

## Instructions for Class W200, W201, Sizes 5 and 6, Three Phase Non-Reversing Magnetic Motor Starters and Contactors



Fig. 1 Class W200 Size 6 Starter

### ADVANTAGE MOTOR CONTROL

Advantage NEMA Size 5 and 6 electrically-operated starters and contactors (motor controllers) have the same physical size, but differ with respect to mechanical parts and settings available.

The motor starters (Class W200) include a solid state current-sensing unit that provides overload protection, phase loss protection, phase imbalance protection, and ground current-sensing protection.

The motor rated contactors (Class W201) do not include overload, phase loss, phase imbalance, or ground current-sensing protection, but they do have the same coil controller that prevents a “contact kiss” position on pickup and dropout when the coil voltage supply drops drastically. Both starters and contactors have this low voltage release. Both require a separate source of control power, preferably taken from the motor supply circuit via a control power transformer.

The combination of the coil controller and the solid state current-sensing unit results in an energy efficient motor starter. Coil and magnet losses and overload sensing losses are significantly less than those with equipment functions by conventional means.

### RATINGS

The maximum horsepower ratings of these motor controllers are shown in Table I. Kilowatt ratings equivalent to the horsepower ratings shown in Table I are shown in Table II.

TABLE I - MAXIMUM HORSEPOWER RATINGS (60HZ)				
Controller Size	Three Phase Horsepower At			
	200V	230V	460V	575V
5	75	100	200	200
6	150	200	400	400

TABLE II - MAXIMUM KILOWATT RATINGS (50HZ)					
Controller Size	Three Phase Horsepower At				
	220V	380V	415V	500V	660V
5	63	110	125	150	150
6	132	220	250	300	300

### PROGRAMMED FEATURES

Advantage NEMA Size 5 starters and contactors are assembled with identical parts except for the circuit board to which the control wires are attached. These circuit boards differ with respect to components and the software program they contain.

NEMA Size 6 starters and contactors are similar. They differ from Size 5 devices by virtue of larger contacts, higher ratings, provision for two conductors per phase, and different software programs.

**Phase Loss Protection** - Advantage starters with this option automatically open (trip) within 2 seconds after they sense a current less than 27 amperes 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.

**Phase Imbalance Protection** - Advantage starters with this option automatically open (trip) within 12 seconds after they sense an imbalance between two phase currents that is greater than 30% of the Trip Rating shown in Tables IV and V. 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 240 amps during motor 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 1045 amperes, ground current-sensing protection will be locked out to allow ground protection to be provided by other protective devices.

## 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 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.

These devices are full voltage motor controllers capable of starting, stopping, and interrupting the locked rotor current of motors within their ratings. They must be protected against short circuits by providing motor branch circuit protection in accordance with the National Electrical Code (NEC) or the applicable electrical code.

In an enclosure with a volume of not less than 14,777 cubic inches, mount the motor controller on a vertical plane with its long axis either horizontal or vertical. The preferred orientation is with the line terminals above their respective load terminal. The control circuit terminals, marked **3-P-E-C** on the nameplate, are accessible without removing the arc box cover via the shelf directly above the center load terminal. They are suitable for one or two conductors per terminal in any combination of sizes. Keep strip length of these conductors to between 3/16 and 1/4 inch. It may be more convenient to remove the arc box cover. See Figure 2 for outline and mounting dimensions and Table III for wiring data.

**TABLE III - WIRING DATA**

Controller Size	Circuit Conductor	Wire Range (AWG)	Tightening Torque (lb-in)
5	Power	(1) #00-500 kcmil	300-375
6	Power	(2) #00-500 kcmil	225-300
5 & 6	Auxiliary Contact	#22-12	7
5 & 6	Control	#18-14*	6

Wire with copper conductors only. Use wire rated 75°C or higher based on the ampacity of 75°C wire  
 \* Strip control wires for terminals 3-P-E-C not more than 1/4 inch.

## THE COIL AND COIL CONTROLLER

The contactor portion of these motor controllers is a conventional design except for the circuit board and coil controller. The coil controller prevents the contacts from touching without spring pressure ("contact kiss" position) when the control voltage is low or dips. It prevents coil energization when the control voltage is too low for proper pickup, and yet maintains the armature sealed to the magnet with reduced current when adequate control voltage is present. Maximum benefit of this low voltage response feature is obtained where the control voltage (110VAC, 50HZ or 120VAC, 60HZ) is supplied by a control power transformer with its primary fed by the motor circuit.

## 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

A Class W200 motor starter 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 three closely coupled current sensors in combination with a microprocessor that counts

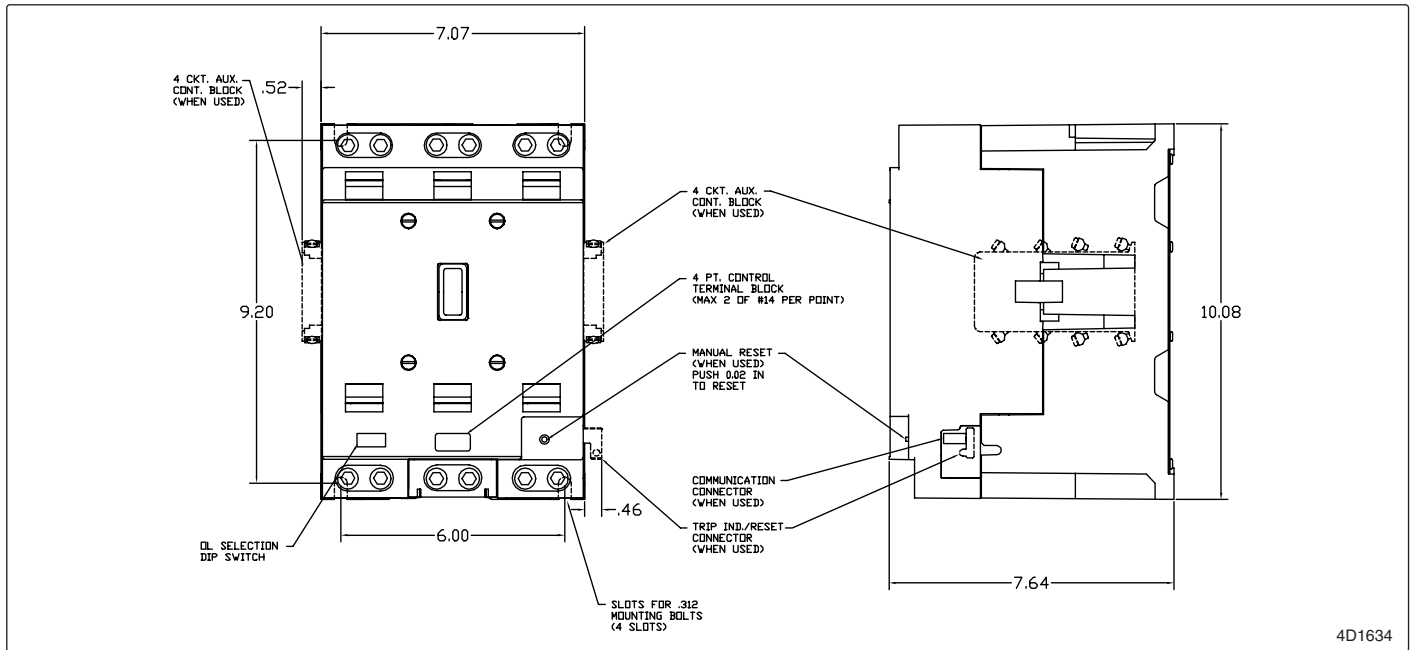


Fig. 2 Size 5 and 6 Outline and Mounting Dimensions (dimensions in inches)

units of the line current squared ( $I^2$ ), the heating effect within the motor. The sensors are coils wound in the form of toroidal helixes 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 very 4 to 5 seconds when power is applied to the starter. If the starter is in an overcurrent condition, the LED will blink every second. Whenever the motor is in an overcurrent condition and turns full ON indicating a tripped condition, a reset is required before the motor can be re-started. 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 SETTINGS**

The cutout in the arc box cover that provides access to the DIP switch is designed to accept a snap-in clear plastic window. Insert the window after initial DIP switch settings have been made by engaging the hooks of one corner and pushing on the opposite corner. To change a DIP

switch setting after the window has been installed, remove the arc box cover by loosening the four captive cover screws accessible through the nameplate.

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 moved away from the position number, the pole is open (represented by "0"). See Figure 3. **Be sure that each DIP switch handle is moved to the full ON (1) or full OFF (0) position.**

RESET METHOD	POSITION 8
<b>MANUAL</b> (Non-automatic. Wait 5 minutes and push reset button)	0
<b>AUTOMATIC</b> (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, etc.

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, current-sensing, or ground protection is wanted. With NONE selected, the Class W210 or W250 motor starter will behave like a Class W211 or W251 contactor.

OVERLOAD CLASS	POSITION 7	POSITION 6
10	0	0
20	0	1
30	1	0
NONE	1	1

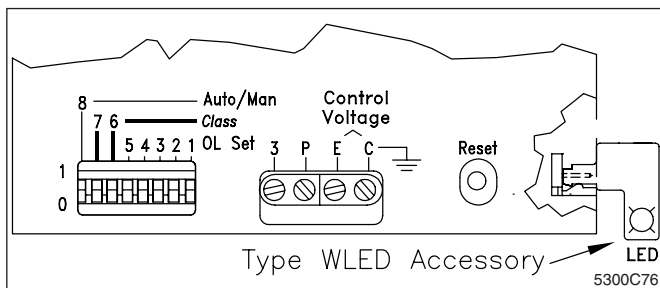


Fig. 3 DIP Switch, Terminals and Reset

**TRIP CURRENT SETTING**

The overload trip current of an Advantage starter is determined by its overload relay software program and its DIP switch settings in Positions 5 through 1 as shown in Tables IV and V. 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 the range of motor FLA in Column A 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.

TABLE IV - 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 arc box cover securely after making selections.

See Tables VI and VII for selection of appropriate short circuit protective device.

TABLE V - 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				
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 arc box cover securely after making selections.

**COMMUNICATIONS**

Two accessory communication 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 Integrated Monitoring, Protection, and Control Communications (IMPACC) system. A typical network consists of shielded wires daisy-chained to a remote personal-size computer as shown in Figure 4. 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 I.L. 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, or 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.

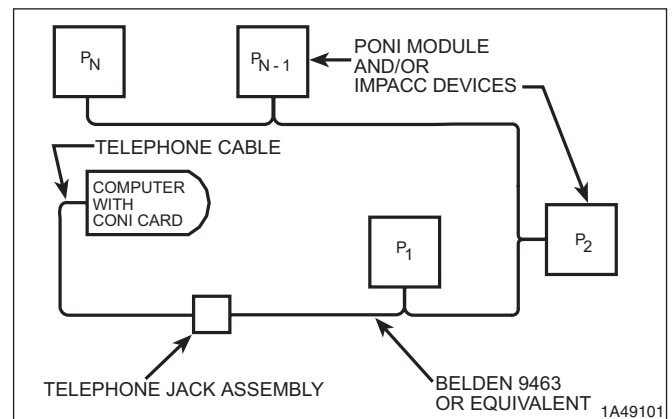


Fig. 4 Typical Network Interwiring

## CONTROL OPTIONS

An Advantage non-reversing motor controller may be used with two-wire control or any one of three three-wire control schemes. The four point (3-P-E-C) terminal block shown in Figure 3 is attached to the shock-mounted circuit board and will give approximately 1/16 inch under screw-driver pressure.

In all cases, control power to terminals 3-P-E-C must be from the same phase. An interposing relay must be used wherever the controller signal to 3 or P would be different voltage, frequency, or phase than the voltage supplied to E and C. See **TWO-WIRE CONTROL**.

If a triac output Programmable Logic Controller (PLC) is being used for control on a Model D or earlier, it will be necessary to know the required triac latching and leakage currents. If the latching current is greater than 6 milliamperes, it will be necessary to mount loading resistors between the P and/or 3 terminal and the C terminal or the contactor may fail to remain sealed. The value of the resistor is determined by dividing the control voltage (120V) by the latching current supplied by the PLC manufacturer. If the leakage current exceeds 0.2 milliamperes, it will be necessary to add a resistor between the P and/or 3 terminal and the C terminal to limit the voltage in the "off" state to 3 volts or less. The value of the resistor is determined by dividing the square of the control voltage ( $120^2$ ) by the resistance value. The resistor should have a power rating that is twice the calculated power level.

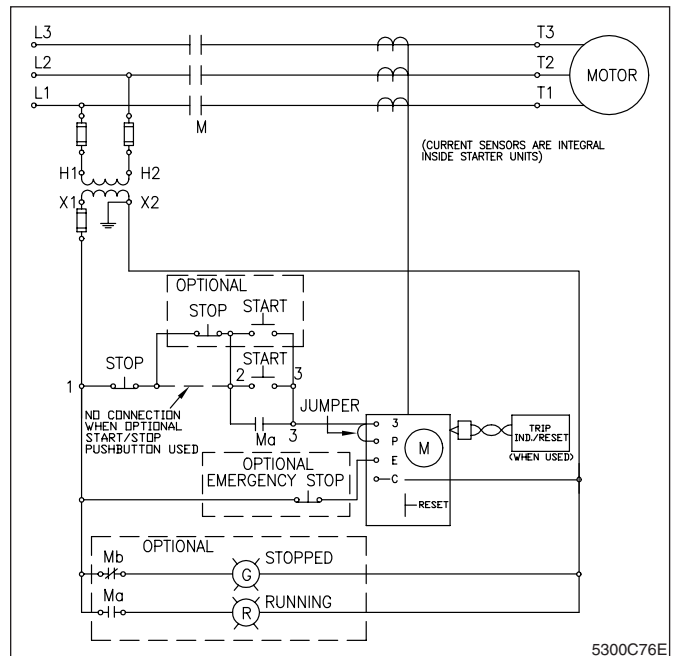


Fig. 5 Conventional Holding Circuit - Three-Wire

## THREE-WIRE CONTROL WITH CONVENTIONAL HOLDING CIRCUIT

Wire as shown in Figure 5 (without communications) or Figure 6 (with communications) using an external auxiliary contact (Ma) as the holding circuit interlock between control circuit terminals 2 and 3. Add a jumper of #16 or #18 AWG stranded wire between control terminals 3 and P. Keep strip length to not greater than 1/4 inch. **Be sure to have jumper clear the power terminal.** Attach and route twisted pair or shielded wires to a remote reset/trip indicator module where provided.

### Without Communications

Wire control devices in the same manner as conventional motor controllers. Add the jumper.

### With Communications

Attach a WPONI communications module and connect it to the INCOM network daisy-chain fashion as shown in Figures 4 and 6.

When wired as shown in Figure 6, the motor cannot be started via the IMPACC system, but only stopped and the starter reset.

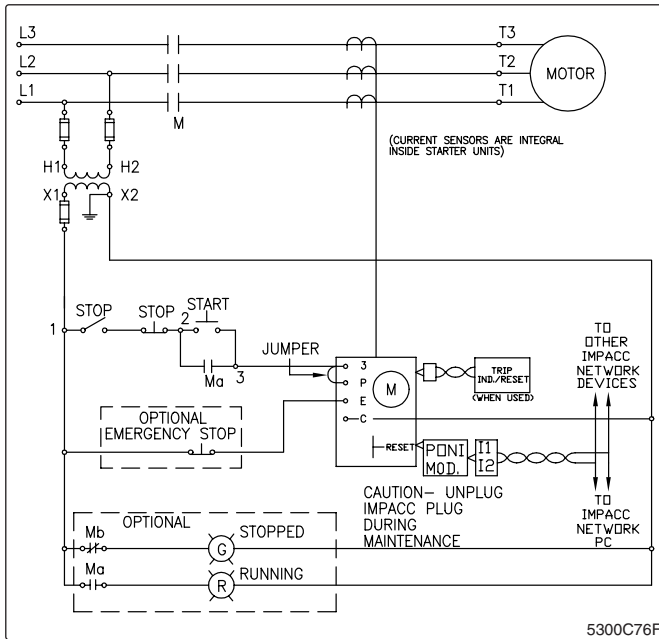


Fig. 6 Conventional Holding Circuit - Three-Wire with IMPACC

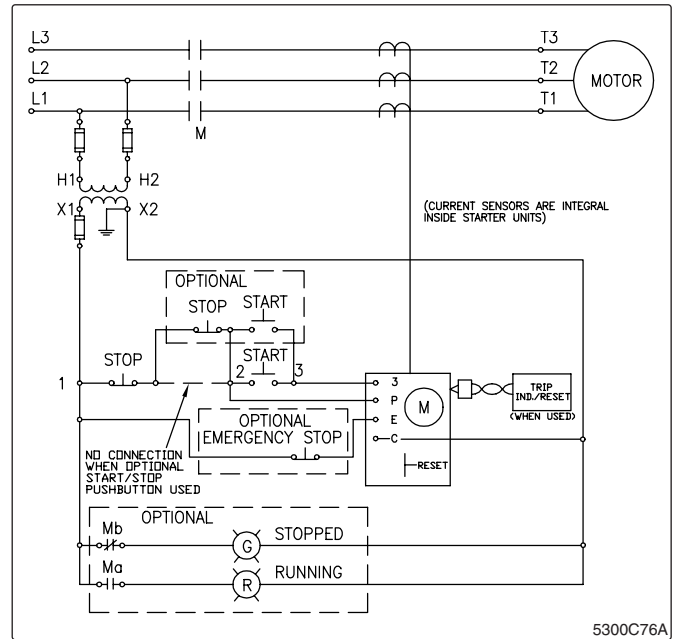


Fig. 7 Internal Holding Circuit - Three-Wire

**EMERGENCY STOP**

The EMERGENCY STOP pushbutton provides a faster stop (by approximately 1/10 of a second) by bypassing the distributed opening sequence provided when the normal STOP pushbutton is operated. The built-in distributed opening sequence insures that each set of contacts associated with a phase takes its share of the wear associated with opening the circuit first and the ease of opening last, to provide uniform wear on all contacts and provide longer life for a given set of contacts, i.e., all three phases wear at the same rate.

**THREE-WIRE CONTROL WITH INTERNAL HOLDING CIRCUIT**

The virtues of three-wire control can also be obtained without an external auxiliary contact and jumper by using the internal holding circuit. Wire as shown in Figure 7 or 8. Attach and route twisted-pair or shielded wires to a remote reset/trip indicator module where provided.

**Without Communications**

Wire control devices in the same manner as conventional motor controllers except omit the holding circuit interlock.

**With Communications**

Attach a WPONI communications module and connect it to the INCOM network daisy-chain fashion as shown in Figures 4 and 8.

When wired as shown in Figure 8, the motor can be stopped and started via the IMPACC system. In order to start the motor via IMPACC, control circuit terminal P must be energized. The motor starter can be reset via IMPACC when wired as shown in Figure 8.

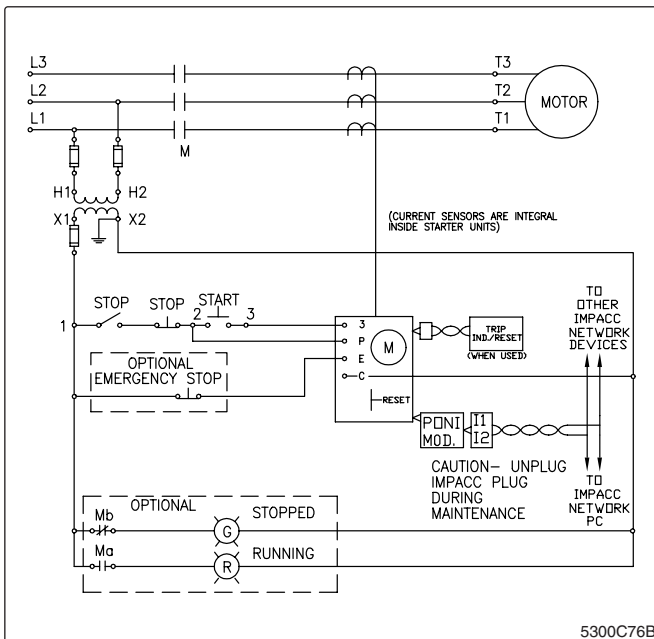


Fig. 8 Internal Holding Circuit - Three-Wire with IMPACC

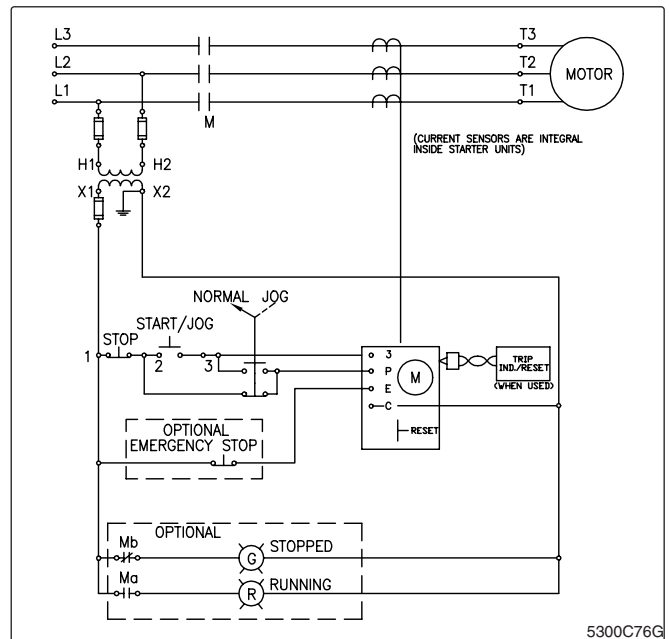


Fig. 9 Internal Holding Circuit - Three-Wire with JOG Option

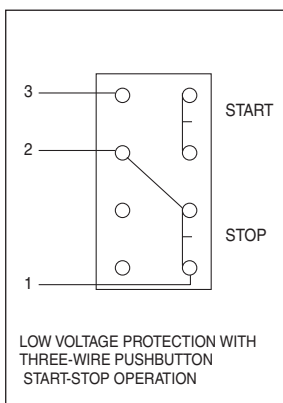
**THREE-WIRE CONTROL WITH JOG OPTION**

The contacts of a two-position NORMAL JOG selector switch can be added to the control circuit between points 2 and 3 of Figure 5 where an external electrical interlock is used as the holding circuit. Install a #16 or #18 AWG stranded wire jumper from 3 to P. Keep strip length to not more than 1/4 inch. **Be sure to have jumper clear the power terminal.** Where the internal holding circuit is used, wire as shown in Figure 9 or 10. No jumper is needed. Attach and route twisted-pair or shielded wires to a remote reset/trip indicator module where provided.

**With Communications**

Attach a WPONI communications module and connect it to the INCOM network daisy-chain fashion as shown in Figures 4 and 10. Where IMPACC control is used, the selector switch must be a type that breaks one circuit before making the other when switching from NORMAL to JOG.

When wired as shown in Figure 10, the motor can be started and stopped via the IMPACC system, provided the selector switch is in the NORMAL position. When the selector switch is in the JOG position, the motor cannot be started via IMPACC, but it can be stopped via IMPACC. However, the motor will restart when the START button is pushed. The starter can be reset via IMPACC with the selector switch in either mode.



Control Station Connection Diagram for Three-Wire Control



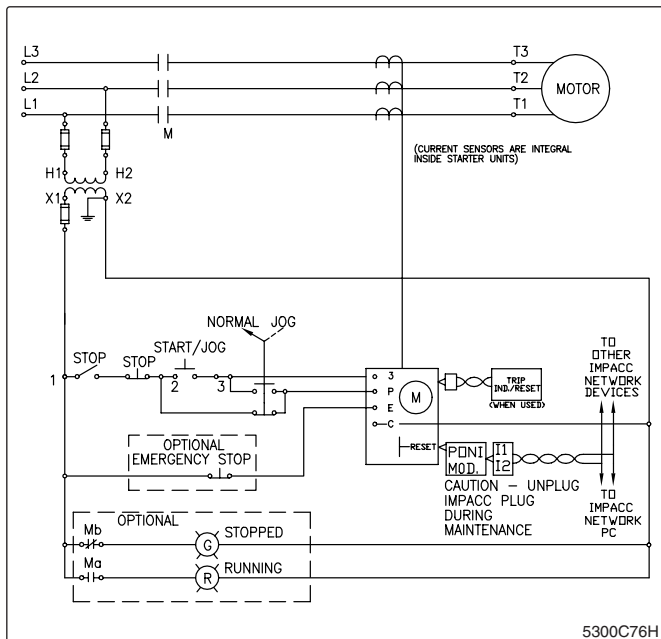


Fig. 10 Internal Holding Circuit - Three-Wire with JOG Option and IMPACC

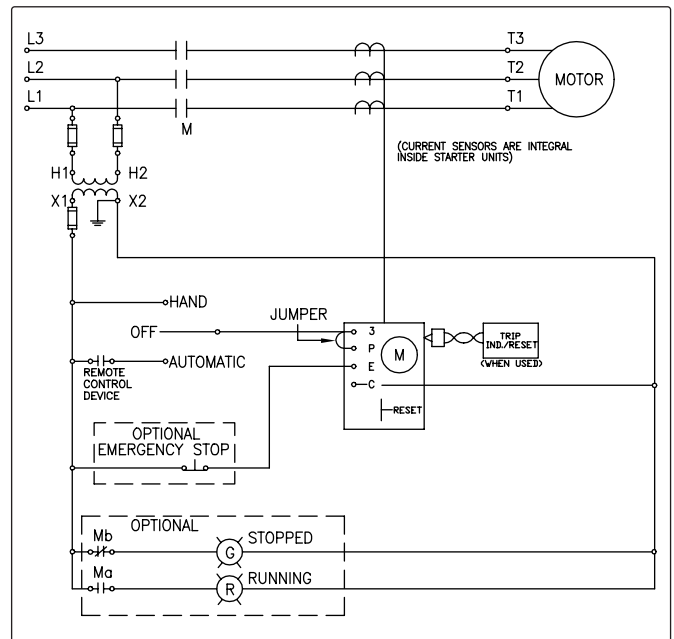


Fig. 11 Two-Wire Control

**TWO-WIRE CONTROL**

Wire as shown in Figure 11 or 12. Install a #16 or #18 AWG stranded wire jumper from 3 to P. Keep strip length to not more than 1/4 inch. **Be sure to have jumper clear the power terminal.** Attach and route twisted-pair or shielded wires to a remote reset/trip indicator module where provided.

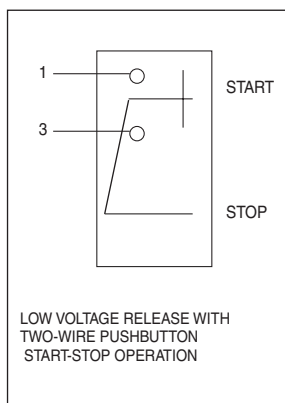
**Without Communications**

Wire control devices in the same manner as conventional motor controllers. Add the jumper.

**With Communications**

Attach a WPONI communications module and connect it to the INCOM network daisy-chain fashion as shown in Figures 4 and 12.

When wired as shown in Figure 12 with two-wire control, the motor cannot be started or stopped via the IMPACC system. The motor starter can only be reset and data obtained via IMPACC where two-wire control is used.



Control Station Connection Diagram for Two-Wire Control

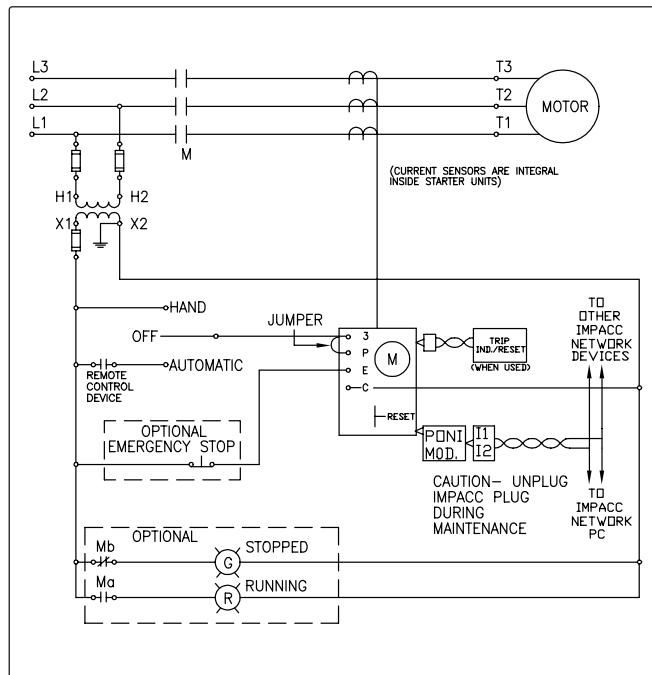
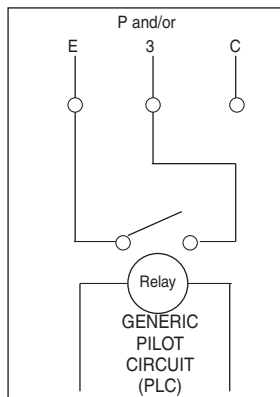


Fig. 12 Two-Wire Control with IMPACC



**CAUTION**

**AUTOMATIC RESET SHOULD NOT BE USED WITH TWO-WIRE CONTROL CIRCUITS WHERE AUTO-MATIC STARTING OF THE MOTOR MAY BE HAZARDOUS**



Interposing Relay

TABLE VI - 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 Sw, 600A "K" Switch	
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	250A & 400A	Marked HMCP	100,000A	480V	HMCP	
			50,000A	600V		
Thermal/Mag. Type CB <sup>3</sup>	400A	35,000A	25,000A	600V	HKD	
		50,000A	100,000A		KDC	
		25,000A	25,000A		HJD	
		35,000A	50,000A		JDC	
	250A	400A	65,000A	65,000A	480V	HKD
		100,000A	100,000A	KDC		
		65,000A	65,000A	HJD		
		100,000A	100,000A	JDC		

TABLE VII - 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, R, or T Fuse	600A	-	100,000A	480V	600A LD-K Molded Case Sw, 600A "K" Switch
			65,000A	600V	
Class L Fuse	800A	-	100,000A	480V	600A LD-K Molded Case Sw 800A "K" Switch
			65,000A	600V	
Magnetic Only <sup>1</sup> Type CB <sup>2</sup>	600A	Marked HMCP	100,000A	480V	HMCP
			50,000A	600V	
	800A	Marked HMC	65,000A	480V	Magnetic Only HMC
			25,000A	600V	
Thermal/Mag. Type CB <sup>3</sup>	600A	65,000A	65,000A	480V	HLD
		35,000A	35,000A		
	800A	50,000A	65,000A	480V	T/Magnetic HMC
		25,000A	25,000A	600V	
Thermal Mag. with CL <sup>4</sup>	800A	200,000A	100,000A	600V	NB Tri-Pac

**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 Tables VI and VII, when protected by the SCPD shown.

**TABLE NOTES**

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

AC COIL DATA (TYPICAL VALUES) SIZES 5 AND 6		
Inrush VA	Sealed VA	Sealed Watts
2600	50	10

Use a 300VA or larger machine tool control transformer. Protect the coil and printed wiring board with a 5 ampere time delay fuse. See Table VIII.

### TROUBLESHOOTING HINTS

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

- All control power to terminals 3-P-E-C must be supplied from the same phase.
- Terminal P must be energized to permit the contactor to pick up.
- Terminals E and C must be energized to obtain a tripped indication.
- A starter in a tripped condition caused by a phase loss or a ground fault 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.

TABLE VIII - AUXILIARY CONTACTS AND TIE POINTS		
Contacts	Tie Points	Catalog No.
1N.O. & 1 N.C.	2	W11T
1 N.O. & 3 N.C.	0	W13
2 N.O. & 2 N.C.	0	W22
3 N.O. & 1 N.C.	0	W31
4 N.O.	0	W40
4 N.C.	0	W04
NONE	6*	WTBF16
N.O. = Normally Open, N.C. = Normally Closed		
* Four points are color-coded and prewired for connection to control terminals 3, P, E, and C. A 5 ampere Buss Type MDL control circuit fuse and two unwired tie points are included.		

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 5A fuse and 2 tie points to accept solid, stranded, or lugged conductors for W200 and W201	WTBF16
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 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	

### CONTROL POWER AND TERMINALS

Advantage motor controllers require a constant source of control power to operate and indicate a tripped condition. Loss of control power or a severe drop in control voltage will cause an Advantage motor controller to open.

The location and function of each control terminal is shown below.

**3** = Terminal to which the START signal must be delivered

**P** = Terminal which must be energized to permit operation

**E** = Ungrounded side of control power source

**C** = Grounded (common) side of control power source

Control power terminals for the motor controller are shown in Figure 3. All the terminals must be supplied by the same phase. The preferred source is a control power transformer (see Figure 13) whose primary windings are connected across phase L1-L2, although phases L2-L3, phase L3-L1, or phases A, B, and C will provide satisfactory performance. In any case, the power supplied to terminals 3 and P must be from the same phase as the power to terminals E and C, except that a DC signal in the range of 5 to 125VDC (24 to 96 volts for Model E or later) may be supplied to terminals 3 and P for remote control, provided one side of the DC voltage source is grounded to the same reference point as terminal C. Be sure to place the control wires in such a position as not to interfere with the power conductor terminals.

**CONTROL CIRCUIT CHECK**

Since an Advantage motor controller can be controlled with an AC signal of 24 to 120 volts at terminals 3 and P, a high impedance fault in the control circuit that bypasses the STOP or START pushbuttons so as to supply voltage in this range can cause controller malfunction, i.e., the fault causes the controller to turn on or the fault nullifies the STOP button. Check pushbutton stations for liquid buildup and the leads to 3 and P for voltage when none should be present.

TABLE IX - AUXILIARY CONTACT RATINGS		
Voltage	Make	Break
NEMA A600		
120-600VAC	7200VA	720VA
28 - 120VAC	60A	6A
NEMA Q300		
28-300VDC	69VA	69VA

TABLE X - RENEWAL PARTS	
Description	Part Number
Replacement Contacts, Size 5*	WCK53
Replacement Contacts, Size 6*	WCK63
Replacement Coil, 110-120V	1A96712G01
Replacement Circuit Board	See Table XI
DIP Switch Windows (10/pkg)	WDIPSW10
* These kits include contacts, screws, and crossbar assembly with armature attached.	

TABLE XI Replacement Circuit Board Catalog Designation	
Each catalog designation consists of six or more characters:	
Example:	W CB C 5 F Y4 (models A thru D)
	W CB C 5E F Y4 (model E only)
	W+ CB C 5 F Y4 (models P and later)
<b>Position:</b>	<b>I II III IV V VI</b>
Note that Model P and later circuit boards are not mechanically compatible with earlier models.	
Position:	
I =	Type <sup>1</sup> Designation W = Advantage Model <sup>2</sup> E or earlier W+ = Advantage+ Model P or later K= KW Rated Advantage Model E or earlier K+= KW Rated Advantage+ Model P or later
Note 1: The Type Designation can be determined by the 1st character of the Catalog Number listed on the nameplate label on the front of the device (i.e. W, W+, K, or K+).	
Note 2: The Model Designation can be determined by the 1st character of the Model listed on the nameplate label on the front of the device (i.e. A, B, C, D, E, or P).	
II =	Category CB = replacement circuit board
III =	Function C = contactor O = overload relay S = starter
IV =	Size 5 = size 5 G = size 5 definite purpose (360 amp) 6 = size 6 H = size 6 definite purpose (760 amp) 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

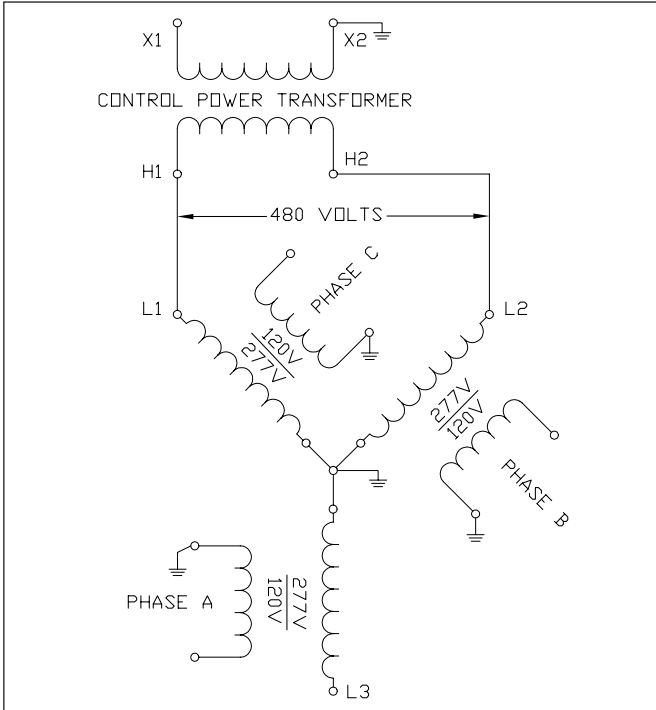


Fig. 13 Phase Relationships



## 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**

### 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.

### To Inspect Contacts

Refer to Figure 14. Loosen the four #10-32 captive arc box cover screws, Item G, accessible through holes in the nameplate and remove the arc box cover, Item H. Be prepared to control the loose crossbar assembly, Item B. Remove the crossbar assembly, Item B, containing the movable contacts. Stationary contacts, Item C, and movable contacts, Item D, are visible. The silver cadmium oxide contacts need **NO** dressing or lubricant throughout their life.

**Important** - Replace all contacts and springs as a group to avoid misalignment.

### To Replace Contacts

With the cross bar assembly, Item B, removed, remove the two stationary contacts, Item C, per pole. Discard all old parts, including the magnet armature attached to the old crossbar. Reverse the procedure to reassemble, tightening the new stationary contact screws, Item I, that hold the new stationary contacts in place to a torque of 75-95 lb-in. Replace the crossbar assembly, Item B, and arc box cover. Tighten the arc box cover screws, Item G, to 15-20 lb-in.

### To Replace the Coil

Refer to Figure 14. Remove the eight self-tapping screws, Item F, that match the back plate, Item J. Note the molded connector, Item E, containing the two coil leads attached to a plug on the circuit board. With a small screwdriver, lift the latch that holds this connector and slide it off the plug. Loosen the four #10-32 captive arc box cover screws, Item G. Remove the arc box cover, Item H, and crossbar assembly, Item B. Use a 1/4" hexagonal Allen wrench to remove the cap screws, Item K, that secure the magnet assembly, Item M. Remove the magnet assembly, Item M, the coil, Item A, and return spring, Item L, from the rear of the controller. Reassemble with the new coil positioned so that the long projections on the coil bobbin engage the magnet. Position the return spring, Item L, between the circular recess in the under-side of the arc box and the circular recess in the top of the coil bobbin. Tighten the two cap screws, Item K, to 100-135 lb-in.

### Magnet Armature Assembly

Self-alignment and permanent air gap features of the magnet make replacement unnecessary. Mating pole face surface should be kept clean.

**Arc box cover must be in place when the contactor interrupts a circuit.**

Attach the coil lead connector, Item E, to its plug. Replace the crossbar assembly, Item B, and arc box cover, Item H. Tighten the arc box cover screws, Item G, to 15-20 lb-in. Replace the back plate, Item J, and tighten the eight back plate retaining screws, Item F, to 7-10 lb-in.

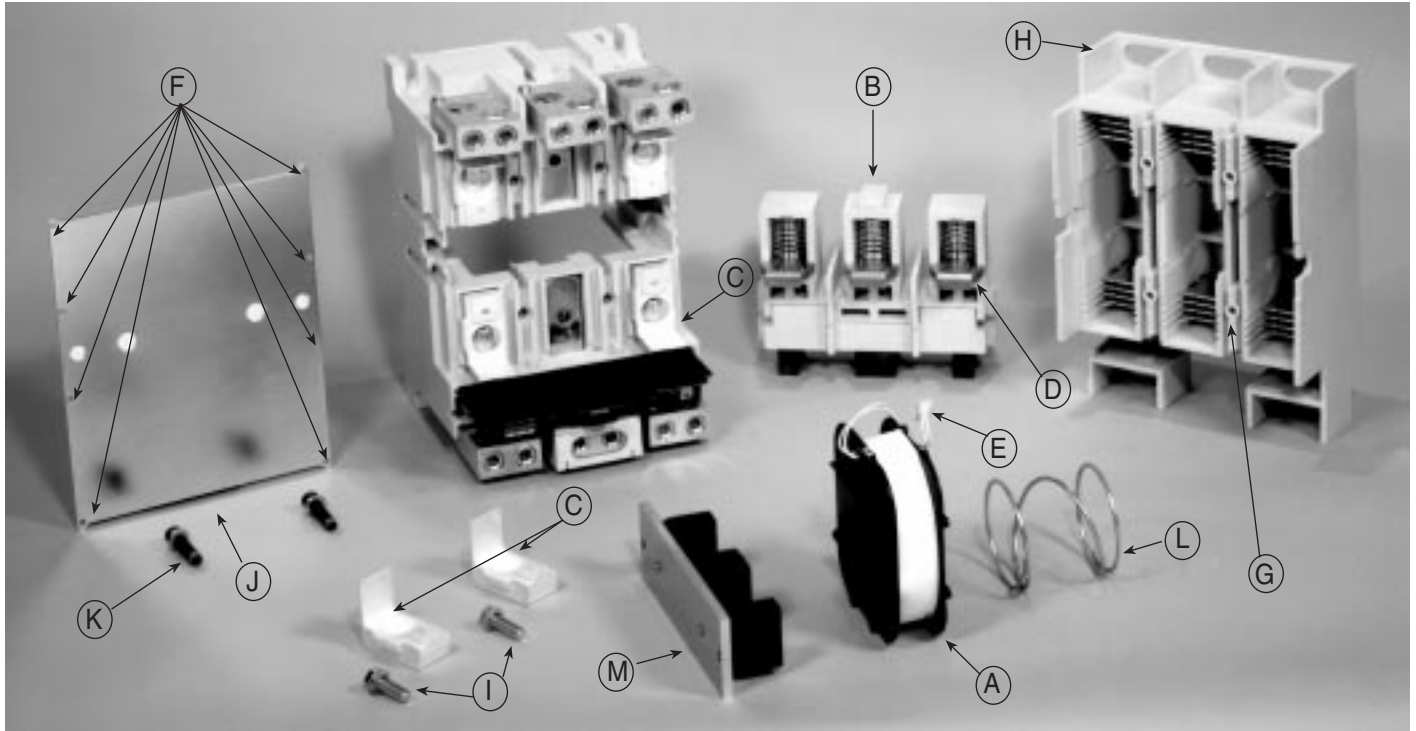


Fig. 14 Size 5 W200 Contactor (Exploded View)

**CUTLER-HAMMER**  
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