

Sequence of operations:

1) When normal power is applied to L1N and L2N, it flows through the *normally closed contacts* of the 30-50A Transfer relay to the L1Load and L2 Load

At the same time, normal power flows through the time delay module (set for one-two minutes delay) to the "**START**" **relay coil** and when the relay is activated, it opens one pair of *normally closed* "start" **contacts**.

At the same time, it opens a second pair of *normally closed contacts*, preventing power from going to transfer/warmup time delay module (T3) and 30-50A **Transfer relay coil**.

At the same time, normal power also flows through the "COOL DOWN/STOP" time delay module (set for one minute delay) to **Stop relay coil** which closes the normally open stop *contacts*, preventing the generator from starting or stopping it if it's running.

2) When normal power fails, the **Start relay** will drop and close the start **contacts** to start the generator.

At the same time, it will close the second pair of **contacts** which will close the circuit for TRANSFER DELAY (**T3**) time delay module.

At the same time Stop **relay** will drop and open the **contacts** of the stop relay, allowing the generator to start at this point.

3) When the generator starts, the **Overcrank relay** which you need to install inside the generator control box (**coil** of which needs to be connected before the main circuit breaker) will open the **normally closed contacts** and cut the circuit of the generators starter relay **coil** while the generator is running. At the same time, power from the generator will flow from the main circuit breaker to the normally opened "L1Em and L2Em" **contacts** of the **Transfer relay**.

At the same time, power will flow through the closed **second pair of contacts** of the **START relay** and through the transfer time delay module (**T3**) (set for three to five minutes transfer delay to warmup the generator) to the **Transfer relay coil**, causing the load to be switched to emergency power from the generator.

4) When the Normal power is restored, it will flow through the Restart/Start delay module (**T1**) (set for one-two minutes delay to prevent "jumping" back and forth between normal and emergency power if normal power fluctuates) to the **Start relay coil** which will open pair of **Start contacts** and also open a Second pair of **contacts**, interrupting power to the **Transfer relay coil** and causing the load to be transferred to normal power (**L1N and L2N**).

At the same time, normal power will flow through the cool down/stop time delay module (set for one minute to allow generator to cool down) to the *coil* of **Stop relay** which will close the **Stop contacts** and shut down the generator.

BEFORE INITIAL STARTUP, KEEP TWO-POLE SWITCH INSTALLED ON CONTROL CIRCUITS IN OFF POSITION FOR AT LEAST THREE MINUTES TO INITIALIZE TIME DELAYS AND PREVENT UNDESIRED START AND STOP OF THE GENERATOR.

If you intend to use this transfer switch with 120V generator and load, you will need to connect L2N, L2Em, L2 Load to neutral and all relays and time delay modules must be changed to 120V.

For this project, I used the following parts from eBay:

- 1) For time delays, I used delay on Make timers TD69 from SUPCO (\$5.75 each plus shipping)
- 2) For start, stop and overcrank relays, I used Omrom DPDT relay (\$9.40 plus shipping, make sure it's a plug-in relay with the base)
- 3) For transfer relays, I used 50A PBC power relay DPDT (\$19.95 plus shipping)
- 4) For status lights, I used 22mm LED Pilot lights, green for normal power, red for emergency power (\$3.99 each plus shipping)
- 5) For control circuit switch, use Cole Hersee 5592DP/DT toggle switch or any other double-pole switch (\$3.95 plus shipping)