



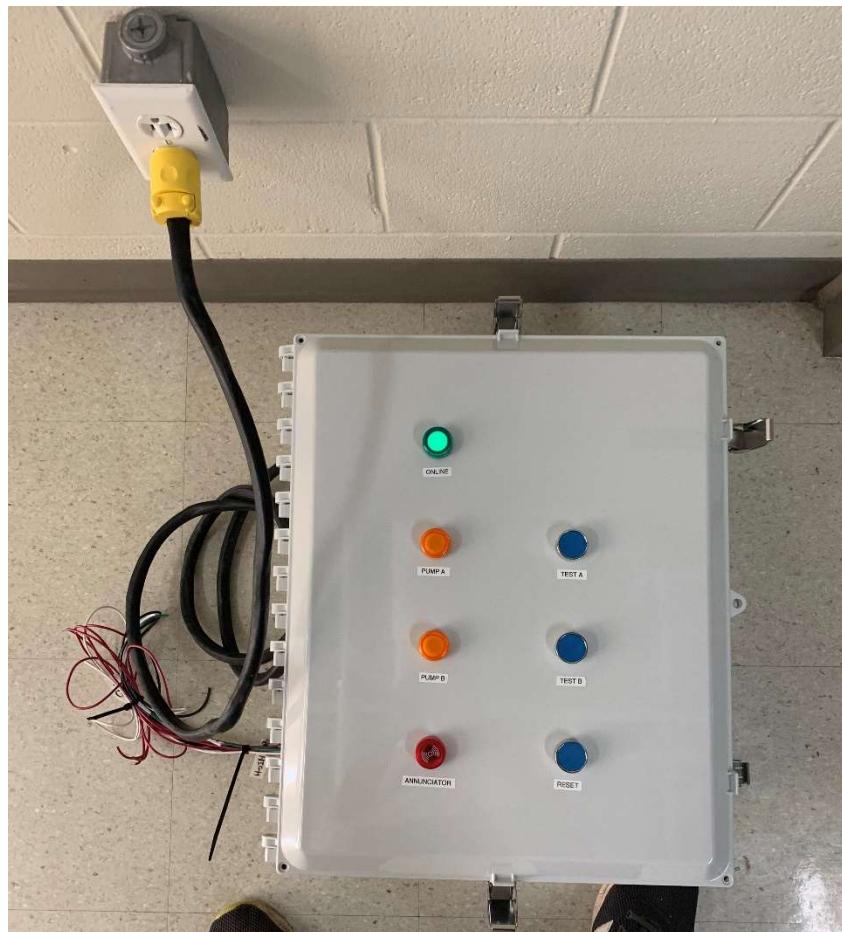
FINAL REPORT FOR DUAL SUMP-PUMP CONTROLLER

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**Electronics Engineering Technology
(Industrial)**



**Preliminary Report for
Dual Sump-Pump Controller**

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Abstract

The Dual Sump-Pump Controller was designed to solve an issue brought up by countryside homeowners where water is collected from rain and melting snow in the sump, which is in the basement. A pump that is fixed inside the sump sends this collected water to the water reservoir. However, specific faults in a pump such as objects stuck in the shaft, mechanical float switch error, and continuous operation fail. As a result, the whole basement flooded with water. In the solution, Dual Sump-Pump Controller controls and monitor two pumps according to water levels (LOW, HIGH, and CRITICAL HIGH) and protect each pump from overload and underload situations. In addition, this device informs the user about the critical condition (where the basement is about to start flooding) by a buzzer. Also, three fuses were used in the circuit, which provides extra protection.

Furthermore, on the front side of the panel, four LED indicators (ONLINE, PUMP A, PUMP B, ANNUNCIATOR) and three push button switches (TEST A, TEST B, RESET) exists, which make this device more user friendly. After installment, the user can connect the pump and adjust current tripping points according to the steps mentioned in this report.

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1 Introduction

This project builds to solve an issue facing by many people having a sump pump in their house(basement). The pump available in the market is not working effectively. Sometimes the basement is flooded with water and, in some cases, a pump suffering from dry run conditions. This project provides a solution to these situations by controlling two pumps connected to it according to water levels (LOW-level, HIGH level, CRITICAL HIGH level). Also, there is an indicator for each pump that shows ongoing operation (ON, OFF, FAULT) on the pump. If the user wants to test whether the pump is working, testing for each pump is available by simply pushing the push button. An annunciator [1] informs users in a critical situation (if water remains above the CRITICAL HIGH level for few minutes). These are the advantages that make this project different from one existing in the market. There is no product available in the market that protects the device from under load and overload, and it is possible with Dual sump-pump Controller. Writing this report aims to sufficiently inform the user of all functions, operations, and troubleshooting techniques. In-depth Details such as block diagrams, wiring diagrams, and datasheets will be helpful to the technician who wants to troubleshoot the fault. In other words, this report works as a user manual for a Dual sump-pump controller.

2.0 Functional Overview

Detailed functionality of the Dual sump-pump Controller has been covered in this content. First, as described in *Appendix B: Block Diagram*. PLC is in the center of the diagram, which has an input supply voltage of 120VAC. There are three safety fuses in this circuit. One of them (primary, 20A) protects the entire system. The remaining two fuses (secondary, 10A) protect individual pumps. Overall, this system monitors, protect, and controls two pumps connected to it according to water level and fault detected by current sensors. Two pushbutton switches connected to CONTACTOR A and CONTACTOR B named TEST PUMP A and TEST PUMP B, respectively. Which allows the users to check the pump is working or not in OFF mode as well.

2.1 Fuse

Fuse's job is to protect the System and part of the System from overload. There are three fuses used in this project. The first connected next to supply (120 VAC) is called primary fuse (*Figure 1: Fuse (20A)*), which protects the entire system, and the other two fuses before contactors (A & B) is known as secondary fuse which saves individual pump (A/B) system.



Figure 1: Fuse (20A)

2.2 Water Levels

In this project, water levels were created by simply connecting conductive electrodes at a different height in the sump. There are three primary water levels: **LOW level, HIGH level, and CRITICAL HIGH level**. As mentioned in *Figure 10: Dimension of Sump and water levels* the LOW level at 4", the HIGH level at 20", and CRITICAL HIGH level at 23" height from the bottom of the sump. PLC using these water levels as input, and according to the program (ladder logic), turns on or off with the help of contractors. Apart from these levels, an electrode is connected at the bottom of the sump (named COMMON), 24 VDC from PLC.

The primary function of the LOW level is to protect pumps from dry run conditions. LOW level is an input for PLC, which acts as a stop switch (concept of stop switch) logic to pump A and pump B (See *Appendix E: Code*, network 5 & 13). When the water reaches below low level, both pumps will be turned off, and pumps would always be at some water level. A HIGH level will allow PLC to turn ON contactor A (pump A) with *2.5 Status Indicators (Q0.0, Q0.1)* (pump A status indicator). If water reaches a CRITICAL HIGH level, then PLC turns ON pump B and pump A (Pump A not ON by High level). At this level, both pumps forcing out water from the sump.

2.3 Reset (I0.3)

This input (*Figure 2: Reset (push button)*) introduced for two main reasons:

1. Once the annunciator starts emitting noise and flashing light, inform the user about a critical situation. The user is now well informed about this situation, and if the user wants to stop the annunciator, press the RESET button for 5 seconds.



Figure 2: Reset (push button)

- When current sensors detect fault (underload/overload), then PLC turns OFF that load (pump A or pump B), and [2.5 Status Indicators \(Q0.0, Q0.1\)](#) start flashing (Fault mode). Now, the user wants to check whether the fault is apparent or not to make sure that they press the REST button for a moment.

2.4 Current Sensors (I0.4, I0.5, I0.6, I0.7)

These sensors connected to the PLC input terminal and hot wire of load (pump A and pump B) pass through the hole on it as shown in ([Appendix C: Wiring Diagram](#)), and The working principle of these sensors is based on a current transformer (C.T.). These sensors ([Figure 3: Current sensors](#)) protect load connected across contactor from overload and underload by opening contactor terminals. The sensor works only when the contactor is ON. These sensors' trip points would be adjustable (if in future user change pump). Inputs I0.4 and I0.5 of PLC save pump A (load connected across contactor A) from overload and underload, respectively. Also, Inputs I0.6 and I0.7 of PLC save pump B (load connected across contactor B) from overload and underload, respectively.



Figure 3: Current sensors

2.5 Status Indicators (Q0.0, Q0.1)

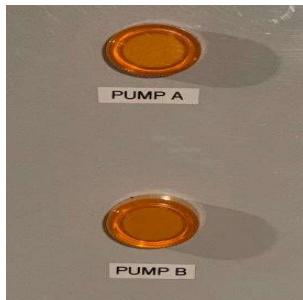


Figure 4: LED status indicator

Indicate the pump's current operation (or status), and it is attached to the front of the panel. Using single [LED indicators \(ECX1053-120, ECX1052-120\)](#), this project saves multiple input terminals and a program line.

Yellow color LED light (has supply voltage 120 VAC) shows ongoing PUMP A and PUMP B operation. During OFF ([Figure 4: LED status indicator](#)) mode, this status indicator stays off. However, during ON mode, light laminate with full lamination, and during FAULT (overload /underload), this indicator starts flashing [2].

2.6 System Enable Indicator (Q0.2)

When this indicator (*LED indicators (ECX1053-120, ECX1052-120)*) is ON (full illumination), it shows the System is Enable, and the input supply (120 VAC) is ok. It can be said that the System is Disable when this indicator is OFF (*Figure 5: Enable indicator*).



Figure 5: Enable indicator

2.7 Test Pump (A & B)



It allows the user to check the functionality of the pump manually (without interfering with PLC logic) at any time and situation by simply pressing *Push Button (GCX1104)*, as showing in *Figure 7: TEST PUMP A and B (pushbutton)*. Also, help the user while replacing the pump and setting current tripping points on current sensors.



Figure 6: Contactors

Figure 7: TEST PUMP A and B (pushbutton)

2.8 Contactor (A & B)

This works as an interference device for PLC and pump. PLC controls (ON/OFF) pumps with the help of this contactor (*Figure 6: Contactors*).

2.9 Annunciator (Q0.5)



It informs the user about the critical situation (if the water stays above the necessary High level for more than 2 minutes) by flashing light and periodic buzzer (*Figure 8: Annunciator*).

Figure 8: Annunciator

3. Technical Description

Physical and user interaction description

It is a fully automatic controller which required the least amount of user interference. The regular



Figure 9: Front side of the panel

operation is performed according to water levels detected by PLC. The operation order could be more transparent by looking *Figure 9: Front side of the panel*, the COMMON electrode located at the bottom of the sump, 24V D.C. from PLC and LOW level fixed at around 4 inches of height from the bottom of the sump. The HIGH and CRITICAL HIGH levels were located about 20 inches and 24 inches, respectively. When the sump starts filling with water and reaches a HIGH level, it will turn on the PUMP A and its indicator if the input water force is more than PUMP A's

through capacity, the water level increases. Once it reaches the CRITICAL HIGH level, PUMP B will be additionally joined to complete operation. In addition to this, if water goes above CRITICAL HIGH level or stays there for more than 2 minutes, the user will be notified by ANNUNCIATOR. When water starts decreasing below the HIGH level, PUMP B will be stopped, and PUMP A works standalone. Once this water level reaches below the LOW level, PUMP A will be destroyed, and there is some amount of water stays in the sump to protect pumps from dry-run conditions. There is a RESET button on the front side (Figure 9: Front side of the panel) of the board, which stops the annunciator (press for 5 seconds when it's ON) and reset

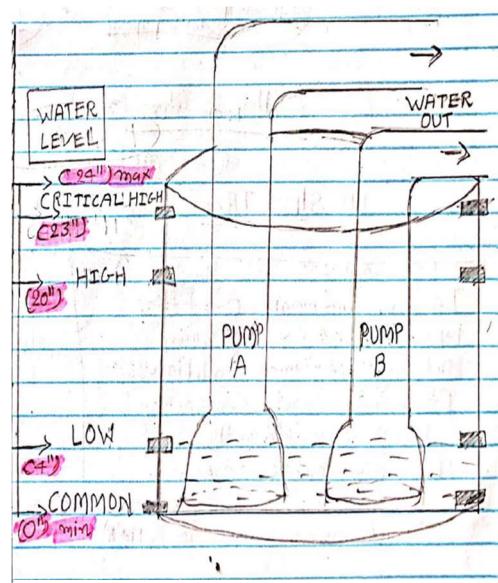


Figure 10: Dimension of Sump and water levels

the load (after clearing the fault, press it for a moment). TEST A and TEST B will allow users to check the pump's functionality and help users while replacing the pump.

Electrical/Electronics description

In this project, seven segments were used (located on the front panel), which works as user interference. Three of them are momentary push button (Appendix G: Datasheets), where 2 TEST button connects 120VAC supply and pump (there is no interference of PLC), and a RESET button is working as an input (I0.3) of PLC. Moreover, as mentioned in the block diagram (Appendix B: Block Diagram), annunciator (O0.5) and three other indicators (PUMP A (O0.0), PUMP B (O0.1), ONLINE (O0.2)) are connected to output PLC which is 120VAC input supply rated.

No specific sensors used in this project measure water level; the conductivity of water is used to do it. The inputs I0.0, I0.1, and I0.2 are the water levels LOW, HIGH, and CRITICAL HIGH defined in this project. All three water levels connected at different heights using conductive wire and at the very bottom of sump COMMON are located, which is +24VDC come from PLC. As the number of waters increases in the sump, it works as a conductive layer for this water level and connects electrically. So as the amount of conductive material is more, it gives better results.

Contactors (*2.8 Contactor (A & B)*) are the medium of the device between PLC and pumps. This contractor works according to the PLC ladder logic and can be operated with TEST buttons (*2.7 Test Pump (A & B)*). TEST button provides a 120VAC supply if it is pressed and hold. The PLC logic is defined to operate PUMP A at the HIGH level of water and both pumps at the CRITICAL HIGH station. When the water level decreases and reaches below HIGH level, PLC will turn OFF PUMP B, and the remaining operation is done with PUMPA. Once the water level goes below the LOW level, both pumps' safety stops and keeps some water in the sump.

Annunciator (*2.9 Annunciator (Q0.5)*) is the device that informs the user about a critical situation in which water stays above the CRITICAL HIGH level for more than 2 minutes. The name annunciator has been given to it because of its functionality, flashing light, and making noise. In addition, the system enables the indicator to show PLC status, either ON or OFF. The logic behind both functions has been defined in the code. Network 17 offers the reason behind the ONLINE (*2.6 System Enable Indicator (Q0.2)*) indicator and network 18 to 22 defined for annunciator.

The output of the current sensors goes to PLC input which is normally closed. Four sensors connected in the system protect both pumps from overload (A.H. and B.H.) and under load (A.L and B.L). The working phenomenon behind these sensors is the same as the current transformer, which works on EMF principal. According to set current tripping points, when these sensors detect the threshold current, send a signal to PLC, and according to the program, PLC controls contactors of the pump.

Analysis or Software description

For programming as an IDE (Integrated development environment) project, STEP 7 Micro WIN 32 has been used, which works only in Windows 98 Operating System device. To install windows 98 in the latest system, one should download and install Oracle V.M. Virtual Box manager (<https://www.virtualbox.org/wiki/Downloads>). It allows working on windows 98 in the current O.S. Once all these steps are done, the windows will look like *Figure 11: STEP 7 Micro WIN 32 installed in Windows 98 O.S.* (also shows the first version of ladder logic). Additionally, suppose there is no DB-9 plug available in someone's computer. In that case, one should buy a USB to the serial port cable, which is available on

https://www.amazon.ca/dp/B01NCAQRM9/ref=sspa_dk_detail_0?psc=1&pd_rd_i=B01NCAQM9&pd_rd_w=Lp8yL&pf_rd_p=2c17e944-5508-41c9-9e34-6115f0c88f84&pd_rd_wg=Do65E&pf_rd_r=7GR01QXRM61QT9VYCMCT&pd_rd_r=a06b228e-3d84-4fd4-9f6e-975ef11d88df&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFWS0hRS1RaRzFPM08mZW5jcnlwdGVkSWQ9QTEwMjk1NzExQ0hBTzQ4V1JNVg2JmVuY3J5cHR1ZEFkSWQ9QTAwNzAxNTAxQUE4QUYyTU5Q1Y1JndpZGdldE5hbWU9c3BfZGV0YWlsJmFjdGlvbj1jbGlja1JIZGlyZWN0JmRvTm90TG9nQ2xpY2s9dHJ1ZQ==. The code for this project is given in Appendix E: Code section. All the rungs and instructions defined and the table mentioned in this section show data of inputs and output of PLC. Network 17 in the program stands for system enable indicator, which states that the siemens ladder logic does not use coil instruction without any input instruction. There is no Status file available like Allen bready (RSlogic), so to blink, the LED light program was defined in three lines. In this program, Network 6,7, and 8 to flash pump A indicator and Network 14, 16, and 17 are determined to blink pump B. Network 1 to 5 controllers the PUMP A, Network 9 to 13 stands for PUMP B Network 18 to 22 define for annunciator.

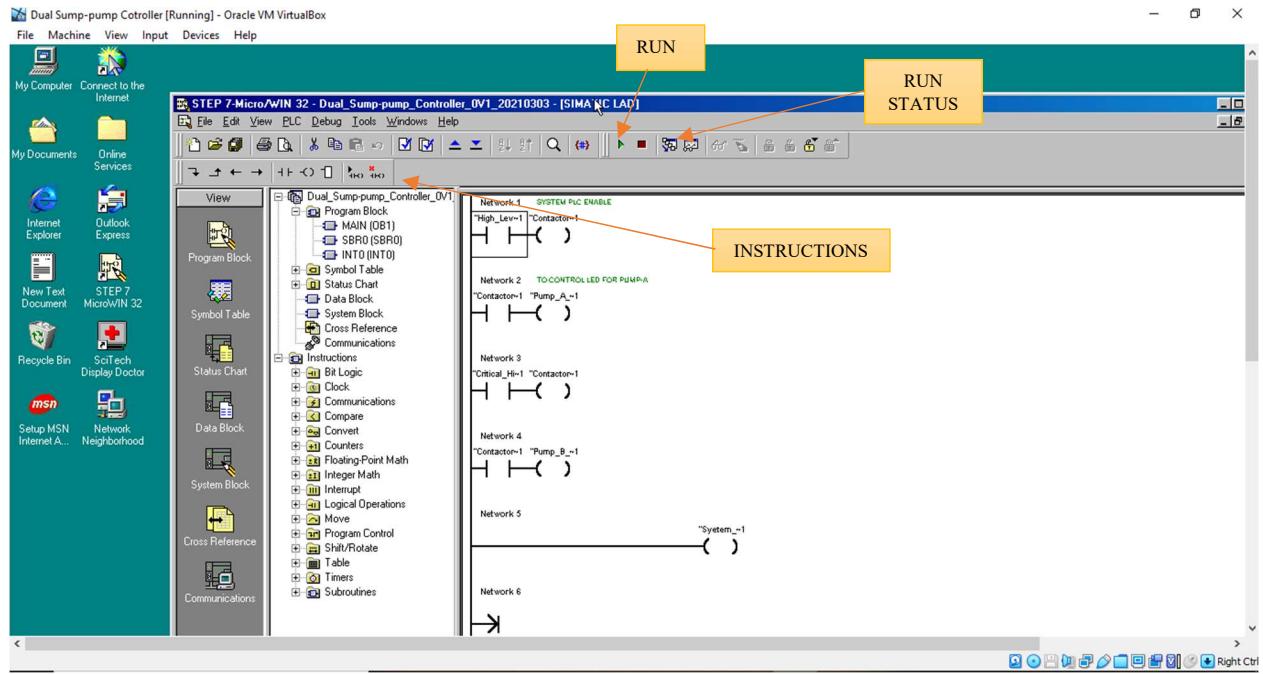


Figure 11: STEP 7 Micro WIN 32 installed in Windows 98 O.S.

4. Testing and Results

There are two tests performed on this project. The first is the Current sensors calibration test, and the second is the RESET function test.

The first test has been performed to define the bracket for the pump. The frame means overload current limit and underload current limit. For example, the pump currently connected in the system consumes 6.7A (I_{FL}) current under normal condition (operation in water, *Figure 12: Current under normal load*). However, when the pump is sucking air, it consumes 7.20A (I_{NL}) current, and when an object stuck in the shaft and shaft stops moving (block rotor current), the pump consumes 9.02A (I_{BL}). By observing this result, it can be concluded that if the pump runs under the limit of 6A to 7.10A would be protected from electrical fault all time. So, this pump bracket is 6A to 7.10A.



Figure 12: Current under normal load

To caliber this bracket on this system, one does not need a multimeter; plug in the pump and press the TEST (Figure 7: TEST PUMP A and B (pushbutton))button for that pump and hold it. Then,

open the panel and observe the input signal on PLC. Considering calibration for PUMPA, on A.H. (pump A upper limit), turn POT clockwise until light doesn't show up on the I0.4 indicator, and when the light glows, turn another half in the same direction. For lower limit, Adjust POT on A.L. (pump A lower) and rotate counter-clockwise until light OFF on I0.5 on PLC. Once the I0.5 indicator turns off, turn another half in the same direction. Now, current sensors are calibrated and ready for operation, release the TEST button and close the enclosure.

The second test performed on RESET functionality, the RESET ([2.3 Reset \(I0.3\)](#)) button designed to perform two tasks. The first task is to stop the annunciator. To accomplish this, pumps were disconnected from the receptacle then water keeps above the critical high-level surface using an external water tank ([Figure 14: 1000-liter water tank](#)). While this process time has been recorded for two minutes after two minutes annunciator starts, and to stop it press the RESET button for five seconds. Then, wait for another 2 minutes to make sure the annunciator doesn't turn on.



Figure 13: Hairdryer measurement

The second part of this test required the same tools as the first part. To do this, fill out the sump with the help of an external water tank ([Figure 14: 1000-liter water tank](#)). After this, plugin nominal load, pump, and press the reset button for a moment, and the



Figure 15: Critical situation (Annunciator ON)



Figure 14: 1000-liter water tank

system, will accept this calibrated load. Repeat these steps for PUMP A) and make sure water remains until CRITICAL HIGH level. At this moment, both pumps start functioning. Next, remove the plug of PUMP B to perform the test in no-load condition. Now, current sensors detect this fault, and PLC will turn off the supply for PUMP B. The pump indicator starts blinking, and to continue with this operation, press the RESET button for a moment. If there is a fault system will not allow operating this pump. Also, perform this with the help of a hairdryer consuming 11.1 A (Overload condition, *Figure 13: Hairdryer measurement*). After this, plugin nominal load, pump, and press the reset button for a moment, and the system, will accept this calibrated load. Repeat these steps for PUMP A.

5 Conclusion

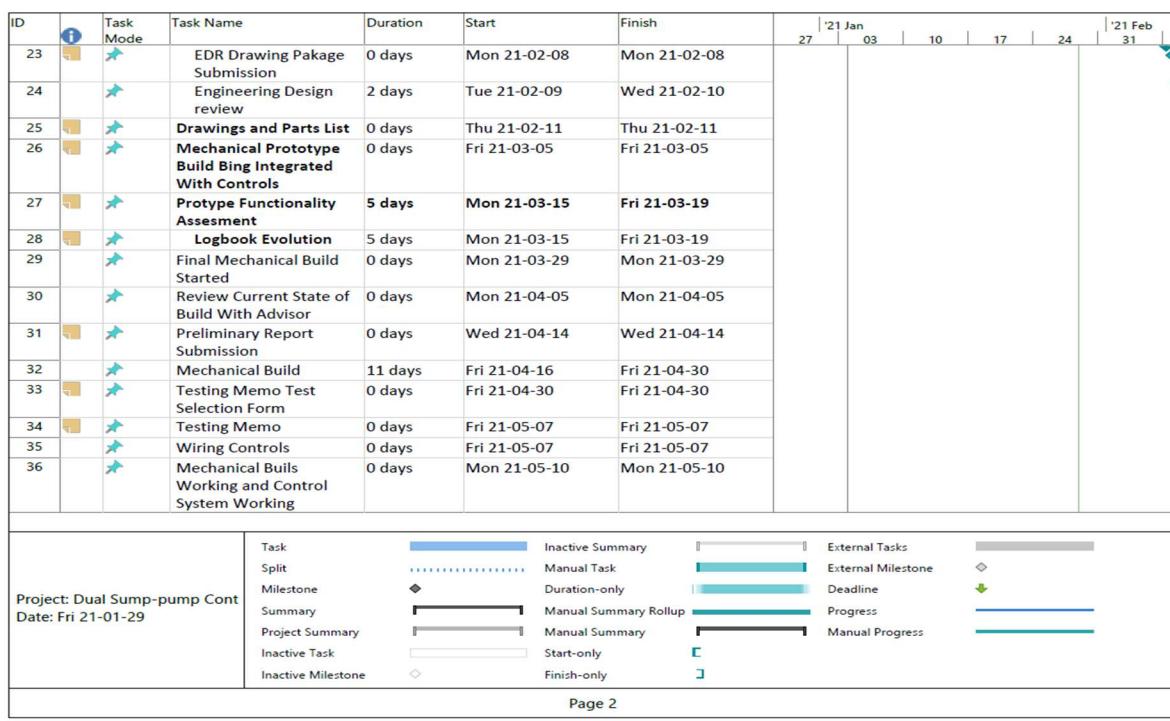
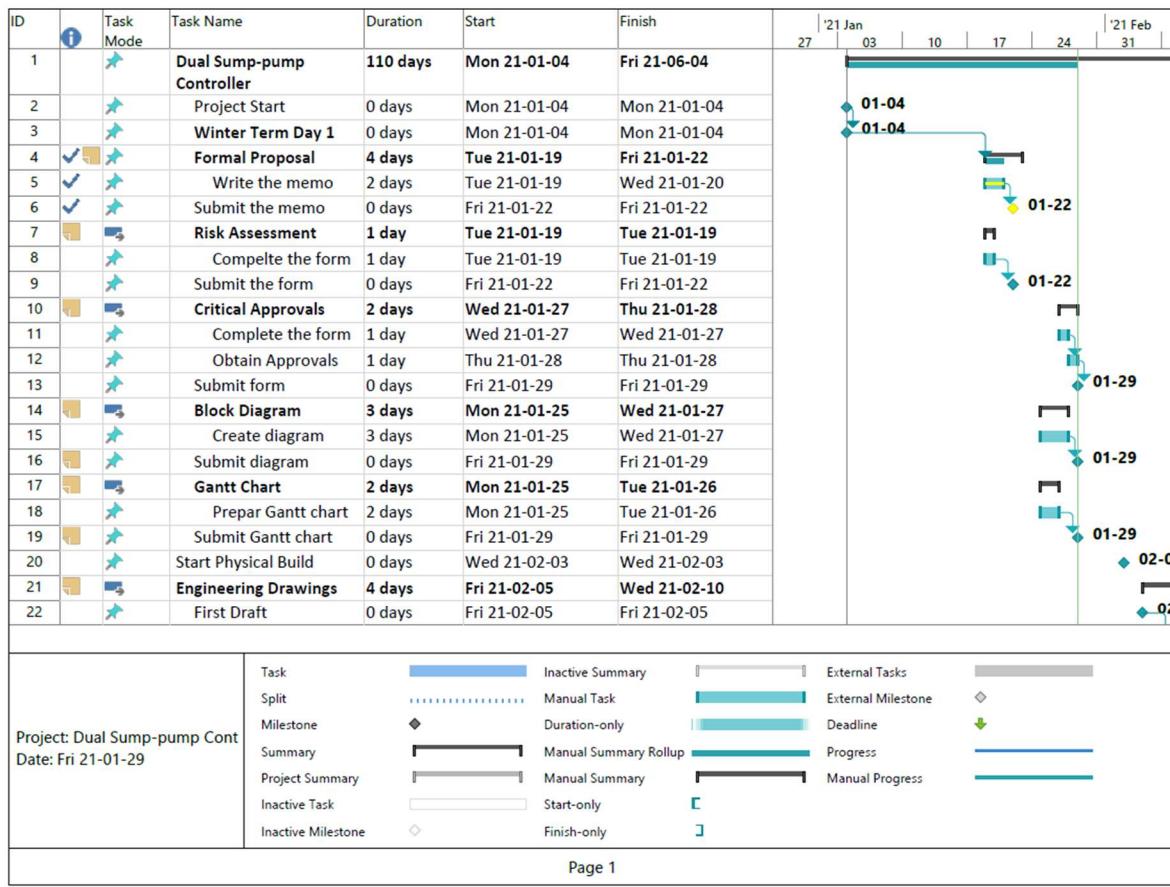
This project is now ready to install in users' houses to provide them better service from one available market by monitoring and controlling two pumps. The idea was initiated by an issue facing by the homeowners (especially from the countryside) whose basement got flooded because of a failure in the pump. The dual sump-pump controller allows pumps to perform according to water levels (LOW level, HIGH level, CRITICAL HIGH level), and it also saves pumps from dry-run condition. In addition, for safety, there are replaceable fuses and current sensors which protect the pump from overload and underload condition. Moreover, Indicators, Test Buttons, and an annunciator are mounted to the panel's front, making this system more user-friendly. However, there was an issue regarding PLC logic and current sensors. Therefore, the RESET button was introduced in the circuit, which works as user input. When a fault is detected and the pump stops functioning because of the fault, this RESET button allows checking to run normally. On the flip side, the initial cost is high compared to the pumps available on the market. Still, this controller works effectively with zero errors and protects the pump from multiple faults, increasing the pump's life span and reducing running costs. As such, it can be said that the initial price is high for this project, but lower maintenance fees and a reliable working process will be helpful to the users over the long term.

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Appendix A: Gantt Chart



ID	Task Mode	Task Name	Duration	Start	Finish	'21 Jan	27	03	10	17	24	'21 Feb	31
37	♂	Testing Completed	0 days	Fri 21-05-14	Fri 21-05-14								
38	♂	Completed Project Assesment	4 days	Mon 21-05-17	Thu 21-05-20								
39	♂	Senior project Symposium	4 days	Mon 21-05-24	Thu 21-05-27								
40	♀ ♂	Final Report Submission	0 days	Fri 21-06-04	Fri 21-06-04								

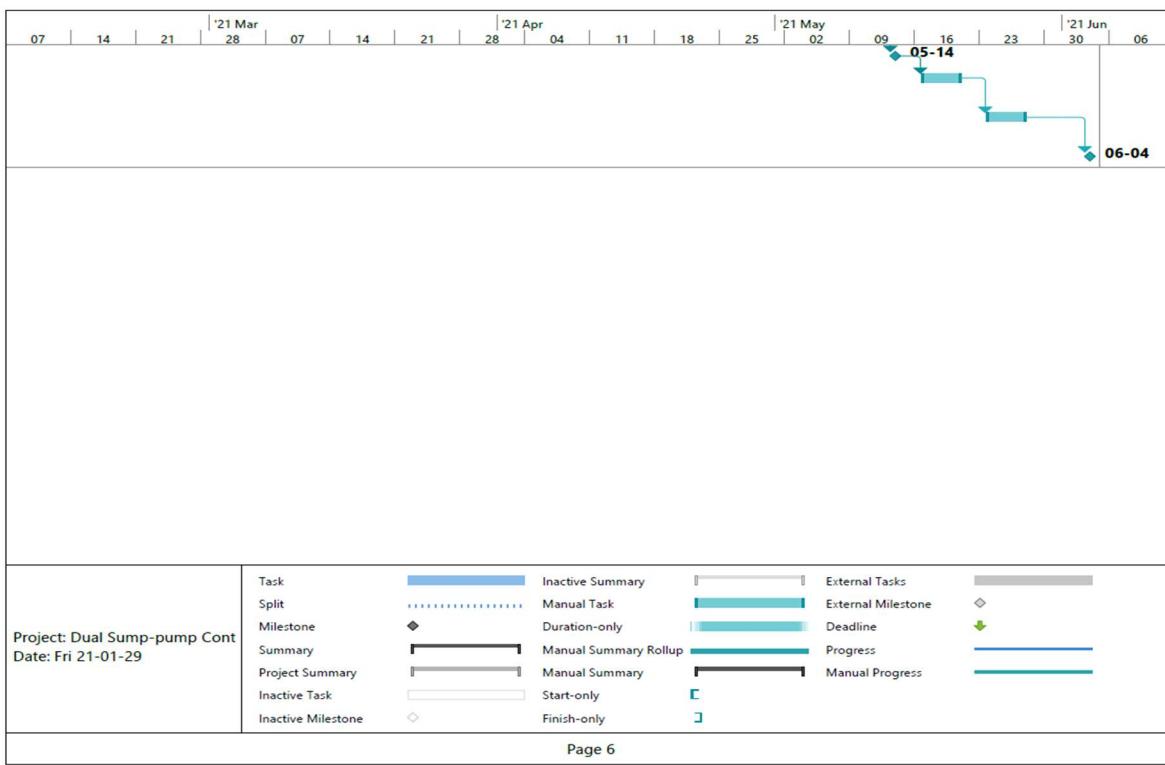
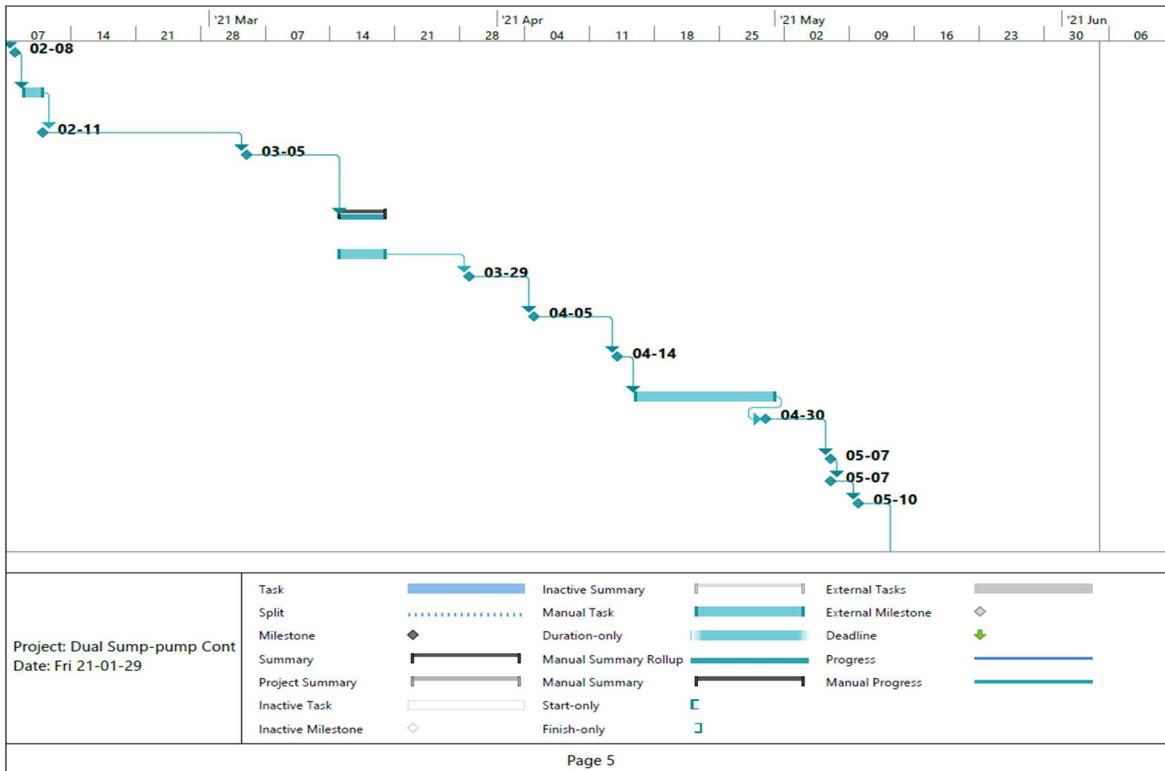
Project: Dual Sump-pump Cont
Date: Fri 21-01-29

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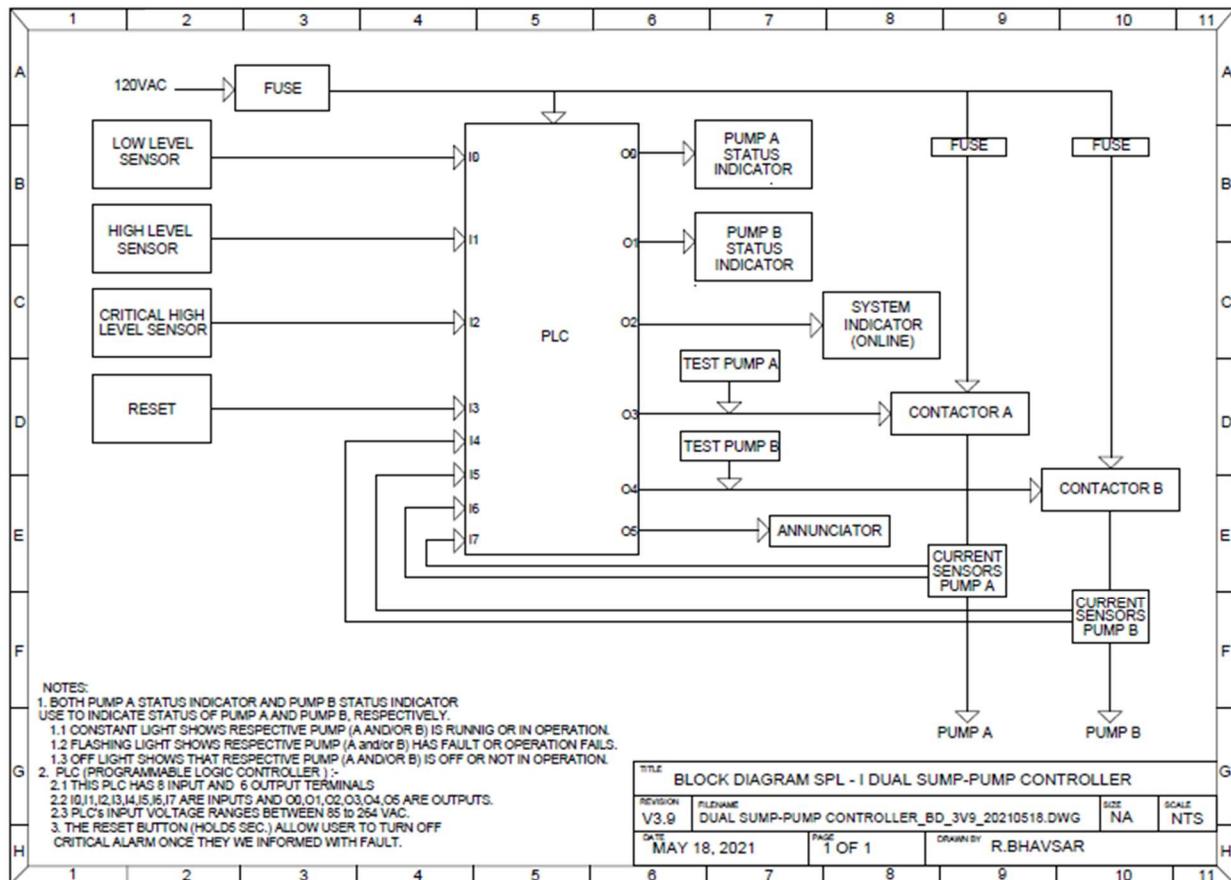
Timeline Legend																			
07	14	21	'21 Mar	28	07	14	21	'21 Apr	04	11	18	'21 May	02	09	16	23	'21 Jun	30	06
2-03																			
02-05																			

Project: Dual Sump-pump Cont
Date: Fri 21-01-29

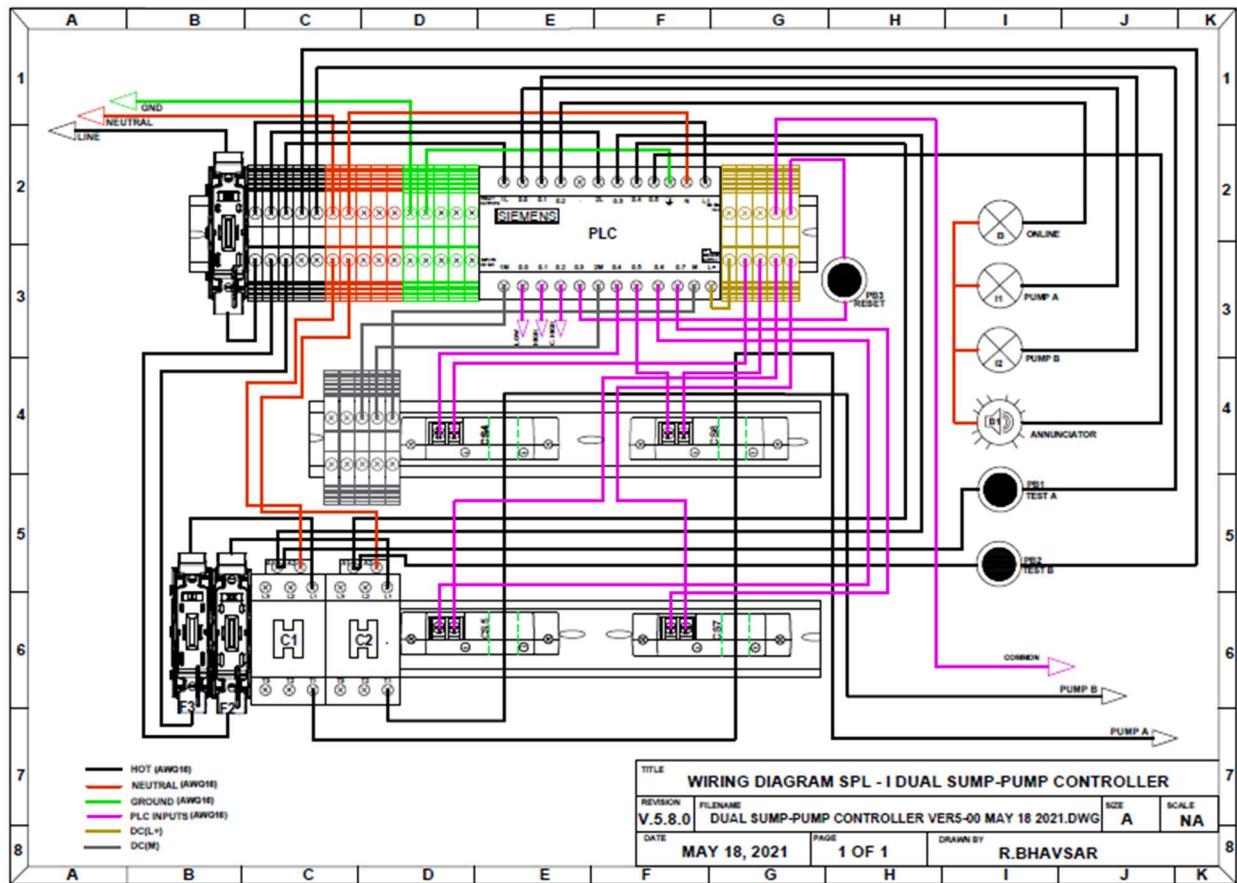
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Appendix B: Block Diagram



Appendix C: Wiring Diagram



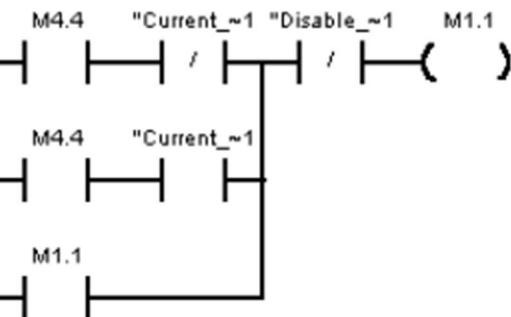
Appendix D: Parts List

PROJECT : DUAL SUMP-PUMP CONTROLLER							SHEET 1 of 1		
ITEM	REF. DESIGNATOR OR ID ON DRAWING	QTY	DESCRIPTION	MANUFACTURER	MANUFACTURER PIN	SUPPLIER	SUPPLIER PIN	ITEM COST	TOTAL COST
1	-	1	DIN RAIL	DINNECTOR	DN-R35S1-2	AUTOMATION DIRECT	DN-R35S1-2	\$ 10.00	\$ 10.00
2	-	5	TERMINAL BLOCK	KONNECT-TT	KN-T12GRAY-25	AUTOMATION DIRECT	KN-T12GRAY-25	\$ 6.75	\$ 13.50
3	-	5	TERMINAL BLOCK	KONNECT-TT	KN-T12BLK-25	AUTOMATION DIRECT	KN-T12BLK-25	\$ 6.75	\$ 13.50
4	-	5	TERMINAL BLOCK	KONNECT-TT	KN-T12GRN-25	AUTOMATION DIRECT	KN-T12GRN-25	\$ 6.75	\$ 13.50
5	-	5	TERMINAL BLOCK	KONNECT-TT	KN-T12YEL-25	AUTOMATION DIRECT	KN-T12YEL-25	\$ 6.75	\$ 13.50
6	-	5	TERMINAL BLOCK	KONNECT-TT	KN-T12WHT-25	AUTOMATION DIRECT	KN-T12WHT-25	\$ 6.75	\$ 13.50
7	-	1	ENCLOSURE	ATTABOX	AH2016SS	AUTOMATION DIRECT	AH2016SS	\$ 218.00	\$ 218.00
8	-	2	FUSE	EDISON	MEQ10	AUTOMATION DIRECT	MEQ10	\$ 84.00	\$ 168.00
9	-	1	FUSE	EDISON	MEQ20	AUTOMATION DIRECT	MEQ20	\$ 84.00	\$ 84.00
10	-	4	SAPRATOR	AUTOMATION DIRECT	KN-STWHT	AUTOMATION DIRECT	KN-STWHT	\$ 3.00	\$ 12.00
11	-	1	END COVER	AUTOMATION DIRECT	KN-ECE18WHT	AUTOMATION DIRECT	KN-ECE18WHT	\$ 2.00	\$ 0.20
12	-	22	TOP COVER	AUTOMATION DIRECT	KN-TC-1	AUTOMATION DIRECT	KN-TC-1	\$ 6.75	\$ 5.94
13	-	25	JUMPERS	AUTOMATION DIRECT	KN-2J12	AUTOMATION DIRECT	KN-2J12	\$ 8.25	\$ 41.30
14	-	6	END BRACKETS	AUTOMATION DIRECT	KN-EB4-10	AUTOMATION DIRECT	KN-EB4-10	\$ 3.00	\$ 1.80
15	-	1	FINGURE CHANNEL	AUTOMATION DIRECT	T1-1022W-1	AUTOMATION DIRECT	T1-1022W-1	\$ 19.50	\$ 19.50
16	-	2	L16 3/8" LOOMEBOX CONNECTOR	REXEL	THSL16	ABB, INC	THSL16	\$ 0.45	\$ 0.90
17	C1,C2	2	CONTACTOR	FUJI ELECTRIC	SC-E02-110VAC	AUTOMATION DIRECT	SC-E02-110VAC	\$ 17.00	\$ 34.00
18	CS1,CS2,CS3,CS4	4	CURRENT SENSOR	ACUAMP	AC5150-CE-F	AUTOMATION DIRECT	AC5150-CE-F	\$ 67.00	\$ 268.00
19	F1,F2,F3	3	FUSE BLOCK	BUSSMANN	RM25030-1SR	AUTOMATION DIRECT	RM25030-1SR	\$ 9.75	\$ 29.25
20	H1,H2	2	YELLOW LED INDICATOR	AUTOMATION DIRECT	ECX1053-120	AUTOMATION DIRECT	ECX1053-120	\$ 7.25	\$ 14.50
21	I3	1	GREEN LED INDICATOR	AUTOMATION DIRECT	ECX1052-120	AUTOMATION DIRECT	ECX1052-120	\$ 7.25	\$ 7.25
22	PB1,PB2,PB3	3	PUSH BUTTON	AUTOMATION DIRECT	GCX1104	AUTOMATION DIRECT	GCX1104	\$ 7.25	\$ 21.75
23	PLC	1	PLC	SIEMENSE	6ES7 212-1BA01-0XB0	WORLD INDUSTRIAL AUTOMATION	6ES7212-1BA01-0XB0	\$ 557.88	\$ 557.88
24									
25								Total=	\$ 1,239.16

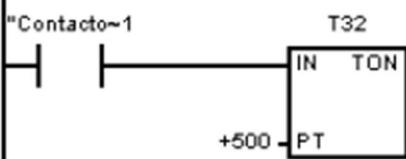
Appendix E: Code

	Name	Address
1	Pump_A_Status_Indicator	Q0.0
2	Pump_B_Status_Indicator	Q0.1
3	Sytem_Enable_Indicator	Q0.2
4	Contactor_A	Q0.3
5	Contactor_B	Q0.4
6	Annunciator	Q0.5
7	Low_Level_Sensor	I0.0
8	High_Level_Sensor	I0.1
9	Critical_High_Level_Sen	I0.2
10	Disable_Annunciator	I0.3
11	Current_Sensor_Pump_A_0	I0.4
12	Current_Sensor_Pump_A_1	I0.5
13	Current_Sensor_Pump_B_0	I0.6
14	Current_Sensor_Pump_B_1	I0.7
15		
16		
17		

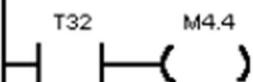
Network 1 CURRENT SENSOR INPUTS (I0.4 AND I0.5) FOR PUMP_A



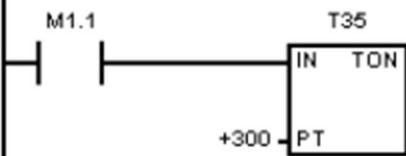
Network 2 TIMER OF 0.5 SECONDS

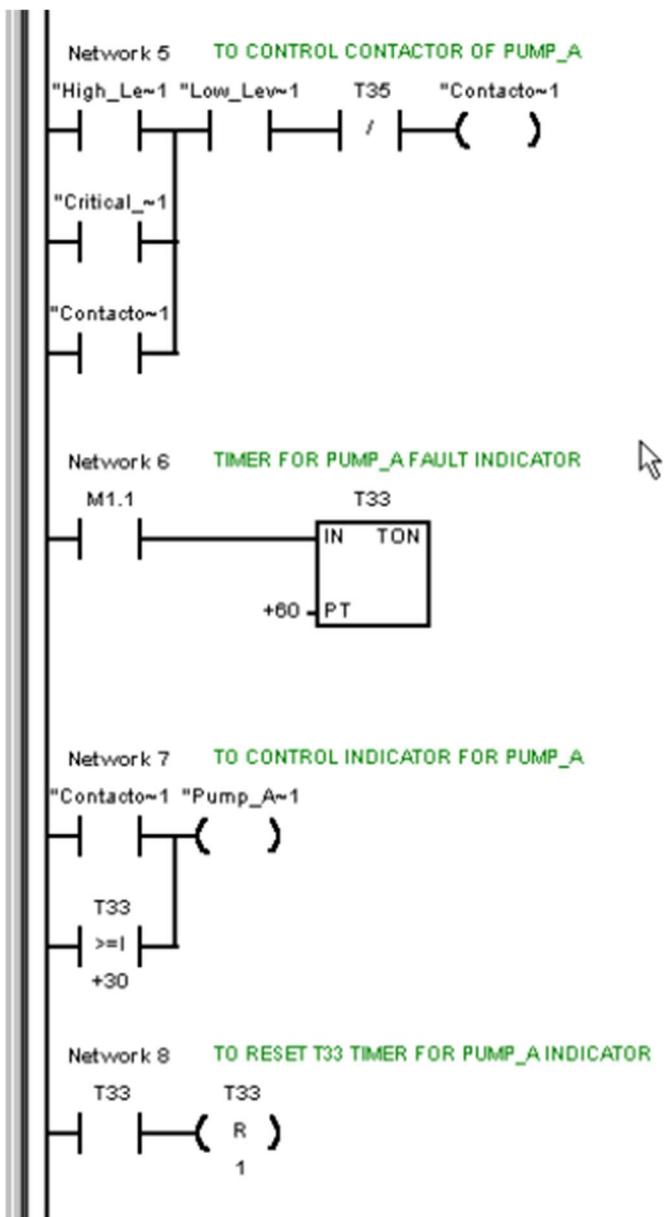


Network 3 AFTER 0.5 SECONDS

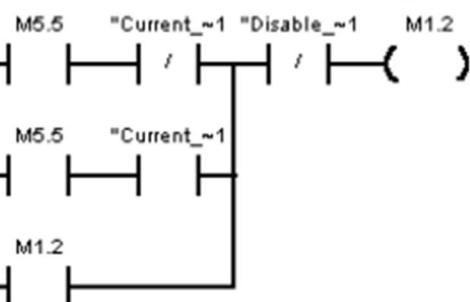


Network 4 TIMER OF 3 SECONDS

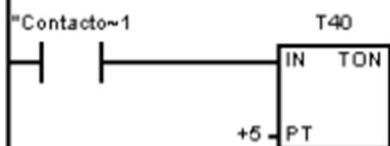




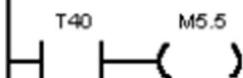
Network 9 CURRENT SENSOR INPUTS (I0.6 AND I0.7) FOR PUMP_B



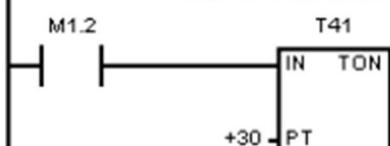
Network 10 TIMER OF 0.5 SECONDS



Network 11 AFTER 0.5 SECONDS



Network 12 TIMER OF 3 SECONDS



Network 13 TO CONTROL CONTACTOR OF PUMP_B

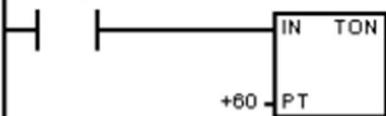
"Critical_~1 "High_Lev1 "Low_Lev1 T41 "Contacto_~1



"Contacto~1

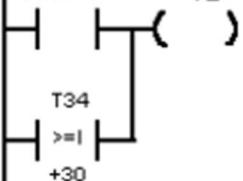
Network 14 TIMER FOR PUMP_B FAULT INDICATOR

M1_2 T34



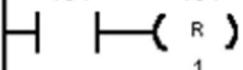
Network 15 TO CONTROL INDICATOR FOR PUMP_B

"Contacto~1 "Pump_B~1



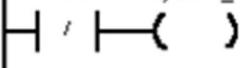
Network 16 TO RESET T34 TIMER FOR PUMP_B INDICATOR

T34 T34

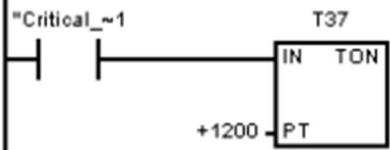


Network 17 FOR PLC(SYSTEM) ENABLE INDICATOR

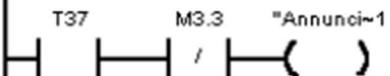
M0.0 "Syetem_~1



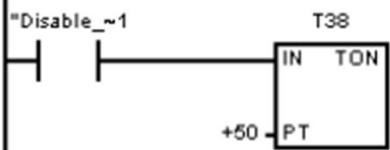
Network 18 TIMER FOR CRITICAL SITUATION



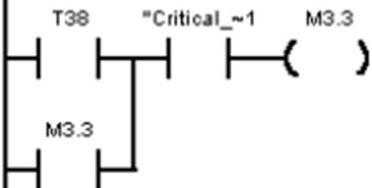
Network 19 TO CONTROL ANNUNCIATOR



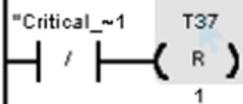
Network 20 5 SECONDS TIMER



Network 21 LOGIC TO TURN OFF ANNUNCIATOR



Network 22 TO RESET ANNUNCIATOR TIMER



Appendix F: Design Calculations

Calculation of area for Panel

Terminal blocks

$$+ (2 \times 5 \text{ mm}) (0.20") \\ + (2 \times 45 \text{ mm}) (0.0.3")$$

100 mm

* (5)

[25.00 mm²]

3 LED

LED indicator

80 mm (D)

* 12 mm

94.25G

* (3)

282.74 mm²

first P.B.

40 mm

* 30 mm

140 mm

* (2)

280 mm



Buzzers

30 mm (D)

(1) 8mm

[94.25 mm²]

Connectors

80 mm

43 mm

246 mm

* (2)

[492 mm²]

Current Sensor

(2x88.9) (3.53")

(2x23.6) (1.15")

226 mm

* (4)

[904 mm²]

Fuse block

2x 25.7 (1.01")

+ 2x 90.1 (3.90")

250 mm

* (1)

[250 mm²]

PLC

(2x160) (6.3")

+ (2x80) (3.13")

480 mm²

* (1)

[480 mm²]

All dimension take from datasheet

Total dimension = 528.3 mm

= (207.99")

Appendix G: Datasheets

Fuse (MEQ20, MEQ10)

1 - 8 0 0 - 6 3 3 - 0 4 0 5

For the latest prices, please check AutomationDirect.com.

General Purpose Midget Class MEQ Fuses



Features

- Compact dimensions
- Fiber tube construction
- Time-delay allows harmless inductive surges to pass without needless fuse opening

Applications

- Supplemental protection of transformers, solenoids, and other high-inrush circuits
- For motor branch circuit applications, refer to EDCC fuses

MEQ Specifications

Time-Delay

Voltage Rating: MEQ - 500 VAC

Ampere Rating: 0.25 - 30 Amps

Interrupting Rating: 10,000 RMS Amps

Agency Approvals

- (0.25 - 30) UL Listed, File E162443
- (0.25 - 30) CSA Certified C22.2, Part 59.2, LR700489
- CE Compliant

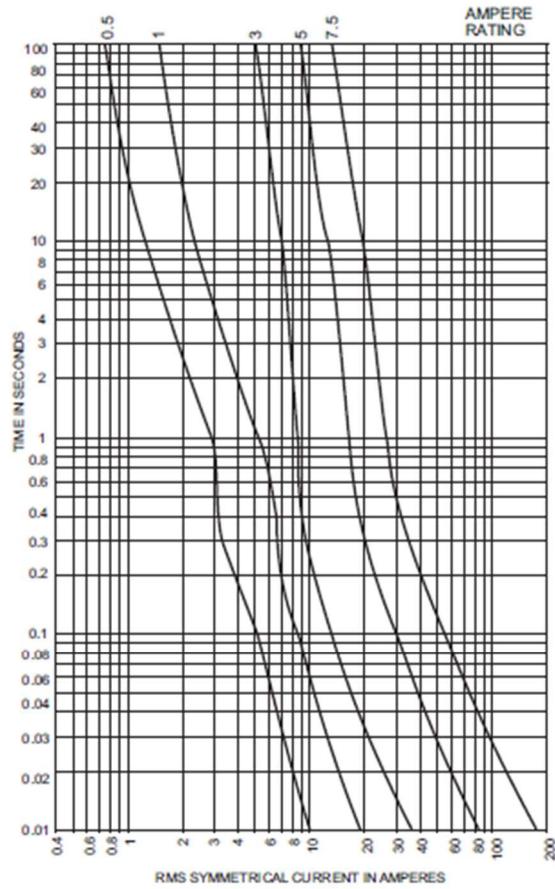


MEQ General Purpose Midget Class Fuses				
Part Number	AMP Rating	Pcs/Pkg	Package Weight	Price
MEQ-25	0.25	10	0.2 lb	\$93.00
MEQ-5	0.5			\$87.00
MEQ1	1			\$84.00
MEQ1-5	1.5			\$87.00
MEQ2	2			\$84.00
MEQ2-5	2.5			\$87.00
MEQ3	3			\$84.00
MEQ3-5	3.5			\$93.00
MEQ4	4			\$84.00
MEQ4-5	4.5			\$101.00
MEQ5	5			\$84.00
MEQ6	6			\$84.00
MEQ7	7			\$87.00
MEQ8	8			\$84.00
MEQ10	10			\$84.00
MEQ12	12			\$84.00
MEQ15	15			\$84.00
MEQ20	20			\$84.00
MEQ25	25			\$84.00
MEQ30	30			\$84.00

DIMENSIONS		
Amps	Female (in)	Length (in)
0.25 - 30	13/32	1-1/2

CROSS REFERENCE			
EDISON	BUSSMANN	GOULD	LITTELFUSE
MEQ	FNQ	ATO	FLQ

Characteristic Curves



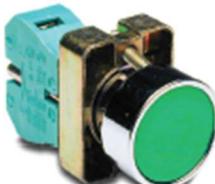
Push Button (GCX1104)

1 - 8 0 0 - 6 3 3 - 0 4 0 5

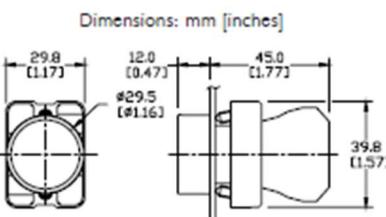
For the latest prices, please check AutomationDirect.com.

GCX Series 22mm Metal Pushbuttons

Momentary flush pushbuttons
with protective metal ring
(30mm dia. actuator)



GCX1102

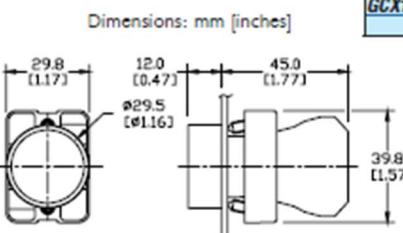


Part Number	Color	Price	Description
GCX1100	Black	\$7.25	One N.O. contact block, 30mm dia. actuator, mounts in 22mm hole
GCX1101	Red	\$7.25	One N.C. contact block, 30mm dia. actuator, mounts in 22mm hole
GCX1102	Green	\$7.25	
GCX1103	Yellow	\$7.25	
GCX1104	Blue	\$7.25	
GCX1105	White	\$7.25	

Momentary Flush ON/OFF
pushbuttons with protective metal
ring (30mm dia. actuator)



GCX1106



Part Number	Color	Price	Description
GCX1106	Red with "Off" symbol (O) on actuator	\$8.00	One N.C. contact block, 30mm dia. actuator, mounts in 22mm hole
GCX1107	Green with "On" symbol (I) on actuator	\$8.00	One N.O. contact block, 30mm dia. actuator, mounts in 22mm hole

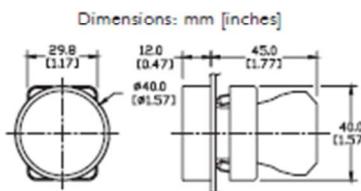


GCX1107

Momentary Pushbuttons
with protective metal ring
(40mm dia. actuator)



GCX1121



Part Number	Color	Price	Description
GCX1120	Black	\$8.50	One N.O. contact block, 40mm dia. actuator, mounts in 22mm hole
GCX1121	Red	\$8.50	One N.C. contact block, 40mm dia. actuator, mounts in 22mm hole
GCX1122	Green	\$8.50	
GCX1123	Yellow	\$8.50	
GCX1124	Blue	\$8.50	
GCX1125	White	\$8.50	

Note: Protective silicone covers are not available for this pushbutton.

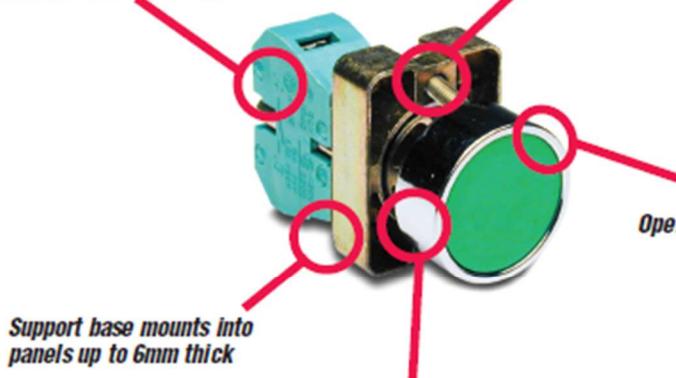
For accessories, see 22mm Metal Pilot Device Accessories in this section.

GCX Series 22mm Metal Pilot Devices

Features

Any combination of contact blocks is allowed, up to a total of six (two blocks wide and three blocks deep)

Secure mounting method eliminates twisting in mounting hole



Operators are protected to IP65

Support base mounts into panels up to 6mm thick

Chrome-plated alloy bezel is not only corrosion-resistant, but also attractive

Easy installation



To remove operator, press toward support base and twist counterclockwise.



Six contact block maximum; two wide by three deep



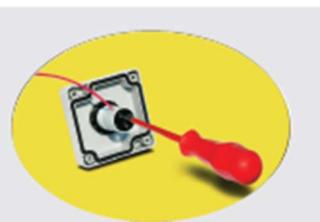
To install switch, place support base against rear of panel (not shown here), insert the operator and twist clockwise until it clicks into place. Carefully tighten the securing screws. Do not over-tighten.

Self-cleaning silver contacts provide reliable, low-energy switching

*Contacts rated A300
(Refer to E22 Series
mounting/contact rating
section for details.)*

Clear contact block for illustration purposes. Clear contact blocks are not available for sale from AutomationDirect.

Minimum current rating
15mA @ 24Vdc



All indicators offer side wire entry with back screw terminals for easy wiring

Fuji Duo Series SC-E Contactors

Features

- 5 to 100 hp at 480 VAC
- cULus and CSA approval, CE mark, meets JIS and IEC standards.
- Models SC-E02-xxx to SC-E4-xxx have 3-pole main circuits and come in three sizes with widths of 43 mm, 54 mm, and 67 mm.
- Models SC-E1-xxx to SC-E7-xxx employ a box terminal structure; allowing wires to be connected directly to the main circuit.
- Has a finger-protection terminal structure that prevents the exposure of live parts.
- Models SC-E5-xxx to SC-E7-xxx use a SUPERMAGNET™ (AC-input/DC-output operation) for high operating reliability and requires no surge suppressor.

Small Size

- SC-E02-xxx to E05-xxx: 43mm wide
- SC-E1-xxx to E2S-xxx: 54mm wide
- SC-E3-xxx, E4-xxx: 67mm wide
- SC-E5-xxx: 88mm wide



Fuji Electric



SC-E2S

SC-E7

Safety

- Terminals with finger-touch protection (DIN 57106/VDE 0106 Teil100)

Utility

- Box lug terminal construction
- Long electrical life
- Easy to wire

Environmental

- Low power consumption
- Recycled thermoplastic resin used for plastic parts.
- The names of materials are indicated on all major parts to facilitate recycling

Standards & Approvals

- UL listed, file E42419, Standard UL 508
- cUL listed, file E42419, Standard CSA C 22.2 No.14
- VDE 0660
- JIS C 8201-4-1
- IEC 60947-4-1 / EN 60947-4-1
- CE compliant

Optional accessories

- Auxiliary contact blocks
- Coil surge suppression units
- Replacement coils for contactor sizes SC-E5 and larger

SC-E Series Contactors Specifications - UL and CSA														
Model	Price	Nominal Coil Voltage	Rated Capacity (HP)						Rated AC-3 Current (A) [note 1]	SCCR Ratings (KA)	Frame Width (mm)			
			3-Phase Motor			1-Phase Motor								
			200V	220-240V	440-480V	550-600V	100-120V	220-240V						
SC-E02-24VAC	\$17.00	24VAC							9	20				
SC-E02-110VAC	\$17.00	110VAC												
SC-E02-220VAC	\$17.00	220VAC												
SC-E02-440VAC	\$17.00	440-480VAC												
SC-E02-500VAC	\$17.00	500-550VAC												
SC-E02G-24VDC	\$19.00	24VDC												
SC-E03-24VAC	\$21.50	24VAC												
SC-E03-110VAC	\$21.50	110VAC												
SC-E03-220VAC	\$21.50	220VAC												
SC-E03-440VAC	\$21.50	440-480VAC												
SC-E03-500VAC	retired		Please consider the Fuji Electric SC-E series as comparable replacement											
SC-E03G-24VDC	\$30.50	24VDC	3	3	7.5	7.5	1/2	2	12	20				
SC-E04-24VAC	\$27.00	24VAC												
SC-E04-110VAC	\$27.00	110VAC												
SC-E04-220VAC	\$27.00	220VAC												
SC-E04-440VAC	\$27.00	440-480VAC												
SC-E04-500VAC	\$27.00	500-550VAC												
SC-E04G-24VDC	\$37.50	24VDC												
SC-E05-24VAC	\$35.00	24VAC												
SC-E05-110VAC	\$35.00	110VAC												
SC-E05-220VAC	\$35.00	220VAC												
SC-E05-440VAC	\$35.00	440-480VAC												
SC-E05-500VAC	\$35.00	500-550VAC												
SC-E05G-24VDC	\$45.00	24VDC												

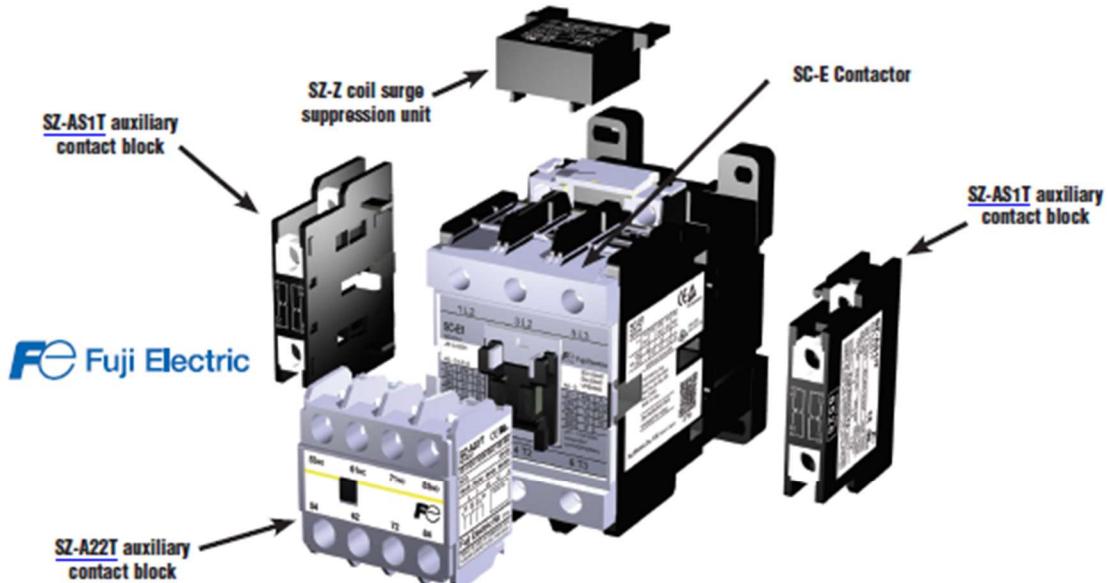
TABLE CONTINUED NEXT PAGE

Notes: 1. AC3 type loads consist of squirrel cage three-phase motors; occasional, limited jogging duty.
2. AC1 non-inductive or slightly inductive loads. Typically resistive loads (i.e. furnaces, ovens, etc.)

Fuji Duo Series SC-E Contactors

Accessories

Optional accessories



Auxiliary contact blocks with terminal covers

Maximum auxiliary contact blocks:
2 side mounted (1 per side) OR 1 front mounted. The front and side blocks cannot be mounted together on the same contactor.



Auxiliary Contact Blocks with Terminal Covers					
Part Number	Price	Applicable Contactor	Mounting	Number of Contacts	Contact Arrangement
SZ-A22T	\$14.50			4	2NO + 2NC
SZ-A20T	\$9.00	SC-E02(G)-xxx to E4(G)-xxx	Front mounting	2	2NO
SZ-A11T	\$9.00				1NO + 1NC
SZ-AS1T	\$14.50	SC-E02(G)-xxx to E4(G)-xxx		2	1NO + 1NC
SZ-AS2T	\$14.50	SC-E5, E6, E7-xxx, SC-N4, N5, N6, N7, N8, N10, N11, N12, SC-E5(G)-xxx to E7(G)-xxx	Side mounting	2	1NO + 1NC

Accessory Auxiliary Contact Ratings - UL and CSA					
NEMA ICS 5-2000 Ratings (note 1)			DC Ratings		
AC Ratings	Making VA	Breaking VA	Designation	Making/Breaking VA	
A600	7200	720	Q300	69	
<i>For more information, refer to Control Circuit Contact Electrical Ratings, page MRC-111.</i>					

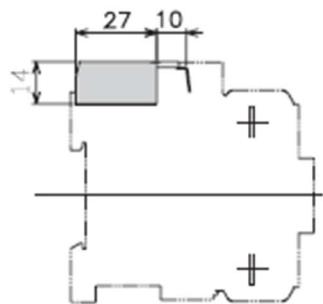
Accessory Auxiliary Contact Ratings - IEC and JIS continued on next page.

Fuji Duo Series SC-E Contactors

Dimensions (mm)

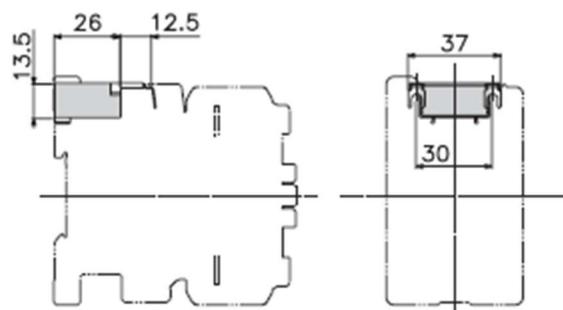
Coil surge suppression units

SZ-Z1, Z2, Z4, Z5

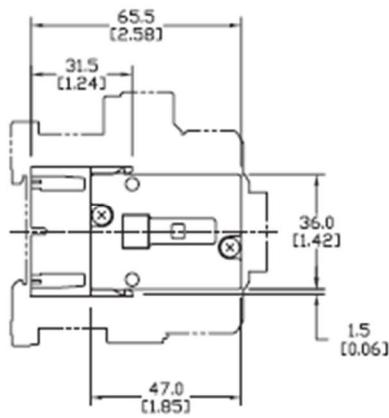


Weight: 14 g

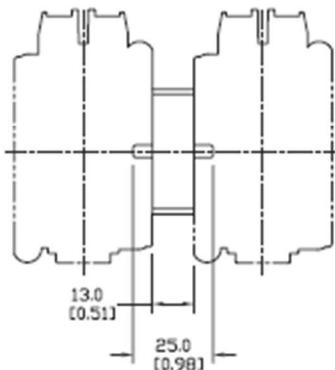
SZ-Z31, Z32, Z34, Z35, Z36, Z36, Z37



Weight: 15 g

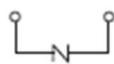


SZ-RM



Wiring diagrams

SC-E02 to E05-xxx + SZ-Z1, Z2
(Built-in varistor)



SC-E02 to E05-xxx + SZ-Z4, Z5
(Built-in capacitor/resistor)



SC-E1 to E4-xxx + SZ-Z31, Z32
(Built-in varistor)



SC-E1 to E4-xxx + SZ-Z34, Z35
(Built-in capacitor/resistor)

SC-E1G to E4G-xxx + SZ-Z36, Z37
(Built-in capacitor/resistor)



Annunciator (ECX2071-127R)

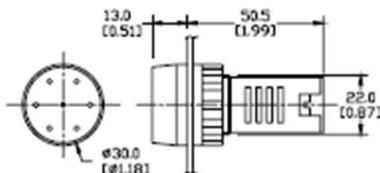
Audible annunciator



- 80dB @ 10cm
- 25mA @ 24V
- Intermittent sound when energized
- IP20 before Installation
- IP65 after installation

Part Number	Color	Price	Description
ECX2070-24	Black	\$7.25	22mm, 25mA audible (80dB at 10cm) buzzer annunciator, 24VAC/DC
ECX2070-127	Black	\$7.25	22mm, 25mA audible (80dB at 10cm) buzzer annunciator, 120VAC/DC
ECX2071-24R	Red	\$9.25	22mm, 25mA audible (80dB at 10cm) buzzer annunciator with non-replaceable LED indicator, 24VAC/DC
ECX2071-127R	Red	\$9.25	22mm, 25mA audible (80dB at 10cm) buzzer annunciator with non-replaceable LED indicator, 120VAC/DC

Dimensions: mm [inches]



Current Sensors (ACS150-CE-F)

1 - 8 0 0 - 6 3 3 - 0 4 0 5

For the latest prices, please check AutomationDirect.com.

ACUAMP® ACS150 Series AC Current Switches



ACS150 Series current operated switches combine a current transformer, signal conditioner and limit alarm into a single package for use in monitoring or proof of operation applications. Offering an adjustable setpoint range of 1 to 150 amps and universal, solid-state outputs, the self-powered ACS150 can be tailored to provide accurate and dependable digital indication of over-current conditions across a broad range of applications. The ACS150 is available in fixed-core and split-core models.

Applications

Electronic Proof of Flow

- Current operated switch eliminates the need for multiple pipe or duct penetrations.
- More reliable than electromechanical pressure or flow switches.

Conveyors

- Detect jams and overloads; useful when interlocking multiple conveyor sections

Heating Circuits

- Detect ON/OFF status; faster response times than with temperature sensors

Loss of Load Detective

- Detect belt or coupling breaks with fast response times

Lighting Circuits

- Easier and faster than photocells

Features

- Choose from:
N.O. 0.15 A @ 240VAC or VDC or
N.C. 0.20 A @ 135VAC or VDC output options.
- Status LED provides visual indication of setpoint trip and contact action.
- Self-powered operation cuts installation time and operating costs.
- Potentiometer-adjustable trip points speed start-up and allow for tailored operation.
- Choose either split core or fixed core enclosure style. Split core packages allow easy installation on existing systems; fixed core enclosures offer more compact package for OEM or new installations.
- Built-in mounting feet with optional 35mm DIN rail adapter available.
- Five-year warranty



ACS150 AC Current Operated Switches					
Part Number	Description	Pcs/Pkg	Wt (lb)	Price	
ACS150-AE-F	AcuAMP AC current switch, fixed core, 1-150A sensing range, 1-150A adjustable trip point, 15-turn potentiometer, solid state switch, N.O. output, 0.15A @ 240 VAC/VDC output rating.	1	0.30	\$67.00	
ACS150-AE-S	AcuAMP AC current switch, split core, 1.75-150A sensing range, 1.75-150A adjustable trip point, 4-turn potentiometer, solid state switch, N.O. output, 0.15A @ 240 VAC/VDC output rating.	1	0.35	\$82.00	
ACS150-CE-F	AcuAMP AC current switch, fixed core, 1-150A sensing range, 1-150A adjustable trip point, 15-turn potentiometer, solid state switch, N.C. output, 0.2A @ 135 VAC/VDC output rating.	1	0.30	\$67.00	
ACS150-CE-S	AcuAMP AC current switch, split core, 1.75-150A sensing range, 1.75-150A adjustable trip point, 4-turn potentiometer, solid state switch, N.C. output, 0.2A @ 135 VAC/VDC output rating.	1	0.35	\$82.00	
Accessories					
DRA-2B	35mm DIN rail adapters, 1.70" x 0.45" x 0.83" [43.7 x 11.4 x 21.0 mm]	2	0.40	\$3.75	

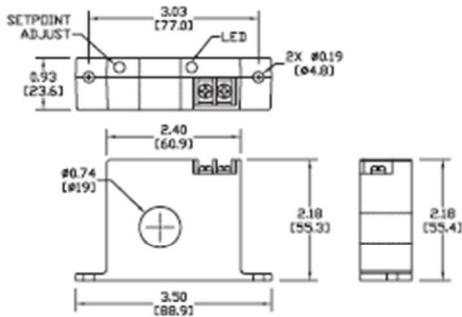
ACS150 Sensed Current Limits					
Type	Input Range	Amps			
		Continuous	6 Sec. max	1 Sec. max	
Fixed Core	1 to 150A	150	400	1000	
Split Core	1.75 to 150A	150	400	1000	

ACS150 Series Specifications	
Power Supply	None - Self-powered
Output	Isolated solid-state switch
Output Rating	N.O. 0.15 A @ 240VAC or VDC N.C. 0.20 A @ 135VAC or VDC
Response Time	120ms
Off State Leakage	<10µA
Setpoint (Trip Point)	Fixed core: 1 to 150A, Split core: 1.75 to 150A
Hysteresis	5% of Setpoint
Setpoint (Trip Point) Adjust	Fixed core: 15-turn potentiometer; Split core: 4-turn potentiometer
Isolation Voltage	UL listed to 1,270VAC. Tested to 5,000VAC (1 minute max)
Frequency Range	6 to 100 Hz
Case	UL 94V-0 flammability rated
Environmental	Operating Temperature: -58 to 149°F [-50 to 65°C]
	Relative Humidity: 0-95% RH, Non-condensing
	Pollution Degree 2
	Altitude to 2000 meters
Certifications	cULus listed (E222847), CE

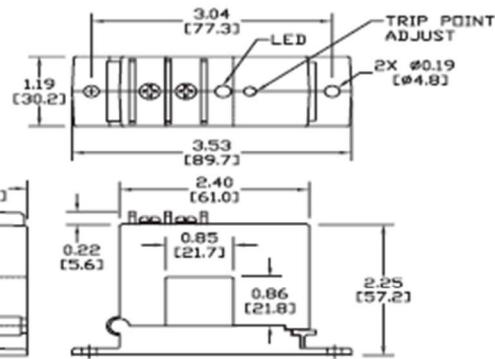
**ACUAMP® ACS150 Series
AC Current Switches**

Dimensions

Inches [mm]



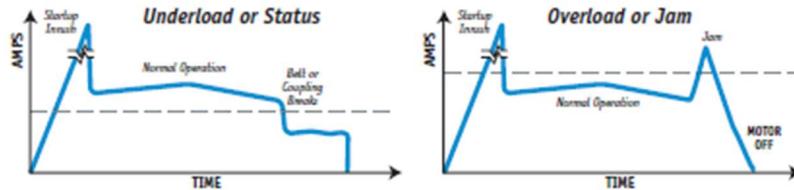
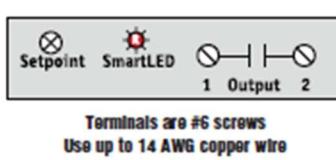
ACS150 Series Fixed Core



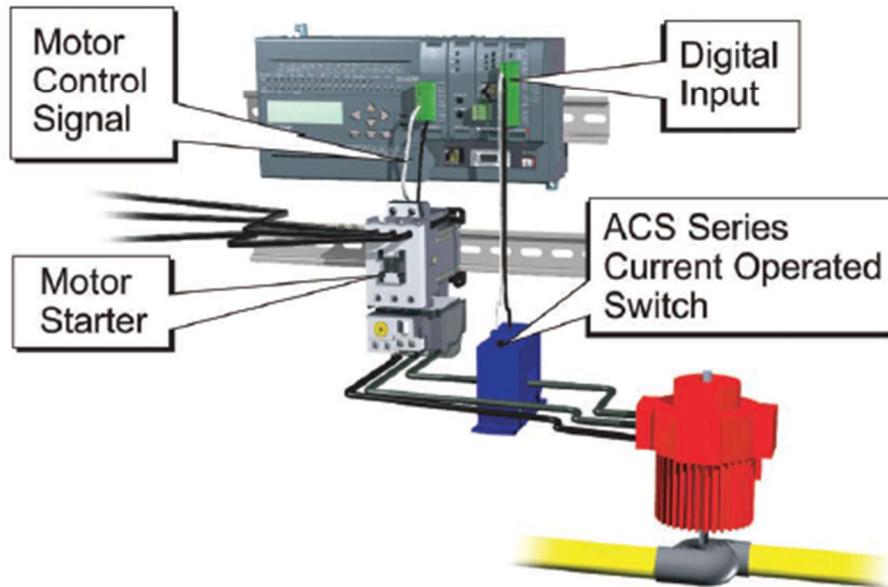
ACS150 Series Split Core

See our website www.AutomationDirect.com for complete Engineering drawings.

Wiring



Application Example



ACUAMP® AC Current Sensors, Switches and Transducers Application Guide

Application Guide

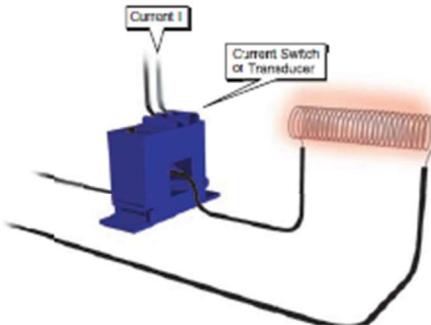
AcuAMP current sensors are a great fit for many applications including material handling, fan and pump applications, and heating systems. With current

transducers, current switches and current indicators, this sensor family gives you valuable data for processes ranging from monitoring loads to preventive maintenance. Models with the ability to read True RMS non-sinusoidal waveforms make it

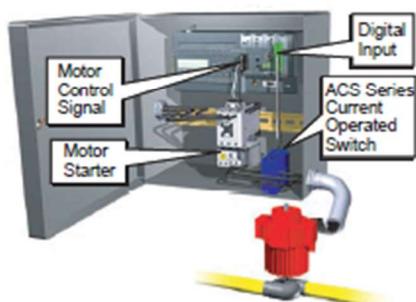
easy to monitor applications using variable frequency drives.

Use the application examples to help choose the best sensor model for your application.

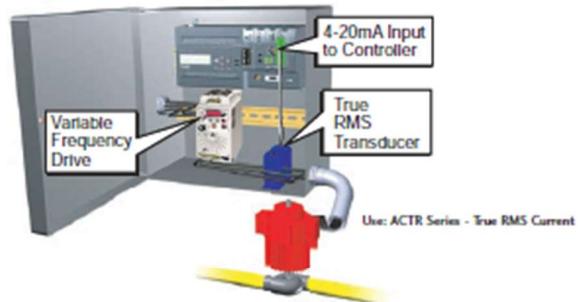
Heater Life Prediction



Pump Jam & Suction Loss Protection



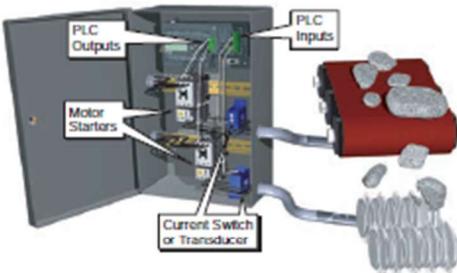
Pump Load Monitoring



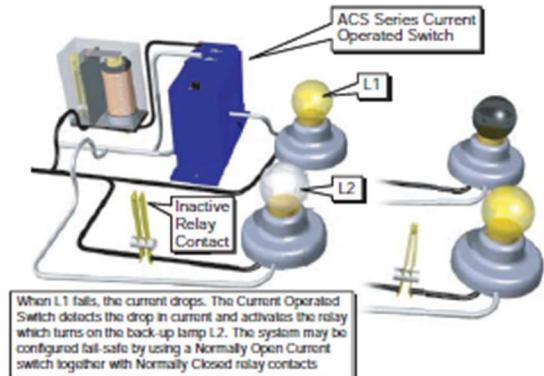
Crusher/Grinder/Shredder Motor Interlocks

The performance of size reduction equipment like crushers or grinders can be optimized by controlling the in-feed in order to:

- Help prevent jamming
- Improve the uniformity of the resultant product
- Enhance overall production efficiency

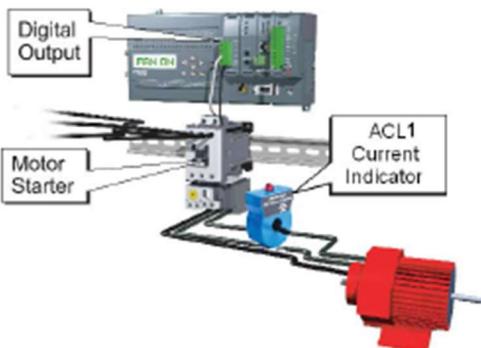


Lamp Failure Detection



When L1 fails, the current drops. The Current Operated Switch detects the drop in current and activates the relay which turns on the back-up lamp L2. The system may be configured fail-safe by using a Normally Open Current switch together with Normally Closed relay contacts.

Electric Motor Load Status



A.3 CPU 212 AC Power Supply, DC Inputs, Relay Outputs

Order Number: 6ES7 212-1BA01-0XB0

General Features		Input Points	
Physical size (L x W x D)	160 x 80 x 62 mm (6.3 x 3.15 x 2.44 in.)	Input type (IEC 1131-2)	Type 1 sinking
Weight	0.4 kg (0.9 lbs.)	ON state range	15-30 VDC, 4 mA minimum 35 VDC, 500 ms surge
Power dissipation	6 W	ON state nominal	24 VDC, 7 mA
User program size/storage	512 words/EEPROM	OFF state maximum	5 VDC, 1 mA
User data size/storage	512 words/RAM	Response time	10.0 to 10.7
Data retention	50 hr typical (8 hr minimum at 40° C)		0.3 ms maximum
Local I/O ¹	8 inputs/6 outputs	Optical isolation	500 VAC, 1 min
Maximum number of expansion modules	2	Power Supply	
Digital I/O supported	64 inputs/64 outputs	Voltage/frequency range	85 to 264 VAC at 47 to 63 Hz
Analog I/O supported	16 inputs/16 outputs	Input current	4 VA typical, CPU only 50 VA maximum load
Boolean execution speed	1.2 µs/instruction	Holdup time	20 ms minimum from 110 VAC
Internal memory bits	128	Inrush current	20 A peak at 264 VAC
Timers	64 timers	Fusing (non-replaceable)	2 A, 250 V, slow blow
Counters	64 counters	5 VDC current	260 mA for CPU 340 mA for expansion I/O
High-speed counters	1 software (2 KHz max.)	Isolated	Yes. Transformer, 1500 VAC, 1 min
Analog adjustments	1	DC Sensor Supply	
Standards compliance	UL 508 CSA C22.2 142 FM Class I, Division 2 VDE 0160 compliant CE compliant	Voltage range	20.4 to 28.8 VDC
Output Points		Ripple/noise (<10MHz)	1 V peak-to-peak maximum
Output type	Relay, dry contact	24 VDC available current	180 mA
Voltage range	5 to 30 VDC/250 VAC	Short circuit current limit	< 600 mA
Maximum load current	2 A/point, 6 A/common	Isolated	No
Overcurrent surge	7 A with contacts closed		
Isolation resistance	100 MΩ minimum (new)		
Switching delay	10 ms maximum		
Lifetime	10,000,000 mechanical 100,000 with rated load		
Contact resistance	200 mΩ maximum (new)		
Isolation			
coil to contact	1500 VAC, 1 min		
contact to contact	750 VAC, 1 min		
(between open contacts)			
Short circuit protection	None		

1 The CPU reserves 8 process-image input and 8 process-image output image register points for local I/O.

Provide Adequate Clearance for Cooling and Wiring

S7-200 devices are designed for natural convection cooling. For proper cooling, you must provide a clearance of at least 25 mm above and below the devices. Also, allow at least 75 mm of depth.

Caution

For vertical mounting, the maximum allowable ambient temperature is reduced by 10 degrees C. Mount the S7-200 CPU below any expansion modules.

When planning your layout for the S7-200 system, allow enough clearance for the wiring and communications cable connections. For additional flexibility in configuring the layout of the S7-200 system, use the I/O expansion cable.

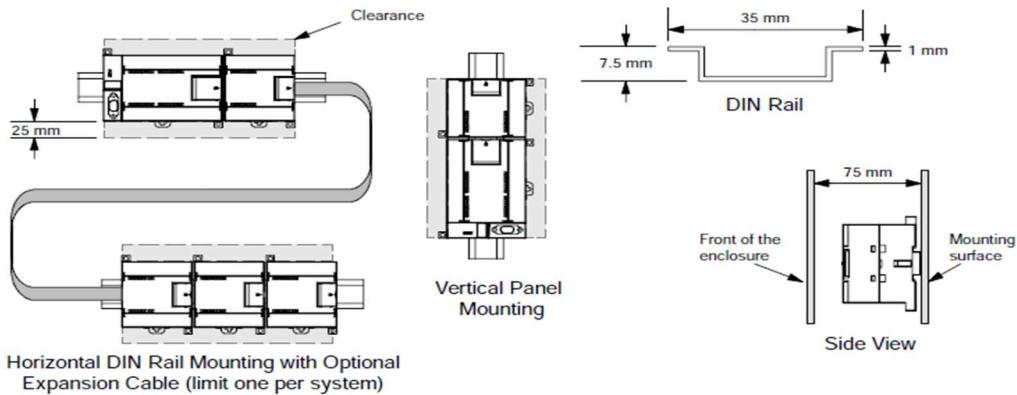


Figure 3-1 Mounting Methods, Orientation, and Clearance

Mounting Dimensions

The S7-200 CPUs and expansion modules include mounting holes to facilitate installation on panels. Refer to Table 3-1 for the mounting dimensions.

Table 3-1 Mounting Dimensions

The diagram illustrates the physical dimensions for DIN rail mounting. It shows two modules on a DIN rail. Key dimensions include:

- Total height: 96 mm (from bottom of rail to top of module)
- Module height: 88 mm
- Module width: 80 mm
- Clearance above module: 4 mm
- Clearance below module: 4 mm
- Module thickness: 9.5 mm*
- Minimum spacing between modules when hard-mounted: 9.5 mm*
- Mounting holes (M4 or No. 8): Located on the front panel of each module.

Dimensions A and B are also indicated.

S7-200 Module	Width A	Width B
CPU 221 and CPU 222	90 mm	82 mm
CPU 224	120.5 mm	112.5 mm
CPU 224XP, CPU 224XPsi	140 mm	132 mm
CPU 226	196 mm	188 mm
Expansion modules: 4- and 8-point DC and Relay I/O (8I, 4Q, 8Q, 4I/4Q) and Analog Out (2 AQ)	46 mm	38 mm
Expansion modules: 16-point digital I/O (16I, 8I/8Q), Analog I/O (4AI, 8AI, 4AQ, 4AI/1AQ), RTD, Thermocouple, PROFIBUS, Ethernet, Internet, AS-Interface, 8-point AC (8I and 8Q), Position, and Modem	71.2 mm	63.2 mm
Expansion modules: 32-point digital I/O (16I/16Q)	137.3 mm	129.3 mm
Expansion modules: 64-point digital I/O (32I/32Q)	196 mm	188 mm

Using Master and Slave Devices on a PROFIBUS Network

The S7-200 supports a master-slave network and can function as either a master or a slave in a PROFIBUS network, while STEP 7-Micro/WIN is always a master.

Masters

A device that is a master on a network can initiate a request to another device on the network. A master can also respond to requests from other masters on the network. Typical master devices include STEP 7-Micro/WIN, human-machine interface devices such as a TD 200, and S7-300 or S7-400 PLCs. The S7-200 functions as a master when it is requesting information from another S7-200 (peer-to-peer communications).

Slaves

A device that is configured as a slave can only respond to requests from a master device; a slave never initiates a request. For most networks, the S7-200 functions as a slave. As a slave device, the S7-200 responds to requests from a network master device, such as an operator panel or STEP 7-Micro/WIN.

Setting the Baud Rate and Network Address

The speed that data is transmitted across the network is the baud rate, which is typically measured in units of kilobaud (kbaud) or megabaud (Mbaud). The baud rate measures how much data can be transmitted within a given amount of time. For example, a baud rate of 19.2 kbaud describes a transmission rate of 19,200 bits per second.

Every device that communicates over a given network must be configured to transmit data at the same baud rate. Therefore, the fastest baud rate for the network is determined by the slowest device connected to the network.

Table 7-1 lists the baud rates supported by the S7-200.

The network address is a unique number that you assign to each device on the network. The unique network address ensures that the data is transferred to or retrieved from the correct device. The S7-200 supports network addresses from 0 to 126. For an S7-200 with two ports, each port has a network address. Table 7-2 lists the default (factory) settings for the S7-200 devices.

Table 7-1 Baud Rates Supported by the S7-200

Network	Baud Rate
Standard Network	9.6 kbaud to 187.5 kbaud
Using an EM 277	9.6 kbaud to 12 Mbaud
Freeport Mode	1200 baud to 115.2 kbaud

Table 7-2 Default Addresses for S7-200 Devices

S7-200 Device	Default Address
STEP 7-Micro/WIN	0
HMI (TD 200, TP, or OP)	1
S7-200 CPU	2

Bit Logic Instructions

Contacts

Standard Contacts

The Normally Open contact instructions (LD, A, and O) and Normally Closed contact instructions (LDN, AN, ON) obtain the referenced value from the memory or from the process-image register. The standard contact instructions obtain the referenced value from the memory (or process-image register if the data type is I or Q).

The Normally Open contact is closed (on) when the bit is equal to 1, and the Normally Closed contact is closed (on) when the bit is equal to 0. In FBD, inputs to both the And and Or boxes can be expanded to a maximum of 32 inputs. In STL, the Normally Open instructions Load, AND, or OR the bit value of the address bit to the top of the stack, and the Normally Closed instructions Load, AND, or OR the logical NOT of the bit value to the top of the stack.

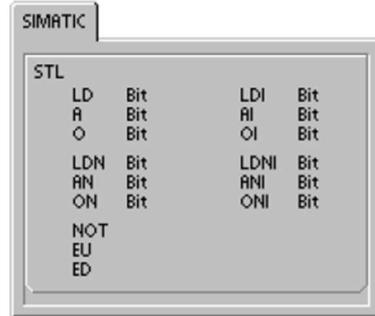
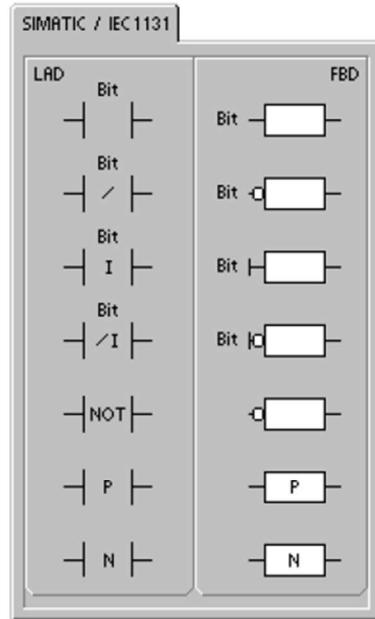
Immediate Contacts

An immediate contact does not rely on the S7-200 scan cycle to update; it updates immediately. The Normally Open Immediate contact instructions (LDI, AI, and OI) and Normally Closed Immediate contact instructions (LDNI, ANI, and ONI) obtain the physical input value when the instruction is executed, but the process-image register is not updated.

The Normally Open Immediate contact is closed (on) when the physical input point (bit) is 1, and the Normally Closed Immediate contact is closed (on) when the physical input point (bit) is 0. The Normally Open instructions immediately Load, AND, or OR the physical input value to the top of the stack, and the Normally Closed instructions immediately Load, AND, or OR the logical NOT of the value of the physical input point to the top of the stack.

NOT Instruction

The Not instruction (NOT) changes the state of power flow input (that is, it changes the value on the top of the stack from 0 to 1 or from 1 to 0).



Coils

Output

The Output instruction (=) writes the new value for the output bit to the process-image register. When the Output instruction is executed, the S7-200 turns the output bit in the process-image register on or off. For LAD and FBD, the specified bit is set equal to power flow. For STL, the value on the top of the stack is copied to the specified bit.

Output Immediate

The Output Immediate instruction (=I) writes the new value to both the physical output and the corresponding process-image register location when the instruction is executed.

When the Output Immediate instruction is executed, the physical output point (Bit) is immediately set equal to power flow. For STL, the instruction immediately copies the value on the top of the stack to the specified physical output bit (STL). The "I" indicates an immediate reference; the new value is written to both the physical output and the corresponding process-image register location when the instruction is executed. This differs from the non-immediate references, which write the new value to the process-image register only.

Set and Reset

The Set (S) and Reset (R) instructions set (turn on) or reset (turn off) the specified number of points (N), starting at the specified address (Bit). You can set or reset from 1 to 255 points.

If the Reset instruction specifies either a timer bit (T) or counter bit (C), the instruction resets the timer or counter bit and clears the current value of the timer or counter.

Error conditions that set ENO = 0

- 0006 (indirect address)
- 0091 (operand out of range)

Set Immediate and Reset Immediate

The Set Immediate and Reset Immediate instructions immediately set (turn on) or immediately reset (turn off) the number of points (N), starting at specified address (Bit). You can set or reset from 1 to 128 points immediately.

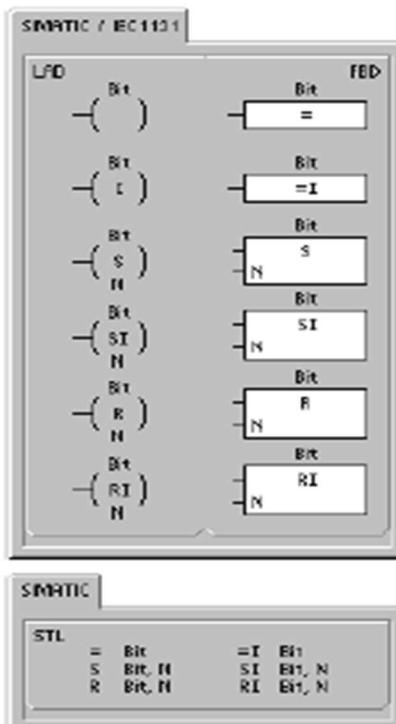
The "I" indicates an immediate reference; when the instruction is executed, the new value is written to both the physical output point and the corresponding process-image register location. This differs from the non-immediate references, which write the new value to the process-image register only.

Error conditions that set ENO = 0

- 0006 (indirect address)
- 0091 (operand out of range)

Table 6-4 Valid Operands for the Bit Logic Output Instructions

Inputs/Outputs	Data Type	Operands
Bit	BOOL	I, Q, V, M, SM, S, T, C, L
Bit (immediate)	BOOL	Q
N	BYTE	IB, QB, VB, MB, SMB, SB, LB, AC, *VD, *LD, *AC, Constant



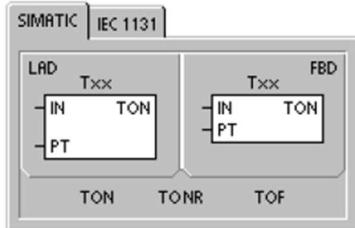
Timer Instructions

SIMATIC Timer Instructions

On-Delay Timer

Retentive On-Delay Timer

The On-Delay Timer (TON) and Retentive On-Delay Timer (TONR) instructions count time when the enabling input is on. The timer number (Txx) determines the resolution of the timer, and the resolution is now shown in the instruction box.



Off-Delay Timer

The Off-Delay Timer (TOF) is used to delay turning an output off for a fixed period of time after the input turns off. The timer number (Txx) determines the resolution of the timer, and the resolution is now shown in the instruction box.

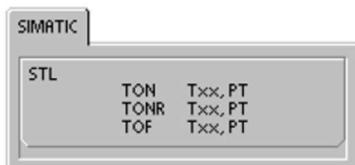


Table 6-72 Valid Operands for the SIMATIC Timer Instructions

Inputs/Outputs	Data Types	Operands
Txx	WORD	Constant (T0 to T255)
IN	BOOL	I, Q, V, M, SM, S, T, C, L, Power Flow
PT	INT	IW, QW, VW, MW, SMW, SW, T, C, LW, AC, AIW, *VD, *LD, *AC, Constant



Tip

You cannot share the same timer number (Txx) for an off-delay timer (TOF) and an on-delay timer (TON). For example, you cannot have both a TON T32 and a TOF T32.

As shown in Table 6-73, the three types of timers perform different types of timing tasks:

- You can use a TON for timing a single interval.
- You can use a TONR for accumulating a number of timed intervals.
- You can use a TOF for extending time past an off (or false) condition, such as for cooling a motor after it is turned off.

Counter Instructions

SIMATIC Counter Instructions

Count Up Counter

The Count Up instruction (CTU) counts up from the current value each time the count up (CU) input makes the transition from off to on. When the current value Cxx is greater than or equal to the preset value PV, the counter bit Cxx turns on. The counter is reset when the Reset (R) input turns on, or when the Reset instruction is executed. The counter stops counting when it reaches the maximum value (32,767).

STL operation :

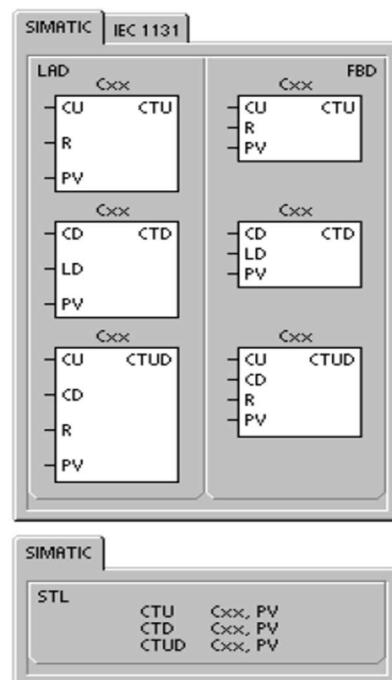
- Reset input: Top of stack
- Count Up input: Value loaded in the second stack location

Count Down Counter

The Count Down instruction (CTD) counts down from the current value of that counter each time the count down (CD) input makes the transition from off to on. When the current value Cxx is equal to 0, the counter bit Cxx turns on. The counter resets the counter bit Cxx and loads the current value with the preset value PV when the load input LD turns on. The counter stops upon reaching zero, and the counter bit Cxx turns on.

STL operation:

- Load input: Top of stack
- Count Down input: Value loaded in the second stack location.



Count Up/Down Counter

The Count Up/Down instruction (CTUD) counts up each time the count up (CU) input makes the transition from off to on, and counts down each time the count down (CD) input makes the transition from off to on. The current value Cxx of the counter maintains the current count. The preset value PV is compared to the current value each time the counter instruction is executed.

Upon reaching maximum value (32,767), the next rising edge at the count up input causes the current count to wrap around to the minimum value (-32,768). On reaching the minimum value (-32,768), the next rising edge at the count down input causes the current count to wrap around to the maximum value (32,767).

When the current value Cxx is greater than or equal to the preset value PV, the counter bit Cxx turns on. Otherwise, the counter bit turns off. The counter is reset when the Reset (R) input turns on, or when the Reset instruction is executed.

STL operation:

- Reset input: Top of stack
- Count Down input: Value loaded in the second stack location
- Count Up input: Value loaded in the third stack location

Table 6-22 Valid Operands for the SIMATIC Counter Instructions

Inputs/Outputs	Data Types	Operands
Cxx	WORD	Constant (C0 to C255)
CU, CD, LD, R	BOOL	I, Q, V, M, SM, S, T, C, L, Power Flow
PV	INT	IW, QW, VW, MW, SMW, SW, LW, T, C, AC, AIW, *VD, *LD, *AC, Constant

Math Instructions

Add, Subtract, Multiply, and Divide Instructions

Add

$IN1 + IN2 = OUT$
FBD
 $IN1 + OUT = OUT$

Subtract

$IN1 - IN2 = OUT$
LAD and STL
 $OUT - IN1 = OUT$

The Add Integer (+I) or Subtract Integer (-I) instructions add or subtract two 16-bit integers to produce a 16-bit result. The Add Double Integer (+D) or Subtract Double Integer (-D) instructions add or subtract two 32-bit integers to produce a 32-bit result. The Add Real (+R) and Subtract Real (-R) instructions add or subtract two 32-bit real numbers to produce a 32-bit real number result.

Multiply

$IN1 * IN2 = OUT$
FBD
 $IN1 * OUT = OUT$

Divide

$IN1 / IN2 = OUT$
LAD and STL
 $OUT / IN1 = OUT$

The Multiply Integer (*I) or Divide Integer (/I) instructions multiply or divide two 16-bit integers to produce a 16-bit result. (For division, no remainder is kept.) The Multiply Double Integer (*D) or Divide Double Integer (/D) instructions multiply or divide two 32-bit integers to produce a 32-bit result. (For division, no remainder is kept.) The Multiply Real (*R) or Divide Real (/R) instructions multiply or divide two 32-bit real numbers to produce a 32-bit real number result.

SM Bits and ENO

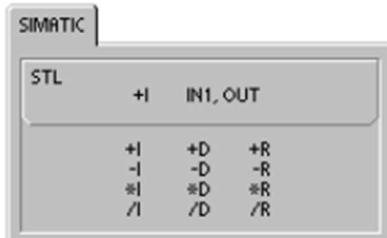
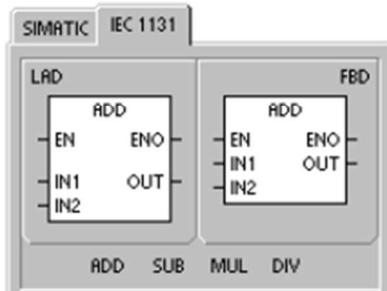
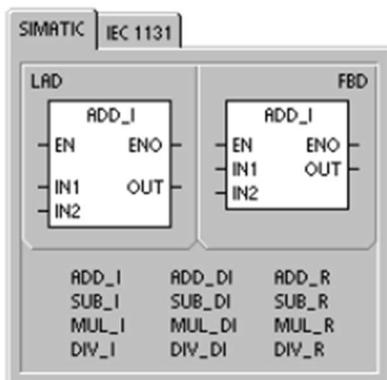
SM1.1 indicates overflow errors and illegal values. If SM1.1 is set, then the status of SM1.0 and SM1.2 is not valid and the original input operands are not altered. If SM1.1 and SM1.3 are not set, then the math operation has completed with a valid result and SM1.0 and SM1.2 contain valid status. If SM1.3 is set during a divide operation, then the other math status bits are left unchanged.

Error conditions that set
ENO = 0

- SM1.1 (overflow)
- SM1.3 (divide by zero)
- 0006 (indirect address)

Special Memory bits affected

- SM1.0 (zero)
- SM1.1 (overflow, illegal value generated during the operation, or illegal input parameter found)
- SM1.2 (negative)
- SM1.3 (divide by zero)



DIN Rail (DN-R35S1-2)

1 - 8 0 0 - 6 3 3 - 0 4 0 5

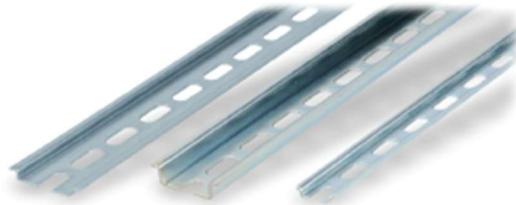
For the latest prices, please check AutomationDirect.com.

Accessories

Steel DIN Rails Features

35mm wide

- Available in 1-meter lengths
- 7.5 mm-high rails primarily used to mount terminal blocks, relays, timers and small PLCs such as the DL05, DL06, DL105, DL205, CLICK, and Productivity3000
- 15mm-high rails for mounting larger and heavier components such as contactors and larger PLCs

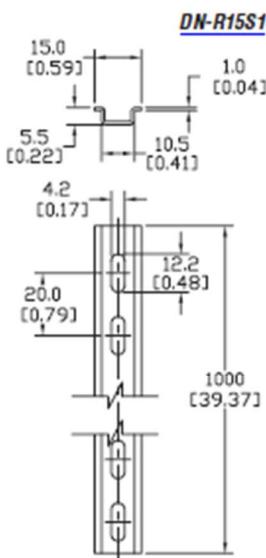
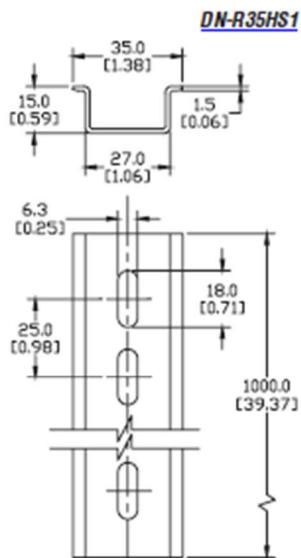
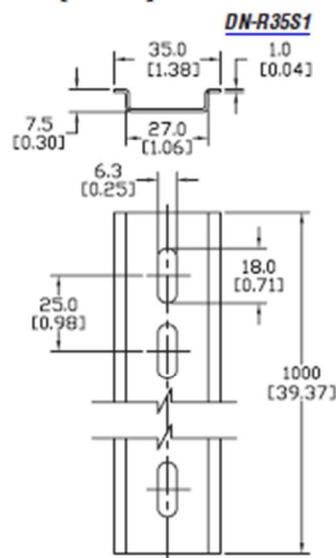
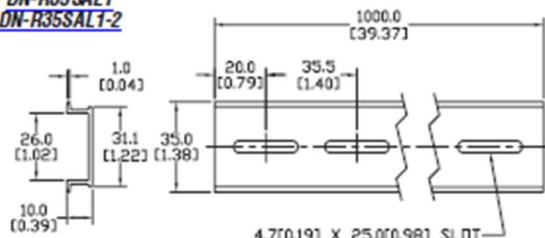
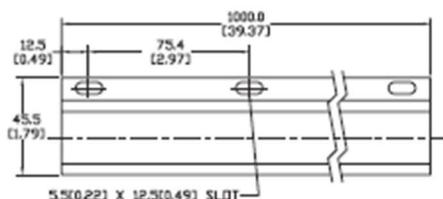
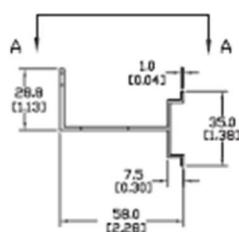
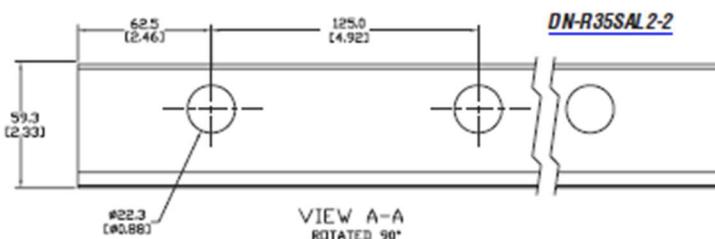


15mm wide

- Available in 1-meter lengths
- DN-R15S1 exclusively for mounting mini terminal blocks such as the [DN-M10-A](#)

	Part Number	Pcs/ Pkg	Price/ Pkg	Part Number	Pcs/ Pkg	Price/ Pkg	Part Number	Pcs/ Pkg	Price/ Pkg						
DIN Rail	DN-R35S1	10	\$32.50	DN-R35HS1	10	\$57.00	DN-R15S1	10	\$29.50						
	DN-R35S1-2	2	\$10.00	DN-R35HS1-2	2	\$15.00	DN-R15S1-2	2	\$9.50						
Steel DIN Rails Specifications															
Description	DINector DIN rail, slotted, 35mm, 7.5mm height, 1m length, plated steel. Package of 10.			DINector DIN rail, slotted, 35mm, 15mm height, 1m length, plated steel. Package of 10.			DINector DIN rail, slotted, 15mm, 5.5mm height, 1m length, plated steel. Package of 2.								
Plating	Zinc-plated and chromated														
International Standards	EN 60715, RoHs														
Suggested Mounting Screw Type	M6			M6			M4								


DINnectors[®] Accessories

Dimensions
 mm [inches]

DN-R35SAL1
DN-R35SAL1-2

DN-R35SAL2-2


Fuse Block (EHM1DU)

1-800-633-0405

For the latest prices, please check AutomationDirect.com.

Modular Fuse Holders for Class CC & Midget Class Fuses



Features

- EHCC Series: High SCCR rated, UL Listed CC holder with Indicator option for 600VAC/DC
- EHM Series: UL Recognized midget holders
- Minimum 90VAC/DC required for illumination
- Rated for use with 75°C or 90°C wire, fine stranded wire, spade terminals and comb-bus bars. Use any higher temperature rated wire with appropriate derating.
- Complete range of UL Listed and high SCCR rated 1-phase and 3-phase finger-safe comb-bus bars and power feed lugs
- Polyester material is UL 94V0 rated, self extinguishing
- Multi-phase connections available for ganging up to 4 poles*
- Mounts on 35 mm DIN rail
- IP20 rated
- Spade terminals are accepted (Max width:10mm, Min ID of slot 4mm Max ID of slot 5mm)
- Wire ferrules may not be used.

Application

- EHM: Edison MCL, MOL, MEQ, MEN, or midget fuses
- EHCC: Edison HCLR, HCTR, EDCC fuses, or class CC fuses

Agency Approvals/ Standards Class CC

- UL File E300536
Guide IZLT Listed
- CSA File #7235, Class 6225-01
- CE Compliant
- RoHS, Reach

Agency Approvals/ Standards Midget

- UL File E300536
IZLT2 Recognized
- CSA File #7235, Class 6225-30
- IEC 60269-2
- CE Compliant
- RoHS, Reach

Modular Fuse Holder Selection Table												
Series Size	Max Voltage & Current	IEC	UL	Phase Configuration	Fuse Holder Without Indication	Box Qty.	Pkg. Wt. (lb.)	Price	Fuse Holder with NEON Indication	Product Weight (lb.)	Box Qty.	Price
EHM Midget Class	UL 600V/30A IEC 690V/32A	•	•	1 pole	EHM1DU	1	0.12	\$9.50	EHM1DIU	0.12	1	\$12.50
		•	•	2 pole	EHM2DU	1	0.24	\$19.50	EHM2DIU	0.24	1	\$25.50
		•	•	3 pole	EHM3DU	1	0.36	\$30.00	EHM3DIU	0.36	1	\$40.50
	UL 600V/30A	•	•	1 pole	EHM1DU-12	12	1.42	\$97.00	EHM1DIU-12	1.42	12	\$129.00
		•	•	2 pole	EHM2DU-6	6	1.42	\$101.00	EHM2DIU-6	1.42	6	\$132.00
		•	•	3 pole	EHM3DU-4	4	1.42	\$102.00	EHM3DIU-4	1.42	4	\$136.00
EHCC Class CC	UL 600V/30A	•	•	1 pole	EHCC1DU	1	0.12	\$11.00	EHCC1DIU	0.12	1	\$14.50
		•	•	2 pole	EHCC1DU-12	12	1.42	\$114.00	EHCC1DIU-12	1.42	12	\$148.00
		•	•	3 pole	EHCC2DU	1	0.24	\$23.00	EHCC2DIU	0.24	1	\$30.00
	UL 600V/30A	•	•	1 pole	EHCC2DU-6	6	1.42	\$117.00	EHCC2DIU-6	1.42	6	\$152.00
		•	•	2 pole	EHCC3DU	1	0.36	\$34.50	EHCC3DIU	0.36	1	\$45.50
		•	•	3 pole	EHCC3DU-4	4	1.42	\$118.00	EHCC3DIU-4	1.42	4	\$153.00

- * To add additional poles, see multi-pole connection kit JV-L in accessories. One JV-L kit is sufficient to gang up to 4 poles.
- UL Recognized, CSA
- UL Listed, CSA

Modular Fuse Holders for Class CC & Midget Class Fuses



Modular Fuse Holder Specifications										
Part Number w/o Indication	Part Number w/ Indication	Holder Size	Max Voltage & Current	Number of poles	Wire Range	Maximum Torque	Operating Temperature	SCCR Rating	Terminal Rating	Flammability Rating
EHM1DU	EHM1DIU	EHM Midget Class and 10x38	UL/CSA 600V/30A IEC 690V/32A	1	18-4 AWG (0.8-21 mm ²) 30 lb-in (3.4 N·m) maximum	-20°C to +90°C -4°F to 194°F (indicating) -20°C to +120°C -4°F to 248°F (non-indicating)	100kA rms sym	Solid, Stranded, Fine stranded, Spade lug, Comb-bus bar; Single and dual wire; 75°C and 90°C Cu wire	UL 94V0 self-extinguishing	
EHM1DU-12	EHM1DIU-12			2						
EHM2DU	EHM2DIU			3						
EHM2DU-6	EHM2DIU-6			1						
EHM3DU	EHM3DIU			2						
EHM3DU-4	EHM3DIU-4			3						
EHCC1DU	EHCC1DIU	EHCC Class CC	UL/CSA 600V/30A	1	18-4 AWG (0.8-21 mm ²) 30 lb-in (3.4 N·m) maximum	-20°C to +90°C -4°F to 194°F (indicating) -20°C to +120°C -4°F to 248°F (non-indicating)	200kA rms sym	Solid, Stranded, Fine stranded, Spade lug, Comb-bus bar; Single and dual wire; 75°C and 90°C Cu wire	UL 94V0 self-extinguishing	
EHCC1DU-12	EHCC1DIU-12			2						
EHCC2DU	EHCC2DIU			3						
EHCC2DU-6	EHCC2DIU-6			1						
EHCC3DU	EHCC3DIU			2						
EHCC3DU-4	EHCC3DIU-4			3						

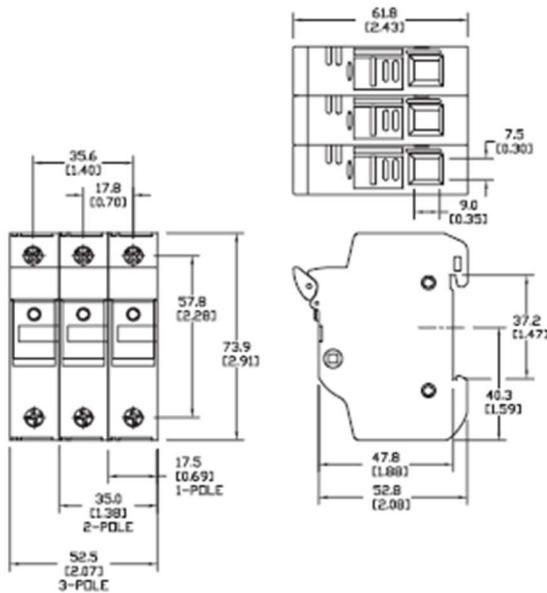
CHCC and EHM Wire Range, Type and Torque

Wire Range	Conductor Type	Number of Conductors	Torque
18-14 AWG (0.8-2.0 mm ²)	Solid, Stranded	Single	20 lb-in (2.3 N·m)
18-16 AWG (0.8-1.3 mm ²)		Dual	25 lb-in (2.8 N·m)
14-10 AWG (2.0-5.2 mm ²)			
12-10 AWG (3.3-5.2 mm ²)			
8-4 AWG (8.3-21.1 mm ²)	Stranded, Fine Stranded	Single	30 lb-in (3.4 N·m)
18-14 AWG (0.8-2.0 mm ²)	Spade Terminal		
N/A	Comb Bus		

Fuse Holder Dimensions

mm [inches]

EHM Midget Class / EHCC Class CC



ECX Series 22mm Plastic Indicator Lights

Plastic incandescent indicator lights



ECX1051-24

These indicators have a key to prevent rotation when mounted.

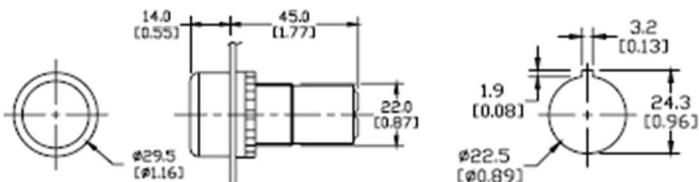
12 models available:

- Available in six colors
- 24V and 120V models
- Incandescent bulbs included
- Accepts LED replacement lamps
- Monoblock design for easy mounting
- Side wire entry with back screw terminals for easy wiring and maintenance
- IP20 rated before installation
- IP65 rated after installation

Note: When using LED replacement lamps with these indicators, it may be necessary to remove the frosted diffuser for enhanced illumination.

Part Number	Lamp Color	Price	Description	Replacement Incandescent Bulb	Replacement Lamp
ECX1051-24	Red	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1911-2 2/pk 26mA
ECX1051-120	Red	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1921-2 2/pk 5mA
ECX1052-24	Green	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1912-2 2/pk 26mA
ECX1052-120	Green	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1922-2 2/pk 5mA
ECX1053-24	Yellow	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1913-2 2/pk 26mA
ECX1053-120	Yellow	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1923-2 2/pk 5mA
ECX1054-24	Blue	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1914-2 2/pk 26mA
ECX1054-120	Blue	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1924-2 2/pk 5mA
ECX1055-24	Clear	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1915-2 2/pk 26mA
ECX1055-120	Clear	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1925-2 2/pk 5mA
ECX1056-24	White	\$6.00	22mm monoblock incandescent indicator light, 24VDC/VAC	ECX1902-5 5pk 80mA	ECX1913-2 2/pk 26mA
ECX1056-120	White	\$7.25	22mm monoblock incandescent indicator light, 120VDC/VAC	ECX1904-5 5pk 20mA	ECX1925-2 2/pk 5mA

Dimensions: mm [inches]



Plastic LED indicator lights

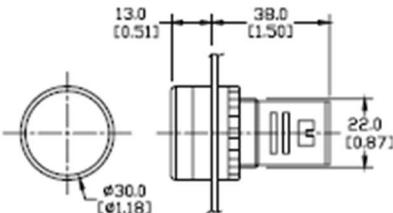


10 models available:

- Available in five colors
- 24V and 120V models
- Non-replaceable LEDs
- Side wire entry with back screw terminals for easy wiring and maintenance
- IP20 rated before installation
- IP65 rated after installation
- 16mA @ 127V, 18mA @ 24V

Part Number	Lamp Color	Price	Description
ECX2051-24L	Red	\$5.50	22mm non-metal monoblock LED indicator light, 24VDC/VAC
ECX2051-127L	Red	\$6.75	22mm non-metal monoblock LED indicator light, 120VDC/VAC
ECX2052-24L	Green	\$5.50	22mm non-metal monoblock LED indicator light, 24VDC/VAC
ECX2052-127L	Green	\$6.75	22mm non-metal monoblock LED indicator light, 120VDC/VAC
ECX2053-24L	Yellow	\$5.50	22mm non-metal monoblock LED indicator light, 24VDC/VAC
ECX2053-127L	Yellow	\$6.75	22mm non-metal monoblock LED indicator light, 120VDC/VAC
ECX2054-24L	Blue	\$9.25	22mm non-metal monoblock LED indicator light, 24VDC/VAC
ECX2054-127L	Blue	\$9.25	22mm non-metal monoblock LED indicator light, 120VDC/VAC
ECX2055-24L	Clear	\$9.25	22mm non-metal monoblock LED indicator light, 24VDC/VAC
ECX2055-127L	Clear	\$9.25	22mm non-metal monoblock LED indicator light, 120VDC/VAC

Dimensions: mm [inches]



For accessories, see 22mm Plastic Pilot Device Accessories in this section.

Terminal Block & Accessories

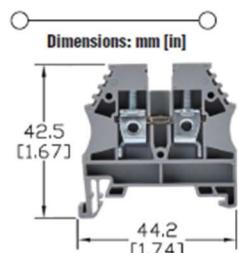
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For the latest prices, please check AutomationDirect.com.

Single-Level Terminal Blocks



- Screw connection terminal
- UL E179129 (For copper wire only. One conductor in terminal only.)
- VDE (IEC 60947-7-1)
- CE (EN 60947-7-1)
- * For 600V application see UL online file usage Group D



See our website: www.AutomationDirect.com
for complete engineering drawings

Ordering Information									
Colors	Part Number	Qty.	Price	Part Number	Qty.	Price	Part Number	Qty.	Price
Gray	KN-T12GRY	100	\$23.50	KN-T10GRY	100	\$27.00	KN-T8GRY	100	\$53.00
	KN-T12GRY-25	25	\$6.75	KN-T10GRY-25	25	\$7.25	KN-T8GRY-25	25	\$15.00
Blue	KN-T12BLU	100	\$23.50	KN-T10BLU	100	\$27.00	KN-T8BLU	100	\$53.00
	KN-T12BLU-25	25	\$6.75	KN-T10BLU-25	25	\$7.25	KN-T8BLU-25	25	\$15.00
Brown	KN-T12BRN	100	\$23.50	KN-T10BRN	100	\$27.00	KN-T8BRN	100	\$53.00
	KN-T12BRN-25	25	\$6.75	KN-T10BRN-25	25	\$7.25	KN-T8BRN-25	25	\$15.00
Black	KN-T12BLK	100	\$23.50	KN-T10BLK	100	\$27.00	KN-T8BLK	100	\$53.00
	KN-T12BLK-25	25	\$6.75	KN-T10BLK-25	25	\$7.25	KN-T8BLK-25	25	\$15.00
Green	KN-T12GRN	100	\$23.50	KN-T10GRN	100	\$27.00	KN-T8GRN	100	\$53.00
	KN-T12GRN-25	25	\$6.75	KN-T10GRN-25	25	\$7.25	KN-T8GRN-25	25	\$15.00
Orange	KN-T12ORG	100	\$23.50	KN-T10ORG	100	\$27.00	KN-T8ORG	100	\$53.00
	KN-T12ORG-25	25	\$6.75	KN-T10ORG-25	25	\$7.25	KN-T8ORG-25	25	\$15.00
Red	KN-T12RED	100	\$23.50	KN-T10RED	100	\$27.00	KN-T8RED	100	\$53.00
	KN-T12RED-25	25	\$6.75	KN-T10RED-25	25	\$7.25	KN-T8RED-25	25	\$15.00
Yellow	KN-T12YEL	100	\$23.50	KN-T10YEL	100	\$27.00	KN-T8YEL	100	\$53.00
	KN-T12YEL-25	25	\$6.75	KN-T10YEL-25	25	\$7.25	KN-T8YEL-25	25	\$15.00
White	KN-T12WHT	100	\$23.50	KN-T10WHT	100	\$27.00	KN-T8WHT	100	\$53.00
	KN-T12WHT-25	25	\$6.75	KN-T10WHT-25	25	\$7.25	KN-T8WHT-25	25	\$15.00

Technical Specifications

Model	KN-T12			KN-T10			KN-T8		
Width	5mm [0.20 in]			6mm [0.24 in]			8mm [0.31 in]		
Stripping Length	10mm [0.39 in]			10mm [0.39 in]			12mm [0.47 in]		
Tightening Torque	0.4 N·m [3.5 lb-in]			0.5 N·m [4.4 lb-in]			0.8 N·m [7.1 lb-in]		
Density	200/m [60 pcs/ft]			166/m [50 pcs/ft]			125/m [38 pcs/ft]		
UL/CSA Approval	600V	20A	26-12 AWG	*300V	30A	26-10 AWG	*300V	50A	26-8 AWG
VDE Approval	750V	24A	2.5 mm ²	750V	32A	4mm ²	630V	41A	6mm ²
CE Conformity	750V	24A	2.5 mm ²	750V	32A	4mm ²	630V	41A	6mm ²
SCCR Rating	100kA			100kA			100kA		
Operating Temperature	Ambient air temperature: -67°F to 185°F [-55°C to 85°C], Relative humidity: 50% max at 104°F [40°C] and 90% max at 68°F [20°C]								
Material	Current Bar: Copper Alloy / Housing: Polyamide 66 / Screw: Zinc Plated Steel								
DIN Rail Width	35mm								

Accessories

End Covers (International colors)	Gray	KN-ECT6GRY	100/pkg	\$17.50	KN-ECT6GRY	100/pkg	\$17.50	KN-ECT6GRY	100/pkg	\$17.50
	Blue	KN-ECT6BLU	25/pkg	\$4.00	KN-ECT6BLU	25/pkg	\$4.00	KN-ECT6BLU	25/pkg	\$4.00
	Brown	KN-ECT6BRN			KN-ECT6BRN			KN-ECT6BRN		
	Black	KN-ECT6BLK			KN-ECT6BLK			KN-ECT6BLK		
	Green	KN-ECT6GRN	10/pkg	\$2.00	KN-ECT6GRN	10/pkg	\$2.00	KN-ECT6GRN	10/pkg	\$2.00
	Orange	KN-ECT6ORG			KN-ECT6ORG			KN-ECT6ORG		
	Red	KN-ECT6RED			KN-ECT6RED			KN-ECT6RED		
	Yellow	KN-ECT6YEL			KN-ECT6YEL			KN-ECT6YEL		
Separators (International colors)	White	KN-ECT6WHT			KN-ECT6WHT			KN-ECT6WHT		
	Gray	KN-ST1GRY	25/pkg	\$8.25	KN-ST1GRY	25/pkg	\$8.25	KN-ST1GRY	25/pkg	\$8.25
	Blue	KN-ST1BLU			KN-ST1BLU			KN-ST1BLU		
	Brown	KN-ST1BRN			KN-ST1BRN			KN-ST1BRN		
	Black	KN-ST1BLK			KN-ST1BLK			KN-ST1BLK		
	Green	KN-ST1GRN	10/pkg	\$3.00	KN-ST1GRN	10/pkg	\$3.00	KN-ST1GRN	10/pkg	\$3.00
	Orange	KN-ST1ORG			KN-ST1ORG			KN-ST1ORG		
	Red	KN-ST1RED			KN-ST1RED			KN-ST1RED		
Jumpers	Yellow	KN-ST1YEL			KN-ST1YEL			KN-ST1YEL		
	White	KN-ST1WHT			KN-ST1WHT			KN-ST1WHT		
	2-pole	KN-2J12	25/pkg	\$8.25	KN-2J10	25/pkg	\$11.50	KN-2J8	25/pkg	\$12.00
	3-pole	KN-3J12	20/pkg	\$10.00	KN-3J10	20/pkg	\$14.00	KN-3J8	20/pkg	\$15.00
Comb-type jumper / 2-pole	4-pole	KN-4J12	15/pkg	\$12.00	KN-4J10	15/pkg	\$14.00	KN-4J8	15/pkg	\$14.50
	10-pole	KN-10J12	5/pkg	\$8.25	KN-10J10	5/pkg	\$10.00	KN-10J8	5/pkg	\$11.50
		KN-2JCC12	25/pkg	\$11.00	KN-2JCC10	25/pkg	\$21.50	KN-2JCC8	25/pkg	\$22.50
	Top Cover / Blank	KN-TC-1	25/pkg	\$6.75	KN-TC-1	25/pkg	\$6.75	KN-TC-1	25/pkg	\$6.75
Top Cover / Symbol	KN-TC-1S	25/pkg	\$9.25		KN-TC-1S	25/pkg	\$9.25	KN-TC-1S	25/pkg	\$9.25
	Marking Tags	KN-L5 Series			KN-L5 Series			KN-L5 / KN-L6P5 Series		

KONNECT-IT® Accessories



Multi-Pole Jumper Bars

Multi-pole jumper bars provide terminal block connection flexibility. Screw-down connection jumpers feature all-metal construction and can be installed quickly just by tightening the screws. Screwless comb-style jumpers are also available. See next page for the larger J1/0 jumper installation instructions.

KN-10J12



KN-2JM12



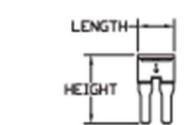
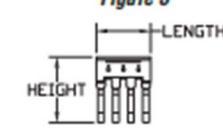
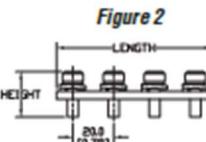
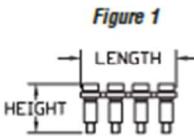
KN-2JCC8



Multi-Pole Jumper Bars Ordering Information										
Type	Part Number	Price	Pcs/ Pkg	Number of Poles	Ratings	Dimensions - mm [in]			Fig.	Works With
						Height	Length	Width		
Screw-down connection	KN-2J12	\$8.25	25	2	750V 24A	10.1 [0.40]				KN-T12 KN-D12 KN-D12X KN-D12DR1 KN-D12LED
	KN-3J12	\$10.00	20	3	750V 24A	15.3 [0.60]				
	KN-4J12	\$12.00	15	4	750V 24A	20.4 [0.80]				
	KN-10J12	\$8.25	5	10	750V 24A	51.1 [2.01]				
	KN-2J10	\$11.50	25	2	750V 32A	10.8 [0.43]				KN-T10 KN-D10 KN-D10X KN-D10DR1 KN-D10LED
	KN-3J10	\$14.00	20	3	750V 32A	15.5 [0.61]	17.0 [0.67]			
	KN-4J10	\$14.00	15	4	750V 32A	23.0 [0.91]				
	KN-10J10	\$10.00	5	10	750V 32A	59.0 [2.32]				
	KN-2J8	\$12.00	25	2	630V 41A	14.3 [0.56]				
	KN-3J8	\$15.00	20	3	630V 41A	15.5 [0.61]	22.3 [0.88]			KN-T8
	KN-4J8	\$14.50	15	4	630V 41A	30.3 [1.19]				
	KN-10J8	\$11.50	5	10	630V 41A	78.3 [3.08]				
	KN-2J6	\$15.50	25	2	630V 57A	18.0 [0.71]				
	KN-3J6	\$16.50	20	3	630V 57A	28.0 [1.10]				
	KN-4J6	\$16.50	15	4	630V 57A	38.0 [1.50]				
	KN-10J6	\$12.50	5	10	630V 57A	98.0 [3.86]				
	KN-2J4	\$24.00	25	2	750V 76A	21.0 [0.83]				
	KN-3J4	\$25.50	20	3	750V 76A	23.0 [0.91]	33.0 [1.30]			
	KN-4J4	\$25.50	15	4	750V 76A	45.0 [1.77]				
	KN-10J4	\$20.50	5	10	750V 76A	117.0 [4.61]				
	KN-2J2	\$24.50	25	2	750V 125A	29.0 [1.14]				
	KN-3J2	\$27.00	20	3	750V 125A	21.0 [0.83]	45.0 [1.77]			
	KN-4J2	\$27.00	15	4	750V 125A	61.0 [2.40]				
	KN-10J2	\$20.50	5	10	750V 125A	157.0 [6.18]				
	KN-2J1/0	\$7.75	5	2	1000V 150A	36.0 [1.42]				
	KN-3J1/0	\$12.50	5	3	1000V 150A	22.3 [0.88]	56.0 [2.20]			KN-T1/0
	KN-4J1/0	\$16.50	5	4	1000V 150A	76.0 [2.99]				
	KN-2JTL12	\$12.50	25	2	440V 24A	11.0 [0.43]				KN-DG12 KN-IG12 KN-IL14 KN-IL14S KN-IL14SLN KN-IL14SP
	KN-3JTL12	\$16.00	20	3	440V 24A	15.5 [0.61]				
	KN-4JTL12	\$14.50	15	4	440V 24A	21.5 [0.85]				
	KN-10JTL12	\$12.50	5	10	440V 24A	57.5 [2.26]				
	KN-2JM10	\$7.75	25	2	750V 32A	9.5 [0.37]				
	KN-3JM10	\$9.25	20	3	750V 32A	23.2 [0.91]	13.0 [0.51]			KN-M10 KN-KBD10
	KN-4JM10	\$11.00	15	4	750V 32A	21.7 [0.85]	18.0 [0.71]			
	KN-10JM10	\$10.00	5	10	750V 32A	48.0 [1.89]				
	KN-2JM12	\$7.25	25	2	750V 24A	8.0 [0.31]				
	KN-3JM12	\$8.25	20	3	750V 24A	13.0 [0.51]				
	KN-4JM12	\$8.25	15	4	750V 24A	18.0 [0.71]				
	KN-10JM12	\$8.25	5	10	750V 24A	26.7 [1.05]				
	KN-2JCC12	\$11.00	25		750V 24A	23.7 [0.93]	8.0 [0.31]			
	KN-2JCC10	\$21.50	25		750V 32A	24.7 [0.97]	9.5 [0.37]			
	KN-2JCC8	\$22.50	25		630V 41A	25.6 [1.01]	13.5 [0.53]			
	KN-2JCC6	\$24.50	25		630V 57A	26.7 [1.05]	16.0 [0.63]			

Note: Screwless Comb-Style jumpers are designed to be connected under the conductor clamp.

Please visit our website
www.AutomationDirect.com
for complete engineering drawings.



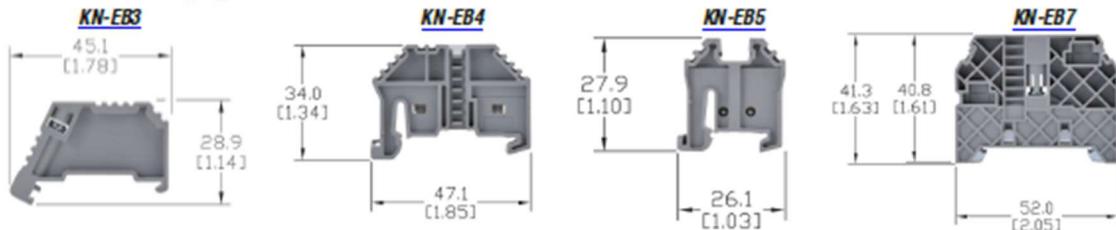
KONNECT-IT® Accessories



End Brackets

End brackets prevent terminal blocks and other DIN rail mount components and devices from moving laterally on the rail. They are constructed from polyamide 66 and available in configurations for 35mm and 15mm DIN rails.

Dimensions mm [in]



End Brackets Ordering Information

Gray End Brackets	KN-EB3	100/pkg \$32.50	KN-EB4	100/pkg \$34.00	KN-EB5	100/pkg \$48.50	KN-EB7	50/pkg \$34.00
	KN-EB3-10	10/pkg \$4.00	KN-EB4-10	10/pkg \$3.00	KN-EB5-10	10/pkg \$5.50	KN-EB7-10	10/pkg \$6.75

Technical Specifications

Description	Screw-type end bracket	Screwless end bracket	Screwless end bracket	Screw-type end bracket
Bracket Width	8 mm [0.31 in]	8 mm [0.31 in]	8 mm [0.31 in]	10 mm [0.39 in]
DIN Rail Width	35 mm	35 mm	15 mm	35 mm
Material	Housing: Polyamide 66 / Clamping Connector: Zinc Plated Steel			
End Bracket Accessories				
Label Holder	—	—	KN-MA-1	25/pkg \$14.00
	—	—	KN-MA-1-10	10/pkg \$6.75
Marking Tags	KN-L5 Series or KN-LGP5 Series			

End Covers

End covers are used to cover the open side of sectional DIN rail mount terminal blocks. They should be used at the end of an assembly of identical terminal blocks or whenever there is a change in the physical size of the terminal block.

Material: Polyamide 66



End Covers Ordering Information

Part Number	Color	Dimensions HxLxW mm [in]	Suitable for	Pcs/ Pkg	Price	Part Number	Color	Dimensions HxLxW mm [in]	Suitable for	Pcs/ Pkg	Price
KN-ECT6GRY	gray			100	\$17.50	KN-ECDORG	orange				
KN-ECT6GRY-25	gray			25	\$4.00	KN-ECDRED	red	48.2x63.2x1.3 [1.90x2.49x0.05]	KN-D10	10	\$4.00
KN-ECT6BLU	blue					KN-ECDYEL	yellow				
KN-ECT6BLK	black					KN-ECTL	gray	54.7x87.1x1.3 [2.15x3.43x0.05]	KN-TL14	10	\$2.50
KN-ECT6BRN	brown					KN-ECTLS	gray	54.7x72.8x1.2 [2.15x2.87x0.05]	KN-TL14S	10	\$3.00
KN-ECT6GRN	green					KN-ECDG12	gray	48.0x71.4x1.2 [1.89x2.81x0.05]	KN-DG12	10	\$3.00
KN-ECT6ORG	orange					KN-ECTG12	gray	62.5x87.5x1.2 [2.46x3.44x0.05]	KN-TG12	10	\$3.00
KN-ECT6RED	red					KN-ECMGRY	gray			100	\$37.50
KN-ECT6WHT	white					KN-ECMGRY-10	gray	28.1x27.0x3.0 [1.11x1.06x0.12]	KN-M12	10	\$4.00
KN-ECT6YEL	yellow					KN-ECMBLU	blue			10	\$4.00
KN-ECT4GRY	gray	45.7x52.8x1.2 [1.80x2.08x0.05]	KN-T4	25	\$8.25	KN-ECMGRN	green/yellow	28.1x27.0x3.0 [1.11x1.06x0.12]	KN-MG12	10	\$4.00
KN-ECT4BLU	blue			10	\$3.50	KN-ECG12SP4	green/yellow	39.7x57.1x1.2 [1.56x2.25x0.05]	KN-G12SP4	10	\$3.00
KN-ECDGRY	gray					KN-ECT12SP4	gray	39.7x57.1x1.2 [1.56x2.25x0.05]	KN-T12SP4	25	\$7.75
KN-ECDBLU	blue	48.2x63.2x1.3 [1.90x2.49x0.05]	KN-D10			KN-ECF10	gray	27.3x69.6x1.2 [1.07x2.35x0.05]	KN-F10	25	\$9.75
KN-ECDblk	black		KN-D12	10	\$4.00	KN-ECKBD	gray	37.1x53.5x1.2 [1.46x2.11x0.05]	KN-KDB10	10	\$4.00
KN-ECDGRN	green										

KONNECT-IT® Accessories

Separators



Separators are used to segment banks of terminal blocks. Allows you to maintain a single row of terminal blocks, but have separate power source clusters.

Separators Ordering Information							
Part Number	Color	Works With	Dimensions - mm [in]			Pcs/Pkg	Price
			Height	Length	Thickness		
KN-ST1GRY	Gray	KN-T12 KN-T10 KN-T8 KN-T6	39.0 [1.54] 52.5 [2.07] 62.6 [2.46]	42.5 [1.67] 50.5 [1.99] 53.1 [2.09]	1.2 [0.05] 1.5 [0.06] 1.5 [0.06]	25	\$8.25
KN-ST1BLU	Blue					10	\$3.00
KN-ST1BLK	Black						
KN-ST1BRN	Brown						
KN-ST1GRN	Green						
KN-ST1ORG	Orange						
KN-ST1RED	Red						
KN-ST1WHT	White						
KN-ST1YEL	Yellow						
KN-ST2GRY	Gray	KN-T4	52.5 [2.07]	50.5 [1.99]	1.5 [0.06]	25	\$11.00
KN-ST2BLU	Blue						\$11.00
KN-ST3GRY	Gray	KN-T2	62.6 [2.46]	53.1 [2.09]	1.5 [0.06]	10	\$5.50
KN-ST3BLU	Blue						\$5.50



KN-ST1GRY

Top Covers and Label Holders

Top Covers and Label Holders Ordering Information							
Part Number	Description	Works With	Dimensions - mm [in]			Pcs/Pkg	Price
			Height	Length	Width		
KN-TC-1	Top cover for Konnect-It terminal block, blank, white	KN-T12 KN-T10 KN-T8 KN-T6 KN-T4 KN-T2 KN-EB4 KN-EB7	6.8 [0.27] 7.3 [0.29] 46.2 [1.82] 37.5 [1.48]	29.0 [1.14] 35.8 [1.41] 46.0 [1.81] 46.2 [1.82]	5.8 [0.23] 9.0 [0.35] 11.4 [0.45] 9.5 [0.37]	25	\$6.75
KN-TC-1S	Top cover for Konnect-It terminal block, printed electric symbol, white					25	\$9.25
KN-TC-2	Top cover for Konnect-It terminal block, blank, white					25	\$17.00
KN-TC-2S	Top cover for Konnect-It terminal block, printed electric symbol, white					25	\$17.00
KN-MA-1	Label holder for terminal block group. Label media not included. Adhesive label: Apply on top. Max label dimensions: 7 x 44 mm (0.28 x 1.73 in).					25	\$14.00
KN-MA-1-10	Label holder for terminal block group. Label media not included. Adhesive label: Apply on top. Max label dimensions: 7 x 44 mm (0.28 x 1.73 in).					10	\$6.75
KN-MA-2	Label holder for terminal block group. Label media not included. Adhesive label: Apply on top. Max label dimensions: 7 x 44 mm (0.28 x 1.73 in).					50	\$36.50
KN-MA-2-10	Label holder for terminal block group. Label media not included. Adhesive label: Apply on top. Max label dimensions: 7 x 44 mm (0.28 x 1.73 in).					10	\$8.25
KN-MA-3	Top mounting marking tag adapter for terminal block. Holds up to (4) L5x5 tags					25	\$9.25
KN-MA-4	Top mounting marking tag adapter for terminal block. Holds up to (4) L5x5 tags					25	\$8.25
KN-MA-5	Label holder for terminal block group. Label media included. Max label dimensions: 10 x 38mm (0.39 x 1.50 in). Thickness 0.30 mm (0.01 in)	Attaches to any 35mm DIN rail	46.4 [1.83]	44.5 [1.75]	10.0 [0.39]	50	\$29.50
KN-MA-5-25						25	\$18.00



KN-MA-1



KN-MA-2



KN-MA-5



KN-TC-1 / KN-TC-2



KN-TC-1S / KN-TC-2S



KN-MA-3



KN-MA-4

Appendix H: Marking Sheets

ELTE1035 Senior Project 1: Drawing and Parts List – Wiring diagram

Student: BHUSAAR, ROHAN
Staff advisor: R.BROAD

Report title: DUAL Sump Pump CONTR.
Date marked: 2021.04.13

Assessed item	Instructions: Assign mark based on these guidelines.	Notes / explanation / page number
Format: Drawing: 7 (10) Parts list: 9 (5)	<p>Drawing: Assess out of 10 based on:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Title <input checked="" type="checkbox"/> Version <input checked="" type="checkbox"/> Filename <input checked="" type="checkbox"/> Scale/page size <input checked="" type="checkbox"/> Not too sparse/small/big <input checked="" type="checkbox"/> Not grey scale <input type="checkbox"/> Title all caps <input type="checkbox"/> Date of last revision <input type="checkbox"/> Page number (x of y) <input type="checkbox"/> Name (drawn by) <input type="checkbox"/> Not to crowded <input type="checkbox"/> Multiple page if and only if needed <p>Parts list: Assess a mark out of 5 based on:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Use of standard template <input checked="" type="checkbox"/> Project title <input checked="" type="checkbox"/> Revision <input type="checkbox"/> Landscape <input type="checkbox"/> Name (drawn by) <input type="checkbox"/> Date 	Print in black & white. Legend does not have meaning without colour. - Revise.
Complexity: 4 (5)	<p>Wiring diagrams: Assess a mark out of 5 by estimating number of components, wires, specification notes, wire type and length, etc. Custom drawn symbols count double or triple if done well.</p> <p>5 – Over 50, Above average complexity 4 – About 40, good, complex project 1-2 – A very simplistic wiring diagram</p>	P.L. Screws? Strain relief
Completeness Drawing: 5 (5) Parts list: 3 (5)	<p>Drawing: Assess a mark out of 5 based on completeness</p> <p>5 – No missing components, parts, wiring, connectors 3-4 – Missing one or two parts etc. 3 – Missing connection to power source. Or computer etc. 1-2 – Needs a lot of work</p> <p>Parts list: Assess a mark out of 5 based on completeness</p> <p>5 – All parts on project represented on parts list, plus other req. 3-4 A few less obvious omissions such as laptop, usb cable 3 – Missing major parts – power supply, enclosure etc. 1-2 – Parts list need a lot of work</p>	Air buzzers are audible Remove. Contactor - spelling
Correctness to standards Drawing: 7 (10) Parts list: 4 (5)	<p>Wiring diagrams: Assess a mark out of 10 based on the following:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Comp./parts have reference designators <input checked="" type="checkbox"/> Comp./parts have terminals identified <input checked="" type="checkbox"/> Oriented towards connecting / how to hook up <input checked="" type="checkbox"/> Wire color <input checked="" type="checkbox"/> Wire type <input checked="" type="checkbox"/> Wire gauge <input type="checkbox"/> Grounding issues addressed chassis <input checked="" type="checkbox"/> Custom parts drawn well <input type="checkbox"/> Standard symbols <input type="checkbox"/> Notes <input type="checkbox"/> Other <p>PLC-upside-down</p> <p>Parts list: Assess a mark out of 5 based on correctness</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> All caps <input checked="" type="checkbox"/> Suppliers <input checked="" type="checkbox"/> Alphabetical order <input checked="" type="checkbox"/> Part numbers 	Indicate wire gauge using note. Abbreviate.
Other: 5 (5)	Other items:	
Total: 39 (Out of 100) 50	Total is sum of all items	

Instructor notes:

Write explanatory notes on this page for ease of CTAB auditors who may not have access to marked up copies of remitted student work. Half marks are allowed. Assign a mark of 0 for any missing item.

Make 2 copies: Original to staff advisor. Copy 1 to student. Copy 2 to SPL coordinating instructor for CTAB auditing purposes.

ver 1.0 Feb 19, 2020

ELTE1035 Senior Project 1: Project Proposal marking sheet

Student: Blausar, Rohan

Project name: Sump pump controller

Staff advisor: L. Bapna

Date marked: 2021.02.03

Assessed item	Instructions	Notes / explanation / page number
Memo appearance Format: <u>5</u> (5) Style: <u>5</u> (5)	Format: One page formal memo with header, body, attach.: 5-All sections present and professional looking 4-Minor grammar, spelling, formatting issue 3-Meets minimum requirements. 2,1-Missing items, not memo format, or not professional 0-Not initiated Style 5-Exemplary, professional 4-Persuasive and communicates technical enthusiasm 3-Technical sales pitch as opposed to project request 2, 1-Fluffy, non-technical language	
Project title: <u>5</u> (5)	Title: Creative, short, descriptive 5-Creative, descriptive and elicits interest 4-Descriptive of project 3-Communicates basic concept of project 2,1-Name but little or no idea what it is 0-Title missing	
Items: To: From: cc: <u>2</u> (2) Date: <u>2</u> (2) Re: <u>2</u> (2) Purpose of memo: <u>0</u> (2) Purpose or project: <u>2</u> (2) Project scope: <u>1</u> (2) State meet deadlines: <u>2</u> (2) Estimated cost: <u>2</u> (2) Req. approval in words: <u>2</u> (2) Req. app. signature line: <u>2</u> (2)	The memo required a number of individual items 2-Item present and correct 1-Present but incomplete or other issue 0-Not present	
Attachments: <u>5</u> (5)	Attachments need to show some depth of research and analysis about the project. 5-Appropriate and linked to body of memo to support the project proposal. 4-Appropriate but not referenced well in body of memo 3-Support components of project but not project as a whole 3-Excessive, waste paper. 2,1-Insufficient to support project request 0-Not present	
Critical requirements: Initiated: <u>N</u> (Yes or No) On Time: <u>Y</u> (Yes or No)	It is critical that the memo be initiated and remitted on time. A "No" for either results in a mark of 0 for the memo.	
Approval: <u>Y</u> (Yes or No) Instructor initials: <u>RBL</u>	Approval for the project is granted by signing the project proposal and also by indicating "Yes" and initialing.	
Total: <u>0</u> Out of: <u>40</u>	Total is out of 40	

Note to student: A mark of 0 does not mean the project is not approved. Likewise a passing mark on the project proposal does not grant approval for the project. Unapproved projects are dealt with on a case by case basis as soon as possible in the term.

Notes to instructor:
Write explanatory notes on this page for ease of CTAB auditors who may not have access to marked up copies of remitted student work.
Half marks are allowed. Assign a mark of 0 for any missing item.
Make 2 copies: Original to staff advisor. Copy 1 to student. Copy 2 to SPL coordinating instructor for CTAB auditing purposes. Enter marks in Brightspace.

Rev 2.01 Jan 15, 2018

Appendix I: Marked Drawing

Roham Bhansali

DUAL SUMP-PUMP CONTROLLER

Conceptual drawing V2.0

FEB. 07, 2021

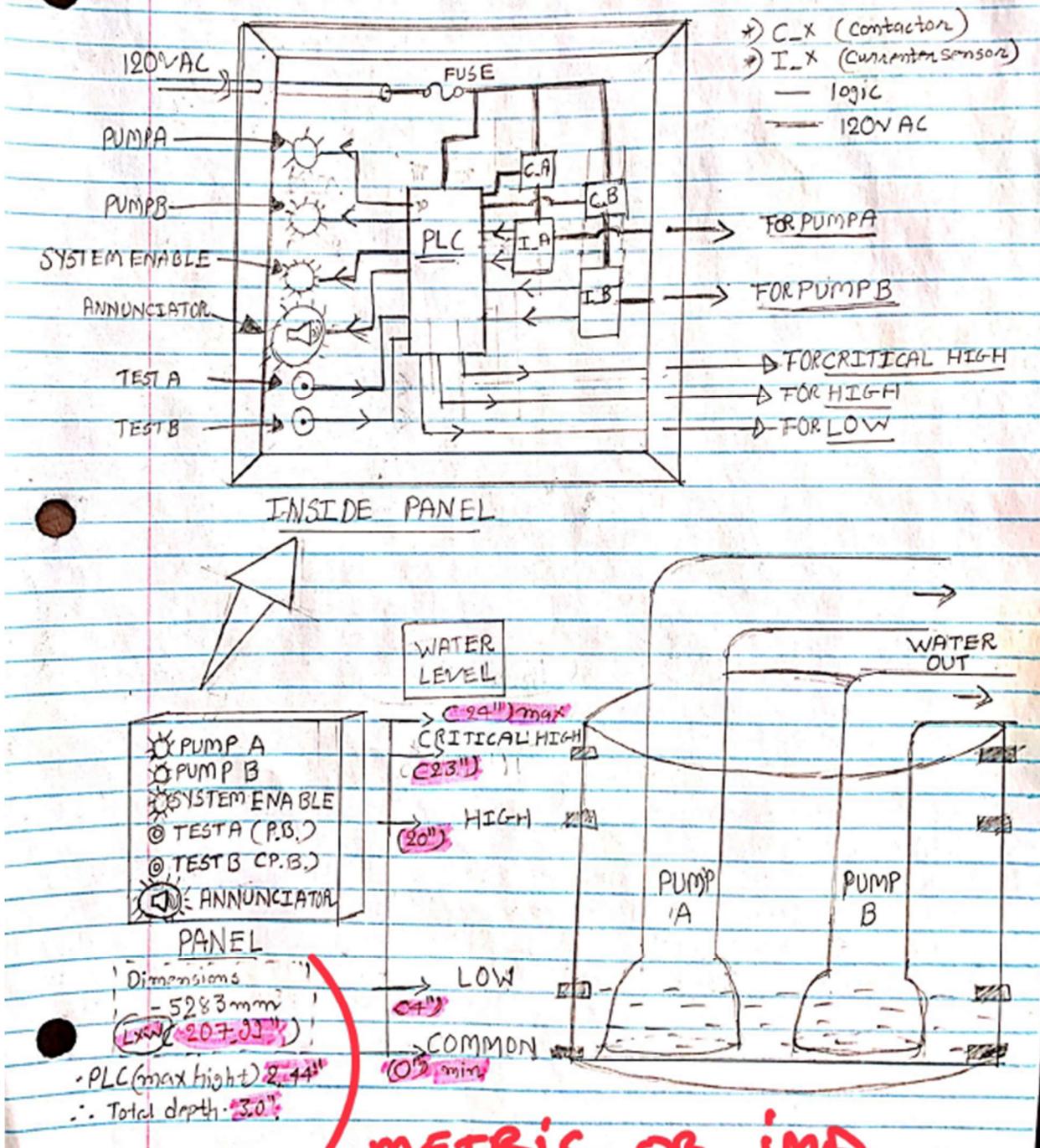


Figure 1: Conceptual Drawing

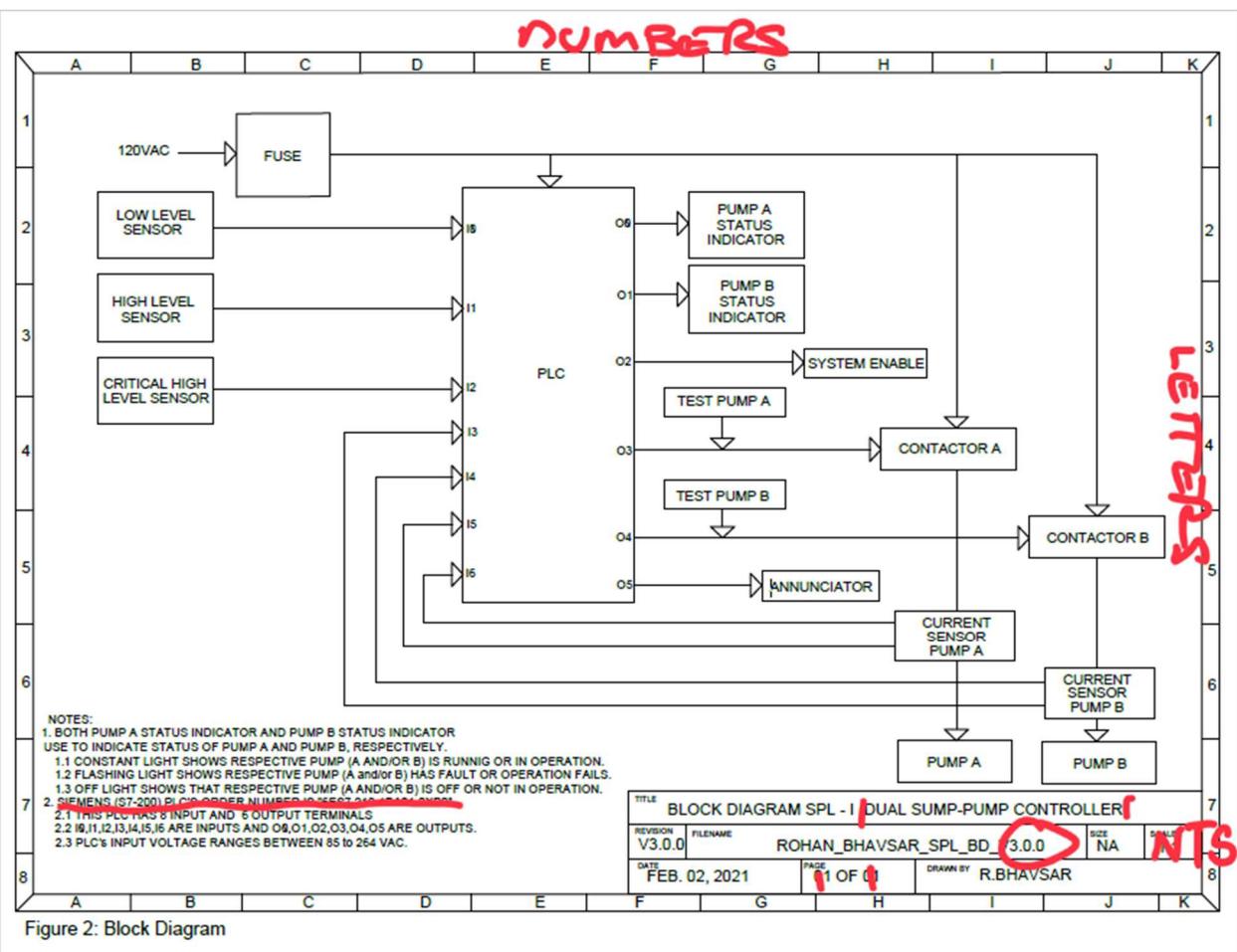


Figure 2: Block Diagram

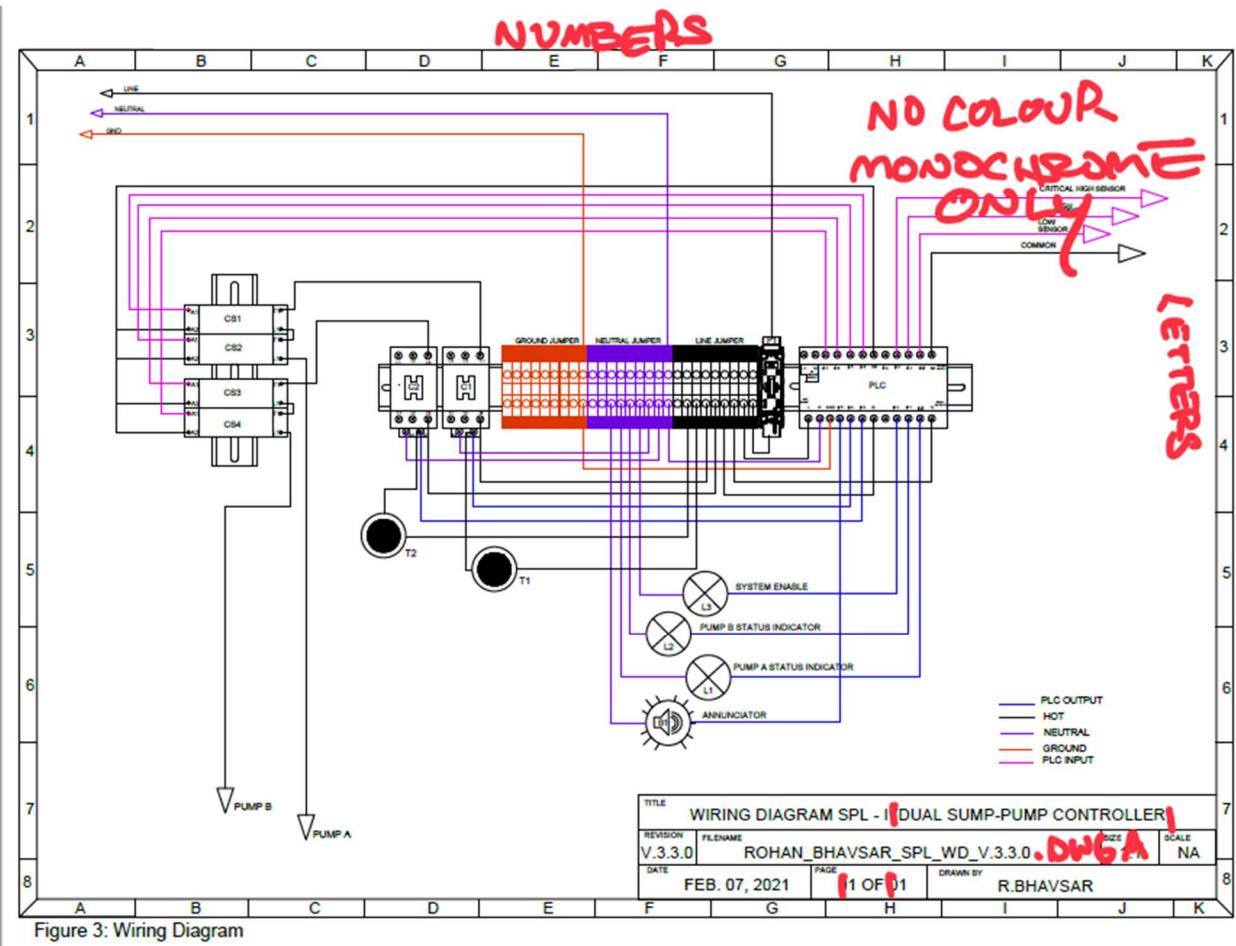


Figure 3: Wiring Diagram

**NOT SPL PADS
LIST TEMPLATE**

PROJECT : DUAL SUMP-PUMP CONTROLLER									
REV: 5.00			DATE: Feb. 07, 2021		DRAWN BY: ROHAN BHAVSAR			SHEET 1 OF 1	
ITEM	REF. DESIGNATOR OR ID ON DRAWING	GTY	DESCRIPTION	MANUFACTURER	MANUFACTURER P/N	SUPPLIER	SUPPLIER P/N	ITEM COST	TOTAL COST
1	B1	1	AUDIBLE BUZZER	AUTOMATION DIRECT	ECX2071-127R	AUTOMATION DIRECT	ECX2071-127R	\$ 9.26	\$ 9.26
2	C1	2	COTACTOR	FUJI ELECTRIC	SC-E02-110VAC	AUTOMATION DIRECT	SC-E02-110VAC	\$ 17.00	\$ 34.00
3	L1,L2	2	YELLOW LED INDICATOR	AUTOMATION DIRECT	ECX1053-120	AUTOMATION DIRECT	ECX1053-120	\$ 7.26	\$ 14.52
4	PLC	1	PLC	SIEMENSE	6E87 212-1BA01-0XB0	WORLD INDUSTRIAL AUTOMATION	6E87212-1BA01-0XB0	\$ 667.88	\$ 667.88
6	C81,C82,C83,C84	4	CURRENT SENSOR	ACUAMP	AC8160-CE-F	AUTOMATION DIRECT	AC8160-CE-F	\$ 67.00	\$ 268.00
8	T1,T2	2	PUSH BUTTON	AUTOMATION DIRECT	GCX3184-120L	AUTOMATION DIRECT	GCX3184-120L	\$ 21.60	\$ 43.20
7	L3	1	GREEN LED INDICATOR	AUTOMATION DIRECT	ECX1063-120	AUTOMATION DIRECT	ECX1063-120	\$ 7.26	\$ 7.26
8	F1	1	FUSE BLOCK	BUSSMANN	RM26030-18R	AUTOMATION DIRECT	RM26030-18R	\$ 9.76	\$ 9.76
9	NA	NA	DIN RAIL	DINNECTOR	DN-R3631-2	AUTOMATION DIRECT	DN-R3631-2	\$ 10.00	\$ 10.00
10	NA	NA	TERMINAL BLOCK	KONNECT-IT	KN-T120RY-26	AUTOMATION DIRECT	KN-T120RY-26	\$ 8.76	\$ 8.76

Figure 4: Part list

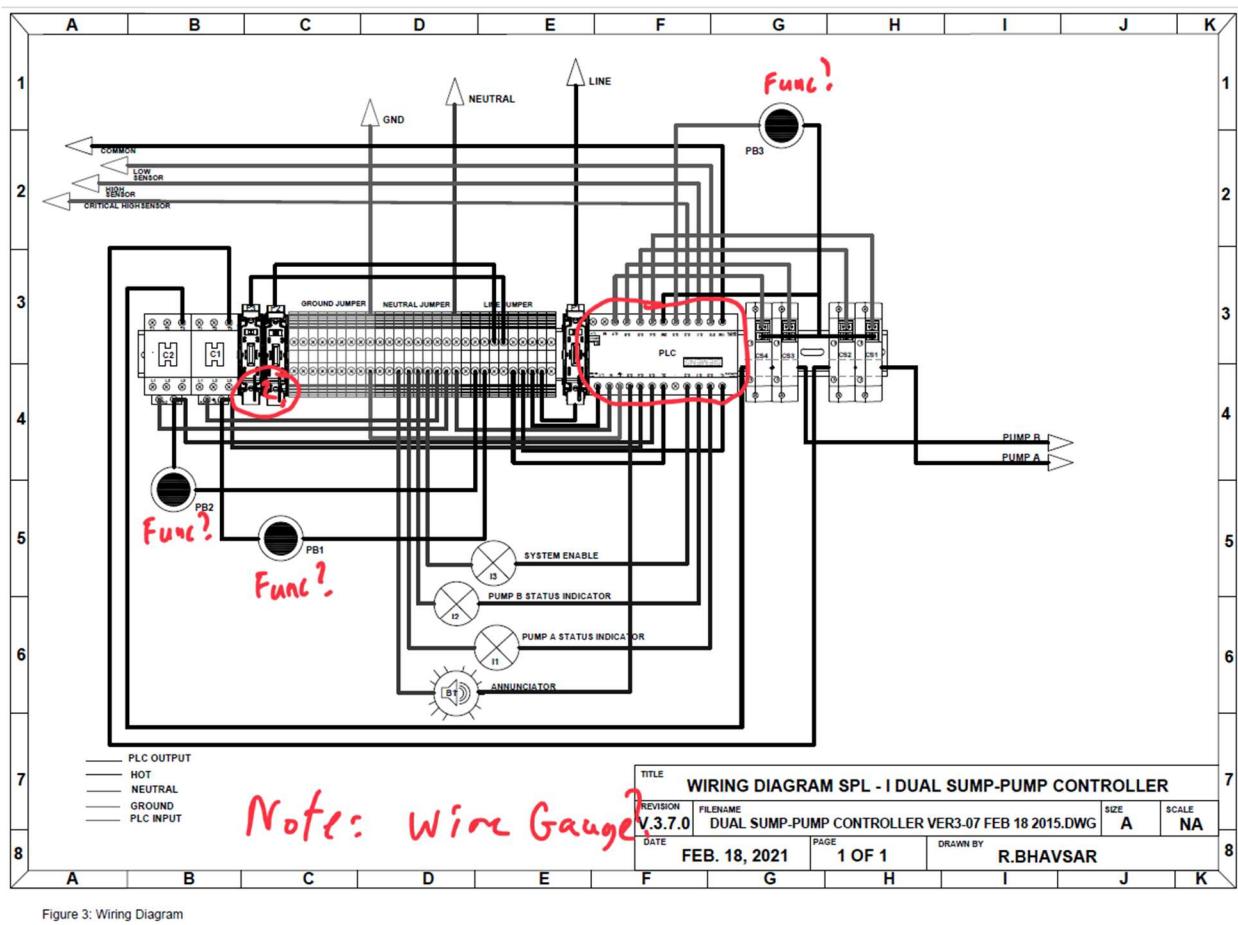


Figure 3: Wiring Diagram

PROJECT : DUAL SUMP-PUMP CONTROLLER							SHEET 1 of 1		
ITEM	REF. DESIGNATOR OR ID ON DRAWING	QTY	DESCRIPTION	MANUFACTURER	MANUFACTURER P/N	SUPPLIER	SUPPLIER P/N	ITEM COST	TOTAL COST
1	B1	1	AUDIBLE BUZZER	AUTOMATION DIRECT	ECX2071-127R	AUTOMATION DIRECT	ECX2071-127R	\$ 9.25	\$ 9.25
2	C1	2	CONTACTOR SP	FUJI ELECTRIC	SC-E02-110VAC	AUTOMATION DIRECT	SC-E02-110VAC	\$ 17.00	\$ 34.00
5	CS1,CS2,CS3,CS4	4	CURRENT SENSOR	ACUAMP	ACS150-CE-F	AUTOMATION DIRECT	ACS150-CE-F	\$ 67.00	\$ 268.00
9	-	2	DIN RAIL	DINNECTOR	DN-R35S1-2	AUTOMATION DIRECT	DN-R35S1-2	\$ 10.00	\$ 10.00
6	F1	1	FUSE BLOCK	BUSSMANN	RM25030-1SR	AUTOMATION DIRECT	RM25030-1SR	\$ 9.75	\$ 9.75
7	I3	1	GREEN LED INDICATOR	AUTOMATION DIRECT	EX1052-120	AUTOMATION DIRECT	EX1052-120	\$ 7.25	\$ 7.25
4	PLC	1	PLC	SIEMENSE	6ES7 212-1BA01-0XB0	WORLD INDUSTRIAL AUTOMATION	6ES7212-1BA01-0XB0	\$ 557.88	\$ 557.88
6	PB1,PB2	2	PUSH BUTTON	AUTOMATION DIRECT	GCX1104	AUTOMATION DIRECT	GCX1104	\$ 7.25	\$ 14.50
11	PB3	1	PUSH BUTTON	AUTOMATION DIRECT	GCX1104	AUTOMATION DIRECT	GCX1104	\$ 7.25	\$ 7.25
10	-	3	TERMINAL BLOCK	KONNECT-IT	KN-T12GRY-25	AUTOMATION DIRECT	KN-T12GRY-25	\$ 6.75	\$ 20.25
3	I1,I2	2	YELLOW LED INDICATOR	AUTOMATION DIRECT	EX1053-120	AUTOMATION DIRECT	EX1053-120	\$ 7.25	\$ 14.50
12									
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Figure 4: Part List