

## Instructions for Type W Three Phase, Standalone Overload Relays, Size 1 through 6

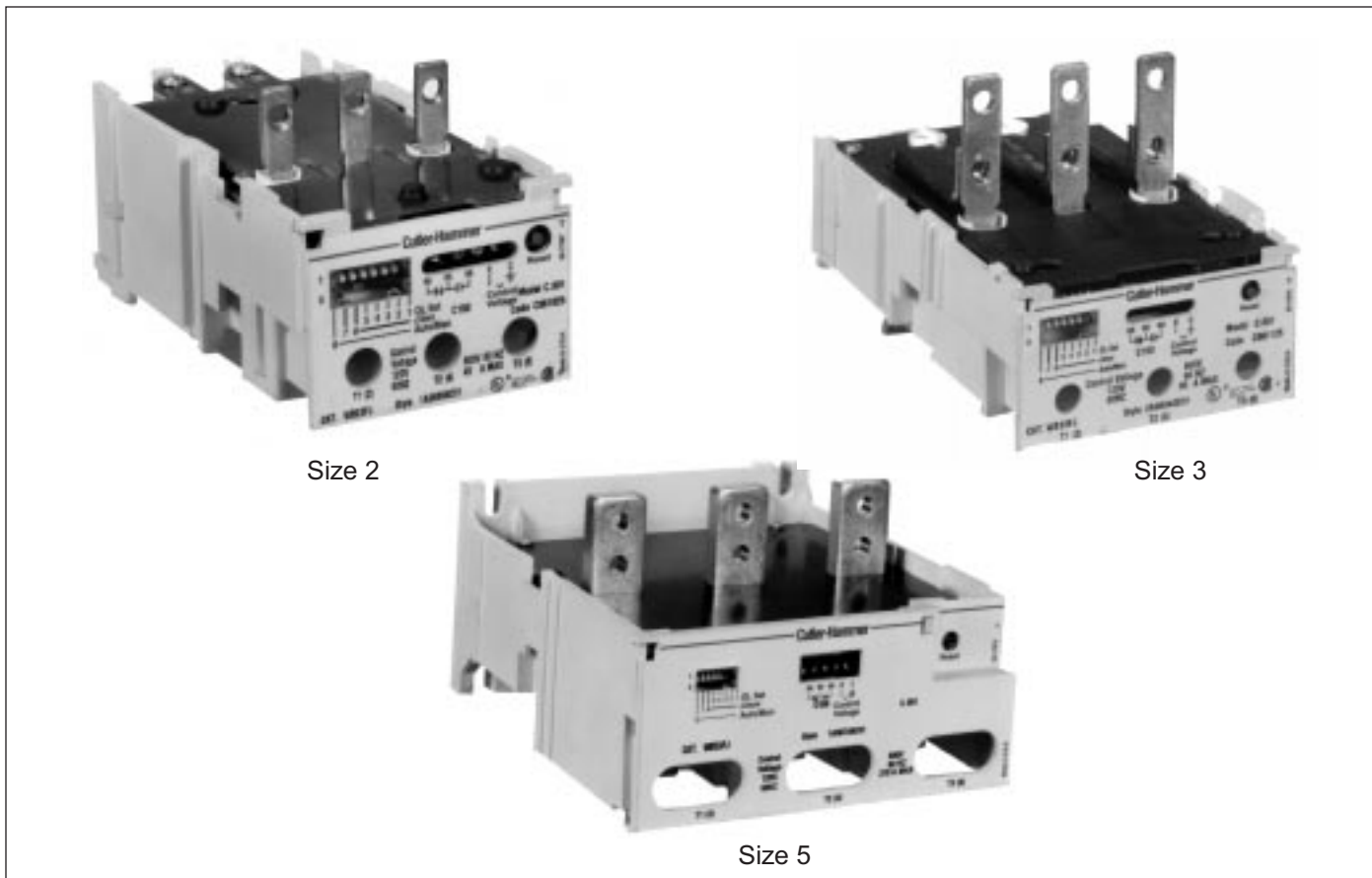


Fig. 1 Type W Standalone Overload Relays

### THE OVERLOAD RELAYS

Advantage Type W three phase, standalone overload relays include the same current-sensing and protection features that are built into Advantage non-reversing starters. There are several configurations that vary by frame size, terminals, and range of trip ratings. They are designed to control the coils of all sizes of Advantage contactors. The ratings of their control circuit contacts are shown in Table I. They may be used to switch any inductive loads that do not exceed their contact ratings. Where the current requirements of the contactors to be controlled by these overload relays exceed any of the ratings shown in Table I, an interposing relay drawing less current must be used.

### PROGRAMMED FEATURES

Each overload relay includes a circuit board to which the

control wires are attached. These circuit boards differ with respect to components and the software program they respect to components and the software program they contain. This program number is shown on the label attached to the DIP switch. See Figure 8.

### Phase Loss Protection

Advantage starters with this option automatically open (trip) within 2 seconds after they sense a current less than the value shown in the table below through any phase after power is applied to the motor. This protection prevents damage when a lead in a motor branch circuit has been lost.

Size	Phase Loss Current Limit
1L	0.33A
1 or 2	2.25A
3 or 4	7A
5 or 6	27A

### Phase Imbalance Protection

Advantage starters with this option automatically open (trip) within 6 seconds for the Size 1 or 2, 9 seconds for the Size 3 or 4, or 12 seconds for the Size 5 or 6 after they sense an imbalance between two phase currents that is greater than 30% of the Trip Rating shown in Tables III through IX. This protection prevents motor damage when a lead in a distribution system has been lost.

### Ground Current-Sensing Protection

Advantage starters with this option automatically open (trip) 0.4 seconds after sensing ground current greater than the trip values shown in the table below while the motor is running. There is a 17 second delay that prevents ground protection from opening (tripping) during starting. If the total current in any phase is greater than the lockout values shown in the table below, ground current-sensing protection will be locked out to allow ground protection to be provided by other protective devices.

Size	Trip Current	Lockout Current
1L	10A	24A
1	10A	48A
2	20A	86A
3	40A	171A
4	60A	256A
5 or 6	240A	1045A

**TABLE I - CONTACT RATINGS - C150**

Volts, AC	Make	Break
24 - 120	15A	1.5A

### TRIPPED CONDITIONS

Phase loss, phase imbalance, and ground current-sensing protection are provided in a Class W200 motor starter unless the catalog number includes “Y4” (phase loss and phase imbalance protection omitted), “Y7” (ground current-sensing protection omitted), “Y10” (phase loss protection omitted), and/or “Y11” (phase imbalance protection omitted). Check the Test Verification label on the side of the motor controller to determine which features are included.

An Advantage starter trips (turns itself OFF) when it recognizes that phase loss, phase imbalance, ground current, or significant overload conditions exist. The starter must be reset after tripping before it can be turned ON again. These protection functions can be nullified by a DIP switch setting. See **OVERLOAD SETTINGS**. The phase and ground functions can be added or deleted from the starter with the use of the optional Advantage Programming Module (WAPM).

A “trip” condition is shown by the lighting of the light emitting diode (LED) at the side of the starter where this accessory (Catalog No. WLED) has been added. This LED can be replaced by a remote reset and trip indicator (Catalog No. WRSTKL). Both trip indicators require that control power be supplied to the starter to light. Reset any trip by manual means with the power ON. “Manual” resetting consists of completing an electrical circuit between internal terminals, with either the reset button provided on the starter or a remote reset kit.

### OVERLOAD PROTECTION

An Advantage Type W overload relay offers overload protection as a Class 10, Class 20, or Class 30 overload relay without the need for heater elements and the resulting heat losses of a thermal overload relay.

Accuracy is obtained by closely coupled current sensors in the overload relay in combination with a microprocessor that counts units of the line current squared ( $I^2$ ), the heating effect within the motor. The sensors are coils wound in the form of toroidal helices around a customized iron core with a controlled air gap. This combination of coil, core, and air gap results in greater accuracy than thermal overload relays, without the fuss of heater elements. The stored count decreases whenever the line current is less than the maximum motor full load current specified for the overload setting selected. This decrease represents the natural motor winding cooling that occurs as the motor runs at full load current or less.

Where an Advantage starter is equipped with an optional internal or external trip indicator, the LED in the indication will blink every 4 to 5 seconds when power is applied to the starter. If the starter is in an overcurrent condition, a reset is required before the motor can be restarted. If a ground current condition exists and the starter has the catalog suffix “Y7” (ground protection omitted), the LED will blink twice every second, but no trip will occur. The internal trip indicator is visible only with the enclosure door open.

### OVERLOAD RELAY SETTINGS

The method of reset, the overload protection class, and the overload relay trip current are selected by DIP switch settings. The DIP switch is visible behind the clear plastic window and is accessible by unsnapping the top of the hinged cover on the overload relay. See Figure 1.

Use the eight position (8 pole) DIP switch to select the method of reset (MANUAL or AUTOMATIC), the overload protection Class (10, 20, 30, or NONE), and the trip current rating appropriate for the motor full load current in amperes (FLA). When a DIP switch handle is moved towards the position number (marked 8 through 1, left to

right) that pole is closed (represented by “1”). When a switch handle is away from the position number, the pole is open (represented by “0”). See Figure 8. **Be sure that each switch handle is moved to the full ON (1) or full off (0) position.**

Reset Method	Position 8
MANUAL (Non-automatic. Wait 5 minutes, then push reset button)	0
AUTOMATIC (Reset time is based on protection Class.)	1

**OVERLOAD CLASS**

Use the Class 10 (fast trip) setting for Design E motors, hermetic refrigerant motor compressors, submersible pumps and similar applications, as well as for protecting general purpose motors where the load permits the motor to reach rated speed without the overload protection circuit tripping.

Use the Class 30 (slow trip) setting for special motors driving high inertia loads such as ball mills, reciprocating pumps, loaded conveyors, and the like.

Use the Class 20 (standard trip) setting for all other applications. Most NEMA rated general purpose motors will be protected by a Class 20 setting.

**IF A PROPERLY SELECTED TRIP CURRENT SETTING RESULTS IN AN OVERLOAD TRIP, MOVE TO A HIGHER CLASS SETTING RATHER THAN TO A HIGHER TRIP CURRENT SETTING.**

Select Class NONE when no overload, phase loss, phase imbalance, and ground current sensing protection is wanted; for example, while troubleshooting.

Overload Class	Position 7	Position 6
10	0	0
20	0	1
30	1	0
NONE	1	1

**TRIP CURRENT SETTING**

The overload trip current of an Advantage overload relay is determined by its software program and its DIP switch settings in positions 5 through 1 as shown in Tables III through IX. Use only the table appropriate for the starter involved and disregard the others.

For motors with a marked temperature rise of not over 40°C or with a service factor of not less than 1.15, find in Column A the range of motor FLA that includes the

FLA of the motor to be protected and use the setting shown for DIP switch positions 5 through 1. For all other motors, select a range in Column B. Settings based on Column A give a trip rating of not more than 125% of motor FLA. Settings based on Column B give a trip rating of not more than 115% of motor FLA.

**APPLICATION RANGES**

The seven configurations of Type W overload relays may be used to monitor and protect motors with full load currents ranging from .47 to 540 amperes. The Size 1 exists in two forms; a lower current range and an upper current range. Each other size exists in only one form with terminals appropriately sized for the conductors involved.

Controller Size	Three Phase Horsepower Range At:			
	200V	230V	460V	575V
1*	1/8 - 3/4	1/8 - 1	1/4 - 2	1/4 - 2
1	1 - 7-1/2	1 - 7-1/2	2 - 10	3 - 10
2	1 - 10	1 - 15	2 - 25	3 - 25
3	3 - 25	5 - 25	7-1/2 - 50	10 - 50
4	3 - 40	5 - 50	7-1/2 - 100	10 - 100
5	15 - 75	15 - 100	30 - 200	40 - 200
6	15 - 150	15 - 200	30 - 400	40 - 400

\* Size 1 with lower FLA current range (.47 - 3.8A)

See Table X. The ranges of motor horsepower ratings typically associated with each overload relay size are shown in Table II.

**COMMUNICATIONS**

Two accessory communications modules, called WPONI and WPONIDNA, are available. The WPONI provides remote control and permits the microprocessor in the solid state current-sensing unit of a motor starter to transmit data at 9600 baud regarding the starter via an INCOM network that is part of an Integrating Monitoring, Protection, and Control Communications (IMPACC) system. A typical network consists of shielded cable daisy-chained as shown Figure 4 to a remote personal size computer. See I.L. 17408 for more information concerning the WPONI. The WPONIDNA provides DeviceNet users with the ability to control and monitor the functions of the Advantage system at 125,000 baud. See Pub 24659 for more information concerning the WPONIDNA. The control functions and data are identified at the computer by the address assigned (selected) for the motor starter and consist of the following:

**For the WPONI**

1. Control voltage
2. ON, OFF, TRIP, and RESET functions
3. Motor current in each phase
4. Overload trip current selected
5. Manual/automatic reset selection
6. Starter status, i.e., ON, OFF, TRIPPED
7. Cause of trip, i.e., overcurrent, phase loss, phase imbalance, ground current

**For WPONIDNA**

1. Contactor position - open/closed
- 2., Three phase motor currents
3. Thermal capacity - percent
4. Network readable Advantage configuration
  - a. Trip Current
  - b. Overload Class
  - c. Phase Loss enable/disable
  - d. Ground Fault enable/disable
5. Percent current imbalance
6. Fault diagnostics
7. Start/stop control
8. Remote reset

Consult the factory for information regarding other networks that may be used with WPONI and WPONIDNA modules.

<b>TABLE IV - SIZE 1 UPPER CURRENT RANGE</b>							
<b>Column A Service Factor</b>		<b>Column B Service Factor</b>		<b>Trip Rating (Amps)</b>	<b>DIP Switch Setting* (Positions 54321)</b>		
<b>1.15 to 1.25</b>		<b>1.0</b>					
<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>				
3.15	-	3.46	3.43	-	3.75	3.93	00000
3.47	-	3.81	3.76	-	4.13	4.33	00001
3.82	-	4.19	4.14	-	4.55	4.77	00010
4.20	-	4.61	4.56	-	4.99	5.25	00011
4.62	-	5.0	5.0	-	5.4	5.77	00100
5.1	-	5.5	5.5	-	6.0	6.35	00101
5.6	-	6.0	6.1	-	6.5	6.90	00110
6.1	-	6.6	6.6	-	7.2	7.70	00111
6.7	-	7.3	7.3	-	8.0	8.50	01000
7.4	-	8.1	8.1	-	8.8	9.30	01001
8.2	-	8.9	8.9	-	9.6	10.2	01010
9.0	-	9.8	9.7	-	10.6	11.2	01011
9.9	-	10.8	10.7	-	11.7	12.4	01100
10.9	-	11.9	11.8	-	12.9	13.6	01101
12.0	-	13.1	13.0	-	14.2	15.0	01110
13.2	-	14.4	14.3	-	15.7	16.5	01111
14.5	-	15.8	15.8	-	17.2	18.1	10000
15.9	-	17.4	17.3	-	18.9	19.9	10001
17.5	-	19.2	19.0	-	20.9	21.9	10010
19.3	-	21.1	21.0	-	22.9	24.1	10011
21.2	-	23.2	23.0	-	25.2	26.5	10100
23.3	-	25.6	25.3	-	27.0	29.1	10101
25.7	-	27.0	-	-	-	32.1	10110

**\*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000**  
Replace the hinged cover securely after making selections.

<b>TABLE III - SIZE 1 LOWER CURRENT RANGE</b>							
<b>Column A Service Factor</b>		<b>Column B Service Factor</b>		<b>Trip Rating (Amps)</b>	<b>DIP Switch Setting* (Positions 54321)</b>		
<b>1.15 to 1.25</b>		<b>1.0</b>					
<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>				
0.47	-	0.51	0.51	-	0.56	0.59	00000
0.52	-	0.56	0.57	-	0.61	0.65	00001
0.57	-	0.61	0.62	-	0.67	0.71	00010
0.62	-	0.68	0.68	-	0.74	0.78	00011
0.69	-	0.75	0.75	-	0.82	0.86	00100
0.76	-	0.82	0.83	-	0.89	0.95	00101
0.83	-	0.90	0.90	-	0.98	1.04	00110
0.91	-	1.00	0.99	-	1.09	1.14	00111
1.01	-	1.09	1.10	-	1.19	1.26	01000
1.10	-	1.21	1.20	-	1.31	1.38	01001
1.22	-	1.33	1.32	-	1.44	1.52	01010
1.34	-	1.46	1.45	-	1.59	1.67	01011
1.47	-	1.61	1.60	-	1.75	1.84	01100
1.62	-	1.77	1.76	-	1.93	2.02	01101
1.78	-	1.95	1.94	-	2.12	2.23	01110
1.96	-	2.14	2.13	-	2.33	2.45	01111
2.15	-	2.36	2.34	-	2.56	2.69	10000
2.37	-	2.60	2.57	-	2.82	2.96	10001
2.61	-	2.85	2.83	-	3.10	3.26	10010
2.86	-	3.14	3.11	-	3.42	3.58	10011
3.25	-	3.46	3.43	-	3.76	3.94	10100
3.47	-	3.81	3.77	-	4.14	4.34	10101

**\*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000**  
Replace the hinged cover securely after making selections.

TABLE V - SIZE 2 CURRENT RANGE						
Column A Service Factor		Column B Service Factor		Trip Rating (Amps)	DIP Switch Setting* (Positions 54321)	
1.15 to 1.25		1.0				
Min.	Max.	Min.	Max.			
3.15	- 3.46	3.43	- 3.75	3.93	00000	
3.47	- 3.81	3.76	- 4.13	4.33	00001	
3.82	- 4.19	4.14	- 4.55	4.77	00010	
4.20	- 4.61	4.56	- 4.99	5.25	00011	
4.62	- 5.0	5.0	- 5.4	5.77	00100	
5.1	- 5.5	5.5	- 6.0	6.35	00101	
5.6	- 6.0	6.1	- 6.5	6.90	00110	
6.1	- 6.6	6.6	- 7.2	7.70	00111	
6.7	- 7.3	7.3	- 8.0	8.50	01000	
7.4	- 8.1	8.1	- 8.8	9.30	01001	
8.2	- 8.9	8.9	- 9.6	10.2	01010	
9.0	- 9.8	9.7	- 10.6	11.2	01011	
9.9	- 10.8	10.7	- 11.7	12.4	01100	
10.9	- 11.9	11.8	- 12.9	13.6	01101	
12.0	- 13.1	13.0	- 14.2	15.0	01110	
13.2	- 14.4	14.3	- 15.7	16.5	01111	
14.5	- 15.8	15.8	- 17.2	18.1	10000	
15.9	- 17.4	17.3	- 18.9	19.9	10001	
17.5	- 19.2	19.0	- 20.9	21.9	10010	
19.3	- 21.1	21.0	- 22.9	24.1	10011	
21.2	- 23.2	23.0	- 25.2	26.5	10100	
23.3	- 25.6	25.3	- 27.8	29.1	10101	
25.7	- 28.1	27.9	- 30.5	32.1	10110	
28.2	- 31.0	30.6	- 33.7	35.3	10111	
31.1	- 34.1	33.8	- 37.0	38.9	11000	
34.2	- 37.5	37.1	- 40.7	42.8	11001	
37.6	- 41.2	40.8	- 44.8	47.0	11010	
41.3	- 45.0	44.9	- 45.0	51.6	11011	
<b>*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000</b>						
Replace the hinged cover securely after making selections.						

TABLE VI - SIZE 3 CURRENT RANGE						
Column A Service Factor		Column B Service Factor		Trip Rating (Amps)	DIP Switch Setting* (Positions 54321)	
1.15 to 1.25		1.0				
Min.	Max.	Min.	Max.			
9.9	- 10.8	10.8	- 11.7	12.4	00000	
10.9	- 11.9	11.8	- 12.9	13.6	00001	
12.0	- 13.1	13.0	- 14.2	15.0	00010	
13.2	- 14.4	14.3	- 15.6	16.5	00011	
14.5	- 15.8	15.7	- 17.2	18.1	00100	
15.9	- 17.4	17.3	- 18.9	19.9	00101	
17.5	- 19.2	19.0	- 20.9	21.9	00110	
19.3	- 21.1	21.0	- 22.9	24.1	00111	
21.2	- 23.2	23.0	- 25.2	26.5	01000	
23.3	- 25.6	25.3	- 27.8	29.1	01001	
25.7	- 28.1	27.9	- 30.6	32.1	01010	
28.2	- 30.9	30.7	- 33.6	35.3	01011	
31.0	- 34.1	33.7	- 37.0	38.8	01100	
34.2	- 37.5	37.1	- 40.8	42.7	01101	
37.6	- 41.3	40.9	- 44.9	47.0	01110	
41.4	- 45.4	45.0	- 49.4	51.7	01111	
45.5	- 50.0	49.5	- 54.3	56.9	10000	
50.1	- 54.9	54.4	- 59.7	62.6	10001	
55.0	- 60.5	59.8	- 65.7	68.8	10010	
60.6	- 66.5	65.8	- 72.3	75.7	10011	
66.6	- 73.2	72.4	- 79.6	83.3	10100	
73.3	- 80.7	79.7	- 87.7	91.6	10101	
80.8	- 88.7	87.8	- 90.0	101	10110	
88.8	- 90.0	-	-	111	10111	
<b>*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000</b>						
Replace the hinged cover securely after making selections.						

TABLE VII - SIZE 4 CURRENT RANGE

Column A Service Factor		Column B Service Factor		Trip Rating (Amps)	DIP Switch Setting* (Positions 54321)
1.15 to 1.25		1.0			
Min.	Max.	Min.	Max.		
9.9	- 10.8	10.8	- 11.7	12.4	00000
10.9	- 11.9	11.8	- 12.9	13.6	00001
12.0	- 13.1	13.0	- 14.2	15.0	00010
13.2	- 14.4	14.3	- 15.6	16.5	00011
14.5	- 15.8	15.7	- 17.2	18.1	00100
15.9	- 17.4	17.3	- 18.9	19.9	00101
17.5	- 19.2	19.0	- 20.9	21.9	00110
19.3	- 21.1	21.0	- 22.9	24.1	00111
21.2	- 23.2	23.0	- 25.2	26.5	01000
23.3	- 25.6	25.3	- 27.8	29.1	01001
25.7	- 28.1	27.9	- 30.6	32.1	01010
28.2	- 30.9	30.7	- 33.6	35.3	01011
31.0	- 34.1	33.7	- 37.0	38.8	01100
34.2	- 37.5	37.1	- 40.8	42.7	01101
37.6	- 41.3	40.9	- 44.9	47.0	01110
41.4	- 45.4	45.0	- 49.4	51.7	01111
45.5	- 50.0	49.5	- 54.3	56.9	10000
50.1	- 54.9	54.4	- 59.7	62.6	10001
55.0	- 60.5	59.8	- 65.7	68.8	10010
60.6	- 66.5	65.8	- 72.3	75.7	10011
66.6	- 73.2	72.4	- 79.6	83.3	10100
73.3	- 80.7	79.7	- 87.7	91.6	10101
80.8	- 88.7	87.8	- 96.4	101	10110
88.8	- 97.5	96.5	- 105	111	10111
97.6	- 106	106	- 116	122	11000
107	- 117	117	- 127	134	11001
118	- 129	128	- 135	147	11010
130	- 135	-	-	162	11011

**\*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000**  
Replace the hinged cover securely after making selections.

TABLE VIII - SIZE 5 CURRENT RANGE

Column A Service Factor		Column B Service Factor		Trip Rating (Amps)	DIP Switch Setting* (Positions 54321)
1.15 to 1.25		1.0			
Min.	Max.	Min.	Max.		
38.3	- 41.9	41.7	- 45.6	47.9	00000
42.0	- 46.1	45.7	- 50.1	52.5	00001
46.2	- 51.0	50.2	- 55.5	57.7	00010
51.1	- 55.9	55.6	- 60.8	63.9	00011
56.0	- 61.7	60.9	- 67.1	70.0	00100
61.8	- 67.5	67.2	- 73.4	77.3	00101
67.6	- 74.9	73.5	- 81.4	84.5	00110
75.0	- 82.3	81.5	- 89.5	93.7	00111
82.4	- 90.3	89.6	- 98.2	103	01000
90.4	- 99.9	98.3	- 108	113	01001
100	- 109	109	- 118	125	01010
110	- 120	119	- 130	137	01011
121	- 132	131	- 143	151	01100
133	- 145	144	- 157	166	01101
146	- 159	158	- 173	182	01110
160	- 175	174	- 190	200	01111
176	- 193	191	- 209	220	10000
194	- 213	210	- 231	242	10001
214	- 233	232	- 254	267	10010
234	- 257	255	- 270	293	10011
258	- 270	-	-	322	10100

**\*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000**  
Replace the hinged cover securely after making selections.

TABLE IX - SIZE 6 CURRENT RANGE					
Column A Service Factor		Column B Service Factor		Trip Rating (Amps)	DIP Switch Setting* (Positions 54321)
1.15 to 1.25	1.0	1.0	1.0		
Min.	Max.	Min.	Max.		
38.3	41.9	41.7	45.6	47.9	00000
42.0	46.1	45.7	50.1	52.5	00001
46.2	51.0	50.2	55.5	57.7	00010
51.1	55.9	55.6	60.8	63.9	00011
56.0	61.7	60.9	67.1	70.0	00100
61.8	67.5	67.2	73.4	77.3	00101
67.6	74.9	73.5	81.4	84.5	00110
75.0	82.3	81.5	89.5	93.7	00111
82.4	90.3	89.6	98.2	103	01000
90.4	99.9	98.3	108	113	01001
100	109	109	118	125	01010
110	120	119	130	137	01011
121	132	131	143	151	01100
133	145	144	157	166	01101
146	159	158	173	182	01110
160	175	174	190	200	01111
176	193	191	209	220	10000
194	213	210	231	242	10001
214	233	232	254	267	10010
234	257	255	279	293	10011
258	282	280	307	322	10100
283	311	308	338	354	10101
312	342	339	372	390	10110
343	376	373	409	429	10111
377	414	410	450	471	11000
415	456	451	496	519	11001
457	501	497	540	571	11010
502	540	-	-	628	11011

**\*ALL SETTINGS NOT SHOWN ARE EQUIVALENT TO 00000**  
Replace the hinged cover securely after making selections.

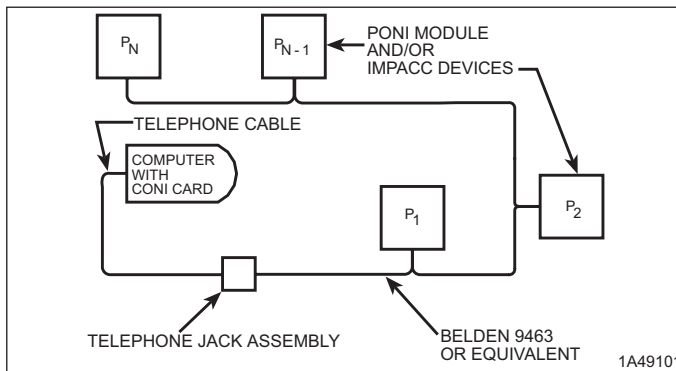


Fig. 2 Typical Network Interwiring

**TERMINAL BLOCK ACCESSORY**

A five-point terminal block assembly, Catalog No. WTBFOL, is available as an accessory to provide additional convenience in wiring and to accept lugged conductors. This terminal

ACCESSORIES	
Description	Catalog Number
Internal Trip Indicator	WLED
External (remote) Reset for W200, 24 inch Leads*	WRST24
External (remote) Reset for W200, 72 inch Leads*	WRST72
External (remote) Reset/Trip Indicator for W200, 24 inch Leads	WRSTL24
External (remote) Reset/Trip Indicator for W200, 72 inch Leads	WRSTL72
Control Circuit Terminal Block with 1A fuse and 1 tie point to accept solid, stranded, or lugged conductors	WTBFOL
Communications Module - Data, Status, and Control	WPONI
Communications Module - DeviceNet	WPONIDNA
Central Monitoring Unit to receive WPONI output	WCMU
Alarm Module with one NO Contact	WBELL
Terminal Lug Kit - Size 1 (one lug per kit)	WTX1
Terminal Lug Kit - Size 2 (one lug per kit)	WTX2
Terminal Lug Kit - Size 3 and 4 (one lug per kit)	WTX34
Terminal Lug Kit - Size 5 (one lug per kit)	WTX5
Terminal Lug Kit - Size 6 (one lug per kit)	WTX6
Advantage Metering Module	WMETER
Advantage Programming Module	WAPM

\* There is no trip indication available when this accessory is used other than via a communications network.

block is suitable for use with all sizes of Type W overload relays. The five points are color coded and prewired for connection to terminals 96,95, 98, E, and C. A one ampere Buss type MDL control circuit fuse and one unwired tie point are included.

**INSTALLATION**

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or

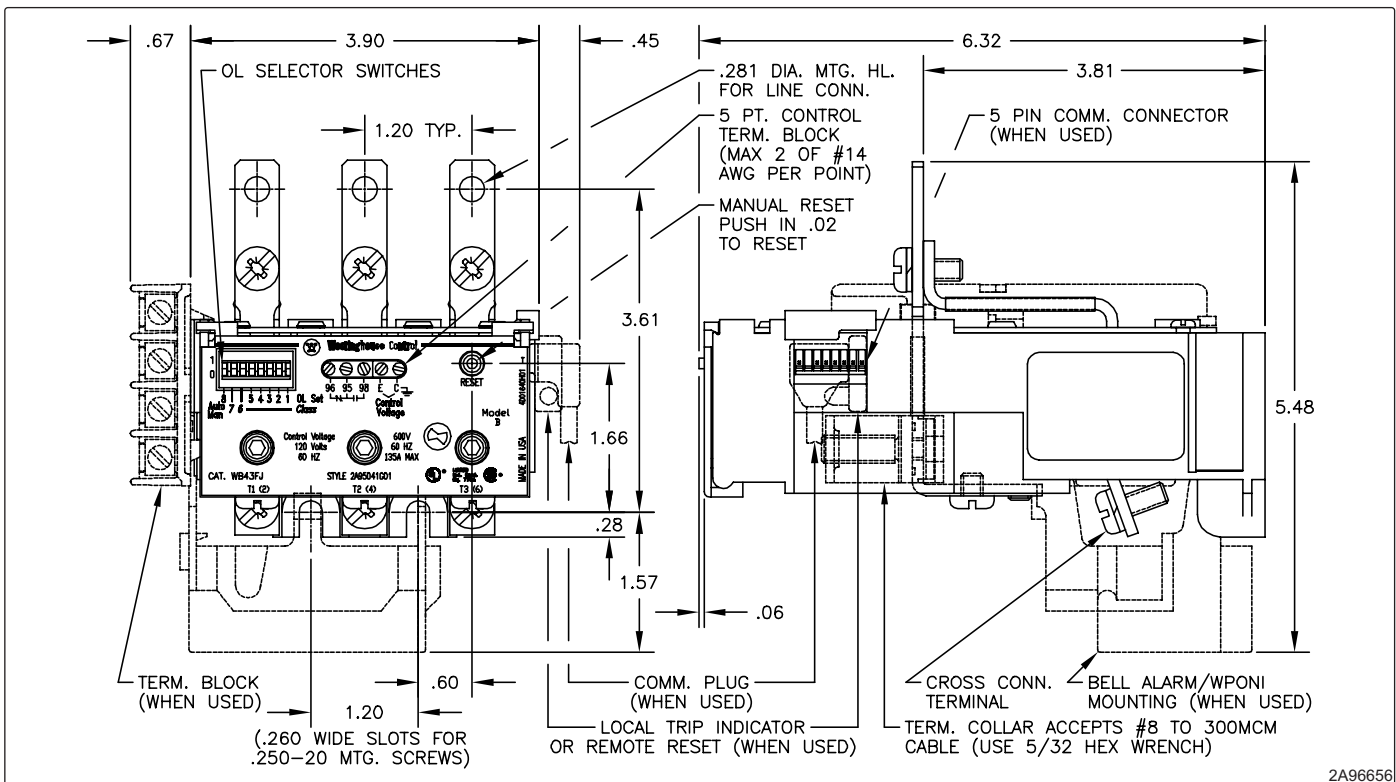
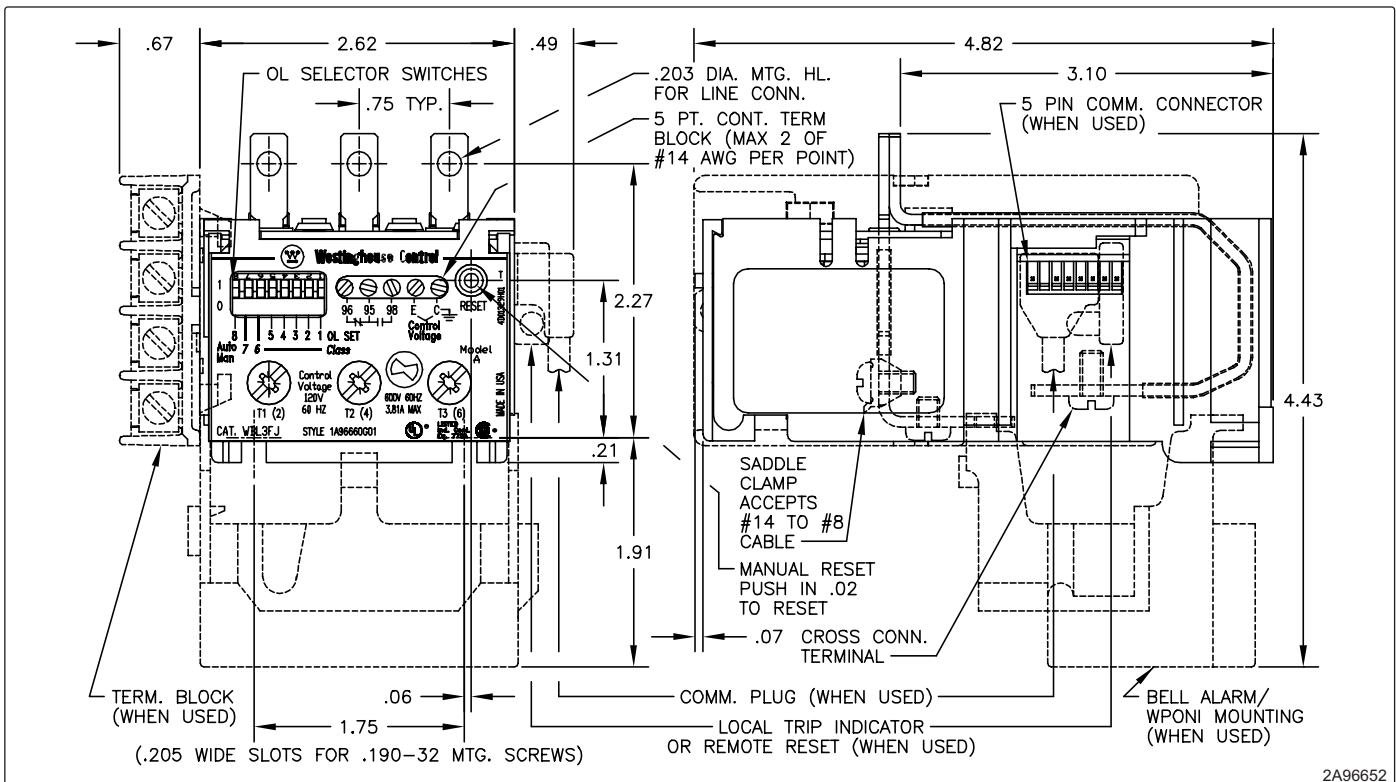


Fig. 4 Size 3 and Size 4 Outline and Mounting Dimensions (dimensions in inches)



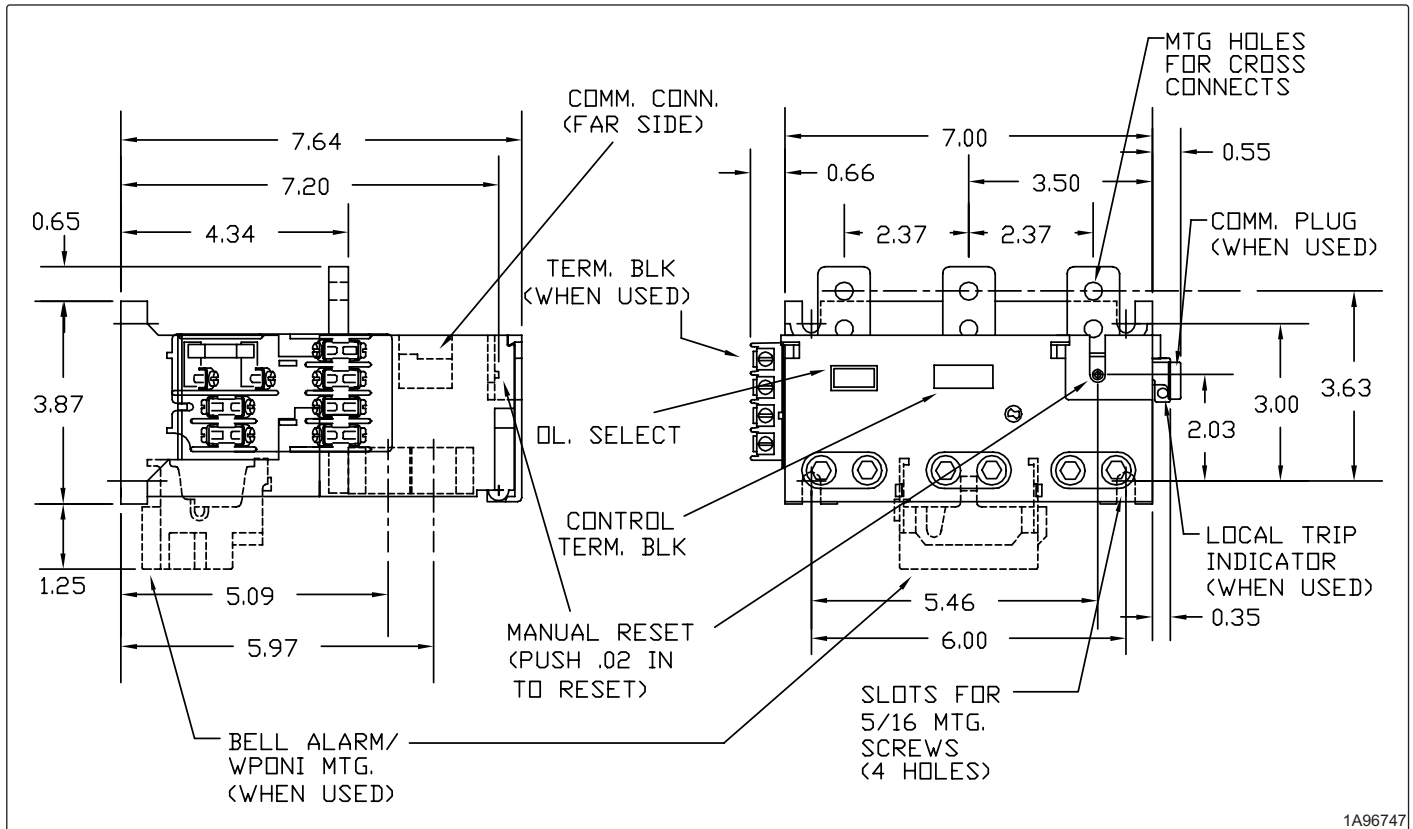


Fig. 5 Size 5 and Size 6 Outline and Mounting Dimensions (dimensions in inches)

combinations of the equipment, its storage, delivery, installation, checkout, safe operation, or maintenance. Care must be exercised to comply with local state, and national regulations, as well as safety practices for this type of equipment.

**CONTROL POWER AND TERMINALS**

Advantage overload relays require a constant source of control power to operate and indicate status. Loss of control power or a severe drop in control voltage will cause a type W overload relay to move to an OFF condition.

The function of each control terminal is as follows:

- 95** = Common terminal of single pole, double throw output relay
- 96** = Normally closed contact with relay energized
- 98** = Normally open contact with relay energized
- E** = Ungrounded side of control power source
- C** = Grounded (common) side of control power source

Control power and output terminals for the overload relays are shown in Figure 8. All the terminals of the overload relay must be supplied by the same phase. The preferred source is a control power transformer, see Figure 6, whose primary windings are connected across phase L1-L2, although

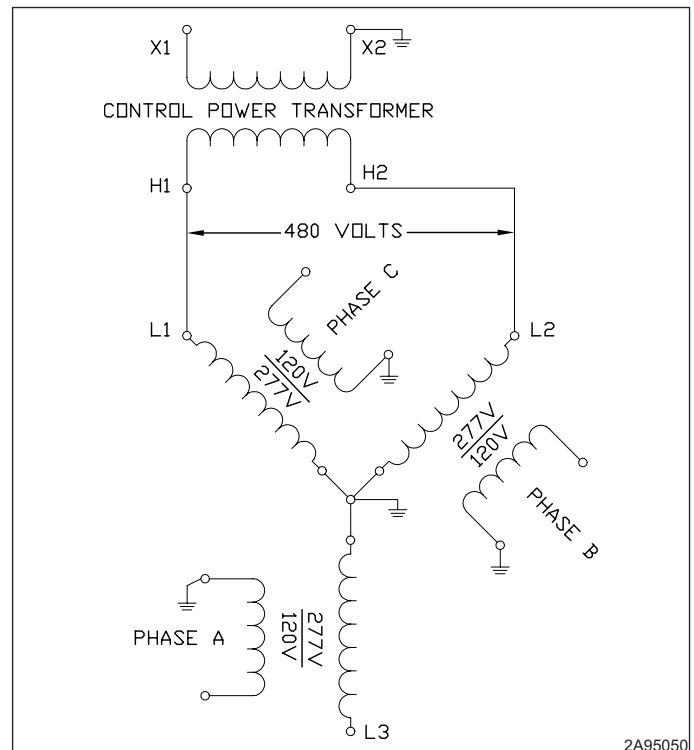


Fig. 6 Phase Relationships

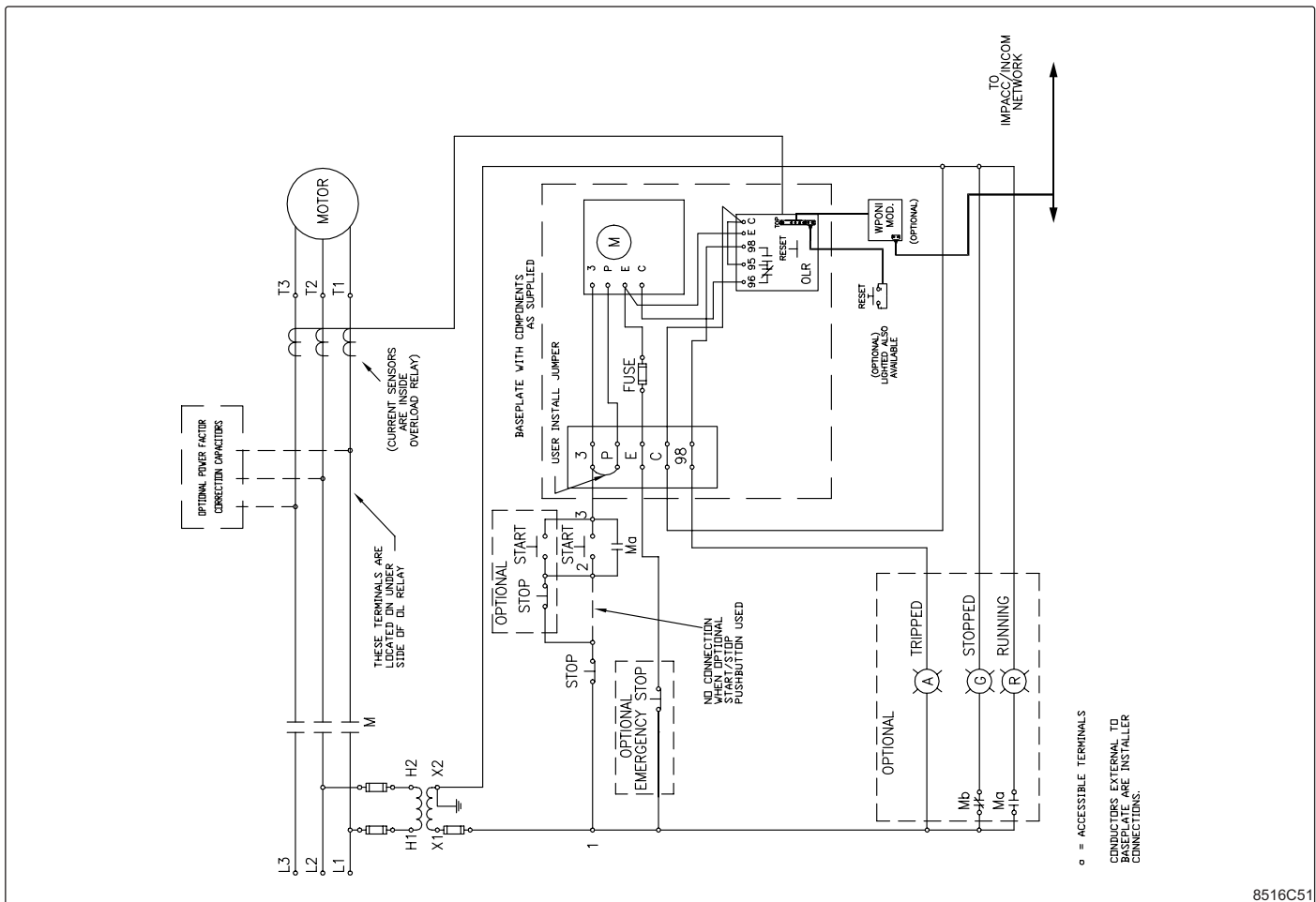


Fig. 7 Typical Connection Diagram (Advantage Contactor Shown)

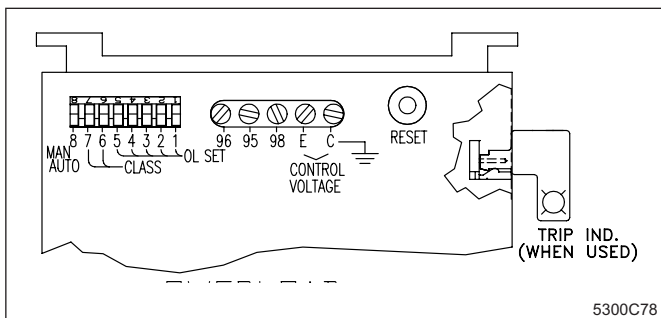


Fig. 8 DIP Switch, Overload Relay Terminals, and Reset

**CONTROL POWER AND TERMINALS, Cont'd**

although phases L2-L3, L3-L1, or phases A, B, and C will provide satisfactory performance.

**Be sure to place the control wires in such a position as to not interfere with the power terminals.**

Wire Advantage or other style magnetic contactor "M" in a manner similar to that shown in Figure 7. An Advantage

contactor may be wired exactly as shown using an external auxiliary contact (Ma) as the holding circuit contact or with its own internal holding circuit contact. Other style contactors require the holding circuit contact (Ma) to be wired for three-wire control, where Ma is operated by contactor "M". Terminals "E" and "C" on the Advantage contactor represent conventional contactor coil terminals.

**SHORT CIRCUIT RATINGS**

These motor controllers are suitable for use on circuits capable of delivering not more than the current (rms symmetrical amperes) shown, in circuits rated not more than the voltage shown in the following tables, when protected by the SCPD shown.

TABLE X - WIRING DATA			
Controller Size	Circuit Conductor	Wire Range (AWG)	Tightening Torque (lb-in)
1	Power	#14 - 8	18 - 20
2	Power	#14 - 10	20 - 22
2	Power	#8 - 4	45 - 50
3 & 4	Power	#14-250 kcmil	90 - 100
5	Power	(1) #00-500 kcmil	300 - 375
6	Power	(2) #00-500 kcmil	225 - 300
All	Control	#18 - 14*	7

Wire with copper conductors only. Use wire rated 75°C or higher based on the ampacity of 75°C wire

When wiring directory to control terminals on devices, strip control wires for terminals 96-95-98-E-C not more than 1/4 inch. See Figure 6.

TABLE XI - SIZE 1 SHORT CIRCUIT RATINGS					
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.
			Current	Voltage	
Class J or R Fuse	60A	-	100,000A	480V	100A FD-K Molded Case Switch 100A "K" Switch
			65,000A	600V	
			100,000A	480V	60A "K" Switch
			50,000A	600V	
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	3, 7, 15 or 30A	Marked GMCP	42,000A	240V	GMCP
			25,000A	480V	
		Marked HMCPS	100,000A	480V	HMCPS
			50,000A	600V	
	15 or 30A	Marked HMCP	100,000A	480V	HMCP
			25,000A	600V	
Thermal/Mag Type CB <sup>3</sup>	50A	65,000A	65,000A	480V	HFD
		25,000A	25,000A	600V	
		100,000A	100,000A	480V	FDC
		35,000A	35,000A	600V	
Magnetic Only <sup>1</sup> Type CB + CL <sup>4</sup>	30A	HMCP plus Current Limiter	100,000A	600V	HMCP + CL
Thermal/Mag Plus CL <sup>5</sup>	50A	100,000A	100,000A	600V	HFD + CL

**TABLE NOTES**

- <sup>1</sup> Instantaneous Adjustable Trip
- <sup>2</sup> Circuit Breaker
- <sup>3</sup> Inverse Time Circuit Breaker

- <sup>4</sup> Instantaneous Adjustable Trip with Current Limiting Attachment
- <sup>5</sup> Inverse Time Circuit Breaker with Current-Limiting Attachment

TABLE XII - SIZE 2 SHORT CIRCUIT RATINGS					
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.
			Current	Voltage	
Class J or R Fuse	100A	-	100,000A	480V	100A FD-K Molded Case Switch
			65,000A	600V	100A "K" Switch
			100,000A	480V	60A "K" Switch
			50,000A	600V	Switch
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	50A	Marked GMCP	42,000A	240V	GMCP
			25,000A	480V	
		Marked HMCPS	100,000A	480V	HMCPS
			50,000A	600V	
	50A	Marked HMCP	100,000A	480V	HMCP
			25,000A	600V	
Thermal/Mag Type CB <sup>3</sup>	90A	65,000A	65,000A	480V	HFD
		25,000A	25,000A	600V	
		100,000A	100,000A	480V	FDC
		35,000A	35,000A	600V	
Magnetic Only <sup>1</sup> Type CB + CL <sup>4</sup>	50A	HMCP plus Current Limiter	100,000A	600V	HMCP + CL
Thermal/Mag Plus CL <sup>5</sup>	90A	100,000A	100,000A	600V	HFD + CL

**TABLE NOTES**<sup>1</sup> Instantaneous Adjustable Trip<sup>2</sup> Circuit Breaker<sup>3</sup> Inverse Time Circuit Breaker<sup>4</sup> Instantaneous Adjustable Trip with Current Limiting Attachment<sup>5</sup> Inverse Time Circuit Breaker with Current-Limiting Attachment

TABLE XIII - SIZE 3 SHORT CIRCUIT RATINGS						
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.	
			Current	Voltage		
Class J or R Fuse	200A	-	100,000A	480V	100A FD-K Molded Case Switch 100A , 200A "K" Switch	
			65,000A	600V		
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	60A or 63A	Marked GMCP	42,000A	240V	GMCP	
	100A		25,000A	480V		
Thermal/Mag Type CB <sup>3</sup>		150A	Marked HMCP	100,000A	480V	HFD
	50,000A			600V		
	65,000A			480V	FDC	
	25,000A			600V		
Magnetic Only <sup>1</sup> Type CB + CL <sup>4</sup>	100A	HMCP plus Current Limiter	100,000A	600V	HMCP + CL	
			35,000A	600V		
Thermal/Mag Plus CL <sup>5</sup>	150A	100,000A	100,000A	600V	HFD + CL	

TABLE XIV - SIZE 4 SHORT CIRCUIT RATINGS					
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.
			Current	Voltage	
Class J or R Fuse	400A	-	100,000A	480V	150A FD-K Molded Case Switch
			65,000A	600V	
			100,000A	600V	250A JD-K Molded Case Sw 400A "K" Switch
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	150A	Marked HMCP	100,000A	480V	HMCP
			50,000A	600V	
Thermal/Mag Type CB <sup>3</sup>	250A	Marked HMCP	100,000A	480V	JDC
			35,000A	600V	
			65,000A	480V	HJD
			25,000A	600V	
Magnetic Only <sup>1</sup> Type CB + CL <sup>4</sup>	150A	HMCP plus Current Limiter	100,000A	600V	HMCP + CL

**TABLE NOTES**

<sup>1</sup> Instantaneous Adjustable Trip  
<sup>2</sup> Circuit Breaker  
<sup>3</sup> Inverse Time Circuit Breaker

<sup>4</sup> Instantaneous Adjustable Trip with Current Limiting Attachment  
<sup>5</sup> Inverse Time Circuit Breaker with Current-Limiting Attachment

TABLE XV - SIZE 5 SHORT CIRCUIT RATINGS					
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.
			Current	Voltage	
Class J or R Fuse	600A	-	100,000A	600V	400A KD-K Molded Case Switch 600A "K" Switch
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	250A	Marked HMCP	100,000A	480V	HMCP
	400A		50,000A	600V	
Thermal/Mag Type CB <sup>3</sup>	400A	35,000A	25,000A	600V	HKD
		50,000A	100,000A	600V	KDC
	250A	25,000A	25,000A	600V	HJD
		35,000A	50,000A	600V	JDC
	400A	65,000A	65,000A	480V	HKD
		100,000A	100,000A	480V	KDC
	250A	65,000A	65,000A	480V	HJD
		100,000A	100,000A	480V	JDC

TABLE XVI - SIZE 6 SHORT CIRCUIT RATINGS					
Short Circuit Protective Device (SCPD)	Max. Rating SCPD	Circuit Breaker Interrupting Rating	Short Circuit Withstand Rating		Typical Disconnect Device Cat. No.
			Current	Voltage	
Class J or R Fuse	600A	-	100,000A	480V	400A KD-K Molded Case Switch; 600A "K" Switch
			65,000A	600V	
Class L Fuse Fuse	800A	-	100,000A	480V	600A KD-K Molded Case Switch; 800A "K" Switch
			65,000A	600V	
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	600A	Marked HMCP	100,000A	480V	HMCP
	800A	Marked HMC	50,000A	600V	Magnetic Only HMC
Thermal/Mag Type CB <sup>3</sup>	600A	65,000A	65,000A	480V	
		35,000A	35,000A	600V	T/Magnetic HMC
	800A	50,000A	65,000A	600V	
		25,000A	25,000A	600V	
Thermal/Mag with CL <sup>4</sup>	800A	200,000A	100,000A	600V	NB Tri-Pac

**TABLE NOTES**<sup>1</sup> Instantaneous Adjustable Trip<sup>2</sup> Circuit Breaker<sup>3</sup> Inverse Time Circuit Breaker<sup>4</sup> Instantaneous Adjustable Trip with Current Limiting Attachment<sup>5</sup> Inverse Time Circuit Breaker with Current-Limiting Attachment

## MAINTENANCE

### TURN OFF POWER!

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, checkout, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices for this class of equipment.



## CAUTION

**FAILURE TO COMPLETELY DISCONNECT THE MOTOR CONTROLLER FROM ALL COMMUNICATIONS NETWORKS AND POWER SOURCES, INCLUDING CONTROL CIRCUIT POWER PRIOR TO INSPECTION MAY RESULT IN SEVERE INJURY OR DEATH**

### TROUBLESHOOTING HINTS

If the controller does not operate as expected, check the following:

- Terminals E and C must be energized to obtain a tripped indication.
- An overload relay in a tripped condition caused by phase or ground must be reset with control power ON.
- Each DIP switch handle must be in the full ON or full OFF position.

A type WCMU central monitoring unit can be of great assistance in troubleshooting.

### ROUTINE MAINTENANCE

The output contacts of the overload relay (terminals 95, 96, and 98) are those of an internal relay designed to control the coil of an Advantage contactor. The contact symbols shown on the overload relay indicate the state of the contacts with control power applied. As a part of every routine maintenance check, with all control power OFF, use any conventional ohmmeter to verify that the contact between terminals 95 and 96 (shown as a normally closed contact) is open and not welded as the result of fault current in the control circuit. If this contact is welded, the overload relay has been abused and must be replaced. With the contacts between 95 and 96 welded, the overload relay cannot trip.

**TABLE XVII - CATALOG DESIGNATIONS**

Each catalog designation consists of six or more characters

Ex:	<b>WB</b>	<b>1</b>	<b>3</b>	<b>F</b>	<b>J</b>	<b>Y4</b>
Pos:	I	II	III	IV	V	VI

Position:

I = Type Designation

WB = Advantage Line with both ground fault and phase loss protection included

II = Size (terminal capacity and trip current range)

L = Size 1 terminals and .59 thru 4.34A trip rating

1 = Size 2 terminals and 3.93 thru 32.1A trip rating

2 = Size 2 terminals and 3.93 thru 51.6A trip rating

3 = Size 3 terminals and 12.4 thru 162A trip rating

5 = Size 5 terminals and 47.9 thru 322A trip rating

6 = Size 6 terminals and 47.9 thru 628A trip rating

III = Phase

1 = Single phase (two toroids)

3 = Three phase (three toroids)

IV = Control Voltage and Frequency

F = 110-120 volts, 60 hertz

N = 110 volts, 50 hertz

V = Mounting

J = With two line connection points per pole on bus bars and load terminals ready to accept conductors.

P = For panel mounting, with line and load terminals ready to accept conductors

VI = Suffix to indicate modifications that alter the characteristics shown above

Y4 = With phase loss protection omitted

Y7 = With ground fault protection omitted

Y10 = Phase loss protection omitted

Y11 = Phase imbalance protection omitted

<b>TABLE XVIII</b>						
<b>Replacement Circuit Board Catalog Designation</b>						
Each catalog designation consists of six or more characters:						
Ex:	W	CB	C	1	F	Y4
	W+	CB	C	1	F	Y4
	W	CB	C	1E	F	Y4
<b>Pos:</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>
Position:						
I = Type Designation W = Model E or earlier W+ = Model P or later						
II = Category CB = replacement circuit board						
III = Function C = contactor O = overload relay S = starter						
IV = Size L = size 1 lower level (.59 through 4.34 amp trip) 1 = size 1 (3.93 through 32.1 amp trip) 2 = size 2 3 = size 3 4 = size 4 5 = size 5 G = size 5 definite purpose (360 amp) 6 = size 6 H = size 6 definite purpose (760 amp) LE = model E size 1 lower level 1E = model E size 1 2E = model E size 2 3E = model E size 3 4E = model E size 4 5E = model E size 5 GE = model E size 5 definite purpose (360 amp) 6E = model E size 6 HE = model E size 6 definite purpose (760 amp)						
V = Control voltage and frequency F = 110-120 volts, 60 Hz N = 110 volts, 50 Hz						
VI = Suffix to indicate modifications that alter the characteristics above Y4 = phase loss and imbalance protection omitted Y7 = ground current sensing protection omitted Y10 = phase loss protection omitted Y11 = phase imbalance protection omitted						

**CUTLER-HAMMER**

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