TANJAY HOUSE EMERGENCY POWER SYSTEM

The local electrical Utility, Noreco, has periodic brownouts. Whole day brownouts occur about once a month on weekends and are scheduled maintenance repairs. This may increase in summer for load-shedding.

Random 10 to 15 minute brownout average twice a week, and lately have come to our attention as being deliberate by Noreco in coordination with local law enforcement authorities making raids (cover of darkness) on nefarious elements in the outlying areas. My solution since three years back was an automatic battery and inverter system that powers only selected lights, fans, TV & the modem-computer system. See earlier blogs.

My solution to the longer brownouts is a 5-KW diesel electric-start generator that can carry the entire house including the refrigerators and some air-cons. I installed this 2 months ago.

Critical is the "switch-over" procedure that I designed so even our maids can handle it.

See diagram, instructions and picture below.

EXISTING WIRING DIAGRAM

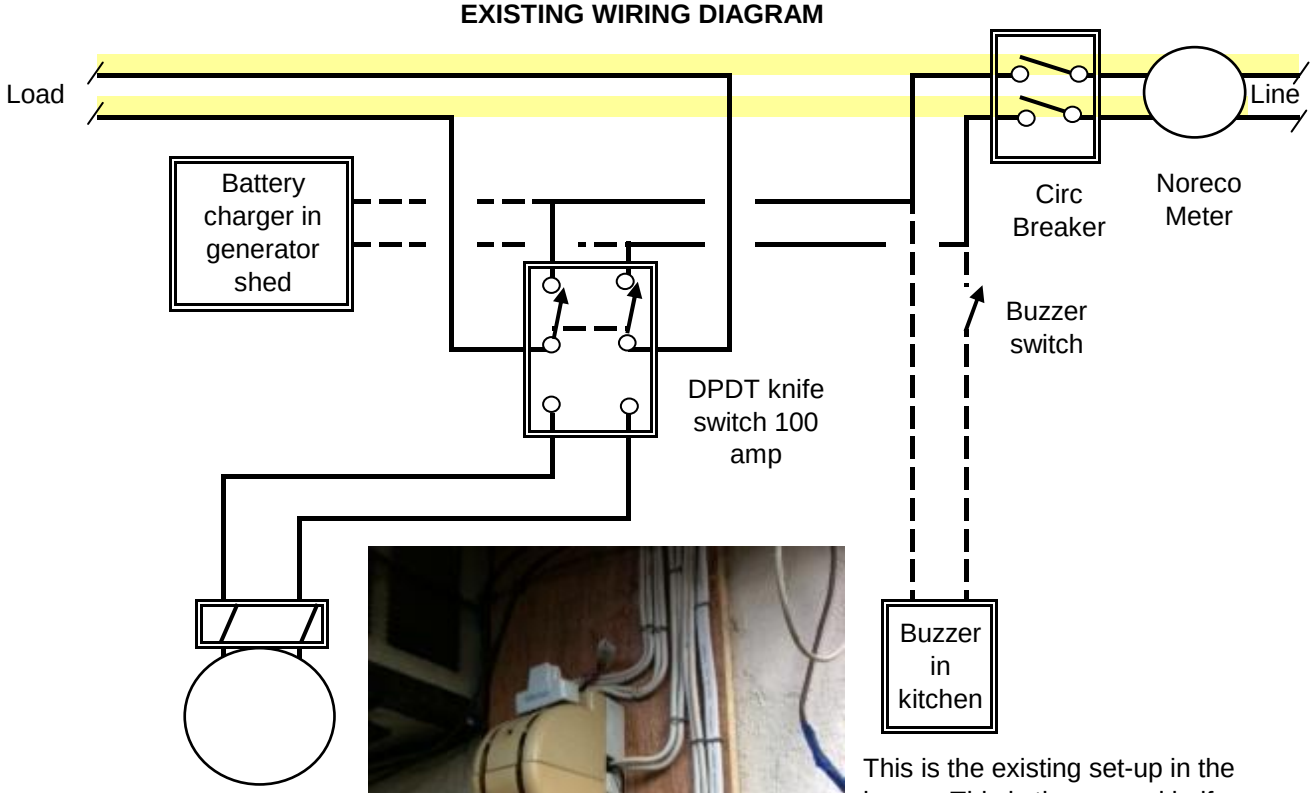


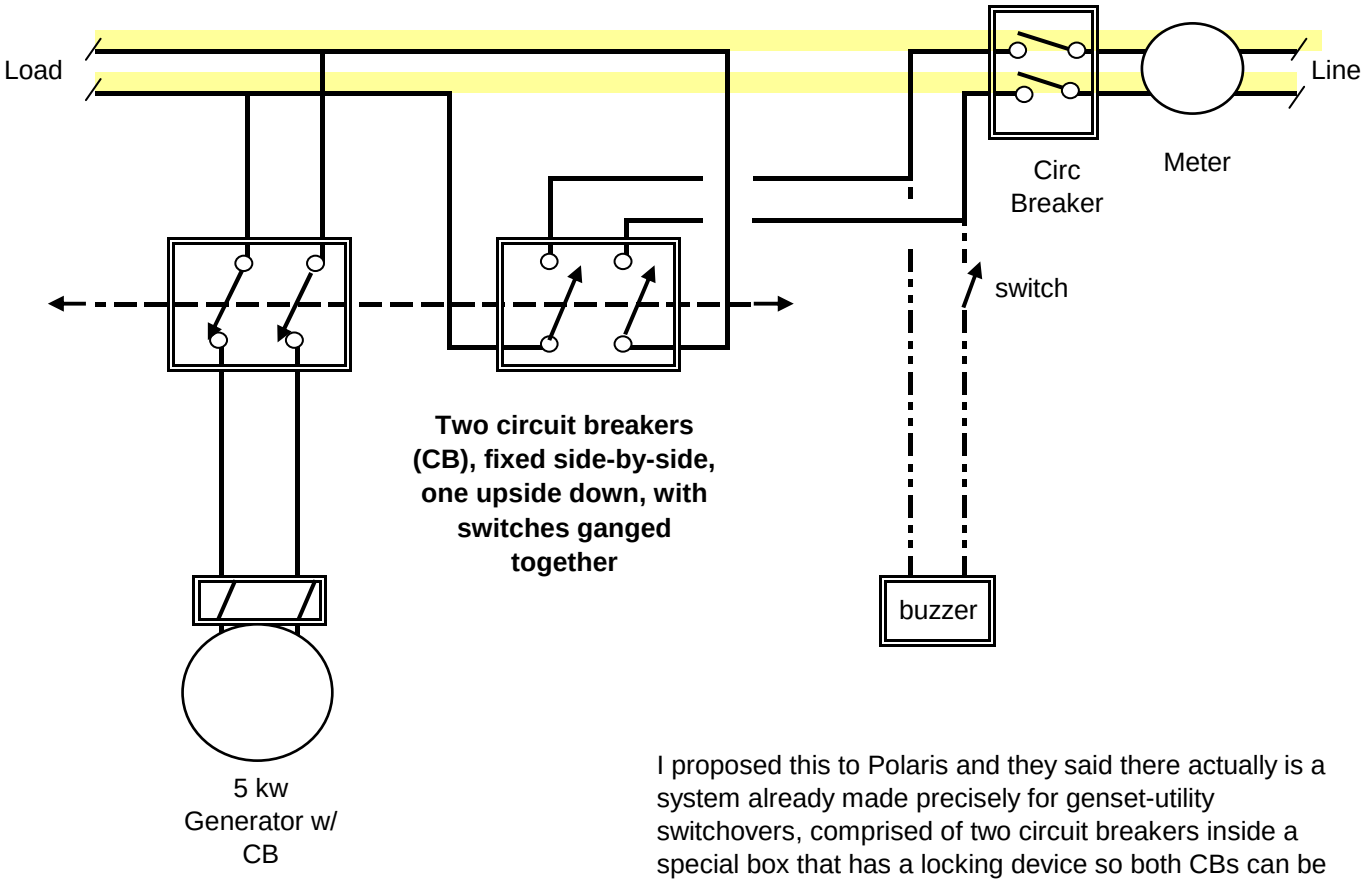
Photo of knife-switch with ammeter hooked on

This is the existing set-up in the house. This is the second knife switch already. The first one burned out due to loose connection between bus bar and lugs. It was a cheapie 100-amp China-made device costing P860. Supplier Polaris replaced it with a similar one but first suggested I use the Japan-made "walang paltos", which was too expensive for me at P3,900.

INSTRUCTIONS:

1. Upon brown out, manually start generator
2. Pull knife-switch to Down position. House is now on generator power.
3 Put buzzer switch in Down position.
4. When brownout ends, buzzer will sound.
5. Put both switches in Up position. Shut off generator.

ALTERNATE WIRING DIAGRAM



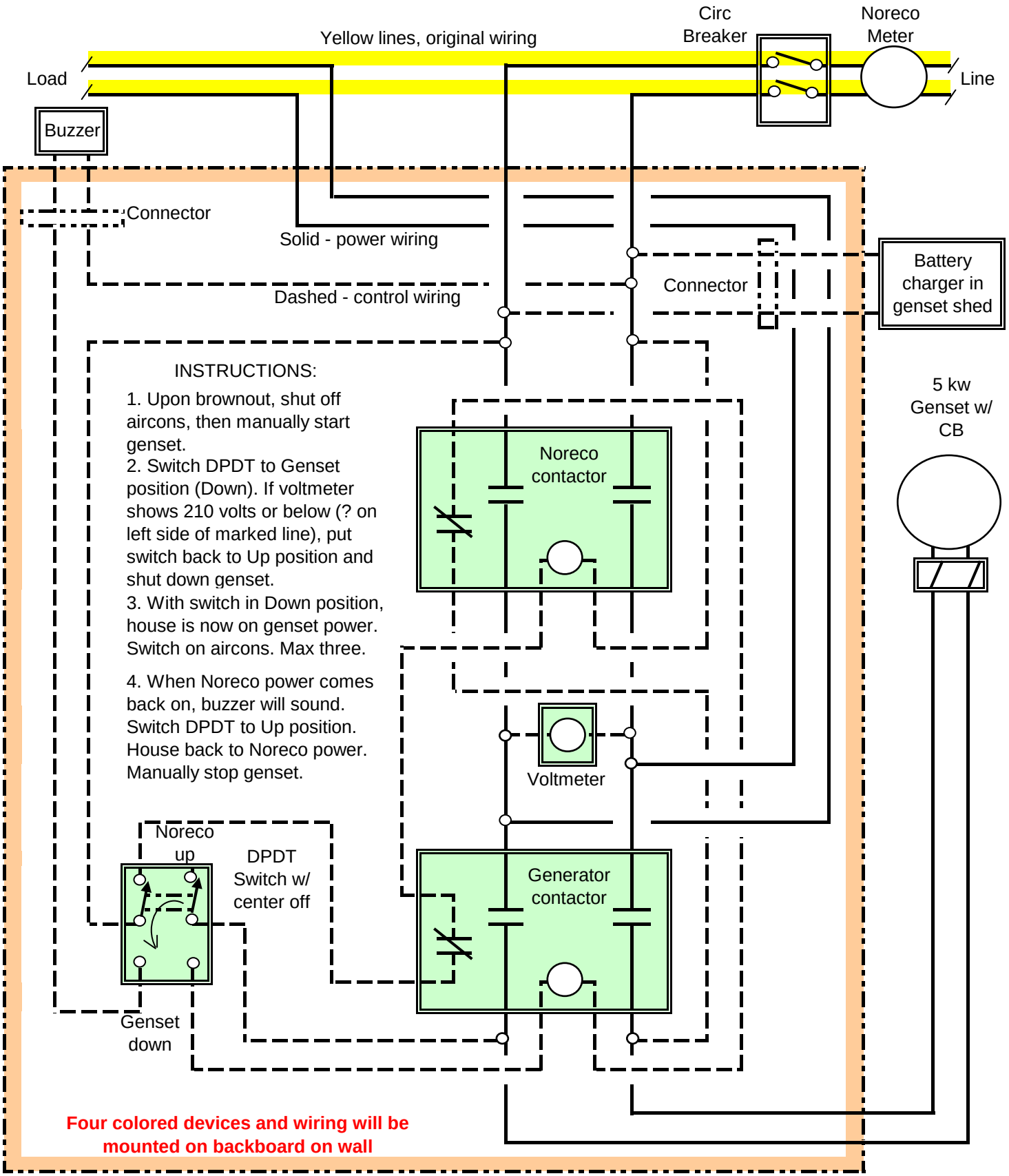
I proposed this to Polaris and they said there actually is a system already made precisely for genset-utility switchovers, comprised of two circuit breakers inside a special box that has a locking device so both CBs can be ON only alternately. But the box alone cost P4,200, and the matching CBs were about P800 each. And switchover is a more complicated procedure of 4 steps.

If I were starting from scratch, I probably would use this design above as CBs are only P470 each, and most reliable. I'd just have to master the ganging of the switches together. But I already have both contactors (about P1,000 each) so the best bet is the contactor design shown on next page. It is most elegant and simplest to use. The only fear I have is that the contactor coil might give way sometime. On the other hand, if the geneset start up could be made fully automatic by a mere pushbutton, then this contactor design is the way to go.

INSTRUCTIONS:

1. Upon brown out, manually start generator
2. Pull CB switch to Down position. House is now on generator power.
3 Put buzzer switch in Down position.
4. When brownout ends, buzzer will sound.
5. Put both switches in Up position. Shut off generator.

PROPOSED EMERGENCY GENERATOR AND WIRING DIAGRAM, TANJAY HOUSE



Danny Gil - 20 Oct 2015

ADDENDA --- 27 Oct 2015

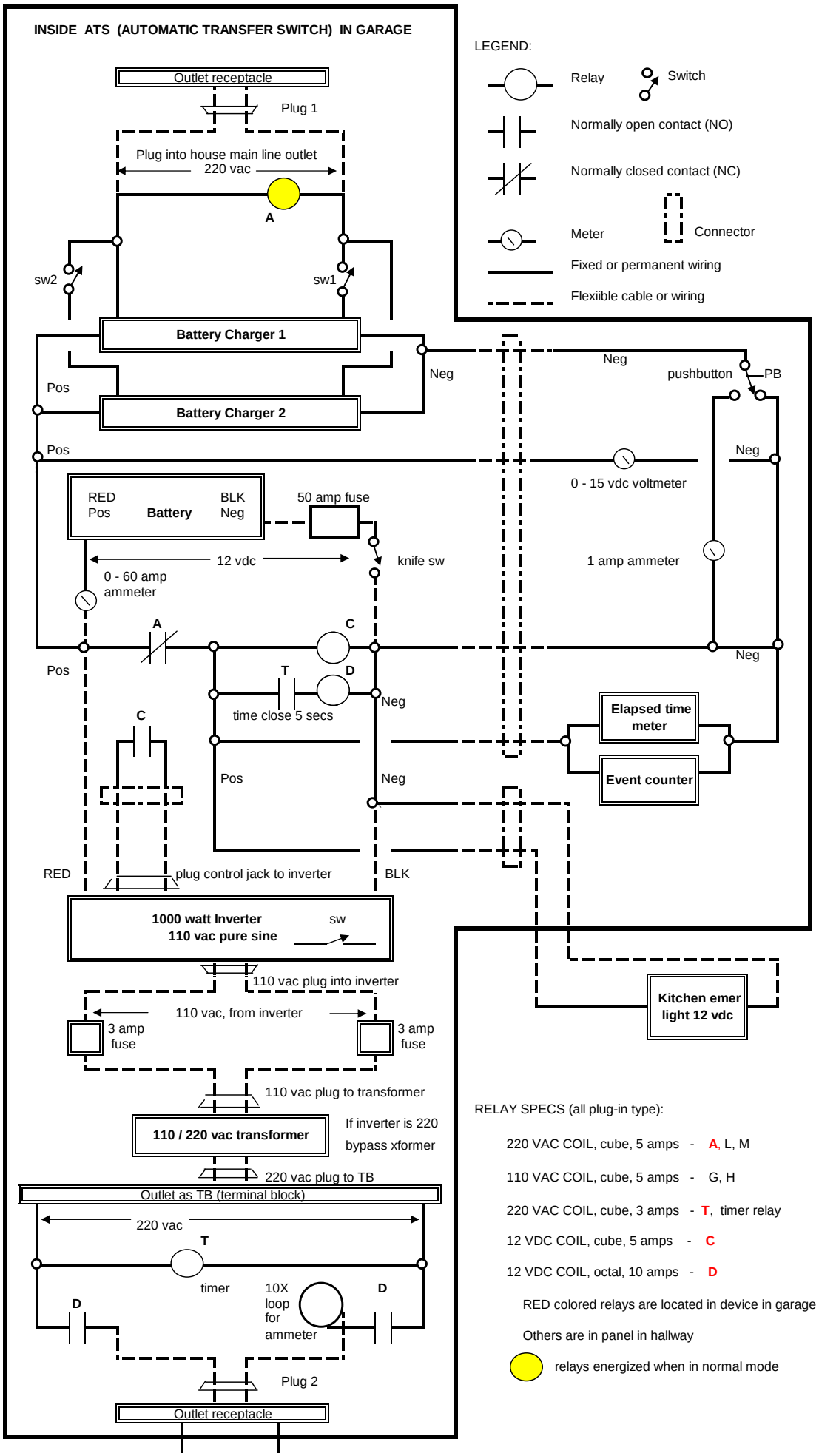
Proposed contactor design has now been implemented. Works perfectly

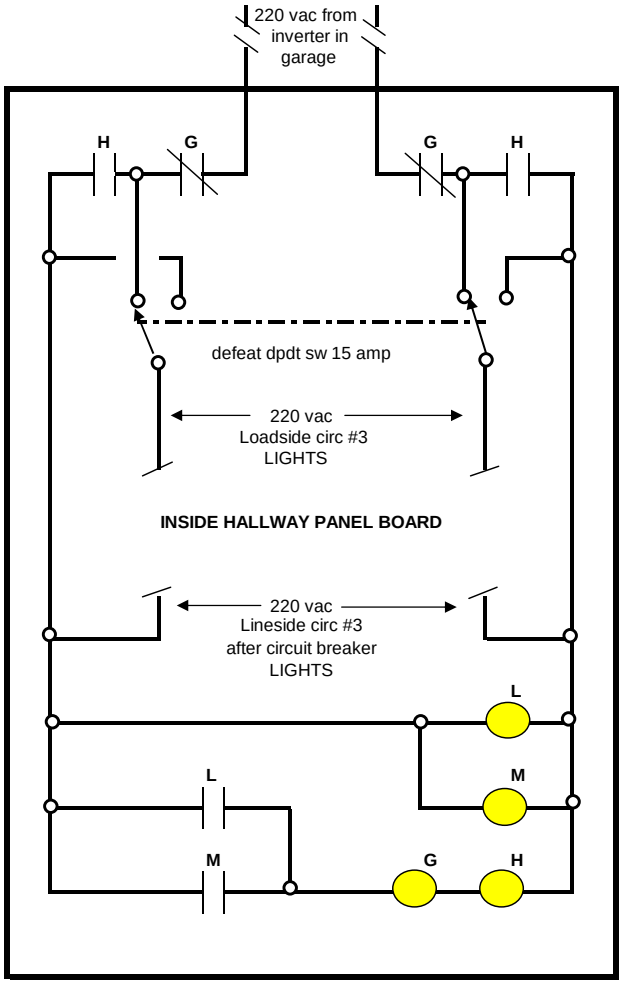
Contactors and wiring are protected by Tupperware box. . With generator, this is solution for long brown-outs

Generator shed. Next project is to try to noise-proof the structure to minimize the racket, by perhaps lining it with styropor and putting a louvered door. Generator is air-cooled.

Inside shed is electric-start diesel generatot (5 kw) on an old tire as base, for additional vibration isolation. . Starting it and switchover is still manual.

For short brown-outs, this is the 3-year old existing solution, a fully automatic battery-inverter transfer switch that carries selected lights, TV, fans & internet modem. Complete circuit and ladder diagram is below.


INSIDE ATS (AUTOMATIC TRANSFER SWITCH) IN GARAGE
Outlet receptacle
Plug 1
Plug into house main line outlet
220 vac
A
sw2
sw1
Battery Charger 1
Battery Charger 2
Pos
Neg
Neg
pushbutton
PB
Pos
Neg
0 - 15 vdc voltmeter
RED
Pos
Battery
BLK
Neg
50 amp fuse
12 vdc
knife sw
1 amp ammeter
0 - 60 amp
ammeter
A
C
Pos
Neg
T
D
time close 5 secs
Neg
C
Elapsed time meter
Event counter
Pos
Neg
RED
plug control jack to inverter
BLK
1000 watt Inverter
110 vac pure sine
sw
110 vac plug into inverter
110 vac, from inverter
3 amp fuse
3 amp fuse
Kitchen emer light 12 vdc
110 vac plug to transformer
110 / 220 vac transformer
If inverter is 220
bypass xformer
220 vac plug to TB
Outlet as TB (terminal block)
220 vac
T
timer
10X loop for ammeter
D
D
Plug 2
Outlet receptacle
LEGEND:
Relay
Switch
Normally open contact (NO)
Normally closed contact (NC)
Meter
Connector
Fixed or permanent wiring
Flexiible cable or wiring
RELAY SPECS (all plug-in type):
220 VAC COIL, cube, 5 amps - A, L, M
110 VAC COIL, cube, 5 amps - G, H
220 VAC COIL, cube, 3 amps - T, timer relay
12 VDC COIL, cube, 5 amps - C
12 VDC COIL, octal, 10 amps - D
RED colored relays are located in device in garage
Others are in panel in hallway
relays energized when in normal mode



FINAL REVISED AS-BUILT LADDER DIAGRAM 6 SEP 2015

SEQUENCE OF OPERATION:

1. In Normal mode, lineside circ #3 of circuit breaker (line 123) supplies power to relays **L** & **M** (lines 127 & 131) thus energizing them to close redundant NO contacts **L** & **M** (lines 132 & 136), which in turn energizes series relays **G** & **H** (line 136) to close NO contact **H** and open NC contact **G** (all on line 102). This provides power to loadside circ #3 (line 116)
2. Circ #3 carries lights, fans and internet modem and laptop. Both relays **G** & **H** must be either off or on, hence they are in series. If one fails, both go off.
3. In the event either relay **L** or **M** fail, **G** & **H** still will function. But if both fail, and/or either **G** or **H fail**, circ #3 will have no power. To restore power, defeat switch should be moved to other position, until such time failed relay(s) are replaced.
4. In the event of brownout, all 4 relays will deenergize, in which case, NC contacts **G** (line 102) will connect to power from inverter (line 95) in garage, which will automatically start up as per sequence below.
5. In Normal mode, relay **A** in garage (line 13) is energized and NC contact **A** (line 43) stays open and none of the relays below are energized.
6. In the event of brownout, relay **A** deenergizes, closing NC contact **A** (line 43) on 12 vdc circuit. This immediately turns on kitchen light, and starts elapsed time meter and event counter. Relay **C** (line 43) also is energized, which starts up inverter via NO contact **C** (line 49). Other instrumentaion and metering allows monitoring of battery charge rate per trickle charger, and battery voltage and inverter draw rate.
7. Inverter ramps up to produce 220 vac (by itself or through a step-up transformer). Timer relay **T** (line 82) energizes, and after 4 seconds, closes NO contact **T** (line 46) which energizes relay **D** (line 82), and this closes NO contacts **D** (line 86) that send 220 power to hallway circuit breaker.
8. When brownout ends, relay **A** is energized and system reverts to Normal mode.