PumpSaver® Plus
SUBMERSIBLE PUMP PROTECTOR

INSTALLATION INSTRUCTIONS FOR THE MODEL 777-KW/HP-P, 777-KW/HP-575-P, 777-KW/HP-HVR-P

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

The Model 777-KW/HP-P is a solid-state (electronic) overload relay. It is fully programmable for customized protection and is designed to protect 3-phase systems with operating voltages of 190-480VAC (500-600VAC for the Model 777-KW/HP-575-P). The output relay is a Form C contact, which can control a contactor or other device within the output relay contact rating. The unit can be programmed prior to installation by applying 120VAC to terminals L1 and L2 (except Model 777-KW/HP-575-P). The unit cannot be tested for proper operation using this voltage. For testing purposes, 3-phase power needs to be used with a minimum voltage of 190VAC (450VAC for the Model 777-KW/HP-575-P). The 777-P offers more advanced network programmable features than the 777 and will work with SymCom's DeviceNet COM-DN and CIO-DN; and Modbus RS485MS-2W Communications Modules.

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. Disconnect power and verify power is off.

2. Using the four corner tabs or the DIN rail mount, install the 777-P directly above or below the contactor. To use the DIN rail mount, hook the top clip first then apply downward pressure until the lower clip snaps onto the rail.

3. A) For amperage ranging from 25-90 amps, insert the motor conductors through the holes marked A, B, and C. Make certain the conductor through each hole corresponds to the same motor conductor, i.e. the A phase conductor should go through the A round hole. See Figure 1 for a typical wiring diagram.

   B) For amperage less than 25 amps, loop the motor conductors according to Table 1. Figure 2 shows an example of the looping required for MULT = 3.

   C) For amperage greater than 90 amps, external CTs (current transformers) are required. Using CTs with terminals is recommended for ease of installation. All CT secondaries must make five passes through the round holes on the 777-P. See Figure 3 for a typical wiring diagram using CTs.

4. Connect 3-phase power from the line side of the contactor to the L1, L2, and L3 terminals using 12-18 AWG copper wire. These should be tightened to no more than 7 in.-lbs. Figure 1 is drawn for a power system wired in ABC sequence. For power systems with ACB sequence, switch the L1 and L3 connections on the 777-P.

5. Connect the control circuit wires to the appropriate terminals. The relay is designed for fail-safe operation, thus the NO (normally open) contact should be in series with the coil of the contactor for motor control. For alarm circuits, the NC (normally closed) contact is in series with the alarm circuitry.

Recommended Full Load Amps	OC Range (Amps)	GF Range (Amps)	# of Passes through each Window	MULT (CT Ratio)
2-2.5	2-10	.3-2,Off	10	10
2.5-3	2.2-11.1	.33-2.22,Off	9	9
3-3.5	2.5-12.5	.37-2.5,Off	8	8
3.5-4	2.8-14.3	.42-2.85,Off	7	7
4-5	3.3-16.7	.5-3.33,Off	6	6
5-6	4-20.1	.6-4,Off	5	5
6-8	5-25.1	.75-5,Off	4	4
8-12	6.6-33.5	1-6.66,Off	3	3
12-25	10-50.3	1.5-10,Off	2	2
25-90	20-100	3-20,Off	1	1
80-110	80-140	12-80,Off	5	100 (100:5)
110-160	120-210	18-120,Off	5	150 (150:5)
160-220	160-280	24-160,Off	5	200 (200:5)
220-320	240-420	36-240,Off	5	300 (300:5)
320-420	320-560	48-320,Off	5	400 (400:5)
400-520	400-700	60-400,Off	5	500 (500:5)
480-600	480-840	72-480,Off	5	600 (600:5)
540-700	560-980	84-560,Off	5	700 (700:5)
560-800	640-992/FFF	96-640,Off	5	800 (800:5)

Table 1: Wiring Configuration Based on Motor Full Load Amps

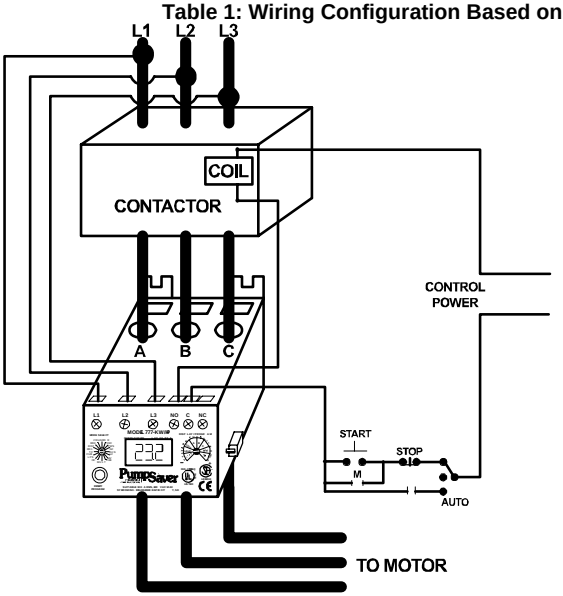


Figure 1: Typical Wiring Diagram for FLA of 26-90A

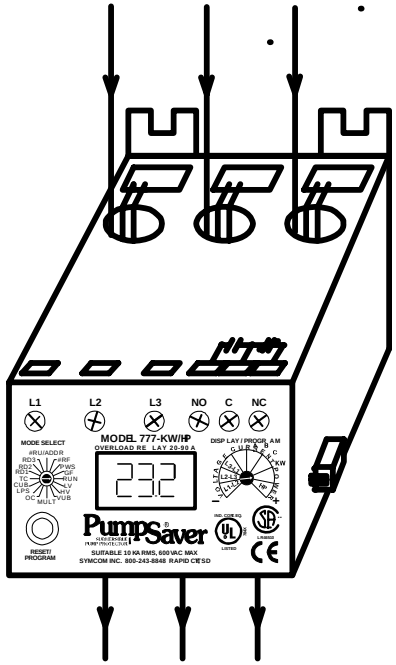


Figure 2: Typical Wiring Diagram with Conductor Looping

NOTE: For ACB sequence input power configuration, invert the L1 and L3 terminal connections on the 777-P.

CURRENT TRANSFORMER WIRING DIAGRAM FOR MODEL 777 KW (80-800 AMPS)

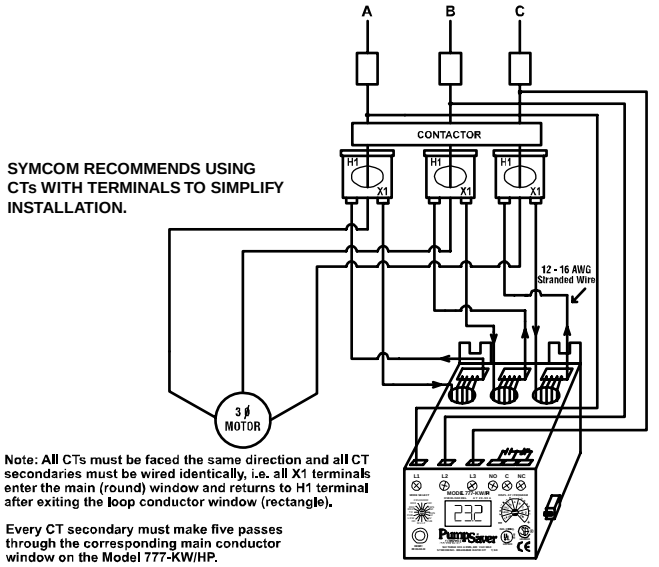


Figure 3: Typical Wiring Diagram Using External CTs

! WARNING !

UNEXPECTED OUTPUT ACTUATION CAN OCCUR.
Use hard-wired safety inerlocks where personnel and/or equipment hazards exist.
Failure to follow this instruction can result in death, injury or equipment damage.

PROGRAMMABLE PARAMETERS

The following settings MUST be programmed by the user in order to provide proper protection for the application. All parameters are actual values except for the VUB and CUB settings—these are programmed as percentages. The range each parameter can be programmed to is found in the specifications table. See page 7 for a programming example.

LV/HV - The recommended settings for LV (low voltage) and HV (high voltage) according to the NEMA MG1 standard are ±10% of the motors nameplate voltage. For other settings, the motor manufacturer should be contacted.

Example: The motor nameplate voltage is 230 volts. 90% and 110% of 230 is 0.9 x 230=207 volts for the LV setting and 230 x 1.1=253 volts for the HV setting. These parameters are based on the average voltage going to the motor.

VUB - VUB (voltage unbalance) is factory set to 6%. The NEMA MG1 standard says a motor should not be operated above a 1% voltage unbalance without derating the motor. Most utility supplied power sources have a difficult time sustaining a 1% voltage unbalance. The motor manufacturer should be consulted for an exact VUB setting. Setting VUB to 999 will disable voltage unbalance protection but will not disable voltage single-phase protection. Voltage unbalance is calculated as follows:
%Voltage Unbalance = [(Maximum deviation from the average)/Average] x 100%

Example: Measured line-line voltages = 203, 210, and 212. The average = (203+210+212)/3 = 208.3. The maximum deviation from the average is the greatest difference between the average voltage (208.3) and any one voltage reading, 212-208.3 = 3.7, 210-208.3 = 1.7 and 208.3-203 = 5.3. The maximum deviation from the average is 5.3, thus voltage unbalance = 5.3/208.3 x 100= 2.5%.

MULT - MULT (multiplier) setting can be found on Table 1. The MULT setting is determined by the current the 777-P will be monitoring. This allows the unit to display the correct current. Set MULT first then set OC and GF.

OC- OC (overcurrent) is typically set to the service factor amperage (SFA) of the motor or 100-115% of motor full-load amps, which are determined by the motor manufacturer. If any one leg exceeds the OC setting, the 777-P will follow the TC settings to determine when to trip; in seconds or by following the trip class curve (see Figure 4).

LP- LP (low power) is used to shut down the motor or pump on an underload condition. Setting LP to 0 disables the underload trip feature. LP can be set in either kilowatts (kW) or horsepower (hp) determined by the PWS setting. **NOTE: PWS must be set before setting LP.**

CUB - CUB (current unbalance) is factory set to 7%. SymCom recommends contacting the motor manufacturer for a specific setting. Current unbalance is calculated the same way voltage unbalance is calculated (see formula above). Current unbalance protection can be disabled by programming CUB to 999. This will disable current unbalance protection and current single phase protection.

TC - The TC (trip class) setting determines how quickly the 777-P will trip when an overload (overcurrent) condition is detected. TC is a dual-function setting—both a thermal trip class (NEMA standard) and a linear trip delay (in seconds) can be set to establish when the 777-P will trip on overcurrent. While the standard trip classes are 5, 10, 15, 20, and 30, TC can be set from 2–30, with or without jam protection. These additional "non-standard" trip classes allow the unit to follow a trip curve in-between the "standard" trip class curves shown in Figure 4.

Trip classes 2–30 can be set from approximately the 7 o'clock to 11 o'clock position on the DISPLAY/PROGRAM dial. Trip classes J02–J30, which include jam protection, can be set from the 11 o'clock to 2 o'clock position (this additional jam protection feature, when enabled is initiated 1 minute after the motor starts and provides a 2-second trip delay for motors exceeding 400% of the OC setting).
The linear overcurrent trip delay can be set after the 2 o'clock position from 0–60 seconds (L00–L60) or to "oFF." If TC is set to L00, the 777-P will trip off within 1 second when an overcurrent condition is detected. If both trip class and linear trip delay settings are programmed, the 777-P will follow the faster trip time. E.g., let's say TC is set to J15 and L20, and the amperage is 200% of the OC setting. Following the trip class 15 curve, the 777-P will trip off in approximately 100 seconds. Thus the 777-P will follow the linear trip delay setting, because it is faster, and will trip off in 20 seconds.

The motor manufacturer should be contacted for an exact TC setting. Table 3 describes the trip classes, and Figure 4 shows the trip class curves.

RD1 - RD1 (restart delay one) is the rapid-cycle timer in seconds. This timer is initiated when power is first applied to the unit. If voltages are within the programmed limits and no SP (single-phase) or RP (reverse-phase) condition exists when power is applied to the device, the output relay will energize (the NO will close and the NC will open) as soon as RD1 expires. Typically, this is set to 20-30 seconds. This will provide adequate protection for successive power outages or short cycling caused by other motor controls.

This timer is also initiated when another control shuts the motor off (current goes to zero). If the user does not want the unit's relay to de-energize when another control shuts the motor off, RD1 must be set to zero. This will also ensure that when an alarm circuit is used, an alarm will sound only when there is a fault or when power is lost.

RD2 - RD2 (restart delay two) is the restart timer, in minutes (standard), used when the unit has shut off due to a current unbalance, current single-phasing, high power, or an overload condition (if "oc" is the prefix to the number in #RF, see #RF description). This timer is known as a motor cool-down timer. A setting of 5-10 minutes will give most motors adequate time to cool down after an overload condition. The motor manufacturer should be contacted for an exact value.

RD3 - RD3 (restart delay three) is the restart timer, in minutes (standard), used after an underload (LP) trip. It is also known as a dry-well recovery timer in pumping applications. This would be the time it takes a well to recharge after pumping dry. This setting varies widely from application to application and there is no typical setting. RD3 can be set from 2-500 minutes or to A to enable the automatic Dry-Well Recovery Calculator.

The Automatic Dry-Well Recovery Calculator allows the 777-P to automatically select a restart delay based on the run time of the last run cycle. Table 2 shows the next restart delay vs. run time. In general a longer run time produces a shorter restart delay. This feature allows the 777-P to optimize running and rest times automatically.

Run Time	Next Restart Delay (minutes)	Starts/Hr
> 1Hr	6	10
30 min.- 59.99 min.	15	4
15 min.- 29.99 min.	30	2
< 15 min.	60	1

Table 2. Automatic Dry-Well Recovery Timer

#RU/ADDR - The #RU/ADDR is a dual-function setting. #RU is displayed when the DISPLAY/PROGRAM knob is between the 7 o'clock and 11 o'clock position of the dial. ADDR is displayed above the 11 o'clock position on the DISPLAY/PROGRAM dial. #RU is the number of restarts the 777-P will attempt after a low power fault before the unit locks out and requires a manual reset. #RU can be set to 0, 1, 2, 3, 4, or A. This counter is cleared one minute after restarting if the 777-P does not trip again on low power.

EXAMPLE: #RU set to 1
If the 777-P trips on low power, restarts automatically (after RD3), then trips again on low power within one minute, the 777-P will lock out and require a manual reset. On the other hand, if the 777-P restarts after a low power fault, but runs without tripping on low power for more than a minute, the unit will not lock out if a low power fault occurs.

If #RU is set to "0," the 777-P will require manual resetting after all low power faults.
If #RU is set to "A," the 777-P will always restart automatically after low power faults.

ADDR is the RS-485 address of the 777-P. This is only used when communicating with an RM-2000, RM-1000, COM-DN, CIO-DN, a PLC, or a PC. The address can be 1–99 (A01–A99).

#RF - #RF is the number of restarts the 777-P will attempt after current unbalance or current single-phase faults. This counter will be cleared one minute after start-up if the unit does not trip again on a current unbalance, or current single-phase condition (see example for #RU). Available settings are 0, 1, 2, 3, 4 and A, or to include overcurrent and high power faults in this restart function, #RF can be set to oc1, oc2, oc3, oc4 or ocA.
If #RF is set to "0," the 777-P will require manual resetting after all current unbalance, single-phase, overcurrent, and high power faults.
If #RF is set to "A," the 777-P will always restart automatically after current unbalance and single-phase faults.
If #RF is set to "ocA," the 777-P will always restart automatically after current unbalance, single-phase, overcurrent, and high power faults.

PWS- PWS (power scale) is the range setting for the LP setting.

PWS Setting	LP Range
1	0.01 - 0.99 kW
2	1.00 - 9.95 kW
3	10.0 - 99.5 kW
4	100 - 650 kW
5	0.01 - 1.30 hp
6	1.34 - 13.3 hp
7	13.4 - 133.0 hp
8	134 - 871 hp

GF - GF (ground fault) is the maximum allowable current that can flow to ground before the 777-P de-energizes its relay. This is a residual, class II ground fault system and should not be used for personnel safety. A typical setting for GF is 10–20% of motor FLA (in amps). The GF test procedure in this instruction manual must be conducted before the device is brought online.

NETWORK PROGRAMMABLE PARAMETER

HPS- **HPS** (high power setting) is used to shut down the motor or pump on a high power condition. This setting is only accessible via an RS-485 network using the RS485MS-2W communications module,

PROGRAMMING

1. Rotate the MODE SELECT switch to the parameter to be programmed. We recommend you program LV first, then move clockwise through the positions to complete the process.
2. Press and hold the RESET/PROGRAM button.
3. Rotate the DISPLAY/PROGRAM knob until the proper setting is displayed.
4. Release the RESET/PROGRAM button. This stores the new parameter in the nonvolatile memory. If the number changes back to what is was before programming, the Tamper Guard is set and will need to be unlocked before programming can be completed. (see the TAMPER GUARD section for a complete description).
5. Repeat steps 1-4 until all parameters are programmed.

OPERATION

The relay operation of the Model 777-P is designed to be fail safe. This means when everything is within the limits programmed into the unit, the relay will energize; the NO contact will close and the NC contact will open. Once the unit has been wired and programmed, the unit is ready to operate. Turn MODE SELECT to the RUN position. The display will show “run” alternating with some number (the numbers displayed will be the number corresponding to where the DISPLAY/PROGRAM knob is pointed). It will do this for the amount of time programmed into RD1. After this time has expired, the relay will energize (NO contact will close and the NC contact will open). If something else is in the display, see the troubleshooting section for more information. If the MODE SELECT is taken out of the RUN position, the units relay will de-energize.

CLEARING LAST FAULT

The last fault stored can be cleared on the PumpSaver®Plus following these steps:

1. Rotate the MODE SELECT switch to GF.
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 777-P’s setpoints can be locked to protect against unauthorized program changes.

1. Rotate the MODE SELECT switch to GF.
2. Press and hold the RESET button. Adjust the DISPLAY/PROGRAM knob until “Loc” appears on the display.
3. Release the RESET button.
4. 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 same steps except adjust the DISPLAY/PROGRAM knob to “unL” in step 2.

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	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% of the OC setting.
LXX	This is linear overcurrent setting, where XX is the number of seconds for a linear trip.
Other Trip Classes	Trip Time in seconds at 6x OC=(TC*.93359s)

Table 3: Trip Class Descriptions

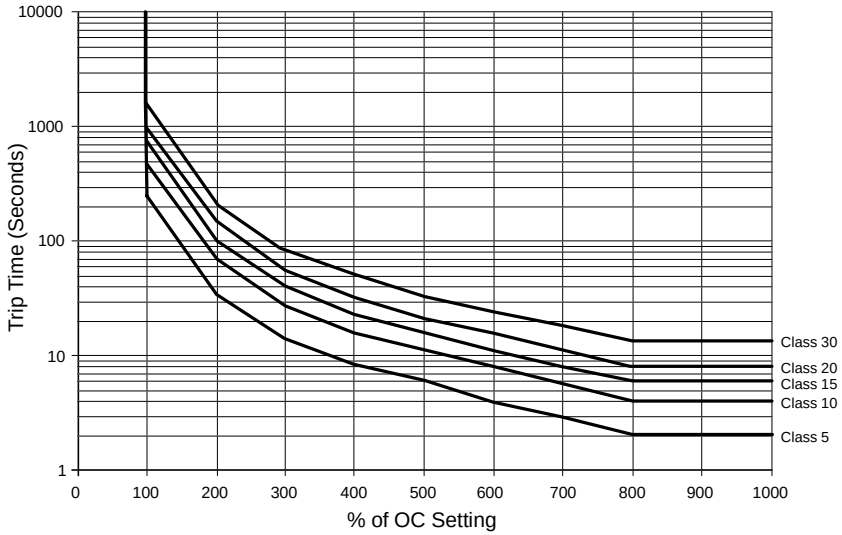


Figure 4: Overload Trip Curves

PROGRAMMING EXAMPLE

Motor to be protected: 3-phase, 460 Volt, 5hp magnetic drive pump with a full load amperage rating of 7.1A and maximum service factor amps of 8.2A. Use the following calculations and reasoning to determine the appropriate settings for this application.

LV-	460 x 0.90 = 414
HV-	460 x 1.10 = 506
VUB-	Standard NEMA motor = 5
MULT-	From Table 1 = 1
OC-	Service Factor Amperage = 8.2
LP-	Normal pumping operation reads 2.86kW Pump with a momentarily restricted flow (dead-head) reads 1.8kW Therefore, set LP = 2.0kW (see PWS for proper range)
CUB-	Standard NEMA motor = 5
TC-	General purpose motor, TC = 20. No linear trip delay is desired, TC also = oFF.
RD1-	To protect the pump for accidental rapid cycling, RD1 = 20 seconds.
RD2-	Because the motor may be hot from running in an unbalance or single-phase condition, a motor cool-down time of 10 minutes, RD2 = 10, should be appropriate.
RD3/#RU-	Because an underload (low power) would signal a serious problem in this application (dead-head), #RU should be set to 0 for a manual reset. Therefore, RD3 does not have any function
#RF-	Because an overload (overcurrent) fault signals a serious problem in this application (e.g., worn bearings), "oc" should not be included in the #RF setting so that a manual reset after an overload fault is required. A #RF=1 will give the system 1 chance to recover from an unbalance or single-phasing problem before manual reset is required.
PWS-	LP setting is 2.0kW, therefore PWS = 2 (1.00-9.95kW)
GF-	A ground fault setting of 15% of full load amps will be a significant indicator that the motor should be evaluated for repair or replacement. Therefore, GF = 7.1A x .15 = 1.0.

COMMUNICATIONS PORT/REMOTE RESET

The unit comes with a 9-pin sub-D connector for remote communications and/or for using a remotely located reset button. If communications are desired, a communications module (part number RS485MS-2W must to be plugged into this 9-pin connector. This module provides isolation, signal conditioning for compatibility with Modbus RTU and RS-485 networks, and provides terminals for connecting the shielded communications cable. Up to 99 units can be installed on one RS-485 network.

A remote reset button can be connected to the communications module Model RS485MS-2W or can be connected directly to the 9-pin connector using a male sub-D connector. It should be wired as shown in Figure 5.

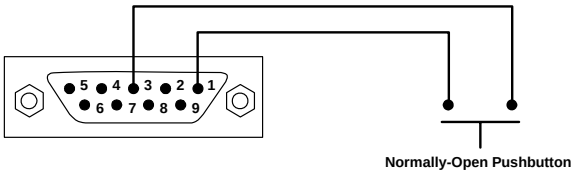


Figure 5: Remote Reset Button Wiring Diagram

SYSTEM DISPLAY

The output display will show the following readings when the MODE SELECT switch is in the RUN position according to where the DISPLAY/PROGRAM knob is pointed: each line-to-line voltage, each line current, kilowatts, and horsepower. The display is also used for programming the operating parameters of the device. The display will identify what caused the unit to de-energize its relay or what is keeping the unit from energizing its relay. The last fault (not the current fault) can be displayed by pressing and holding the RESET/PROGRAM button while the MODE SELECT switch is in the RUN position. When the unit trips off or is holding the motor off, the current fault condition will be shown in the display without pressing the button. Table 4 below lists the fault codes the unit could display.

Displayed Message	Meaning
Oc	Tripped on overcurrent
SP	Tripped on current single-phasing or unit won't start because the voltage is single-phased
Ub	Tripped on current unbalance or unit won't start because the voltage is unbalanced
LPr	Tripped on low power
Hpr	Tripped on high power
CF	Tripped on contactor failure
GrF	Tripped on ground fault
HI	A high voltage condition exists
Lo	A low voltage condition exists
rP	Incoming phases have been reversed, the motor may run backwards if started
oFF	A stop command was issued from a remote source

Table 4: Fault Codes and Their Meaning

On power up the 777-P will show the current software revision for example if the software rev is 2947 the 777-P will show 029 followed by 047. This can be used to determine the model number of 777-P.

TROUBLESHOOTING

The 777-P will display a fault code alternating with a number or with "run" when it is in a trip condition. If the unit is showing a fault code (see Table 4) alternating with "run," it has tripped on a current (amperage) condition. If the fault code is alternating with some number (voltage reading or zero), the unit will not allow the motor to start because there is a problem with the incoming voltage. If the display is showing just a fault code, the unit is in a mode that requires a manual reset. This could be because the number of restarts has been met or automatic restarts are not allowed (determined by #RF, #RU settings). If the display reads "off," a stop command has been issued through the communications network.

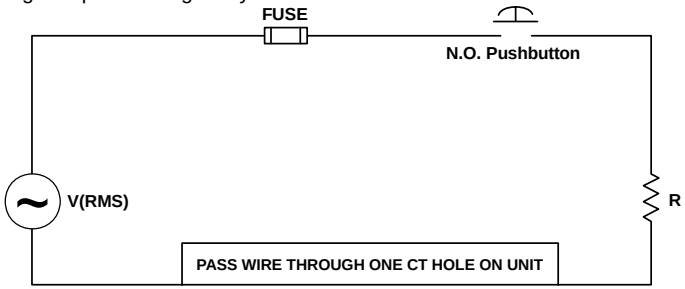
PROBLEM	SOLUTION
The unit will not start. Display alternates "rP" with the DISPLAY/PROGRAM parameter value.	The voltage inputs are reverse phased. If this is the initial start-up, swap any two of the leads connected to L1, L2, or L3 on the 777-P to correct the problem. If the overload relay has been previously running, the power system has been reverse phased. Check the phase sequence of the incoming power lines. Note: L1 must be tapped from conductor Phase A, L2 from B, and L3 from C for correct power factor measurements on remote communications.
The unit will not start. Display alternates "SP", "ub", "HI", or "Lo" with the DISPLAY/ PROGRAM parameter value.	The incoming voltage is not within the limits programmed in the VUB, HV, and LV settings; or a single phase condition exists on the system. Adjust the DISPLAY / PROGRAM knob to read the incoming line voltage values. Correct the incoming power problem and check programmed limits to verify they are correct.
Display alternates "SP", "ub", "HPr" or "oc" with "run."	The 777-P has tripped on the fault shown on the display and is timing down RD2 before restarting. **The HPS setting is only accessible using RS-485 communications.**
Display alternates "LPr" with "run."	The 777-P has tripped on low power (LP) and is timing down RD3 before restarting. If low power is not a normal condition for this installation, check for broken shafts, broken belts, etc.
Display is showing a solid "SP", "ub", "HPr", or "oc."	The 777-P has tripped on the fault shown and a manual reset is required because of the programmed setting in #RF. Check the system for problems that would produce the single-phase, high power, overload or current unbalance fault, such as a jam. **The HPS setting is only accessible using RS-485 communications.**
Display is showing a solid "LPr"	The 777-P has tripped on low power and a manual reset is required because of the #RU setting. Check the system for problems that would produce a loss of load such as a broken belt or a lack of liquid to pump.
Display is showing a solid "CF."	The 777-P has tripped on current single-phasing, but was not single-phased by the incoming voltage. Check for damaged contacts or loose wiring.
Display is showing a solid "GrF."	A ground fault current greater than the programmed GF value has been detected. A manual reset is required. Check the motor for insulation breakdown.

Table 5- Troubleshooting

GROUND FAULT TESTING PROCEDURE

A ground fault test must be performed before installing the 777-P as required by UL1053 and NEC, ANSI/NFPA 70.

1. Disconnect power.
2. Hook up the three line voltages to L1, L2, and L3 as required by the installation instructions.
3. Program the desired parameters into the unit. For test purposes, set MULT to 1 and GF to the minimum allowed setting.
4. Construct the circuit, using an AC power supply. This circuit simulates a ground fault condition by generating a current in one of the phases. Alternate test circuits may be used. The only requirement is the current through the current transformer must be between 115% and 150% of the GF setting and pass through only one CT window.



5. The values of V and R will be determined by the current required to generate a GF trip condition: I = Vrms/R, where I = 115% of GF setting.
6. Place the unit in the RUN position, apply 3-phase power and allow the NO contact to close.
7. Energize the test circuit by pushing and holding the test pushbutton until the unit trips (within 8.5 seconds). The display should show “GrF” and the NO contacts should be open. Release the NO pushbutton.
8. The results of the test are to be recorded on the test form provided below. The form should be kept by those in charge of the building’s electrical installation in order to be available to the authority having jurisdiction.
9. Confirm programmed parameters and proceed with installation instructions.

GROUND FAULT TEST RESULTS*

Date	Performed by	Results	Location

*A copy of this form should be retained by the building’s electrical foreman.

MODEL 777-KW/HP-P SPECIFICATIONS	
ELECTRICAL	
3-Phase Input Voltage	200 – 480VAC (Model 777-KW/HP-P) 500 – 600VAC (Model 777-KW/HP-575-P) 380 – 480VAC (Model 777-KW/HP-HVR-P)
Frequency	50/60Hz
Motor Full Load Amp Range	2 – 25A (looped) 25 – 90A (direct) 80 – 800A (external CTs)
Power Consumption	10 Watts (max.)
Output Contact Rating SPDT (Form C)	Pilot duty rating: 480VA @ 240VAC General purpose: 10A @ 240VAC 470 VA @ 600 VAC Pilot duty for 777-HVR-P****
Expected Life	
Mechanical	1 x 10^5 operations
Electrical	1 x 10^5 operations at rated load
Accuracy at 25° C (77° F)	
Voltage	±1%
Current	±3%(<100A direct)
GF Current	±15%
Timing	5% ±1 second
Repeatability	
Voltage	±0.5% of nominal voltage
Current	±1% (<100A direct)
Trip Times (Those not shown have user selectable trip times.)	
Ground Fault Trip Delay	Trip time
101%-200% of setpoint	8 seconds ±1 second
201%-300% of setpoint	4 seconds ±1 second
301%-400% of setpoint	3 seconds ±1 second
401% or greater	2 seconds ±1 second
Current Unbalance Trip Times	
% Over Setpoint	Trip time
1%	30 seconds
2%	15 seconds
3%	10 seconds
4%	7.5 seconds
5%	6 seconds
6%	5 seconds
10%	3 seconds
15%	2 seconds
Safety Marks	
UL	UL508, UL1053
CSA	LR46510
CE	IEC 60947-1, IEC 60947-5-1
Standards Passed	
Electrostatic Discharge (ESD)	IEC 1000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity (RFI), Conducted	IEC 1000-4-6, Level 3 10V
Radio Frequency Immunity (RFI), Radiated	IEC 1000-4-3, Level 3 10V/m
Fast Transient Burst	IEC 1000-4-4, Level 3, 3.5 kV input power
Surge	
IEC	1000-4-5 Level 3, 2kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Vibration	IEC 68-2-6, 10-55Hz, 1mm peak-to-peak, 2 hours, 3 axis

Shock	IEC 68-2-27, 30g, 3 axis, 11ms duration, half-sine pulse
MECHANICAL	
Dimensions	3.0"H x 5.1"D x 3.6"W
Terminal Torque	7 in.-lbs.
Enclosure Material	Polycarbonate
Weight	1.2 lbs
Max. Conductor Size Through 777-P	0.65" with insulation
ENVIRONMENTAL	
Temperature Range	Ambient Operating:-40° to 70°C (-40° to 158°F) Ambient Storage: -40° to 80° C (-40° to 176°F)
Pollution Degree	3
Class of Protection	IP20, NEMA 1
Relative Humidity	10–95%, non-condensing per IEC 68-2-3
Programmable Operating Points	**Range**
LV- Low Voltage Threshold	170V – 524V (450V–649V*) (340V–523V****)
HV- High Voltage Threshold	172 – 528V (451V–660V*) (341V–528V****)
VUB- Voltage Unbalance Threshold	2–15% or 999 (disabled)
MULT	1–10, 100, 150, 200, 300, 400, 500, 600, 700, 800
OC- Overcurrent Threshold	(20–100A) ÷ MULT or 80–140% of CT Primary
LP (low power threshold) / PWS (power range setting)	1 = 0.01–0.99kW 5 = 0.01–1.32hp 2 = 1.00–9.95kW 6 = 1.34–13.3hp 3 = 10.0–99.5kW 7 = 13.4–133hp 4 = 100–650kW 8 = 134–871hp
CUB- Current Unbalance Threshold	2–25% or 999 (disabled)
TC- Overcurrent Trip Class ** and Linear Overcurrent Trip Delay	02–30, J02–J30 L00–L60, oFF
RD1- Rapid Cycle Timer	0, 2–500 seconds (standard)
RD2- Restart Delay After All Faults Except Low power (motor cool-down timer)	2–500 minutes (standard)
RD3- Restart Delay After Low power (dry-well recovery timer)	2–500 minutes (standard), A (Automatic)
#RU- Number of Restarts After Low power	0, 1, 2, 3, 4, A (Automatic)
ADDR- RS485 Address	A01– A99
#RF-Number of Restarts After All Faults Except Low power ***	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA
GF- Ground Fault Current Threshold	(3–20A) ÷ MULT or 12–80% of CT Primary or OFF

NOTES: SymCom's Overload Relay can be programmed prior to installation by applying 120VAC between the L1 and L2 terminals (except 575 Volt model).

* 575 volt model.

**If a "J" is displayed in the trip class (TC) setting, jam protection is enabled meaning the 777-P will trip in 2 seconds if the motor exceeds 400% or the OC setting regardless of trip class.

***If "oc" is displayed in the #RF setting, overcurrent and high power and will be included as a normal fault and the relay will automatically restart after RD2 expires, otherwise, a manual reset is required after an overcurrent and high power fault.

**** HVR model

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Littelfuse:

777-KWHP-P2-DEMO3 777-P2-DEMO 777-P2-DEMO-3 777-P2-DEMO-2 777-KWHP-P2-DEMO2