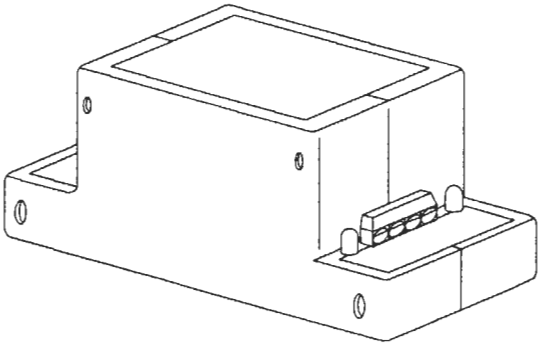
Solidyne

BI-DIRECTIONAL (tri-state) MOTOR CONTROL MODULE



#M930

THE M930 BI-DIRECTIONAL MOTOR CONTROL MODULE IS DESIGNED TO CONTROL VARIOUS MIXING VALVES, DAMPERS, AND ACTUATORS FOR HVAC AND OTHER PROCESS VARIABLE CONTROL SYSTEMS. THE M930 INTERFACES ANY 24V BI-DIRECTIONAL ACTUATOR WITH THE Clipper™ OR ClipperNet™ UTILIZING A VARIABLE DUTY CYCLE OUTPUT. THE M930 CAN ALSO BE CONTROLLED BY A "SLOW" PWM OUTPUT AVAILIBLE IN THE XL9600, ClipperLAN/+ AND ClipperLAN/XL.

- Inexpensive and effective method of controlling various modulated and proportional valves, dampers
- Small DIN rail mountable package
- LED indication of clockwise and counterclockwise motor rotation
- Can be mounted up to 3000 feet away from the Controller
- Can be easily adjusted by Controller setpoint to prevent system overshoot and hunting

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GENERAL

The M930 bi-directional motor control module is designed to convert the Variable Duty Cycle output signal available from a Clipper or the "SLOW" PWM signal available from the LAN/+, LAN/XL, and XL9600 into clockwise and counterclockwise signals for a motor operated damper, valve, mixer, or other motor operated actuator. When combined with other programs, a variety of control strategies are possible for generating different setpoints at different times, such as programming night setback and holiday schedules.

Programming the M930 output via the Clipper is simple and straightforward. First enter sensor values for the high and low limits. Then, entering a one second, two second, and three second ON time Variable Duty Cycle will result in a clockwise, no rotation, and counterclockwise motor rotation respectively.

Programming the M930 via the ClipperLAN/XL or XL9600 uses the Floating or Resettable PWM Setpoints for control. The Clipper LAN/+ utilizes a "Hidden" PWM Setpoint.

The M930 is totally optically isolated for reliable and safe operation, utilizing the most advanced solid state circuitry design. The M930 requires a 24VAC supply which should be readily available from existing controls.

SPECIFICATIONS

ELECTRICAL

SUPPLY: 24VAC +/- 10%

INPUT: 12VDC Variable duty cycle signal
10-15 VDC "SLOW" PWM signal
@ 10mA from controller output

OUTPUT: Two Form "C" relay contacts rated
3 Amps @ 30 VDC, 120 or 240 VAC
1/8 HP @ 120 VAC,
1/4 HP @ 240 VAC

EXPECTED LIFE: Mechanical: 100 million operations minimum
Electrical: 100,000 operations minimum

OPERATING TEMP : 32° F to 120° F

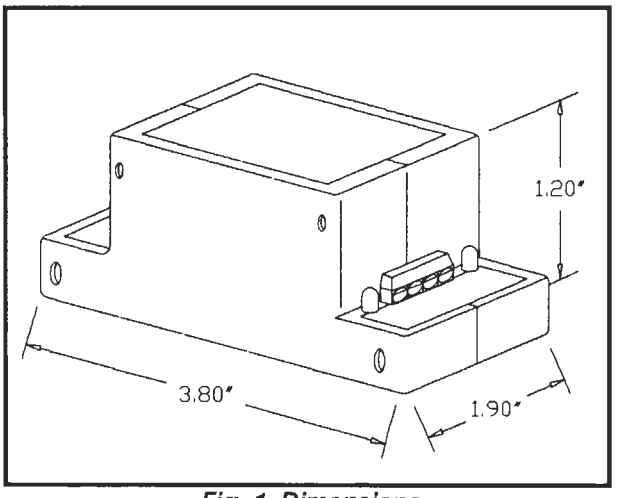

Fig. 1, Dimensions

MECHANICAL

DIMENSIONS: 3.80"L x 1.90"W x 1.20"H (See *Fig. 1*)
BODY: ABS plastic

CONNECTIONS: 4 position terminal strip for supply and and input signals, 6 position terminal strip for relay outputs (See *fig. 2*).

INSTALLATION

CAUTION

BEORE INSTALLING OR REMOVING THE M930 MODULE, DISCONNECT POWER TO PREVENT EQUIPMENT DAMAGE OR PERSONAL INJURY

1. Read installation instructions carefully. Failure to do so may cause equipment damage, unnecessary delays or may result in personal injury.

2. Discharge any static you may have accumulated by touching a good earth ground before touching any internal components.

3. Check the ratings in the specifications and verify that this product will meet the requirements of your application.

4. This product should be installed by a trained and qualified service technician.

5. After the installation is complete, be sure to check the system out for proper operation.

MOUNTING / LOCATION

The M930 is designed to be mounted near the equipment being controlled for ease of wiring, and quickly snaps onto a standard DIN rail. Make sure that the M930 is not exposed to direct outside environment such as rain, direct sunlight, etc. Keep in mind that it is better to keep the wiring from the output of the M930 to the load as short as possible, as the distance between the Solidyne Controller and the M930 can be up to 3000 feet.

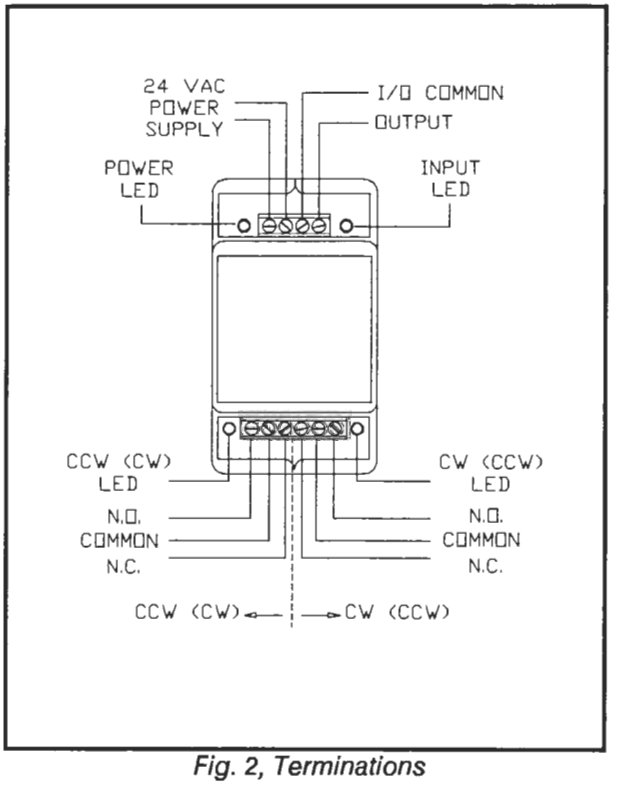

Fig. 2, Terminations

WIRING with ClipperNet™

All wiring must comply with local codes and ordinances. Terminal blocks are provided to connect the M930 to the Solidyne Controller, the supply, and the equipment being controlled.

1. Connect the two signal wires from the M930 to the Clipper. The M930 (-) signal is connected to the I/O COMMON of the Clipper controller, and the M930 (+) signal to any one of the 8 outputs. Be certain to observe the polarity. Note that the wiring from the Clipper does not have to be shielded, and can be up to 3000 feet away from the M930. A twisted pair of 18 AWG wire is recommended for most applications.
2. Wiring to the Clipper controller is low voltage and need not be in conduit unless required by local codes. Figure 4 shows the connection of the M930 to the 8008 controller.
3. There are a total of 4 LED's on the M930 (fig. 2). The LED nearest the 24 VAC supply terminal indicates power to the module. The LED located directly adjacent to the input terminals is for diagnostic purposes, and indicates the presence of a duty cycle signal. The two LED's near the relay output teminals pulse with their CW and CCW relays respectively.

WIRING with XL9600

The M930 has two terminals which must be wired to an STB Transition Block Module in order to properly interface the XL9600 Controller. The STB is a straight through connection from the XL9600 ICS Board's 6 conductor RJ11 terminals to a 6 position terminal block.

The STB connects and allows access to all 6 positions of the ICS Board's individual female RJ11 "J" terminals. Using a STB connected to a "J" terminal with a DO and C(OUT) configuration, the "I/O COM" terminal of the M930 connects to a DO output of the STB. The "OUTPUT" terminal connects to the C(OUT) terminal on the STB (See *fig. 5*). This wiring scheme is opposite to how the M930 wires to Clipper Controllers.

CONTACT PROTECTION

A contact protection kit has been provided to prolong the life of the M930 relay contacts. The kit includes 2 varistors rated at 30 Volts. The varistors should be placed in parallel with the loads connected to the M930, see fig. 3.

The varistors will reduce the kickback voltage applied to the contacts when the circuit of an inductive load, such as a relay coil, solenoid, etc. is opened.

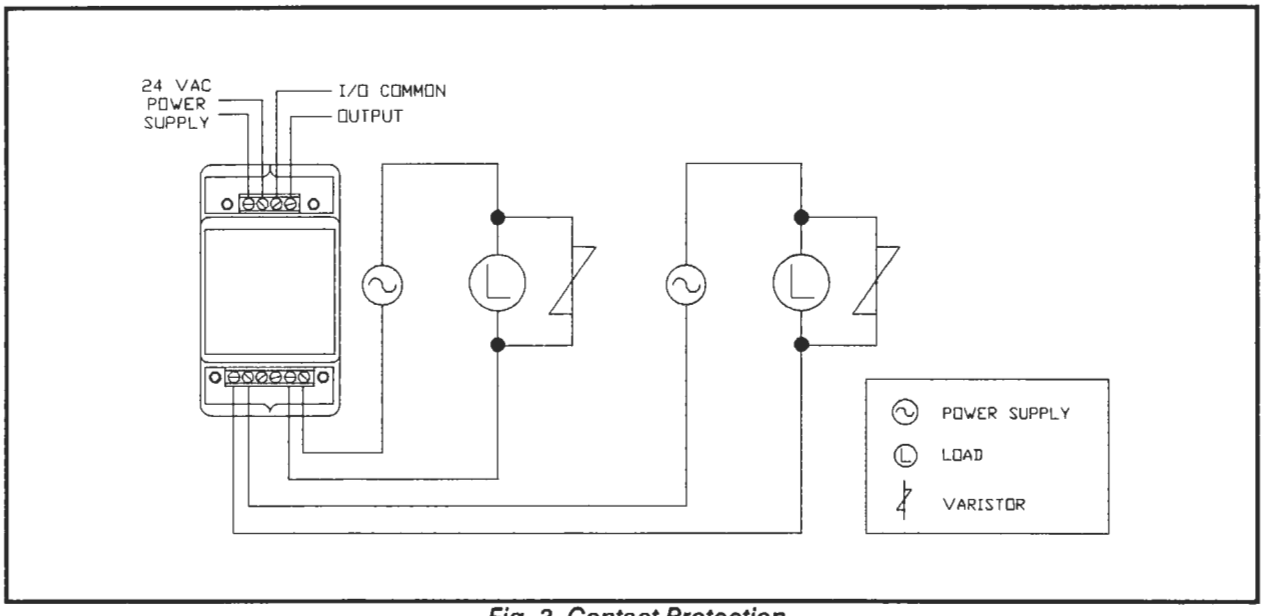

Fig. 3, Contact Protection

OPERATION

The Clipper system uses a standard Variable Parallel Duty Cycle, with seconds response setpoint program. First enter sensor values for the high and low limits. Then entering a one second, two second, and three second ON time Variable Duty Cycle will result in a clockwise, no rotation, and counterclockwise motor rotation respectively.

The M930 operates on pulses coming from the Clipper controller. There are three distinct pulse widths that the M930 will respond to:

A) A *one* second ON and *x* seconds OFF (Will give a clockwise motor rotation for a period of one second by energizing the CW relay).

B) A *two* seconds ON and *y* seconds OFF (No motor rotation, as neither relay will be energized).

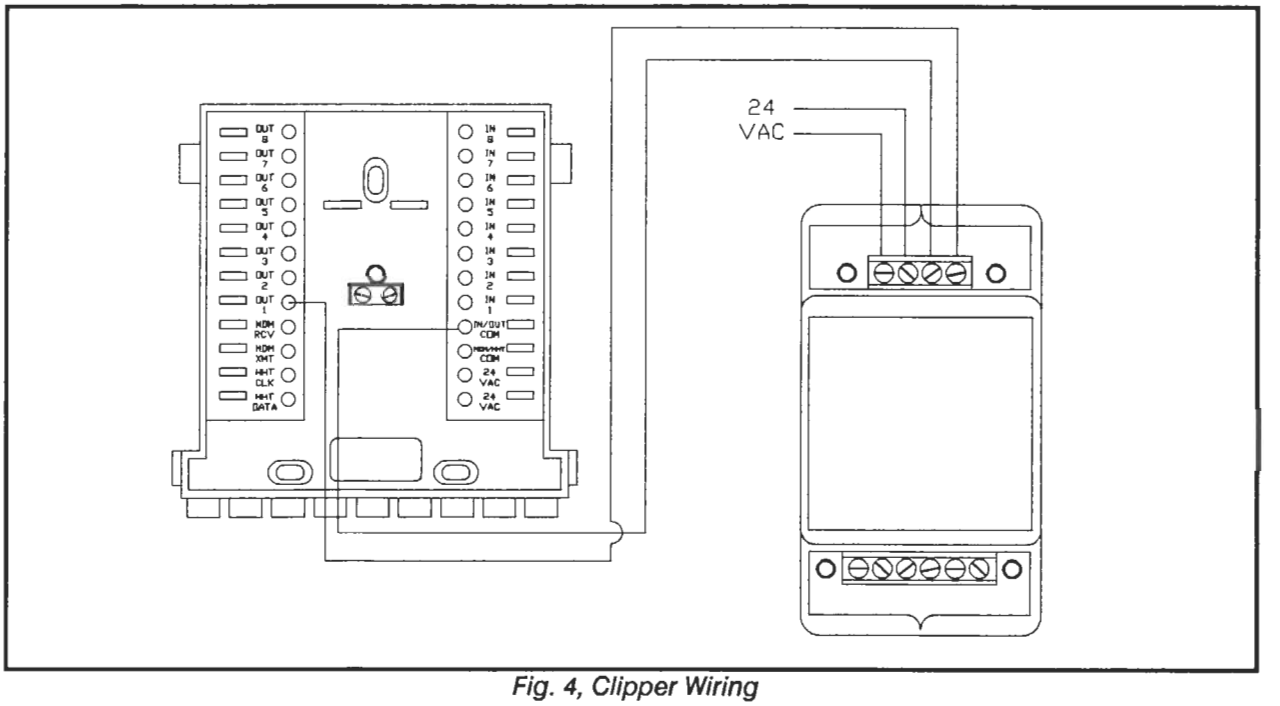

Fig. 4, Clipper Wiring

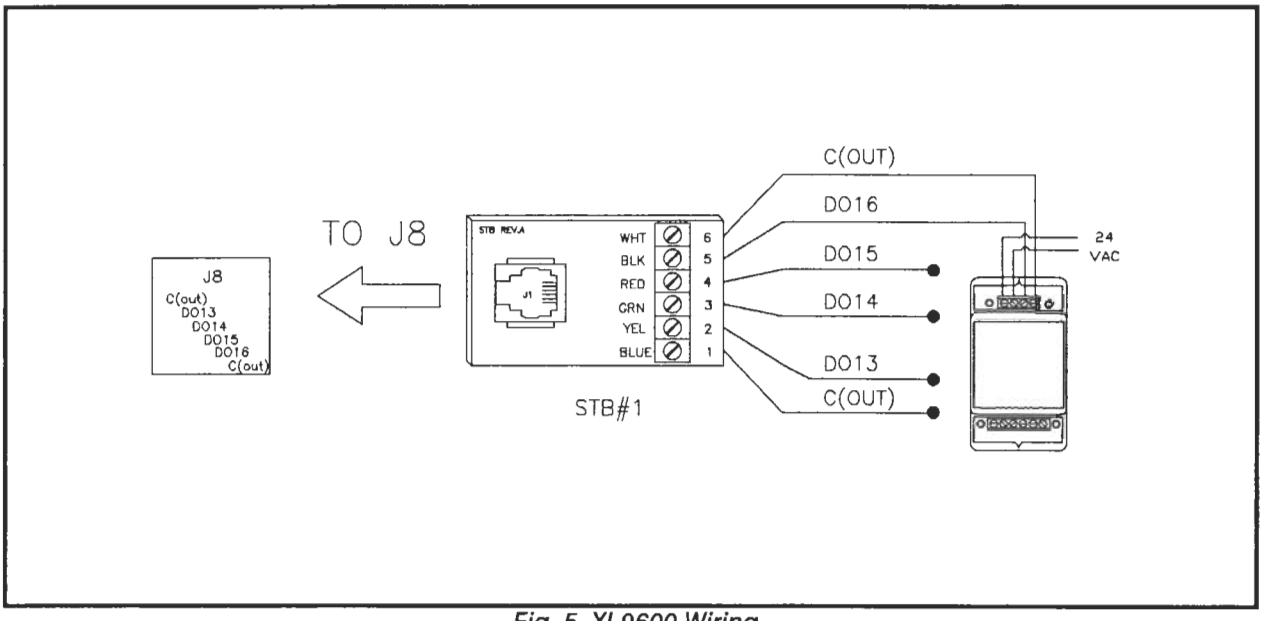

Fig. 5, XL9600 Wiring

C) A *three* seconds ON and *z* seconds OFF (Will give a counterclockwise motor rotation for a period of one second by energizing the CCW relay).

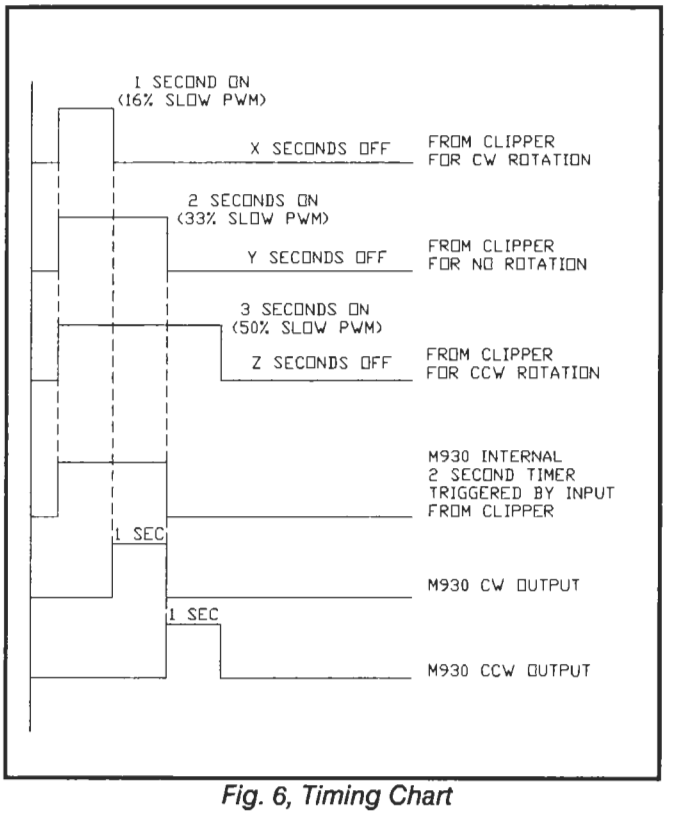

Fig. 6, Timing Chart

The *x*, *y*, and *z* values are variable and can be any number greater than two. There is a two second internal timer in the M930 that is used to determine which pulse width is being received. The incoming pulses from the Clipper start the internal timer of the M930. The M930 then compares its timer to the incoming pulse to produce the CW output, CCW output, or no output. See *figure 6* for the timing diagram with a 1, 2, and 3 second pulse. There are two LEDs by the output terminal strip on the M930 to indicate which output relay is energized.

EXAMPLE: The temperature in a room is to be controlled to stay within a range of 72° to 76° F. Select the Variable Duty Cycle, Parallel, Seconds setpoint program on the Clipper controller.

1. Set the high data for controlling sensor to be 76, where the output will be ON for 1 second, and OFF for 5 seconds.

2. Set the low data to be 72, where the output will be ON for 3 seconds, and OFF for 3 seconds.

Now whenever the temperature is greater than or equal to 76°, the Clipper will send a 1 second ON pulse to the M930 which will cause the damper motor to turn clockwise (closing the damper slightly) for one second every six seconds. When the temperature falls somewhere between 76° and 72° (typically around 74°), the Clipper will send a 2 second ON pulse to the M930 which will cause the damper motor to maintain its present position.

If the temperature falls to or below 72° the Clipper will send a 3 second ON pulse to the M930 which will cause the damper motor to turn counterclockwise (opening the damper slightly) for one second every six seconds. Once the temperature rises back up to between 72° and 76° the Clipper will again send 2 second ON pulses to the M930 which will maintain the present damper position.

NOTE: *If you attach a 5000 ohm multi-turn potentiometer to one of the analog inputs, you can set this potentiometer to simulate a desired analog input reading. By selecting the LOGGED DATA menu and SENSOR READING sub-menu, you can observe the change of analog reading as you turn the potentiometer. When the sensor input reads between the programmed input data values, the relay outputs will change according to the program.*

"SLOW" PWM OPERATION

The ClipperLAN/+, LAN/XL and XL9600 controllers are capable of generating a "SLOW" PWM signal to interface the M930. The "SLOW" PWM signal is a continuous pulse with a period of 6 seconds. While the period of the pulse remains constant at 6 seconds, the width of the pulse may be modulated by PWM setpoints to simulate 1 second, 2 second, and 3 second control signals. These control signals will correspond to CLOCKWISE (1 second), no rotation (2 second) and COUNTER CLOCKWISE (3 second). For a 1 second control signal, the PWM cycle rate is set to 16% (16% = 1/6 of 6 seconds). Two second and three second signals are attained by 33% and 50% PWM duty cycle rates. These cycle rates can be used to aid in programming the PWM setpoints:

16% = CLOCKWISE
33% = NO ROTATION
50% = COUNTERCLOCKWISE

NOTE: *These values are valid with the "LOAD POLARITY" as "ENERGIZED = ON" for the "SLOW" PWM output selected.*

CHECK OUT PROCEDURE

1) Apply power to the Clipper controller. The M930 module should be wired to the Clipper baseplate. The output of the Clipper being used for the M930 should be selected for a Variable Parallel Duty Cycle program in Seconds, and the should be programmed as outlined earlier.

2) Verify the 24 VAC supply to the M930 module.

3) Verify that the LED located next to the input terminal on the M930 is flashing.

4) By changing the analog input value (by shorting or disconnecting a sensor), verify that the relay outputs change based on the program you have entered.

CHECKOUT for "SLOW" PWM OUTPUT

1. Apply power to the controller. The output should be selected under the Miscellaneous Menu as a "SLOW" PWM OUTPUT and the LOAD POLARITY under the same menu should be selected to be ON = ENERGIZED. Refer to the Controllers' Operations manual for details. Do *not* enter a PWM setpoint at this point.

2. Verify the 24 VAC supply to the M930 is present. The loads connected to the M930 *should not* be powered at this time.

3. Verify that the PWM LED on the M930 is flashing at approximately 4 Hz.

4. If the Controller and M930 are mounted some distance from each other, an assistant would be helpful for this procedure.

Under the EXAMINE LOGGED DATA menu of the Controller, select the PWM OUTPUT DUTY CYCLE VALUES menu. Select the output to which the M930 is connected. This menu will allow you to see the PWM value of that output, as well as "manually enter" a known test value (See Controller Operations Manual for details). The display should now show 50%, which if no program was entered, would be the default value.

NOTE: *If a program was entered, this step would not be possible as the program would take control of the output and not allow manually entered values to set the duty cycle rate.*

With the PWM output at 50%, the CCW relay should be turning ON and OFF. Enter a test PWM value into the Controller and observe the M930 operation. For example, entering a value of 16% would cause the CW relay to turn ON and OFF, a value of 33% would cause neither relay to activate (refer to *figure 6* for values and load status).

IMPORTANT NOTE: *PWM outputs require 24 hour control for PWM modules to operate properly. Typically a daytime and night setback control strategy will cover the 24 hour period. With only a daytime control strategy implemented, the PWM signal rate will be locked onto its last value when the program became INACTIVE. This may lock the PWM module into an undesirable state until daytime control becomes ACTIVE.*

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ORDERING KEY

Refer to your authorized SOLIDYNE Wholesaler or Blue Sheet price list for complete ordering information.

If you have additional questions or need further information related to this product or any other SOLIDYNE products, call (800) 648-3980 for order information, or call (708) 394-3333 for technical help and support.

1. Order Part # M930.

2. For use with the Solidyne #8008 series ClipperNet controllers.

3. For use with the Solidyne XL9600 Controller (Part #STB required).