



## Instructions for Advantage Control Modules Used with Full Voltage Reversing Advantage Motor Starters & Contactors



Fig. 1 Type WPBR3 ACM

### ADVANTAGE CONTROL MODULES

The three full voltage reversing (FV-R) Advantage Control Modules (ACM's) listed in Table I are designed to be connected to Advantage reversing motor controllers and replace discrete pushbuttons, indicating lights, and external resets.

TABLE I - ADVANTAGE CONTROL MODULES		
Catalog Number	ACM Type *	Operators Included
WPBR1	Status Only	Reset Only
WPBR2	Forward/Reverse/Stop	3PBs + Reset
WPBR3	Forward/Reverse/Stop with Hand/Off/Auto	3PBs + Reset + Selector Switch

\* All include five LED's to indicate status

Each of the ACM's has Run Fwd, Run Rev, Off, Overload Alarm, and Trip status indicators in the form of light emitting diodes (LED's) as follows:

LED	Color	Starter Status
Run Fwd	Red (steady)	Forward contactor/starter is closed
	Red (blinking)	In transition from reverse to forward
	Blank	Forward contactor/starter is open
Run Rev	Red (steady)	Reverse contactor/starter is closed
	Red (blinking)	In transition from forward to reverse
	Blank	Reverse contactor/starter is open
Off	Green (steady)	Both forward and reverse contactors/starters are open
	Green (blinking)	Both contactor/starters are open; the mandatory off-time timer is timing in response to the opposite direction pushbutton
	Blank	One contactor/starter is closed
Overload Alarm	Red (blinking)	Thermal Overload Alarm Condition
Trip	Red	Tripped due to Ground Fault, Phase Loss, or Phase Imbalance
OL Trip*	Red	Overload Trip

\* Both the Overload Alarm and Trip LED's will be on when an Overload Trip condition is present.

The operation of all front panel LED's can be checked at any time by pressing the RESET membrane pushbutton. All LED's will remain lit as long as the RESET button is pressed.

The primary function of the reset membrane pushbutton is to reset trip conditions (overload, phase, or ground).

### DEFINITIONS

**IMPACC** - The Cutler-Hammer communications system which includes computer interface cards, WPONI modules, INCOM network, Advantage motor controllers, twisted wire, IQ products, etc.

**INCOM** - The network that is part of the IMPACC system

**ADVANTAGE MOTOR CONTROLLERS** - Advantage contactors and starters

**DEFINITIONS, Cont'd**

**MODE** - Method of control, e.g. hand (manual) or automatic, or status (ON, OFF)

**ACM** - Advantage Control Module

**FV-R** - Full Voltage Reversing

**INSTALLATION**

This device 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.

Use Greenlee punch and die set, Greenlee #50600710, or utility tools to create the 2.25 x 3.50 inch opening in sheet metal ranging from .060 to .090 inch in thickness. The mounting holes shown in Figure 2 are not needed for Type 1 enclosures where the snap-in feature provided is sufficient for mounting. For Type 12 enclosures, drill the two .180" diameter holes and use two #8 screw/washer/nut combinations to compress the gasket provided.

Determine the appropriate length of interconnect cables needed to connect the ACM to the Advantage motor controllers (starters or contactors). See Table II. Insert the straight end of the Forward starter/contactor interconnect cable into the port labeled ADV-1 on the back of the ACM. Insert the straight end of the Reverse starter/contactor interconnect cable into the port labeled ADV-4 on the back of the ACM. Be sure to line up the blank position in the cable connector with the missing pin on the ACM internal connector. Take the right angle end of each interconnect cable and insert it into the front 5 pins in the device cable connector receptacle on the side of the appropriate Advantage motor controller. Be sure to line up the blank position in the cable connector with the missing pin in the device connector receptacle. Expect the shock-mounted printed circuit board inside the device to give under pressure of insertion. If remote inputs are to be used, wire the units per the provided figures. If an Advantage communications module (WPONI) is to be used, connect the WPONI cable to the open connection on the back of the ACM labeled "WPONI/METERING UNIT". See Figure 3.

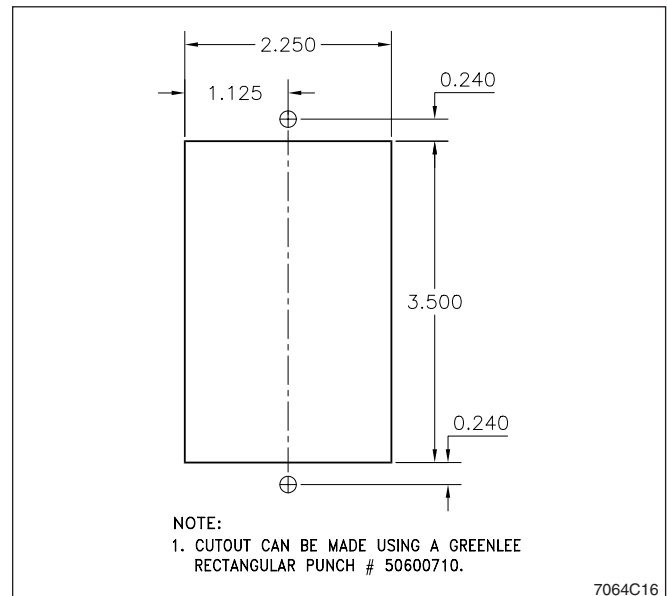


Fig. 2 Panel Cutout Dimensions (dimensions in inches)

**TABLE II - INTERCONNECT CABLES**

Catalog Number	Description
WACM1	1 Foot Interconnect Cable
WACM3	3 Foot Interconnect Cable
WACM6	6 Foot Interconnect Cable
WACM10	10 Foot Interconnect Cable

**CAUTION**

**REMOVE POWER FROM (DEENERGIZE) THE DEVICE TO WHICH THE ACM IS BEING ATTACHED OR WIRED, OR DAMAGE WILL RESULT.**

**DO NOT CONNECT ANY EXTERNAL 120VAC SOURCE TO THE REMOTE INPUT TERMINAL LABELED "VAC OUT" ON THE BACK OF AN ACM. SEE FIGURE 3. ALSO, DO NOT CONNECT ANY EXTERNAL LOADS (PILOT LIGHTS, RELAY, ETC.) TO THE TERMINAL LABELED "VAC OUT".**

**THIS IS A TERMINAL TO BE USED ONLY FOR THE WIRING OF THE REMOTE CONTROL DEVICES PER THE CONNECTION DIAGRAMS.**

**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.**

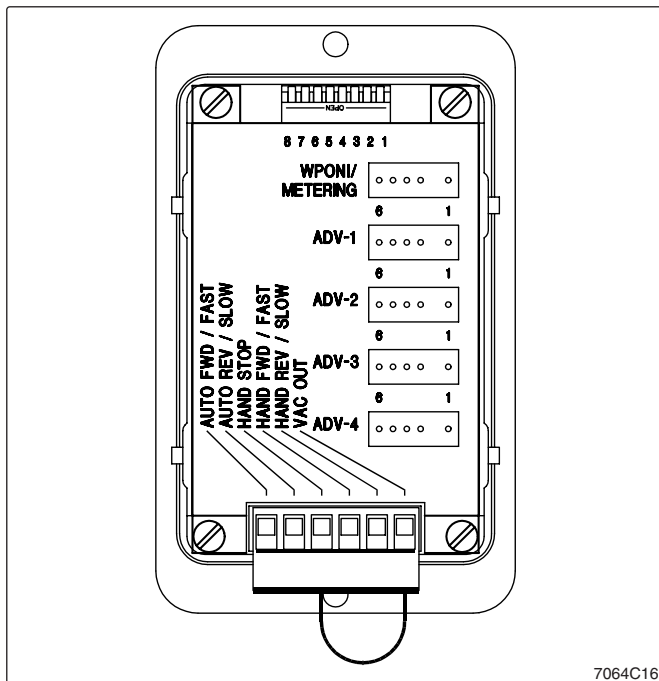


Fig. 3 Rear View of an ACM

Each full voltage reversing ACM is designed to be used with two starters connected to the ADV-1 and ADV-4 ports on the rear of the unit. See Figure 3. The forward starter must be connected to the port labeled ADV-1 and the reverse starter to the port labeled ADV-4. When using a reversing ACM with two starters, a separate overload relay is not needed. A reversing ACM transfers the overload protection information from one starter to the other.

A reversing ACM can be used with two contactors in place of starters. The drawbacks to this setup are:

1. A separate form of overload protection must be provided for the motor.
2. A reversing ACM will not display trip indication since contactors do not trip.

### ACM TYPE WPBR1

The Type WPBR1 ACM provides status only. It has no front panel control capability other than reset. See Figure 4. This ACM can only be used to monitor the operation status of the Advantage motor controller from the front panel of the unit. In order to control the Advantage motor controller, remote FORWARD/REVERSE/STOP pushbuttons must be used and the remote input terminals on the rear of the ACM must be wired according to Figure 6. Remove the jumper installed between HAND STOP and VAC OUT. See Figure 3. The motor controller cannot be controlled over the INCOM network, but can be monitored as long as an ACM is connected to an Advantage motor



Fig. 4 Type WPBR1

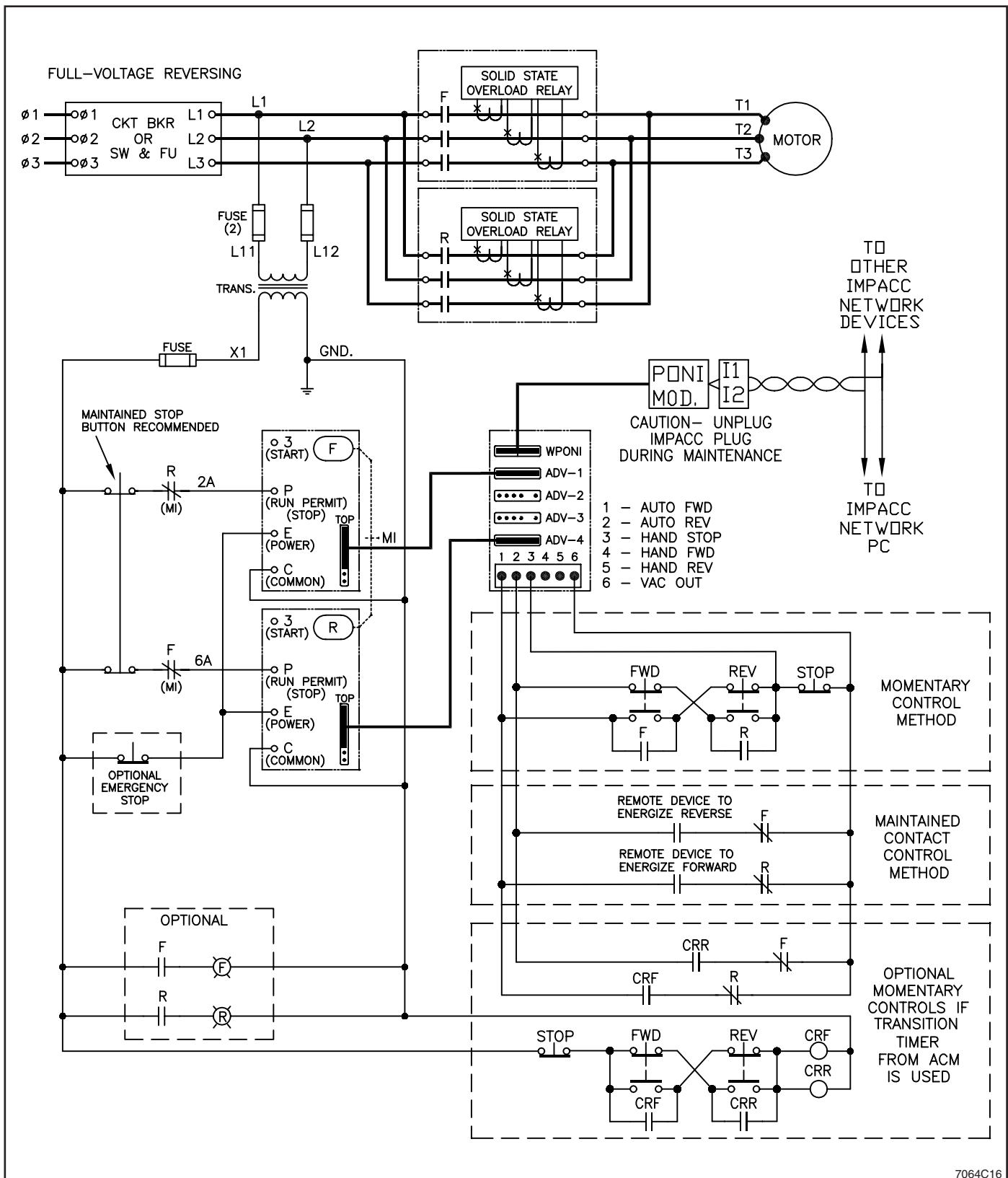


Fig. 5 Type WPBR2

controller from the 3PEC terminals. The 3PEC terminals can only be used to stop the starter.

### ACM TYPE WPBR2

The Type WPBR2 ACM can be used to monitor the Advantage motor controller operational status and control the starter (starting and stopping) from the front panel FORWARD (FWD)/REVERSE (REV)/STOP membrane pushbuttons. See Figure 5. Control of the starter or contactor can also be implemented via the remote input terminals on the back of the ACM. This type ACM cannot be controlled with the IMPACC system. If the remote inputs are not connected per Figure 7, a jumper must be connected between VAC OUT and HAND STOP in order to control the starter from the front panel FWD/REV/STOP membrane pushbuttons. See Figure 5. This jumper is installed at the factory. As long as an ACM is connected to an Advantage motor controller, the user cannot start the Advantage motor controller from the 3PEC terminals. The 3PEC terminals can only be used to stop the starter.



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Fig. 6 Connection Diagram for Type WPBR1

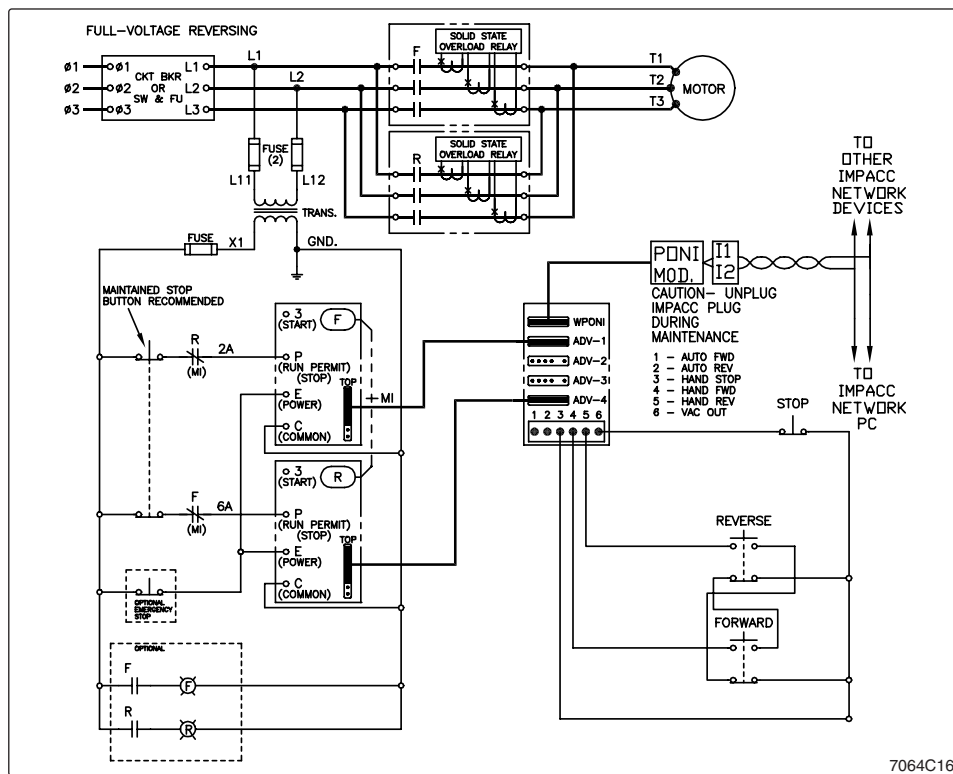


Fig. 7 Type WPBR2 Connection Diagram



Fig. 8 Type WPBR3

### ACM TYPE WPBR3

The Type WPBR3 ACM (Figure 8) can be used to monitor the operational status of the Advantage motor controller and provide full control (HAND, AUTO, and IMPACC) of the controller. The FWD/REV/STOP-HAND/OFF/AUTO is the only version of the ACM where both local and remote pushbuttons and automatic (IMPACC) control can be implemented. In order to control the Advantage starter with the IMPACC system, the ACM must first be put in the AUTO mode. If the ACM is in either the OFF or HAND

mode, control over the INCOM network will not be allowed. Monitoring is available in all modes. In order to control the unit with either the front panel FWD/REV/STOP membrane pushbuttons or the remote pushbuttons, the ACM must be first placed in the HAND mode. In order to control the unit with remote FWD or remote REV devices wired to the terminals 1 and 2, the ACM must first be placed in the AUTO mode. See Figure 9 for wiring these “auto” remote control devices.

If the remote pushbuttons are not connected per Figure 9, a jumper must be connected between terminals VAC OUT and HAND STOP (see Figure 3) in order to control the starter from the front panel FWD/REV/STOP membrane pushbuttons or with the IMPACC system. As long as an ACM is connected to an Advantage motor controller, the user cannot start the Advantage motor controller from the 3PEC terminals. The 3PEC terminals can only be used to stop the starter.

The “automatic” (AUTO) remote control referred to in this section may be any contact-making device. It need not be automatic in its operation. The word AUTO is used merely to distinguish a control remote from the ACM while maintaining conventional selector switch terminology.

If AUTO mode is selected, control can be implemented by either of the remote AUTO inputs (remote control devices) or the IMPACC system.

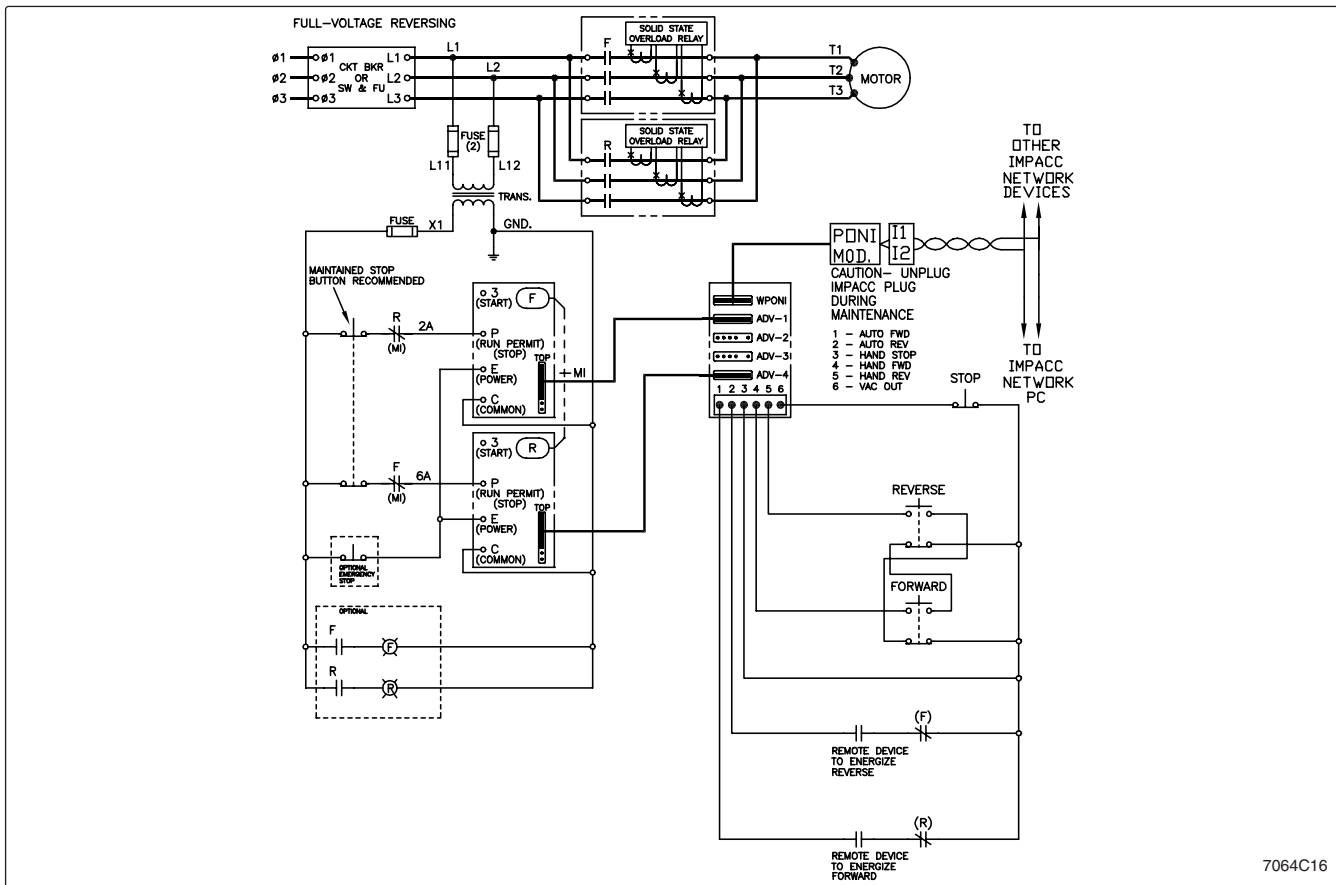


Fig. 9 Type WPBR3 Connection Diagram

Note that the LED's behind the HAND, OFF, and AUTO pushbuttons light to show the mode selected when the type WPBR3 ACM is connected to a reversing motor controller and control power is applied.

### EMERGENCY STOP

The optional EMERGENCY STOP pushbutton shown in Figures 6, 7, and 9 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.



### CAUTION

**PRESSING THE FRONT PANEL KEY SEQUENCE OFF-AUTO-OFF OR OFF-HAND-OFF FASTER THAN 1.5 SECONDS BETWEEN KEY PRESSES MAY RESULT IN THE ACM ENTERING AN INCORRECT MODE ON POWER CYCLE.**

### OPERATION

All three versions of the FV-R ACM's have an eight-position DIP switch located on the back side. See Figures 3 and 10. Three DIP switch positions, 5, 6, and 8, are not used in FV-R ACM's. The remaining positions are used to control the method of changing direction (forward to reverse or reverse to forward) and selecting the minimum time permitted between the removal of power to the motor rotating in one direction and the application of power to the motor in the opposite direction.



This Mandatory Off-Time Interval can be set for zero to thirty seconds by positions 1 through 4 of the DIP switch. See Table III. Set the Mandatory Off-Time Interval at the maximum consistent with the equipment being driven, since the application of power to drive the motor in one direction while it is still rotating in the opposite direction (plugging) introduces spikes of transient voltage into the power system and produces a countertorque on the driven shaft. This countertorque can twist or break the shaft, depending upon the shaft strength, load inertia, rotation speed, and how much counter-torque is produced.

Use DIP switch position 7 to control the method of changing direction. When position 7 is closed (switch handle moved toward position number), the direction of motor rotation cannot be changed without operating the STOP pushbutton. When position 7 is open (switch handle moved away from the position number), motor direction of rotation can be changed by plugging, i.e., applying power to drive the motor in the opposite direction without first stopping the motor. The Mandatory Off-Time Interval applies with switch 7 in either the open or closed position. Note that without some form of braking, the motor may still be turning in one direction when power is applied to drive it in the opposite direction regardless of the Mandatory Off-Time Interval. When the thirty second off-time is not sufficient to prevent plugging, add a zero speed switch to the control circuit, wired for autoplugging.

When the opposite direction pushbutton has been pushed after the motor has been running and the STOP button is pushed, the green LED marked OFF will blink to show that the Mandatory Off-Time timer is timing. When a Mandatory Stop is not required and the opposite direction pushbutton has been pushed before the timing period has expired, a red LED marked RUN FWD or RUN REV will blink to show a new direction chosen. See Table IV.

### OPERATIONAL CHECK

When an ACM is first powered up, the top rows of LED's will blink while the ACM is establishing communications with the Advantage motor controller. If, after approximately two seconds the LED's do not stop blinking, there is a communication problem between the ACM and the Advantage motor controller. After communication is established, the ACM will then display the status of the Advantage motor controller. **Also, the ACM will default to the mode of operation it was in before power was removed (HAND, OFF, or AUTO).** In order to tell which mode of operation the ACM is in, observe the LED's in the upper left-hand corners of the HAND/OFF/AUTO membrane pushbuttons. The ACM can only be in one mode at a time.

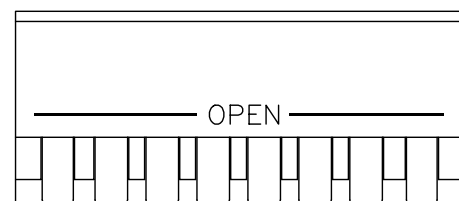
**TABLE III - MANDATORY OFF-TIME SETTINGS**

Select the minimum off-time between changes in motor direction of rotation.

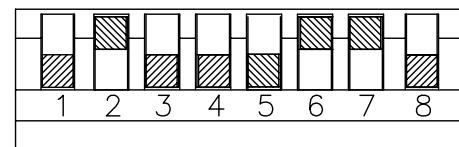
Minimum Off-Time (Seconds)	DIP Switch Position			
	#1	#2	#3	#4
0	O	O	O	O
2	O	O	O	X
4	O	O	X	O
6	O	O	X	X
8	O	X	O	O
10	O	X	O	X
12	O	X	X	O
14	O	X	X	X
16	X	O	O	O
18	X	O	O	X
20	X	O	X	O
22	X	O	X	X
24	X	X	O	O
26	X	X	O	X
28	X	X	X	O
30	X	X	X	X

X = Closed

O = Open



WHEN SWITCH HANDLE IS MOVED TOWARDS POSITION NUMBER IT IS CLOSED  
OPPOSITE DIRECTION IS OPEN



EXAMPLE:  
SWITCH #1 CLOSED  
SWITCH #2 OPEN  
SWITCH #3 CLOSED  
SWITCH #4 CLOSED  
SWITCH #5 NOT USED  
SWITCH #6 NOT USED  
SWITCH #7 OPEN  
SWITCH #8 NOT USED

MANDATORY OFF TIME  
SET TO 22 SECONDS

MANDATORY STOP  
IS NOT REQUIRED

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Fig. 10 Example of DIP Switch Setting

**TROUBLESHOOTING HINTS****Problem:**

Top two rows of LED's continue to alternate blinking after the unit is first powered up.

**Cause:**

- Interconnect cable plugged into wrong port on rear of ACM.
- Bad interconnect cable.
- Bad ACM or Advantage motor controller.

**Solution:**

- Move interconnect cable to ports shown on the related connection diagram.
- Replace interconnect cable.
- Replace defective component.

**Problem:**

Cannot start the Advantage motor controller from front panel membrane pushbuttons or remote pushbuttons.

**Cause:**

- There are no jumpers between VAC OUT and HAND STOP.
- Terminal P is not energized on the Advantage motor controller.
- If remote inputs are used, they are not wired per Figures 6, 7, or 9.

**Solution:**

- Add a jumper between VAC OUT and HAND STOP.
- Energize the P terminal on the Advantage motor controller.
- Correct the remote input wiring per Figures 6, 7, or 9, depending on which version of the ACM is being used.

**ACM SPECIFICATIONS****Input Supply Requirements**

120VAC (supplied by the Advantage motor controller)

Maximum Distance from Advantage Motor Controller  
10 Feet

Operating Frequency  
50 or 60 HZ

Operating Temperature  
0 to 40°C

Storage Temperature  
-20 to 85°C

Humidity  
0 to 95% (non-condensing)

Remote Input Wire Size  
#18 - #14 AWG

Maximum Distance Between Remote  
Pushbuttons and ACM  
200 Feet

Terminal Input Control Voltages  
ON State: >31.6VAC  
OFF State: <10.7VAC

Cutout Dimensions  
2-1/4 x 3-1/2 inches (see Figure 2)  
The cutout can be made using a Greenlee  
rectangular punch #50600710

Enclosure Type  
1 or 12 when properly installed

**TABLE IV - TRANSITION PERIOD EXAMPLES**

No. 7 DIP Switch	Operation Restriction	Situation	Controller Status	LED Indication
Open	STOP button not required to change direction	Running FWD when REV pushbutton depressed	FWD contactor opens and timing period begins; REV contactor closes after timing period	RUN REV LED (red) blinks until selected off time has expired
Closed	STOP button required to change direction	Running FWD when REV pushbutton depressed	FWD contactor remains closed; motor continues to run	None
Closed	STOP button required to change direction	Running FWD when both STOP and REV pushbuttons depressed in sequence	FWD contactor opens and timing period begins; REV contactor does not close until REV pushbutton is depressed after off time has expired	OFF LED (green) blinks until selected off time has expired
Open	STOP button required to change direction	Running FWD when both STOP and REV pushbuttons depressed in sequence	FWD contactor opens and timing period begins; REV contactor closed after timing period	RUN LED (red) blinks until selected off time has expired

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