INSTALLATION INSTRUCTIONS FOR SYMCOM'S MOTORSAVER MODEL 520CS

BE SURE POWER IS DISCONNECTED PRIOR TO INSTALLATION!!
FOLLOW NATIONAL, STATE AND LOCAL CODES!

!!! ATTENTION !!!

Turn off power to the 520CP or 520CS **BEFORE** plugging in the 520RD. **DO NOT** plug the 520RD into the socket when the 520CP or 520CS is powered-up Loss of set points may occur if the 520CP or 520CS has its L1 and L2 terminals energized.

CONNECTIONS

1. Mount the MotorSaver in a convenient location in or near the motor control box. If the location is wet or dusty, then use a NEMA 3R, 4 or 12 enclosure.
2. Connect the control panel power to L1 and L2 on MotorSaver's terminal strip. See Figure No. 1.
3. Connect the MotorSaver's normally open output contacts in series with the magnetic contactor coil as shown in Figure No. 1.
4. Ensure the proper Current Transformer (CT) size using Table 1.

   A) Find the voltage of the motor to be protected.
   B) Move down the column to the correct horsepower.
   C) Follow the row over to find the CT size.

EXAMPLE:
A three-phase, 2HP, 230V motor. Find the 230 V column and move down to the 2HP row. Move across the row and read the CT size - 50:5 (read 50 to 5).

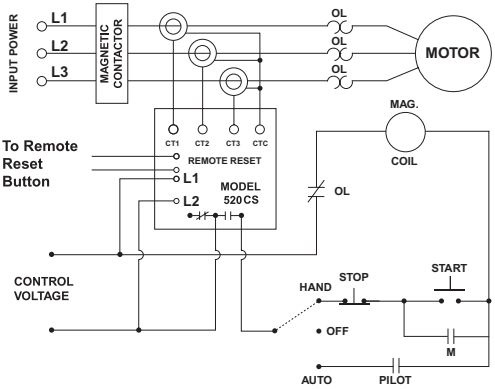

Figure No. 1: Typical Wiring Diagram.

230 Volt Motors		400 Volt Motors		575 Volt Motors	
Horsepower	**CT Size**	**Horsepower**	**CT Size**	**Horsepower**	**CT Size**
.5 - 1	5:5	.5 - 1	2.5:5	.5 - 1	2.5:5
1.5 - 5	50:5	1.5 - 2	5:5	1.5 - 3	5:5
7.5 - 20	75:5	3-10, 25-30	50:5	5-15, 30	50:5
25 - 30	100:5	15-20, 40	75:5	20-25, 40-50	75:5
40	150:5	50-60	100:5	60-75	100:5
50 - 60	200:5	75	150:5	100	150:5
75 - 125	400:5	100-125	200:5	125-150	200:5
		150-260	400:5	200-325	400:5

Table No. 1: Current Transformer Selection - Squirrel Cage and Wound Rotor Motors

II-520CS-B

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5. Determine the number of loops required. A CT operates best if the current it is sensing is between 60% and 80% of its range. Multiply the motor operating current by a number which will result in the new multiple being between 60% and 80% of the upper limit of the CT. [The upper limit of the CT is the number in front of the colon (:) in the CT designator.] The multiplier is the number of loops.

EXAMPLE: *A 230V, 2 Hp motor has a normal operating current of 6.8 A. From Table No. 1, a 50:5 CT is required. The range we are looking for is between 30A and 40A (60% of 50 and 80% of 50). If we multiply 6.8A times 5, we have 34A. {6.8A x 4 = 27.2A which is out of the 60%-80% range and 6.8A x 6 = 40.2A which is also out of the 60%-80% range}. Therefore, we should make 5 loops through the center of the CT.*

6. Calculate the normal CT current. Multiply the motor operating current by the number of loops through the CT and divide by the CT ratio. The CT ratio is the upper limit of the CT divided by the maximum CT current (e.g., a 50:5 CT has a upper limit of 50 and a maximum CT current of 5. Therefore, the CT ratio is 50÷5 or 10).

EXAMPLE CONTINUED: *We determined that the 230V, 2 Hp motor needs 5 loops through a 50:5 CT. The CT ratio is 50÷5=10. We multiply the normal operating current by the number of loops and divide by the CT ratio...(6.8x5)÷10 = 3.4A. The normal CT current is 3.4A. This is the current the CT will output when the motor is running normally.*

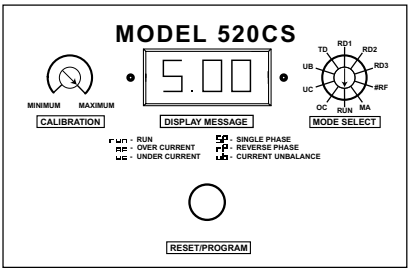
7. Run the motor's supply wires through the CTs the required number of loops as determined in step 5. A loop is defined as one pass of the supply wire through the center of the CT. The CT side marked "HI" should face away from the motor. Each CT should have one supply wire running through its center.

8. Connect each of the three black CT leads to one of MotorSaver's "CT1", "CT2" and "CT3" terminals. Connect the white CT leads together at MotorSaver's "CTC" terminal. See Figure No. 1.

9. Connect a remote reset button to the "Remote Reset" terminals if desired.

MESSAGE		STATUS INDICATION
"OFF"	Flashing	In power-up delay (RD1)
"run"	Flashing	Contacts are energized, waiting for motor start-up current
"run"	Steady	In motor acceleration period (4 seconds)
"oc"	Flashing	Tripped on OverCurrent, waiting for RD 2 minutes
"oc"	Steady	Tripped on OverCurrent #RF times
"uc"	Flashing	Tripped on UnderCurrent, waiting for RD 3 minutes
"uc"	Steady	Tripped on UnderCurrent #RU times
"SP"	Flashing	Tripped on Single Phasing, waiting for RD 2 minutes
"SP"	Steady	Tripped on Single Phasing #RF times
"rP"	Flashing	Tripped on Reverse Phasing, waiting for RD 2 minutes
"rP"	Steady	Tripped on Reverse Phasing #RF times
"ub"	Flashing	Tripped on current UnBalance, waiting for RD 2 minutes
"ub"	Steady	Tripped on current UnBalance #RF times

PROGRAMMING THE MODEL 520CS



1. Select the feature to program by rotating the "MODE SELECT" screw to the desired position.
   "OC" - OverCurrent set point,
   "UC" - UnderCurrent set point,
   "UB" - current UnBalance set point,
   "TD" - Trip Delay set point,
   "RD1" - Restart Delay on power-up (Rapid Cycle Timer),
   "RD2" - Restart Delay after all faults except undercurrent,
   "RD3" - Restart Delay after undercurrent,
   "#RF" - Number of Restarts after all faults,
   "MA" - Motor Acceleration time.

2. Push and hold the "RESET/PROGRAM" button.

3. Rotate the "CALIBRATION" screw to the desired setting of the feature as shown in the LED display. Release the "RESET/PROGRAM" button.

4. Continue steps 1-3 until all features are programmed.

SUGGESTED SETTINGS

(Consult the motor manufacturer for their recommendations.)

1. The recommended settings for **"OC"** (overcurrent) and **"UC"** (undercurrent) depend on many factors such as motor usage, motor size, environmental factors and tolerance of the motor. The motor manufacturer should be consulted for "OC" and "UC" settings. However, "OC" is typically set between 110% and 125% of Full Load current. "UC" is typically set at 80% of Full Load current. The setting can be determined by following Installation instruction #5 and #6 and multiplying by the % over and under desired.

2. Most motor manufacturers recommend operating under no more than 5% current unbalance. Therefore, SymCom suggests starting with **"UB"** set at 5%.

3. **"TD"** is the trip delay. Since most motors can be damaged by poor power in a very short time, setting "TD" between 2.0 and 10.0 seconds is typical. However, the application and power conditions will affect the decision about the setting of "TD". NOTE: The Model 520CS will trip on single phasing and reverse phasing faults in 0.5 seconds regardless of the "TD" setting. Also, the Model 520CS will trip faster than "TD" on an overcurrent fault as shown on the "Over Current Inverse Time Curve" in the specification sheet.

4. **"RD1"** acts as a rapid cycle timer. The setting of "RD1" depends on the application. Generally, a setting of 20 to 30 seconds will absorb successive rapid power outages and prevent on-off-on-off operation of the motor. A setting of 0 allows the motor to restart immediately after a normal power shut-down.

5. **"RD2"** is the restart delay after all faults except undercurrent. The setting of "RD2" is dependent upon the "#RF" setting, the application and the motor manufacturer's recommendations. Generally, the higher the setting of "#RF" the higher the "RD2" setting.

6. **"RD3"** is the restart delay after an undercurrent fault. "RD3" is normally set for the time required for the well to recharge. As with the other timer settings, "RD3" is dependent on the application.

7. **"#RF"** is the number of times the output contacts will close after the same fault has occurred in succession. The setting of "#RF" depends on the application, "RD2" setting and the motor manu facturer's recommendations. "#RF" can be set to 0,1,2,3,4 or 999. A setting of "0" is manual reset. A setting of "999" is unlimited retries.

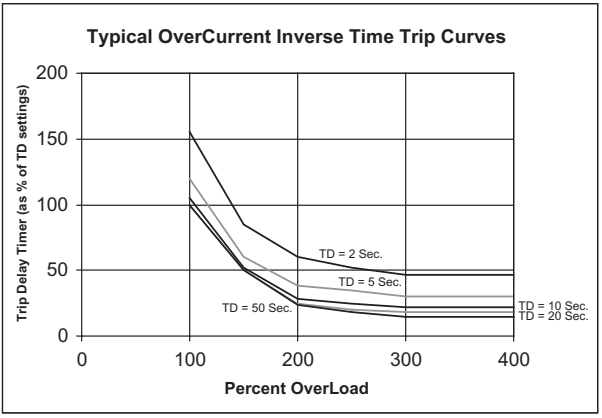
8. **"MA"** is the motor acceleration period. The motor acceleration period is related to the load on a motor. For high inertia loads such as flywheels or conveyor systems, the motor acceleration time is considerably longer than low inertia loads such as submersible pumps. Therefore, "MA" is typically set higher for high inertia loads and lower for low inertia loads. During the motor acceleration period, overcurrent, undercurrent and current unbalance are ignored. Therefore, it is important not to set "MA" too high because damage could occur to the motor.

OPERATION

Once the Model 520CS has been programmed, turn the "MODE SELECT" switch to the "RUN" position. The LED display will flash "OFF" for the period of time set in the "RD1" setting. After this power-up delay, the output contacts will close and the LED display will flash "run" until the motor starts. After the 520CS senses motor current, the LED display will show "run" steadily during the user-programmed motor acceleration period (MA). Following the motor acceleration period, the LED display will show the average of the three CT currents. If any message sequence other than that described above occurs the first time the motor is started, see TROUBLESHOOTING below.

TROUBLESHOOTING

PROBLEM	SOLUTION
rP is displayed on initial start-up	1. Swap any two of CT1, CT2 and CT3. 2. Make sure that all CT sides marked HI are pointed away from the motor. 3. If splices are made, check the splices to ensure the electrical integrity, use larger wire or shorten the run of the wire. 4. Move the CTs to the line side of a Variable Frequency Drive.
SP is displayed on initial start-up	See steps 2 and 4 above.
uB is displayed on initial start-up	Check to make sure the same # of loops are made through all of the CTs.
oC or uC is displayed on initial start-up	Check for proper CT sizing for the motor and the proper number of loops.
Continual tripping on uC	Increase the number of loops to reach the 60%-80% window as explained in installation step #5.



Model 520CS SPECIFICATIONS	
Control Voltage	100 to 130 VAC (MS520CS-115) 200 to 250 VAC (MS520CS-230) 400 to 500 VAC (MS520CS-460) 550 to 600 VAC (MS520CS-575)
Frequency	50 - 60 Hz
Current Transformers	Available from SymCom, Inc.
Maximum Full Scale Current	5 Amp Max. Secondary
Operating Points	
Fixed Settings	
Reverse Phase Trip Delay	0.5 Seconds
Single Phase Trip Delay	0.5 Seconds
Programmable Settings	Range (Increment)
"OC" OverCurrent Trip Point (Overload)	UnderCurrent Trip - 5.00 (0.02)
"UC" UnderCurrent Trip Point	0.00 - OverCurrent Trip (0.02)
"UB" Current UnBalance Trip Point	2.0 - 50.0% (0.2)
"TD" Trip Delay (except Phasing and OverCurrent faults - see inverse time curve for OverCurrent trip delay)	2.0 - 50.0 Seconds (0.2)
"RD1" Restart Delay on Power-Up (Rapid Cycle Timer)	0 - 500 Seconds (2)
"RD2" Restart Delay after all Faults except UnderCurrent (Motor Cool Down Timer)	2 - 500 Minutes (2)
"RD3" Restart Delay after UnderCurrent (Dry Well Recovery Timer)	2 - 500 Minutes (2)
"#RF" Number of Restarts after all Faults	0, 1, 2, 3, 4 or 999 (Unlimited)
"MA" Motor Acceleration Time	0.0 - 50.0 Seconds (0.2)
Temperature Range	0 - 70° Celsius
Output Contact Rating	480 VA @ 240 VAC (Models MS520CS115 and MS520CS230)
(SPDT)	470 VA @ 600 VAC (Models MS520CS460 and MS520CS575)
Transient Protection (Internal)	2500 Volts for 10 mSeconds
Repeat Accuracy	
Trip Point	± 2%
Timing	± 25%, ±1 Sec.
Power Consumption	5 Watts (Max.)
Weight	2 lbs.
Special Options on Model 520CS	
DPDT Relay	470 VA @ 600 VAC (Pilot Duty)

A remote display is available for the 520CS series MotorSaver. Order 520CS-xxx-RJ and remote display part number 520RD. The 520RD allows all the 520CS programmable functions and actual motor running amperage to be viewed without opening the panel. Call your Distributor or SymCom for details today!!!

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