240V	380/400/415V
OFF	90%	85%	85%
ON	75%	70%	70%

## 3.5 Generator control

Controller can control generator through "X3 - GEN" port. During Source 1 Priority mode, when the controller loses power or Source 1(Priority source) has some abnormality, the controller sent generator start up signal. When priority source resume, a time delay keeps the generator running for 2 minutes (cool-down period), then send generator stop signal. If the controller lose power, the "NC and COM" of "GEN" will be closed automatically (send generator stop signal). When the controller restart, generator stop signal will be sent after 2 minutes delay too.

## 3.6 RS485 Communication Port (Optional)

There is an optional RS485 communication port on the side of C1000 controller, as shown in figure 3-4.



Figure 3-4 RS485 Communication Port

While using the external connection wire, a computer or intelligent device can communicate with C1000 controller. The MODBUS protocol has been integrated for customer's applications.

The RS485 communication port is a half-duplex communication port, supply 485+ and 485- as differential signals. DGND is communication digital ground and PGND is protected ground. Customer can connect wires according to actual applications. The right plug is protected earth connector. Use the grounding cable in accessory connection the plug to the grounding as short as possible; customer can gain Surge and lightning protection for communication port.

## Chapter 4 Maintenance and Troubleshooting

This chapter introduces how to test the controller after installation, to make sure everything is working properly. This chapter also includes maintenance and troubleshooting information.

### 4.1 Start Up / Function Test

Please refer to ASCO Series 230 Transfer Switch Manuals for start-up and functional testing procedures.

### 4.2 Maintenance

To ensure consistent reliability of the transfer switch to make sure it is operating normally, regular maintenance testing should be conducted. It is recommended to do so once every three months.

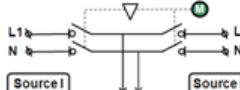
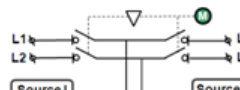
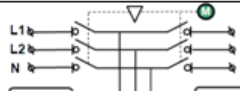
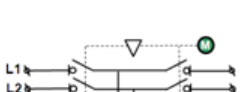
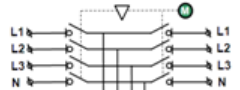
### 4.3 Common Troubleshooting

Before transfer switches any positions, please make sure that the interface wiring and controller setting are reliable and correct. After that, Power on and observe the indicator status, and carry out the following trouble items, as necessary.

Table 4-1 Causes of Abnormal Indicator Conditions

Indicator	Normal	Abnormal	Issue	Solution
RUN	On	Off	No power	Check if there is normal voltage in the power input port; if not, check external power supply. If yes, check DIP Switch Bit 1-2, If are not ON and ON, If there is, the Controller may be damaged, please contact Emerson customer service representatives.
ALARM	Off	Constantly on or flashing	The Controller detects an abnormality or mechanism failure.	When it is constantly on, check if Source I or Source II is normal. If it flashing, this indicates that there is a switch failure, and you may press the button to clear it. If the failure occurs often, it indicates that the transfer switch is experiences a larger problem, please contact Emerson customer service representatives.

## Appendix 1 Configuration Description and Number of Poles

Switch Category						Type Sample							
	Line and Neutral				AC Voltage (V)		D2ADTL	B3	250	H	E	0	0
Poles	L1	L2	L3	N	L-L	L-N	①	②	③	④	⑤ <sup>①</sup>	⑥ <sup>②</sup>	⑦ <sup>③</sup>
2P	✓			✓	-	220		B1		D			
	✓			✓	-	230		B1		E			
	✓			✓	-	240		B1		F			
	✓	✓			208	-		02		C			
	✓	✓			220	-		02		D			
	✓	✓			230	-		02		E			
	✓	✓			240	-		02		F			
3P	✓	✓		✓	220	110		B2		D			
	✓	✓		✓	230	115		B2		E			
	✓	✓		✓	240	120		B2		F			
	✓	✓			208	-		03		C			
	✓	✓			220	-		03		D			
	✓	✓	✓		380	-		03		H			
	✓	✓	✓		400	-		03		J			
	✓	✓	✓		415	-		03		K			
4P	✓	✓	✓	✓	208	-		B3		C			
	✓	✓	✓	✓	220	-		B3		D			
	✓	✓	✓	✓	380	220		B3		H			
	✓	✓	✓	✓	400	230		B3		J			
	✓	✓	✓	✓	415	240		B3		K			