

# INSTALLATION INSTRUCTIONS FOR SYMCOM'S MODEL 77C-LR ELECTRONIC OVERLOAD RELAY

**BE SURE POWER IS DISCONNECTED PRIOR TO INSTALLATION!!  
FOLLOW NATIONAL, STATE AND LOCAL CODES!  
READ THESE INSTRUCTIONS ENTIRELY BEFORE INSTALLATION.**

## **DANGER!**



**HAZARDOUS VOLTAGES MAY BE PRESENT DURING INSTALLATION.**

**Electrical shock can cause death or serious injury.**

**Installation should be done by qualified personnel following all national, state and local electrical codes.**



## **CONNECTIONS**

1. Using the four corner tabs OR the DIN rail mounting bracket, mount the Model 77C-LR directly above or below the magnetic contactor. To use the DIN rail bracket, hook the top clip first, then apply downward pressure until the lower clip "clicks" onto the rail, then stop applying downward pressure.
2. Insert the motor conductors through the round holes marked "A" and "B." Terminate the conductors at the line or load side of the magnetic contactor. **Note: For motors with full load amps less than 2.1 Amps**, loop the conductors through the hole marked "B" according to Table No. 1 below. The rectangular hole behind the hole marked "B" is provided for wire looping. (see Figure No. 1).
3. Connect the single-phase power from the line side of the contactor to "L1" and "L2." First insert a #12 - #18 AWG wire into the top of the terminal marked "L1" and tighten the screw on the front of the overload relay. Then, connect the other end of the wire to the line side of the contactor. Repeat these two steps for "L2." (see Figure No. 1).
4. Connect the output relay to the circuitry to be controlled (see Figure No. 1). To control a motor, connect the normally open contact in series with the magnetic coil of the motor starter as shown. To sound an alarm, connect the normally closed contact in series with the alarm (not shown).

| Full Load Amps | # of Loops<br>(Required on B Phase only) | # of Conductors through B | MULT to Program (CT ratio) |
|----------------|------------------------------------------|---------------------------|----------------------------|
| 1.0-2.0        | 1                                        | 2                         | 2                          |
| 2.1-9.0        | 0                                        | 1                         | 1                          |

**Table No.1: Wiring Configuration Based on Motor Amps**

## **PROGRAMMING**

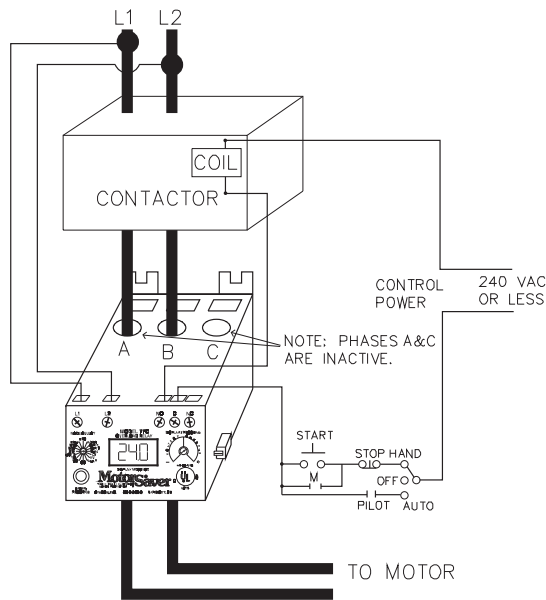
1. Select the feature to program by rotating the "MODE SELECT" switch to the desired position. The "MULT" setting must be programmed before any of the current settings to ensure proper display of actual current setpoints. Therefore, SymCom recommends programming the "LV" setting first, then move clockwise through the positions to complete the process.
2. Push and hold the "RESET / PROGRAM" button.
3. Rotate the "DISPLAY / PROGRAM" adjustment to the desired setting of the feature as shown in the LED display.
4. Release the "RESET/PROGRAM" button. The Model 77C-LR is programmed when the button is released.
5. Continue steps 1-4 until all features are programmed.



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II-77C-LR-B



**Figure No. 1: Typical Wiring Diagram**

### **SUGGESTED SETTINGS**

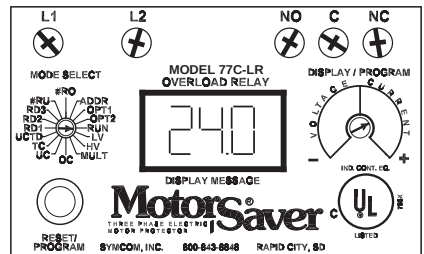
(Consult the Motor Manufacturer for their recommendations.)  
[Don't forget to read the programming examples on page 5.]

**LV/HV-** The recommended settings for "LV" (low voltage) and "HV" (high voltage) depend on many factors such as motor usage, motor size, environmental factors and tolerance of the motor. The motor manufacturer should be consulted for "HV" and "LV" settings. However, the NEMA MG1 standard recommends that "LV" and "HV" be set to no more than  $\pm 10\%$  of the motor's nameplate voltage. The setting can be determined by multiplying the motor's nameplate voltage by the recommended percent over and under voltage. (eg., The motor nameplate voltage is 230 V, set "LV" to  $0.9 \times 230 = 207$ , set "HV" to  $1.10 \times 230 = 253$ ) "LV" can not be set higher than "HV", so "HV" may have to be adjusted higher before the proper "LV" setting can be programmed.

**MULT-** "MULT" is the multiplication factor for determining true current settings and represents the number of conductors passing through the main current windows marked "A" and "B," or current transformer ratio of external CTs. The appropriate number can be determined from Table No. 1 on page 1. "MULT" must be correctly programmed in order to accurately program the current settings.

**OC-** **Represents the motor's maximum service factor amperage.** The "OC" (overcurrent) setting depends on many factors such as motor usage, motor size, environmental factors and tolerance of the motor. The motor manufacturer should be consulted for "OC" settings. However, "OC" is typically between 110% and 125% of full load amperage (FLA).

**UC-** The "UC" (undercurrent) setting is typically set to 80% of full load amperage (FLA). The overload relay with a "UC" setting of 80% of FLA will typically detect a loss of load for many pumps and motors such as a dry well condition for submersible pumps. The "UC" setting may be set to 0.00 to disable undercurrent (loss of load) protection.

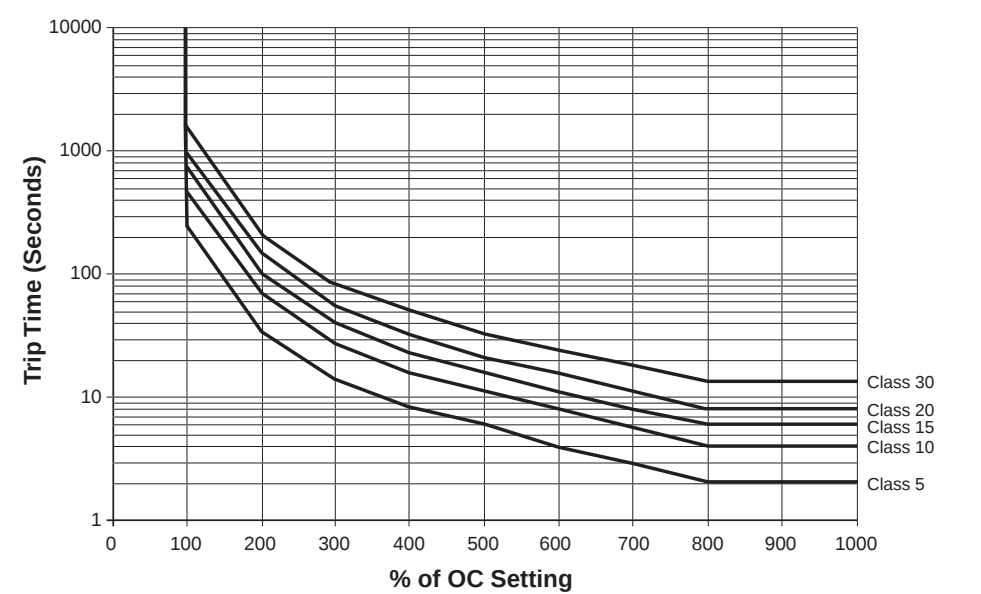


- TC-** "TC" designates the trip class for overload protection. The trip class defines the trip delay when an overload is detected (see Table No. 2). Trip class is determined by the type of motor and application. Your motor manufacturer should be consulted for the proper setting. The following table shows the trip class and a general description of the applications.
- RD1-** "RD1" is the rapid cycle timer. It will engage when the motor is first powered-up or after the motor controls shut down the motor. An "RD1" setting of 20-30 seconds will generally protect the motor from rapid, successive power outages or short cycling caused by the motor controls. A setting of 0 seconds will allow the motor to start immediately after power-up or after a normal shutdown.
- RD2-** "RD2" is the restart delay after the overload relay trips on overload. This delay allows the motor to cool down after experiencing an overcurrent. It is also known as a motor cool down timer. Your motor manufacturer should be contacted to determine this setting. Under normal circumstances, a setting of 5-10 minutes will give the motor enough time to cool down between faults.
- RD3-** "RD3" is the restart delay after an undercurrent. It is also known as a dry well recovery timer and is usually used in submersible pumping applications. The setting of "RD3" depends on the recovery time of the water well and varies widely from application to application.
- #RU-** "#RU" is the number of successive restart attempts allowed after an undercurrent fault before the overload relay requires manual reset. A setting of "0" is manual reset and a setting of "A" is continuously automatic reset.
- ADDR-** "ADDR" is the address setting for RS485 communications. Available settings are from A01 - A99. You may ignore this setting if RS485 communications are not used.
- #RO-** "#RO" is the number of successive restart attempts allowed after an overcurrent fault. The following settings are available: 0, 1, 2, 3, 4 and A. A setting of "0" is manual reset and a setting of "A" is continuously automatic.
- UCTD-** "UCTD" is the undercurrent trip delay timer. This setting represents the maximum time that the Model 77C-LR will tolerate an under current condition. Typically, UCTD is set to 2 - 4 seconds.
- OPT1-** Linear overcurrent trip delay (2-60 seconds). This programming position is used only if the TC position is set to Lin. This setting will determine the period of time that will expire before tripping on overcurrent, after the amperage exceeds the OC setting. (See Programming Example #2).
- OPT2-** RD2 & RD3 time units programming. This position sets the time units used by the RD2 and RD3 timers. (e.g., RD2 = 10, RD3 = 20, OPT2 = 2 from the table below;  
RD2 = 10 seconds and RD3 = 20 minutes.

| SETTING | RD2     | RD3     |
|---------|---------|---------|
| 0       | Minutes | Minutes |
| 1       | Minutes | Seconds |
| 2       | Seconds | Minutes |
| 3       | Seconds | Seconds |

| Trip Class | Application Description                                                                                                                                                                                                                            |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5          | Small fractional horsepower motors where acceleration times are almost instantaneous or where extremely quick trip times are required.                                                                                                             |
| 10         | (Fast Trip) Hermetic refrigerant motors, compressors, submersible pumps and general purpose motors that reach rated speed in less than 4 seconds.                                                                                                  |
| 15         | Certain specialized applications.                                                                                                                                                                                                                  |
| 20         | (Standard Trip) Most NEMA-rated general purpose motors will be protected by this setting.                                                                                                                                                          |
| 30         | (Slow Trip) Motors with long acceleration times (>10 seconds) or high inertia loads.                                                                                                                                                               |
| J Prefix   | Programming any of the trip classes with the J Prefix will enable jam protection. This additional protection is enabled 1 minute after the motor starts and provides a 2-second trip time for motors exceeding 400% SFA, regardless of trip class. |
| LIn        | Programming the trip class LIn disables the normal trip classes shown above and enables a linear trip delay on overcurrent. The linear trip delay is set in program position OPT1.                                                                 |

**Table No. 2: Trip Class Descriptions**



**FIGURE #3: Overload Trip Classes**

**PROGRAMMING EXAMPLE**

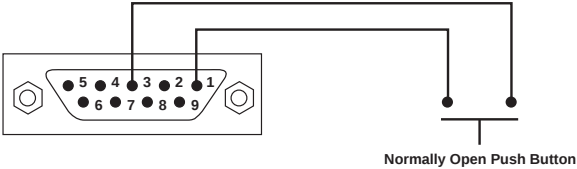
Motor To Be Protected: 1Ø, 230 Volt, 1/2 Hp raw material transfer auger. This auger moves material from a delivery pit to the production area main storage hopper. The motor has a full load amperage rating of 5.0 Amps and a maximum service factor of 6.0 Amps. Use the following calculations and reasoning to determine the appropriate settings for this application.

- LV-        230 x 0.90 = 207
- HV-        230 x 1.10 = 253
- MULT - From Table No. 1; MULT = 1
- OC-        6.0 Usually set at service factor amps
- UC-        Since the motor current will unload at least 20% if a shaft shear pin breaks or the auger runs out of material, UC = 50A x 0.80 = 40
- TC-        Because the motor is a general purpose motor and the motor should be protected from being jammed by a foreign object, TC = J20
- UCTD- 5-10 seconds
- RD1-       To protect the motor from rapid successive power outages, RD1 = 20
- RD2-       N/A, see #RO setting.
- RD3-       N/A, see #RU setting.
- #RU-       Setting #RU to 0 will require a manual reset after undercurrent. Therefore, RD3 has no affect in this application. This setting will allow the auger to be started, and left unattended, and will run until the delivery pit is empty. Pressing a remote reset button will start the auger for the next load.
- #RO-       Setting #RO to 0 will require a manual reset after an overcurrent. Therefore, RD2 has no affect.
- ADDR- N/A.
- OPT1- N/A.
- OPT2- N/A.

**COMMUNICATIONS PORT / REMOTE RESET**

The Model 77C-LR comes standard with a 9-pin Sub D connector for remote communications. The Model 77C-LR supports RS-485 communication standard. This standard allows up to 99 Model 77C-LRs to be controlled and monitored from a single remote personal computer.  
NOTE: An RS-485MS-2W module and software is required to operate the communications bus. (Refer to RS-485MS-2W Installation Instructions for more information on this subject.)

The communications port also provides connections for remote reset as shown below.



## **MULTI-FUNCTION SYSTEM DISPLAY**

The output display can show various system operating parameters: L1-L2 Voltage, L2 Current (B).

When the "MODE SELECT" switch is in the "RUN" position, the LED will display one of the above operating parameters. To select or change the displayed parameter, turn the "DISPLAY / PROGRAM" adjustment to the desired position as shown on its label.

The multifunction display also announces system faults such as low voltage and high voltage. Any time the "MODE SELECT" switch is in the "RUN" position, the "RESET/PROGRAM" button may be pushed to view the last fault which occurred. The table below shows the possible messages.

| Displayed Message | Meaning                                         |
|-------------------|-------------------------------------------------|
| oc                | Tripped on Overcurrent                          |
| uc                | Tripped on Undercurrent                         |
| H I               | Tripped on High Voltage                         |
| Lo                | Tripped on Low Voltage                          |
| oFF               | A stop command was issued from a remote source. |

## **TROUBLESHOOTING**

| PROBLEM                                                                                                       | SOLUTION                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The unit will not start. Display alternates "HI" or "Lo" with the "DISPLAY / PROGRAM" switch parameter value. | The incoming voltage is not within the limits programmed in the "HV" and "LV" settings. Adjust the "DISPLAY / PROGRAM" switch to read the incoming line voltage value. Correct the incoming power problem and check programmed limits to verify they are correct. |
| Display alternates "oc" with "RUN."                                                                           | The overload relay has tripped on overcurrent and is timing down "RD2" before restarting.                                                                                                                                                                         |
| Display alternates "uc" with "RUN."                                                                           | The overload relay has tripped on undercurrent and is timing down "RD3" before restarting. If undercurrent is not a normal condition for this installation, check for broken shafts, broken belts, etc.                                                           |
| Display is showing a solid "oc."                                                                              | The unit has tripped on overcurrent and manual reset is required because of the programmed setting in "#RO." Check the system for problems that would produce the overload fault like a jam.                                                                      |
| Display is showing a solid "uc."                                                                              | The unit has tripped on undercurrent and a manual reset is required because of the programmed setting in "#RU." Check the system for problems that would produce an underload condition like a broken belt or shear pin.                                          |

**If you need further assistance, call us at 1-800-843-8848 . . . we'd be happy to help!!!!**

## **OPERATION**

Once the overload relay has been programmed, turn the "MODE SELECT" switch to the "RUN" position. The LED display will flash "RUN" alternatively with a number representing the parameter indicated by the "DISPLAY / PROGRAM" adjustment. After the period of time programmed into RD1, the output contacts will close and the value of the parameter indicated by the "DISPLAY / PROGRAM" adjustment will appear on the LED display.

If a message other than those indicated above is shown on the LED display, see the TROUBLE-SHOOTING section on page 6 to diagnose the problem.

| SPECIFICATIONS                                                                      | 77C-LR Overload Relay                                                                                                                                                                                                                                                        |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|-----|---|---------|---------|---|---------|---------|---|---------|---------|---|---------|---------|
| Input Voltage                                                                       | 100 - 240 VAC, 1Ø                                                                                                                                                                                                                                                            |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Frequency                                                                           | 50 - 60 Hz                                                                                                                                                                                                                                                                   |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Motor Full Load Amp Range                                                           | 1 - 9 Amps, 1Ø (Direct)                                                                                                                                                                                                                                                      |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| <b>Programmable Operating Points</b>                                                | <b>Range</b>                                                                                                                                                                                                                                                                 |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| LV - Low Voltage Threshold                                                          | 85V - HV Setting                                                                                                                                                                                                                                                             |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| HV - High Voltage Threshold                                                         | LV Setting - 264V                                                                                                                                                                                                                                                            |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| MULT - # of Conductors                                                              | 1 or 2 Conductors                                                                                                                                                                                                                                                            |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| OC - Overcurrent Threshold                                                          | (2.0 -3.5A) / MULT                                                                                                                                                                                                                                                           |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| UC - Undercurrent Threshold                                                         | (0, 1.0 - 3.0A) / MULT                                                                                                                                                                                                                                                       |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| TC - Overcurrent Trip Class *                                                       | 5, J5, 10, J10, 15, J15, 20, J20, 30, J30 or                                                                                                                                                                                                                                 |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| RD1 - Rapid Cycle Timer                                                             | 0, 2 - 500 Seconds                                                                                                                                                                                                                                                           |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| RD2 - Restart Delay After All Faults Except Undercurrent (Motor Cool Down Timer) ** | 2 - 500 (Minutes/Seconds)                                                                                                                                                                                                                                                    |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| RD3 - Restart Delay After Undercurrent (Dry Well Recovery Timer) **                 | 2 - 500 (Minutes/Seconds)                                                                                                                                                                                                                                                    |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| #RU - Number of Restarts After ADDR - RS485 Address                                 | 0, 1, 2, 3, 4, A (Automatic)<br>A01 - A99                                                                                                                                                                                                                                    |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| #RO - Number of Restarts After Overcurrent                                          | 0, 1, 2, 3, 4, A                                                                                                                                                                                                                                                             |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| UCTD - Undercurrent Trip Delay                                                      | 2 - 60 Seconds                                                                                                                                                                                                                                                               |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| OPT1 - Linear Overcurrent Trip Delay                                                | 2 - 60 Seconds                                                                                                                                                                                                                                                               |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| OPT2 - RD2 and RD3 Timer Units                                                      | <table><tr><th>SETTING</th><th>RD2</th><th>RD3</th></tr><tr><td>0</td><td>Minutes</td><td>Minutes</td></tr><tr><td>1</td><td>Minutes</td><td>Seconds</td></tr><tr><td>2</td><td>Seconds</td><td>Minutes</td></tr><tr><td>3</td><td>Seconds</td><td>Seconds</td></tr></table> | SETTING | RD2 | RD3 | 0 | Minutes | Minutes | 1 | Minutes | Seconds | 2 | Seconds | Minutes | 3 | Seconds | Seconds |
| SETTING                                                                             | RD2                                                                                                                                                                                                                                                                          | RD3     |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| 0                                                                                   | Minutes                                                                                                                                                                                                                                                                      | Minutes |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| 1                                                                                   | Minutes                                                                                                                                                                                                                                                                      | Seconds |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| 2                                                                                   | Seconds                                                                                                                                                                                                                                                                      | Minutes |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| 3                                                                                   | Seconds                                                                                                                                                                                                                                                                      | Seconds |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| <b>Physical Specifications</b>                                                      |                                                                                                                                                                                                                                                                              |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Output Contact Rating (Pilot Duty) SPDT                                             | 480 VA @ 240 VAC                                                                                                                                                                                                                                                             |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Transient Protection (Internal)                                                     | 2500 V for 10 mSeconds                                                                                                                                                                                                                                                       |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Accuracy                                                                            |                                                                                                                                                                                                                                                                              |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Voltage                                                                             | ±1%                                                                                                                                                                                                                                                                          |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Current                                                                             | ±3% (<10.0 Amps Direct)                                                                                                                                                                                                                                                      |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Timing                                                                              | 5% ± 1 Second                                                                                                                                                                                                                                                                |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Repeatability                                                                       |                                                                                                                                                                                                                                                                              |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Voltage                                                                             | ±0.5%                                                                                                                                                                                                                                                                        |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Current                                                                             | ±1% (<10.0 Amps Direct)                                                                                                                                                                                                                                                      |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Dimensions                                                                          | 3.0" H x 5.1" D x 3.6" W                                                                                                                                                                                                                                                     |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Power Consumption                                                                   | 5 Watts (Max.)                                                                                                                                                                                                                                                               |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Weight                                                                              | 1.2 lbs.                                                                                                                                                                                                                                                                     |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |
| Max Conductor Diameter                                                              | .650"                                                                                                                                                                                                                                                                        |         |     |     |   |         |         |   |         |         |   |         |         |   |         |         |

\* If J Prefix is displayed in trip class setting, jam protection is enabled. If programmed to Lln position, overcurrent trip delays are fixed linear time delays set in OPT1 position.

\*\* RD2 & RD3 can be changed from minutes to seconds under program position OPT2.

### **Clearing Last Fault**

The last fault stored can be cleared on the MotorSaver.

This procedure is outline as follows:

1. Rotate the Mode Select Switch to 'OPT2'.
2. Press and hold the Reset/Program Button. Adjust the Display/Program adjustment until cLr appears on the display. Release the Reset/Program Button.

To verify the last fault was cleared, place the Mode Select switch in the Run position. Then press and hold the Reset/Program Button, cLr should be on the display.

### **Tamper Guard**

The MotorSaver can be protected from unauthorized program changes by locking in the setpoints.

This procedure is outlines as follows:

1. Rotate the Mode Select switch to 'OPT2'.
2. Rotate Display/Program adjustment fully clockwise.
3. Press and hold the Reset Button. Adjust the Display/Program adjustment until 'Loc' appears in the display.
4. Release the Reset Button.
5. Turn Mode Select switch to 'run'.

The program is now locked, but all settings can be viewed. The unit can be unlocked by following the procedure above except step three. This step should say: Press and hold the Reset Button. Adjust the Display/Program adjustment until 'unL' appears in the display.

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