

# **OPERATION AND INSTALLATION GUIDE**

**FOR MODELS:  
SPS-120 & SPP-180**



**GILLETTE GENERATORS**

**AUTOMATIC POWER SYSTEMS**

# TABLE OF CONTENTS

	<u>Page</u>
Introduction, General Cautions, Warnings, & Danger Points -----	3-6
Un-packing and Inspection of your Generator Set -----	6-7
Pre-installation and Plot Planning of your Generator Set -----	7-9
Know your Gillette Generator Set-----	10
Know your Gillette Automatic Control System-----	11
Gaseous Dry Fuel System : Natural Gas (NG)-----	12-13
Gaseous Dry Fuel System : Liquid Propane Gas (LPG) -----	14-15
Prepare for Generator Operation: -----	15-18
Access to Interior, Battery Selection & Installation, Electricians Wiring Installation, & Final Preparations before Start-up	
Additional Hi-Lights of (8) Point Diagnostic Panel -----	18
Changing Fuel from NG to LPG at Job-Site -----	19-20
Initial Start-Up-----	20-21
General Service Tips -----	21-23
Dimensional Print: Models SPS-120 -----	24-25
Dimensional Print: Model SPP-180-----	26-27
Electrical Connection Prints -----	28-29
Service Schedule -----	30
Maintenance Record-----	31

# SAVE THESE INSTRUCTIONS

**THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS THAT MUST BE FOLLOWED DURING INSTALLATION, OPERATION, AND MAINTENANCE OF THIS GENERATOR SET AND ALL ASSOCIATED EQUIPMENT.**

Thoroughly read this operators manual before installing, operating, or servicing your generator set. Safe operation and best performance can be achieved only when this generator is operated and maintained properly.

## INTRODUCTION

Thank you for your purchase of this **SENTRY-PRO** automatic start/stop home standby generator set by GILLETTE GENERATORS, INC. This generator set is intended for use as an alternative source of electric power to operate normally required household electric loads, during a utility power failure.

This generator set has an all weather protected metal enclosure, **MADE EXCLUSIVELY FOR OUTDOOR INSTALLATION**, and will operate on either vapor withdrawal liquid propane gas (LPG) or natural gas (NG). **CAUTION:** This generator does not comply with emergency power as defined in NFPA 70 of National Electric Code.

GILLETTE GENERATORS has made every effort to present a modern, safe generator set that will give you a safe, clean supply of an alternative source. However, because each installation is different, it is impossible for this manual and GILLETTE to know and advise against all possible hazards. The listings, warnings, and cautions in this manual and on tags and decals affixed to the generator set, are therefore, **NOT ALL INCLUSIVE**. If a certain procedure, work method, test method, or operating procedure is used, and is not recommended by GILLETTE, the person or company responsible for the generator modification, must assume all responsibility for safety and correct operation for the operator, service technician, and all others within generator area.

**READ YOUR GENERATOR SET MANUAL, PLUS SEPARATE ENGINE OPERATORS MANUAL AND AUTOMATIC TRANSFER SWITCH MANUAL CAREFULLY. KNOW YOUR EQUIPMENT BEFORE YOU USE IT. CONSIDER ANY POSSIBLE, POTENTIAL HAZARDS, BEFORE OPERATING YOUR GENERATOR SET.**

**CAUTION:** Only current licensed electrical and plumbing contractors should install your home standby generator. All phase of installation must comply with all applicable local and national codes,

industry standards, and regulations.

**THE GILLETTE WARRANTY IS AUTOMATICALLY NULL AND VOID WITHOUT THE USE OF LICENSED ELECTRICIANS AND PLUMBERS, AND SO NOTED ON THE REGISTRATION FORM THAT IS TO BE RETURNED TO GILLETTE GENERATORS, INC.**

## IMPORTANT SAFETY RULES

The safety alert symbol  is used as a signal for possible danger, caution warning, or general hazard.

**DANGER:** Indicating a hazard that, if not avoided, will result in death or serious injury.

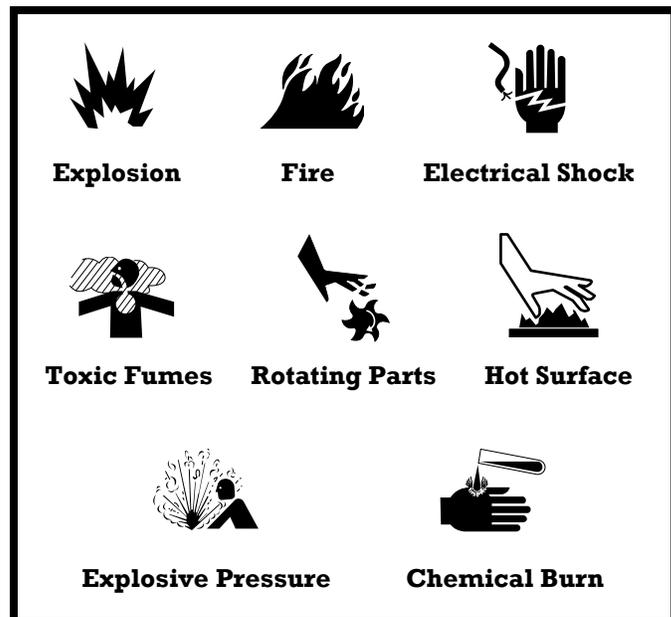
**WARNING:** Indicating a hazard that, if not avoided, could result in a death or serious injury.

**CAUTION:** Indicating a hazard that, if not avoided, might result in minor or moderate injury.

**NOTICE:** Indicating a hazard that, if not avoided, could result in general damage.

Read and understand the above listed safety alert symbols, plus the following symbols that are used through out this manual.

## A LIST OF HAZARD SYMBOLS AND THEIR MEANINGS





## WARNING



The engine exhaust from this product contains chemicals known to the state of California to cause cancer, birth defects, or other reproductive harm.

## NOTICE

- For all safety reasons to the equipment, GILLETTE recommends installation, start-up and service be performed by experienced personnel.
- Sufficient, un-obstructed flow of cooling air is critical for correct generator operation.
- The generator must be installed outdoors, away from an over-hang roof where ice and snow could avalanche onto generator and away from sprinklers that could throw water up into cooling vents of generator.
- Electric load applied to generator should be no more than 75% of generator maximum rating to avoid constant maximum generator load use.
- Generator should not be exposed to excessive and constant moisture, dust, dirt, or corrosive environments.
- If connected loads cause over heating or excessive vibration, an overload condition exists. Remove loads until condition stabilizes.
- Do not sit, step, or load heavy items on generator roof. Added stress can cause breakage.
- Do not start generator with air cleaner, air cleaner cover, or oil dipstick removed, nor with oil drain hose in open drain position.
- Keep a fire extinguisher rated "ABC" close by your generator and be familiar on how to use it. Consult your local fire department, for additional fire prevention ideas.
- Be sure that a positive manual fuel valve be installed in fuel line feeding generator.
- Do not tamper with engine controls, generator is factory adjusted to supply rated voltage and speed.
- Never operate generator when ambient temperature is over 105° F, as electrical insulation system may fail.



## WARNING



## STARTING BATTERY PRECAUTIONS

Starting batteries are not furnished with your generator set, but they are available through your installing contractor. The home standby generator requires a Group 36, 12 VDC fully charged battery with minimum 390 cold cranking amps.

- Released battery electrolyte can burn your skin and eyes and is toxic.
- When electrolyte touches skin, wash it off immediately with water and seek medical attention. When electrolyte contacts eyes, flush thoroughly with water and seek medical attention.
- Spilled electrolyte must be washed away with an acid neutral agent. Use a solution of one pound bicarbonate of soda to one gallon of water, and wash down acid effected areas until evidence of acid foaming reaction has ended.
- A battery provides risk of electric shock. Remove watches, rings, or other metal items when working with batteries. Use tools with insulated handles.
- When disconnecting battery cables, always disconnect the battery charger first, the positive battery cable second, and negative battery cable last. When reconnecting cables, always reconnect the positive battery cable first, then negative cable, and reconnect battery charger last, to reduce possible arcing.
- Discharge body static electricity by touching a grounded metal surface on generator before touching battery.
- Do not dispose of batteries in a fire and do not open or mutilate a battery, as the battery is capable of exploding.
- Lead acid batteries present a risk of fire or explosion because they generate hydrogen gas, within. Do not smoke, nor have flame or spark in a battery area.

 **DANGER** 



**ELECTRICAL HAZARDS**

A generator produces dangerous electric voltages and can cause a fatal electric shock and will cause sudden illness, dizziness, and incoherent actions.

- Despite the safe design of this GILLETTE generator, operating it carelessly, neglecting its normal maintenance, or being ill informed of proper operations can cause possible serious injury or death.
- Avoid contact with bare wires, connection points, etc., while generator is running.
- Do not touch any kind of electrical circuit while standing in water, while barefooted, or while hands or feet are wet or moist.
- Never wear any type of jewelry while working on a generator. Jewelry will conduct electricity, causing electric shock.
- If generator must be serviced while it is running, stand on a dry, insulated surface from ground to reduce shock hazard. Never service a generator in the rain or snow.
- Do not allow unqualified or ill-experienced persons to operate or service generator.
- Remain alert at all times. Never work on a generator when you are physically or mentally fatigued.
- This generator is equipped with a ground terminal. Always complete the grounding path from generator to an external grounding source to prevent possible electric shock.
- In case of electric shock, shut the generator down at once. If this cannot be done, free the victim from source of live electric power. **AVOID ANY DIRECT CONTACT WITH VICTIM OR THE LIVE ELECTRIC POWER.** Use a dry piece of wood, a dry rope, or any other such non-conductive item, to free the victim from source of power. If victim is semi or totally unconscious, apply CPR (cardio-pulmonary resuscitation) and call for medical help immediately.

 **DANGER** 



**CARBON MONOXIDE POISON**

A running engine produces a poisonous gas from its muffler exhaust pipe. This is an odorless, invisible, and colorless poison that cannot easily be detected.

Breathing carbon monoxide will cause fatigue, headache, dizziness, vomiting, fainting, and in prolong conditions, even death.

- Operate generator only outdoors, where adequate ventilation is available. Avoid generator installations under decks, inside garages or carports, in basement, along side home exterior within five feet of home vent, roof overhang vent, a window that can be opened, or other such home invasion points. Use same precautions when installing generator at property line, close to a neighbor's home, or any buildings that house animals.

 **WARNING** 



**POTENTIAL BURN OR FIRE CONDITIONS**



Contact with exhaust muffler and exhaust pipe can result in serious burns.

Exhaust heat may ignite combustibles such as leaves or other such debris that is allowed to accumulate around base of generator where exhaust exits.

- Do not touch hot exhaust or engine parts, and avoid hot exhaust gases.
- Keep at least a three foot clearance on all sides of generator.
- Do not install generator any closer than five feet from any combustibles or buildings with walls having less than one hour, fire rating.
- Code of Federal Regulation (CFR), Title 36, states that generators must have a spark arrestor attached to muffler outlet pipe, to eliminate sparks from engine operation. USDA Forest Service standard #5100-C requires spark arrestor protection when generator is operated within federal parks and forests.
- Generator installation must always comply with local codes, standards, laws, and regulations. Check with your local fire department to learn of these precautions. Keep a fire extinguisher (rated "ABC" by NFPA as appropriate use on generator fires) nearby, at all times. Keep the extinguisher properly charged and become familiar with its use.

 **WARNING** 



**FIRE OR EXPLOSION CONDITIONS**

Gaseous fuels such as natural gas (NG) and liquid propane (LP) are extremely explosive. Make sure the fuel supply system is installed in compliance with local and state fuel codes and regulations. Fuel leaks when ignited, can cause fire and explosion, resulting in harm or possible death.

- Before initial generator start-up, all fuel system lines must be purged and leak tested according to applicable codes by experienced service personnel. No leaks are permitted.
- Do not smoke or allow open flame near generator while servicing fuel system or battery. Lead acid battery will emit a highly explosive hydrogen gas that can be ignited. Leaks in LP or NG system can be ignited. Both are conditions that can cause fire and/or explosion, leading to possible death.
- Do not operate generator if smell of fuel is detected.
- Wipe up any oil spills immediately. Remove any debris that has accumulated inside or around generator base and housing.
- Always maintain a scheduled inspection of entire fuel system and starting battery, looking for leaks or other negative conditions.

 **CAUTION** 

Following is a list of potential events that might result in minor or moderate injury or damage to the generator.

- Never operate generator with oil dipstick partially seated or completely missing.
- Never operate generator without air cleaner and cover in place.
- Always check oil drain hose or radiator drain hose for leaks.
- Generator operating speeds beyond 3750 RPM increase risk of operator injury and engine damage.
- Never insert any objects through generator cooling slots.
- The control panel and wiring access area doors

must be installed at time of operation.

- If connected electrical items overheat, disconnect them immediately.
- Immediately shut down generator if it loses electrical output, shows sparks, smokes, emits flames, vibrates, or shows any other abnormal operation.
- Do not modify generator design.
- Do not modify carburetion system, as it is factory set for C.A.R.B./EPA emissions certification.

This concludes the limited hazard listing. However, GILLETTE cannot possibly anticipate every possible hazard. Therefore, the warnings in this manual, plus the warning tags and decals attached to the generator are not all inclusive. If the generator operator has a different operating method, other than described in this manual, than operator becomes responsible to make sure that different procedure, work method, or operating method is totally safe, against harm and hazards to operators, buildings or environments.

**UNPACKING AND INSPECTION**

After receiving the generator, note that it is mounted on a heavy wood skid base and protected by a multiply cardboard container. While the transportation carrier is still present, note the condition of skid and cardboard box. If noticeable damage is apparent, immediately remove cardboard box and inspect generator for possible freight damage. If damage occurs, make a note of damage on carrier's freight bill and have truck driver sign his name on the freight bill, under "Consignor's memo of loss or damage".

If shipping container shows damage of any kind, and time does not permit container removal for actual generator inspection, while transportation carrier is still available, be sure to:

- Make note of container damage "with possible interior product damage" on carrier's freight bill.
- Have truck driver sign his name on freight bill under "Consignor's Memo of Loss or Damage".

This action will help prove your case against shipper. Always save shipping materials in the event that gen-set must be sent back to factory due to need of extensive repairs.

If damage is noticed after carrier leaves, contact the carrier for "concealed damage" form. **NOTE:** Missing or damaged parts on generator, is not a warranty claim.

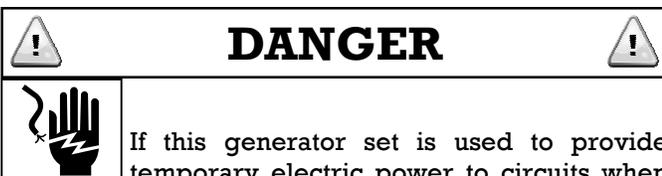
## GENERATOR CONTENTS

The GILLETTE home generator set is supplied with the following components:

- Home generator system within soundproofed all weather metal enclosure (Depending on option choice, this can be an open set or a super-silent enclosure add).
- Residential muffler system for quiet operation.
- Choice of (3) gen-set mounting systems:
  - A) Base direct mounting to concrete slab.
  - B) Base direct mounting to crushed gravel base, secured in ground with ground stakes.
  - C) Base with plastic pad for floating mount on crushed gravel.
- 3/4" NPT female coupling for gas connection.
- Four lifting holes with cover plugs.
- Two locking door keys (NOTE: One key fits all locks.)
- One spare 20 amp fuse. (Located just above fuse holder in control panel wiring area)
- Diagnostic LED panel.
- One owner/operator panel.

**NOTE:** All accessory items will be pre-mounted and wired to generator. If separate automatic transfer switch (ATS) is ordered, it is placed on top of generator shipping box and steel banded in place.

### **AUTOMATIC TRANSFER SWITCH (ATS)**



If this generator set is used to provide temporary electric power to circuits when loss of normal utility power occurs, it is required by National Electric Code, to install an automatic transfer switch (ATS).

The ATS must isolate the home electrical system from the utility electrical distribution system when the home generator is operating (see NEC 700, 701, and 702). Failure to isolate an electrical system with an approved ATS will result in damage to home generator and also **can result in severe injury or death to utility power workers who may receive electrical back-feed shock from the home**

### **generator set.**

The automatic transfer switch is an optional selection and can be used with any model GILLETTE home generator set. All installation procedures, operating cautions, and warranties are responsibility of the separate manufacturers of the ATS.

## PRE-INSTALLATION PLANNING

The beginning installation requires some thought and planning. The following illustrations are meant to familiarize reader with typical installation circumstances and to plan the best installation possible.

First, Federal, State, and local codes may be a factor. The local fire department can be of help on learning these codes. As with all generators, your generator must be installed in accordance with current NFPA-37 and NFPA-70 standards. Contact your local electrical inspector or city hall to insure you are aware of all codes and regulations. Contact your natural gas supplier to verify that increased BTU gas demand can be handled with existing NG gas meter. The same is true for LPG fueled generators.

The most common fuel mistakes are:

- A) Not a dedicated fuel line from fuel source to generator, on either LPG or Natural Gas fuel.
- B) Not having a dedicated primary fuel regulator for only the generator, while using LPG tank.
- C) Wrong fuel pressures. (See fuel pressure information on page 14)
- D) Not understanding that fuel pipe diameter must increase in direct proportion to fuel line length. (See gas charts on page 12 for further details)
- E) Wrong primary regulator. This is a common problem, using an existing regulator on a LPG Tank is typically too small for the supply needed for a generator.

Locate the generator site. It should be as close as possible to the natural gas meter, and as close as possible to the home electrical distribution panel.

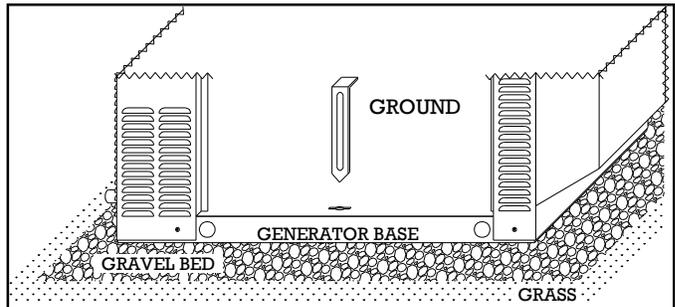
Determine the type of generator anchoring. There are three types:

- 1) **ACCEPTABLE:** Generator is mounted on a composite (plastic) pad, placed on a bed of pea gravel or crushed stone. It "floats" in place. (See Illustration #1)
- 2) **ACCEPTABLE:** Generator is mounted directly on a bed of pea gravel or crushed stone (no composite

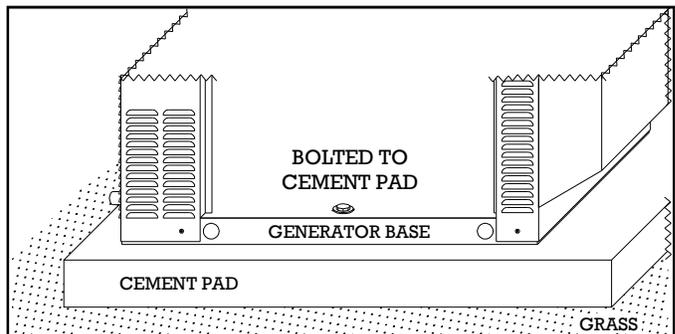
3) **PREFERRED:** Generator is mounted directly on a concrete slab, 4 inches thick, extending 6 inches beyond generator perimeter, and bolted in place. This method is for those locals with “high wind” considerations. (See Illustration #3)

If gravel bed is chosen, its perimeter must be eight inches larger than generator base. Dig a rectangular area six inches deep, cover with landscape cloth (so drainage can take place) and fill with pea gravel or crushed stone. Final gravel level must be two to three inches higher than original level to ensure water run-off away from generator. A normal plastic landscape border can be used between grass and gravel area to provide a more attractive installation.

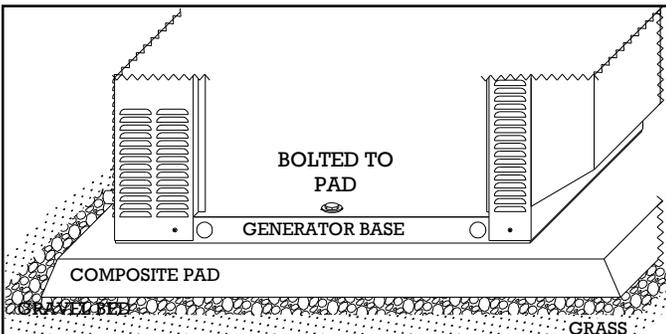
Compact and level the stone. Place generator on stone using either the “composite” pad (optional equipment) or place aluminum generator base directly on gravel, using ground stakes for a fixed installation.



**ILLUSTRATION #2:** Generator is placed on top of gravel bed. The ground stakes are driven through the slots in generator base, to hold it in place on gravel bed. **CAUTION: Make sure there is no underground electric wires, gas lines, sprinkler lines, or any other vulnerable items, directly in the path of these two ground stakes.**



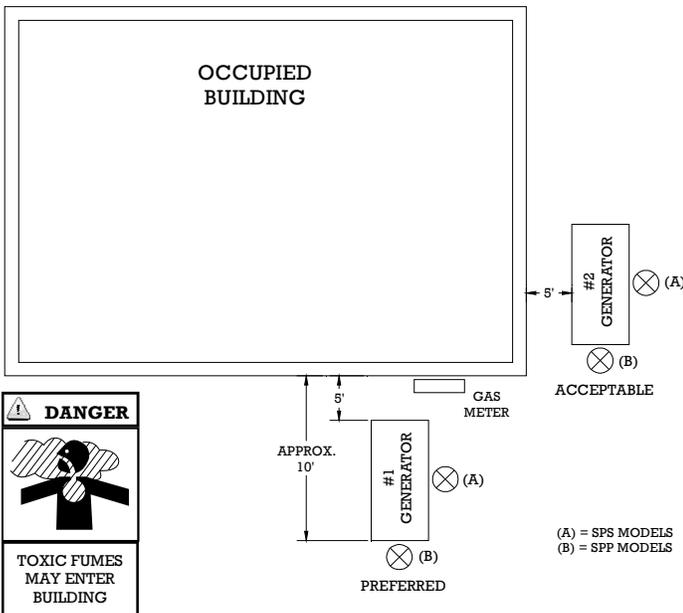
**ILLUSTRATION #3:** Generator base is bolted directly to a poured concrete slab (provided by others). **Notice** that all three illustrations provide bolting or staking methods that are always secured from inside the generator housing, behind locked doors. This is designed to deter theft of your home standby generator set.



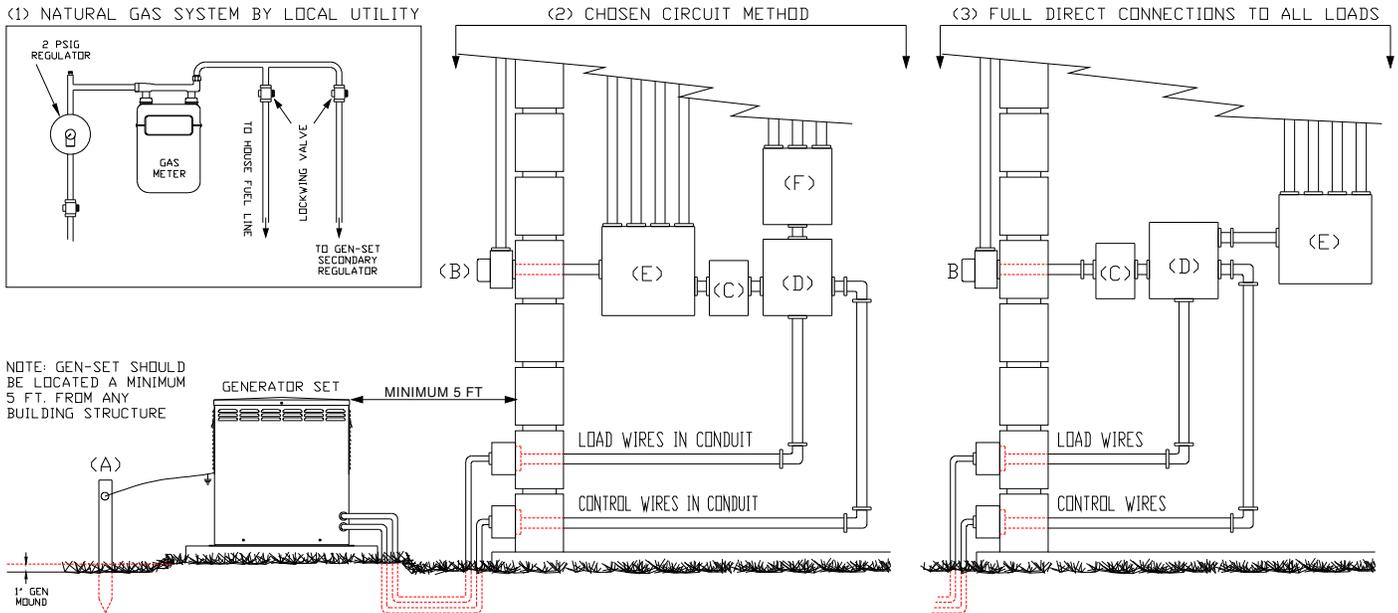
**ILLUSTRATION #1:** Composite pad bolted to generator base and placed over a bed of crushed stone or gravel.

## SUGGESTIONS FOR GENERATOR LOCATIONS

- 1) Always install your generator within 20 feet from natural gas meter. Further distances may cause “starving” of fuel from generator engine.
- 2) Exhaust end ⊗ must always be turned away or parallel with building and minimum 5 feet away.
- 3) Exhaust end ⊗ is not to be directed towards play areas, patios, under canopies or overhangs, or where people or animals congregate.
- 4) Do not install generator under deck of house.
- 5) Furnace and other air intakes should be minimum 10 feet from exhaust end ⊗
- 6) Windows and doors on adjacent walls, to be closed at all times, during generator operation.
- 7) Nearest roof overhang vent should be 10 feet from exhaust end ⊗
- 8) If electrical distribution center panel is far away from gas meter, locate generator close to gas meter. Installation costs are lower, if electric wiring is oversized for long distances, to utility point rather than oversized fuel lines to gas meter.



# TYPICAL EMERGENCY GENERATOR INSTALLATION PRACTICES



(1) Drawing shows a typical gas utility approach on how to bring natural gas fuel to the gen-set. The fuel from utility is connected by dedicated fuel line, to the installed 4 ounce, 7" water column secondary regulator, inside gen-set housing. **CAUTION:** Consult your natural gas supplier about your meter size. Most meters must be replaced with a larger BTU size, due to larger demand of BTU's from generator. The same procedure is also used with LPG: a 6 ounce, 11" water column, dedicated primary regulator is placed at fuel outlet of "vapor withdrawal" LPG tank. Fuel is piped directly to LPG 6 ounce, 11" water column secondary regulator, inside gen-set housing.

(2) Drawing shows chosen circuit connection: Load circuits are selected based on importance of needs, plus the starting and running amps. All connected loads should not exceed the amp size of generator. The auto transfer switch should equal or exceed total amp load of (F), smaller distribution panel.

When "Chosen" load is matched to gen-set amp size, the gen-set is never overloaded.

(3) Drawing shows full load connection: The gen-set output is applied to the entire load of the utility electrical distribution panel. For this installation, the auto transfer switch, must be of same amp size as utility power. This is the easiest, lower priced electrical installation, but subject to gen-set shutdown whenever load amps exceed gen-set amp capacity.

(A) Drive a corrosion resistant steel stake, into ground and attach a 10 gauge stranded copper wire from stake to ground lug on outside of gen-set. This bleeds off any potential lightning strike and any static electricity, which can occur on metal parts of ungrounded generators. **For a non-separately derived system (where normal electric utility power is in building and gen-set is a back-up emergency power supply), the gen-set neutral must connect only to utility power neutral and not to the ground stake.** The best place for these two neutrals to meet (generator and utility neutral), is in the automatic transfer switch. However, still connect gen-set mechanical ground to the stake. All factory gen-sets, have a "floating neutral" ready to be connected to utility neutral, by installer.

(B) Normal utility power meter and power inlet to panel.

(C) Safety disconnect switch, sized to ATS amp rating.

(D) Auto transfer switch with UL-1008 label and NEMA-1 housing for inside installation. Consult factory for NEMA-3R, outside installations.

(E) Original electric utility distribution panel.

(F) Separate, smaller distribution panel, with chosen circuit loads.

## HELPFUL INSTALLATION TIPS

- Mound the gen-set location upwards at least 1 inch from normal terrain, for proper drainage. Fill an area 6 inches larger than gen-set mounting pad perimeter and 3 inches deep, with crushed gravel. This provides flexible settling of gen-set and mounting pad. **NOTE:** Specific locales may require a cement pad installation.

- Gen-set must be located minimum 5 feet from all structures. This clearance will provide for ample service room.

- Watch out for roof overhangs. Snow, ice, or rain should not be allowed to accumulate on roof, and cascade onto gen-set roof.

- Check prevailing wind direction. Winds should blow toward the engine end of housing, which is the normal cool air intake end. The opposite end is hot air discharge.

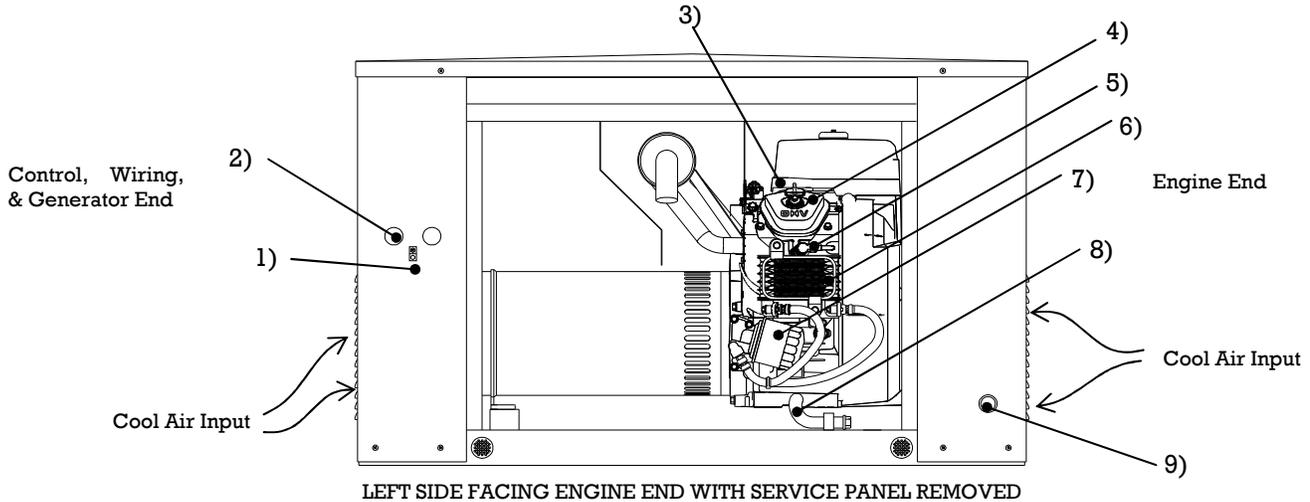
- Engine exhaust from generator end is hot and dangerous. Exhaust must be allowed to dissipate into free air zone, with no obstructions (air conditioner condenser, buildings, plants, trees, living quarters, etc.) within 5 feet.

- Control wires and load wires should be made in (2) **different circuit runs to auto transfer switch**, to avoid any possible magnetic interference between the two. These lines should be underground for best protection.

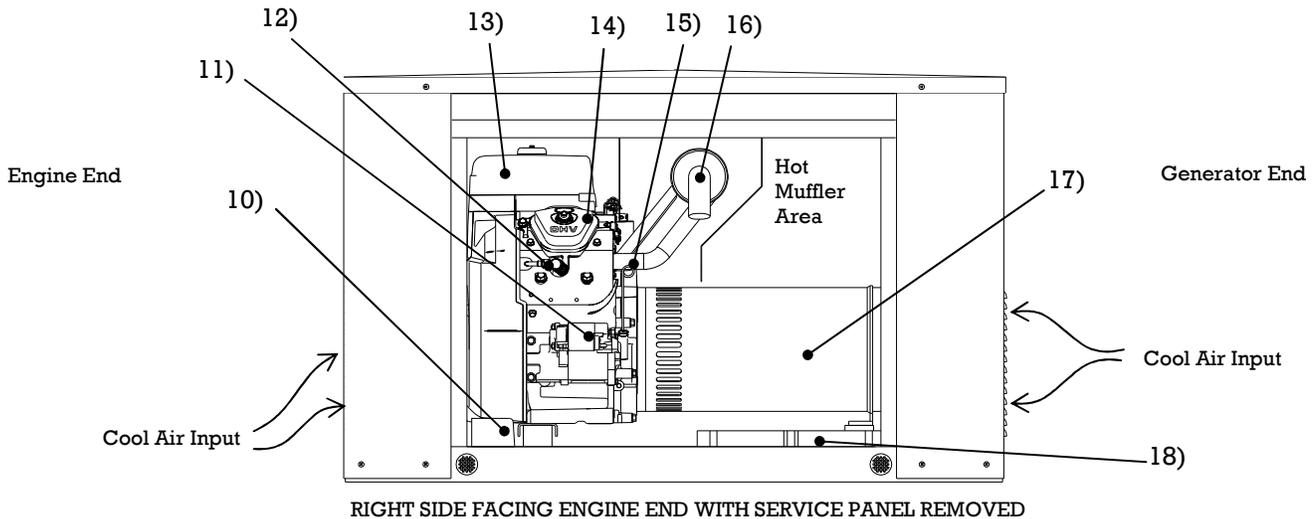
- Don't allow snow, ice, or debris to accumulate around and on gen-set. If possible, plant a short hedge or a series of evergreens, as a protective "wall", 5 feet from gen-set on windward (engine) side, to stop such accumulation, and still

# KNOW YOUR GILLETTE HOME GENERATOR

Compare the following illustrations and individual component locations, with your actual GILLETTE home generator system. This will help familiarize yourself with the entire generator set.



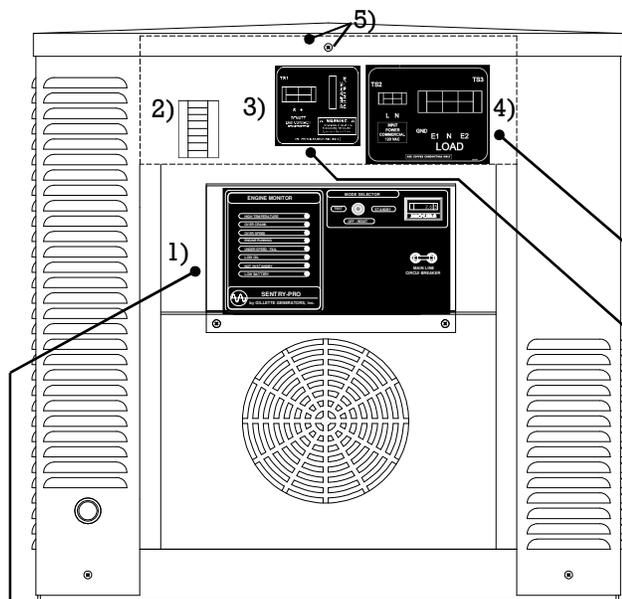
- |   |   |
|---|---|
| 1) Ground Wire to Ground Stake (Electrician)    | 6) Oil cooler.  |
| 2) Two Electrical Knockouts (Electrician)       | 7) Oil filter (Replace every 200 hours).  |
| 3) Oil fill.                                    | 8) Oil drain with flexible drain hose. <b>NOTE:</b> Change oil after every 50 hours of use. |
| 4) Engine.                                      | 9) Dry fuel gas input (Always use flexible fuel line).                                      |
| 5) Spark plug (Replace every 300 hours of use). |   |



- |   |  |
|---|--|
| 10) 12 VDC battery charger. Installer must connect 120 volt, 1 phase utility power to this charger. | 15) Oil dipstick.  |
| 11) 12 VDC engine starter motor.  | 16) Muffler. <b>CAUTION:</b> Hot to the touch when in use.       |
| 12) Spark plug (replace every 300 hours of use).  | 17) Generator.   |
| 13) Air cleaner element (Clean every 50 hours, replace at 300 hours).                               | 18) Battery tray (see page 16 for installation and caution use). |

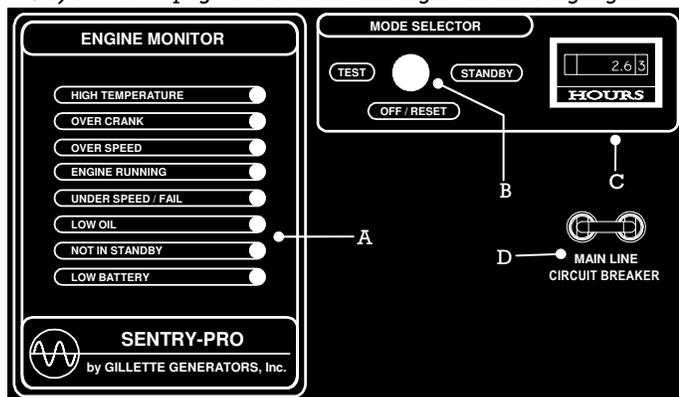
# KNOW YOUR SYSTEM CONTROL PANEL

Compare the illustration with actual GILLETTE home generator system.



Control and connection points on generator end, shown with safety cover removed and access door opened.

1) Note: See page 18 for additional engine monitor highlights



The control panel is the central point for all automatic controls and wiring points. This panel is made, so that repair person can easily remove it from control box, for easier service.

Following is a listing of parts and their descriptions, as found on this panel:

**A) Engine Monitor:** (8) Annunciations consisting of:

**High Temperature LED:** This is a sensor that will shut gen-set down, if certain engine temp-limits are exceeded. At this high temp point, LED lights, until high temp is reduced.

**Over Crank:** Engine will crank for 10 seconds, rest for 10 seconds, and continue for a total of (3) cycle cranks, before shutdown and over crank LED turns on.

**Over Speed:** If speed of gen-set exceeds 300 VAC (69 HZ), the gen-set shuts down and over speed LED will constantly flash while engine is cranking, and when over speed fault occurs.

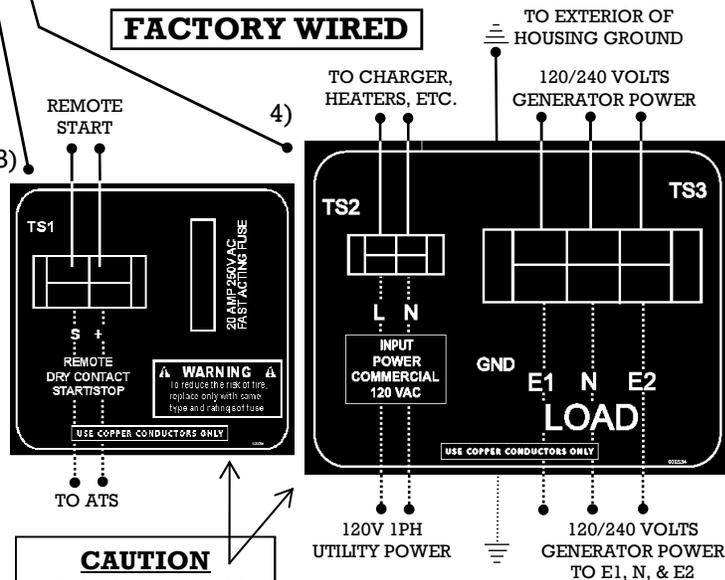
**Engine Running:** Engine is running normally and system is functioning as it should. LED light will constantly flash during cranking and remain steady while engine is running.

- 1) 8 Point, LED diagnostic display panel.
- 2) #S-2 optional alarm system interface for fault detection.
- 3) TS1: Electrician's connection terminals for 2-Point Remote Start/Stop Dry Contact Terminals.
- 4) TS2: Electrician's 120 VAC Utility Power connection terminals for powering optional equipment i.e. battery charger, oil heater, battery blanket, etc...

TS3: Electrician's connection terminals for 120/240 VAC Generator Output Power.

5) Dotted line indicates cover shield protecting unauthorized person's from entering high voltage area. Licensed electrician is required to remove hex head bolt (5), slide dotted line panel down by approx. 2" and pull straight out, for full wiring access. Note: 20 amp fuse is removed from fuse holder and taped to upper part of panel #3 for electricians installation

## FACTORY WIRED



**CAUTION**  
A bolted cover shields these three wiring connection points and should be accessed only by licensed electricians. (see page 16)

## INSTALLER WIRED

**Under Speed/Fail:** If engine should reduce in speed below 53 HZ, the system will shut down and LED turns on.

**Low Oil:** If engine oil pressure becomes too low, the engine will shutdown and LED light turns on.

**Not in Standby:** When mode selector switch is in the "Test" position, the "Not in Standby" LED remains on, to remind operator that gen-set is not in "Standby" position. When the setup and testing procedures are finished, remember to place mode switch in "Standby" position.

**Low Battery:** If 12 VDC starting battery drops below 11 VDC, LED turns on and remains until battery voltage is corrected.

**B) Mode Selector Switch:** Control switch for manual testing and standby (auto) position. After each fault condition happens and fault is repaired, mode switch must be placed in "OFF/RESET" position for 15 seconds, to reset the microprocessor control board, before returning to normal operation.

**C) Hour Meter:** Total hours of use and is used as service reminder.

**D) Main Line Circuit Breaker:** UL-146 circuit breaker will trip open upon short circuits, or overloads.

# THE GASEOUS DRY FUEL SYSTEM INSTALLATION

## ! WARNING !



**Propane (LPG) and natural gas (NG) is extremely flammable and explosive.**



**Fire or explosion can cause serious burns or death.**

LPG is heavier than air and will settle in low areas. NG is lighter than air and will collect in high areas. The slightest spark can ignite either fuel and can cause fire or explosion.

The following LPG and NG fuel information is provided to assist the fuel installer. In no way should this information be deemed to be all-inclusive or to conflict with local dry fuel codes. Consult your local fuel supplier or Fire Marshall for final answers on proper local codes and installations.

This home standby generator set leaves the factory set up for natural gas (NG) fuel. This generator can be ordered with liquid petroleum gas (LP) from the factory or it can easily be converted at the jobsite with no special tools or test equipment.

All piping and layout planning must comply with NFPA 54 (specifications for dry fuel equipment). Before fuel pipe installation begins, installer should consult local fuel supplier and the local Fire Marshall to learn proper codes/regulations for a safe installation.

Special consideration should be given where local conditions include flooding, tornados, hurricanes, earthquakes, or unstable ground for the flexibility and strength of fuel pipe and pipe connections. Use an approved gas pipe sealant on all threaded pipe joints.

All installed gas fuel lines must be purged and leak tested prior to initial start-up in accordance to local codes, standards, and regulations.

A minimum of (1) approved manual shut-off gas valve must be installed in the gas line leading to the

## ! WARNING !



generator. This valve must be easily accessible.

A furnished, flexible fuel line is to be installed between stationary fuel supply pipe and fuel inlet pipe to generator. Always install this flexible line in a horizontal, straight manner. If it is installed with a bend of any degree, it may eventually crack at

the bend and cause a gas leak, causing a possible fire hazard.

### NATURAL GAS FUEL

Required natural gas fuel pressure must be 6 to 8 inches water column (4 to 4½ ounces) and minimum 1000 BTU rating per cubic foot/hour

NATURAL GAS CONSUMPTION AT FULL LOAD			
Gen. Model	Gen. KW	Cubic Ft./Hr	BTU/Hr. *
SPS-120	12.0	195	195,000
SPP-180	16.0	280	280,000

**Figure 1**

\* BTU Values based on 1000 BTU's per cubic foot. Gas supplier may need to know Nat. Gas consumption at full load, in measurements of cubic feet/hour or BTU/hour

**Figure 2**

NATURAL GAS FUEL LINE MAXIMUM DIAMETERS AND LENGTHS										
Pipe Length In Feet	Allowed Distance From NG Meter to Gen-Set									
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	
Pipe Diameter In Inches	¾	350	249	200	171	152	138	---	---	---
	1	600	415	342	288	251	224	204	187	---
	1¼	1265	890	740	628	553	497	455	421	350

Cubic feet of natural gas that can safely be carried in its matching pipe diameter.

**CAUTION:** It is critically important to understand that as a specific fuel line pipe diameter is extended in length, its ability to carry the volume of gas, diminishes in direct proportion.

**EXAMPLE 1:** A model SPS-120, 11 KW generator is to be installed 35 feet from gas meter. In reading the charts: figure 1 chart shows this model to require 195 cubic feet per hour (or 195,000 BTU/HR) gas volume to be delivered to generator. Figure 2 chart shows the required 195 cubic feet/hour can only be delivered up to 30 feet, with ¾" diameter pipe, or up to 50 feet with a 1" diameter pipe, or up to 90 feet with a 1¼" diameter pipe. **This means the original planned distance of 35 feet, must be shortened to 30 feet with ¾" diameter pipe, or use 1" diameter pipe at the 35 feet distance.**

**EXAMPLE 2:** A model SPP-180, 16 KW generator is to be installed 50 feet from gas meter. In reading the charts, Fig. 1 shows this model to require 280 cubic feet/hour (or 280,000 BTU/hr) gas volume to be delivered to generator. Figure 2 chart show this required 280 cu.ft. can not be delivered with a ¾" or 1" pipe. Only a 1¼" diameter pipe can safely deliver the 280 cu.ft. gas requirement, over a 50 foot distance.

**INSTALLER'S RESPONSIBILITY:** Use **Figure 1** chart to learn cubic feet/hour value of generator to be installed. Use **Figure 2** chart to learn minimum pipe size diameter and maximum distance from gas meter, to insure sufficient fuel volume from natural gas meter to generator set.

### CRITICAL POINTS FOR A PROPER NATURAL GAS INSTALLATION

⚠ Before natural gas fuel line plans are made, call your natural gas supplier, give information on the amount of cubic feet/hour and the BTU's/hour that generator will use, and ask if natural gas meter and primary regulator, is adequate for your natural gas generator. Natural gas companies have different meters for increasing BTU gas demands.

⚠ Check the natural gas primary regulator, connected at natural gas meter output. The correct primary regulator is set at 6 to 8 inches water column (4 to 4½ ounces pressure or 0.19 to 0.26 PSI). The existing primary regulator (for other gas appliances) may be too small to run your gas driven generator.

⚠ **A dedicated natural gas fuel line and primary gas regulator (if required) is mandatory for proper operation.**

⚠ A flexible natural gas fuel line is furnished for installation between utility gas line and generator for input.

**CAUTION:** Make sure this flexible fuel line is installed in horizontal position without bends. A bend of any kind in this flexible line could lead to an eventual crack in the bend, causing a possible leak. See Figure 3 for a recommended installation.

⚠ Make sure fuel pipe installation and connection at generator includes an on/off manual gas valve.

⚠ All new installations, plus any future repair or troubleshooting procedures must include a natural gas manometer test. This test should be conducted after all other natural gas appliances have been turned on. After all appliances are running, start the generator. If manometer stays within 6 to 7 inches water column with full load applied to a proper

running generator, it's a good installation. (See Figure 3)

If manometer reading falls below 5 inches water column while generator engine is cranking, or running, it may indicate the gas meter or primary regulator is too small, or the fuel pressure from gas supplier is inadequate. Any of these three problems will cause a fault in proper generator operation.

If manometer reading stays within the 6 to 7 inches water column, but generator engine still will not start, or it runs erratic, it may indicate insufficient fuel volume due to long fuel line runs or fuel pipe diameter is too small. Check calculations of chart in

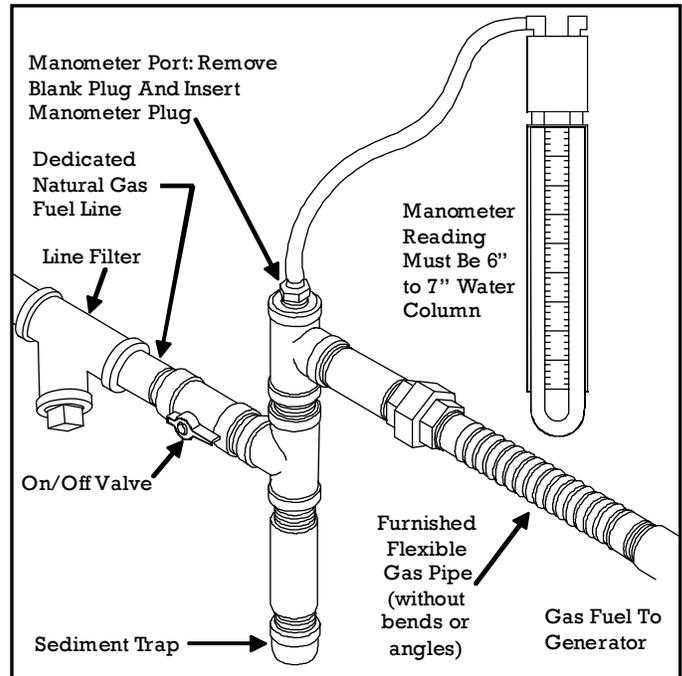


Figure 1 & 2.

Figure 3

**NOTE:** After completion of all gas tests, remove manometer and replace blank plug, using fresh pipe sealant.

⚠ For additional precautions, a manual fuel shut-off valve should also be installed inside the building, for those locations with inside gas meters.

⚠ Climates that have snow and ice build-up, along with sub-zero temperatures, should have gas fuel piping protection against freezing. The generator end of the hard piping installation should include a sediment trap to drain any condensation, and a line filter. (See Figure 3)

⚠ Best installations happen when electric utility meter and gas meter are close together, as it results in short runs for both electric wires and fuel lines. When these two utilities are far apart, always choose to locate gen-set close to the gas meter, as installation

## LPG GAS FUEL

This home generator system has been set up at the factory for natural gas fuel, unless it has been specifically ordered for vapor withdrawal liquid propane gas (LPG). This installation/operation guide will explain the factory LPG system. Additional information is available upon request for field conversion from one fuel to the other.

LPG fuel is typically at farms or remote areas where there is no natural gas fuel.

LPG must be a vapor withdrawal system (the generator **will not work on liquid withdrawal systems**). Proper LPG is clean and free of moisture or particulate matter. It consists of a propane HD5 grade with minimum 2500 BTU's per cubic foot energy rating. A typical blend is 5% propylene and butane plus a minimum 90% propane.

**Required LPG vapor withdrawal fuel pressure is 11-14 inches water column at (6-6½ ounces) 2500 BTU's per cubic feet.**

Figure 4

<b>LPG FUEL CONSUMPTION AT FULL LOAD</b>			
Gen. Model	Gen. KW	Cubic Ft./Hr	BTU/Hr. *
SPS-120	12.0	87	220,000
SPP-180	18.0	135	337,500

\*BTU VALUES BASED ON 2500 BTU'S PER CUBIC FEET GAS SUPPLIER MAY NEED TO KNOW LPG CONSUMPTION AT FULL LOAD, IN MEASUREMENTS OF CUBIC FT./HOUR OR BTU/HOUR.

Figure 5

<b>LPG FUEL LINE MAXIMUM DIAMETERS &amp; LENGTHS</b>										
Pipe Length In Feet		Allowed Distance From LPG Tank to Gen-Set								
		0- 10	11- 20	21- 30	31- 40	41- 50	51- 60	61- 70	71- 80	81- 90
Pipe Diameter In Inches	½	110	76	61	---	---	---	---	---	---
	¾	227	157	126	107	95	87	78	70	62
	1	428	293	236	201	179	164	151	138	129
	1¼	807	523	445	379	338	309	285	255	242

Cubic feet of LPG (vapor withdrawal) that can safely be carried in it's matching pipe diameter.

**CAUTION:** It is critically important to understand, that as a specific fuel line pipe diameter is extended in length, its ability to carry the volume of gas, diminishes in direct proportion.

**EXAMPLE 1:** In reading the charts: A model SPS-120, 12 KW generator is to be installed 50 feet from LPG fuel tank. Figure 4 chart shows this model to require 87 cubic feet per hour, gas volume to be delivered to generator. Figure 5 chart shows the required 87 cubic feet can be delivered over a 50 foot distance with ¾" diameter fuel pipe.

**EXAMPLE 2:** A model SPP-180, 18 KW generator set is to be installed 70 feet from LPG tank. In reading the charts, fig. 4 chart show this model to require 135 cu.ft./hr. gas volume to be delivered to generator. Fig. 5 chart shows the required 135 cu.ft. can be delivered over a 50 ft. distance with a 1" diameter fuel pipe.

**INSTALLER'S RESPONSIBILITY:** Use Figure 4 chart to learn cubic feet/hour value of generator to be installed. Use Figure 5 chart to learn minimum pipe size diameter and maximum distance from LPG tank to insure sufficient fuel volume from LPG tank to generator.

### **CRITICAL POINTS FOR A PROPER LPG GAS INSTALLATION**

Before LPG fuel line plans are made, call your LPG supplier, give information on the amount of cubic feet/hour (Figure 4) and BTU's/hour (Figure 5) that your generator will use, and ask about local codes and regulations concerning LPG fuel connected to generators.

Only LPG vapor withdrawal (not LPG liquid withdrawal) will work on these generators. Make sure the LPG tank has the correct fuel.

LPG fuel pressure must be 6 ounce pressure (11-14 inches water column) delivered to the generator.

Often new LPG tanks or existing LPG tanks already located at the installation site, have a pre-installed, primary regulator set for 250 PSI and intended for home heating and cooking. **This is wrong for generator fuel.**

The LPG fuel tank must have a dedicated primary LPG fuel regulator mounted at the tank fuel outlet point, and set for 6 ounce pressure (11-14 inches water column). A direct, dedicated fuel line connected to the 6 ounce fuel tank primary regulator, must be connected directly to the generator mounted, secondary regulator, also, set at 6 ounce pressure.

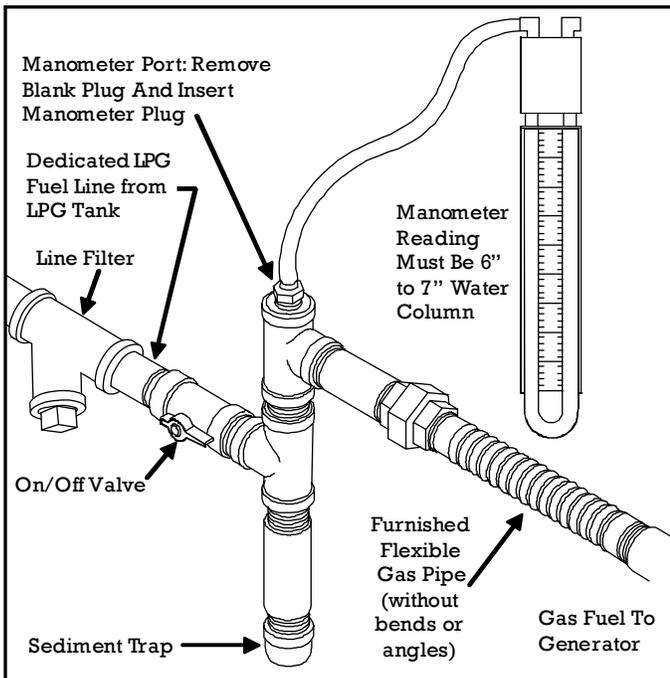
⚠ A flexible LPG fuel line is furnished for installation between the LPG fuel line & generator fuel input.

**CAUTION: Make sure this flexible fuel line is installed in a horizontal position, without bends. A bend of any kind, in this flexible line could lead to an eventual crack in the bend, causing a possible fuel leak. See Figure 6 for recommended installation.**

⚠ Make sure fuel line installation includes an on/off manual gas valve at both the LPG tank and at connection point of generator.

⚠ All new installations, plus any future repair or troubleshooting procedures must include an LPG manometer test. This test should be conducted after all other LPG appliances are turned on. After all appliances are working, start the generator. If manometer stays within 10 to 12 inches water column with full load applied to generator, it's a good installation. (See Figure 6) If manometer reading falls below 10 inches water column while generator is cranking or running, it may indicate the primary regulator on LPG tank is wrong or the LPG tank is too low to produce the vapors required to operate generator.

If manometer reading stays within 10 to 12 inches water column, but generator will not run properly, it may indicate fuel line length is too long or fuel line diameter is too small to deliver proper volume of fuel.



Check calculations from charts in Figure 4 and 5.

Figure 6

**NOTE:** After completion of all gas tests, remove manometer and replace blank plug, using fresh pipe sealant.

⚠ Climates that have snow and ice build-up, along with sub-zero temperatures should have LPG fuel pipe protection against freezing. The generator end of the hard piping installation should include a sediment trap to drain any condensation and a line filter. (See Figure 6)

⚠ Best installations happen when electric utility meter and LPG tank are reasonably close (20 Ft. to 50 Ft.), as it results in short runs for both electric wires and LPG fuel lines. When these two identities are far apart, always choose to locate generator as close to the LPG tank as possible, because installation costs are lower when increased wire size must be used for longer runs rather than increased fuel pipe dia.

### GENERATOR PERFORMANCE

When matching a generator to a specific application, whether gross intermitted or gross continuous power is used, it is important to derate this power output for the following adverse conditions:

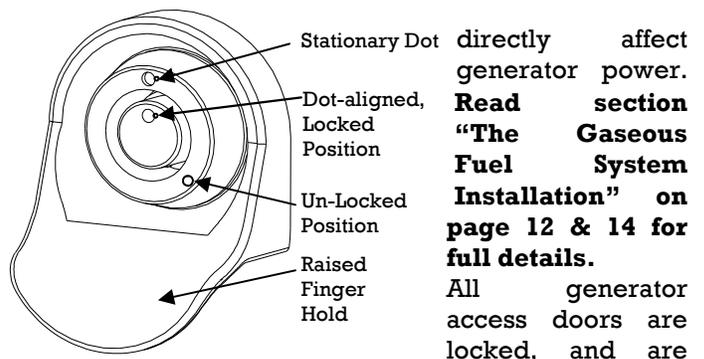
⚠ Engine power rating after "break-in" is usually within 3% of engine published rating.

⚠ Temperature and altitude directly derate generator power. Derate 3½% for each 1,000 feet above 326 feet, over sea level. Derate 1% for every 10° F (5.6° C) over 77° F (25° C).

⚠ Generator location is important. If it is located too far from fuel source, fuel line may not deliver adequate fuel. If it is located too far from electric distribution box, the electric power lines may not deliver adequate electric power. Both examples will

## PREPARE THE GENERATOR FOR OPERATION

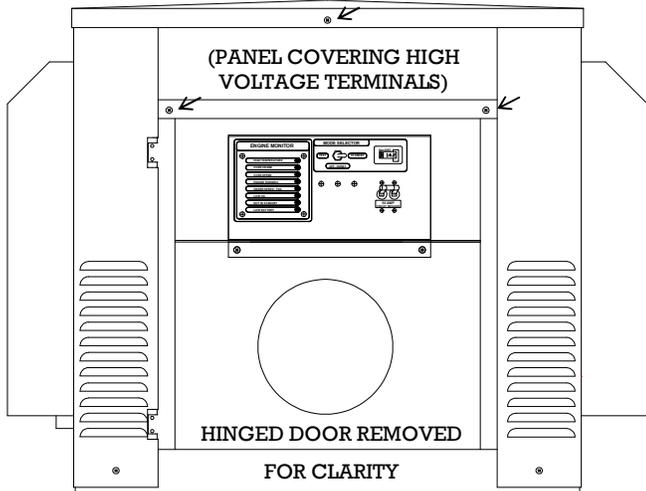
### ACCESS TO HOUSING INTERIOR



opened with a common key for all locks. Notice the door lock (in the locked position) has matching dot system in alignment. Insert the key into lock and turn counterclockwise. Remove the key and note, the dots are now out of alignment. Re-insert

**FOR LICENSED ELECTRICIAN'S USE, ONLY**

When hinged door on generator end of housing is unlocked and opened, the control panel is exposed. (see item 1, 8 point diagnostic display panel on page 11). An access panel, for electrician's use only, is located at top of hinged door access.



Electrician must remove (3) cap screws (see arrows) and slide panel down 2 inches, then pull straight out for complete removal. At this point, high voltage wiring terminals are exposed. Replace panel by positioning it 2" under roof, sliding it upwards until it stops, then replacing (3) cap screws.

**TIGHTENING TORQUE REQUIREMENTS FOR FIELD WIRING TERMINALS**

FIELD CONNECTION	SCREW SIZE	WIRE SIZE AWG	TORQUE (LB/IN)
TS1 REMOTE START WIRES	#6	14	12
COMMERCIAL POWER	#6	14	12
TS2 GENERATOR OUTPUT & EXTERNAL GROUND LUG	LUG TYPE CONNECTOR	18-10	20
		8	25
		6-3	35
		2	40

**WARNING**



The high voltage access panels should only be removed by experienced licensed electricians, repair and service personnel, and installers.



⚠ Electrical shock from mishandled battery.



⚠ Toxic fumes from battery or engine exhaust may be inhaled.



⚠ Hot surfaces may cause severe burns.

⚠ Explosions from battery or dry fuel fumes being ignited by careless smoking or sparks from mishandled tools.

**DANGER**



At engine end, behind bolted panel contains dangerous high voltage electricity. These voltages can cause a fatal electric shock and will cause sudden illness, dizziness, and incoherent actions. Only experienced licensed electricians and authorized service technicians should have access to this high voltage area.

**BATTERY SELECTION & INSTALLATION**

The 12 VDC battery is not furnished with the standby generator set. The generator can be installed in a wide range of temperatures and climate conditions. As climates get colder, batteries lose their ability to produce required power. Therefore, battery size must be increased.

Climates that reach to a low of 30° F (-1.1 ° C) can achieve good generator operation with a 12 VDC, 45 amp hour battery. Climates that reach below this temperature line should have a 55 amp/hour 12 VDC battery.

**CAUTION:** All 12 VDC batteries will lose a certain percent of their charge while in storage. It is very important to test the battery voltage before it is installed in generator and taken to jobsite. A fully charged battery must test at 12.5 – 13.0 volts DC. Also, the correct battery for models SPS-120 and SPP-180 must have lug terminals to match lug battery cables, for a bolt-together connection.

This generator is equipped with a battery tray, a battery hold down strap and battery cables. Place the selected fully charged battery with full electrolyte in battery tray and secure with battery hold down clamp.

Before connecting battery cables to battery, complete the following steps:

- 1) Set the generator's toggle switch to "OFF" position. Remove the 20 amp fuse near the remote start/stop terminal block (labeled "S" & "+") on the back panel of the control circuit (see these locations at "Know Your Systems Control Panel" on page 11).
- 2) Turn off utility power supply to the previously installed automatic transfer switch.
- 3) Battery cables are factory connected at the generator points. Electrician should connect the red battery cable (from engine starter solenoid point) to battery post shown with "positive", POS, or (+) indicator. Connect the black battery cables (from frame ground) to the battery.



## NOTICE

Dielectric grease should be used on battery lugs or posts to help in the prevention of normal corrosion.

Damage will result to generator controls, if battery cables are made in reverse connections.

Inspect, clean, or re-grease battery connections ever 60-90 days.

In cold climate areas, where temperatures normally reach 10° F (-12° C) or colder, a battery wrap-around heater, controlled by thermostat, should be used, for increased battery power.

This generator is equipped with an automatic “float type” battery trickle charger, energized by utility power, to maintain full battery power while on standby (non-running) condition. **CAUTION:** This trickle charger can not recharge a fully discharged or defective battery.



## DANGER



• Do not dispose of battery in a fire. The battery is capable of exploding and spewing electrolyte in several directions.



• Do not open up a battery. It has electrolyte and is harmful to the skin and eyes, and is toxic.



• Battery electrolyte is electrically conductive and corrosive.

• Contact with battery acid will cause severe burns to the skin and eyes.



## BATTERIES CAN CAUSE DANGEROUS ELECTRICAL SHOCK

A battery can cause an electrical shock. Before working on a battery, follow safe procedures:

- Remove the start/stop 20 amp fuse in control circuit.
- Remove all rings, watches, & other metal objects.
- Wear rubber gloves and boots.
- Use tools with insulated handles.
- Do not lay tools or metal objects on top of battery.
- Disconnect the battery charger before working on battery terminals.



## BATTERIES CAN CAUSE DANGEROUS CHEMICAL BURNS

A battery can cause a chemical burn. Before working on a battery, follow safe procedures:

- Wear full eye protection and protective clothing.
- When battery electrolyte contacts the skin, wash it off immediately with water.
- When battery electrolyte contacts the eyes, flush immediately and repeatedly with water and seek medical help.
- Spilled electrolyte should be washed away with an acid neutralizing product.
- A battery can cause fire or explosion because they emit hydrogen gas.



## BATTERIES CAN CAUSE FIRE OR EXPLOSION

- Do not smoke or cause any type of flame within 30 feet from battery.
- Discharge body static electricity from body, by touching a grounded metal surface, before working on battery.

### BEFORE WORKING ON BATTERY:

- Always remove 20 amp fuse in control panel.
- Always turn the “auto-off-manual” switch to off position.

### FINAL PREPARATIONS BEFORE INITIAL START-UP

Before checking oil, always move controller selector switch to “OFF/RESET” position, and remove 20 amp fuse.

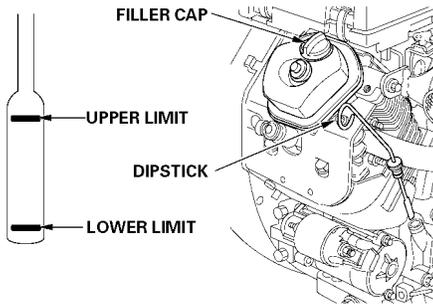
1) Oil Considerations: Check the oil to make sure it's at the proper level. Remove the oil dipstick, wipe it clean, re-install oil dipstick, then remove it again to check the oil level. See diagram on page 18.



## WARNING



Crankcase pressure can blow hot engine oil out the fill opening, causing severe burns. Always stop the gen-set before removing oil dipstick or oil fill cap. Use API SJ 10W-30 oil for temperatures above 32° F (0° C). All gen-sets are shipped with this grade oil.



**NOTE:** For air temperatures below 32° F (0° C), it is highly recommended to replace oil with a synthetic oil, API SJ/CF 5W-30W. This allows for easier engine

starting and better dry fuel engine performance during cold weather.

Add necessary oil to bring level to “upper limit” on dipstick, replace dipstick and filler cap.

2) Check radiator fluid level on generator sets that are liquid cooled. The radiator was factory filled with a 50% mixture of water and anti-freeze. Fill radiator to full level only if level is low. **DO NOT OVERFILL ABOVE FULL LEVEL.**

3) Become familiar with gen-set control panel (see page 11) before actual operation takes place. Keep the “MODE SELECTOR” switch located on the control panel in (OFF/RESET) position at all times, while connections, battery installation, or any other installations take place. The “MODE SELECTOR” switch, placed in “STANDBY” or “TEST MODE” position during this time, **may cause unwanted engine crank action.** However, if the 20 amp controller fuse is removed, and the controller “MODE SWITCH” is kept in the “OFF/RESET” position, the engine cannot start up. Keep controller in this position until “Initial Start-Up” test is performed.

The “MODE SELECTOR SWITCH” is a 3 position device, referred to, as a “TEST-OFF/RESET-STANDBY” switch, as shown on page 11.

“STANDBY” position is the normal operation position. When a utility power outage is sensed, the control system will automatically start the generator. After a few seconds, the generator will reach full operating speed and connect “KLEEN-POWER®” generator power to the automatic transfer switch. When utility power returns, the control system automatically connects utility power back to the automatic transfer switch, allowing the generator to continue to run for a few minutes for a “cool down” at no load, shuts down and is on guard for the next utility power failure.

“OFF/RESET” switch position will turn off a running generator, takes the control system out of the automatic start/stop mode and resets any fault condition. **This is important: If any fault condition happens (low oil, high temperature, etc), this switch must be turned to “OFF/RESET” while repairs are made.** If the controller is not “RESET” the automatic operation cannot function. The generator will not exercise in this position.

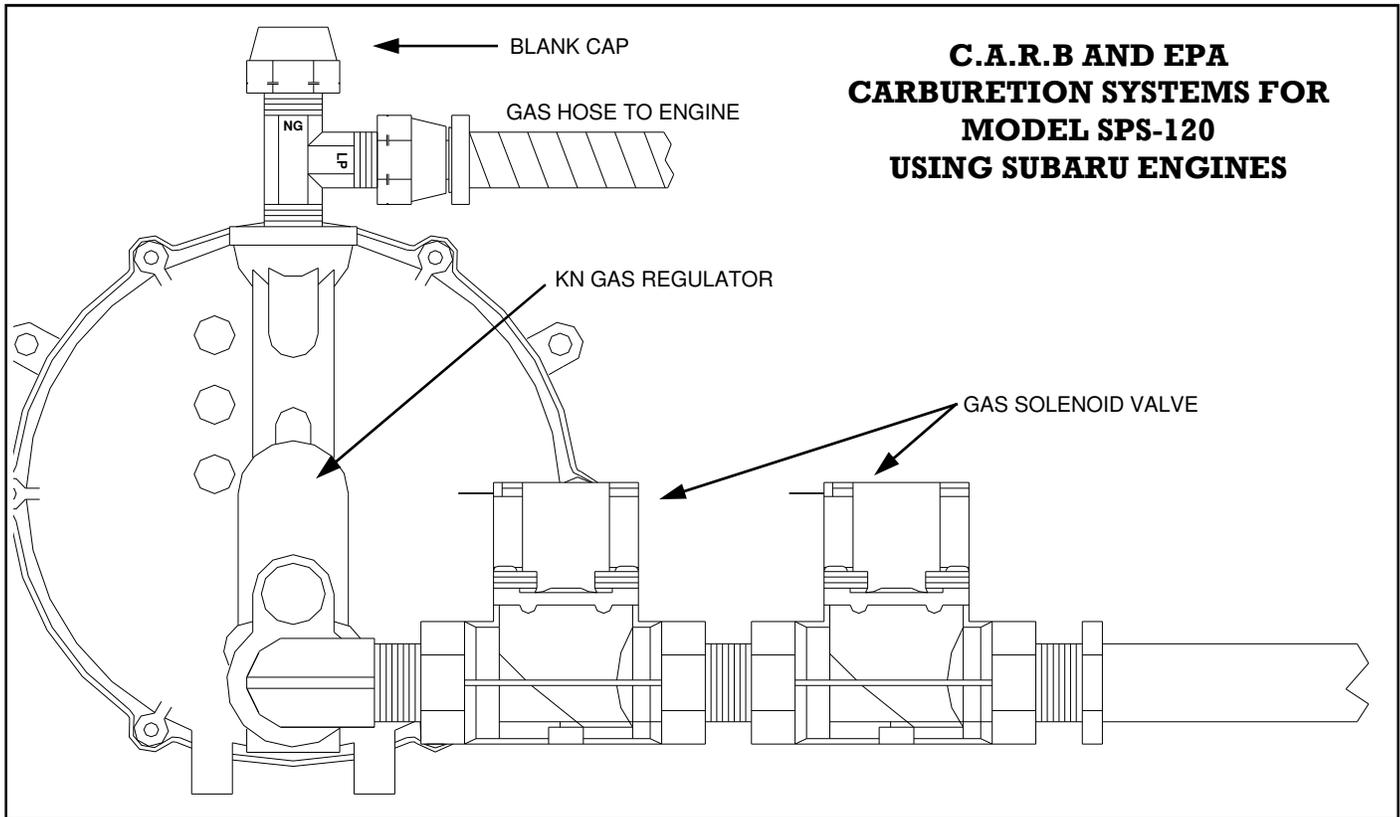
“TEST” position will start the engine, but will not disconnect utility power from the transfer switch. This position is used for testing the generator after maintenance or repairs, or viewing the (8) point diagnostic functions. See page 11 for Control Panel view.

4) Become familiar with the “Sentry-Pro control Panel” and its functions. Especially note the (8) annunciators and their specific actions (LED actions that have flashing or steady on lights) (see page 11). Consult optional equipment items, if a remote (8) point annunciator is required at a more convenient viewing location.

### **ADDITIONAL HIGHLIGHTS OF SOLID STATE, DIGITAL MICROPROCESSOR CONTROLLER With (8) Point Diagnostic Panel (See page 11)**

- Time Delay to Engine Start (TDES): A time delay period of up to 10 seconds should exist from initial power outage, to actual engine start. This avoids false starts on intermittent power losses. The "Engine Running" LED will constantly flash during this period. The generator is shipped with this TDES set to 0 seconds because the TDES is usually controlled by the transfer switch. This 0 second delay may be optionally enabled to a 10 second delay if the function is not provided by the transfer switch or no transfer switch is available.
- Cool Down: When utility power returns, load is switched back to utility power, and engine continues to run for (2) minutes, unloaded to cool down engine and generator. This (2) minute cool down delay may be optionally disabled, if required.
- LED Test: All LED lights automatically flash (3) times upon switching into “Standby” mode. This function acts as a LED light test.
- When fault condition occurs, repair the problem and turn the mode selector switch to “off/reset” for 15 seconds to clear all past memories, and reset the controller.
- Controller Memory Clear Time: If one was to turn controller off, then immediately turn it back on without waiting 15 seconds or more, the controller still thinks it’s in the running mode, and sees the gen-set, as stopped. This would be indicated by a flashing “Over Speed” LED. When resetting controller, always allow 15 seconds, before it is put into “Standby” mode, to avoid this problem.
- In some applications, the gen-set is used with an inverter rather than utility power. Inverters can produce harmonics, that disrupts the entire

## CARBURETION SYSTEMS FOR RESIDENTIAL SENTRY-PRO GEN-SETS



**MODEL SPS-120** use the gas system as shown above. The KN gas regulator is used to regulate the gas flow by responding to pressure changes in the engine intake manifold. When the engine is shut down, with no demand for fuel, the “demand” secondary regulator stops all gas flow. The first 12 VDC electric fuel solenoid valve acts as a second positive shut-off device and the second fuel solenoid is for safety per UL2200. The fuel of choice is set at factory by connecting the engine fuel hose to the barb marked with either LPG (Liquid Propane Gas) or NG (Natural Gas). The fuel can be easily changed in the field:

Changing from LPG to natural gas fuel and vice-versa is a simple function. The drawing at top & left shows the fuel line from secondary regulator, to engine carburetor, for LPG fuel. Notice the fuel line is connected to a brass fitting with “LP” stamped on it. This brass fitting has the LPG venturi for proper LPG fuel operation. Do not remove or reposition this LPG venturi. For natural gas operation, remove the carburetor flexible fuel line from “LP” stamped, brass fitting and dead-end brass cap from “NG” stamped brass fitting. Attach fuel line to brass fitting marked “NG” and attach dead-end cap to brass fitting marked “LP”. No other adjustments are required.

REMEMBER: These instructions are only if fuel needs to be changed, at gen-set final location. If fuel is correct at time of installation, no other changes are required.

**MODEL SPP-180** uses a similar fuel system as shown above. The difference is that the engine uses an electronic fuel mixer which is set for specific Natural Gas or LPG use. **This does not allow the fuel needs to be changed, at gen-set final location. The gen-set must have the correct fuel selection prior to installation.**

**IMPORTANT: THESE GEN-SETS ARE DESIGNED ON A CLOSE-LOOP SYSTEM, WHICH THE SECONDARY FUEL REGULATOR & EXHAUST EMISSIONS HAVE BEEN SET TO MEET EPA & C.A.R.B. REGULATIONS. ANY MODIFICATIONS TO THIS FUEL SYSTEM WILL VOID WARRANTY ON THE ENTIRE GEN-SET. IF EPA FINDS THAT THE EMISSIONS FROM THIS GEN-SET HAVE BEEN CHANGED, THE USER WILL BE FINED.**



## CAUTION



**BE EXTREMELY CAREFUL. YOU ARE READY TO TEST RUN A GENERATOR THAT HAS BOTH ELECTRIC SHOCK AND FLAMMABLE FUEL POTENTIAL HAZARDS. CHECK AND REVIEW ENTIRE INSTALLATION BEFORE START-UP. MAKE SURE THAT RATING OF TRANSFER SWITCH, MATCHES OR IS MORE THAN THE RATING OF THE EMERGENCY GENERATOR, IN VOLTS, PHASE, AND FREQUENCY. MISMATCHED SPECIFICATIONS WILL CAUSE**

### SELECTING THE FUEL

#### EQUIPMENT DAMAGE.

A) All models will allow either natural gas or LPG to be connected to fuel input line. It may be necessary for a minor adjustment to be made at “engine load adjustment screw”, during initial start-up, or when changing from one fuel to another. See page 19 for more details.

B) C.A.R.B and EPA CARBURETION SYSTEMS: The secondary gas regulator has (2) separate fuel inputs. One is marked “LP” and the second is marked “NG”. When using LPG, the fuel hose from engine carburetor must be connected to the regulator input “LP” with a dead plug attached to the “NG” input. When Natural Gas is used, the fuel hose is connected to the “NG” input, with a dead plug attached to the “LP” input. It’s just that simple to change fuel input, in the field. See page 19 for further details.

C) Model SPP-180: This model is designed for specific fuel use on the mixer with specific pressure. There is no fuel change available in the field or at the factory. The gen-set must be ordered for either LPG or

### INITIAL START-UP

Natural Gas No other adjustments are required.

At this time, before the initial start-up is performed, the 20 amp fuse is still removed from controller and the “MODE SELECTOR” switch is at “OFF/RESET”. Also, fully charged battery is connected, oil level is correct, coolant in radiator (if liquid cooled set is being tested) is correct, and all listed requirements,



## CAUTION



leading up to the initial start has been completed. When the automatic start/stop system is activated, it may cause an unwanted start cycle. Be very cautious of these possible, sudden engine starts.

**STEP 1:** Replace 20 amp fuse in its proper position on control panel, and keep the “MODE SELECTOR” switch on “OFF/RESET” position. Also, turn off the

main 2-pole, automatic circuit breaker (item “D” on control panel, page 11). Apply electric utility power



## WARNING



**PROCEED WITH CAUTION. THE CONTROL PANEL IS NOW “LIVE” WITH UTILITY POWER. CONTACT WITH THESE “LIVE” TERMINALS INSIDE TRANSFER SWITCH AND GENERATOR CONTROL PANEL WILL RESULT IN SHOCK AND POSSIBLE DEATH WILL RESULT.**

### START-UP USING MANUAL TEST MODE

to connected automatic transfer switch (ATS).

**STEP 2:** Turn the “MODE SELECTOR” switch, located on the control panel, from “OFF/RESET” position to “TEST” position. This will establish the first engine start cycle. With the “ENGINE RUNNING” lamp (located on the annunciator panel) flashing, after a 10 second time delay, the generator should crank over and start. **NOTE:** If a special controller is used that does not allow for a 10 second delay to start (for hospitals or nursing homes), the engine will immediately start cranking, when switch is placed in “TEST” mode. Allow engine to run for approximately 2 minutes. Then return the engine test switch to the “OFF/RESET” position. The engine will then shut down.

If the engine should fail to start, for some reason, the engine will crank for 10 seconds, rest for 10 seconds, and continue for a total (3) attempt cycle cranks before a complete shutdown occurs, and “Overcrank” LED energizes on 8 point annunciator. Check all gas connections and shut off valves. **REMEMBER:** This no start problem is a “Fault” and when fault is corrected, the “MODE SELECTOR” switch must be turned to “OFF/RESET” to reset the controller. After 15 seconds, turn the “MODE SELECTOR” back to “TEST” for another start-run attempt. Anytime there after, the generator can be manually test run from this “MODE SELECTOR” switch by pushing it to the “TEST” position.

**STEP 3:** During this initial testing time, it is advised to test the voltage at no load conditions, and at full load conditions. **Repeat the manual start process.** Turn the “MODE SELECTOR” switch, located on the gen-set, from “OFF/RESET” position to “TEST” position. This will establish another engine start attempt. The engine should crank steadily, and after a few seconds start running. The generator set is now running and will remain running until “MODE SELECTOR” switch is returned to the “OFF/RESET” position. **Do not move the switch from the “TEST MODE” position at this time.** Allow engine to run un-loaded for 5-10 minutes to warm up. This gives installer time to perform certain quality tests. Use an AC Voltmeter

voltage and frequency at no load conditions. Typical no load test readings should be 230-245 volts at 61.0-61.5 hertz. After all meter tests are complete, return the "MODE SELECTOR" switch to the "OFF/RESET" position. The engine will then shut down.

**STEP 4:** When all connections, adjustments, and tests are completed, and the automatic transfer switch is installed and wired, the standby generator system is ready to be placed on standby duty. When testing the packaged standby set, using the furnished Automatic Transfer Switch (ATS), refer to included wiring diagrams & ATS owners manual. For an ATS system furnished by others, follow instructions and wiring diagrams furnished with the separate ATS system.

**STEP 5: EXERCISER:** Each automatic transfer switch has an exerciser circuit that automatically starts and runs gen-set for a predetermined time, before it shuts down. This "Trial Run" feature is to ensure that system is working and ready to use, when you need it, the most. The automatic engine exerciser must be set for the automatic time to come on, run for a pre-set time, then automatically shut itself down. The installer must set the initial exercising time, depending on the needs of owner. Review the ATS manual for exercising operation.

**IT IS IMPORTANT TO KNOW, THAT WHEN EXERCISING THE SELECTION OF NOT TRANSFERRING THE LOAD TO THE GENERATOR SET, IS THE MOST DESIRABLE**

 <b>CAUTION</b> 
<b>THE ELECTRIC LOAD TO BE APPLIED TO GENERATOR SET MUST NEVER BE MORE THAT GENERATOR RATINGS. THE GENERATOR IS RATED IN WATTS. CALCULATE THE ELECTRICAL LOAD TO BE APPLIED TO GENERATOR IN WATTS. NEVER EXCEED 75% OF GENERATOR RATING IN ACTUAL</b>

**METHOD.**

It is possible that a different auto transfer switch may be used, rather than the Gillette furnished automatic transfer switch (ATS). In this case, any different style or brand, 2-wire ATS will work with generator circuitry. Consult the owners guide and its wiring diagrams, for any different ATS system, for its method of operation.

**STEP 6:** Simulate a utility power failure by turning off disconnect switch, installed between utility power and auto transfer switch. The auto transfer switch will activate. The "Engine Running" LED (located on control panel) will flash repeatedly for up to 10 seconds (normal time delay to start) until engine begins to start and run. (This may be set to 0 seconds

depending on the specific setup at this location.) The auto transfer switch will switch the connected load from utility to emergency generator power.

Note that engine generator set must start under an immediately applied load. In most cases, the gen-set is strong enough to perform under this demanding scenario. However, if the load is 75% or more inductive (large motors, UPS systems, large air conditioners), it may be necessary to install a time delay device, allowing gen-set to get up and running (approx. 10 seconds), then allow load to be applied.

**STEP 7:** Return the disconnect switch to on position, allowing utility power, to no longer be interrupted. The auto transfer switch will sense this and switch the connected load from emergency generator power, back to utility power. The engine will continue to run for 2 minutes and will allow engine and generator to normally cool down, without connected load.

**Optional:** The sensing device may not always be 2-wire automatic transfer switch. Many auto start/stop, 2-wire sensing devices such as pressure switch, float switch, temperature switch, may control the start/stop functions of Sentry-Pro gen-sets, under special custom applications. However, the operating

**GENERAL SERVICE TIPS**

 <b>CAUTION</b> 
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If the 3 position switch is left in the "STANDBY" position at any time, the generator system is being serviced or repaired, the engine may crank and start without warning. Such automatic starting may happen when utility voltage dips below a preset voltage level or during a normal exercise period. To prevent possible injury that may be caused, always set the "TEST-OFF/REST-STANDBY" switch to "OFF/RESET" position and remove the 20 amp cartridge fuse, while working on or around the generator set, or accompanying automatic transfer switch.

procedures, as described above, are always the same.

**AIR FILTER:** remove air filter cover and existing air filter element and foam element. Reassemble air filter with new air filter elements in place. Do not oil the filter elements.

**OIL FILTER:** remove oil filter by turning it counterclockwise, using an oil filter wrench. Clean the gasket sealing surface of oil filter holder. Apply a light coat of clean oil to the rubber seal of the new oil filter. Dispose of old filter in an environmentally safe manner. **NOTE:** Best time to replace oil filter is during time of oil change, when oil is drained from engine.

dipstick and oil fill cap to facilitate complete draining process. When oil is drained, replace dip stick, oil fill cap, oil hose drain cap and place hose in holding clip.

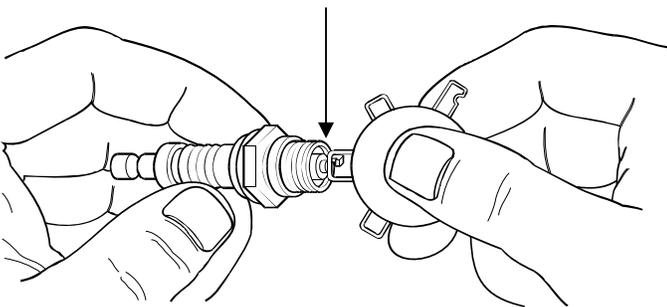
**OIL FILL:** Replace oil with premium grade API SJ/10W-30 oil when ambient temperature is above 32° F (0° C). When temperature is below 32° F, use a synthetic premium grade, API SJ/CF5W-30W. This synthetic oil facilitates cold weather starting. Oil level should reach “upper limit” level on oil dipstick. **CAUTION:** Too much oil can cause oil foaming, high oil consumption (white smoke emitting from exhaust) or high operating temperature. Also, too little oil (oil level to, or below “lower limit” on oil dipstick) can cause severe engine damage.

For best starting results, oil should be scheduled to change, using synthetic oil, just before winter season, in those cold climate areas. After oil is changed, replace dipstick and oil fill cap.

**SPARK PLUG:** Remove the plug and inspect it's condition. Also, clean the plug threaded base and temporarily cover, to keep dirt and debris from falling into plug hole. Replace the plug if it is badly worn or in questionable condition. **CAUTION: WHEN REPLACING SPARK PLUGS, ALWAYS CHECK THE SPARK PLUG GAP AND RE-GAP PLUG FOR DRY FUEL USE, IF REQUIRED.** Clean good plugs with a wire brush. Do not sand blast or air blast the plug electrode. Re-gap existing or new plug to 0.70 - 0.80 mm (0.028 - 0.032 in) for Subaru engines, by using feeler gauge and bending plug electrode. Replace spark plug at recommended torque values.

### **Setting Spark Plug Gap for Dry Fuel Engines**

SET SPARK PLUG GAP AS SHOWN IN



ABOVE PARAGRAPH

**COOLING SYSTEM:** Engines may be air cooled or liquid cooled with a radiator. Inspect the debris guard on engine air intake to insure no obstructions have accumulated. Inspect radiator (liquid cooled sets) to insure no debris accumulation has occurred. Some generator models have bug/rodent screens. Inspect and clean off any aluminum screens that may

collect debris.

**EXHAUST SYSTEM:** One end of generator set, will be the hot exhaust discharge. Keep any combustibles (building materials, fuels, chemicals, flammables, etc.) away from this exhaust area. Periodically inspect exhaust system components (flexible pipes, mufflers, clamps, etc.) for leaks, cracks, or corrosion. Your muffler maybe equipped with a spark arrestor screen, which prevents exhaust sparks from exiting the exhaust system. This screen must be checked and cleaned, every 50-75 hours of engine operation. **NOTE:** Check run time meter for periods of maintenance.

**CORROSION:** Depending on the area of generator installation, will depend on the amount of attention given to cleanliness. Heavy concentration of salt water exposure will require frequent washings and a final waxing of housing exterior. Salt water corrosion may enter the interior of generator housing, which must be removed by special detergents. Every 3 months, spray the engine governor linkage and other engine moving parts, and engine, generator, base exterior with a light coverage of WD-40 to prevent corrosion build-up, on these parts.



Only professional generator repair person should clean and/or spray oil inside the generator housing.

**BATTERY:** Inspection should include:

- Inspect battery posts and cables for corrosion build-up. Clean and tighten as required.
- Have the state of charge and over all condition checked. A fully charged battery should test at 12.5-13.0 volts D.C.
- See battery section on page 17 for further information.



After each maintenance repair procedure is complete, remember to replace 20 amp controller fuse, and set controller switch to “STANDBY” position.

# **BASIC SERVICE TIPS/TROUBLE SHOOTING GUIDE**

BASIC SERVICE TIPS, TROUBLE SHOOTING AND NEW START-UP HELP, FOR YOUR GILLETTE STANDBY GENERATOR:

## **A) ENGINE WILL NOT CRANK:**

- BATTERY LEAD CONNECTIONS LOOSE OR CORRODED
- BATTERY CHARGE IS LOW OR DISCHARGED
- BATTERY CABLES REVERSED
- LOOSE CONNECTIONS IN WIRING HARNESS
- STARTER SOLENOID DEFECTIVE
- FUSE BLOWN IN STARTER WIRING

## **B) ENGINE WILL CRANK BUT WILL NOT START:**

- TOO LITTLE OR NO FUEL SUPPLY
- FUEL SOLENOID VALVE DEFECTIVE
- FUEL VALVES ARE NOT ENERGIZED
- GAS REGULATOR NOT OPENING
- SPARK PLUG IS DEFECTIVE OR SPARK PLUG WIRE IS DEFECTIVE OR DISCONNECTED
- VENTS IN GAS REGULATOR IS PLUGGED UP

## **C) ENGINE RUNS ERRATIC:**

- AIR CLEANER IS DIRTY AND NEEDS CLEANING
- SPARK PLUG GAP IS CORRODED OR IS IN-CORRECTLY SET
- FUEL LEVEL IS TOO LOW
- FUEL IS NOT ON DEDICATED LINE AND HAS OTHER APPLIANCES ON IT
- FUEL LINE IS TOO SMALL OR TOO LONG
- CARBURETOR IS DIRTY OR HAS LOOSE SPRINGS OR LEVERS
- FUEL IS SET TOO RICH OR TO LEAN\*

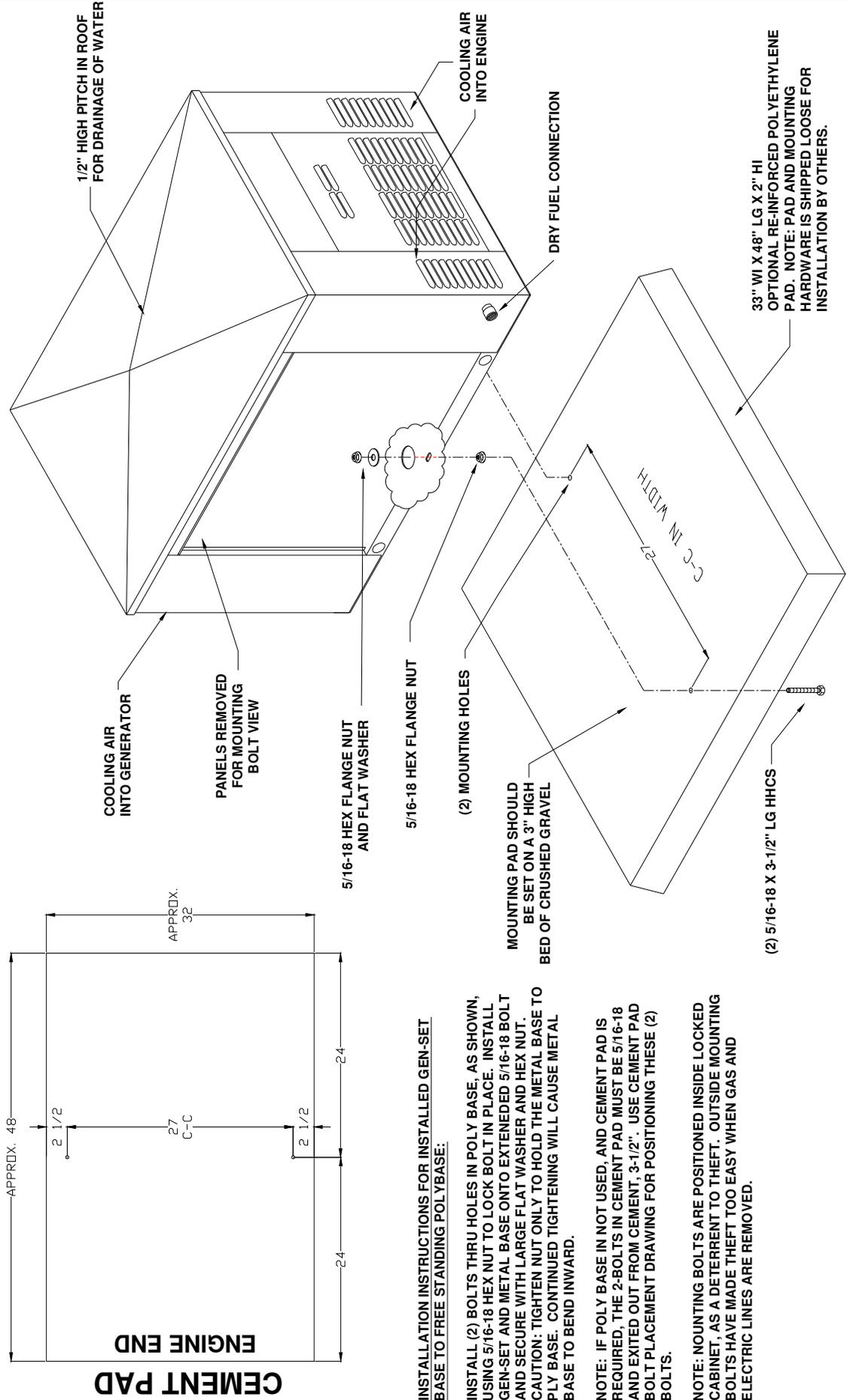
## **D) ENGINE SUDDENLY SHUTS DOWN:**

- RUNNING OUT OF FUEL
- BATTERY POWER IS INTERRUPTED
- DEFECTIVE FUEL SOLENOID
- ENGINE HIGH HEAT SENSOR IS ENGAGED (SEE PAGE 19)

\* CARBURETOR CAN NOT BE ADJUSTED AS THIS ACTION WILL VOID THE C.A.R.B./EPA EMISSIONS LEVELS.



# MOUNTING DIMENSIONS FOR 3600 RPM SPS SERIES STANDBY SETS 12 KW



**INSTALLATION INSTRUCTIONS FOR INSTALLED GEN-SET BASE TO FREE STANDING POLYBASE:**

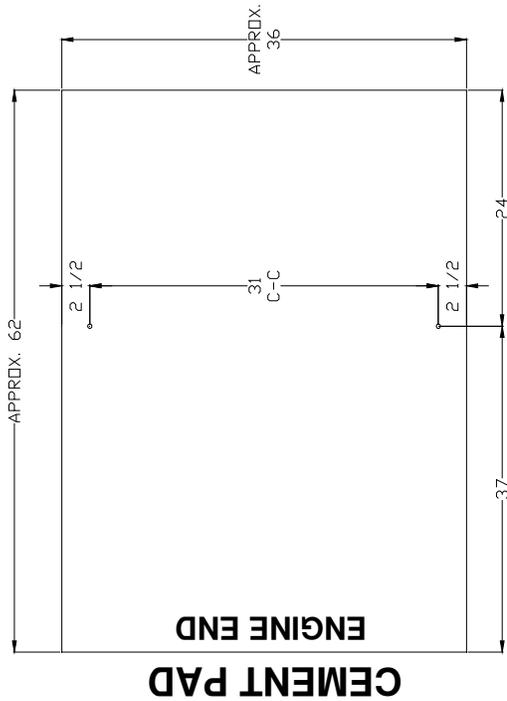
INSTALL (2) BOLTS THRU HOLES IN POLY BASE, AS SHOWN, USING 5/16-18 HEX NUT TO LOCK BOLT IN PLACE. INSTALL GEN-SET AND METAL BASE ONTO EXTENDED 5/16-18 BOLT AND SECURE WITH LARGE FLAT WASHER AND HEX NUT. CAUTION: TIGHTEN NUT ONLY TO HOLD THE METAL BASE TO PLY BASE. CONTINUED TIGHTENING WILL CAUSE METAL BASE TO BEND INWARD.

NOTE: IF POLY BASE IS NOT USED, AND CEMENT PAD IS REQUIRED, THE 2-BOLTS IN CEMENT PAD MUST BE 5/16-18 AND EXITED OUT FROM CEMENT, 3-1/2". USE CEMENT PAD BOLT PLACEMENT DRAWING FOR POSITIONING THESE (2) BOLTS.

NOTE: MOUNTING BOLTS ARE POSITIONED INSIDE LOCKED CABINET, AS A DETERRENT TO THEFT. OUTSIDE MOUNTING BOLTS HAVE MADE THEFT TOO EASY WHEN GAS AND ELECTRIC LINES ARE REMOVED.



# MOUNTING DIMENSIONS FOR 3600 RPM SPP SERIES STANDBY SETS 18 KW



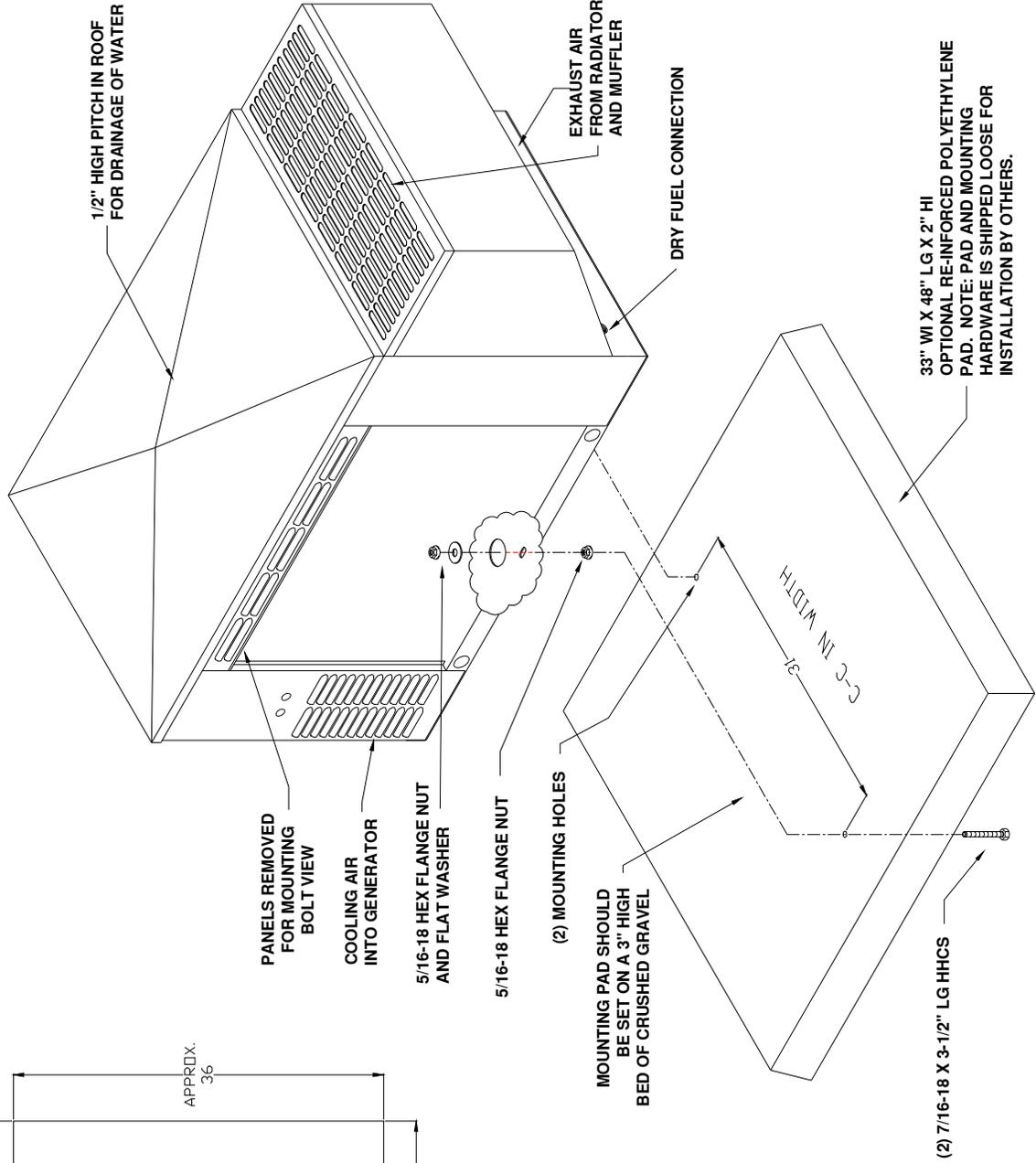
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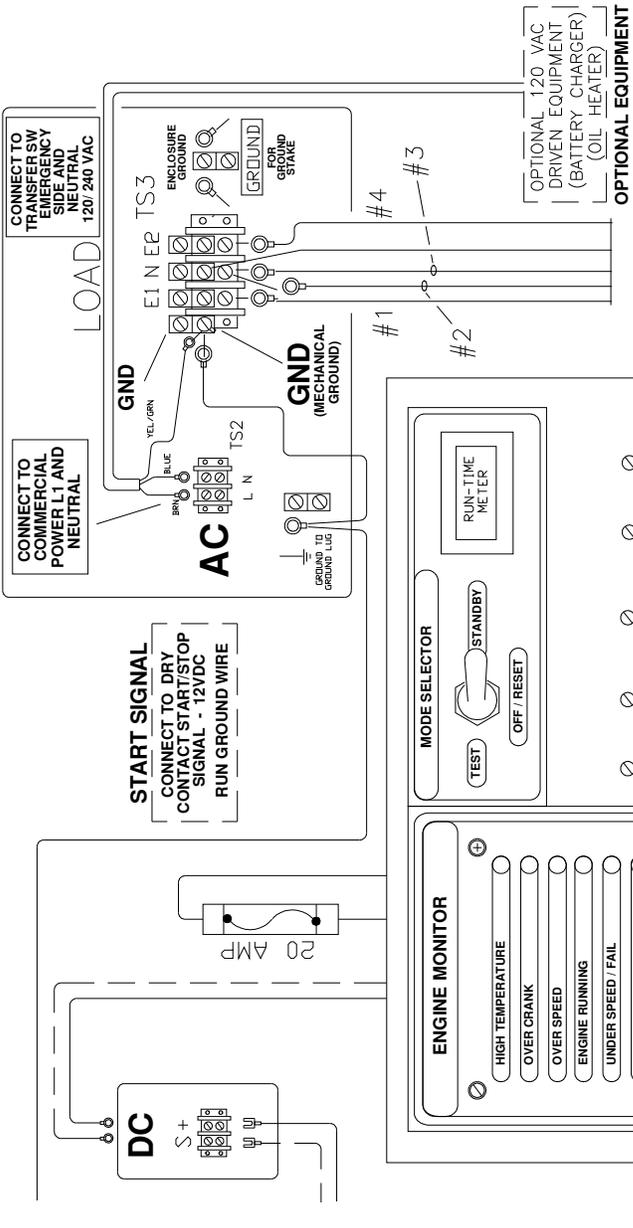
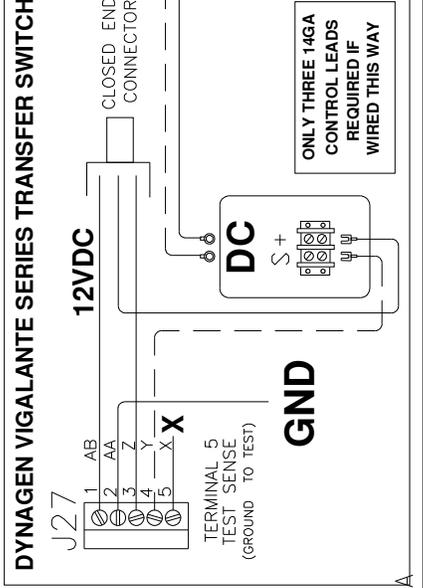
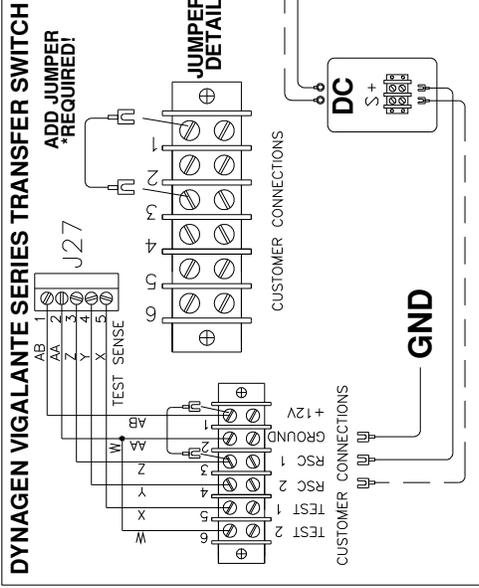
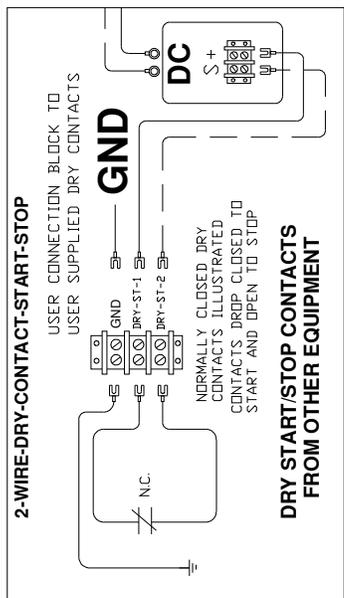
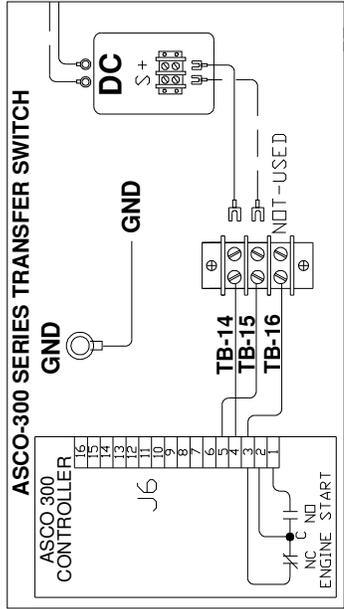
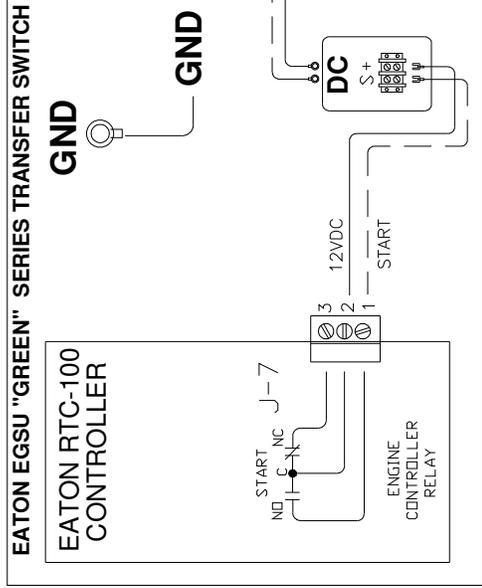
INSTALL (2) BOLTS THRU HOLES IN POLY BASE, AS SHOWN, USING 7/16-18 HEX NUT TO LOCK BOLT IN PLACE. INSTALL GEN-SET AND METAL BASE ONTO EXTENDED 7/16-18 BOLT AND SECURE WITH LARGE FLAT WASHER AND HEX NUT.

CAUTION: TIGHTEN NUT ONLY TO HOLD THE METAL BASE TO PLY BASE. CONTINUED TIGHTENING WILL CAUSE METAL BASE TO BEND INWARD.

NOTE: IF POLY BASE IS NOT USED, AND CEMENT PAD IS REQUIRED, THE 2-BOLTS IN CEMENT PAD MUST BE 7/16-18 AND EXITED OUT FROM CEMENT, 3-1/2". USE CEMENT PAD BOLT PLACEMENT DRAWING FOR POSITIONING THESE (2) BOLTS.

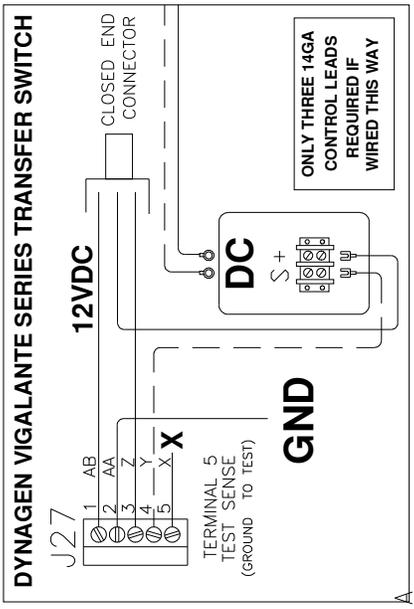
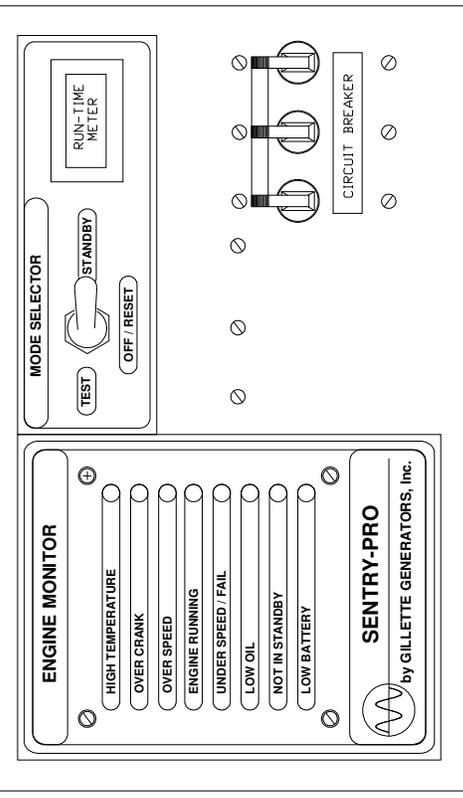
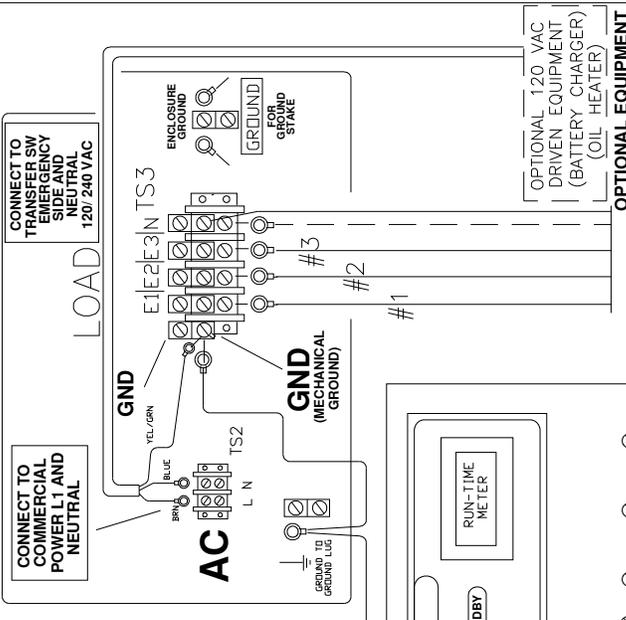
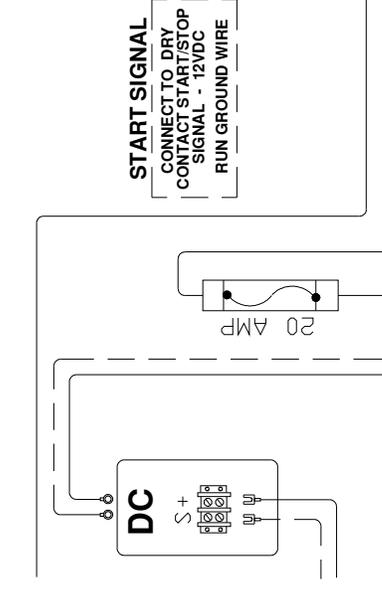
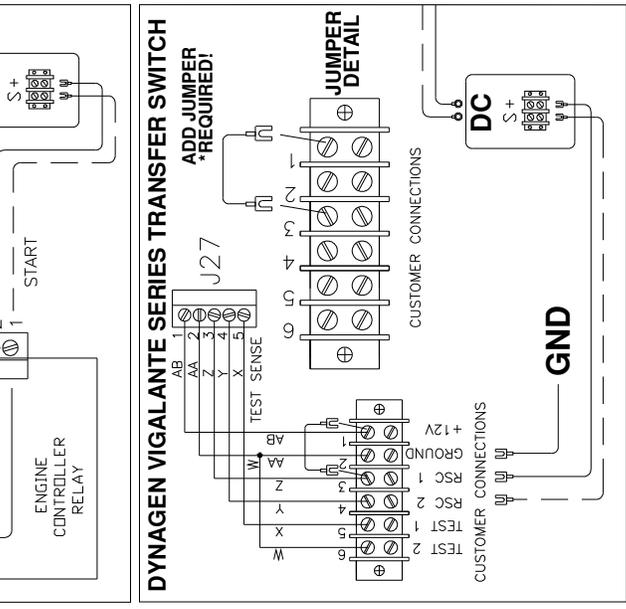
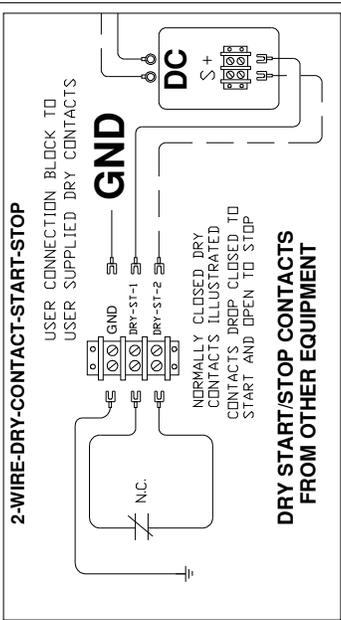
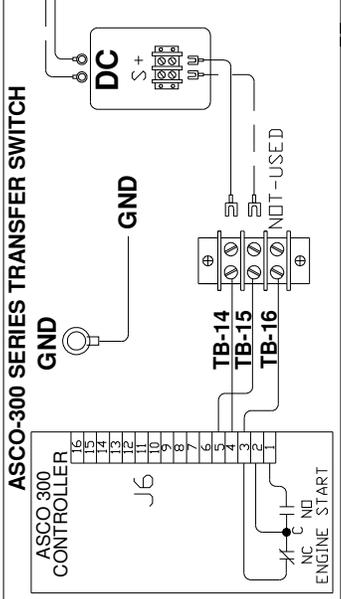
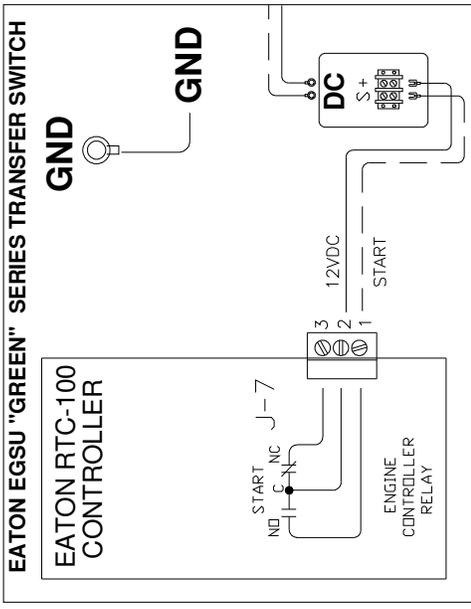
NOTE: MOUNTING BOLTS ARE POSITIONED INSIDE LOCKED CABINET, AS A DETERRENT TO THEFT. OUTSIDE MOUNTING BOLTS HAVE MADE THEFT TOO EASY WHEN GAS AND ELECTRIC LINES ARE REMOVED.





# SPS-IA-120/240VAC INTERCONNECT DETAIL

<b>GILLETTE GENERATORS, INC.</b> 1340 WADE DR., ELKHART, IN 46514 (574) 264-9639	
DESCRIPTION: 1 PH 120/240 VAC CONFIGURATION WITH SUBARU ENGINE	REV 0
SPS DRY FUEL SERIES WIRING W/ GSC2 PANEL INTERCONNECT DETAIL	0
DATE: 11-12-2010	PT. NO.: N/A
SCALE: N/A	CAD_NO.: 2011217.12.00.00
DR. BY: TEDD	ENG. RH
PG. NO. 1	OF 1
DRAWING NO.: SPS-SERIES-INTERCONNECT	



## SPS-IA--3-PHASE INTERCONNECT DETAIL

		<b>GILLETTE GENERATORS, INC.</b> 1340 WADE DR., ELKHART, IN 46514 (574) 264-9639	
DESCRIPTION:	1 PH 120/240 VAC CONFIGURATION WITH SUBARU ENGINE	REV	0
DATE:	11-12-2010	PT. NO.:	N/A
DR. BY:	TEDD	SCALE:	N/A
PT. NO.:	N/A	CAD_NO.:	20111217.12.00.00
ENG. RH	PG. NO. 1	OF 1	DRAWING NO.: SPS-SERIES-INTERCONNECT

## SERVICE SCHEDULE

SYSTEM COMPONENT OR PROCEDURE	SEE PAGE	CHECK	CHANGE	CLEAN	TEST	FREQUENCY
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### ENGINE

AIR CLEANER		X	X	R		YEARLY OR EVERY 100 HRS.
SPARK PLUG		X	X	X		YEARLY OR EVERY 250 HRS.
VIBRATION ISOLATORS		X				YEARLY
FUEL PIPING		X				YEARLY

### GENERATOR

EXERCISE (RUN) GEN-SET					X	WEEKLY
ROTOR AND STATOR*					X	YEARLY
VIBRATION ISOLATORS		X				YEARLY

### LUBRICATION

OIL LEVEL		X				MONTHLY
CHANGE OIL **			X			EVERY 100 HRS
REPLACE FILTER **			X			EVERY 150 HRS

### BATTERY

TERMINAL CORROSION		X		X		EVERY 6 MONTHS
TIGHTEN TERMINALS		X				EVERY 6 MONTHS
VOLTAGE OUTPUT		X			X	EVERY 6 MONTHS
ELECTROLYTE LEVEL		X				EVERY 6 MONTHS

### FUEL

FLEX LINES		X				YEARLY
FUEL LINES		X				YEARLY
CONNECTOR JOINTS		X				YEARLY

### EXHAUST

MUFFLER		X				EVERY 6 MONTHS
SPARK ARRESTOR				X		EVERY 6 MONTHS
FLEX LINE		X				EVERY 6 MONTHS
LEAKAGE		X				EVERY 6 MONTHS
JOINT CLAMPS		X				EVERY 6 MONTHS

### COOLING

AIR SCREENS		X		X		YEARLY
LOUVERS		X		X		YEARLY

### CLEAN \* (SALT SPRAY AREAS)

HOUSING EXTERIOR		X		X		EVERY MONTH
ENGINE LINKAGE		X		X		EVERY MONTH
GEN/ENG EXTERIOR		X		X		EVERY MONTH
<b>COMPLETE ENG TUNE-UP ***</b>	BY AUTHORIZED REPAIR PERSONNEL					YEARLY

\* Contact nearest repair station. \*\* Recommended oil filter and air filter changed after first 20 hours operation. Change filters every 50 hours of operation for dusty, dirty environment, or constant high ambient temperatures. \*\*\* Complete engine inspection and maintenance items replaced by authorized repair service, on a regular scheduled maintenance program.



**Gillette Generators, Inc.**  
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**Elkhart, IN 46514**  
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**E-mail: [sales@gillettegenerators.com](mailto:sales@gillettegenerators.com)**

**[www.gillettegenerators.com](http://www.gillettegenerators.com)**

**Call for Tech Support: 1-866-537-4388**  
**Email: [service@gillettegenerators.com](mailto:service@gillettegenerators.com)**

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**GILLETTE GENERATORS**

**AUTOMATIC POWER SYSTEMS**

