

Recommended Full Load Amps	OC Range (Amps)	UC Range (Amps)	# of Passes through each Window	MULT (CT Ratio)
2-2.5	2-10	0, 1-9.8	10	10
2.5-3	2.22-11.1	0, 1.11-10.8	9	9
3-3.5	2.5-12.5	0, 1.25-12.2	8	8
3.5-4	2.85-14.2	0, 1.42-14	7	7
4-5	3.33-16.6	0, 1.66-16.3	6	6
5-6	4-20	0, 2-19.6	5	5
6-8	5-25	0, 2.5-24.5	4	4
8-12	6.66-33.3	0, 3.33-32.6	3	3
12-25	10-50	0, 5-49	2	2
25-90	20-100	0, 10-98	1	1
⌋ EXTERNAL CTs REQUIRED. SEE EXTERNAL CT WIRING DIAGRAM.⌋				
80-110	80-140	0, 40-120	5	100 (100:5)
110-160	120-210	0, 60-180	5	150 (150:5)
160-220	160-280	0, 80-240	5	200 (200:5)
220-320	240-420	0, 120-360	5	300 (300:5)
320-420	320-560	0, 160-480	5	400 (400:5)
400-520	400-700	0, 200-600	5	500 (500:5)
480-600	480-840	0, 240-720	5	600 (600:5)
540-700	560-980	0, 280-840	5	700 (700:5)
560-800	640-992	0, 320-960	5	800 (800:5)

Table 1: Wiring Configuration Based on Motor Amps

MULTI-FUNCTION SYSTEM DISPLAY

When the MODE SELECT switch is in the RUN position, the display will show either L1-L2 Voltage or L2 Current (B). To select the displayed parameter, adjust the DISPLAY/PROGRAM dial to the desired position as shown on its label.

The multi-function display also shows system faults. Any time the MODE SELECT switch is in the RUN position, the RESET/PROGRAM button may be pushed to view the last fault that occurred. The table below shows the possible messages.

Displayed Message	Meaning
Oc	tripped on overcurrent
Uc	tripped on undercurrent
HI	high voltage condition exists
Lo	low voltage condition exists
oFF	a stop command was issued from a remote source

Table 2: Multifunction Display Fault Messages

PROGRAMMING

1. Select the feature to program by rotating the MODE SELECT dial to the desired position. The MULT setting must be programmed before programming any of the current settings to ensure proper display of actual current setpoints. Therefore SymCom recommends programming the LV setting first, then moving clockwise through the positions to complete the process.
2. Push and hold the RESET/PROGRAM button.
3. Rotate the DISPLAY/PROGRAM dial to the desired setting of the feature as shown on the display.
4. Release the RESET/PROGRAM button. The Model 77C is programmed when the button is released.

NOTE: If a setting jumps back to its original number when the button is released, the tamper guard is set. Refer to the TAMPER GUARD section (page 11) to unlock the setpoints.

5. Repeat steps 1-4 until all features are programmed.

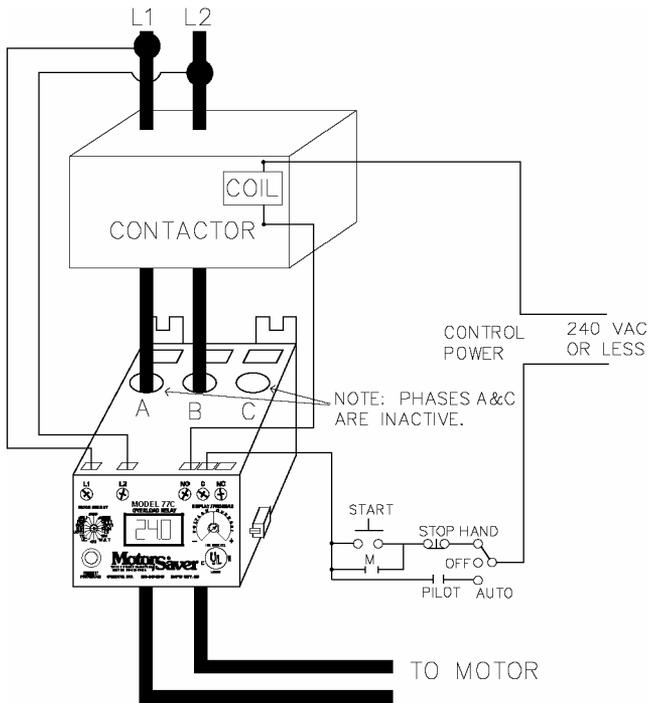


Figure 1: Typical Wiring Diagram

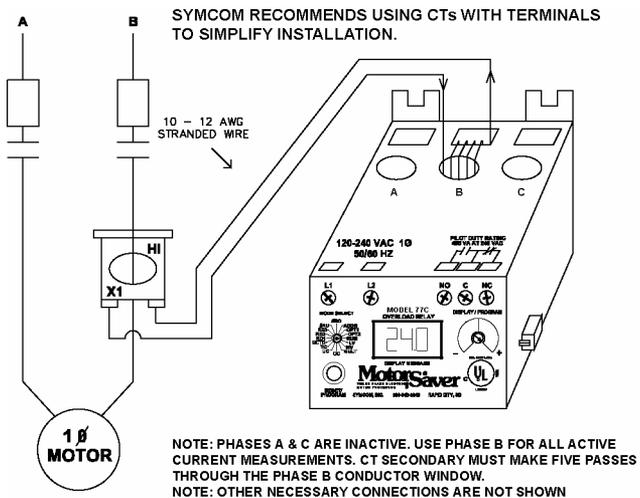


Figure 2: External CT wiring diagram

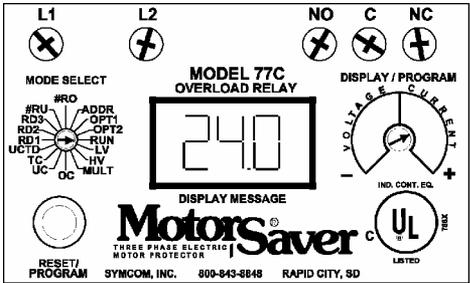
SUGGESTED SETTINGS

Consult the motor manufacturer for recommended settings. Refer to the PROGRAMMING EXAMPLES section for additional assistance.

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. (e.g., The motor nameplate voltage is 230V, set LV to $0.9 \times 230 = 207$, set HV to $1.10 \times 230 = 253$)

NOTE: LV cannot be set higher than HV – 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 window marked B, or current transformer ratio of external CTs. The appropriate number can be determined from Table 1 on page 1. **MULT must be correctly programmed in order to accurately program the current settings.**

OC- 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. Trip class is determined by the type of motor and application. The motor manufacturer should be consulted for the proper setting. Table 4 shows the trip classes and gives general application descriptions.

RD1- RD1 is the rapid-cycle timer. **It will engage when the motor is first powered-up and 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 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. The 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.

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) This setting will protect most NEMA-rated, general-purpose motors.
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% OC, regardless of trip class.
LIn	Programming the trip class to LIn disables the normal trip classes and enables a linear trip delay on overcurrent. The linear trip delay is set at program position OPT1.

Table 4: Trip Class Descriptions

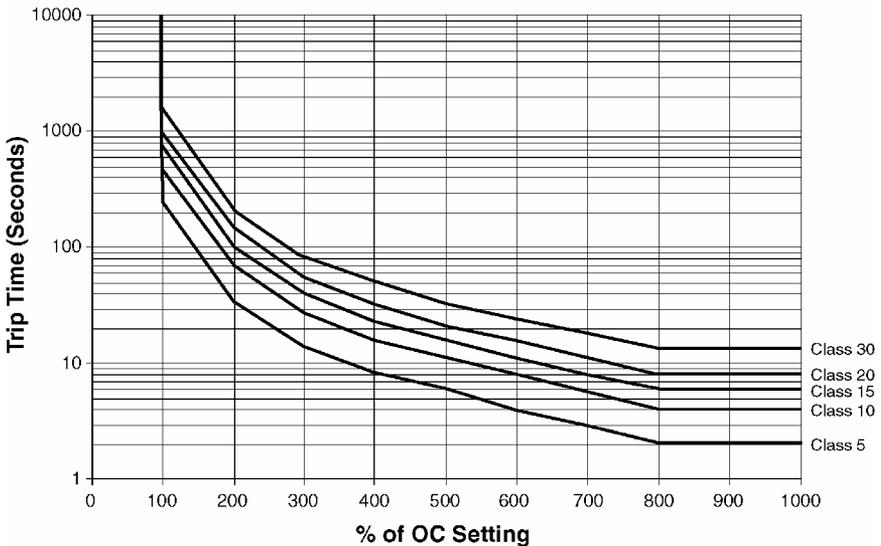


Figure 3: Overload Trip Curves

- #RU-** #RU is the number of successive restart attempts allowed after an undercurrent fault before the overload relay requires manual resetting. A setting of 0 is manual reset and a setting of A is continuously automatic reset.
- #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.
- ADDR-** ADDR is the address setting for RS-485 communications. Available settings are from A01 - A99. This setting is ignored if RS-485 communication is not used.
- UCTD-** UCTD is the undercurrent trip delay timer. This setting represents the maximum time the Model 77C will tolerate an undercurrent condition. Typically, UCTD is set to 2-4 seconds.
- OPT1-** OPT1 is the 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-** OPT2 is the used to set RD2 and RD3 in seconds or minutes. (e.g., RD2=10, RD3=20, if OPT2=2 (from the table below), RD2=10 seconds and RD3=20 minutes.)

OPT2	RD2	RD3
0	Minutes	Minutes
1	Minutes	Seconds
2	Seconds	Minutes
3	Seconds	Seconds

Table 3: OPT2 Settings

PROGRAMMING EXAMPLE

Motor to be protected: single-phase, 230V, 10hp raw material transfer auger. This auger moves material from a large bulk delivery pit to the production area main storage hopper. The motor has a full load amperage rating of 50 Amps and a maximum service factor of 57 Amps. Use the following calculations and reasoning to determine the appropriate settings for this application.

LV- $230 \times 0.90 = 207$

HV- $230 \times 1.10 = 253$

MULT - From Table 1; MULT = 1

OC- 57

UC- Since the motor current will unload at least 20% if a shaft shear pin breaks or the auger runs out of material, UC = $50A \times 0.80 = 40$

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 (undercurrent trip delay)

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 an undercurrent trip. 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 trip. Therefore, RD2 has no affect.

ADDR- N/A

OPT1- N/A

OPT2- N/A

COMMUNICATIONS PORT / REMOTE RESET

The Model 77C comes standard with a 9-pin sub D connector for remote communications. The Model 77C supports RS-485 communication standard. This standard allows up to 99 Model 77Cs to be controlled and monitored from a single remote personal computer.

NOTE: An RS485MS-2W communications module and software are required to operate the communications bus. Refer to RS485MS-2W installation instructions for more information (available at www.symcominc.com).

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

