

CAP-START®

Goodall

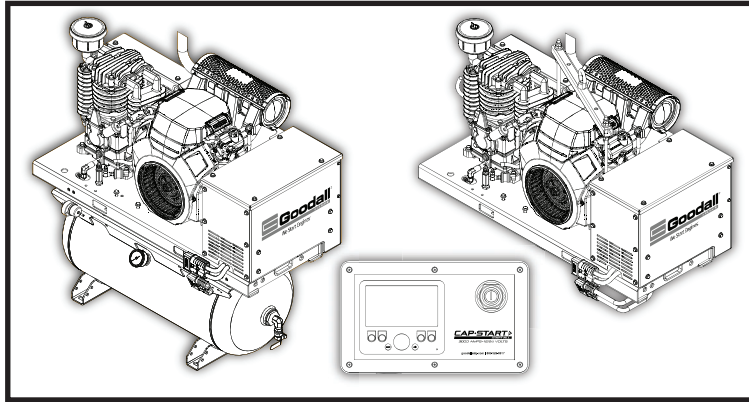
3000 A • 12/24V • 24 CFM • L

GASOLINE-DRIVEN • 3000A • 12V/24V BATTERY STARTER • CHARGER • AIR COMPRESSOR • LIGHTWEIGHT OPERATION MANUAL AND PARTS LIST

NOTE

This publication contains the latest information available at the time of preparation. Every effort has been made to ensure accuracy.

Vanair®, a Lincoln Electric Company, reserves the right to make design change modifications or improvements without prior notification.



IMPORTANT



Read this manual before installing, operating or servicing this equipment. Failure to comply with the operation and maintenance instructions in this manual can result in personal injury, and can void the equipment warranty.

⚠ DANGER



DO NOT OPERATE IN AN ENCLOSED SPACE.

Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion.

CO build-up can cause death!



Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT

An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries.

These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion.

It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions.

Vanair® assumes no responsibility or liability for installations it did not perform.



VANAIR®

A Lincoln Electric Company

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**KEEP THE MANUAL
WITH THE VEHICLE
OR EQUIPMENT**

NOTE

Making unauthorized modifications to the system components **WILL VOID THE WARRANTY!**

Always inform Vanair® before beginning any changes to the Vanair® Cap-Start® Series system.

NOTE

Use only Vanair® Reciprocating Compressor Oil and Genuine Vanair® Parts. Inspect and replace damaged components before operation. Substituting non-Vanair® oil or non-genuine Vanair® filter components **WILL VOID THE COMPRESSOR WARRANTY!**

Goodall®
by VANAIR

We Start Engines®

P/N: 090175-OP_r2

**Effective Date:
FEBRUARY 11, 2026**

DEV

BOOST-ALL®
SUPER BOOST-ALL®
CAP-START®



GUARANTEE

This limited warranty supersedes all previous Vanair® warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY—Subject to the expressed terms and conditions set forth below, Vanair®, a Lincoln Electric Company ("Vanair"), of Michigan City, Indiana (USA), warrants to the original retail purchaser of new Vanair® equipment that such equipment is free from defects in materials and workmanship when shipped by Vanair®.

For warranty claims received by Vanair® within the applicable warranty periods described below, Vanair® will repair or replace any warranted equipment, parts or components that fail due to defects in material or workmanship or refund the purchase price for the equipment, at Vanair's discretion. Vanair® is not responsible for time or labor to gain access to the machine to perform work. **WARRANTY WILL BE VOID IF GENUINE VANAIR® PARTS AND FLUIDS ARE NOT USED.**

Vanair® must be notified in writing within thirty (30) days of any such defect or failure. All warranty or returns must be pre-authorized in writing prior to performing warranty work. Call Vanair® for process and forms. Vanair® will provide instructions on the warranty claim procedures to be followed.

Warranty will commence upon receipt of the Warranty Registration Card. If the Warranty Registration Card is not received within six (6) months of shipment from Vanair®, the warranty commencement date shall be thirty (30) days from the date of shipment from Vanair®. Records of warranty adherence are the responsibility of the end user.

1. 6 Years Parts – 3 Years Labor
 - Vanair® Super Capacitor™ (VSC™)
2. 2 Years Parts – 1 Year Labor
 - Reciprocating Compressor Air End
3. 1 Years Parts – 1 Year Labor
 - Generators
 - Hydraulic Motors
 - Hydraulic Pumps
4. 1 Year Parts – 1 Year Labor
 - All electronics including, but not limited to:
 - I) I/O Boards
 - II) Modules
 - III) Panel Boxes
 - IV) Instrumentation
 - V) Solenoids
 - Clutches
 - Running Gear/Trailers
 - Compressor/Hydraulic Coolers, including Fan and Radiator Core

This Limited Warranty shall not apply to:

1. Consumable components, such as shaft seals, valves, belts, filters, capacitors, contactors, relays, brushes or parts that fail due to normal wear and use.
2. Items furnished by Vanair®, but manufactured by others, such as engines and trade accessories (these items are covered by the manufacturer's warranty, if any).
3. Equipment that has been modified by any party other than Vanair® or equipment which has not been used and maintained in accordance with Vanair's specifications.

4. Equipment which has been improperly installed and/or improperly operated, based upon Vanair's specifications for the equipment or industry standards.
5. Equipment installed by non-authorized or third party personnel. Vanair® products are intended for purchase and use by commercial/industrial users and persons trained and experienced in the use and maintenance of industrial equipment.

In the event of a warranty claim covered by this Limited Warranty, the exclusive remedies shall be, at Vanair's sole discretion: (i) repair; or (ii) replacement; (iii) where authorized in writing by Vanair® in appropriate cases, the reasonable cost of repair or replacement at an authorized Vanair® service facility; or (iv) payment of (or credit for) the purchase price (less reasonable depreciation based upon actual use) upon return of the equipment at the warranty claimant's risk and expense. Vanair® will pay standard ground freight for any warranty item shipped to and from Vanair® or (Vanair® designated facility) within the first year of the applicable warranty period. Any additional expedited freight cost is the responsibility of the purchaser.

TO THE GREAT EXTENT PERMITTED BY APPLICABLE LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES APPLICABLE TO THE VANAIR® EQUIPMENT. IN NO EVENT SHALL VANAIR® BECOME LIABLE FOR DIRECT, INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT OR LOST BUSINESS OPPORTUNITY), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY. IN NO EVENT SHALL VANAIR® BECOME OBLIGATED TO PAY MORE ON ANY WARRANTY CLAIM THAN THE PURCHASE PRICE ACTUALLY PAID BY THE ORIGINAL RETAIL PURCHASER.

THIS LIMITED WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY OR GUARANTY ARISING BY OPERATION OF LAW. ANY WARRANTY NOT EXPRESSLY PROVIDED HEREIN, IMPLIED WARRANTY, GUARANTY AND ANY REPRESENTATION REGARDING THE PERFORMANCE OF THE EQUIPMENT, AND ANY REMEDY FOR BREACH OF CONTRACT, IN TORT, OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE, OR COURSE OF DEALING ARE EXCLUDED AND DISCLAIMED BY VANAIR®.

Some states in the United States of America do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, and as such, the above limitations and exclusions may not apply to you. This warranty provides specific legal rights. Other rights may be available to you, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be saved, the limitations and exclusions set out forth above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

ALL WARRANTY OR RETURNS MUST BE PRE-AUTHORIZED PRIOR TO PERFORMING ANY WARRANTY WORK.

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EFFECTIVE: AUGUST 11, 2020



VANAIR®
A Lincoln Electric Company

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WARRANTY CLAIMS PROCEDURE

CLAIMS PROCESS FOR WARRANTED VANAIR® PARTS

This process must be used by owners of Vanair® equipment in situations where a warranted item needs repair or replacement under the terms of the purchase warranty. Do not return items to Vanair® without prior authorization from the Vanair® Warranty Administrator.

PROCEDURE:

When a customer needs assistance in troubleshooting a system and/or returning parts, follow the steps below.

1. Locate the machine's serial number:

The machine package serial number plate is located inside the machine compartment on the floor near to the generator mounting location (see **Figure W-1**).

The engine and the compressor also have individual serial numbers respectively (see **Figure W-1**). For engine warranty issues, consult the Engine Operation Manual for the engine's limited warranty details. For particular compressor unit issues, the compressor serial number may be needed. In any case, engine and/or compressor issues can be confirmed using the machine serial number as found in **Figure W-1**.

2. Have a list of the symptoms/condition/malfunctions along with any applicable temperature and pressure readings, and also the number of operational hours available:

Note that the above information will also need to be included on the Return Material Authorization Form (per **Step #6**); this form is necessary for warranty processing if the warranty claim is deemed valid by the service case review.

3. Contact the Vanair® Service Department by phone (1-844-VANSERV or 1-219-879-5100) to speak with a Service Technician.

4. Vanair® Service will troubleshoot the problem based on the information provided by the customer, and attempt to return the unit to service as quickly as possible.
5. If the unit cannot be returned to service, and Vanair® determines this matter is a warranty issue, the Service Technician will assign an RMA (Return Material Authorization) number that will provide for the return of the item to Vanair® for analysis and a final determination as to the item's warranty status.

NOTE

The RMA number must be placed on the outside of the package being returned.

6. Warranty Claims are solicited via a Return Material Authorization (RMA) Form. This form can be obtained via download from the web site, or requested directly from the Vanair® Service Department:

Once a current form has been obtained, follow the instructions given on the form to fill in the information needed. This form is used for the purpose of soliciting a warranty case. All of the field information except for the bottom section block fields, which includes Disposition of Goods, Notifications and Additional Notes, will be required.

Customers have 30 days after the RMA number is issued to return the item. If the part is not returned within this period, the RMA is void and any claims will be denied.

NOTE

All labor claims or invoices must be approved by the Vanair® Warranty Administrator prior to starting repair work along with the cost of the repair.

Continued...

WARRANTY PROCEDURE

Cap•Start® 3000 + Air Light •
Gasoline -Driven • Battery Starter •
Charger • Air Compressor

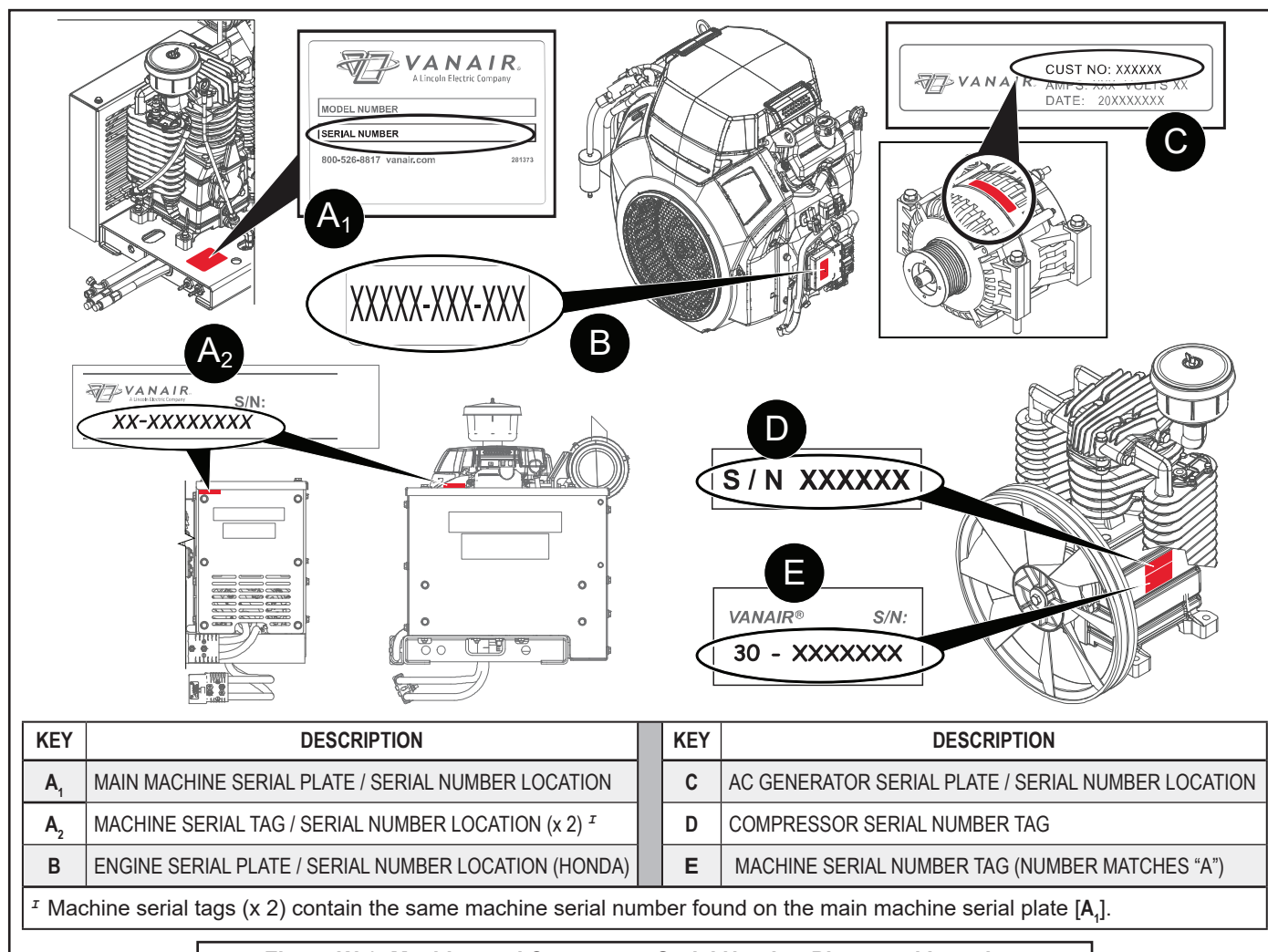


Figure W-1: Machine and Component Serial Number Plates and Locations

NOTE (continued)

All paper work associated with the returned item and warranty repair cost must reference the RMA number issued against the part, and be forwarded to Vanair® within 30 days of the completion of work.

Before sending a warranty part to a customer, Vanair® will need a P.O. or credit card number to cover the cost of the part and shipping. After the part is analyzed and deemed to be covered under warranty, Vanair® will issue credit to the customer. All parts eligible for warranty must have the RMA number on the invoice at the time of purchase.

No items can be returned "freight collect". Freight costs will be addressed at the time the claim is closed. The customer pays any additional costs for warranty parts delivered through expedited services (i.e., Next Day, Second Day).

IMPORTANT

VANAIR® WILL NEVER ACCEPT ANY INVOICES FOR PARTS RETURNED: ANY PARTS RETURNED VIA INVOICE WILL BE RETURNED FREIGHT COLLECT: NO PARTS ARE TO BE RETURNED FREIGHT COLLECT!

Vanair®, a Lincoln Electric Company, strives to continuously improve its customer service. Please forward any questions, comments, or suggestions to:

**Service Toll Free: 1-844-VAN-SERV
1-844-826-7378**

Service Direct: 1-219-879-5100, ext. 400

E-mail: service@vanair.com

SECTION 1:

! SAFETY

1.1 ! GENERAL INFORMATION

The products provided by Vanair®, a Lincoln Electric Company, are designed and manufactured for safe operation and maintenance. But it is ultimately the responsibility of the users and maintainers for safe use of this equipment. Part of this responsibility is to read and be familiar with the contents of this manual before operation or performing maintenance actions.

! IMPORTANT	
	It is mandatory that all operators read this manual before operating or servicing the Cap•Start® system. Failure to do so could result in death, bodily injury or damage to equipment.

! DANGER	
	DO NOT OPERATE IN AN ENCLOSED SPACE. Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion. CO build-up can cause death!
	Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT	
An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries.	
These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion.	
<i>Continued...</i>	

IMPORTANT (continued)

It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions.

Vanair® assumes no responsibility or liability for installations it did not perform.

1.2 ! DANGERS, WARNINGS, CAUTIONS, AND NOTES

Specific safety and operation information given throughout the manual may be presented within a separate bordered frame and header for easy and clear identification. Those issues that regard safety measures are also tagged with the international safety symbol (see **Section 1.3**), and should always be taken into consideration before performing an operation. Specific definitions of these bordered instructions are as follows:

! DANGER
Identifies actions or conditions which will cause death, severe injury, equipment damage or destructive malfunctions.

! WARNING
Identifies actions or conditions which may cause death, severe injury, equipment damage or destructive malfunctions.

! CAUTION
Identifies actions or conditions which will or can cause injuries, equipment damage or malfunctions.

IMPORTANT

Additional information (or existing information) which must be brought to the attention of operators/maintainers affecting safety, operation, maintenance, or warranty requirements.

NOTE

Additional information (or existing information) which should be brought to the attention of operators/maintainers affecting safety, operation, maintenance, or warranty requirements.

1.3 INTERNATIONAL SAFETY SYMBOL -

The symbols shown and defined in **Section 1: Safety** are used throughout this manual to call attention to and identify possible hazards.

The international warning symbol shown above is used on all decals, labels and signs that concern information pertaining to bodily harm. When you see the international warning symbol, pay extremely careful attention, and follow the given instructions or indications to avoid any possible hazard.

1.4 ENGINE HAZARDS

** IMPORTANT**

Operator must be familiar with all safety precautions listed in the Engine Operation Manual, in addition to the safety issues listed in this section.

1.4.1 BATTERY EXPLOSION CAN BLIND



Always wear a face shield, rubber gloves, and protective clothing when working on a battery.

Stop engine before disconnecting or connecting battery cables or servicing battery.

DO NOT allow tools to cause sparks when working on a battery.

1.4.2 FUEL CAN CAUSE FIRE OR EXPLOSION



Stop engine and let it cool down before checking or adding fuel.

Always keep nozzle in contact with tank when fueling.

DO NOT mix gasoline or alcohol with diesel fuel.

DO NOT add fuel while smoking or if unit is near any sparks or open flames.

DO NOT overfill tank—allow room for fuel to expand.

DO NOT spill fuel. If fuel is spilled, clean up before starting engine.

Dispose of rags in a fireproof container.

1.4.3 MOVING PARTS CAN CAUSE INJURY



Keep away from fans, belts, and rotors. Keep all doors, panels, covers, and guards closed and securely in place.

Stop engine before installing or connecting unit.

Have only qualified people remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.

Disconnect negative (–) battery cable from battery to prevent accidental starting during servicing.

Keep hands, hair, loose clothing, and tools away from moving parts.

Reinstall doors, panels, covers, or guards when servicing is finished and before starting engine.

1.4.4 HOT PARTS CAN CAUSE SEVERE BURNS



DO NOT touch hot parts bare handed.

Allow cooling period before working on equipment.

1.4.5 ENGINE EXHAUST GAS CAN KILL



If used in a closed area, vent engine exhaust outside and away from any building air intakes.

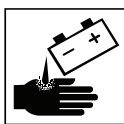
Check the fuel system at a well-ventilated, open space.

1.4.6 **ENCLOSED SPACES CAN CAUSE A BUILD-UP OF NOXIOUS FUMES AND OVERHEATING**



DO NOT use in enclosed spaces where deadly exhaust gas can build up and machine can overheat, causing fire.

1.4.7 **BATTERY ACID CAN BURN SKIN AND EYES**



DO NOT tip battery.

Replace damaged battery.

Flush eyes and skin immediately with water.

1.4.8 **ENGINE HEAT CAN CAUSE FIRE**



DO NOT locate unit on, over, or near combustible surfaces or flammables.

Keep exhaust and exhaust pipes way from flammables.

1.4.9 **EXHAUST SPARKS CAN CAUSE FIRE**



Use approved engine exhaust spark arrester in required areas — see applicable codes.

1.5 **CAPACITOR SAFETY**



The Vanair® Super Capacitor (VSC™) used in the Vanair® Cap•Start® under normal usage should be treated as a lead-acid battery from a safety standpoint. The capacitor is capable of storing a large amount of electrical energy, and care must be taken to avoid shorting the battery across the posts. Shorting the capacitor will result in high electrical amperage discharge over a short time, which can result in burns or fire, injury or death.

Do not operate the capacitor if damage has occurred to the external or internal connections. Risk of shorts, high energy discharge, burns, toxic fumes, fire, injury or death can occur.

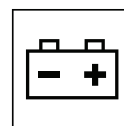
Do not operate or store in corrosive atmospheres including when chlorides, sulfides, acids, alkali, salts, and organic solvents are present.

Keep the machine cooling fan operating to avoid the capacitor operating at temperatures above 122°F. Excessive temperatures will reduce the life of the capacitor.

IMPORTANT

Do not attempt to charge the capacitor to voltages exceeding the rating for the machine. Damage to the capacitor will occur.

1.5.1 **BATTERY HANDLING SYSTEMS - ADDITIONAL SAFETY ISSUES**



All designated charging areas should be in compliance with OSHA directives 29 CFR 1910.178(g)(1), (8), (9), (10), (11) and (12), and any other safety directive that may apply.

Vehicle parking brakes shall be applied before batteries are charged or changed.

Only designated persons shall change or charge batteries.

Smoking and other ignition sources are prohibited in charging areas.

Batteries shall be free of corrosion buildup and cap vent holes shall be open.

Adequate ventilation shall be provided during charging.

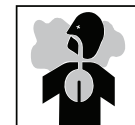
Metallic objects shall not be placed on uncovered batteries.

Do not use excessive force when connecting cables to batteries.

Battery handling equipment that could contact battery terminals or cell connectors shall be insulated or otherwise protected.

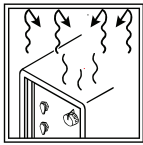
1.6 **COMPRESSED AIR HAZARDS**

1.6.1 **BREATHING COMPRESSED AIR CAN CAUSE SERIOUS INJURY OR DEATH**



DO NOT use compressed air for breathing. Use only for cutting, gouging, and tools.

1.6.2 ⚠ ENCLOSURE SPACES CAN CAUSE A BUILD-UP OF NOXIOUS FUMES AND OVERHEATING



DO NOT use in enclosed spaces where deadly exhaust gas can build up and machine can overheat, causing fire.

1.6.3 ⚠ COMPRESSED AIR CAN CAUSE INJURY



Wear approved safety goggles.

DO NOT direct air stream toward self or others.

1.6.4 ⚠ TRAPPED AIR PRESSURE AND WHIPPING HOSES CAN CAUSE INJURY



Release air pressure from tools and system before servicing, adding or changing attachments, or opening compressor oil drain or oil fill cap.

1.6.5 ⚠ HOT PARTS CAN CAUSE SEVERE BURNS



DO NOT touch hot parts bare handed.

Allow cooling period before working on equipment.

1.6.6 ⚠ READ INSTRUCTIONS



Read Owner's Manual before using or servicing unit.

Stop engine and release air pressure before servicing.

Use only genuine Cap•Start® replacement parts.

1.7 ⚠ ADDITIONAL SYMBOLS FOR INSTALLATION, OPERATION AND MAINTENANCE

1.7.1 ⚠ FALLING UNIT CAN CAUSE INJURY



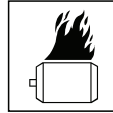
Use lifting bail to lift unit and properly installed accessories only.

Lift and support unit only with proper

equipment and correct procedures.

If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.

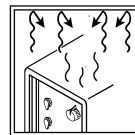
1.7.2 ⚠ OVERHEATING CAN DAMAGE MOTORS



Turn off or unplug equipment before starting or stopping engine.

DO NOT let low voltage and frequency caused by low engine speed damage electric motors.

1.7.3 ⚠ ENCLOSURE SPACES CAN CAUSE A BUILD-UP OF NOXIOUS FUMES AND OVERHEATING



DO NOT use in enclosed spaces where deadly exhaust gas can build up and machine can overheat, causing fire.

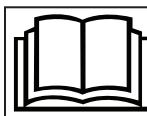
1.7.4 ⚠ TILTING OF TRAILER CAN CAUSE INJURY



Use tongue jack or blocks to support weight.

Properly install unit onto trailer according to instructions supplied with trailer.

1.7.5 ⚠ READ INSTRUCTIONS



Use only genuine Cap•Start® replacement parts.

Perform engine and air compressor (if applicable) maintenance and service according to this manual and the engine/air compressor (if applicable) manuals.

1.8 ⚠ CALIFORNIA PROPOSITION 65 WARNINGS

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

For Gasoline Engines: Engine exhaust contains chemicals known to the State of California to

cause cancer, birth defects, or other reproductive harm.

For Diesel Engines: Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

1.9 PRINCIPAL SAFETY STANDARDS

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, web site: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (phone: 703-412-0900, web site: www.cganet.com).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 11 West 42nd Street, New York, NY 10036-8002 (phone: 212-642-4900, web site: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection

Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, web site: www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices; phone for Region 5, Chicago, is 312-353-2220, web site: www.osha.gov).

1.10 EMF INFORMATION

Current, as it flows through certain cables, will cause electromagnetic fields.

There has been and still is some concern about such fields. However, after examining more than 500 studies spanning seventeen years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's

judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when operating the machine.

To reduce magnetic fields in the workplace, use the following procedures:

Keep cables close together by twisting or taping them.

Arrange cables to one side and away from the operator.

Do not coil or drape cables around your body.

Keep power source and cables as far away from operator as possible.

About Pacemakers:

Pacemaker wearers consult your doctor before going near battery assistance operations. If cleared by your doctor, then following the above procedures is recommended.

1.11 SAFETY DECALS

Safety decals are placed onto, or located near, system components that can present a hazard to operators or service personnel. All pertinent decals listed in **Section 7.13, Decal Locations and Identifications (Section 7)** are located near a component, which is subject to respect in terms of safety precautions. Always heed the information noted on the safety decals.

WARNING

DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

1.12 UPFITTERS' OBLIGATIONS

Any modifications or additions made to a vehicle by an upfitter must adhere to all applicable Federal Motor Vehicle Safety Standards (FMVSS), and applicable state regulations to assure the altered vehicle remains safe and meets the same safety requirements as a standard manufactured vehicle.

If unsure about the compliance requirements for specific modifications, vehicle upfitters should consult with the National Highway Traffic Safety Administration (NHTSA) to understand their obligations. www.NHTSA.gov or 1-888-327-4236.

When mounting Vanair® engine-driven equipment the following guidelines must be followed to ensure safe operation and ventilation:

1. Provide Adequate Ventilation:

- Ensure sufficient airflow openings for intake and exhaust to prevent CO build-up and overheating.
- Use louvers, vents, or fans to facilitate proper air exchange.

2. Exhaust Management:

- Route engine exhaust outside of the service body and away from any enclosed areas, vehicle occupants, or flammable materials.
- Use properly rated exhaust piping and ensure there are no leaks.
- Use properly rated heat shields and heat wrap.

3. Temperature Control:

- Install heat shields or insulation where necessary to reduce heat transfer to nearby materials.
- Avoid placing flammable items near equipment that generates heat.

4. CO Detection:

- Install carbon monoxide detectors in areas where equipment is mounted to provide early warnings of hazardous gas build-up.

5. Regular Inspection:

- Frequently inspect the mounting area for adequate ventilation, proper exhaust routing, and any signs of heat damage or gas leaks.

It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a manner that ensures adequate airflow and ventilation for safe operation. Failure to provide proper ventilation may result in hazardous conditions.

⚠ DANGER



DO NOT OPERATE IN AN ENCLOSED SPACE.

Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion. CO build-up can cause death!



Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT

An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries.

These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion.

It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions.

Vanair® assumes no responsibility or liability for installations it did not perform.

1.13 ♻ DISPOSING OF MACHINE FLUIDS

Always dispose of machine fluids under the guidance of all applicable local, regional and/or federal law.

Vanair® encourages recycling when allowed. For additional information, consult the container label of the fluid in question.

SECTION 2: SPECIFICATIONS

2.1 GENERAL INTRODUCTION

The tables and figures in this section list the specifications (including operational, output and dimensional) of the overall machine. Contact the Vanair® Service Department if additional specifications are needed that cannot be found

in this manual.

Refer to **Figure 2-1** for general machine component locations. For additional measurement specifications refer to the full identification assembly drawings, **Figure 3-1A** for 12V systems, or **Figure 3-1B** for 12/24V systems, in **Section 3, Installation**.

TABLE 2A: CAP•START® 3000 + AIR LIGHT SPECIFICATIONS	
SYSTEM INFORMATION	SPECIFICATION
Electrical System:	12 VDC
Instrumentation:	12 VDC Remote-mount Capable Instrument Control Panel
Rated DC Alternator Output:	240A
Charging Cable Leads:	30 Feet (Standard; other lengths optional)
Battery Charger Capacity:	12V Charge, 12V Start, and 24V Charge, 24V Start ⁱ
Engine: ⁱⁱ	24.9 HP (18.6 Kw) @ 3600 RPM (SAE J1349)
Engine Oil Capacity:	2.0 Quarts
Fuel Consumption:	Two (2) GPH at Full Engine Speed / Load
Fuel Type:	Gasoline ⁱⁱ
Operating Temperature Limits:	+10°F (-7°C) to 120°F (49°C) ⁱⁱⁱ
Compressor:	Reciprocating, Dual-stage
Air Compressor Capacity:	24 CFM @ 175 PSI
Compressor Inlet Control:	Zero (0) No Load / 100% Load
Compressor Air Filter:	Pleated Paper, Dry Type
Compressor Oil Type:	Vanair® Reciprocating Compressor Oil
Compressor Oil Capacity:	Service: 1.75 Quarts
Compressor Safety Valve Rating:	225 PSI
Air Tank Capacity:	Remote Tank ^{iv}
Adjustable Air Pressure Control Settings:	Factory Preset Pressure: Cut-in Pressure: 150 PSI / Cut-out Pressure: 175 (Maximum) PSI
Air Service Outlet:	One (1) on Machine
ⁱ Cap•Start® 3000A is also available for 12V / 24V capacity.	
ⁱⁱ For in-depth specifications and requirements for your engine type refer to the Engine Operation Manual.	
ⁱⁱⁱ With cold weather kit, temperature range expands to -40°F (-40°C). Consult Section 6.3 for Extreme Condition Operation.	
^{iv} Consult Vanair® for tank size options. Note that tank must be rated for no less than 200 PSI, and include a safety valve capable of handling at least 200 PSI.	

TABLE 2B: UNIT WEIGHT AND DIMENSIONS SPECIFICATIONS [†]

	Length (in)	Width (in)	Height (in)	Weight (lbs) (dry)
Dimensions (Overall Package, not including Remote-mount Instrument Panel):	45	21	27.38	560 ^{††}
Dimensions (Remote-mount Instrument Panel):	10	3.25	8	25 ^{††}
[†] See Figures 3-1A (Parts 1 and 2) through 3-1C, Installation and Dimension Diagram , for full machine dimension requirements.				
^{††} Weight listed for machine does not include the remote-mounted fuel tank (where applicable) or instrument panel.				

TABLE 2C: BOLT AND TORQUE SPECIFICATIONS

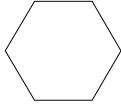
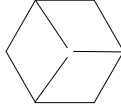
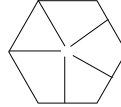
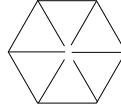
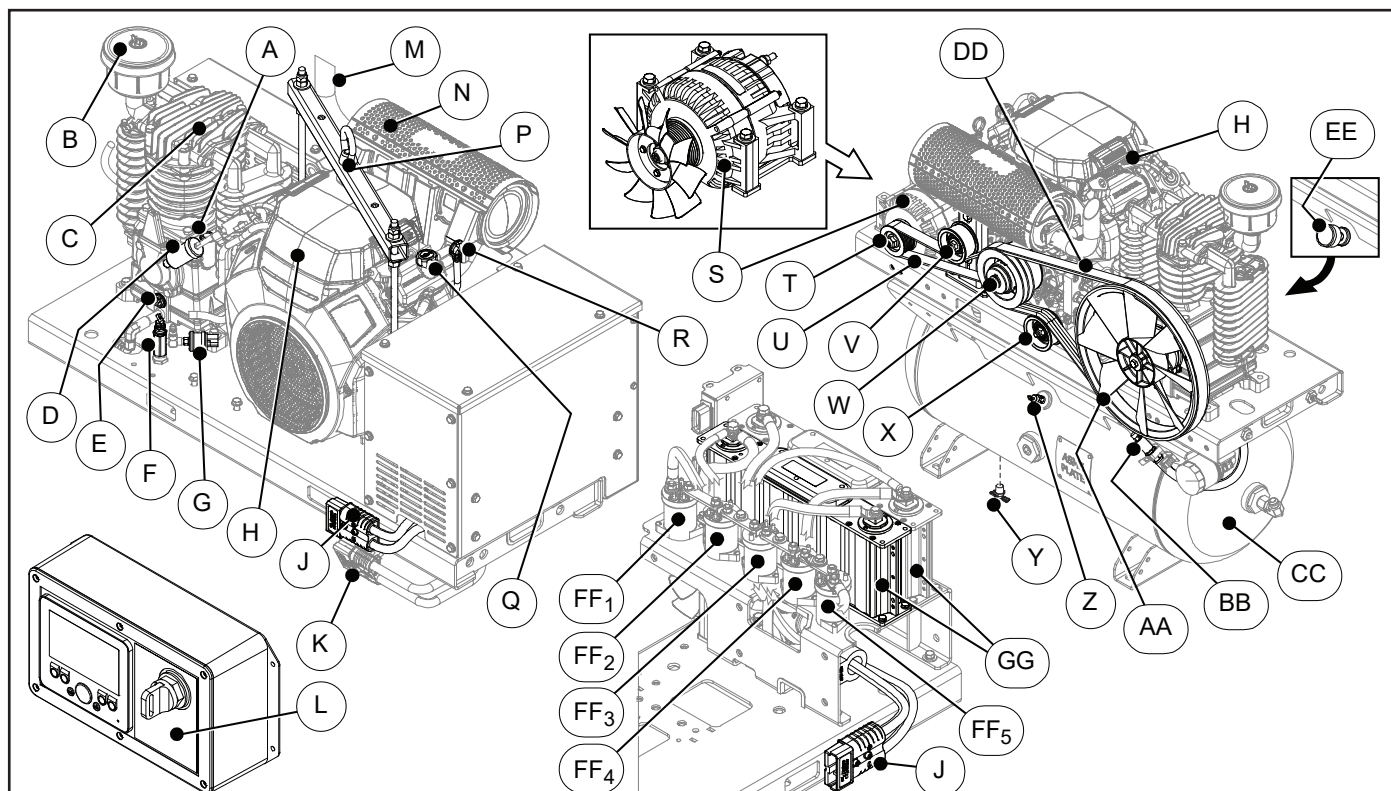
					SOCKET HEAD CAP SCREW
	SAE 2	SAE 5	SAE 7	SAE 8	
I.D. Marks:	No markings	3 lines	5 lines	6 lines	Allen head
Material:	Low - carbon	Medium - carbon, tempered	Medium - carbon, quenched & tempered	Medium - carbon, quenched & tempered	High - carbon, quenched & tempered
Tensile Strength (minimum):	74,000 PSI	120,000 PSI	133,000 PSI	150,000 PSI	160,000 PSI

TABLE 2D: US BOLT TORQUE SPECIFICATIONS (Torque in foot-pounds)

		2	2	5	5	7	7	8	8	Socket head cap screw	Socket head cap screw
Bolt Diameter	Thread Per Inch	Dry	Oiled	Dry	Oiled	Dry	Oiled	Dry	Oiled	Dry	Oiled
1/4	20	4	3	8	6	10	8	12	9	14	11
1/4	28	6	4	10	17	12	9	14	10	16	13
5/16	18	9	7	17	13	21	16	25	18	29	23
5/16	24	12	9	19	14	24	18	29	20	33	26
3/8	16	16	12	30	23	40	30	45	35	49	39
3/8	24	22	16	35	25	45	35	50	40	54	44
7/16	14	24	17	50	35	60	45	70	55	76	61
7/16	20	34	26	55	40	70	50	80	60	85	68
1/2	13	38	31	75	55	95	70	110	80	113	90
1/2	20	52	42	90	65	100	80	120	90	126	100
9/16	12	52	42	110	80	135	100	150	110	163	130
9/16	18	71	57	120	90	150	110	170	130	181	144
5/8	11	98	78	150	110	140	140	220	170	230	184
3/4	10	157	121	260	200	320	240	380	280	400	320
3/4	16	180	133	300	220	360	280	420	320	440	350
7/8	9	210	160	430	320	520	400	600	460	640	510
7/8	14	230	177	470	360	580	440	660	500	700	560
1	8	320	240	640	480	800	600	900	680	980	780
1	12	350	265	710	530	860	666	990	740	1060	845



KEY	DESCRIPTION	KEY	DESCRIPTION
A	COMPRESSOR OIL FILL PORT/CAP	U	AC GENERATOR DRIVE BELT
B	COMPRESSOR AIR FILTER HOUSING	V	AC GENERATOR TENSION PULLEY
C	COMPRESSOR UNIT	W	AC GENERATOR/COMPRESSOR DRIVE SHEAVE ASSEMBLY
D	ENGINE FUEL FILTER	X	COMPRESSOR DRIVE TENSION PULLEY
E	COMPRESSOR OIL LEVEL SIGHT GLASS	Y	MOISTURE DRAIN
F	PILOT/UNLOADER VALVE	Z	PRESSURE RELIEF VALVE (200 PSI)
G	PRESSURE SWITCH	AA	COMPRESSOR DRIVE SHEAVE
H	ENGINE	BB	COMPRESSOR OIL DRAIN TUBE
J	CHARGE / START BATTERY CONNECTION (GREY)	CC	AIR TANK (30 GALLON) ^I
K	TO CAP•START® BATTERY (YELLOW)	DD	COMPRESSOR BELT DRIVE
L	INSTRUMENTATION/CONTROL PANEL	EE	PRESSURE GAUGE (FOR 30 GALLON TANK)
M	EXHAUST OUTLET PIPE	FF ₁	RELAY: 500A WITH STUDS ^{II}
N	MUFFLER	FF ₂	RELAY: 500A WITH STUDS ^{II}
P	LIFTING BAIL ASSEMBLY (OPTIONAL)	FF ₃	RELAY: 500A WITH STUDS ^{II}
Q	ENGINE OIL FILL PORT	FF ₄	RELAY: 500A WITH STUDS ^{II}
R	ENGINE DIPSTICK/OIL LEVEL GAUGE	FF ₅	RELAY: 500A WITH STUDS ^{II}
S	AC GENERATOR	GG	ULTRACAPACITOR (x2)
T	AC GENERATOR DRIVE SHEAVE		

^I 30 gallon tank shown. Other options include a dual 14-gallon tank mount (refer to **Section 7.5** for information) or a skid (non-tank) mount.

^{II} For relay component locations refer to **Section 7.4, Alternator / Capacitor Relay Tray - 4 OF 4**.

NOTE: For additional location information refer to **Figure 3-2A** and **3-2B**, and **Section 7** (for a complete part breakdown).

Figure 2-1: Machine Main Component Locations

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SECTION 3: INSTALLATION

3.1 MACHINE PACKAGE RECEIPT/INSPECTION

Upon receipt of the machine package, inspect the exterior of the shipping crate for signs of shipping/transit damage. Any damage should be reported immediately to the shipping company.

NOTE

Before fully unpacking the unit, inspect the component parts, supports and loose-packed parts to ensure that there have been no internal movements of assemblies or components, which may have been damaged during shipment.

Should any damage be discovered during package inspection, contact the shipping company immediately. To report missing items, incorrect part numbers, or other discrepancies, contact Vanair® at the contact information given below.

Vanair®, a Lincoln Electric Company
10896 West 300 North
Michigan City, IN 46360
Toll Free: (800) 526-8817
Telephone: (219) 879-5100
Service (toll free): (844) VAN-SERV
(844) 826-7378
vanair.com

3.2 GENERAL OVERVIEW OF INSTALLATION

The machine must be mounted in a constantly-ventilated space. This space must also adhere to the minimum clearance distances given in this figure for safety and maintenance reasons.

⚠ DANGER



DO NOT OPERATE IN AN ENCLOSED SPACE.

Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion.

CO build-up can cause death!



Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT

An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries.

These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion.

It is the responsibility of the installation party to determine and mount Vanair® engine driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions.

Vanair® assumes no responsibility or liability for installations it did not perform.

⚠ WARNING

ELECTRICAL HAZARD! Be sure the vehicle battery is disconnected before starting the installation.

Continued...

⚠ WARNING (continued)

Installation must adhere to the safety precautions listed in the Safety Section of this manual for cooling and noxious fume ventilation.

If mounting footprint is tighter than the recommended minimum requirements, consult the Vanair® Service Department for application installation recommendations.

⚠ WARNING

Reciprocating Air Compressors can generate high heat during use. Never touch the compressor or output hose while it is hot or running.

Vanair® recommends the use of braided Stainless-Steel (SS) air hose for connecting the output air from the air compressor to the air receiver tank. Braided Stainless hose is suitable for this application as it is rated for high heat.

IMPORTANT

For durability and safety reasons, non-Stainless-Steel hoses for compressed output air should be avoided for this task. The heat rating of hoses made from materials other than braided Stainless-Steel, may be exceeded during regular use of a reciprocating air compressor.

If nearby objects, surfaces, or materials are subject to combustion or damage due to high heat, consider the use of heat shielding.

Optional output air hose heat shielding is available from your dealer or directly from the manufacturer.

IMPORTANT

Do not permanently bolt machine down until after all instructions given in Section 3.2 and Section 3.3 have been addressed.

NOTE

Although much of the information given in this installation section is comprehensive, these guidelines should be considered as referential material only, due to the diverse possibilities of the end user's vehicle make, model and year, and the unit model specifications.

NOTE

Install electrical components (pressure switches, toggle switches, etc.) in locations where exposure to water or moisture will be most minimized.

NOTE

In order to prevent accidental damage to vehicle components (fuel tanks, lines, brake lines, wiring harnesses), note their location before drilling any holes.

NOTE

For guidance on machine start-up procedure and control panel functions, consult Section 4, Operation.

When determining the factors involved with the installation of the Cap•Start® machine on a vehicle, use this manual in tandem with the vehicle's own manual to aide in determining how the machine and its functions need to integrate with the vehicle's layout and systems.

Refer to **Figures 3-1A** through **Figure 3-1C**, for proper clearances and dimensions, and for wiring (**Section 7.14**) to assist with machine package installation.

3.2.1 MACHINE LOAD BEARING SURFACE

For particular load-bearing locations, if necessary, additional support may be needed to assure stability of the machine once it is mounted.

IMPORTANT

Mounting surface must be able to bear the weight of the machine.

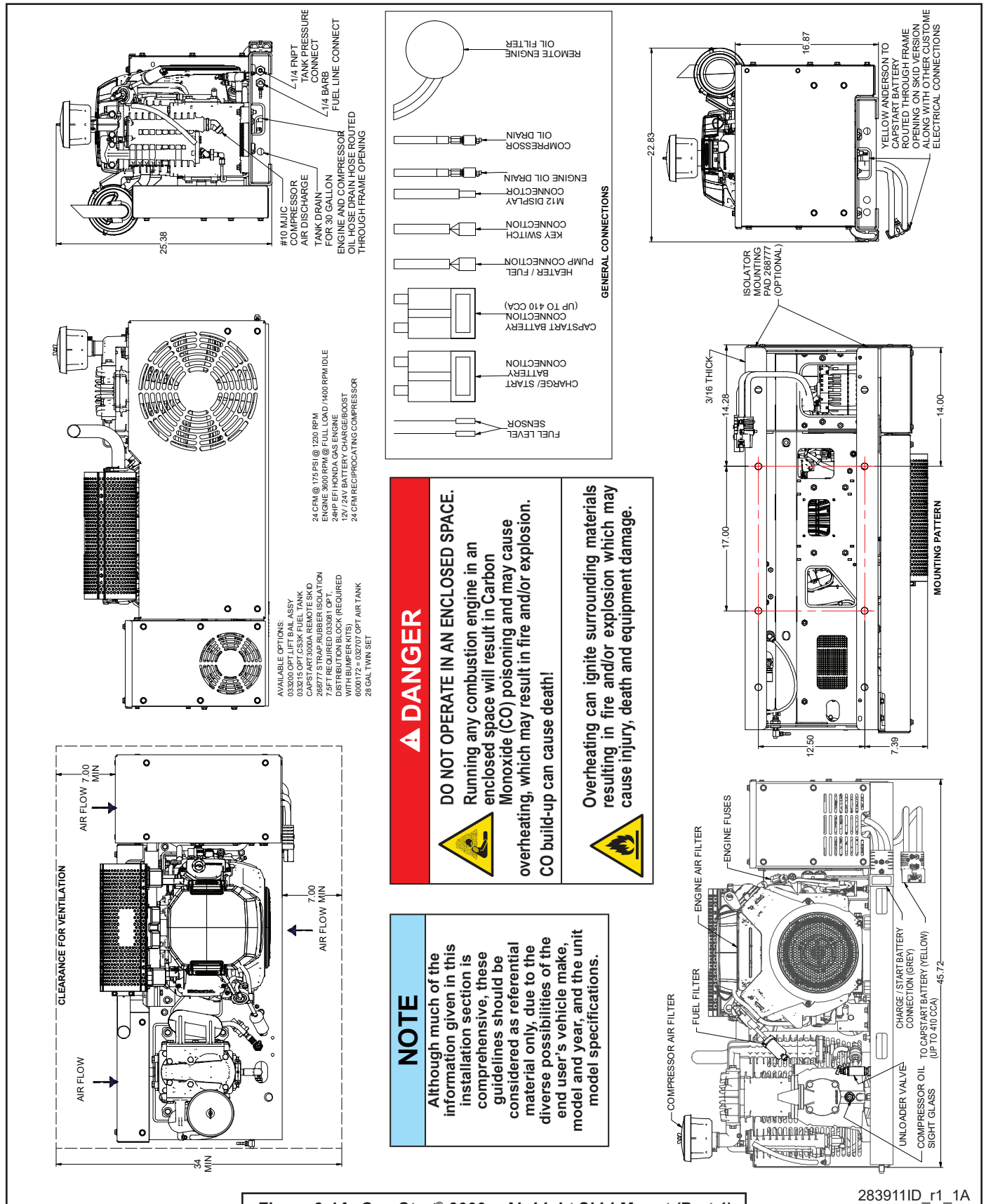
Refer to **Figures 3-1A** (Parts 1 and 2) through **Figure 3-1C**, and the following instructions.

1. Remove packing and inspect machine and control panel for shipping damage.
2. Check fluid levels; refill if needed. Refer to the Engine Operation Manual for engine oil specification.
3. Check for possible leaks.

3.2.2 EXHAUST OUTLET LOCATION

Engine exhaust must have provision for exhausting without recirculating engine exhaust back to the cool air intake.

Continued on page 3 - 7...



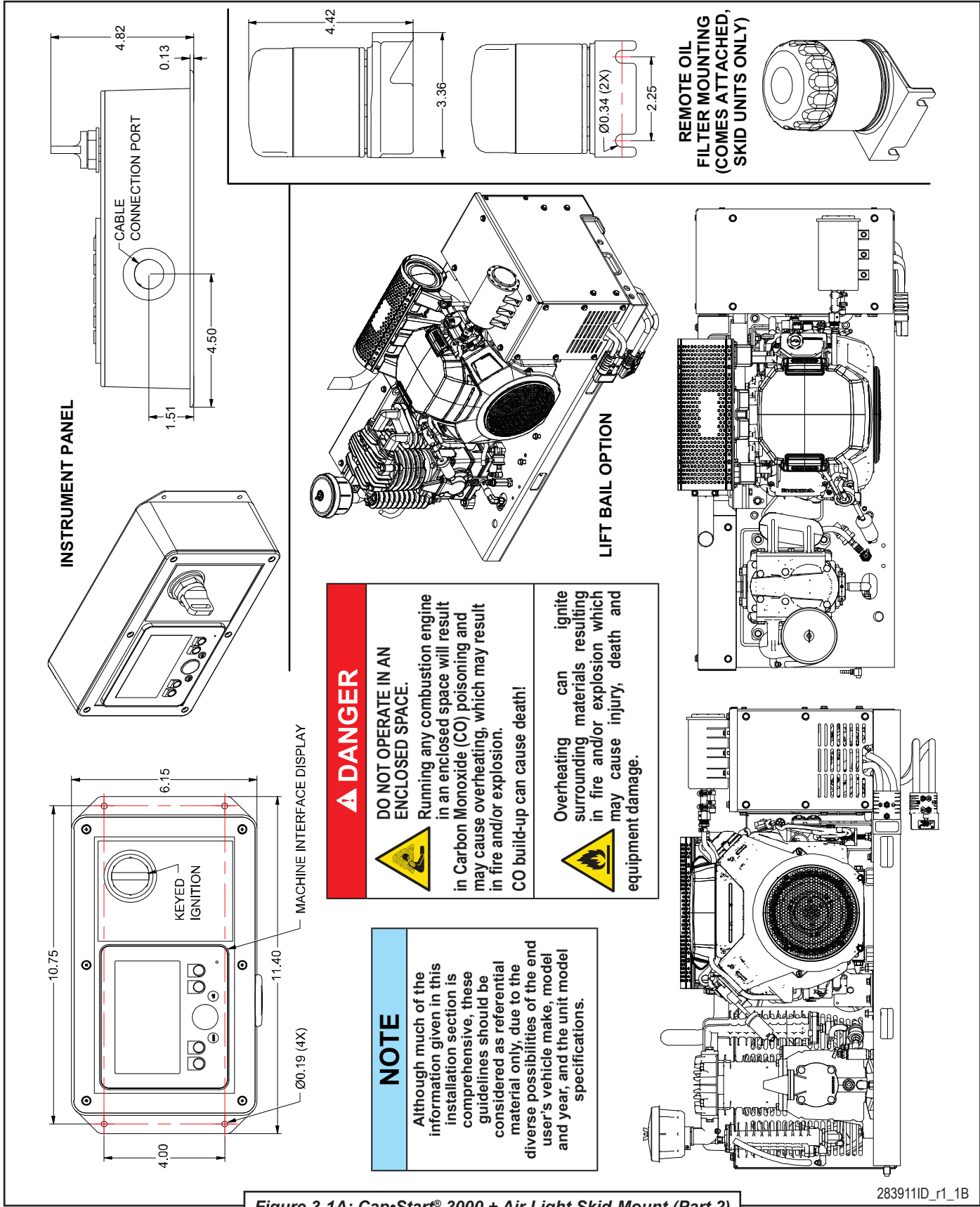


Figure 3-1A: Cap•Start® 3000 + Air Light Skid-Mount (Part 2)

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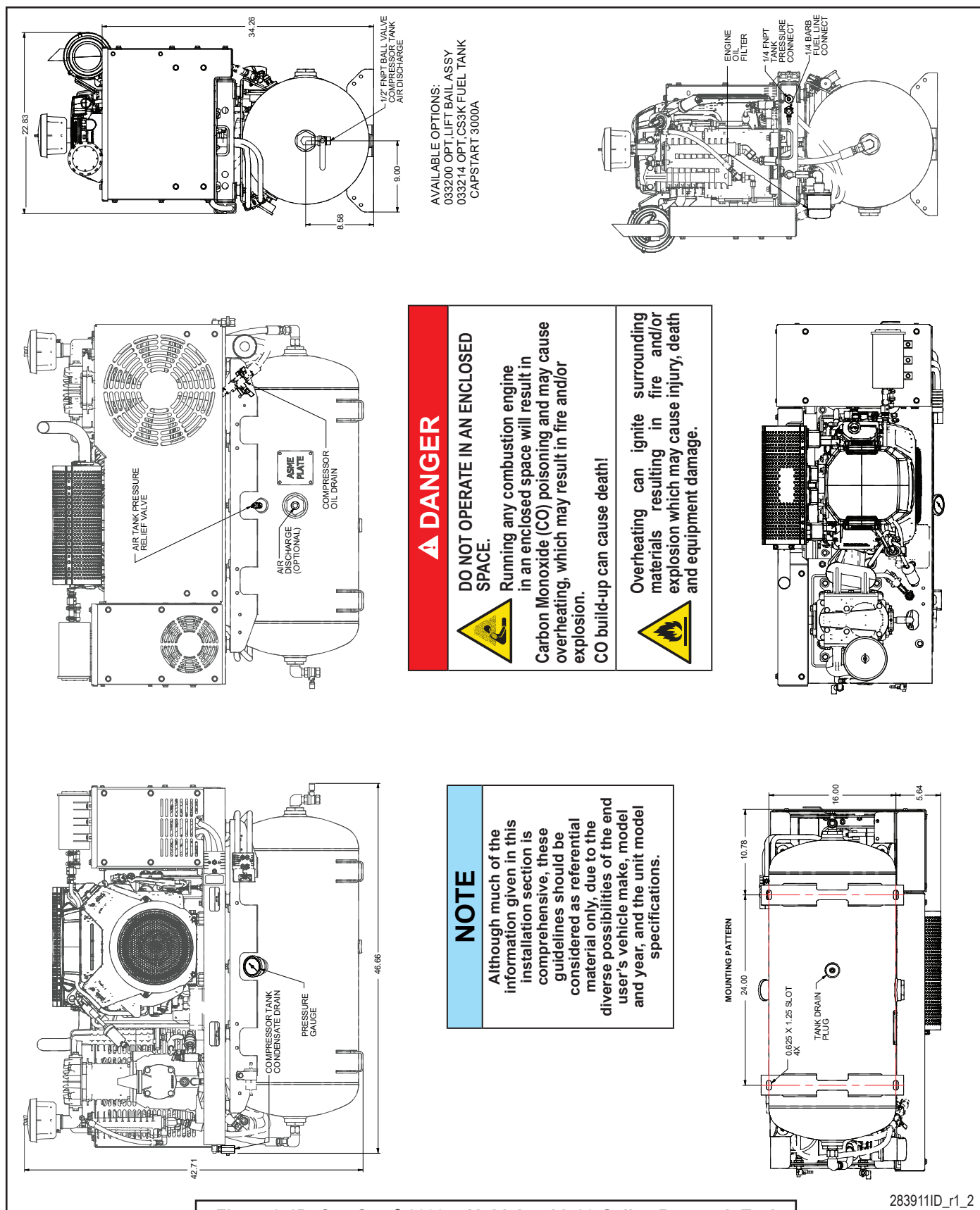


Figure 3-1B: Cap•Start® 3000 + Air Light with 30-Gallon Reservoir Tank

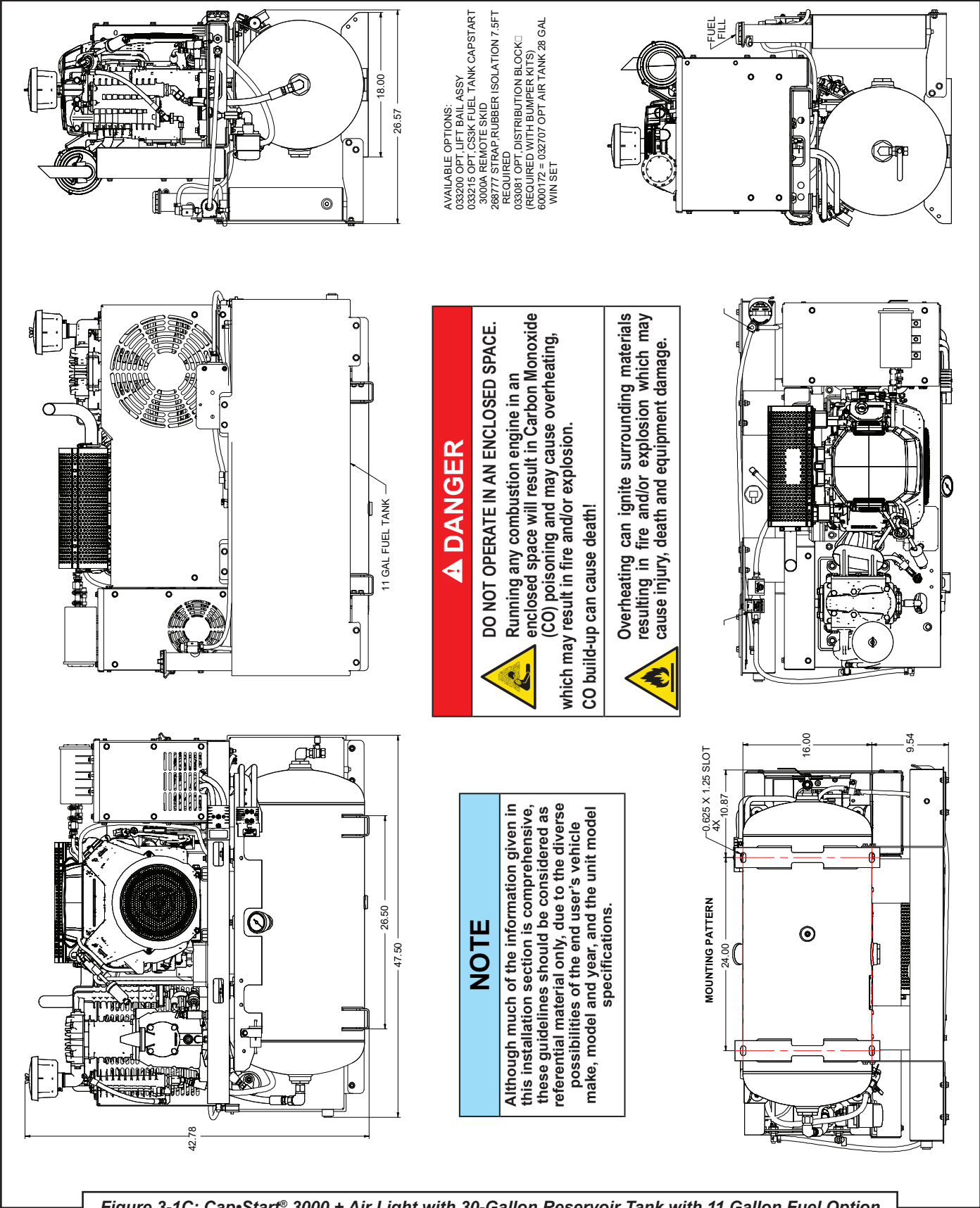


Figure 3-1C: Cap•Start® 3000 + Air Light with 30-Gallon Reservoir Tank with 11 Gallon Fuel Option

Continued from page 3 -2...

Exhaust tubing must be made of a flexible pipe with a secure connection at both ends (Vanair® recommends: *flex pipe exhaust 1-1/2 inch; order no. 280550*). Maximum use length is 10 feet, with no sharp bends.

A spark arrestor assembly is also available (spark arrestor **no. MA68724** and diffuser disk for spark arrestor **no. MA69132**).

3.2.3 MACHINE CLEARANCE ALLOWANCE

DO NOT Install in an enclosed space:

⚠ DANGER	
	DO NOT OPERATE IN AN ENCLOSED SPACE. Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion. CO build-up can cause death!
	Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT
An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries. These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion. It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions. Vanair® assumes no responsibility or liability for installations it did not perform.

Refer to **Figure 3-1A** for minimum machine clearance distances, for safety and maintenance.

The machine must be mounted in a constantly-ventilated space.

3.2.3.1 MACHINE VENTILATION

Cap•Start® machines are air-cooled and adequate provision for supply of cool air to the engine, compressor and alternator is required. Refer to **Figures 3-1A** through **Figure 3-1C** for minimum clearance distances, for both air flow and service access. Heated exhaust air must have provision for exhausting air without recirculating back to the cool air intake.

3.2.3.2 MACHINE PARAMETERS FOR CIRCULATION REQUIREMENTS

Refer to **Figures 3-1A** through **Figure 3-1C**.

Allowances must be made for proper distance surrounding the machine to allow for adequate air circulation in order to cool the package during operation.

Most importantly a fresh, cool and unhindered air supply must be allowed at the air intake side of machine. In addition, clearance space surrounding the machine is needed for purposes of heat dissipation and maintenance and control.

When referring to the machine dimensions given in **Figures 3-1A** through **Figure 3-1C**. Take into account the additional cooling and maintenance space requirements before locating the machine mounting position.

If there is an air gap on the sides of the machine greater than two inches (2"), this gap must be baffled to disallow recirculation of hot air back to cool air intake.

3.3 MOUNTING THE MACHINE

Refer to **Figures 3-1A** through **Figure 3-1C**. Once all of the factors listed in **Section 3.2** have been considered, and the machine placement location has been resolved, the machine must be fully unpacked from its crate mounting.

⚠ WARNING
Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual.

▲ IMPORTANT

Note that improperly-mounted equipment may have the potential to cause harm, and possibly cause damage or undue stress on the equipment.

▲ CAUTION

Lift the machine package in accordance within the safety guidelines given in *Section 1.7.1*, *Falling Unit Can Cause Injury*.

3.3.1 MACHINE STABILIZATION AND GROUNDING

Machine should be mounted to vehicle using a minimum of four (4) isolators. Isolators absorb vibration. Isolators are available from Vanair®; order bolt down vibration isolator kit **no. KIT1202-001** (kit contains four [x 4] isolators).

▲ WARNING

GROUNDING STRAP: If the machine and/or instrument panel respectively are isolated from contacting the chassis (paint fiberglass body, rubber mounts, etc.), then the machine must be grounded to the truck chassis with a minimum two (2) ga wire (reference Vanair® ground strap no. 267498).

If the machine is bonded by traditional hard mounting (metal to metal contact with chassis), then the grounding strap is not required.

3.3.2 TRUCK CHASSIS FUEL TANK INSTALLATION

Refer to truck manual for tying into existing fuel system. Vanair® service and engineering can also lend assistance in this regard.

IMPORTANT

Make sure pick-up tube does not extend to the bottom of the tank to ensure that unit will never run the truck's fuel tank empty.

IMPORTANT

Route fuel line so that it never drops below the bottom of the tank

3.3.3 REMOTE-MOUNTED FUEL TANK INSTALLATION

Refer to **Section 3.4** for pump location information.

The 12V+ relay signal wire to power the fuel pump is located in the machine harness. The wire is purple, with a bullet-style connector (refer to **Figure 3-1A** and the wiring diagram [**Section 7.14 Wiring Diagram**]). The ground wire can be connected to the truck chassis.

Route fuel line so that it never drops below the bottom of the tank.

3.3.4 REMOTE-MOUNTED INSTRUMENT PANEL INSTALLATION

If remote-mounting the instrument panel, all "pass-throughs" in the frame or body should be at minimum, a one and a half inch (1-1/2") diameter hole. All openings must have a grommet installed to protect the wiring from sharp edges.

3.3.5 INSTALLING THE CAP•START® BATTERY

The Cap•Start® 3000 + Air Light requires installation of its own dedicated battery. The battery must be 12VDC and 410CCA or smaller.

NOTE

DO NOT connect the Cap•Start® to the Service Vehicle Battery.

IMPORTANT

Failure to use a 410CCA or smaller battery or connecting to the Service Vehicle Battery may cause the engine to shut down and/or cause damage to the machine.

3.3.6 REMOTE-MOUNTED AIR TANK INSTALLATION

If tank is larger than six inches (6") OD it must be ASME rated.

▲ IMPORTANT

Tank must include a safety valve rated for no less than 200 PSI.

(Vanair® tank is supplied; reference Vanair® **no.**

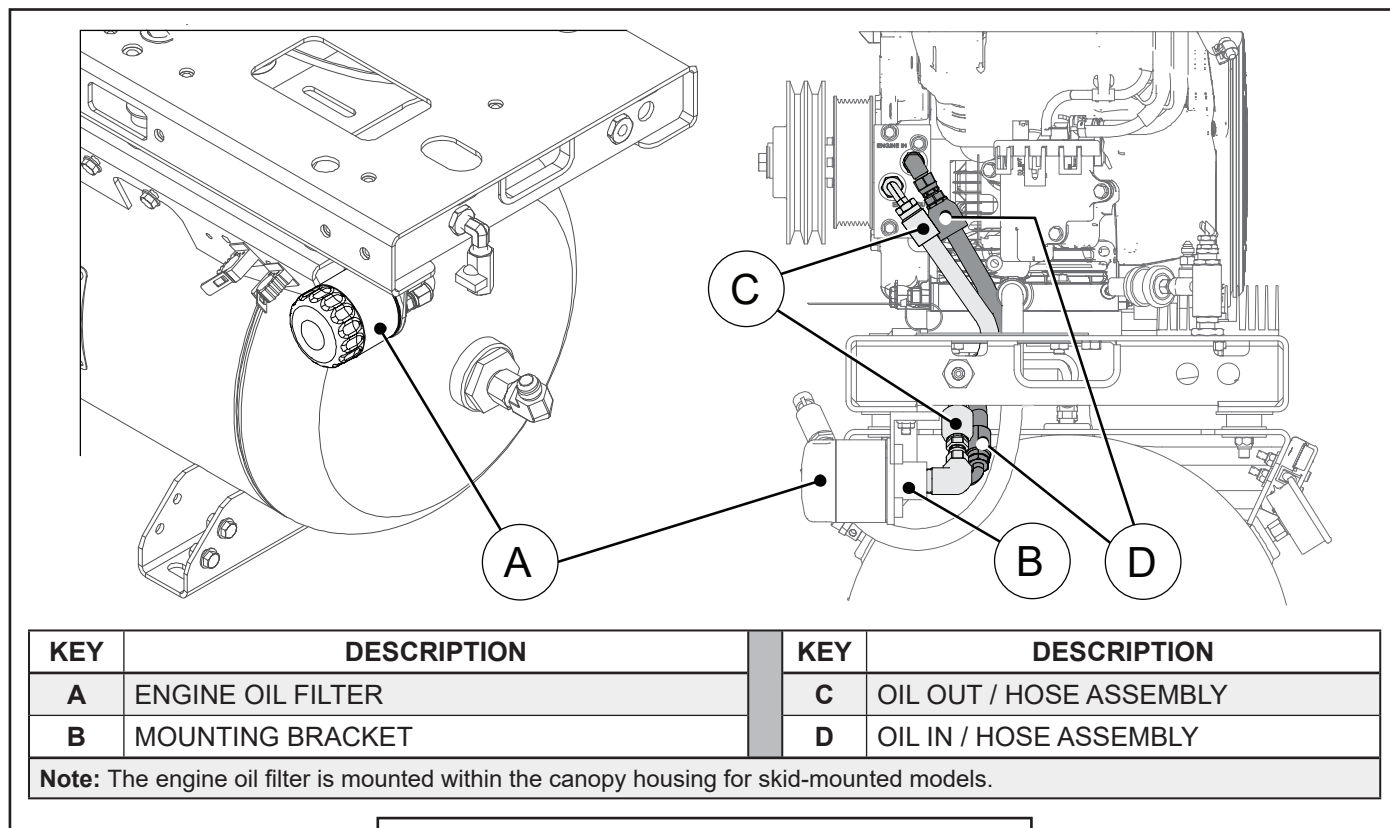


Figure 3-2: Engine Oil filter Remote Mounting Bracket

CO450008).

NOTE

Recommended tank capacity is 20 gallons minimum.

Install a 1/2" check valve in line from compressor to tank. Connect pressure sense line to unloader downstream of check valve.

To determine the location of a remote-mounted air tank, consider the following:

- Air system piping relation to the Cap•Start® machine.
- Hindrance to any access, or operation of, other standard or mounted vehicle system(s), including any under deck, or accessible wiring, piping, etc.
- Service output location.

NOTE

When determining the location of the air tank, keep in mind that the tank's drain valve will need to be accessed on a frequent (daily) basis.

NOTE

When adding auxiliary air tank(s), Vanair® recommends installing a pressure gauge that is visible to the operator.

To prepare and install the remote air tank follow these guidelines for reciprocating compressor discharge (3/4"):

NOTE

DISCHARGE TO TANK (HOSE) SPECIFICATION:

Parker 919-12 or equal: working pressure 1200 PSIG, rated -100°F to 450°F.

Flouropolymer PTFE SAE 100R14A, 304 stainless steel reinforcement.

Hose specifications listed above are used for hose run from compressor unit to tank, and from tank to hose reel.

3.3.7 REMOTE-MOUNTED ENGINE OIL FILTER BRACKET

Refer to **Figure 3-2**. The engine oil filter bracket

can be mounted anywhere that will allow for the hoses to reach, without being twisted.

IMPORTANT

Ensure that engine’s oil filter run hoses are connected correctly for proper oil flow. Reversing the flow direction can damage the engine.

3.4 CONNECTING THE FUEL SYSTEM

To connect to the fuel pump, refer to **Figure 3-3**, and follow these steps:

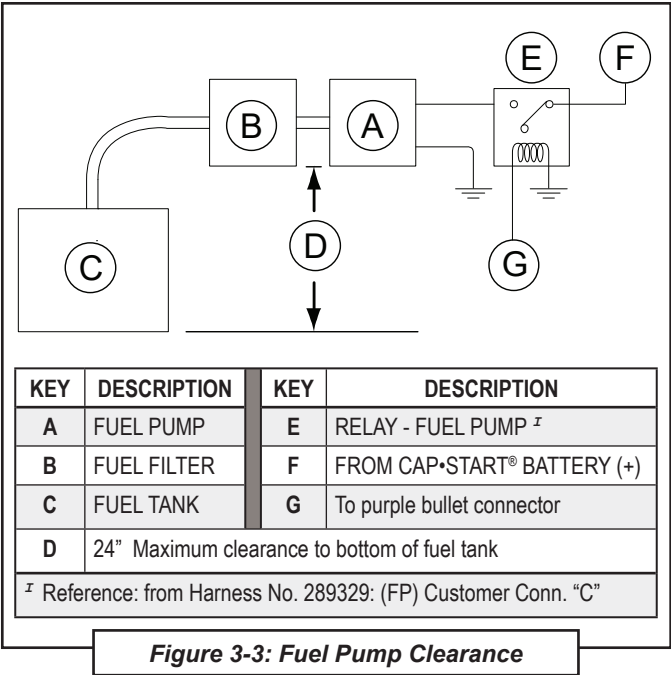
IMPORTANT

The Vanair-supplied fuel pump includes an internal check valve. **DO NOT** add an external check valve when assembling the fuel pump line connection.

1. Mount the electric fuel pump at the desired location on the service body, keeping it as close to the truck fuel tank as possible. Mount the electric fuel pump a maximum distance of 24 inches from the bottom of the tank.
2. Install the pick-up fuel lines.
 - Ensure that the lines do not make contact with sharp edges, moving parts or exhaust heat (consult **Section 7.16, Hose Installation Guide**, for assistance in running hose lines).
 - Units must have a 75 micron chassis pre-fuel filter in line before the pump (included). Refer to **Section 7.11** or **7.12** for fuel pump assembly for remote fuel.

NOTE

Fuel pump cannot exceed four (4) PSIG at engine booster pump.



3.5 INSTALLING THE REMOTE CONTROL PANEL

For remote instrument panel mounting, install the remote control panel at the desired location on the service body, and route the control trunk line to the location where the unit will mount. All pass-throughs in the frame or body should be sized to at least a one and a half inch (1-1/2") diameter hole. Ensure that all sharp edges that the trunk-line contacts are shielded or grommet-protected, and that there are no excessively sharp bends in the trunk-line. Ensure the trunk line does not come in contact with exhaust parts.

SECTION 4: OPERATION

4.1 GENERAL INFORMATION

The Cap•Start® 3000 + Air Light System has a comprehensive array of controls and indicators for each function of the power system. Understanding the correct operation of the system will help you to understand and recognize when the system is operating optimally.

⚠ IMPORTANT



Before starting the Cap•Start® 3000A Series machine, read this section thoroughly and familiarize yourself with the controls and indicators - their purpose, location and use.

The information in the Operation Section will help the operator to recognize and interpret the readings, which will call for service or indicate the beginning of a malfunction.

⚠ DANGER



DO NOT OPERATE IN AN ENCLOSED SPACE.

Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion.

CO build-up can cause death!



Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage.

IMPORTANT

An enclosed space refers to any area partially or fully enclosed by walls, a roof, or other boundaries.

These spaces can limit natural ventilation, restrict airflow, trap hazardous gases, and increase the risk of heat build-up, fire, or explosion.

Continued...

IMPORTANT (continued)

It is the responsibility of the installation party to determine and mount Vanair® engine-driven equipment in a way that ensures proper airflow and ventilation for safe operation. Failure to provide proper ventilation and clearances may result in hazardous conditions.

Vanair® assumes no responsibility or liability for installations it did not perform.

⚠ DANGER

Grounding must consist of a minimum two (2) gauge wire between the instrument panel, the machine, and the truck chassis.

⚠ WARNING

Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual.

⚠ WARNING

Before performing maintenance or repair operations on the machine, ensure that all power has been removed and locked out to prevent accidental start-up.

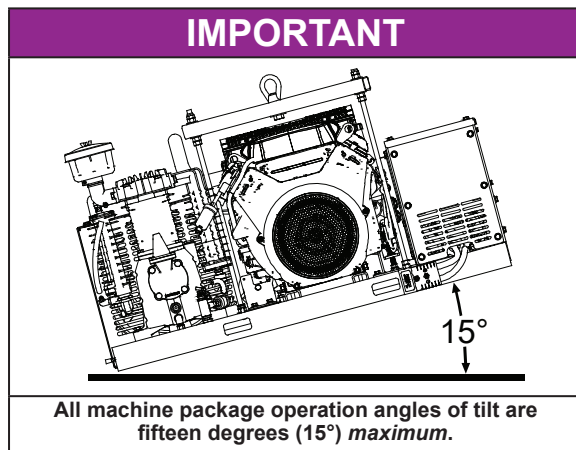
NOTE

If start-up and shutdown procedures are not followed, damage to the system and its components may occur.

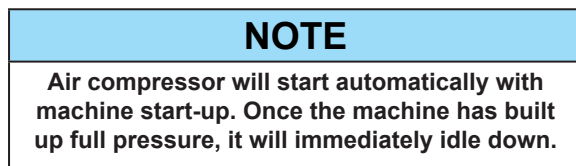
4.2 ENGINE START-UP AND SHUTDOWN PROCEDURE

NOTE

A visual breakdown of panel function by control feature can be found by consulting *Figure 4-1*.

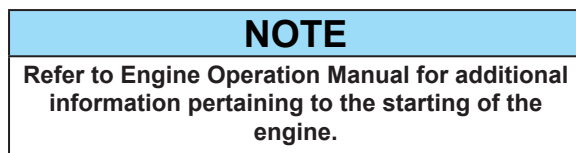


4.2.1 ENGINE START-UP

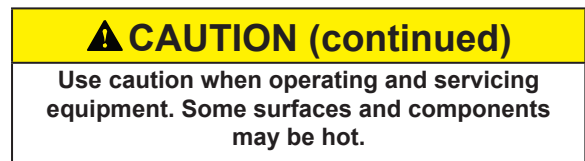


Consult **Figure 4-1**, (control key functions) and **Figure 4-2** (screen display navigation) as guidance for controlling the Cap•Start®. Follow the steps below to start the engine:

1. Check to make sure all switches are in the **OFF** [1] position (pilot valve lever in UNLOAD position) prior to starting.
2. Turn the engine control switch from the **OFF** to the **ON** [2] position; wait 3-5 seconds for the fuel pump to prime the system.
3. Continue turning the engine control switch to the **START** [3] position until the engine starts (when the switch is let go, it will revert back to ON position).
4. The engine will automatically go into a warm-up sequence based on ambient temperature.



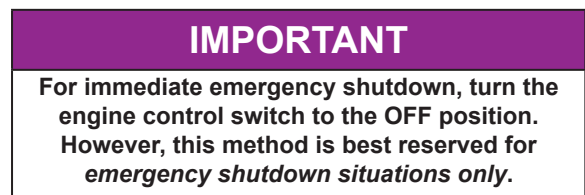
4.2.2 ENGINE SHUTDOWN



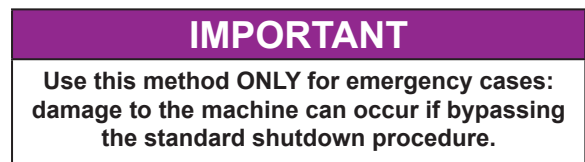
Consult **Figure 4-1**. Vanair® recommends that the following procedure is used for routine shutdowns in order to keep the system in optimal condition, and minimize undue stress that may occur during the next start up session if some of the machine conditions were left in working mode(s).

TO PREPARE THE MACHINE FOR SHUTDOWN:

1. Close service valve(s).
2. Ensure the display is on the HOME screen..
3. Disconnect charging cables.
4. Allow machine to run at idle for a 3-5 minutes to allow for a cool down sequence.
5. Turn the engine control switch to the **OFF** position [1]. If no air leaks are present, the engine should start at idle speed the next time it is started.



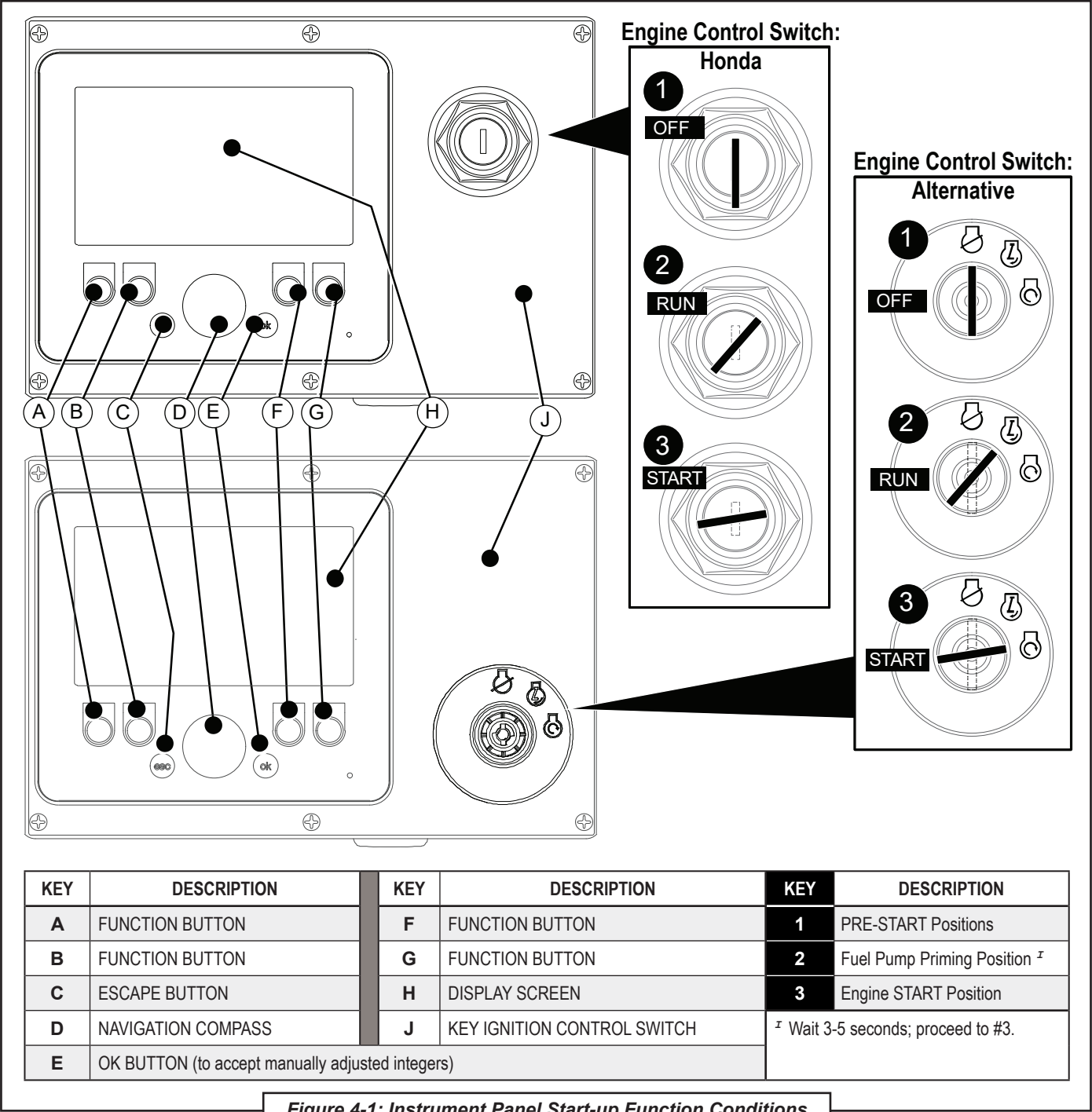
4.2.3 EMERGENCY SHUTDOWN PROCEDURE



AFTER AN EMERGENCY SHUTDOWN:

Troubleshoot the problem before restarting the machine.

ALWAYS turn off or reset all functions, including turning off all service valves, that may have been active at the time the emergency shutdown



occurred.

4.3 ENGINE THROTTLE CONTROL FUNCTIONS

The engine speed is controlled by two factors:

- The level of air pressure in the tank and the

position of the pilot valve switch, if applicable.

- The function selected on the control panel.

4.4 OPERATING THE BATTERY STARTER / CHARGER

The Vanair® state-of-the-art battery charging

module adds versatility to the Cap•Start® system. The battery charging system operates off the DC alternator.

⚠ DANGER

Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual,
Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual.

⚠ DANGER

Grounding must consist of a minimum 2 gauge wire between the machine, and the truck chassis.

⚠ WARNING

NEVER disconnect charging connections or cables while charging / starting. This will cause a voltage spike on the machine. Failure to follow this warning can result in injury, and/or damage or failure of any or all electronic components, thus voiding the warranty of the machine.

NOTE

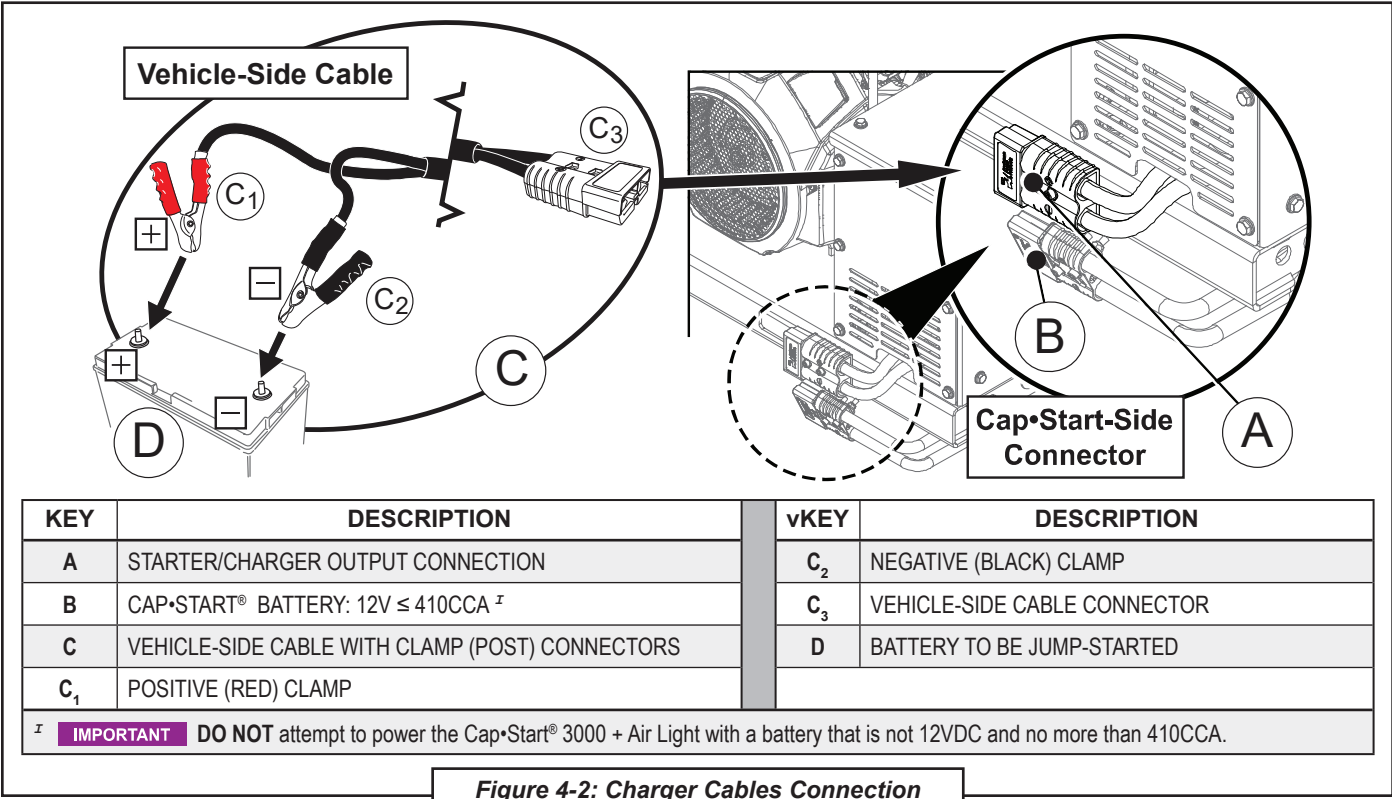
For vehicle engine start-up, refer to Section 4.4.1, Starting a Vehicle Engine. For vehicle battery charging, refer to Section 4.4.2, Charging a Battery.

Refer to **Figures 4-1, 4-2**, and the following instructions.

- 1. Turn vehicle ignition switch to accessory or battery mode, and turn the vehicle heater fan on.
- 2. Connect the Vanair-approved charging cable as follows (Refer to **Figure 4-2**):

VEHICLE-SIDE CABLE PREPARATION:

- 3. Attach the jumper cable by placing the red positive cable clamp [B₁] to positive [+] battery post; negative cable clamp [B₂] to black negative [-] battery post, to ensure correct polarity.
- 4. Attach the jumper cable 2-pin connector [B₃] to the machine [A].
- 5. Turn the Cap•Start® engine ignition key clockwise fully until the engine starts.



4.4.1 STARTING A VEHICLE ENGINE

⚠ WARNING

If vehicle batteries are below minimum vehicle operating voltage, it is recommended to proceed to **Section 4.4.2** prior to starting the vehicle.

⚠ WARNING

NEVER disconnect charging connections or cables while charging / starting. This will cause a voltage spike on the machine. Failure to follow this warning can result in injury, and/or damage or failure of any or all electronic components, thus voiding the warranty of the machine.

Once the Cap•Start's engine is engaged as per **Section 4.2.1**, consult the following instructions:

1. Refer to **Figure 4-1**: On the Cap•Start's instrument panel, depress the correct button for the appropriate chassis voltage.
2. Depress the START button.
- If no faults are present, the CHARGING CAPACITORS screen will appear indicating that the Vanair® Super Capacitor (VSC™) is self-charging. This step may take up to 20 seconds to complete.
- Once charged the READY screen will appear indicating that the capacitor is charged and ready to jump-start the vehicle.
3. Attempt to start the vehicle. If glow plugs are present on vehicle, allow glow plugs to turn on and reach operating temperature before attempting to turn over.

IMPORTANT

If engine does NOT turn over on first attempt, allow capacitor to recharge, and try again.
DO NOT crank for longer than 10 seconds per attempt. Allow 30 seconds between cranks.
If vehicle does not turn over after three (3) attempts consult a mechanic, as other problems may be present in vehicle.

4. Once the vehicle starts or the batteries are charged, return the Cap•Start's operation selector switch to the "OFF" position. Allow

the Cap•Start® to idle down for two minutes then turn engine ignition key to the "OFF" position.

5. Disconnect the charging cable clamps from the vehicle battery first, then disconnect the connector from the Cap•Start®.

4.4.2 CHARGING A BATTERY OPERATION

⚠ WARNING

NEVER disconnect charging connections or cables while charging / starting. This will cause a voltage spike on the machine.

Failure to follow this warning can result in injury, and/or damage or failure of any or all electronic components, thus voiding the warranty of the machine.

Once the Cap•Start's engine is engaged as per **Section 4.2.1**, consult **Figure 4-1** and the following instructions:

1. On the Cap•Start® instrument panel, depress the correct button for appropriate chassis voltage position.
2. Depress CHARGE button.
- If no faults are present, the CHARGE IN PROGRESS screen will appear indicating that the unit is outputting a charge.
3. Charge battery until it reaches an adequate voltage.
- To check the vehicle's battery voltage turn off the CHARGE function by depressing the CHARGE button, and refer to the Cap•Start® panel's Battery Voltage display.
4. Once the batteries are charged depress the CHARGE button. Allow the Cap•Start® to idle down for two minutes then turn engine ignition key to the "OFF" position.

IMPORTANT

DO NOT attempt to start while in charge mode.

5. Disconnect the charging cable clamps from the vehicle battery first, then disconnect the connector from the Cap•Start®.

4.4.3 ERROR CODES

⚠ WARNING

If a voltage fault is present be sure a short circuit is not present before using override switch.

Refer to **Section 6.4, Diagnostic Codes** in the **Troubleshooting Section (Section 6)**.

4.4.4 MANUAL ACTIVATION

The Cap•Start® 3000 + Air Light is designed to start vehicles at very low voltage. If your battery is too low or unable to take a charge, the Cap•Start® may be unable to detect the connection. If you need to start a vehicle in this condition, the Cap•Start® 3000 + Air Light can be manually activated. This allows the unit to engage when normally unable to do so.

⚠ WARNING

Use Manual Activation Mode with extreme care. This mode is for 12 or 24V lead acid batteries only. Low current, low voltage, and reverse polarity protection features are disabled.

Use Manual Activation Mode with extreme care. This mode is for 12 or 24V lead acid batteries only. Low current, low voltage, and reverse polarity protection features are disabled.

Pay close attention to the polarity of the battery and ensure a proper connection before using this mode.

DO NOT touch the clamps together, as the Cap•Start® will generate sparks. This mode uses high current that can cause sparks and heat if not used properly. If you are unsure about using this mode, contact the Service Department at 1-844-VAN-SERV (1-844-826-7378).

To manually activate the Cap•Start® 3000 + Air Light:

1. Turn the unit on.
2. Select the desired mode, 12V charge, 12V start, 24V charge, or 24V start.
3. When the red error screen appears, such as a low voltage or poor connection, press the OK button.

This will change the display to a yellow warning screen.

4. Press and hold the mode button for 3-4 seconds. The unit will now be activated.

⚠ CAUTION

Turn "off" the Cap•Start® before disconnecting the clamps. This will ensure operator safety.

4.5 OPERATING THE AIR COMPRESSOR

The air compressor on the Cap•Start's Air System is a continuous-run compressor. This means that the compressor continues to turn at all times, even when it is not building pressure in the air storage tank. The compressor is controlled by a pilot valve that activates the compressor unloader and provides an air pressure signal to the pressure switch, which activates the throttle solenoid.

⚠ WARNING

The Cap•Start® unit features a high pressure, 175 PSI air system. Check the maximum air pressure rating on the air tools being used.

The operator is responsible for regulating the air pressure when necessary (See **Section 5.4.1, Adjusting Compressor Cut-In/Cut-Out Pressure**).

⚠ CAUTION

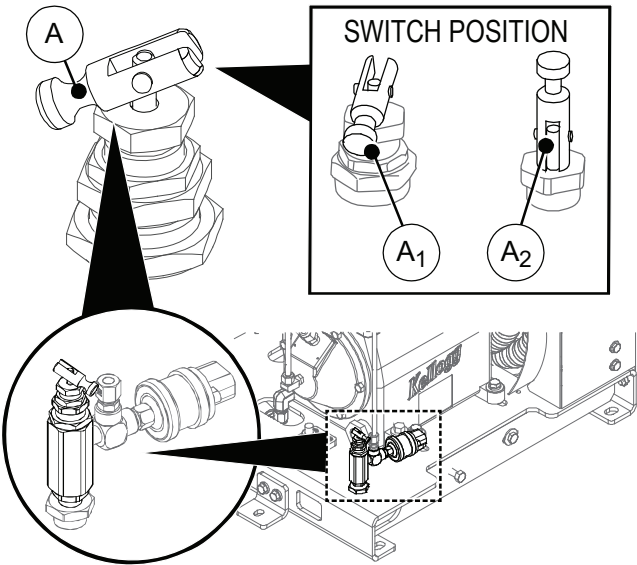
Exposed high pressure air lines on the unit become hot during operation; keep everyone clear.

When the air tank pressure builds to 175 PSI, a spring loaded valve in the pilot valve opens, providing an air pressure signal to the head unloader valves of the compressor. This causes the air in the compressor to vent to the atmosphere. This air signal is also sent to the throttle pressure switch, energizing the throttle solenoid allowing the engine to idle.

When the air tank pressure falls below 150 PSI, the pilot valve will close, stopping the air signal to the unload valves, allowing the compressor to start pumping air to the tank. This signal also causes the pressure switch to de-energize the throttle solenoid, forcing the engine to full speed.

A lever on the top of the pilot valve will allow the operator to manually stop the compression of air by the compressor during initial engine start-up or if operation does not require the use of

compressed air (refer to **Figure 4-3** and **Section 5.4.1**). Since the head unloader valves require air pressure to operate, there must be a minimum of 10 PSI in the air tank to allow the valves to operate properly.



KEY	DESCRIPTION
A	PILOT VALVE
A ₁	LEVER - ON POSITION (LOADED)
A ₂	LEVER - OFF POSITION (UNLOADED)

Figure 4-3: Pilot Valve Manual Adjustment Lever

NOTE

The leading cause of component failure of the air control system is moisture. Air tanks must be drained daily as a minimum to eliminate condensation. Consult **Section 5.4.4** for maintenance information.

When purchasing air tools or planning a project, the rated capacity of the compressor (24 CFM up to 175 PSI) will need to be taken into consideration. For information on the compressed air requirements of common tools, check the desired power tool manufacturer's specifications. The air storage tank will allow additional air CFM output for intermittent use.

NOTE

The pressurized air system requires routine maintenance. See **Table 5A: Routine Maintenance Schedule**, for important maintenance procedures.

4.6 EXTREME CONDITIONS

When operating in extreme cold or hot conditions, at a high altitude, or in the presence of high humidity, extra attention should be given to any indication that could lead to a serious problem. Preventative safeguards exist that can minimize the possibility of malfunctions that are prone to occur under certain ambient conditions. Refer to **Section 6.3, Extreme Condition Operation**, for additional information on variable ambient operating conditions, and adjustment adaptations that can be made accordingly.

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SECTION 5: MAINTENANCE

5.1 GENERAL INFORMATION

A strict maintenance program is the key to long life for the Cap•Start®. This section contains a program that, when adhered to, should keep the package in top operating condition. Refer to **Table 5A: Routine Maintenance Schedule**, and **Section 5.4, Parts Replacement and Adjustment Procedures** in this section for detailed service information for specific compressor system components. When ordering parts or requesting assistance for the machine, please have your machine's specific serial number available. The serial number locations can be seen in **Figure 5-1**.

DANGER

Disconnect the capacitor before performing any non-routine maintenance functions on the Cap•Start® 3000 + Air Light.

WARNING

DO NOT discharge the capacitor.
DO NOT short the capacitor.

WARNING

Follow all applicable safety recommendations as outlined in **Section 1: Safety of this manual**.

WARNING

DO NOT remove caps, plugs and/or other components when compressor is running or pressurized. Stop compressor and depressurize system prior to maintenance of system.

Wear personal protective equipment such as gloves, work boots, and eye and hearing protection as required for the task at hand.

NOTE

Operating the machine package in a severe environment may require more frequent service intervals.

5.2 ROUTINE MAINTENANCE SCHEDULE

IMPORTANT

Follow and perform the prescribed routine maintenance schedule at the recommended intervals. Failure to follow the prescribed maintenance at the recommended intervals will impair the package safety, performance characteristics, shorten the package's life, and will negatively affect the warranty coverage of the package.

Vanair®, a Lincoln Electric Company, considers the maintenance schedule given in **Table 5A: Routine Maintenance Schedule**, to be part of the warranty agreement with the customer. This maintenance regimen must be followed in order to protect the warranty of the machine package.

Vanair® especially requires that a consistent service regimen be established for engine oil changes, and engine and compressor air filter servicing. The service schedule given in **Table 5A** is designed so that many of the other maintenance tasks are completed when the engine and compressor air filters are serviced, and the engine oil is changed.

Please take a moment to acquaint yourself with the service schedule. There is also a corresponding service log (**Table 7B**) to assist the customer in establishing a maintenance routine log.

For assistance in obtaining routine maintenance or replacement parts, consult **Table 5B, Section 7.1, Parts Ordering Procedure**, and **Table 7A: Recommended Spare Parts List**.

5.3 REPLACEMENT PARTS

Replacement parts should be purchased through your local Vanair® representative or where the Cap•Start® 3000 + Air Light was purchased. If, for any reason, parts are not available in this manner, they can be purchased from Vanair® directly.

IMPORTANT

Table 5A: Recommended Spare Parts List, in Section 5, contains items that require maintenance on a routine basis, and also those parts that may require maintenance over the course of the Cap•Start® package's performance schedule. Although this recommended list is proffered as a comprehensive guide to replacement parts, damage may occur to the machine beyond the scope of this listing.

Continued...

IMPORTANT (CONTINUED)

Should any part of the Cap•Start® that is not listed in Table 5A become damaged or inoperable, use the various sub-sections in Section 6 to best locate and identify the damaged part(s).

For convenience Table 5B (next page) contains a condensed routine kit part list (only).

Vanair®, a Lincoln Electric Company
10896 West 300 North
Michigan City, IN 46360
Toll Free: (800) 526-8817
Telephone: (219) 879-5100
Service (toll free): (844) VAN-SERV
(844) 826-7378
vanair.com

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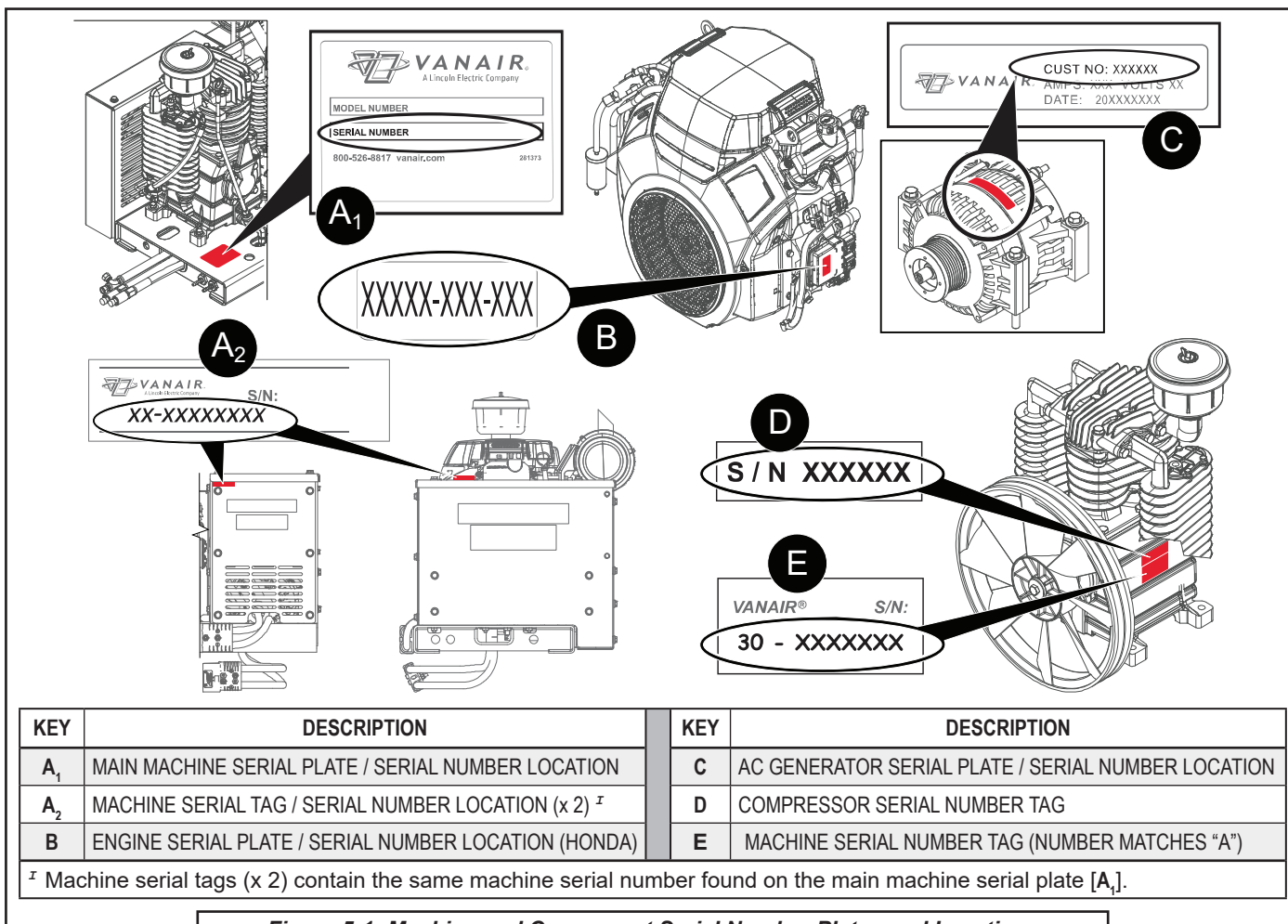


Figure 5-1: Machine and Component Serial Number Plates and Locations

Vanair®, a Lincoln Electric Company
(844) VAN-SERV • vanair.com

Cap•Start® 3000 + Air Light •
Gasoline -Driven • Battery Starter •
Charger • Air Compressor

⚠ WARNING Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual, if the line is hot, allow package to cool before removing any panel. NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.	
	Daily Maintenance
	Weekly Maintenance
	Every 100 Hours
	Every 200 Hours
	Every 500 Hours
	Every 1000 Hours

ACTION TO TAKE / REFERENCES	
PROCEDURE:	A daily visual inspection will help to prevent dirt and debris build-up, which can affect machine operation. When cleaning external parts, always wait for machine surfaces to cool down before wiping off.
PROCEDURE:	Clear machine check before starting machine, when machine surfaces are cool to the touch.
PROCEDURE:	Clean or clear as necessary. Refer to Engine Operation Manual for engine cooler maintenance procedure. DO NOT bend or damage cooling fins.

PROCEDURE:	daily visual inspection will help to prevent dirt and debris build-up, which can affect machine operation. When cleaning external parts, always wait for machine surfaces to cool down before wiping off.
PROCEDURE:	Clear machine check before starting machine, when machine surfaces are cool to the touch.
PROCEDURE:	clean or clear as necessary. Refer to Engine Operation Manual for engine cooler maintenance procedure. DO NOT bend or damage cooling fins.

IMPORTANT

Perform compressor oil level check with machine on level surface.

Procedure continued on next page...

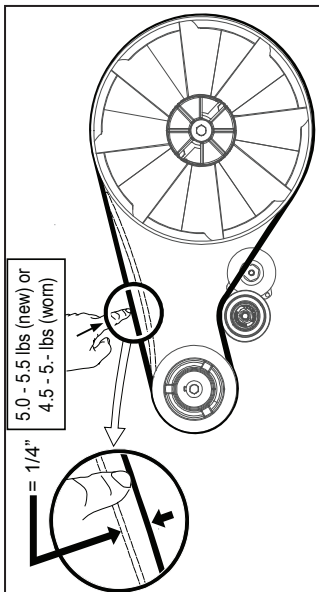
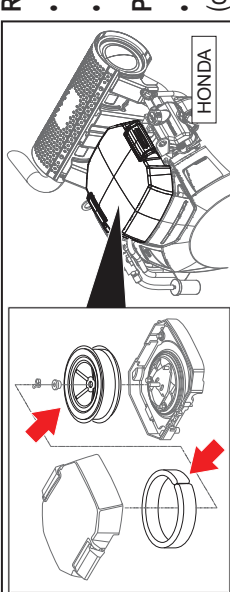
TABLE 5A: ROUTINE MAINTENANCE SCHEDULE							TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ^z				
KEY	DESCRIPTION	INTERVALS					KEY #	ORDER NO.	DESCRIPTION	QTY	
		Refer to footnote ^z in Table 5B									
▲ WARNING Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel. NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.		Daily Maintenance	Weekly Maintenance	Every 100 Hours	Every 200 Hours	Every 500 Hours	Every 1000 Hours	Every 1500 Hours	1	Kit, Full Service Engine ^{xx}	
									2	Kit, Vanair® Reciprocating Compressor ^{xx}	
									3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{xxx}
									4	277608-001	Element, Compressor Air Filter
			^z If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.								
		^{xx} Refer to Tables 7A and 7B for kit contents, including separate component order information.									
		^{xxx} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.									
		PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER									
ACTION TO TAKE / REFERENCES											
		...Continued from previous page									
8	Check compressor oil level (continued)										
	IMPORTANT Perform compressor oil level check with machine on level surface.										
9	Check tension of both compressor drive belts										
		PROCEDURE: Tighten compressor belt if necessary (alternator belt is self-adjusting). Tension is approximately 1/2" of belt deflection tested at the center point of each belt between the drive sheaves. For details consult Consult Sections 5.4.3.1 and 5.4.3.2 for procedures on how to check and re-tension the air compressor drive belts. 									
10	Clean/inspect engine air pre-cleaner										
	NOTE Honda engine air pre-cleaner element, comes included in full service kit no. KIT1497, or can be obtained separately.										
		REFERENCE: • Engine Air Pre-Cleaner [red arrow] • Reference - Engine Air Filter [red arrow] PART REPLACEMENT: • Individual Engine Air Pre-Cleaner (only) replacement order no. 281452-02. 									
		Procedure continued on next page...									

TABLE 5A: ROUTINE MAINTENANCE SCHEDULE

INTERVALS Refer to footnote ^x in Table 5B		DESCRIPTION	KEY
Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.			
NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.			
Daily Maintenance	■		
Weekly Maintenance	■		
Every 100 Hours			■
Every 200 Hours			
Every 500 Hours			
Every 1000 Hours			
Every 1500 Hours			
▲ WARNING Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel. NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.		DESCRIPTION 10 Clean/inspect engine air pre-cleaner (continued) NOTE Honda engine air pre-cleaner element, comes included in full service kit no. KIT1497, or can be obtained separately.	
		11 Perform engine full service - (Initial break-in maintenance; then routine schedule) NOTE: Use Full Engine Service Kit no. KIT1497 For full service kit content refer to Table 7A in Section 7.	

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ^x

KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ^{xx}	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ^{xx}	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{xxx}	1
4	277608-001	Element, Compressor Air Filter	1

^x If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.

^{xx} Refer to Tables 7A and 7B for kit contents, including separate component order information.

^{xxx} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.

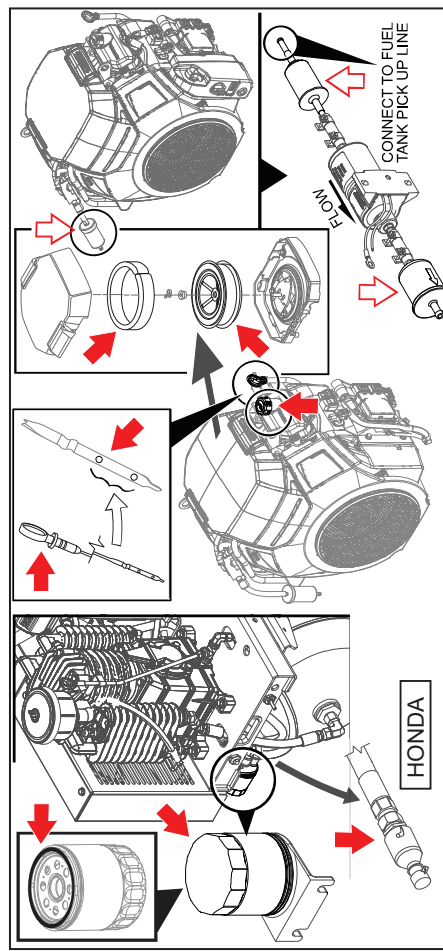
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

ACTION TO TAKE / REFERENCES

...Continued from previous page

PROCEDURE:

Consult the air filter procedure in the Engine Operation Manual to service the engine air pre-cleaner. Replace if necessary. Replace air filter if necessary.



HONDA REFERENCE:

• Engine Oil Fill Port / Cap [↗]	• Engine Oil Filter Element [↗] ^x
• Engine Air Filter [↗]	• Engine Oil Filter Seal Ring [↗]
• Engine Oil Dipstick/Level Gauge [↗]	• Engine Oil Level Range [↗]
• Engine Air Pre-Filter [↗]	• Engine Fuel Filter [↗]
• Engine Oil Drain Tube [↗]	• Inline Engine Fuel Filter [↗] (where applicable)

^x 30-gallon model location shown; skid-mount filter is mounted to bracket in location.

Procedure continued on next page...

TABLE 5A: ROUTINE MAINTENANCE SCHEDULE

KEY	DESCRIPTION	INTERVALS					
		Refer to footnote ^z in Table 5B					
11	Perform engine full service - (Initial break-in maintenance; then routine schedule) (continued) NOTE: Use Full Engine Service Kit no. KIT1497 For full service kit content refer to Table 7A in Section 7.	Daily Maintenance					
		Weekly Maintenance					
		Every 100 Hours					
		Every 200 Hours					
		Every 500 Hours					
12	Replace compressor oil IMPORTANT Perform compressor oil replacement with machine on level surface, and locked out from starting. System service fill is approximately 1.75 quarts.	100 hours or annually, whichever comes first.					

▲ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ^z			
KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ^{zz}	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ^{zz}	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{zzz}	1
4	277608-001	Element, Compressor Air Filter	1

^z If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.

^{zz} Refer to Tables 7A and 7B for kit contents, including separate component order information.

^{zzz} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

ACTION TO TAKE / REFERENCES

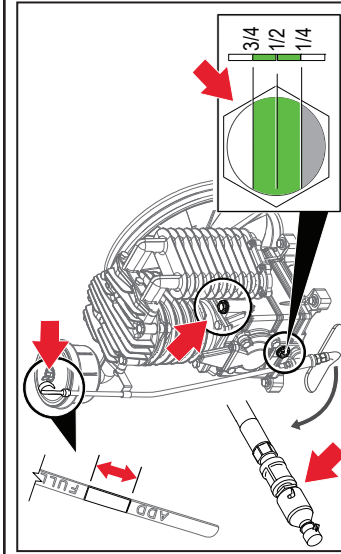
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PART REPLACEMENT:

- Full engine service kit no. KIT1497; Kit contains: fuel filter no. 281452-01; engine air pre-cleaner filter no. 281452-02; engine air filter element no. 281452-03; spark plug no. 281452-04; engine oil filter no. 283651 and 10W-30 motor oil no. 844300-001-QT (in quart units; two [2] quarts per kit). For models that use an inline filter [] (where applicable), order inline filter no. RC81465. Note that additional engine oil is also sold separately by the quart: no. 844300-001-QT.

PROCEDURE:

Consult the oil replacement procedure in the Engine Operation Manual to replace the engine oil, engine oil filter and engine fuel filters (if necessary).



REFERENCE:

- Compressor Oil Dipstick/Level Gauge []
- Compressor Oil Drain Outlet Tube []
- Compressor Oil Fill Port []
- Compressor Sight Glass [] ^z

PART REPLACEMENT:

Order Vanair® compressor reciprocating oil no. 271856-1GAL (one gallon)

PART REPLACEMENT:

Vanair® compressor reciprocating oil no. 271856-1QT (sold in quart units; two [2] quarts required for full replacement).

Procedure continued on next page...

TABLE 5A: ROUTINE MAINTENANCE SCHEDULE					
KEY	DESCRIPTION	INTERVALS			
		Refer to footnote ^x in Table 5B			
12	Replace compressor oil (continued) IMPORTANT Perform compressor oil replacement with machine on level surface, and locked out from starting. System service fill is approximately 1.75 quarts.	Daily Maintenance			
		Weekly Maintenance			
		Every 100 Hours			
		Every 200 Hours			
		Every 500 Hours			
		Every 1000 Hours			Every 1500 Hours
		Every 1500 Hours			
		Every 1500 Hours			

⚠ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ^x

KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ^{xx}	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ^{xx}	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{xxx}	1
4	277608-001	Element, Compressor Air Filter	1

^x If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.

^{xx} Refer to Tables 7A and 7B for kit contents, including separate component order information.

^{xxx} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

ACTION TO TAKE / REFERENCES

... Continued from previous page

REFERENCE:

- Compressor Oil Dipstick/Level Gauge [↕]
- Compressor Oil Drain Outlet Tube [↕]
- Compressor Oil Fill Port [↕]
- Compressor Sight Glass [↕] ^x

PART REPLACEMENT:

Order Vanair® compressor reciprocating

oil no. 271856-1GAL (one gallon)

PART REPLACEMENT:

Vanair® compressor reciprocating oil no. 271856-1GAL (one gallon).

PROCEDURE:

Place a container with a minimum capacity of 1/2 gallon (unit fill is 1.75 qt.) to catch the oil as it drains from the outlet tube [↕]. Remove the sealing cap [↕] from the oil fill port; remove the end cap from the drain tube and allow all of the system oil to drain into the container.

PROCEDURE:

Replace the cap at the end of the drain tube. Add fresh reciprocating oil at the oil fill port, and check the dip stick to assure that the final level is in the satisfactory operation range ^x. Replace and tighten the fill port cap; dispose of the drained oil per **Section 1.13, Disposing of Machine Fluids** in the **Safety Section**.

^x Optimal level is between 1/4 and 3/4 full of the sight glass window.

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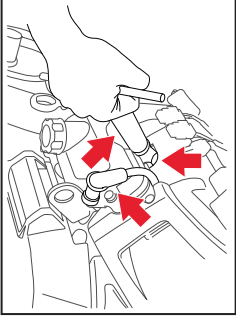
TABLE 5A: ROUTINE MAINTENANCE SCHEDULE					
KEY	DESCRIPTION	INTERVALS			
		Refer to footnote ¹ in Table 5B			
		Daily Maintenance	Weekly Maintenance	Every 100 Hours	Every 200 Hours
					Every 500 Hours
					Every 1000 Hours
					Every 1500 Hours
⚠ WARNING Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel. NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.					
KEY	DESCRIPTION				
12	Replace compressor oil (continued) IMPORTANT Perform compressor oil replacement with machine on level surface, and locked out from starting. System service fill is approximately 1.75 quarts.			100 hours or annually, whichever comes first.	
13	Inspect air compressor drive belt for wear, damage or excessive cracking			■	
14	Inspect unit mounting bolts			■	
15	Replace engine air filter element			■	
16	Replace engine spark plugs			■	
REFERENCE: • Spark Plug Cap [↗] • Spark Plug [↗] • Spark Plug Wrench [↗] PROCEDURE: Consult the procedure in the Engine Operation Manual on how to replace the spark plugs.					
					

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ¹			
KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ¹¹	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ¹²	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ¹²¹	1
4	277608-001	Element, Compressor Air Filter	1
¹¹ If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.			
¹² Refer to Tables 7A and 7B for kit contents, including separate component order information.			
¹²¹ Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.			
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER			

ACTION TO TAKE / REFERENCES

...Continued from previous page

PROCEDURE:

Replace the cap at the end of the drain tube. Add fresh reciprocating oil at the oil fill port, and check the dip stick to assure that the final level is in the satisfactory operation range ¹. Replace and tighten the fill port cap; dispose of the drained oil per **Section 1.13, Disposing of Machine Fluids in the Safety Section**.

¹ Optimal level is between 1/4 and 3/4 full of the sight glass window.

PROCEDURE:

Ensure that all drive belts are in satisfactory operating condition. To check the compressor drive belts' tension, refer to Key #11. Note that the alternator belt is self-tensioning. Should a belt need to be replaced, consult **Section 5.4.3** (including **Sections 5.4.3.1 and 5.4.3.2**) for compressor belt procedure, and **Section 5.4.3** (including **Sections 5.4.3.3 and 5.4.3.4**) for the alternator belt procedure.

PROCEDURE:

Tighten any loose mounting bolts as necessary.

PROCEDURE:

Refer to the Engine Operation Manual for procedure.

Continued on next page

TABLE 5A: ROUTINE MAINTENANCE SCHEDULE							
KEY	DESCRIPTION	INTERVALS					
		Refer to footnote ⁱ in Table 5B					
		Daily Maintenance	Weekly Maintenance	Every 100 Hours	Every 200 Hours	Every 500 Hours	
	▲ WARNING Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel. NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY: Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.						

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ⁱ

KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ^{xx}	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ^{xx}	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{xxx}	1
4	277608-001	Element, Compressor Air Filter	1
ⁱ If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing. ^{xx} Refer to Tables 7A and 7B for kit contents, including separate component order information. ^{xxx} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.			
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER			

ACTION TO TAKE / REFERENCES

REFERENCE:

- Compressor Air Filter Element [▲]

PART REPLACEMENT:

Order compressor service kit no. KIT1397, or separate compressor air filter element replacement no. 77608-001.

PROCEDURE:

Remove air filter housing lid. Pull filter outward away from the base. Replace with new filter; replace cover and wingnut. Discard old filter under the guidance of all applicable local, regional, and/or federal law.

NOTE

Replace cover seal if damaged. To clean: remove element from housing.

PROCEDURE:

Clean and tighten as necessary. Replace any worn cables.

PROCEDURE:

Ensure that the cut-in and cut-out pressure settings are correct. Adjust if necessary, per Section 5.4.1.

PROCEDURE:

Ensure that the engine speed is running at correct interval. Adjust if necessary, per Section 5.4.2.

TABLE 5A: ROUTINE MAINTENANCE SCHEDULE						
KEY	DESCRIPTION	INTERVALS				
		Refer to footnote ⁱ in Table 5B				
		Daily Maintenance	Weekly Maintenance	Every 100 Hours	Every 200 Hours	Every 500 Hours
						Every 1000 Hours
						Every 1500 Hours
21	Inspect the alternator belt tensioner					
23	Replace (both) air compressor drive belt and the alternator serpentine drive belt					
24	Replace compressor safety valves					

▲ WARNING

Before performing maintenance: Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing any panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during maintenance.

TABLE 5B: ROUTINE REPLACEMENT PARTS KITS ⁱ			
KEY #	ORDER NO.	DESCRIPTION	QTY
1	KIT1497	Kit, Full Service Engine ^{xx}	1
2	KIT1387	Kit, Vanair® Reciprocating Compressor ^{xx}	1
3	271856-1QT	Oil, Compressor Vanair® Reciprocating ^{xxx}	1
4	277608-001	Element, Compressor Air Filter	1

ⁱ If working in dusty or dirty conditions, reduce the recommended time intervals between servicing by half for engine and compressor oil replacement, and engine and compressor filter servicing.

^{xx} Refer to Tables 7A and 7B for kit contents, including separate component order information.

^{xxx} Reciprocating oil is sold in quart containers. System quantity is approximately two (2) quarts.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

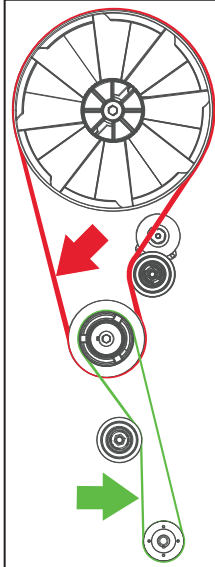
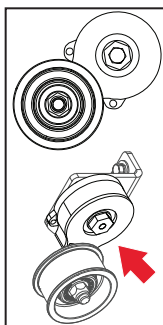
ACTION TO TAKE / REFERENCES

REFERENCE:

- Belt Tensioner [▲]

PROCEDURE:

Ensure that the automatic belt idler assembly is free of rough, noisy or worn bearings.



REFERENCE:

- Compressor Drive Belt [▲]
- Alternator Drive Belt [▲]

PART REPLACEMENT:

Compressor V-belt replacement belt no. 278813-680 and alternator

serpentine belt replacement no. 273459.

PROCEDURE:

Consult Section 5.4.3 for entire drive belt system maintenance.

REFERENCE:

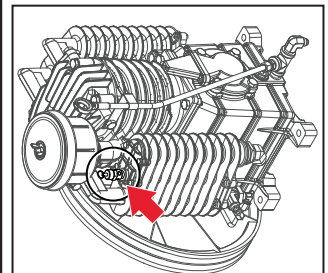
- Safety Valve [▲]

PART REPLACEMENT:

Order relief valve (rated @ 225 PSI) replacement no. 277127.

IMPORTANT

DO NOT test the valves by pulling on the metal rings. Pulling on the metal rings may promote valve sticking.



Continued from page 5 - 2...

5.4 PARTS REPLACEMENT AND ADJUSTMENT PROCEDURES

⚠ WARNING

Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual before performing ANY service on the Cap•Start®.

5.4.1 ADJUSTING COMPRESSOR CUT-IN / CUT-OUT PRESSURE

The Cut-in pressure is defined as the pressure in which the compressor starts pumping. Anytime the pressure in the tank falls below this pressure the compressor is allowed to start pumping.

The Cut-out pressure is defined as the pressure in which the compressor stops pumping. When the pressure in the air tank rises above this pressure the compressor is signaled to stop pumping.

Pressure settings for both the minimum and maximum rated capacity levels for this machine are adjusted at the factory before shipping, and should not need to be adjusted. However, a situation may occur where it is necessary to manually adjust or reset either or both of these settings. For such cases, consult the following procedure.

Refer to **Figure 5-2**. Locate the pilot valve left on the base frame, near the engine, and use the

following procedure to make adjustments.

⚠ WARNING

Relieve pressure from the compressor system before performing maintenance on any components.

1. With a marker or scoring object, make a corresponding mark [B] on the pressure adjustment screw [A₂], locknut [A₃], pressure differential adjustment nut [A₄], and the valve body [A₅] for referential purposes.
2. With the machine off, loosen the locknut [A₃], and adjust the pressure adjustment nut clockwise (in) to raise the cut-in/cut-out pressure, and counter-clockwise (out) to lower the cut-in/cut-out pressure. Using the reference mark made in Step #1, adjust the pressure adjustment nut by a 1/4 - 1/2 turn interval, and tighten the locknut.
3. Start the engine and check the air pressure gauge reading after the engine has returned to idle speed.
4. Repeat Steps #2 and #3 if further adjustment is needed.

NOTE

DO NOT adjust the factory set pressure differential adjustment nut. Reference the mark made on the pressure variation adjustment nut, and the valve body to insure that it has not changed position.

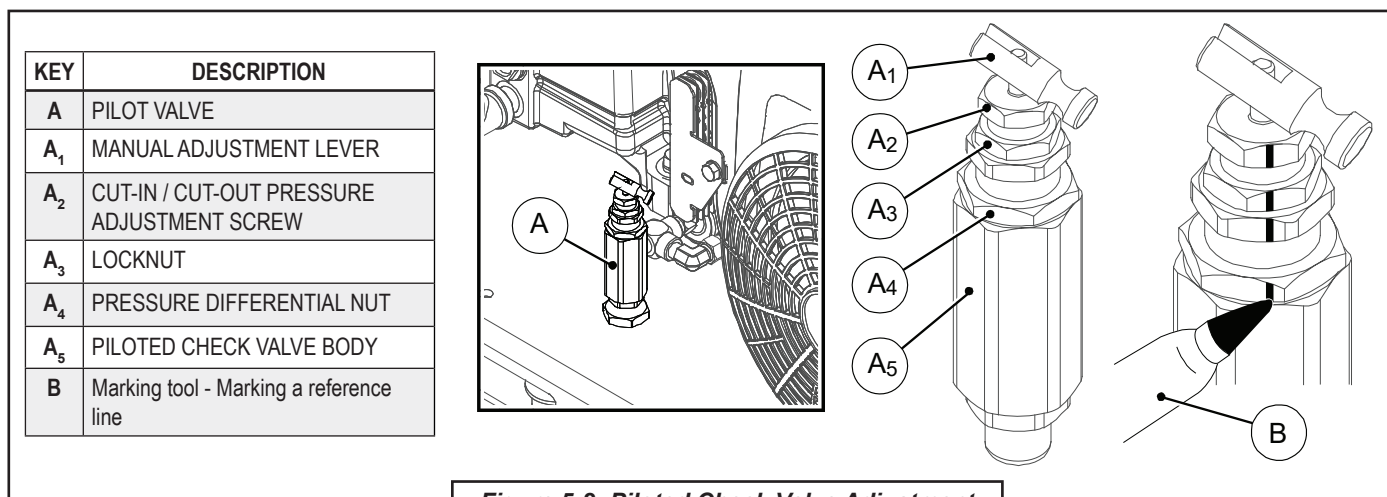


Figure 5-2: Piloted Check Valve Adjustment

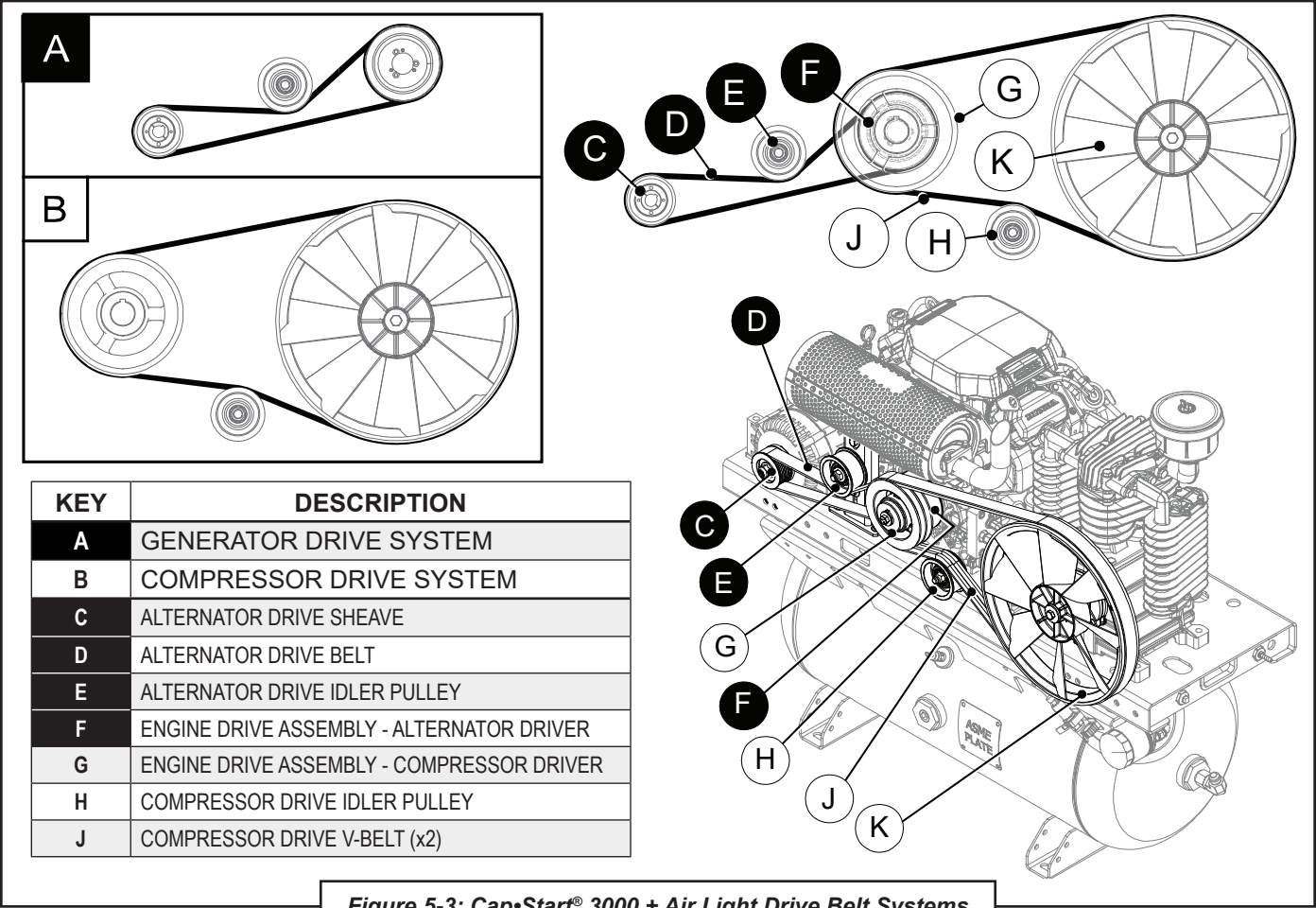


Figure 5-3: Cap•Start® 3000 + Air Light Drive Belt Systems

5.4.2 ADJUSTING THE ENGINE SPEED

Consult the Vanair® Service Department for issues relating to adjustment of engine speed.

NOTE

DO NOT tamper with the governor setting to increase the maximum engine speed. Overspeed is hazardous and will void the engine warranty.

5.4.3 REPLACING AND RE-TENSIONING THE COMPRESSOR AND/OR ALTERNATOR DRIVE BELTS

⚠ WARNING

Follow all applicable safety recommendations as outlined in Section 1: Safety of this manual.

Refer to **Figure 5-3**. The compressor and alternator are driven by the engine via the use of

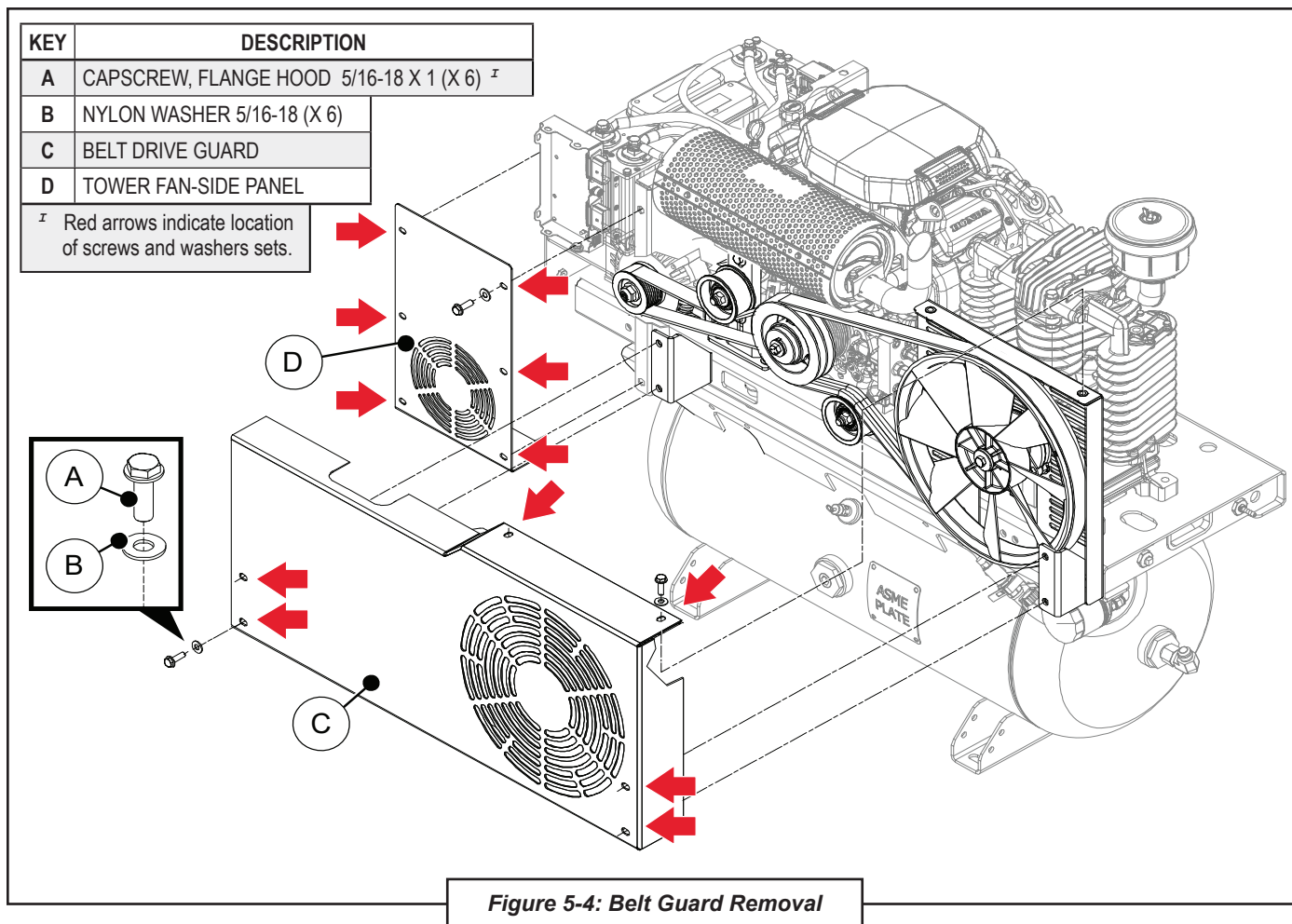
two drive belt types. The compressor is driven by a double-grooved drive belt, which contours to the compressor pulley, and the alternator is driven by a single serpentine belt. The belts will generally not need replacement during the service life of the system. However, over time they become loose and need to be tightened or replaced.

Consult **Section 5.4.3.2** for instruction on how to check the compressor belt(s) tension, and **Section 5.4.3.5** to check the alternator belt tension.

Both belt systems are kept in constant tension by use of tensioners, which adjust pressure to the belts vial idler pulleys.

IMPORTANT

DO NOT attempt to adjust the compressor belt drive by tampering with the engine mount, the engine sheave, the compressor mount or the compressor drive pulley.



The compressor belt is adjusted and loosened for removal via the tensioner/idler assembly only.

5.4.3.1 BELT GUARD REMOVAL

⚠ WARNING

Relieve pressure from the compressor system before performing maintenance on any components.

Refer to **Figure 5-4**.

1. Remove the 5/16"-18 x 1" cap screws [A] and 5/16" washers [B] from the belt guard panel [C] and set aside in a proper place for retrieval and replacement after maintenance has been performed.
2. Remove the belt guard and set aside.

NOTE

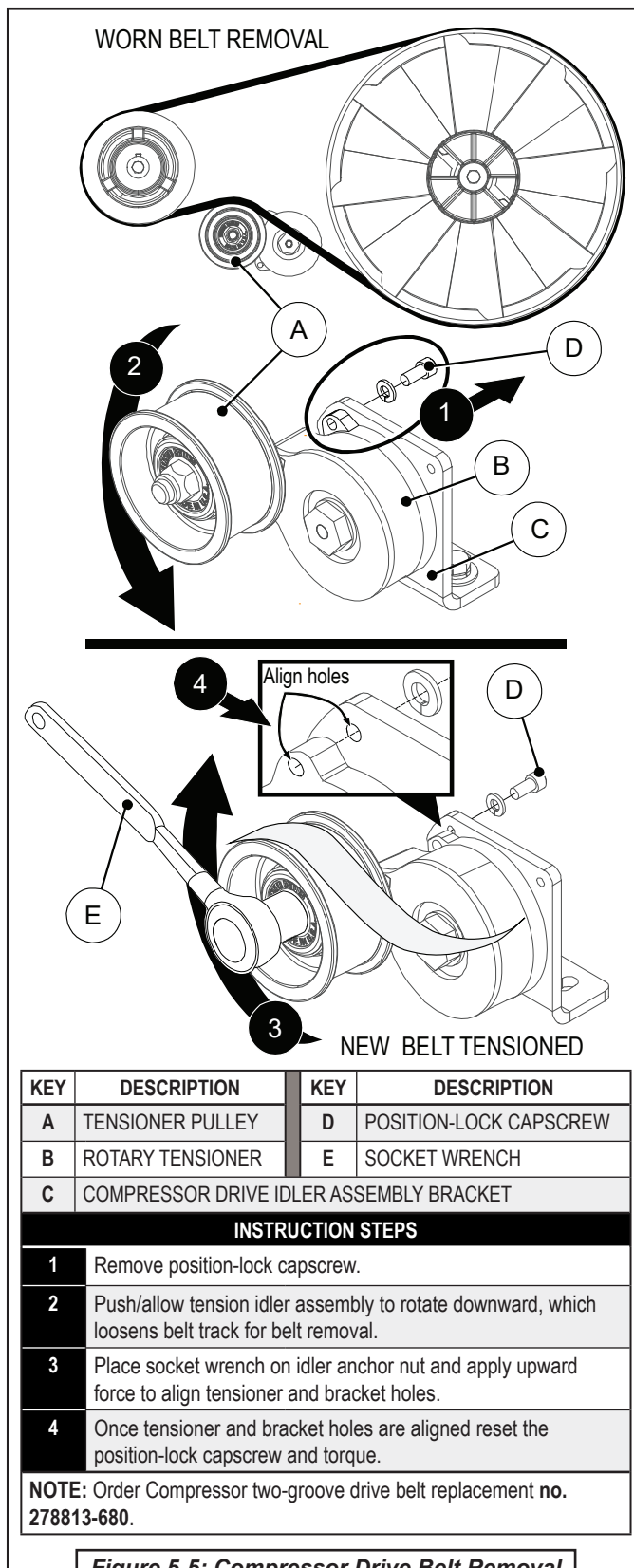
When replacing the alternator drive belt the tower fan-side panel [D] may need to be removed as well. Remove the cap screw/nylon washer sets as shown to remove this panel to access the alternator drive belt.

5.4.3.2 COMPRESSOR DRIVE TWO-GROOVE BELT REPLACEMENT

Refer to **Figure 5-5** and the following instructions.

REMOVAL

1. Locate the idler tension position-lock cap screw [D] on the idler assembly bracket [C].
2. Loosen and remove the position-lock cap screw.



Once the position-lock capscrew is removed the tensioner assembly is free to re-position enough to allow removal of the drive belt.

3. Remove the worn drive belt and replace with new belt. Note that the compressor drive belt tracks to the engine sheave closest to the engine; follow **Figure 5-3** to assure belt track is correctly placed.
4. Apply enough downward pressure on the wrench to loosen the belt, then disengage/remove the belt.
5. Allow the tensioner to retain its position and remove the wrench.

REPLACEMENT

1. Thread the new belt onto the compressor drive sheave grooves, and onto the grooves of the (front) engine/alternator drive assembly sheave.
2. With a fitted wrench socket placed over the nut on the tensioner assembly's pulley, apply pressure downward on the wrench until the belt can be positioned onto the idler pulley.
3. Once the belt is in place, allow the idler pulley to regain its normal operating position and remove the wrench.

5.4.3.3 ALTERNATOR DRIVE SERPENTINE BELT TENSION

Refer to **Figures 5-6** and **5-7**. The alternator belt system is kept at a constant operating tightness via the position of the idler pulley. The idler's position has been pre-set at the factory.

However the idler tension assembly needs to be temporarily adjusted to allow for replacement of a new belt, should the need arise. Reset back to the factory set point.

5.4.3.4 ALTERNATOR DRIVE BELT REPLACEMENT

⚠ WARNING

Relieve pressure from the compressor system before performing maintenance on any components. Disconnect the battery cables from the battery.



WARNING

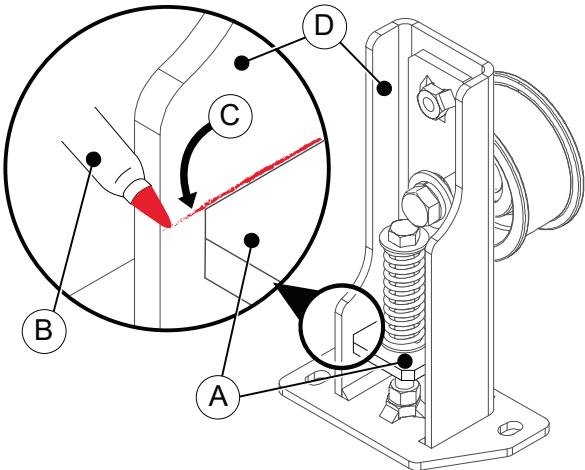
In order to replace the alternator belt, the compressor drive belt must first be removed. Follow the procedure in Section 5.4.3.2 to remove the compressor drive belt.

MARKING FACTORY PRESET TENSIONER PLATE LEVEL

The tensioner assembly for the alternator belt drive idler pulley is pre-set at the factory to allow for proper tension of the drive belt. Before removing the alternator drive belt, the plate position needs to be marked in order to re-establish the factory preset after the belt has been replaced.

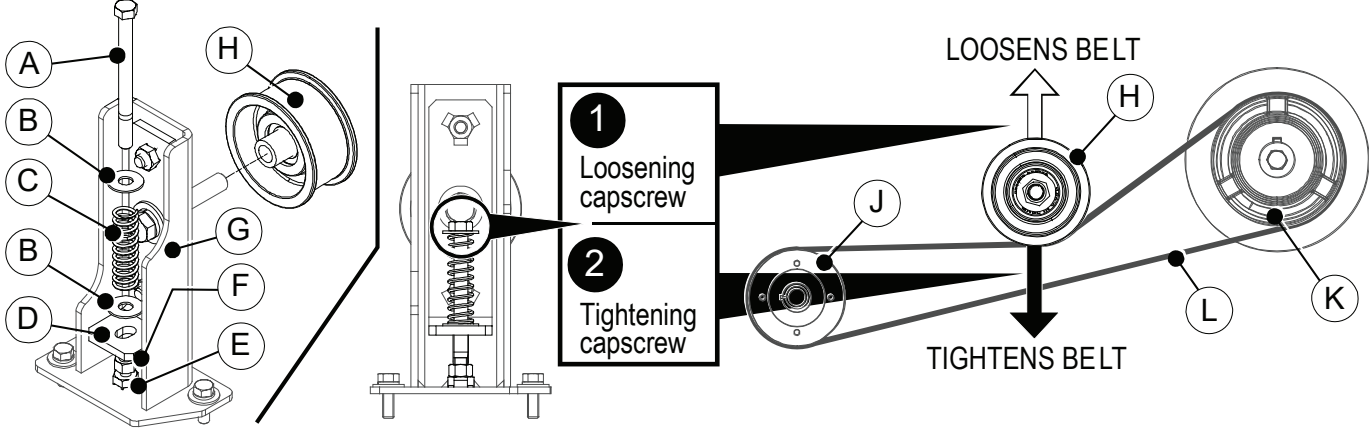
Refer to **Figure 3-5** and the following procedure to mark the factory preset.

- Obtain a marking or scoring tool such as a marker, nail or piece of tape.
- Run the tool along the edge of the tensioner



KEY	DESCRIPTION	KEY	DESCRIPTION
A	TENSIONER SLIDE PLATE	D	SLIDE PLATE LEVEL (FACTORY SET POINT)
B	MARKING TOOL	E	ALTERNATOR TENSIONER BODY

Figure 5-6: Marking the Tensioner Slide Plate's Factory Set-point Level



KEY	DESCRIPTION	KEY	DESCRIPTION
A	CAPSCREW 3/8-16 X 4.5	G	ALTERNATOR TENSIONER BODY
B	WASHER 3/8"	H	ALTERNATOR IDLER PULLEY
C	SPRING 3.5"	J	ALTERNATOR DRIVE PULLEY
D	TENSIONER SLIDE PLATE	K	ENGINE/ALTERNATOR DRIVE SHEAVE
E	WELDED BASE NUT	L	ALTERNATOR SERPENTINE DRIVE BELT [‡]
F	HEX NUT 3/8-16		
1	Loosening cap screw [1] raises the idler pulley, which LOOSENS the alternator drive belt		
2	Tightening cap screw [1] lowers the idler pulley, which TIGHTENS the alternator drive belt		

[‡] Order alternator serpentine drive belt replacement no. 273459.

Figure 5-7: Alternator Belt Removal

slide plate to mark the current plate position as shown in **Figure 3-6** (the mark will be placed upon the alternator tension body [C]).

BELT REPLACEMENT

Refer to **Figure 5-7**. Although the alternator drive idler assembly is preset to apply correct constant tension to the drive belt, the pulley may be manually lowered to allow temporarily loosening of the drive belt for removal.

1. Loosen the hex nut [F], which locks the position of the capscrew [A].
2. Loosen the capscrew; this will raise the tensioner slide plate [D], causing the idler pulley to raise, which in turn loosens the belt.
Loosen the capscrew enough to allow the belt to be removed from the alternator idler pulley.
3. Remove the alternator drive belt from the idler pulley [H], alternator drive pulley [J], and engine (inside track) drive sheave [K].
4. Route/place the new replacement alternator drive belt onto the alternator sheave track, as well as the inside track on the engine sheave assembly, and under the alternator idler pulley, as shown in **Figure 5-7**.

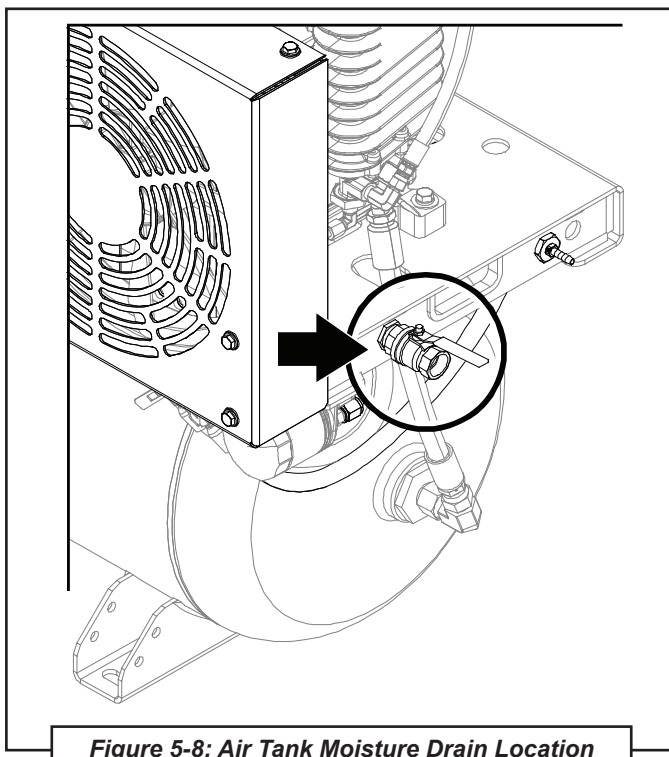


Figure 5-8: Air Tank Moisture Drain Location

5. Tighten the capscrew [A] on the idler tensioner until the edge of the tensioner slide plate is aligned to the factory set point mark on the alternator tensioner body, as shown in **Figure 5-6**.
6. Set and tighten the hex nut (6) to lock the capscrew in place.
7. Use a tension tester to confirm proper belt tension.

NOTE

The alternator drive system does not require a frontal alignment check.

IMPORTANT

If a new replacement alternator belt is installed, recheck the tension after 10-20 hours of operation, and re-tension if necessary by adjusting the slide plate as explained above.

5.4.4 DRAINING THE AIR TANK

⚠ WARNING

Ensure tank pressure is below 5 PSI before draining the tank with this method.

Refer to **Figure 5-8**. The air tank reservoir may accumulate a moisture build-up on the inside due to the compression of air. The air tank should be checked daily and allowed to drain by opening the drain cock on the tank valve. For areas of high ambient moisture content the valves may need to be checked more than once per day. The plug may be replaced with a valve for better convenience.

5.5 SERVICING THE SYSTEM FUSES AND CONTROL RELAYS

⚠ DANGER

Fuses will need to be replaced if they are tripped. When changing any fuse, or dealing directly with any function or the electrical system maintenance, always be aware of the safety warnings given in Section 1, Safety.

⚠ WARNING**Before performing maintenance:**

Shut down machine, relieve all system pressure and lock out all power, as per the Safety Section of this manual. If machine is hot, allow package to cool before removing the panel.

NOTE THAT THE SYSTEM CAN BE STARTED REMOTELY:

Always clearly tag the start-up instrumentation against accidental system start-ups during

IMPORTANT

Replacement fuses must have same rating as tripped fuse. Never use a fuse with a different rating from that specified. Serious damage to the electrical system or a fire could result.

NOTE

Replacement fuses can sometimes be found at local vendor carriers, such as automobile supply stores, hardware stores, etc.

Figure 5-9 shows the engine fuse ratings and locations. In addition, please consult the Engine Operation Manual for information concerning the

proper engine of the machine. **Figure 5-10** shows fuse locations and information, for machine operation functions. For additional assistance, also consult the machine wiring diagram to service the system fuses.

5.6 STORAGE AND INTERMITTENT USE

5.6.1 INTERMITTENT USE

If the unit is not used very regularly always treat the fuel with a fuel stabilizer.

Check all belts and hoses for signs of deterioration such as visible surface cracks, stiffness or discoloration.

5.6.2 LONG TERM STORAGE

Disconnect the battery supply connector that is connected to the positive (+) side of the battery.

The capacitor should not be manually discharged. For long term storage, the negative cable should be disconnected from the capacitor to avoid slow discharge.

De-pressurize the air tank and open the drain valve on the tank.

Cover the unit with a tarp or plastic to prevent the

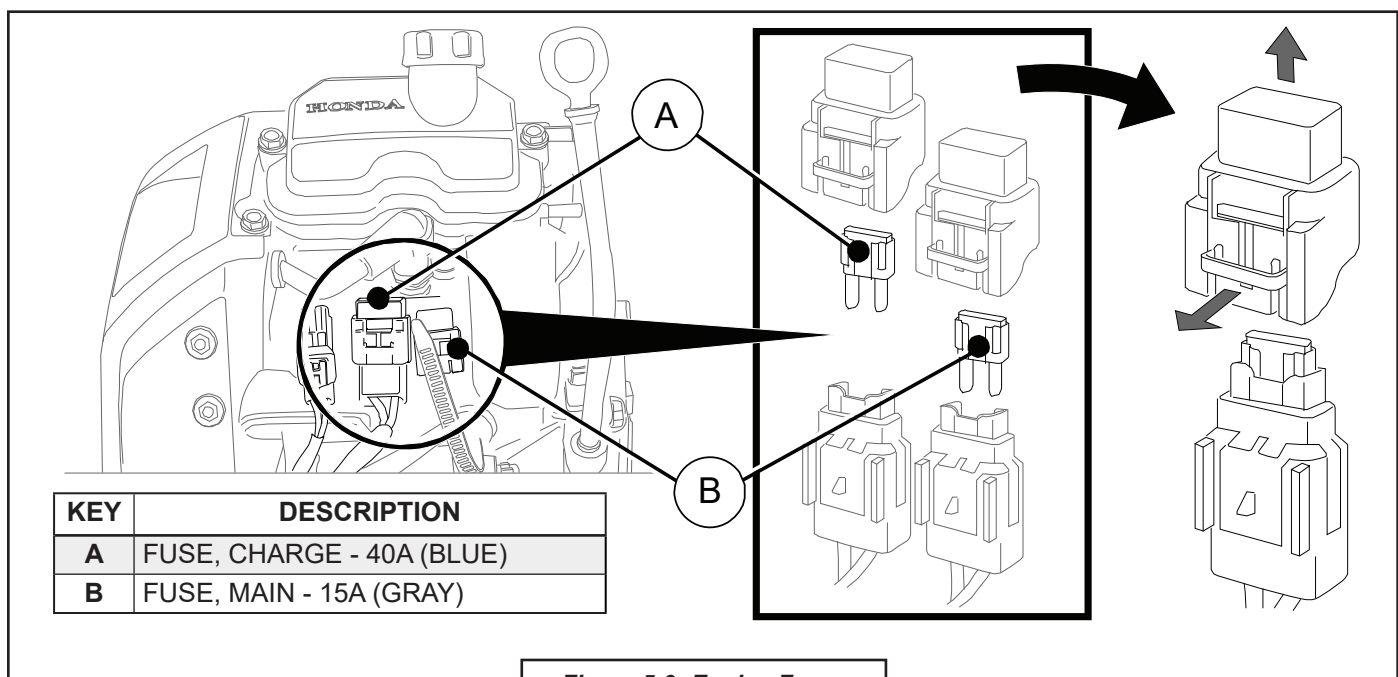
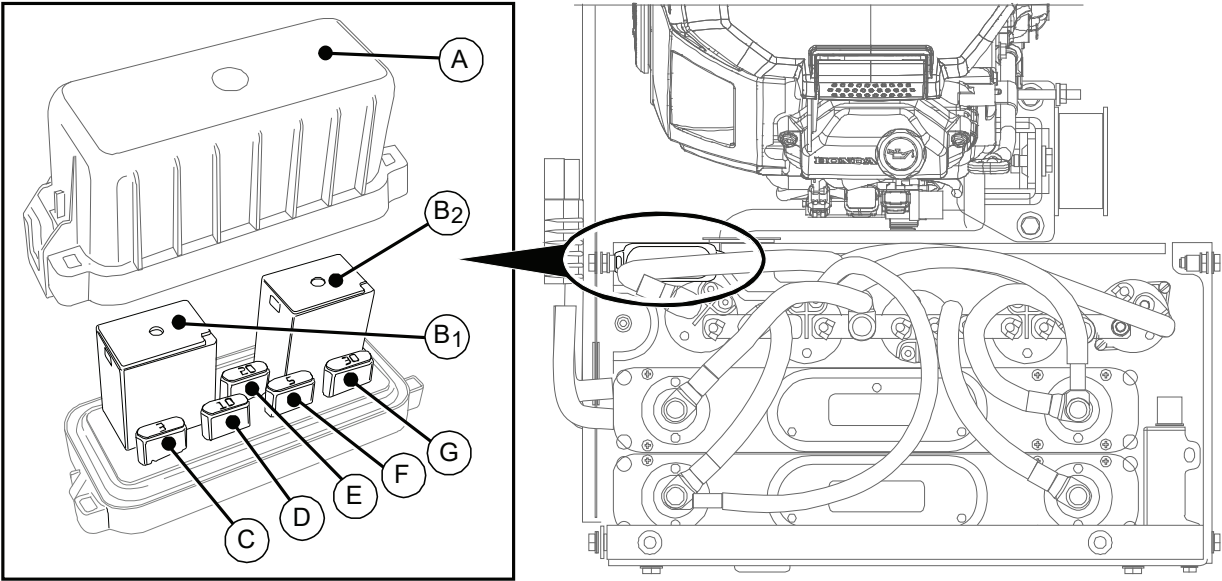


Figure 5-9: Engine Fuses



⚠ WARNING - Remove positive cables from capacitor prior to servicing. - DO NOT discharge capacitor or open capacitor case.			NO.	COMPONENT	DESCRIPTION
A	FUSE BOX LID	(Shown removed)	C	FUSE, 3A	I/O POWER
B ₁	RELAY, 35A	KEYED POWER	D	FUSE, 10A	KEYED POWER
B ₂	RELAY, 35A	OPTIONAL FOR HEATER, IF EQUIPPED	E	FUSE, 20A	OPTIONAL FOR HEATER, IF EQUIPPED
			F	FUSE, 5A	FUEL PUMP
			G	FUSE, 30A	MAIN POWER

Figure 5-10: Fuses - Locations and Identification

accumulation of dust, but leave the bottom open for air circulation.

If equipped with a remote fuel tank, fill gas tank with fuel and fuel stabilizer to prevent moisture build-up in the tank.

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SECTION 6: TROUBLESHOOTING

6.1 GENERAL INFORMATION

The information contained in this section has been compiled from years' worth of information gathered from the field. It contains symptoms and usual causes for the most common types of problems that may occur. All available data concerning the trouble should be systematically analyzed before undertaking any repairs or component replacement.

A visual inspection is worth performing for almost all problems and may avoid unnecessary additional damage to the machine. The procedures which can be performed in the least amount of time and with the least amount of removal or disassembly of parts, should be performed first. Adherence to a routine maintenance regimen will minimize the occurrence of many common problems. Refer to **Table 5A: Routine Maintenance Schedule**, for a typical maintenance regimen program.

Although Vanair® strives to anticipate situations that may occur during the operation life of the machine package, the Troubleshooting Guide may not cover all possible situations. Be aware that additional troubleshooting information may be found in other sources such as the Engine Operation Manual. Should the situation remain unresolved after exhausting available sources, contact the Vanair® Service Department at:

Vanair®, a Lincoln Electric Company
10896 West 300 North
Michigan City, IN 46360
Toll Free: (800) 526-8817
Telephone: (219) 879-5100
Service (toll free): (844) VAN-SERV
(844) 826-7378
vanair.com

⚠ WARNING

Before starting, performing maintenance, or replacing parts, relieve the entire system pressure by opening the air tank drain/vent valve, which will vent all pressure to the atmosphere.

⚠ WARNING

DO NOT operate any of the Cap•Start® functions if there is a known unsafe condition. Disable the equipment by disconnecting it from its power source. Install a lock-out tag to identify the equipment as inoperable to other personnel to prevent accidental application.

NOTE

When contacting the Vanair® Service Department, please have machine serial number on hand to quickly expedite service. See Figure 6-1 for machine serial plate location.

Machine serial number also displays on instrument panel at start-up, on the hours screen.

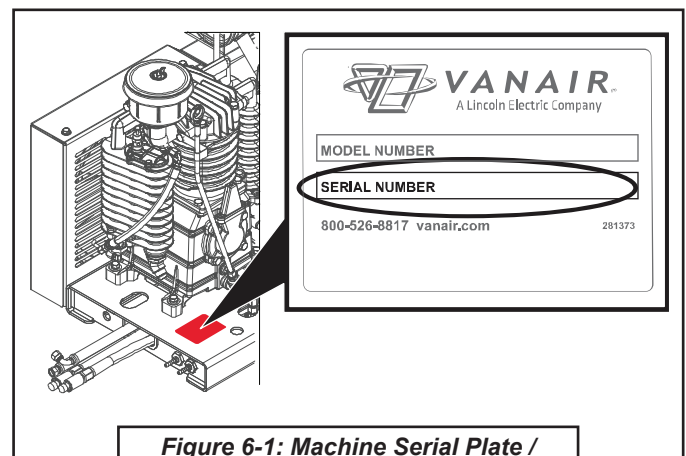


Figure 6-1: Machine Serial Plate / Serial Number Location

6.2 TROUBLESHOOTING GUIDE

Fault/Malfunction	Possible Cause	Corrective Action
ENGINE [‡]		
<i>For additional information concerning the engine, consult the Engine Operation Manual</i>		
NOTE The engine is equipped with performance level monitoring via the engine ECU. During event of a fault occurrence, a diagnostic code is stored in the fault memory. This fault code can be used to help determine system malfunctioning. Refer to Table 6.4A, Engine Fault Codes for additional information as well as a list of codes.		
Engine will not crank	Faulty battery connection	Check for proper battery connections and battery charge.
	Battery out of power	Recharge or replace battery.
	Engine fuse blown or faulty	Check engine fuse: Consult Figure 5-9 , and/or the Engine Operation Manual.
	Faulty starter connection	Check for proper electrical connections at starter.
	Faulty starter	Replace.
	Faulty starter solenoid	Replace.
	Engine seized	Replace.
Engine will crank, but not start	Low fuel and/or oil supply	Check fuel level. Check engine oil level; refer to Table 5A, Key No. 2 . Replenish as necessary. Consult the Engine Operation Manual for additional information.
	Wrong fuel type fill	Use only clean, automotive grade gasoline—do not use E85, etc. Refer to Engine Operation Manual for information on engine fuel type to use.
	Pinched fuel line	Replace or reroute if necessary.
	Fuel filter(s) and/or fuel lines partly plugged	Replace fuel filter or lines. Refer to Table 5A, Key No. 11 , and the Engine Operation Manual.
	Low battery voltage	Recharge or replace if necessary.
		Loose connections; tighten connections.
		Dirty connections; clean connections.
	Fuel pump faulty	Fuel pump fuse blown; replace fuse. Consult Section 5.5, Servicing the System Fuses and Control Relays , and/or consult the Engine Operation Manual.
	Restricted engine air filter	Check that the air cleaner element and pre-cleaner are clean and all components are properly secured (Table 5A, Key No. 10). Clean or replace as necessary.
	Blown engine fuse	Check continuity, and replace if necessary. Consult Figure 5-9 in Section 5 , and/or the Engine Operation Manual.
	Poor ground connection	Check and clean/renew connection.
	Fouled spark plug	Check spark plug; clean or replace if necessary. Refer to Engine Operation Manual.
	Broken or faulty wiring	Check harness connections and wiring condition (refer to machine wiring diagram).
[‡] Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Contact the Engine manufacturer.		
<i>Continued on next page</i>		

6.2 TROUBLESHOOTING GUIDE		
Fault/Malfunction	Possible Cause	Corrective Action
ENGINE (CONTINUED) [‡]		
<i>For additional information concerning the engine, consult the Engine Operation Manual</i>		
NOTE The engine is equipped with performance level monitoring via the engine ECU. During event of a fault occurrence, a diagnostic code is stored in the fault memory. This fault code can be used to help determine system malfunctioning. Refer to Table 6.4A, Engine Fault Codes for additional information as well as a list of codes.		
Engine will crank, but not start (continued)	Blown system fuse	Check system fuse; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
Improper Control Operation: Engine does not speed up	Throttle solenoid stuck	Check throttle solenoid. Replace if necessary.
		Check throttle relay; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
	Faulty throttle solenoid	Check throttle solenoid; replace if necessary.
		Check throttle relay; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
	Governor stuck	Free governor and lubricate if necessary.
	Faulty pressure switch	Check; replace if necessary.
	Faulty relay	Check; replace if necessary.
	Fuel filter(s) and/or fuel lines partly plugged	Replace fuel filter or lines. Refer to Table 5A, Key No. 11 , and the Engine Operation Manual.
	Blown system fuse	Check system fuse; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
	Broken or faulty wiring	Check harness connections and wiring condition (refer to machine wiring diagram).
Improper Control Operation: Pressure switch	Frozen water in switch	Thaw system.
	Connection failed	Check connection to switch; repair if necessary.
Improper Control Operation: Engine does not slow down	Leak in control line	Check for leaks; replace line if necessary.
	Unloader valve(s) sticking or faulty	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions.
	Pressure control out of adjustment or malfunctioning	Pressure settings may need to be reset. Consult Section 5.4.1, Adjusting the Cut-in / Cut-out Pressure .
	Throttle solenoid stuck or disconnected	Check throttle solenoid. Reconnect if disconnected, or replace if necessary.
	Throttle solenoid stuck or disconnected (continued)	Check throttle relay; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
[‡] Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Contact the Engine manufacturer.		
<i>Continued on next page</i>		

6.2 TROUBLESHOOTING GUIDE

Fault/Malfunction	Possible Cause	Corrective Action
ENGINE (CONTINUED) [‡]		
NOTE The engine is equipped with performance level monitoring via the engine ECU. During event of a fault occurrence, a diagnostic code is stored in the fault memory. This fault code can be used to help determine system malfunctioning. Refer to Table 6.4, Engine Fault Codes for additional information as well as a list of codes.		
Improper Control Operation: Engine does not slow down (continued)	Broken or faulty wiring	Check harness connections and wiring condition (refer to machine wiring diagram).
	Faulty pressure switch	Check; replace if necessary.
	Faulty relay	Check; replace if necessary.
	Blown system fuse	Check system fuse; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays .
Engine overheats	Located too close to obstruction	Move further from obstruction, or move obstructing obstacle(s).
	Restricted engine oil filter	Replace engine oil filter. Refer to Table 5A, Key No. 11 (for oil filter). Also refer to the Engine Operation Manual.
	Restricted cooling air in or out	Clean engine intake grill; also refer to the Engine Operation Manual.
	Low oil level	Check engine oil level; refer to Table 5A, Key No. 2 . Replenish as necessary. Also refer to the Engine Operation Manual.
	Restricted engine air filter	Check that the air cleaner element and pre-cleaner are clean and all components are properly secured. Clean or replace as necessary. Refer to Table 5A, Key No. 10 . Also refer to the Engine Operation Manual.
	Engine oil cooler plugged	Clear debris/dirt from cooler core/flush shroud. Refer to the Engine Operation Manual.
	RPM's too high	Adjust setting.
	Demand too high	Check requirements; adjust demand level accordingly.
Engine stops during operation	Low oil level	Check engine oil level; refer to Table 5A, Key No. 2 . Replenish as necessary. Also refer to the Engine Operation Manual.
	Low fuel	Check fuel level. Fill as necessary.
	Fuel filter(s) and/or fuel lines partly plugged	Replace fuel filter or lines. Refer to Table 5A, Key No. 11 , and the Engine Operation Manual.
	Wrong fuel type	Use only clean, automotive grade gasoline— DO NOT use E85, etc. Refer to Engine Operation Manual for information on engine fuel type to use.
	Restricted engine air filter	Replace.
	Fuel pump faulty	Check battery/electrical connection.
	Restricted cooling air in or out	Clean engine intake grill; also refer to the Engine Operation Manual.
	Fouled spark plug	Check spark plug; clean or replace if necessary. Refer to Engine Operation Manual.
[‡] Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Contact the Engine manufacturer.		
<i>Continued on next page</i>		

6.2 TROUBLESHOOTING GUIDE

Fault/Malfunction	Possible Cause	Corrective Action
ENGINE (CONTINUED) [‡]		
NOTE The engine is equipped with performance level monitoring via the engine ECU. During event of a fault occurrence, a diagnostic code is stored in the fault memory. This fault code can be used to help determine system malfunctioning. Refer to Table 6.4, Engine Fault Codes for additional information as well as a list of codes.		
Engine stops during operation (continued)	Blown engine fuse	Check continuity, and replace if necessary. Consult Figure 5-9 in Section 5 , and/or the Engine Operation Manual.
	Dead battery	Check voltage; recharge or replace.
	Demand too high	Check requirements; adjust demand level accordingly.
	Faulty charge system	Check; replace if necessary.
Gradual loss of engine power	Contaminated fuel	Drain and replace fuel supply.
	Restricted engine air filter	Check that the air cleaner element and pre-cleaner are clean and all components are properly secured. Clean or replace as necessary. Refer to Table 5A, Key No. 10 . Also refer to the Engine Operation Manual.
	Wrong fuel type	Use only clean, automotive grade gasoline—do not use E85, etc. Refer to Engine Operation Manual for information on engine fuel type to use.
	Fuel filter(s) and/or fuel lines partly plugged	Replace fuel filter or lines. Refer to Table 5A, Key No. 11 , and the Engine Operation Manual.
	Vapor lock	Machine overheating. Allow to cool.
		Refer to “ Engine overheats ” section in this Troubleshooting Guide.
	Fouled spark plug	Check spark plug; clean or replace if necessary. See Engine Operation Manual.
	Demand too high	Check requirements; adjust demand level accordingly.
COMPRESSOR		
Compressor slows down	Belt(s) slipping	Re-tension or replace belts. Refer to Section 5.4.3, Replacing and Re-tensioning the Compressor And/Or Alternator Drive Belts .
	Engine slowing	Refer to Engine portion of the Troubleshooting Section, and the Engine Operation Manual.
Severe vibration	Mounting loose	Secure mounting.
	Loose compressor flywheel	Secure flywheel.
Internal compressor / internal engine knocking noise [‡]	Loose valve assembly	Tighten valve bolt and lock nut.
	Piston hits cylinder cover	Consult the Vanair® Service Department.
	Worn connecting rod bearing.	Replace bearing.
[‡] Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Contact the Engine manufacturer.		
<i>Continued on next page</i>		

6.2 TROUBLESHOOTING GUIDE

Fault/Malfunction	Possible Cause	Corrective Action
COMPRESSOR (CONTINUED)		
Compressor will not build up pressure	Worn valve plate	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions (valves, rings, gaskets are available).
	Worn valve plate	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions (valves, rings, gaskets are available).
	Reed valves have lost their temper	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions. Kits (valves, rings, gaskets) and are available.
	Obstructed or restricted intake air flow	Check for obstructions (frame, body, etc.) to air filter vents. Replace air filter if necessary; Refer to Table 5A, Key No. 17 .
	Belt worn or broken	Replace belt. Refer to Section 5.4.3, Replacing and Re-tensioning the Compressor And/Or Alternator Drive Belts for belt service information.
	Dirt on the valve plate	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions. Kits (valves, rings, gaskets) and are available.
	Leaks from safety valve	Repair or replace safety valve.
	Leaks from bolt holes	Tighten the nuts even with packing (gasket).
	Uneven valve seat surface	Remove and lap the surface.
	Excessive blow by on piston rings	Replace with new ones. Consult the Vanair® Service Department for compressor maintenance instructions. Ring kit is available.
	Bad packing (gasket too thick)	Replace packing (gasket). Consult the Vanair® Service Department for compressor maintenance instructions. Gasket kit is available.
	Compressor system is not receiving enough operating power	If running more than one function simultaneously, turn off competing function.
	Air demand too high	Check for leaks and take corrective action.
		Check air tools for wear, damage, or malfunctions. Replace or repair.
		Improve duty cycle.
	Pressure control out of adjustment or malfunctioning	Pressure settings may need to be reset. Consult Section 5.4.1, Adjusting the Cut-in / Cut-out Pressure .
	Compressor capacity too low to accommodate demand	Add additional air tank.
	Obstructed or restricted intake air flow	Check for obstructions (frame, body, etc.) to air filter vents. Replace air filter if necessary; Refer to Table 5A, Key No. 12 (compressor air filter).
	Unloader valve(s) sticking or faulty	Valves may need to be cleaned, rebuilt or replaced. Consult the Vanair® Service Department for compressor maintenance instructions.
	Pressure relief valve not operating properly	Replace if necessary.
Continued on next page		

6.2 TROUBLESHOOTING GUIDE		
Fault/Malfunction	Possible Cause	Corrective Action
COMPRESSOR (CONTINUED)		
Compressor will not build up pressure (continued)	Belt(s) slipping	Re-tension or replace belts. Refer to Section 5.4.3, Replacing and Re-tensioning the Compressor And/Or Alternator Drive Belts.
	Engine governor stuck	Free governor and lubricate if necessary. Consult the Engine Operation Manual.
	Leak in air system	Inspect air system for leaks; correct.
	Faulty throttle solenoid	Check throttle solenoid; replace if necessary.
		Check throttle relay; replace if necessary. Refer to Section 5.5, Servicing the System Fuses and Control Relays.
	Service valve is open	Close service valve.
	Pressure gauge is malfunctioning	Check pressure gauge function/control line routing: adjust, repair or replace as necessary.
		Check for proper operation with an auxiliary air source. Replace if necessary.
	Discharge piping leaks	Tighten connections; replace faulty piping.
Slipping of belts	Internal compressor damage	Refer to Table 7A: Recommended Spare Parts List for available compressor rebuild kits. For additional assistance, contact the Vanair® Service Department.
	Working pressure too high	Lower working pressure.
	Improper belt tension	Adjust belt tension. Consult Section 5.4.3, Replacing and Re-tensioning the Compressor And/Or Alternator Drive Belts.
	Oil on belt(s)	Clean belt(s), sheave and pulley treads.
Inaccuracy of pressure gauge	Worn belt(s)	Replace with new ones. Consult Section 5.4.3, Replacing and Re-tensioning the Compressor And/Or Alternator Drive Belts.
	Pressure gauge damaged	Replace.
Excessive moisture in the compressed air	Moisture accumulating in air tank	Drain water from air tank. Refer to Section 5.4.4, Draining the Air Tank.
Compressor system over-pressures and/or relief valve opens	Damaged/kinked control line	Check line for damage (wear, kinks, etc.). Re-route, re-tie or replace if necessary.
	Restriction in control line	Clean if soiled; if ice is present, clear and remove.
	Control line connections are not properly seated/poor connection quality	Check lines for proper seating/ensure line ends have been cut cleanly and are square (DO NOT use wire cutters: use a loom cutting tool or a clean, sharp razor blade).
	Pilot valve out of adjustment or malfunctioning	Pressure settings may need to be reset. Consult Section 5.4.1, Adjusting the Cut-in / Cut-out Pressure.
	Defective safety valve	Replace safety valve.
	Pressure gauge is malfunctioning	Check for proper operation with an auxiliary air source. Replace if necessary.
Continued on next page		

6.2 TROUBLESHOOTING GUIDE

Fault/Malfunction	Possible Cause	Corrective Action
COMPRESSOR (CONTINUED)		
Compressor system over-pressures and/or relief valve opens (continued)	Pressure gauge is malfunctioning (continued)	Check pressure gauge function/control line routing: adjust, repair or replace as necessary.
	Unloader sticking	Free unloader. Replace if necessary.
No service air output	If equipped, OSHA valve/velocity fuse, not functioning properly	Reset or replace OSHA (service) valve.
	Pinched or plugged service line	Alleviate kink or remove line obstacle.
System operating pressure below specified minimum	Air demand too high	Check air tools for wear, damage, or malfunctions. Replace or repair.
	Compressor capacity too low to accommodate demand	Substitute larger capacity compressor system.
	Pilot valve out of adjustment or malfunctioning	Pressure settings may need to be reset. Consult Section 5.4.1, Adjusting the Cut-in / Cut-out Pressure .
	Clogged compressor air filter	Replace air filter if necessary; Refer to Table 5A, Key No. 17 .
	System leaks or is damaged	Inspect for leaks. Repair and/or replace damaged parts as necessary.
System operating pressure below specified minimum (continued)	Incorrect input speed	Reduce load. Refer to Section 5.4.2, Adjusting the Engine Speed .
	Pressure switch set too low/ malfunction	Adjust pressure switch setting. Refer to Section 5.4.1, Adjusting the Cut-in / Cut-out Pressure . Replace if switch continues to deviate from setting.
	Input rpm too low	Adjust to proper setting.
	Pilot valve stuck open	Check valve; clean or replace if necessary.
	Unloader sticking	Free unloader. Replace if necessary.
Excess amount of oil in air discharge	Compressor oil level too high	Check oil level and drain to proper level if necessary. Refer to Table 5A, Key No 8 . Do not overfill.
	Worn piston ring	Replace; consult Vanair® Service Department for piston ring and cylinder maintenance procedures. Note that compressor unit may need to be replaced.
Excessive oil consumption	Worn piston ring	Replace; consult Vanair® Service Department for piston ring and cylinder maintenance procedures. Note that compressor unit may need to be replaced.
	Worn piston	Replace; consult Vanair® Service Department for piston ring and cylinder maintenance procedures. Note that compressor unit may need to be replaced.
	Worn cylinder	Replace; consult Vanair® Service Department for piston ring and cylinder maintenance procedures. Note that compressor unit may need to be replaced.
Battery charger behaves erratically	Connection cables or receptacles are soiled/contaminated	Check for soiled, contaminated, damaged or loose receptacle connections.
	Connection cables or receptacles are soiled/contaminated	Untwist and/or straighten out any suspected cable tensions. Carefully wipe off any contaminants to receptacle connectors before re-connecting. Replace any worn or damaged cables or receptacles. Contact the Vanair® Service Department if behavior persists.
Continued on next page		

6.2 TROUBLESHOOTING GUIDE		
Fault/Malfunction	Possible Cause	Corrective Action
CHARGE / START SYSTEM		
No DC output	Blown fuse	Replace the fuse. Refer to Section 5.5, Servicing The System Fuses and Control Relays.
	Loose or faulty wiring	Check wiring: Loose—secure; faulty—replace.
	Faulty regulator	Replace.
	Serpentine belt out of position or malfunctioning	Re-situate and adjust belt tension, or replace belt if necessary. Consult Section 5.4.3 , Replacing and Re-tensioning the Compressor And/ Or Alternator Drive Belts.
	Faulty relay	Check; replace if necessary.
	Faulty contactor	Check; replace if necessary.
Display not working	Loose or faulty wiring	Check wiring: Loose—secure; faulty—replace.
Connection fault	Loose cable connection	Check and clean cable connection.
	Poor clamp connection	Clean clamp and Terminal and reattach clamp securely.
	Faulty battery	Replace Battery With a New Battery (Do not try to force the Cap•Start® to charge faulty battery).
	Cables not connected	Check and clean all cable connections.
	Clamps are reversed	Check clamps to make sure they are correctly attached to Battery.
	Jumper cables not connected	Check cables and make sure they are connected properly.
Voltage fault	Battery is below minimum required sensing voltage	Check cables and connections to make sure they are correct. Use override switch to enable charging/start function.
	Clamps are touching each other	Separate and Isolate clamps so they are not touching. Use a piece of non-conductive rubber if needed to keep clamps apart in tight quarters.
	Jumper cables have short	Replace jumper cables with new cables.
	Internal wiring has short	Consult Vanair® Service Department.
Vehicle fails to start	Extreme cold / vehicle battery frozen	Wait until the Cap•Start® has charged batteries to minimum vehicle starting voltage and try again.
		Consult professional mechanic.
	Batteries are below minimum starting voltage of vehicle	Wait a few minutes for the Cap•Start® to charge batteries and try again
Vehicle fails to start after third (3 rd) try	One or more batteries are faulty	Change batteries.
	Vehicle has unknown issues	Consult professional mechanic.
	Batteries below minimum starting voltage	Wait until the Cap•Start® has charged batteries to minimum vehicle starting voltage and try again.
Sparks occur from clamps	Polarity reversed while using override	Turn Mode Selector switch to OFF and correct cables to correct polarity.
	Poor connection	Clear terminals and reconnect.

6.3 EXTREME CONDITION OPERATION

When operating in extreme humidity, cold or hot conditions, dusty environments, or at high altitudes, extra attention should be given to any indication that could lead to a serious problem. Engine power and compressor air output will be reduced at high altitude or hot ambient temperatures.

Machine review and maintenance check schedules should be more frequent than the normal suggestions given in the **Table 5A, Routine Maintenance Table**, in **Section 5**.

Become acquainted with the situation-adjusted operation approaches given in this section before operating the power system package in any type of extreme ambient condition. For additional operation information consult the Engine Operation Manual.

6.3.1 COLD WEATHER OPERATION

Consult the information in **Table 6.3A** for preventative and/or repair measures. The Cap•Start® can be more difficult to start in cold weather. Once the engine is started, the air density becomes larger and the intake efficiency also becomes higher. More output can be expected in cold areas. When the temperature is very low, extra care must be taken regarding

fuel and oil changes in their viscosity, freezing of water contained in the piping, or of water adhering on the filter.

6.3.2 HIGH TEMPERATURE OPERATION

Consult the information in **Table 6.3B** for preventative and/or repair measures. Reduce load duty cycle to less than 60% when operating in ambient temperatures above 104°F (40°C).

Extra care should be taken to keep the engine and air compressor clean and to not restrict the air flow around the unit. Consult the Engine Operation Manual for fuel, lubrication oil and cooling requirements under extreme temperatures.

When operating the machine in high temperature areas, precautions should be taken to prevent overheating. At the minimum, all vents, including air passage ways around the vents, should be free of debris and dirt.

The operator should be aware that high temperatures can influence engine performance, which can directly effect some machine function capacity outputs.

6.3.3 HIGH DUST CONTENT OPERATION

Consult the information in **Table 6.3C** for

TABLE 6.3A - COLD WEATHER OPERATION

SYMPTOM	CAUSE	PREVENTION / CORRECTIVE ACTION
Water freezes in the fuel line Lubrication oil viscosity increases	WATER Water in the fuel can freeze at temperatures below 32°F (0°C), blocking fuel lines. At an extremely cold temperature, the viscosity of lubrication oil may increase and the torque of starter may exceed its permissible value, hindering proper starting.	• Park the vehicle or equipment indoors when not in use. • Use a block heater. • Maintain the battery; this will make it easier to start a diesel engine in cold weather. • In below zero temperatures a fuel line deicer product may need to be used. • Check the fuel filter regularly to insure that it contains no water. • Vanair® Reciprocating Oil is suitable for use from -40°F to 110°F (-40°C to 43°C). • For additional engine precautions, consult the Engine Operation Manual. • Vanair® recommends installation of the cold weather heater option kit. Consult Table 3A in Section 3 for cold weather kit option. • Keep the fuel tank full to prevent condensation from forming inside the tank and lessen the chances of water getting in the fuel line. • Refer to the Engine Operation Manual for engine cold weather oil recommendations.

TABLE 6.3B - HIGH TEMPERATURE OPERATION

SYMPTOM	CAUSE	PREVENTION / CORRECTIVE ACTION
Overheating/high compartment temperatures Diminished engine performances	High ambient temperatures, confined spaces, soundproof cases and other reasons. Among these the most important factor is the temperature of the intake and cooling air.	• Extra care should be taken to keep the engine and air compressor clean and to not restrict the air flow around the unit. • Consult the Engine Operation Manual for fuel, lubrication oil and cooling requirements under extreme temperatures. • At the minimum, all coolers, including air passage ways around the coolers, should be free of debris and dirt. The fan, driven by the engine, is designed to run continuously to assure a constant flow of cooling air. • If high ambient overheating occurs, reduce the duty cycle. The operator should be aware that high temperatures can influence engine performance, which can directly effect some machine function capacity outputs.

preventative and/or repair measures. When the machine is to be used in continuously dusty environments, special care must be taken with the engine's air cleaner, compressor air cleaner, and compressor oil cooler.

6.3.4 HIGH ALTITUDE OPERATION

Engine horsepower will decrease by 3.5% for every 1,000 feet above sea level. At high altitude overall unit performance will deteriorate, and care will need to be taken not to overload the engine.

6.4 DIAGNOSTIC CODES

The fault code(s) can be accessed in order to help determine what portion of the system is malfunctioning. The ERROR fault codes available are listed in **Table 6.4: Diagnostic Codes** (page 6 - 12).

6.5 HONDA FAULT CODES

Refer to **Table 6.5: Blink Codes** (page 6 - 12). When the ECH detects an abnormality in the system, it turns on the warning indicator. Troubleshoot the system according to the number of DTC (Diagnostic Trouble Code) listings.

Proceed in the sequence as follows:

1. Turn the combination switch OFF if indicator(s) comes on or blinks.
2. Turn the combination switch ON and check that the indicators come on and go off after 0.5 seconds. If the indicators operate normally, the system is normal and the failure will be intermittent.

TABLE 6.3C - HIGH DUST CONTENT OPERATION

SYMPTOM	CAUSE	PREVENTION / CORRECTIVE ACTION
Overheating System contamination Stalling	Machine components exposed to frequent or constant dust interaction, can result in diminished system performance, or machine cessation.	• The intake air must be cleaned with the air cleaner—inspect the air filter frequently for dust build-up and replace as needed. • Ensure that the oil cooler fins are kept clean to prevent overheating. • If the machine is not being used for an extended period of time, an additional precaution, such as covering the machine with a tarp, will help to keep the inside of the machine free of dust particle accumulation. • For extreme cases of high dust content environments, machine fluids may need to be replaced at more frequent intervals. Adjust maintenance schedule accordingly.

TABLE 6.4: DIAGNOSTIC CODES ¹

FAULT	DESCRIPTION	NOTES	TROUBLESHOOTING	MANUALLY ACTIVATE
ERROR E1	REVERSE POLARITY	Means the positive and negative clamps are reversed	Check clamps. Ensure positive clamp is on positive terminal and negative clamp is on the negative terminal.	NO
ERROR E2	TIME LIMIT EXCEEDED	Re-activate desired mode to continue	Cycle Key on and off.	NO
ERROR E3	HIGH ENGINE OIL TEMPERATURE DETECTED	Engine oil temp is too high	Check temp switch voltage to ensure switch is not faulty. Check fluid level. Ensure engine fan is free of debris.	NO
ERROR E6	NO AMPERAGE DRAW DETECTED	Battery internals may be damaged	Ensure correct connections before proceeding. Turn on accessory circuit, fan, radio to provide amp draw.	YES
ERROR E7	SHORTED CABLES DETECTED	Verify all connections before proceeding	Manual activation could result in damage if connections are incorrect.	YES
ERROR E10	BATTERY VOLTAGE TOO LOW	Check connections	Verify appropriate system voltage before proceeding.	YES
ERROR E11	BATTERY VOLTAGE TOO HIGH	Manual activation is not possible	Check that you are in the correct mode (12V or 24V) for the receiving vehicle.	NO
ERROR E12	CHECK CONNECTIONS, OPEN CABLES DETECTED	Cap-start cannot detect any battery/ vehicle voltage	Check Clamps to ensure connections. Measure battery voltage with multimeter.	YES
ERROR E13	CAPSTART SYSTEM VOLTAGE TOO HIGH	An internal voltage regulation fault may have occurred	If problem repeats call Vanair® Service at 1-844-VAN-SERV.	NO
ERROR E14	LOW ENGINE OIL PRESSURE DETECTED	Indicates low engine oil, engine failure, or engine oil pressure switch failure	Check engine oil immediately.	NO
ERROR E15	CABLES DISCONNECTED DURING OPERATION	Check clamp connections	If clamps are connected properly see manual activation procedure.	YES

¹ Consult the Honda Engine Operation Manual for further details.**TABLE 6.5: ENGINE DIAGNOSTIC BLINK CODES**

DTC	INDICATOR	FUNCTION FAILURE
0-1	9 BLINKS	ECU Malfunction
1-1	2 BLINKS	Throttle Motor Malfunction
2-1	3 BLINKS	TPS 1 MALFUNCTION
3-1	4 BLINKS	TPS 2 MALFUNCTION
4-1	5 BLINKS	TPS MALFUNCTION
5-1	6 BLINKS	IAT SENSOR MALFUNCTION
6-1	7 BLINKS	TE SENSOR MALFUNCTION
7-1	8 BLINKS	MAP SENSOR MALFUNCTION

SECTION 7: ILLUSTRATED PARTS LIST

7.1 PARTS ORDERING INFORMATION

Part orders should be placed through the distributor from whom the unit was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the address or phone numbers below.

When ordering parts always indicate the Serial Number of the machine package. This can be obtained from the Bill of Lading for the machine package, or from the unit's serial number plate. See **Figure 7-1** for location of machine package serial plate. **Consult Table 7A: Recommended Spare Parts List** on the next page for a listing of replacement parts.

Vanair®, a Lincoln Electric Company
10896 West 300 North
Michigan City, IN 46360
Toll Free: (800) 526-8817
Telephone: (219) 879-5100
Service (toll free): (844) VAN-SERV
(844) 826-7378
vanair.com

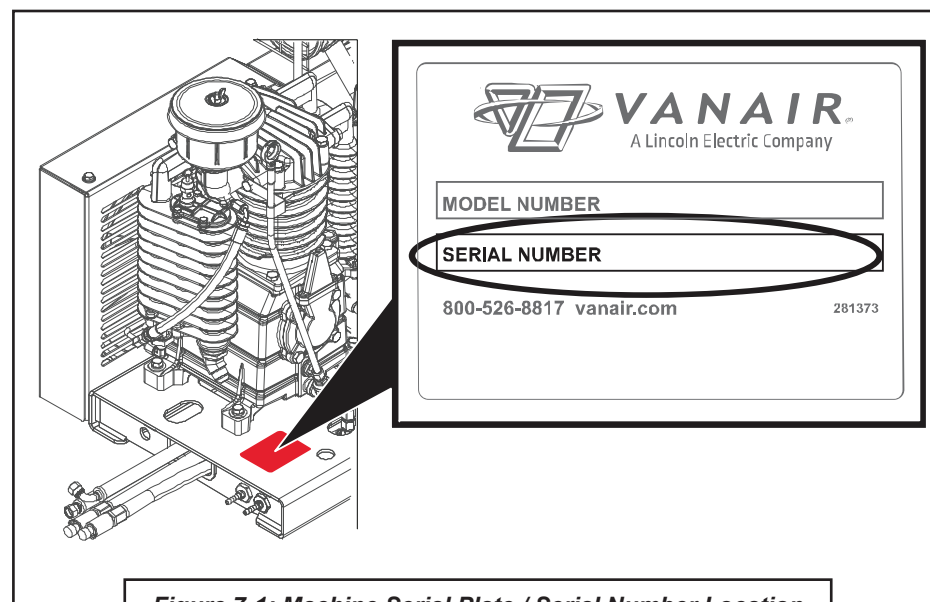


Figure 7-1: Machine Serial Plate / Serial Number Location

TABLE 7A: RECOMMENDED SPARE PARTS LIST

FULL MAINTENANCE ITEMS							
KEY NO.	DESCRIPTION	ORDER NO.	QTY	KEY NO.	DESCRIPTION	ORDER NO.	QTY
1	Kit, Full Engine Service ⁱ	KIT1497	1	4	Kit, Compressor Valves Set Replacement	CM274539-102	1
2	Kit, Compressor Service ⁱⁱ & ⁱⁱⁱ	KIT1387	1	5	Kit, Compressor Gasket Replacement	CM274539-103	1
3	Kit, Compressor Ring Replacement	CM274539-101	1	6	Option, (Kit for) Cold Weather	032983	1
INDIVIDUAL MAINTENANCE ITEMS							
KEY NO.	DESCRIPTION: Honda Engine KIT1497 Parts ⁱ	ORDER NO.	QTY	KEY NO.	DESCRIPTION: Various Component Parts	ORDER NO.	QTY
7	Oil, motor Honda 10W-30 (qt unit)	844300-001-QT	2	13	Filter, replacement element compressor air	277608-001	1
8	Filter, fuel Honda IGX800	281452-01	1	14	V-belt, compressor replacement ^{iv}	278813-680	1
9	Element, pre-filter Honda IGX800	281452-02	1	15	Belt, serpentine alternator drive replacement	273459	1
10	Element, air filter Honda IGX800	281452-03	1	16	Fuse, replacement	^v	-
11	Plug, spark RFI Honda IGX700	281452-04	2	17	Relay, replacement ^{vi}	EL274682	-
12	Filter, oil engine CS3K-Honda remote	283651	1	18	Kit, vibration isolator (contains x 4 isolators)	KIT1202-001	1
ⁱ KIT1497 consists of 10W-30 motor oil (2 qts) (no. 844300-001-QT); fuel filter (no. 281452-01); pre-filter (no. 281452-02); air filter (no. 281452-03), engine oil filter (no. 283651), and spark plug (no. 281452-04).							
ⁱⁱ Use only Vanair® Reciprocating Oil and Genuine Vanair® Parts. Service quantity of system is approximately 1.75 quarts. Inspect and replace damaged components before operation. Substituting non-Vanair® oil or non-genuine Vanair® filter components WILL VOID THE COMPRESSOR WARRANTY!							
ⁱⁱⁱ KIT1387 consists of: two (2) quarts of Vanair® reciprocating compressor oil (no. 271856-1QT; offered in quart units), and compressor air filter replacement element (no. 277608-001).							
^{iv} If a compressor V-belt needs replacement, always replace both belts at the same time regardless of the condition of the second belt.							
^v For specific-rated fuse amp, part number and location, refer to Section 5.5, Servicing the System Fuses and Control Relays . NOTE: Replacement fuses can sometimes be found at local vendor carriers, such as automobile supply stores, hardware stores, etc.							
^{vi} For individual relay identification refer to Section 5.5, Servicing the System Fuses and Control Relays .							
NOTE: Standard components such as fuses and spark plugs can be obtained quicker and more economically from local sources, such as an auto supply store, etc.							
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

IMPORTANT

The above table listing contains items that require maintenance on a routine basis, and also those parts that may require maintenance over the course of the compressor package's performance schedule. Although this recommended list is proffered as a comprehensive guide to replacement parts, damage may occur to the machine beyond the scope of this listing.

Should any part of the compressor package that is not listed in Table 5A become damaged or inoperable, contact the Vanair® Service Department.

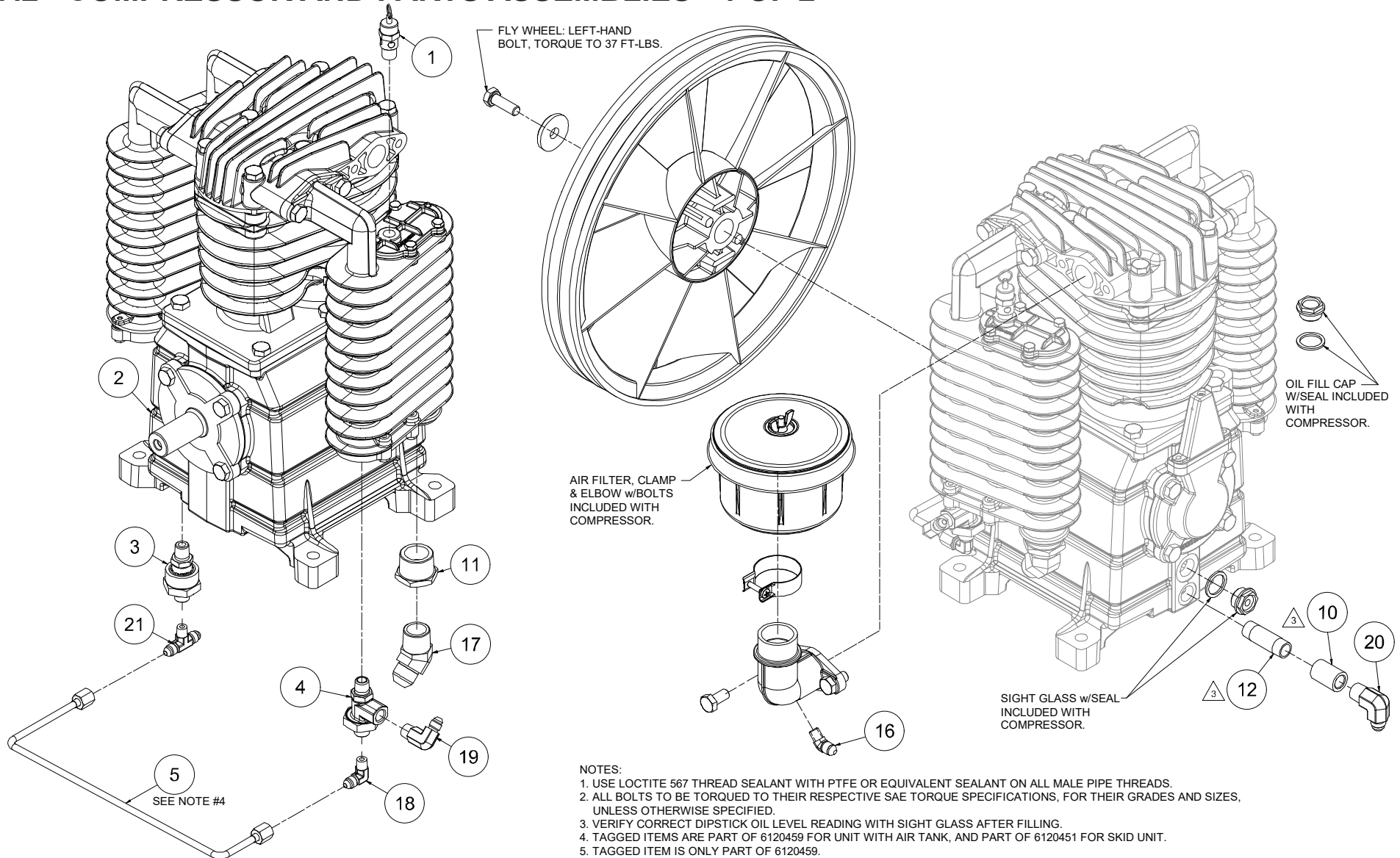
IMPORTANT

If additional spare parts are being stored for future use, ensure that they are stored in proper containers that allow for protection against contamination, and kept in a clean area of moderate temperature reading. For information on storing the machine package for periods of non-use, consult **Section 5.6.2, Long Term Storage**.

TABLE 7B: MAINTENANCE TRACKING LOG

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7.2 COMPRESSOR AND PARTS ASSEMBLIES - 1 OF 2



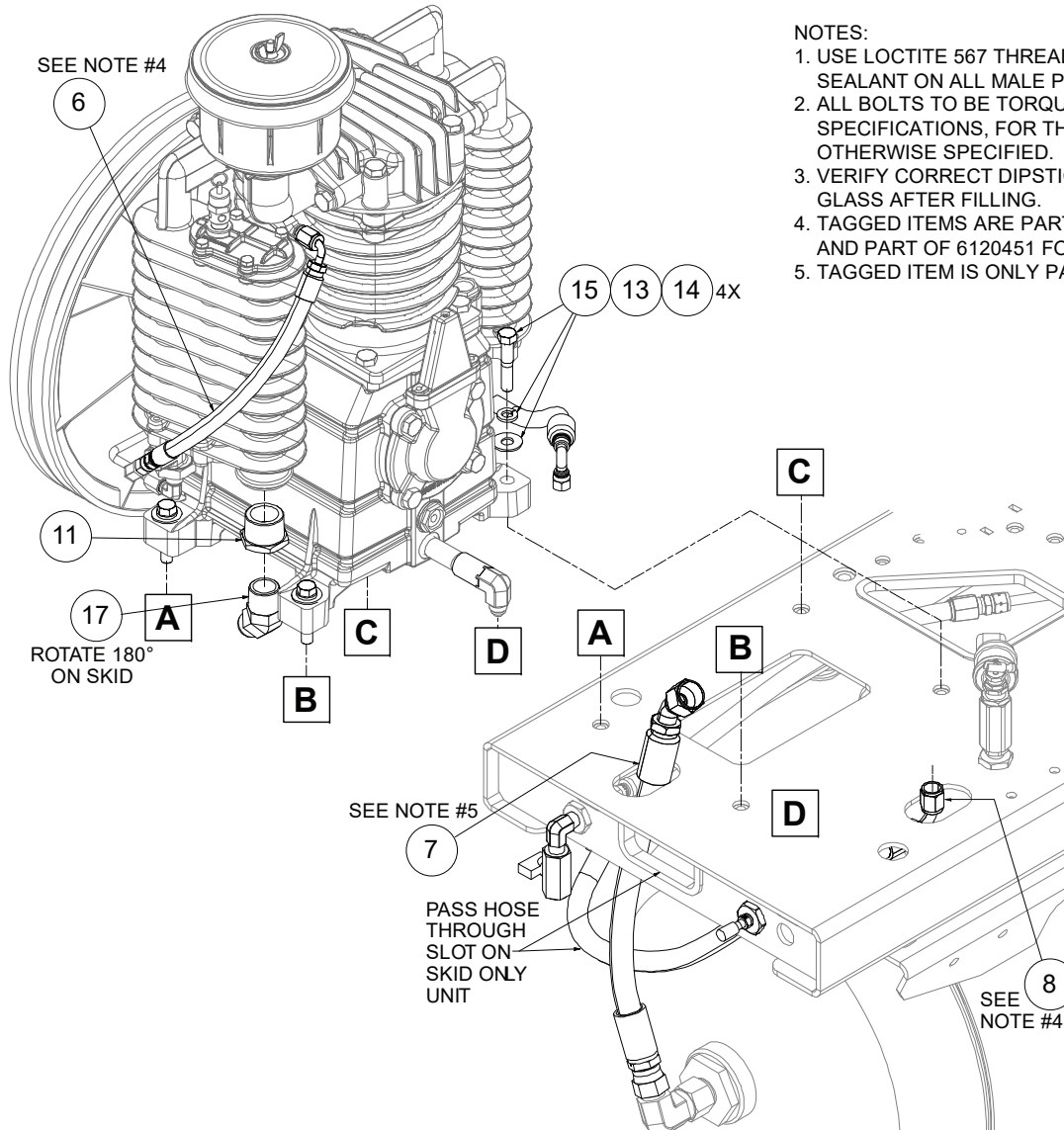
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7.2 COMPRESSOR AND PARTS ASSEMBLIES - 1 OF 2

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	VALVE, RELIEF 225 PSI 1/4 NPT MALE	277127	1	12	NIPPLE, PIPE GALV 3/8 x 2	823106-020	1
2	COMPRESSOR,TWO-STAGE PISTON 20CFM-175PSI	277608	1	13	CAPSCREW, HEX GR8 3/8-16 x 2	829406-200	4
3	VALVE, INTERSTAGE UNLOADER	277958	1	14	WASHER, FLAT 3/8	838206-071	4
4	VALVE, DISCH UNLOADER1/4IN FNPT OUT	279348	1	15	WASHER, LOCK 3/8	838506-094	4
5	TUBE, COMPRESSOR UNLOADER	279634	1	16	ELBOW, 45 DEG. 1/8 MPT x #4 MJIC	860004-012	1
6	HOSE, DISCHARGE UNLOAD TO COMP	279639	1	17	ELBOW, 45 DEG. 3/4 MPT x #10 MJIC	860010-075	1
7	HOSE, COMPRESSOR DISCHARGE	280689	1	18	ELBOW, 37FL/90M #04 x 1/8	860204-012	1
8	HOSE, COMPRESSOR OIL DRAIN CS3K	281300	1	19	ELBOW, 37FL/90M #04 x 1/4	860204-025	1
9	HOSE, PILOT SIGNAL CS3K STRAIGHT	281547	1	20	ELBOW, 37FL/90M #06 x 3/8	860206-038	1
10	COUPLING, PIPE 3/8	801215-015	1	21	TEE, 37FL/M BR #4 x 1/8	861704-012	1
11	BUSHING, RED STEEL 1 x 3/4	807604-030	1	22	DRAIN, ENGINE OIL	FI273012	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

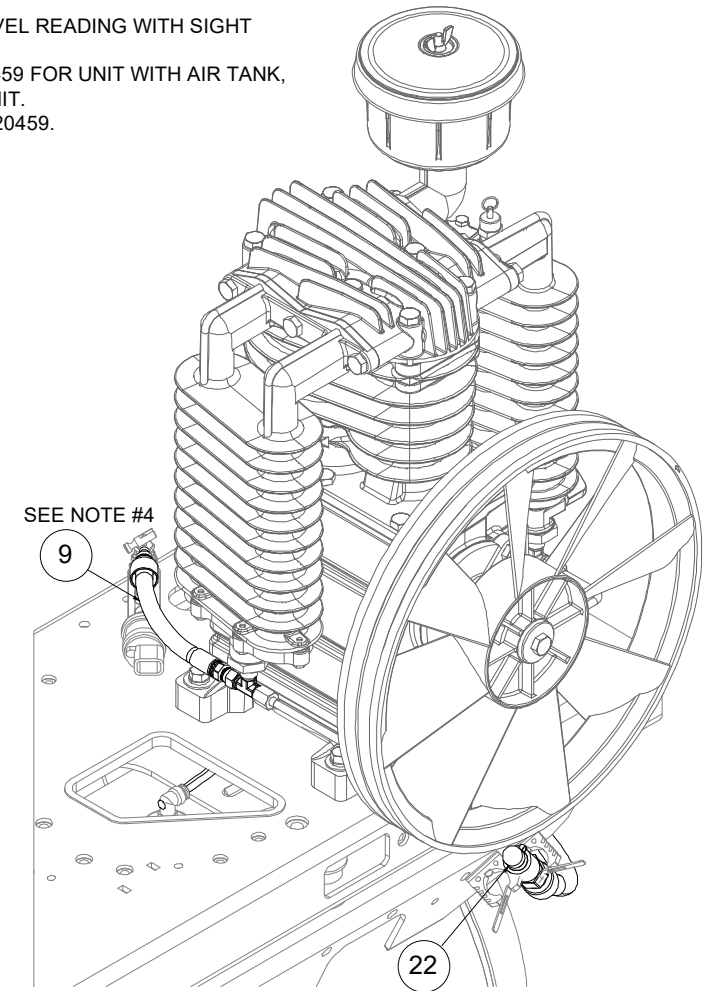
COMPRESSOR (277608) REPLACEABLE COMPONENTS	
DESCRIPTION	PART NUMBER
ELEMENT, AIR FILTER	277608-001
ASSEMBLY, AIR FILTER	277608-002
FLYWHEEL	277608-003
PLUGS, SIGHT GLASS AND OIL FILL	277608-004
KIT, COMPRESSOR HEAD REBUILD	277608-005
KIT, COMPLETE COMPRESSOR REBUILD	277608-006

7.2 COMPRESSOR AND PARTS ASSEMBLIES - 2 OF 2



NOTES:

1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES, UNLESS OTHERWISE SPECIFIED.
3. VERIFY CORRECT DIPSTICK OIL LEVEL READING WITH SIGHT GLASS AFTER FILLING.
4. TAGGED ITEMS ARE PART OF 6120459 FOR UNIT WITH AIR TANK, AND PART OF 6120451 FOR SKID UNIT.
5. TAGGED ITEM IS ONLY PART OF 6120459.



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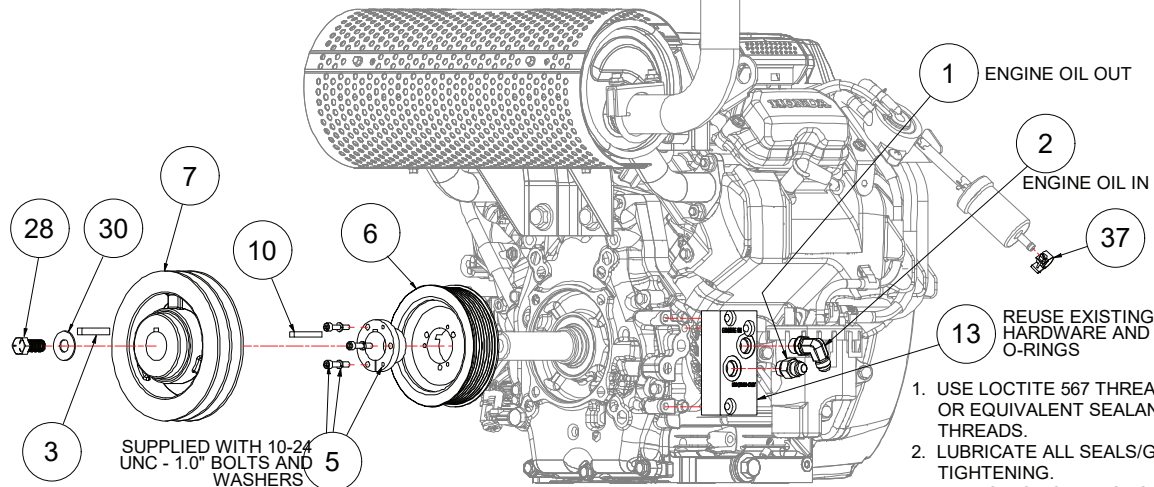
7.2 COMPRESSOR AND PARTS ASSEMBLIES - 2 OF 2

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	VALVE, RELIEF 225 PSI 1/4 NPT MALE	277127	1	12	NIPPLE, PIPE GALV 3/8 x 2	823106-020	1
2	COMPRESSOR,TWO-STAGE PISTON 20CFM-175PSI	277608	1	13	CAPSCREW, HEX GR8 3/8-16 x 2	829406-200	4
3	VALVE, INTERSTAGE UNLOADER	277958	1	14	WASHER, FLAT 3/8	838206-071	4
4	VALVE, DISCH UNLOADER1/4IN FNPT OUT	279348	1	15	WASHER, LOCK 3/8	838506-094	4
5	TUBE, COMPRESSOR UNLOADER	279634	1	16	ELBOW, 45 DEG. 1/8 MPT x #4 MJIC	860004-012	1
6	HOSE, DISCHARGE UNLOAD TO COMP	279639	1	17	ELBOW, 45 DEG. 3/4 MPT x #10 MJIC	860010-075	1
7	HOSE, COMPRESSOR DISCHARGE	280689	1	18	ELBOW, 37FL/90M #04 x 1/8	860204-012	1
8	HOSE, COMPRESSOR OIL DRAIN CS3K	281300	1	19	ELBOW, 37FL/90M #04 x 1/4	860204-025	1
9	HOSE, PILOT SIGNAL CS3K STRAIGHT	281547	1	20	ELBOW, 37FL/90M #06 x 3/8	860206-038	1
10	COUPLING, PIPE 3/8	801215-015	1	21	TEE, 37FL/M BR #4 x 1/8	861704-012	1
11	BUSHING, RED STEEL 1 x 3/4	807604-030	1	22	DRAIN, ENGINE OIL	FI273012	1

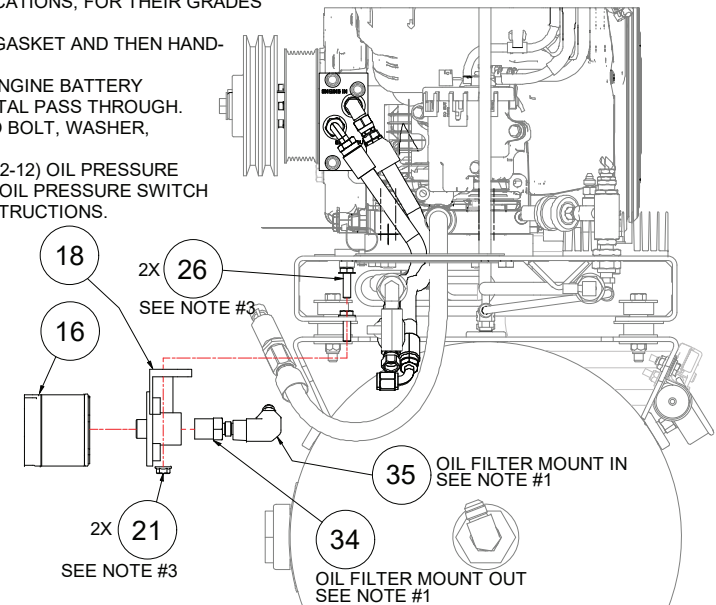
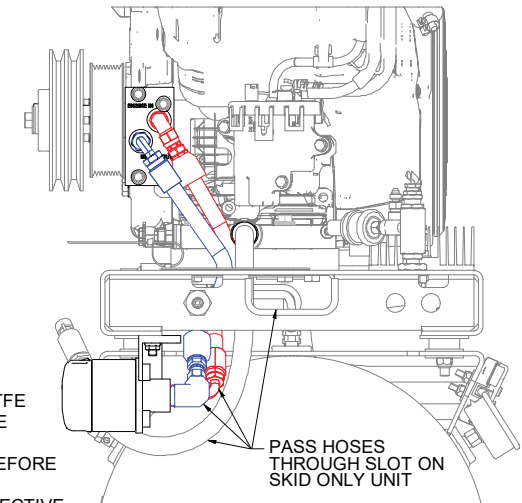
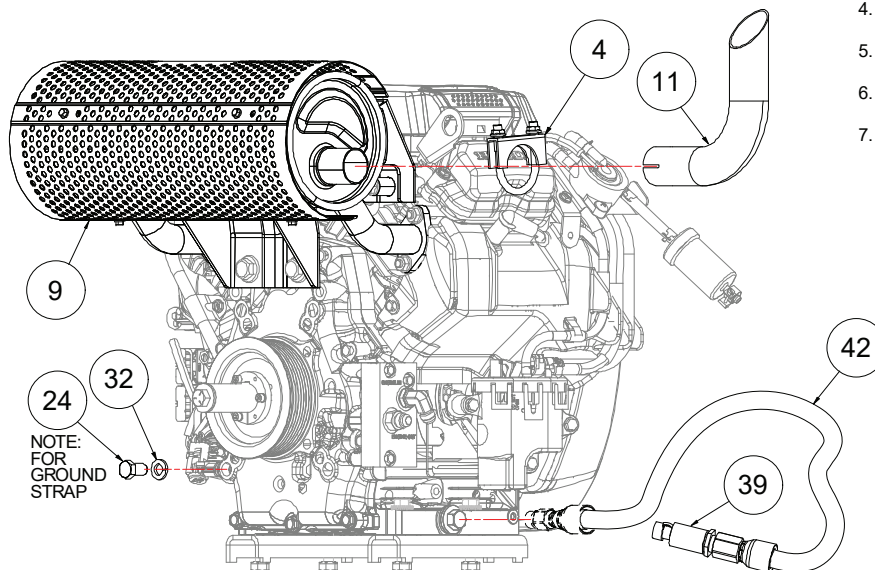
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.

COMPRESSOR (277608) REPLACEABLE COMPONENTS	
DESCRIPTION	PART NUMBER
ELEMENT, AIR FILTER	277608-001
ASSEMBLY, AIR FILTER	277608-002
FLYWHEEL	277608-003
PLUGS, SIGHT GLASS AND OIL FILL	277608-004
KIT, COMPRESSOR HEAD REBUILD	277608-005
KIT, COMPLETE COMPRESSOR REBUILD	277608-006

7.3 ENGINE AND DRIVE ASSEMBLY - 1 OF 3



1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. LUBRICATE ALL SEALS/GASKETS/O-RINGS BEFORE TIGHTENING.
3. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES.
4. REMOVE, LUBRICATE GASKET AND THEN HAND-TIGHTEN OIL FILTER.
5. ADD SPLIT LOOM TO ENGINE BATTERY CABLES BY SHEET METAL PASS THROUGH.
6. APPLY LOCTITE 242 TO BOLT, WASHER, AND KEY SQUARES.
7. SEE IN0361 FOR (281452-12) OIL PRESSURE SWITCH, AND (281474) OIL PRESSURE SWITCH HARNESS INSTALL INSTRUCTIONS.

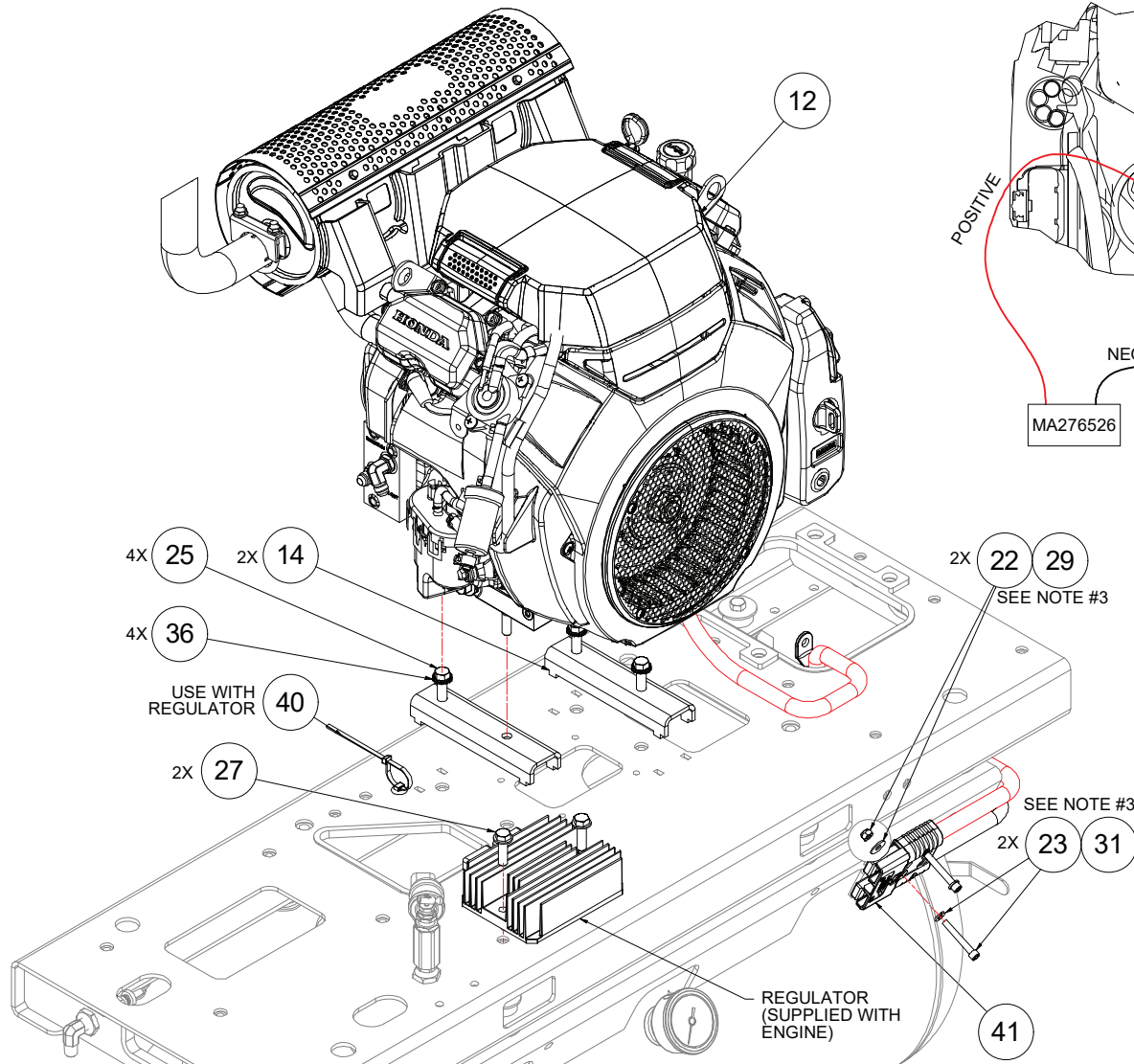
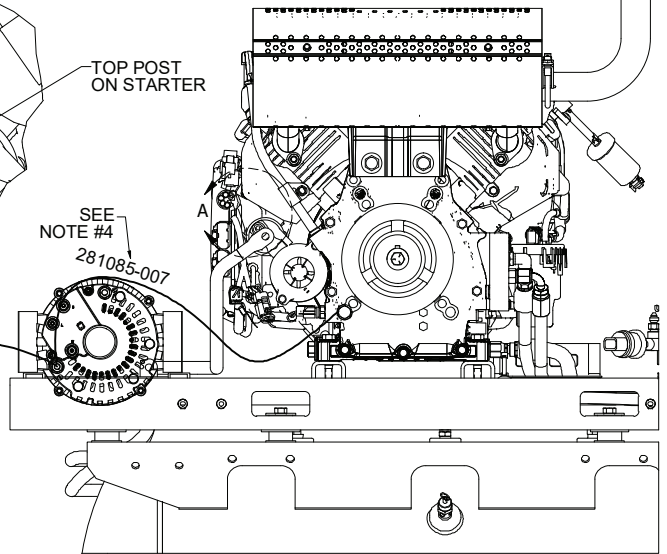


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7.3 ENGINE AND DRIVE ASSEMBLY - 1 OF 3

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, #6 MSAE x #6 MJIC	260387-105	1	23	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
2	ELBOW, 90 DEG #6 MJIC x #6 MSAE	260403-103	1	24	CAPSCREW, HEX GR5 7/16-14 x 0.75	829107-075	1
3	KEY, SQUARE 1/4 X 1/4 X 1 1/2	262082	1	25	CAPSCREW, HEX GR8 3/8-16X 2 1/2	829406-250	4
4	CLAMP, EXHAUST 1 1/2	262906-150	1	26	SCREW, SER WASH 5/16-18 x 1	829705-100	2
5	BUSHING, QD STYLE JA118 1.125 BORE	273523	1	27	SCREW, SER WASH 3/8-16 x 1.25	829706-125	2
6	SHEAVE, DRIVE K SECTION 8 GROOVE 4.5	275162	1	28	CAPSCREW, HEX GR5 7/16-20 X 1	829807-100	1
7	SHEAVE, V-BELT 2-GROOVE A 5.75 O.D. 1.125 SHAFT	278595	1	29	WASHER, FLAT 1/4	838204-071	2
8	SWITCH, OIL PRESS HONDA IGX800 IGX700	281452-12	1	30	WASHER, FLAT 7/16	838207-071	1
9	MUFFLER ,HONDA IGX800	281453	1	31	WASHER, LOCK 1/4	838504-062	2
10	KEY, 3/16 X 1/4 X 1 1/2 UNDERSIZE +0.0000/-0.0030	281503	1	32	WASHER, LOCK 7/16	838507-109	1
11	TUBE, EXHAUST TIP GV3	282400	1	33	OIL, MOTOR 10W-30 (55GAL DRUM)	844300-001	2
12	ENGINE, GAS HONDA IGX700 22.1HP EFI ETB	283059	1	34	CONNECTOR, 37FL/MPT #06 x 1/2	860106-050	1
13	ADAPTER, ENGINE OIL REMOTE HONDA IGX700-800	283285	1	35	ELBOW, 37FL/90M #06 x 1/2	860206-050	1
14	MOUNT, ENGINE IGX700-800 CS3K-HONDA	283359	2	36	WASHER, 3/8ID X 13/16OD NORD-LOCK	FA49463	4
15	CABLE, CS3K-HONDA CAN ADAPTER (NOT SHOWN)	283485	1	37	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	1
16	FILTER, OIL ENGINE CS3K-HONDA REMOTE	283651	1	38	VALVE, QUICK DRAIN 3/8NPT	FI273012	1
17	SPLITTER, M12 Y-TYPE CAN TEE ECB116	284079	1	39	DRAIN, ENGINE OIL	FI273012	1
18	ADAPTER, PH1 REMOTE OIL FILTER MOUNT 3/4-16 THREAD	284405	1	40	TIE, CABLE PUSH MOUNT WITH UMBRELLA	HA270685	1
19	HARNESS, OIL PRESS SWITCH HONDA IGX700 IGX800	288474	1	41	CABLE, BATTERY EXTENSION, MACHINE	MA276526	1
20	HARNESS, CS3K ENGINE CONNECTOR A	289329	1	42	HOSE, ENGINE OIL DRAIN 20MM X 35IN IGX800 IGX700	SEE NOTE #5	1
21	NUT, HEX FLANGE 5/16-18	825305-283	2	43	HOSE, ENGINE REMOTE OIL FILTER	SEE NOTE #5	2
22	NUT, HEX LOCKING 1/4-20	825504-145	2				
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

7.3 ENGINE AND DRIVE ASSEMBLY - 2 OF 3

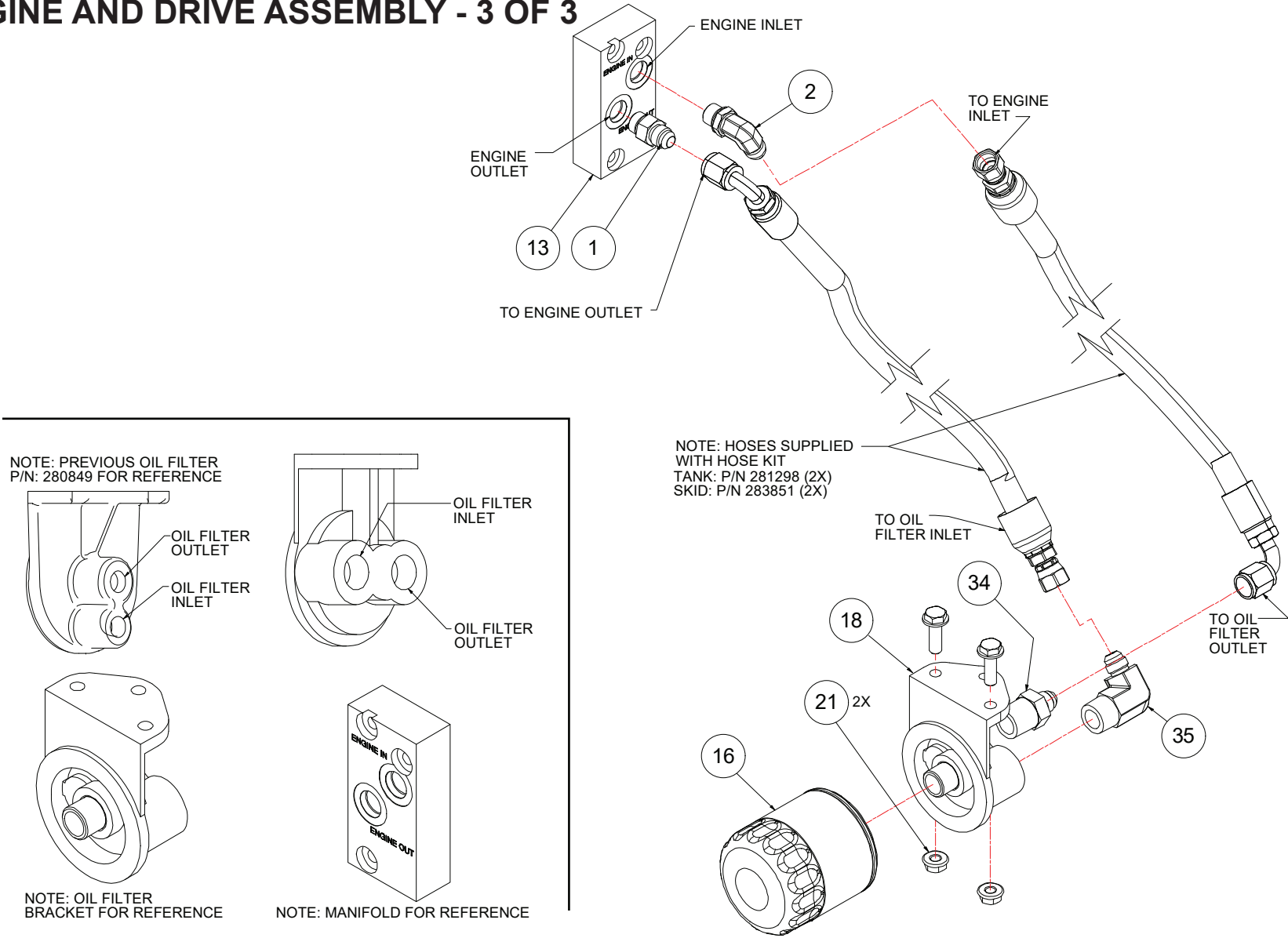
DETAIL A
SCALE 3/4

NOTES:

1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. LUBRICATE ALL SEALS/GASKETS/O-RINGS BEFORE TIGHTENING.
3. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES.
4. REMOVE, LUBRICATE GASKET AND THEN HAND-TIGHTEN OIL FILTER.
5. ADD SPLIT LOOM TO ENGINE BATTERY CABLES BY SHEET METAL PASS THROUGH.
6. APPLY LOCTITE 242 TO BOLT, WASHER, AND KEY SQUARES.

7.3 ENGINE AND DRIVE ASSEMBLY - 2 OF 3							
ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, #6 MSAE x #6 MJIC	260387-105	1	23	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
2	ELBOW, 90 DEG #6 MJIC x #6 MSAE	260403-103	1	24	CAPSCREW, HEX GR5 7/16-14 x 0.75	829107-075	1
3	KEY, SQUARE 1/4 X 1/4 X 1 1/2	262082	1	25	CAPSCREW, HEX GR8 3/8-16X 2 1/2	829406-250	4
4	CLAMP, EXHAUST 1 1/2	262906-150	1	26	SCREW, SER WASH 5/16-18 x 1	829705-100	2
5	BUSHING, QD STYLE JA118 1.125 BORE	273523	1	27	SCREW, SER WASH 3/8-16 x 1.25	829706-125	2
6	SHEAVE, DRIVE K SECTION 8 GROOVE 4.5	275162	1	28	CAPSCREW, HEX GR5 7/16-20 X 1	829807-100	1
7	SHEAVE, V-BELT 2-GROOVE A 5.75 O.D. 1.125 SHAFT	278595	1	29	WASHER, FLAT 1/4	838204-071	2
8	SWITCH, OIL PRESS HONDA IGX800 IGX700	281452-12	1	30	WASHER, FLAT 7/16	838207-071	1
9	MUFFLER ,HONDA IGX800	281453	1	31	WASHER, LOCK 1/4	838504-062	2
10	KEY, 3/16 X 1/4 X 1 1/2 UNDERSIZE +0.0000/- .0030	281503	1	32	WASHER, LOCK 7/16	838507-109	1
11	TUBE, EXHAUST TIP GV3	282400	1	33	OIL, MOTOR 10W-30 (55GAL DRUM)	844300-001	2
12	ENGINE, GAS HONDA IGX700 22.1HP EFI ETB	283059	1	34	CONNECTOR, 37FL/MPT #06 x 1/2	860106-050	1
13	ADAPTER, ENGINE OIL REMOTE HONDA iGX700-800	283285	1	35	ELBOW, 37FL/90M #06 x 1/2	860206-050	1
14	MOUNT, ENGINE IGX700-800 CS3K-HONDA	283359	2	36	WASHER, 3/8ID X 13/16OD NORD-LOCK	FA49463	4
15	CABLE, CS3K-HONDA CAN ADAPTER (NOT SHOWN)	283485	1	37	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	1
16	FILTER, OIL ENGINE CS3K-HONDA REMOTE	283651	1	38	VALVE, QUICK DRAIN 3/8NPT	FI273012	1
17	SPLITTER, M12 Y-TYPE CAN TEE ECB116	284079	1	39	DRAIN, ENGINE OIL	FI273012	1
18	ADAPTER, PH1 REMOTE OIL FILTER MOUNT 3/4-16 THREAD	284405	1	40	TIE, CABLE PUSH MOUNT WITH UMBRELLA	HA270685	1
19	HARNESS, OIL PRESS SWITCH HONDA IGX700 IGX800	288474	1	41	CABLE, BATTERY EXTENSION, MACHINE	MA276526	1
20	HARNESS, CS3K ENGINE CONNECTOR A	289329	1	42	HOSE, ENGINE OIL DRAIN 20MM X 35IN IGX800 IGX700	SEE NOTE #5	1
21	NUT, HEX FLANGE 5/16-18	825305-283	2	43	HOSE, ENGINE REMOTE OIL FILTER	SEE NOTE #5	2
22	NUT, HEX LOCKING 1/4-20	825504-145	2				
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

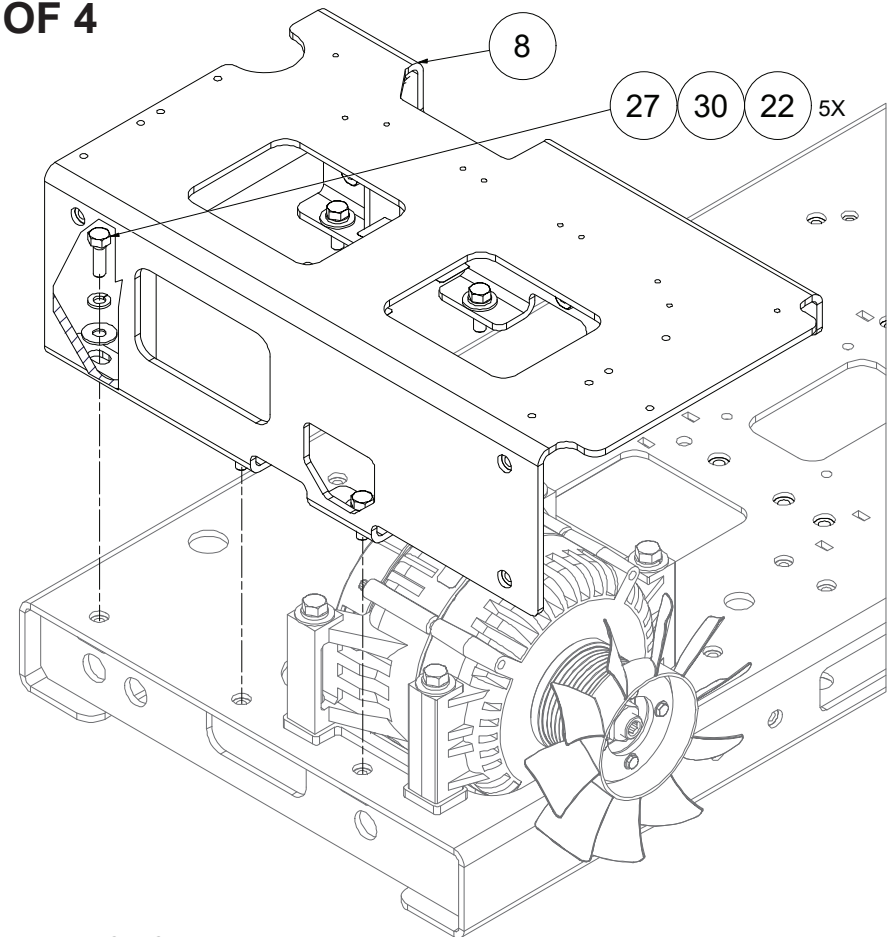
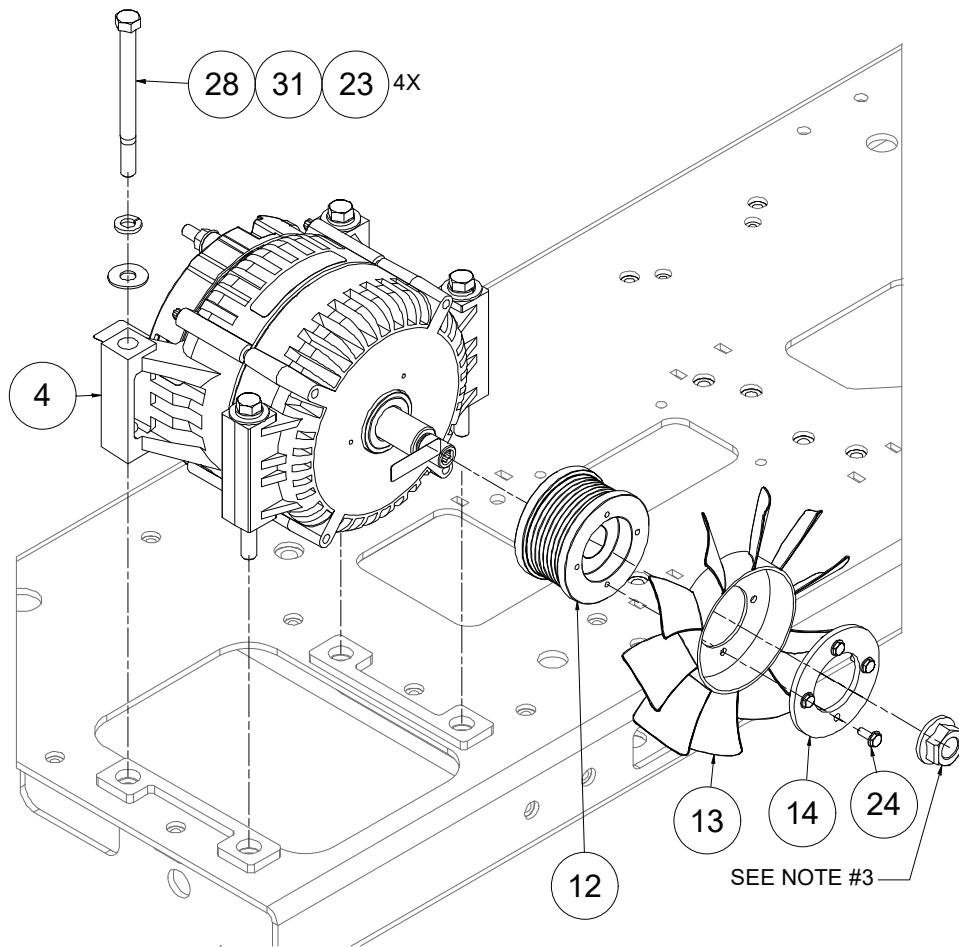
7.3 ENGINE AND DRIVE ASSEMBLY - 3 OF 3



7.3 ENGINE AND DRIVE ASSEMBLY - 3 OF 3

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	CONNECTOR, #6 MSAE x #6 MJIC	260387-105	1	23	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
2	ELBOW, 90 DEG #6 MJIC x #6 MSAE	260403-103	1	24	CAPSCREW, HEX GR5 7/16-14 x 0.75	829107-075	1
3	KEY, SQUARE 1/4 X 1/4 X 1 1/2	262082	1	25	CAPSCREW, HEX GR8 3/8-16X 2 1/2	829406-250	4
4	CLAMP, EXHAUST 1 1/2	262906-150	1	26	SCREW, SER WASH 5/16-18 x 1	829705-100	2
5	BUSHING, QD STYLE JA118 1.125 BORE	273523	1	27	SCREW, SER WASH 3/8-16 x 1.25	829706-125	2
6	SHEAVE, DRIVE K SECTION 8 GROOVE 4.5	275162	1	28	CAPSCREW, HEX GR5 7/16-20 X 1	829807-100	1
7	SHEAVE, V-BELT 2-GROOVE A 5.75 O.D. 1.125 SHAFT	278595	1	29	WASHER, FLAT 1/4	838204-071	2
8	SWITCH, OIL PRESS HONDA IGX800 IGX700	281452-12	1	30	WASHER, FLAT 7/16	838207-071	1
9	MUFFLER ,HONDA IGX800	281453	1	31	WASHER, LOCK 1/4	838504-062	2
10	KEY, 3/16 X 1/4 X 1 1/2 UNDERSIZE +0.0000/-0.0030	281503	1	32	WASHER, LOCK 7/16	838507-109	1
11	TUBE, EXHAUST TIP GV3	282400	1	33	OIL, MOTOR 10W-30 (55GAL DRUM)	844300-001	2
12	ENGINE, GAS HONDA IGX700 22.1HP EFI ETB	283059	1	34	CONNECTOR, 37FL/MPT #06 x 1/2	860106-050	1
13	ADAPTER, ENGINE OIL REMOTE HONDA IGX700-800	283285	1	35	ELBOW, 37FL/90M #06 x 1/2	860206-050	1
14	MOUNT, ENGINE IGX700-800 CS3K-HONDA	283359	2	36	WASHER, 3/8ID X 13/16OD NORD-LOCK	FA49463	4
15	CABLE, CS3K-HONDA CAN ADAPTER (NOT SHOWN)	283485	1	37	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	1
16	FILTER, OIL ENGINE CS3K-HONDA REMOTE	283651	1	38	VALVE, QUICK DRAIN 3/8NPT	FI273012	1
17	SPLITTER, M12 Y-TYPE CAN TEE ECB116	284079	1	39	DRAIN, ENGINE OIL	FI273012	1
18	ADAPTER, PH1 REMOTE OIL FILTER MOUNT 3/4-16 THREAD	284405	1	40	TIE, CABLE PUSH MOUNT WITH UMBRELLA	HA270685	1
19	HARNESS, OIL PRESS SWITCH HONDA IGX700 IGX800	288474	1	41	CABLE, BATTERY EXTENSION, MACHINE	MA276526	1
20	HARNESS, CS3K ENGINE CONNECTOR A	289329	1	42	HOSE, ENGINE OIL DRAIN 20MM X 35IN IGX800 IGX700	SEE NOTE #5	1
21	NUT, HEX FLANGE 5/16-18	825305-283	2	43	HOSE, ENGINE REMOTE OIL FILTER	SEE NOTE #5	2
22	NUT, HEX LOCKING 1/4-20	825504-145	2				
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 1 OF 4

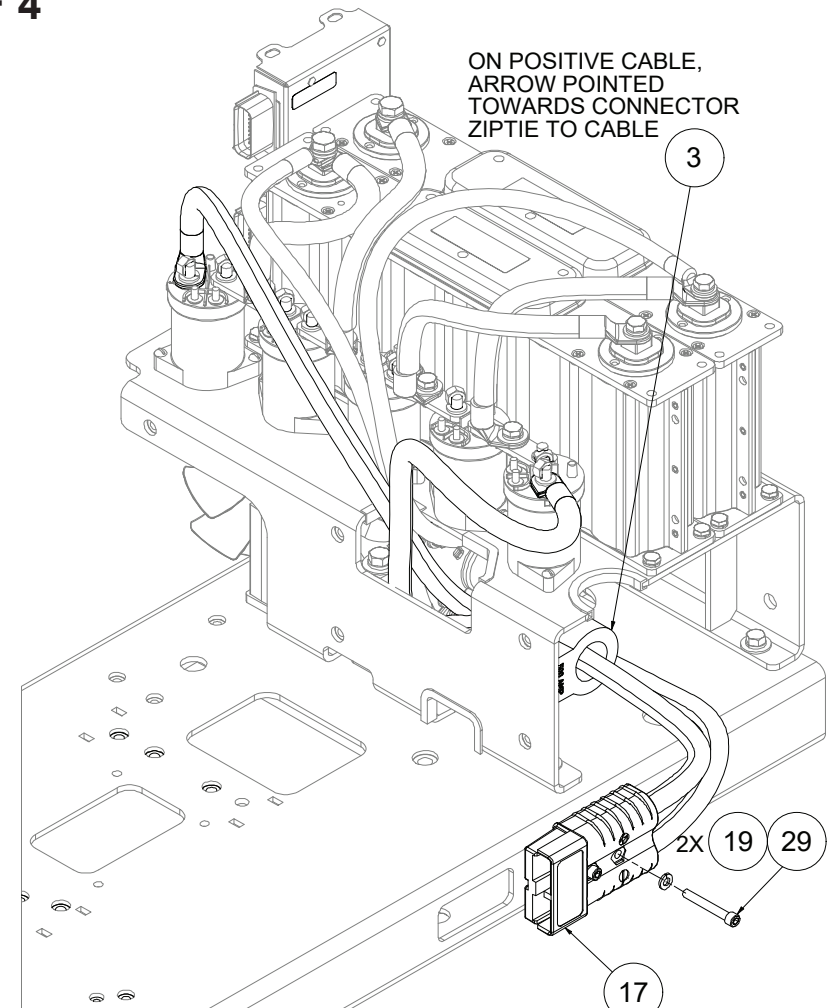
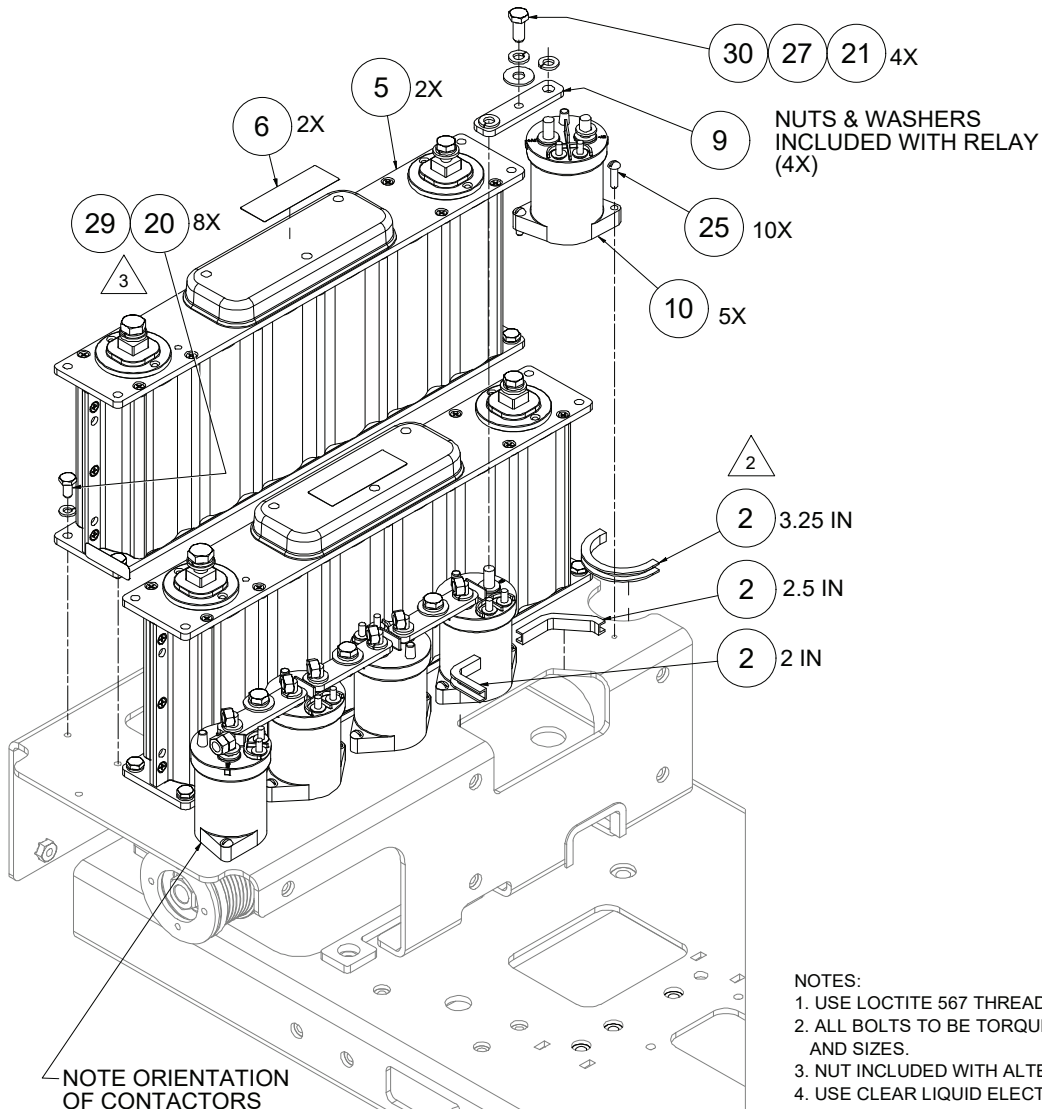


NOTES:

1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES.
3. NUT INCLUDED WITH ALTERNATOR. TORQUE PULLEY NUT TO 102 ± 7 Nm [75.2 ± 5.2 FT-LB].
4. USE CLEAR LIQUID ELECTRICAL TAPE ON ALL EXPOSED CONNECTIONS.

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 1 OF 4							
ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WASHER, NYLON 5/16-18	262943	9	18	NUT, HEX FLANGE 5/16-18	825305-283	2
2	TRIM-LOK, 1/4 GROOVE	268080	1 ft	19	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
3	SENSOR, HALL EFFECT 500 AMP	275718	1	20	CAPSCREW, HEX GR5 1/4-20 x 0.5	829104-050	9
4	ALTERNATOR, 240A PAD MNT, MULTI-VOLT	276942	1	21	CAPSCREW, HEX GR5 5/16-18 x 0.75	829105-075	4
5	ULTRACAPACITOR, 65.52kJ 12/24V	277956	2	22	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	5
6	DECAL, VSC LS MTRON	278446	2	23	CAPSCREW, HEX GR8 3/8-16 x 4.25	829406-425	4
7	BOLT, FLANGE 5/16-18 x 3/4 SILVER	278623-075	9	24	SCREW, SER WASH #10-24 x 0.5	829702-050	4
8	TOWER, CAPACITOR & RELAY	280165	1	25	SCREW, ROUND HD #10-24 x 0.75	831602-075	10
9	BAR, COPPER BUS	280201	4	26	WASHER, FLAT 1/4	838204-071	1
10	RELAY, 500A W/STUDS	280203	5	27	WASHER, FLAT 5/16	838205-071	9
11	PANEL, TOWER INSIDE	280571	1	28	WASHER, FLAT 3/8	838206-071	4
12	SHEAVE, 8K-GRV 2.795 PD W/FAN MOUNT	280771	1	29	WASHER, LOCK 1/4	838504-062	11
13	FAN, 7IN PULL MECH	280908	1	30	WASHER, LOCK 5/16	838505-078	9
14	WASHER, FAN MOUNTING	280975	1	31	WASHER, LOCK 3/8	838506-094	4
15	MODULE, MACHINE CONTROL	281025-0101	1	NS	CABLE, M12 MALE/FEMALE PATCH STRAIGHT/STRAIGHT 3FT	283909-03	1
16	PANEL, SPARK PLUG ACCESS	281111	1	NS	HARNESS, CS3K CONTROLS CONNECTOR B	280717	1
17	HARNESS, BOOSTER OUTPUT CNNCTR	281132	1	NS	KIT, CABLE CAP•START 3000A+AIR LIGHT,12/24V 24CFM	281085	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 2 OF 4

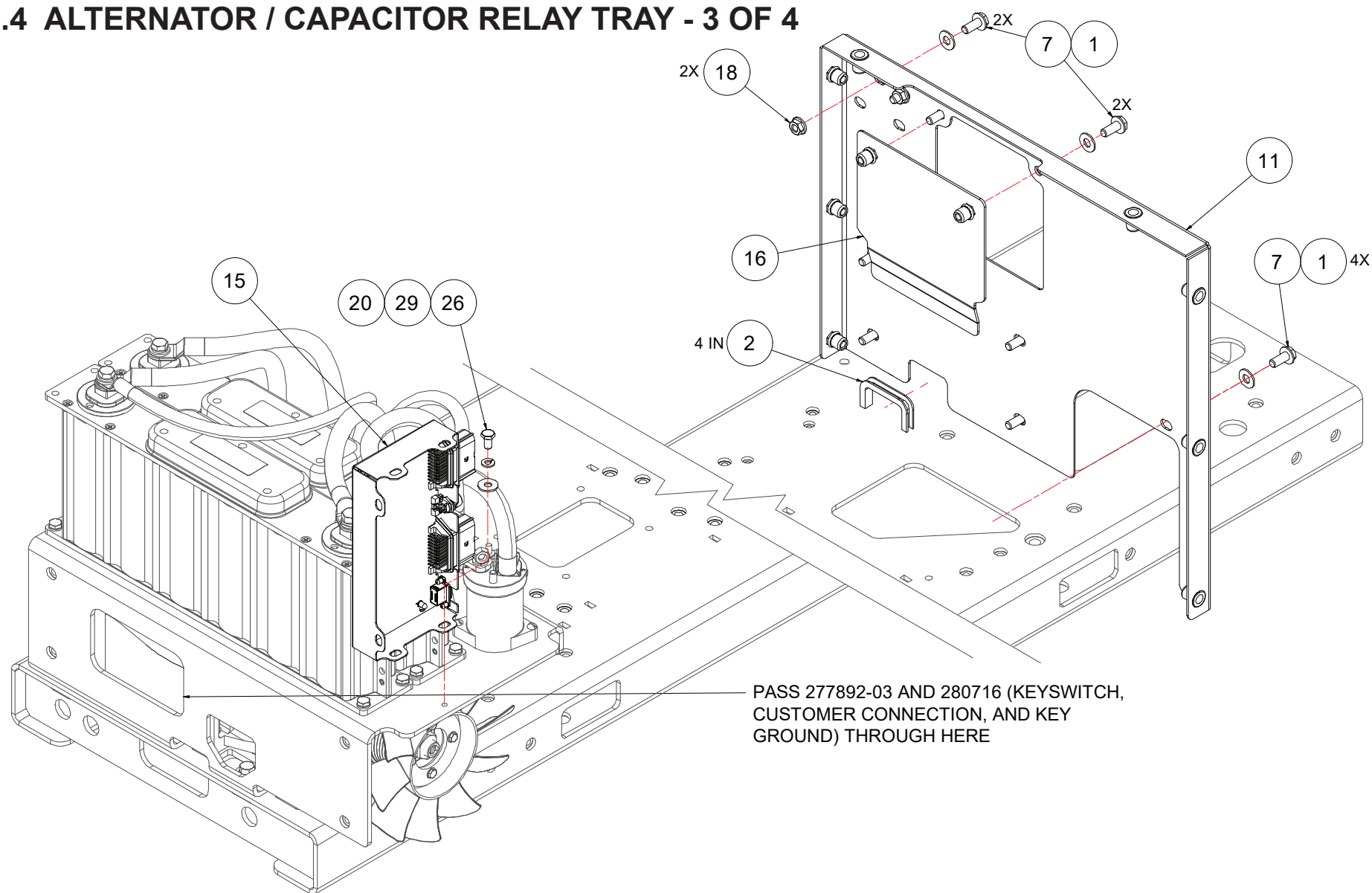


NOTES:

1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES.
3. NUT INCLUDED WITH ALTERNATOR. TORQUE PULLEY NUT TO 102 ±7 Nm [75.2 ±5.2 FT-LB].
4. USE CLEAR LIQUID ELECTRICAL TAPE ON ALL EXPOSED CONNECTIONS.

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 2 OF 4							
ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WASHER, NYLON 5/16-18	262943	9	18	NUT, HEX FLANGE 5/16-18	825305-283	2
2	TRIM-LOK, 1/4 GROOVE	268080	1 ft	19	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
3	SENSOR, HALL EFFECT 500 AMP	275718	1	20	CAPSCREW, HEX GR5 1/4-20 x 0.5	829104-050	9
4	ALTERNATOR, 240A PAD MNT, MULTI-VOLT	276942	1	21	CAPSCREW, HEX GR5 5/16-18 x 0.75	829105-075	4
5	ULTRACAPACITOR, 65.52kJ 12/24V	277956	2	22	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	5
6	DECAL, VSC LS MTRON	278446	2	23	CAPSCREW, HEX GR8 3/8-16 x 4.25	829406-425	4
7	BOLT, FLANGE 5/16-18 x 3/4 SILVER	278623-075	9	24	SCREW, SER WASH #10-24 x 0.5	829702-050	4
8	TOWER, CAPACITOR & RELAY	280165	1	25	SCREW, ROUND HD #10-24 x 0.75	831602-075	10
9	BAR, COPPER BUS	280201	4	26	WASHER, FLAT 1/4	838204-071	1
10	RELAY, 500A W/STUDS	280203	5	27	WASHER, FLAT 5/16	838205-071	9
11	PANEL, TOWER INSIDE	280571	1	28	WASHER, FLAT 3/8	838206-071	4
12	SHEAVE, 8K-GRV 2.795 PD W/FAN MOUNT	280771	1	29	WASHER, LOCK 1/4	838504-062	11
13	FAN, 7IN PULL MECH	280908	1	30	WASHER, LOCK 5/16	838505-078	9
14	WASHER, FAN MOUNTING	280975	1	31	WASHER, LOCK 3/8	838506-094	4
15	MODULE, MACHINE CONTROL	281025-0101	1	NS	CABLE, M12 MALE/FEMALE PATCH STRAIGHT/STRAIGHT 3FT	283909-03	1
16	PANEL, SPARK PLUG ACCESS	281111	1	NS	HARNESS, CS3K CONTROLS CONNECTOR B	280717	1
17	HARNESS, BOOSTER OUTPUT CNNCTR	281132	1	NS	KIT, CABLE CAP•START 3000A+AIR LIGHT,12/24V 24CFM	281085	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 3 OF 4

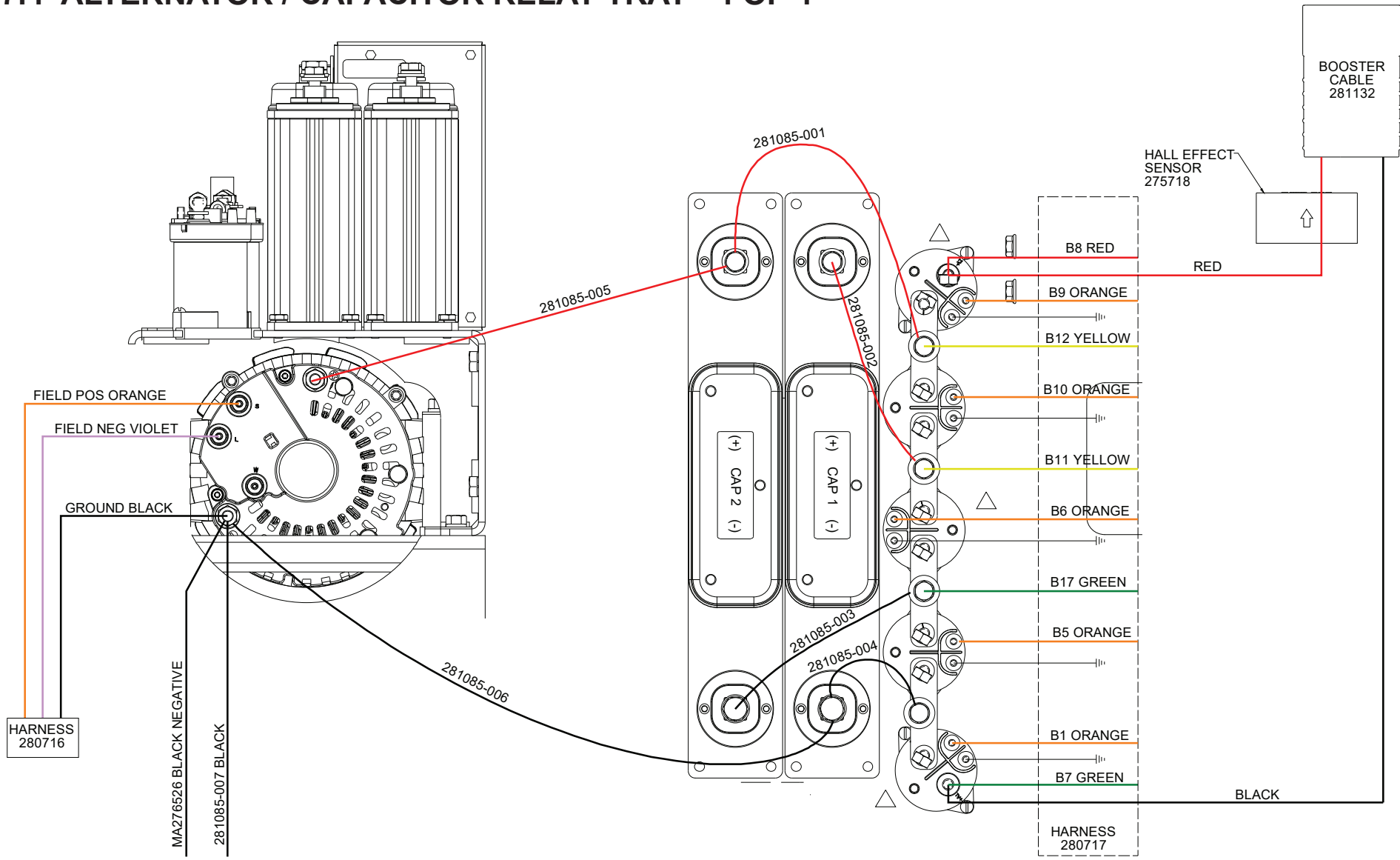


7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 3 OF 4

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WASHER, NYLON 5/16-18	262943	9	18	NUT, HEX FLANGE 5/16-18	825305-283	2
2	TRIM-LOK, 1/4 GROOVE	268080	1 ft	19	CAPSCREW, S.H. 1/4-20 x 1 3/4	828304-175	2
3	SENSOR, HALL EFFECT 500 AMP	275718	1	20	CAPSCREW, HEX GR5 1/4-20 x 0.5	829104-050	9
4	ALTERNATOR, 240A PAD MNT, MULTI-VOLT	276942	1	21	CAPSCREW, HEX GR5 5/16-18 x 0.75	829105-075	4
5	ULTRACAPACITOR, 65.52kJ 12/24V	277956	2	22	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	5
6	DECAL, VSC LS MTRON	278446	2	23	CAPSCREW, HEX GR8 3/8-16 x 4.25	829406-425	4
7	BOLT, FLANGE 5/16-18 x 3/4 SILVER	278623-075	9	24	SCREW, SER WASH #10-24 x 0.5	829702-050	4
8	TOWER, CAPACITOR & RELAY	280165	1	25	SCREW, ROUND HD #10-24 x 0.75	831602-075	10
9	BAR, COPPER BUS	280201	4	26	WASHER, FLAT 1/4	838204-071	1
10	RELAY, 500A W/STUDS	280203	5	27	WASHER, FLAT 5/16	838205-071	9
11	PANEL, TOWER INSIDE	280571	1	28	WASHER, FLAT 3/8	838206-071	4
12	SHEAVE, 8K-GRV 2.795 PD W/FAN MOUNT	280771	1	29	WASHER, LOCK 1/4	838504-062	11
13	FAN, 7IN PULL MECH	280908	1	30	WASHER, LOCK 5/16	838505-078	9
14	WASHER, FAN MOUNTING	280975	1	31	WASHER, LOCK 3/8	838506-094	4
15	MODULE, MACHINE CONTROL	281025-0101	1	NS	CABLE, M12 MALE/FEMALE PATCH STRAIGHT/STRAIGHT 3FT	283909-03	1
16	PANEL, SPARK PLUG ACCESS	281111	1	NS	HARNESS, CS3K CONTROLS CONNECTOR B	280717	1
17	HARNESS, BOOSTER OUTPUT CNNCTR	281132	1	NS	KIT, CABLE CAP•START 3000A+AIR LIGHT,12/24V 24CFM	281085	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.

7.4 ALTERNATOR / CAPACITOR RELAY TRAY - 4 OF 4

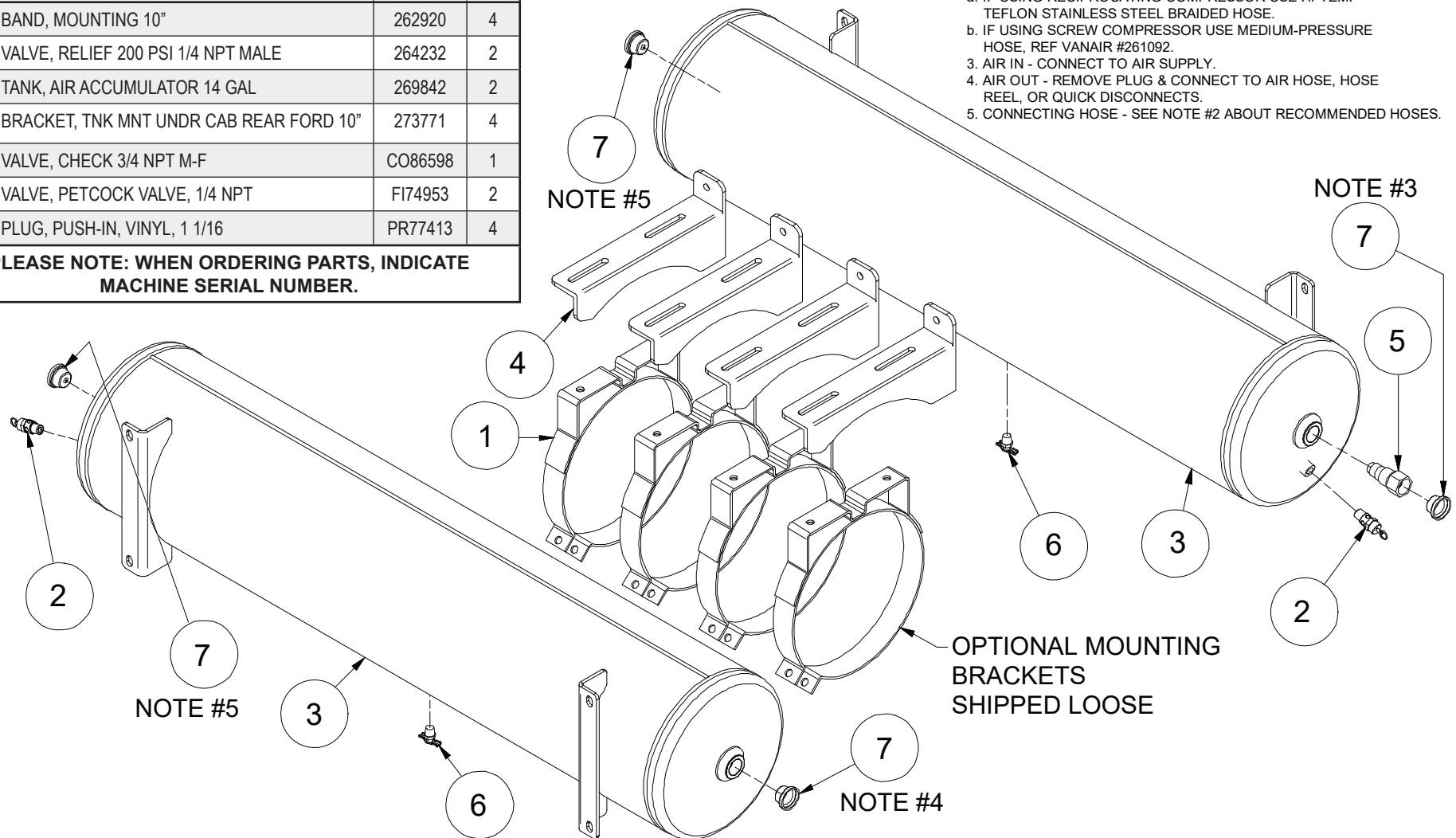


7.5 AIR TANK 14-GALLON (X2) OPTION ASSEMBLY

ITEM	DESCRIPTION	PART NUMBER	QTY
1	BAND, MOUNTING 10"	262920	4
2	VALVE, RELIEF 200 PSI 1/4 NPT MALE	264232	2
3	TANK, AIR ACCUMULATOR 14 GAL	269842	2
4	BRACKET, TNK MNT UNDR CAB REAR FORD 10"	273771	4
5	VALVE, CHECK 3/4 NPT M-F	CO86598	1
6	VALVE, PETCOCK VALVE, 1/4 NPT	FI74953	2
7	PLUG, PUSH-IN, VINYL, 1 1/16	PR77413	4
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.			

NOTES:

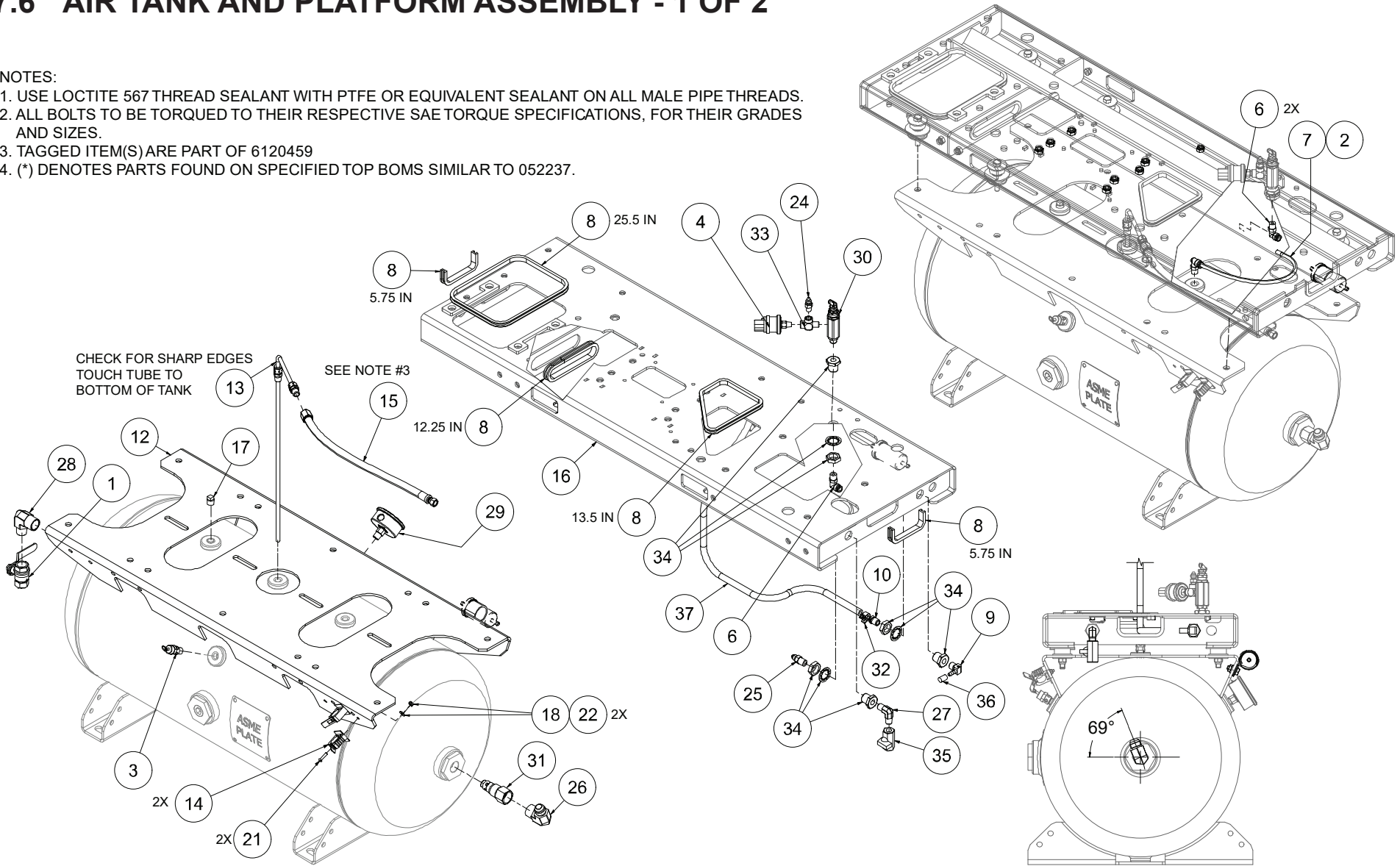
1. APPLY LOCTITE®567 PST®THREAD SEALANT OR EQUIVALENT TO ALL MALE NPT FITTINGS.
2. RECOMMENDED HOSE FROM COMPRESSOR TO AIR TANK:
a. IF USING RECIPROCATING COMPRESSOR USE HI-TEMP TEFLON STAINLESS STEEL BRAIDED HOSE.
b. IF USING SCREW COMPRESSOR USE MEDIUM-PRESSURE HOSE, REF VANAIR #261092.
3. AIR IN - CONNECT TO AIR SUPPLY.
4. AIR OUT - REMOVE PLUG & CONNECT TO AIR HOSE, HOSE REEL, OR QUICK DISCONNECTS.
5. CONNECTING HOSE - SEE NOTE #2 ABOUT RECOMMENDED HOSES.



7.6 AIR TANK AND PLATFORM ASSEMBLY - 1 OF 2

NOTES:

1. USE LOCTITE 567 THREAD SEALANT WITH PTFE OR EQUIVALENT SEALANT ON ALL MALE PIPE THREADS.
2. ALL BOLTS TO BE TORQUED TO THEIR RESPECTIVE SAE TORQUE SPECIFICATIONS, FOR THEIR GRADES AND SIZES.
3. TAGGED ITEM(S) ARE PART OF 6120459
4. (*) DENOTES PARTS FOUND ON SPECIFIED TOP BOMS SIMILAR TO 052237.



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7.6 AIR TANK AND PLATFORM ASSEMBLY - 1 OF 2

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	VALVE, SERVICE 1/2	260448	1	21	SCREW, ROUND HD #8-32 x 0.75	831601-075	2
2	LOOM, FLEX-GARD 3/8 ID 300 DEG. F.	261410	1.5 ft	22	WASHER, FLAT #8	838201-045	2
3	VALVE, RELIEF 200 PSI 1/4 NPT MALE	264232	1	23	WASHER, FLAT 3/4	838212-112	8
4	SWITCH, PRESS N.C. 10 PSI W/ CON	264690	1	24	CONNECTOR, 37FL/MPT #04 x 1/8	860104-012	1
5	WASHER, SNUBBING RBR MOUNT	265332	24	25	CONNECTOR, 37FL/MPT #04 x 1/4	860104-025	1
6	ELBOW, 5/16T X 1/4P PUSH ON	267187	2	26	ELBOW, 37FL/90M #10 x 3/4	860210-075	1
7	TUBING, NYLON 5/16 RED	267189	1.5 ft	27	ELBOW, PIPE 1/4M x 1/4M	860504-025	1
8	TRIM-LOK, 1/4 GROOVE	268080	5.8 ft	28	ELBOW, PIPE 1/2M x 3/4M	860508-075	1
9	ELBOW, 1/4 NPT x 1/4 HOSE BARB	270611	1	29	GAUGE, AIR 0-200 PSI 2.5DIA 1/4NPT BACK MTG	CO47028	1
10	BARB, HOSE 1/4 NPT X 1/4 HOSE	276101	1	30	VALVE, PILOT VALVE, 150-175 PSI	CO67609	1
11	MOUNT, RUBBER 280# AXIAL WHT	279018	8	31	VALVE, CHECK 3/4 NPTF IN 3/4 NPTM OUT 30SCFM	CO86598	1
12	TANK, AIR 30 GAL. HORZ SHORT	280349	1	32	CLAMP, HOSE, T-BOLT STYLE 14MM	FA78162	1
13	TUBE, TANK CONDENSATE PICK UP	280477	1	33	TEE, MALE STREET 1/8 x 1/8 x 1/8	FI31152	1
14	CLAMP, HOSE 1/2" TO 7/8" RUBBER	280707	2	34	PIPE BRASS, BULKHEAD 1/4 NPT	FI45068	3
15	HOSE, TANK CONDENSATE DRAIN	281010	1	35	VALVE, BALL, MINI, 1/4 NPT, F/F	FI52633	1
16	PLATFORM, CS3K STEEL II	283465	1	36	CAP, VINYL, STRETCH, 1/4 DIA	PR62720	1
17	PLUG, PIPE 1/4	807800-010	1	37	HOSE, FUEL 1/4 INCH SAE 30R9 CARB APPRVD	TU269439	3.5 ft
18	NUT, HEX LOCKING #8-32	825501-070	2	38*	NUT, HEX FLANGE 5/16-18	825305-283	1
19	NUT, HEX LOCKING 3/8-16	825506-198	8	39*	SCREW, SER WASH 5/16-18 x 0.75	829705-075	1
20	CAPSCREW, HEX GR8 3/8-16 x 2.5	829406-250	8	40*	CLAMP, HOSE SUPPORT 1.25 ID	261546	1

* Denotes parts found on specified top BOMs similar to 052237.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.

REF
FUEL FILTER
281452-01

38* 39* 40*

20 8X
5 8X
11 8X
23 8X
11 8X
5 8X
19 8X

ASME
PLATE

**FUEL FILTER ALTERNATE LOCATION
(WHEN SPECIFIED)**

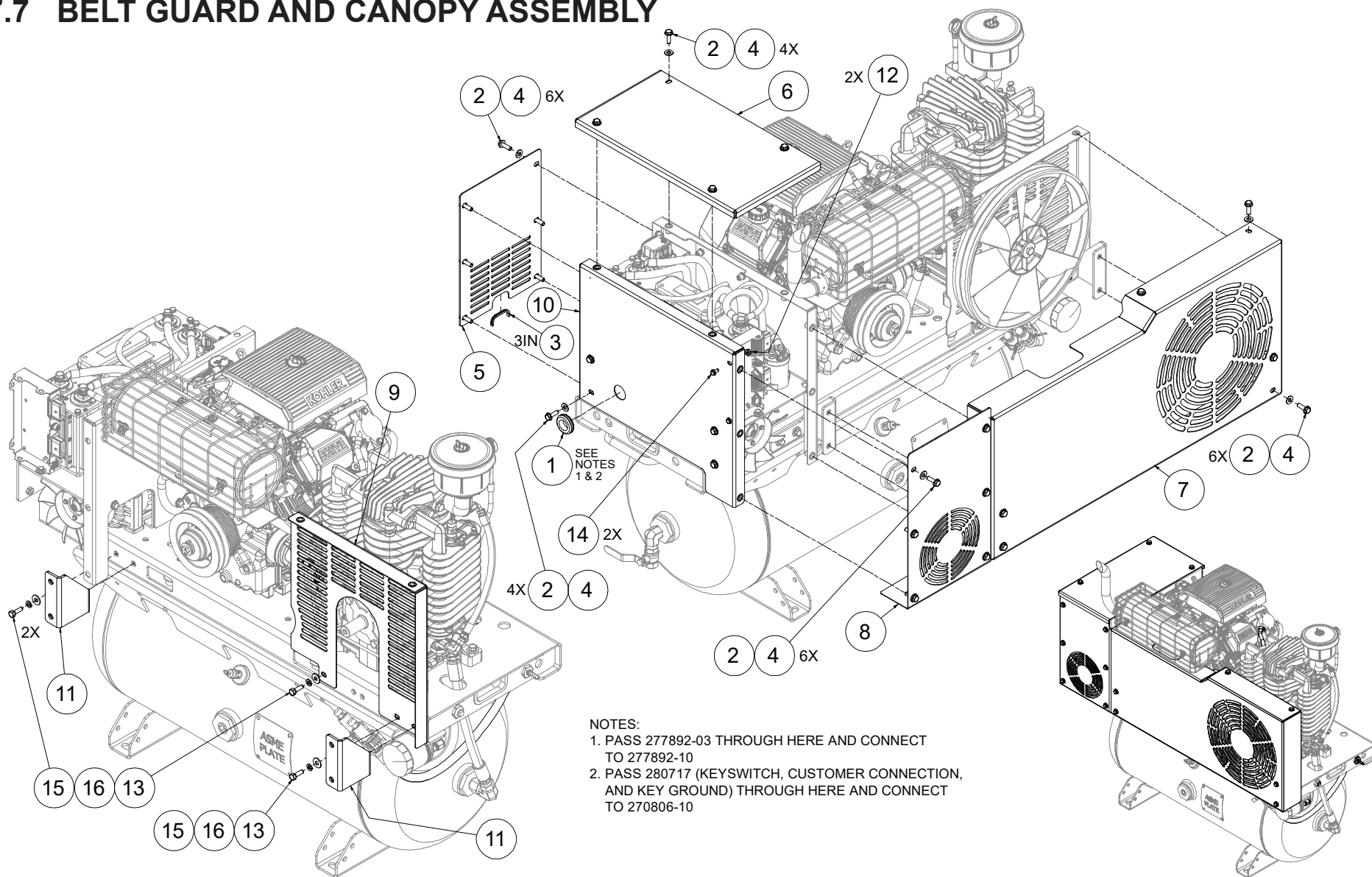
NOTE:
(*) DENOTES PARTS FOUND ON SPECIFIED
TOP BOMS SIMILAR TO 052237.

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7.6 AIR TANK AND PLATFORM ASSEMBLY - 2 OF 2

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	VALVE, SERVICE 1/2	260448	1	21	SCREW, ROUND HD #8-32 x 0.75	831601-075	2
2	LOOM, FLEX-GARD 3/8 ID 300 DEG. F.	261410	1.5 ft	22	WASHER, FLAT #8	838201-045	2
3	VALVE, RELIEF 200 PSI 1/4 NPT MALE	264232	1	23	WASHER, FLAT 3/4	838212-112	8
4	SWITCH, PRESS N.C. 10 PSI W/ CON	264690	1	24	CONNECTOR, 37FL/MPT #04 x 1/8	860104-012	1
5	WASHER, SNUBBING RBR MOUNT	265332	24	25	CONNECTOR, 37FL/MPT #04 x 1/4	860104-025	1
6	ELBOW, 5/16T X 1/4P PUSH ON	267187	2	26	ELBOW, 37FL/90M #10 x 3/4	860210-075	1
7	TUBING, NYLON 5/16 RED	267189	1.5 ft	27	ELBOW, PIPE 1/4M x 1/4M	860504-025	1
8	TRIM-LOK, 1/4 GROOVE	268080	5.8 ft	28	ELBOW, PIPE 1/2M x 3/4M	860508-075	1
9	ELBOW, 1/4 NPT x 1/4 HOSE BARB	270611	1	29	GAUGE, AIR 0-200 PSI 2.5DIA 1/4NPT BACK MTG	CO47028	1
10	BARB, HOSE 1/4 NPT X 1/4 HOSE	276101	1	30	VALVE, PILOT VALVE, 150-175 PSI	CO67609	1
11	MOUNT, RUBBER 280# AXIAL WHT	279018	8	31	VALVE, CHECK 3/4 NPTF IN 3/4 NPTM OUT 30SCFM	CO86598	1
12	TANK, AIR 30 GAL. HORZ SHORT	280349	1	32	CLAMP, HOSE, T-BOLT STYLE 14MM	FA78162	1
13	TUBE, TANK CONDENSATE PICK UP	280477	1	33	TEE, MALE STREET 1/8 x 1/8 x 1/8	FI31152	1
14	CLAMP, HOSE 1/2" TO 7/8" RUBBER	280707	2	34	PIPE BRASS, BULKHEAD 1/4 NPT	FI45068	3
15	HOSE, TANK CONDENSATE DRAIN	281010	1	35	VALVE, BALL, MINI, 1/4 NPT, F/F	FI52633	1
16	PLATFORM, CS3K STEEL II	283465	1	36	CAP, VINYL, STRETCH, 1/4 DIA	PR62720	1
17	PLUG, PIPE 1/4	807800-010	1	37	HOSE, FUEL 1/4 INCH SAE 30R9 CARB APPRVD	TU269439	3.5 ft
18	NUT, HEX LOCKING #8-32	825501-070	2	38*	NUT, HEX FLANGE 5/16-18	825305-283	1
19	NUT, HEX LOCKING 3/8-16	825506-198	8	39*	SCREW, SER WASH 5/16-18 x 0.75	829705-075	1
20	CAPSCREW, HEX GR8 3/8-16 x 2.5	829406-250	8	40*	CLAMP, HOSE SUPPORT 1.25 ID	261546	1
* Denotes parts found on specified top BOMs similar to 052237.							
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

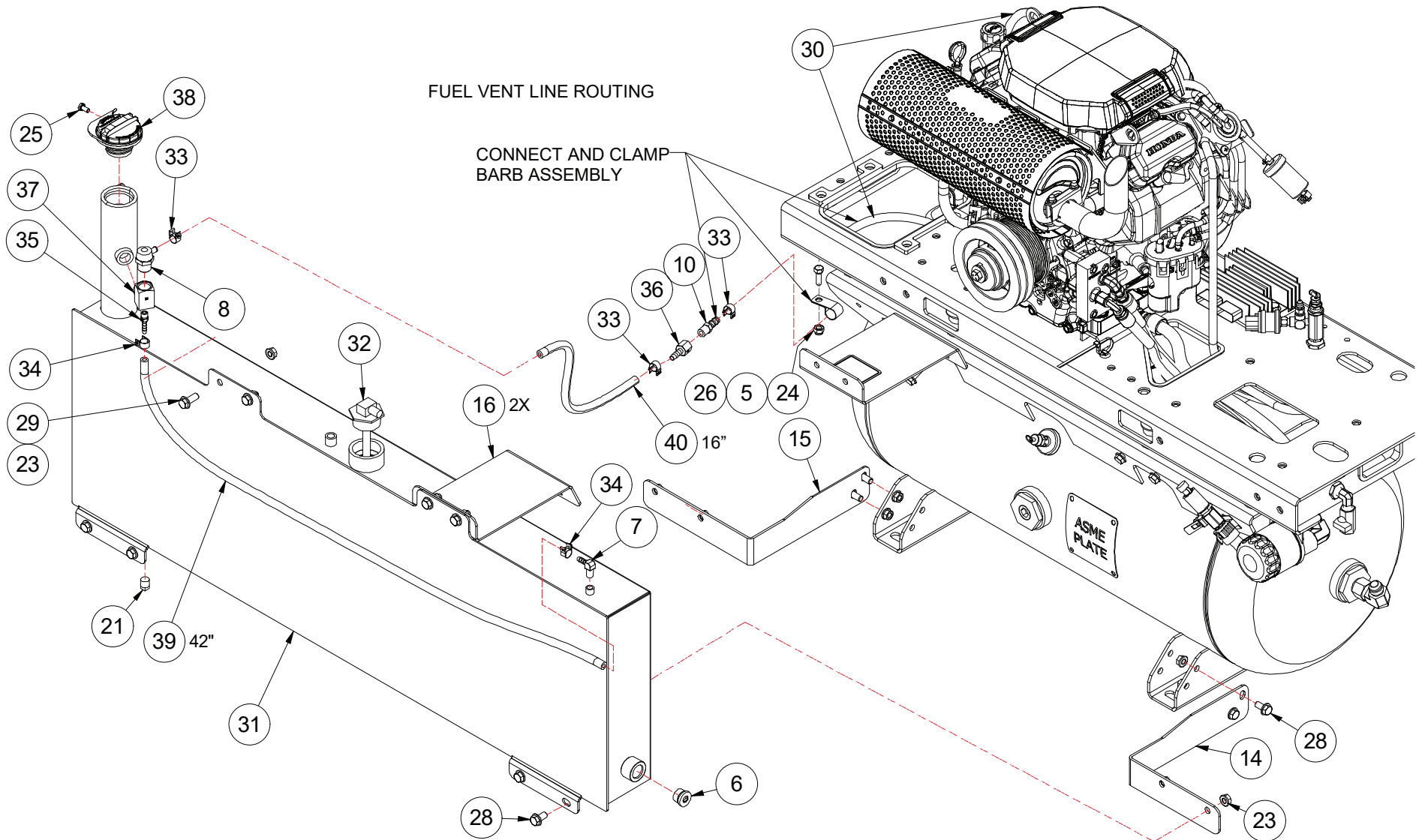
7.7 BELT GUARD AND CANOPY ASSEMBLY



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7.7 BELT GUARD AND CANOPY ASSEMBLY			
ITEM	DESCRIPTION	PART NUMBER	QTY
1	GROMMET, RUBBER 1-3/4 OD	680-495	1
2	WASHER, NYLON 5/16-18	262943	26
3	TRIM-LOK, 1/4 GROOVE	268080	3 in
4	BOLT, FLANGE 5/16-18 x 1 SILVER	278623-100	26
5	PANEL, TOWER REAR	280240	1
6	PANEL, TOP ACCESS	280248	1
7	GUARD, BELT DRIVE	280445	1
8	PANEL, TOWER FAN	280446	1
9	GUARD, COMPRESSOR FLYWHEEL	280449	1
10	PANEL, TOWER OUTSIDE	280570	1
11	BRACKET, GUARD MOUNTING	280576	2
12	NUT, HEX FLANGE 1/4-20	825304-236	2
13	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	5
14	SCREW, SER WASH 1/4-20 x 0.5	829704-050	2
15	WASHER, FLAT 5/16	838205-071	5
16	WASHER, LOCK 5/16	838505-078	5
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.			

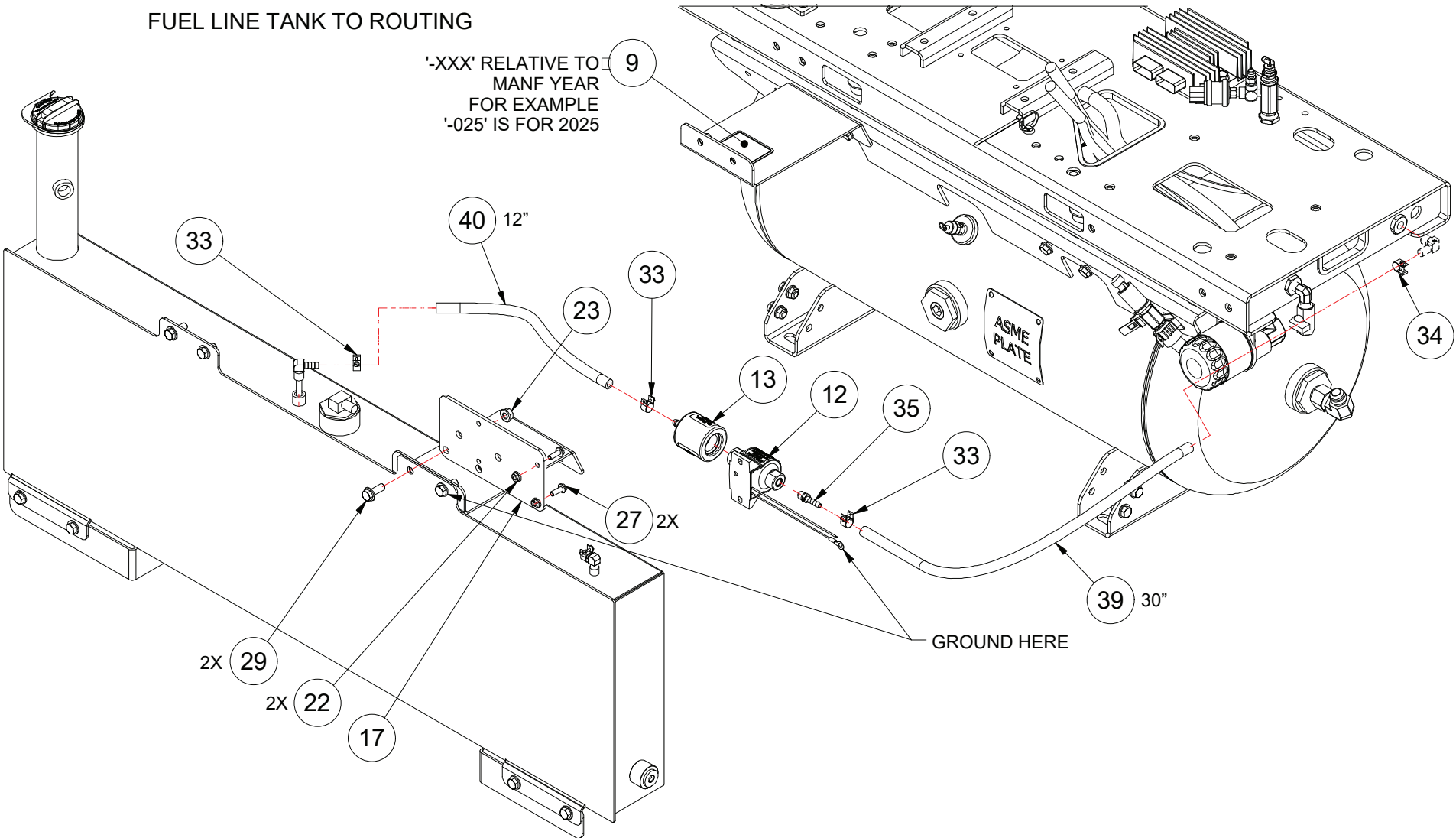
7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 1 OF 3



7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 1 OF 3

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WRAP, HEAT SHRINK 3/4" BLACK	260663-009	0.75 ft	21	PLUG, PIPE 1/4	807800-010	1
2	LOOM, FLEX-GARD 1/4 ID 300 DEG. F.	262751	6 ft	22	NUT, HEX FLANGE 1/4-20	825304-236	2
3	TERMINAL, BUTT HEAT SHRINK 14-16GA	264058	1	23	NUT, HEX FLANGE 3/8-16	825306-347	16
4	TERMINAL, BUTT HEAT SHRINK 18-20GA	264059	4	24	NUT, HEX LOCKING 3/8-16	825506-198	1
5	CLAMP, HOSE SUPPORT 3/4 I.D.	265711	1	25	CAPSCREW, HEX GR5 1/4-20 X 1/2	829104-050	1
6	PLUG, SAE O-RING HOLLOW HEX #10	268081-007	1	26	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	1
7	ELBOW, 1/8 NPT x 1/4 HOSE BARB	269963	1	27	SCREW, SER WASH 1/4-20 x 0.75	829704-075	2
8	VALVE, ROLLOVER FUEL VENT 1/2 NPT	270956	1	28	SCREW, SER WASH 3/8-16 x 0.75	829706-075	9
9	LABEL, EPA	271790-XXX	1	29	SCREW, SER WASH 3/8-16 x 1	829706-100	7
10	FITTING, 3/8 BARB X 1/4 MNPT	279298	1	30	HOSE, FUEL LINE 3/8	842315-038	3 ft
11	TUBE, FUEL PICK-UP 5/16 BARB	280562	1	31	FUEL TANK, 11GAL GAS TETHERED	A1271630	1
12	PUMP, FUEL 1.0-2.0PSI 7GPH	280723	1	32	SENDER UNIT, FUEL LEVEL, 15LG	CO39360	1
13	FILTER, FUEL 1/8NPT X 5/16HOSE 74 MICRON	280724	1	33	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	6
14	BRACKET, FUEL TANK LOWER RIGHT CS3K	281339	1	34	CLAMP, HOSE, T-BOLT STYLE, 12mm	FA86779	3
15	BRACKET, FUEL TANK LOWER LEFT CS3K	281340	1	35	HOSEBARB, 1/8 INCH MNPT X 1/4 BRASS	FI57609	2
16	BRACKET, FUEL TANK TOP CS3K	281341	2	36	HOSEBARB, 1/4FNPT X 5/16 BRASS	FI271131	1
17	BRACKET, FUEL PUMP TO FUEL TANK	282410	1	37	ELBOW, 90° 1/2" MPT X 1/2" FPT X 1/8" FPT	FI273718	1
18	WIRE, TXL EXTRA THIN WALL BLACK (18 AWG)	283407-018	3 ft	38	CAP, GAS VENTED TETHERED	HA271571	1
19	WIRE, TXL EXTRA THIN WALL RED (16 AWG)	283409-016	3 ft	39	HOSE, FUEL 1/4 INCH SAEJ30R14T2 APPROVED	TU269439	6 ft
20	WIRE, TXL EXTRA THIN WALL GRAY (18 AWG)	283417-018	3 ft	40	HOSE, FUEL 5/16 INCH SAEJ30R14T2 APPROVED	TU270137	4.5 ft
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

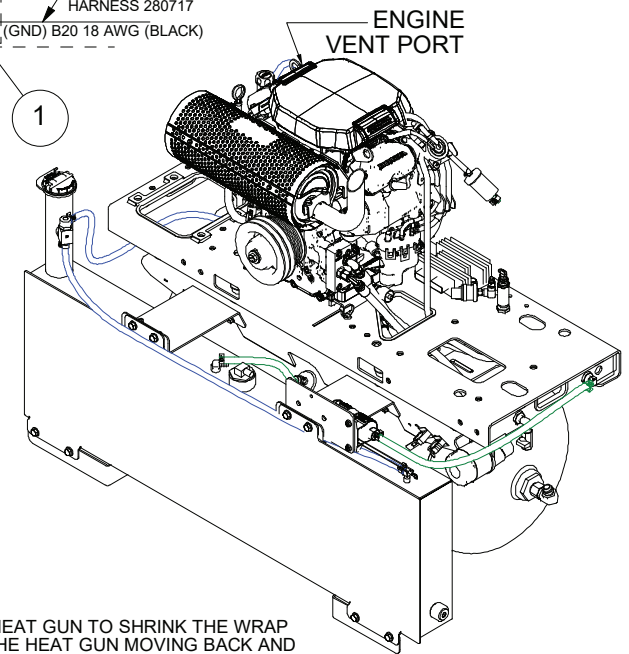
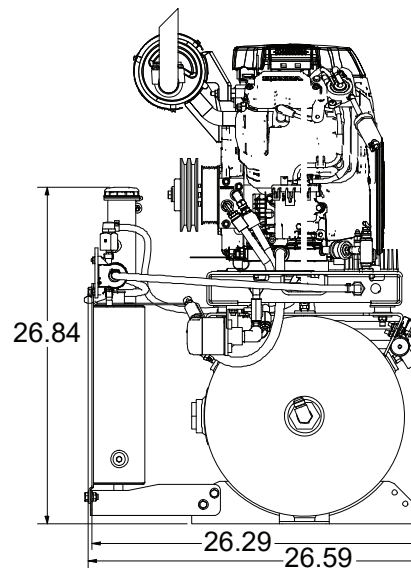
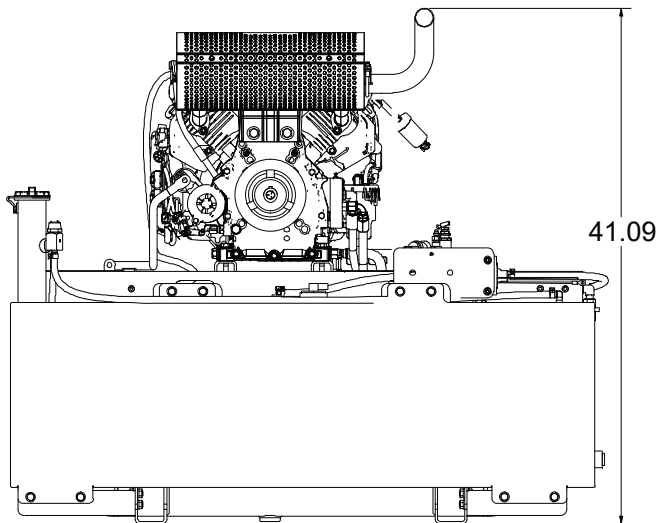
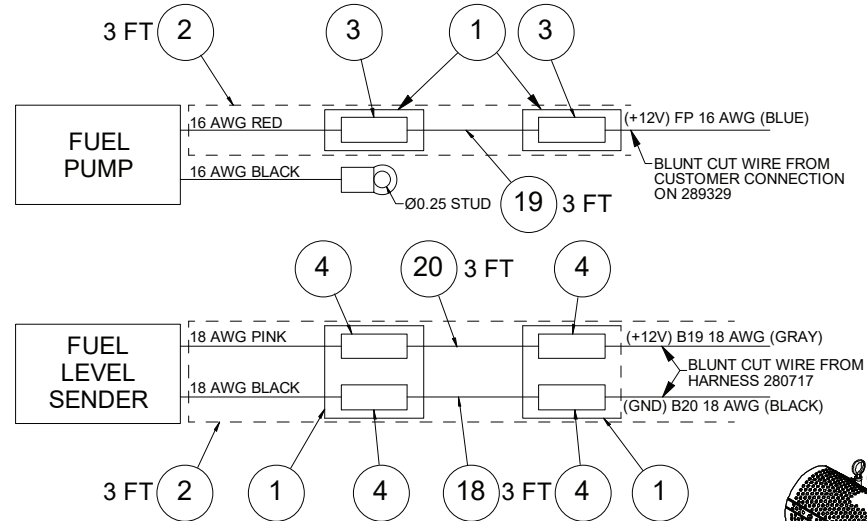
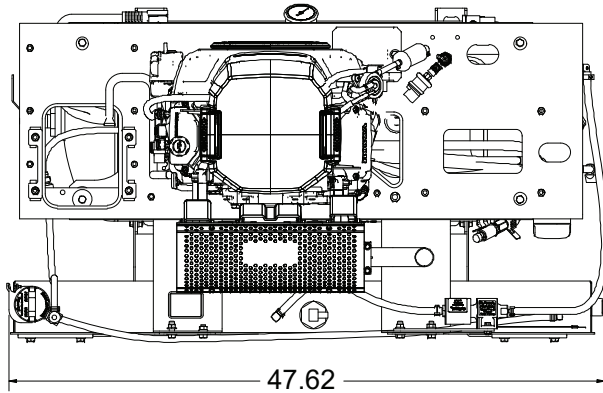
7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 2 OF 3



7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 2 OF 3

ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WRAP, HEAT SHRINK 3/4" BLACK	260663-009	0.75 ft	21	PLUG, PIPE 1/4	807800-010	1
2	LOOM, FLEX-GARD 1/4 ID 300 DEG. F.	262751	6 ft	22	NUT, HEX FLANGE 1/4-20	825304-236	2
3	TERMINAL, BUTT HEAT SHRINK 14-16GA	264058	1	23	NUT, HEX FLANGE 3/8-16	825306-347	16
4	TERMINAL, BUTT HEAT SHRINK 18-20GA	264059	4	24	NUT, HEX LOCKING 3/8-16	825506-198	1
5	CLAMP, HOSE SUPPORT 3/4 I.D.	265711	1	25	CAPSCREW, HEX GR5 1/4-20 X 1/2	829104-050	1
6	PLUG, SAE O-RING HOLLOW HEX #10	268081-007	1	26	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	1
7	ELBOW, 1/8 NPT x 1/4 HOSE BARB	269963	1	27	SCREW, SER WASH 1/4-20 x 0.75	829704-075	2
8	VALVE, ROLLOVER FUEL VENT 1/2 NPT	270956	1	28	SCREW, SER WASH 3/8-16 x 0.75	829706-075	9
9	LABEL, EPA	271790-XXX	1	29	SCREW, SER WASH 3/8-16 x 1	829706-100	7
10	FITTING, 3/8 BARB X 1/4 MNPT	279298	1	30	HOSE, FUEL LINE 3/8	842315-038	3 ft
11	TUBE, FUEL PICK-UP 5/16 BARB	280562	1	31	FUEL TANK, 11GAL GAS TETHERED	A1271630	1
12	PUMP, FUEL 1.0-2.0PSI 7GPH	280723	1	32	SENDER UNIT, FUEL LEVEL, 15LG	CO39360	1
13	FILTER, FUEL 1/8NPT X 5/16HOSE 74 MICRON	280724	1	33	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	6
14	BRACKET, FUEL TANK LOWER RIGHT CS3K	281339	1	34	CLAMP, HOSE, T-BOLT STYLE, 12mm	FA86779	3
15	BRACKET, FUEL TANK LOWER LEFT CS3K	281340	1	35	HOSEBARB, 1/8 INCH MNPT X 1/4 BRASS	FI57609	2
16	BRACKET, FUEL TANK TOP CS3K	281341	2	36	HOSEBARB, 1/4FNPT X 5/16 BRASS	FI271131	1
17	BRACKET, FUEL PUMP TO FUEL TANK	282410	1	37	ELBOW, 90° 1/2" MPT X 1/2" FPT X 1/8" FPT	FI273718	1
18	WIRE, TXL EXTRA THIN WALL BLACK (18 AWG)	283407-018	3 ft	38	CAP, GAS VENTED TETHERED	HA271571	1
19	WIRE, TXL EXTRA THIN WALL RED (16 AWG)	283409-016	3 ft	39	HOSE, FUEL 1/4 INCH SAEJ30R14T2 APPROVED	TU269439	6 ft
20	WIRE, TXL EXTRA THIN WALL GRAY (18 AWG)	283417-018	3 ft	40	HOSE, FUEL 5/16 INCH SAEJ30R14T2 APPROVED	TU270137	4.5 ft
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

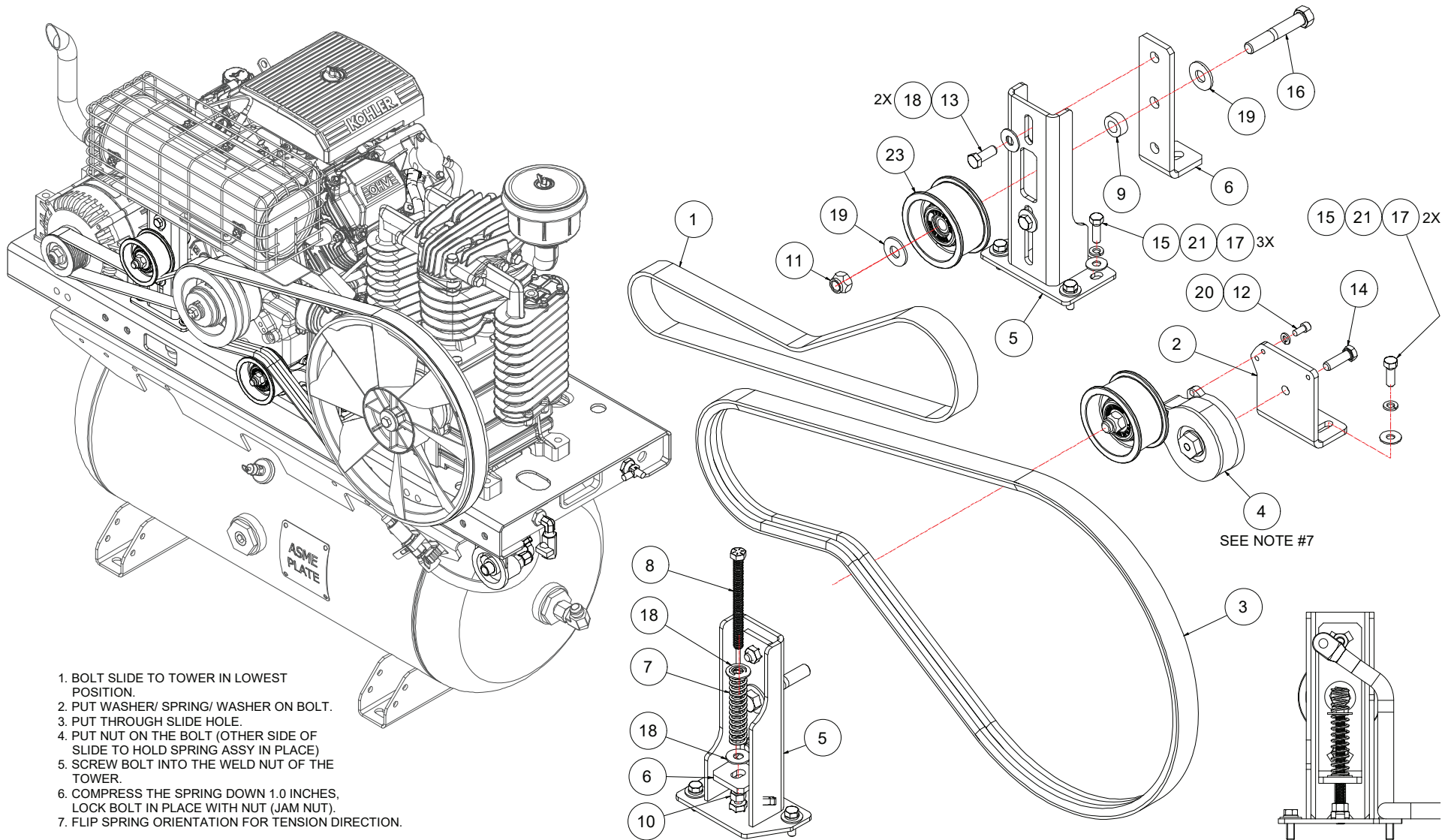
7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 3 OF 3



NOTES:
1. USE A HEAT GUN TO SHRINK THE WRAP. KEEP THE HEAT GUN MOVING BACK AND FORTH ALONG THE LENGTH OF THE WRAP, AS STAYING IN ONE PLACE CAN DAMAGE THE WIRE. CONTINUE HEATING THE TUBING UNTIL IT IS TIGHTLY SECURED TO THE WIRE.

7.8 FUEL TANK ASSY, CAP•START® 3000 + AIR LIGHT 11 GALLON CS3K-HONDA - 3 OF 3							
ITEM	DESCRIPTION	PART NUMBER	QTY	ITEM	DESCRIPTION	PART NUMBER	QTY
1	WRAP, HEAT SHRINK 3/4" BLACK	260663-009	0.75 ft	21	PLUG, PIPE 1/4	807800-010	1
2	LOOM, FLEX-GARD 1/4 ID 300 DEG. F.	262751	6 ft	22	NUT, HEX FLANGE 1/4-20	825304-236	2
3	TERMINAL, BUTT HEAT SHRINK 14-16GA	264058	1	23	NUT, HEX FLANGE 3/8-16	825306-347	16
4	TERMINAL, BUTT HEAT SHRINK 18-20GA	264059	4	24	NUT, HEX LOCKING 3/8-16	825506-198	1
5	CLAMP, HOSE SUPPORT 3/4 I.D.	265711	1	25	CAPSCREW, HEX GR5 1/4-20 X 1/2	829104-050	1
6	PLUG, SAE O-RING HOLLOW HEX #10	268081-007	1	26	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	1
7	ELBOW, 1/8 NPT x 1/4 HOSE BARB	269963	1	27	SCREW, SER WASH 1/4-20 x 0.75	829704-075	2
8	VALVE, ROLLOVER FUEL VENT 1/2 NPT	270956	1	28	SCREW, SER WASH 3/8-16 x 0.75	829706-075	9
9	LABEL, EPA	271790-XXX	1	29	SCREW, SER WASH 3/8-16 x 1	829706-100	7
10	FITTING, 3/8 BARB X 1/4 MNPT	279298	1	30	HOSE, FUEL LINE 3/8	842315-038	3 ft
11	TUBE, FUEL PICK-UP 5/16 BARB	280562	1	31	FUEL TANK, 11GAL GAS TETHERED	A1271630	1
12	PUMP, FUEL 1.0-2.0PSI 7GPH	280723	1	32	SENDER UNIT, FUEL LEVEL, 15LG	CO39360	1
13	FILTER, FUEL 1/8NPT X 5/16HOSE 74 MICRON	280724	1	33	CLAMP, HOSE T-BOLT STYLE 14MM	FA78162	6
14	BRACKET, FUEL TANK LOWER RIGHT CS3K	281339	1	34	CLAMP, HOSE, T-BOLT STYLE, 12mm	FA86779	3
15	BRACKET, FUEL TANK LOWER LEFT CS3K	281340	1	35	HOSEBARB, 1/8 INCH MNPT X 1/4 BRASS	FI57609	2
16	BRACKET, FUEL TANK TOP CS3K	281341	2	36	HOSEBARB, 1/4FNPT X 5/16 BRASS	FI271131	1
17	BRACKET, FUEL PUMP TO FUEL TANK	282410	1	37	ELBOW, 90° 1/2" MPT X 1/2" FPT X 1/8" FPT	FI273718	1
18	WIRE, TXL EXTRA THIN WALL BLACK (18 AWG)	283407-018	3 ft	38	CAP, GAS VENTED TETHERED	HA271571	1
19	WIRE, TXL EXTRA THIN WALL RED (16 AWG)	283409-016	3 ft	39	HOSE, FUEL 1/4 INCH SAEJ30R14T2 APPROVED	TU269439	6 ft
20	WIRE, TXL EXTRA THIN WALL GRAY (18 AWG)	283417-018	3 ft	40	HOSE, FUEL 5/16 INCH SAEJ30R14T2 APPROVED	TU270137	4.5 ft
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.							

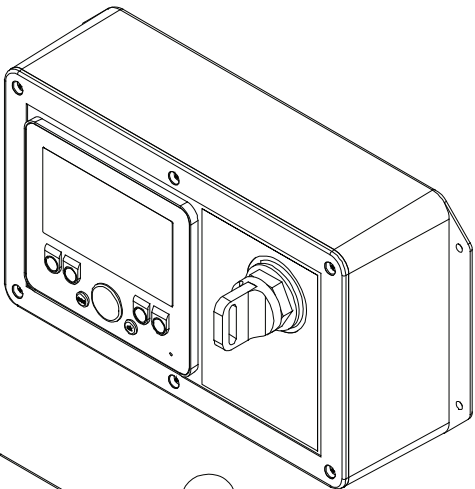
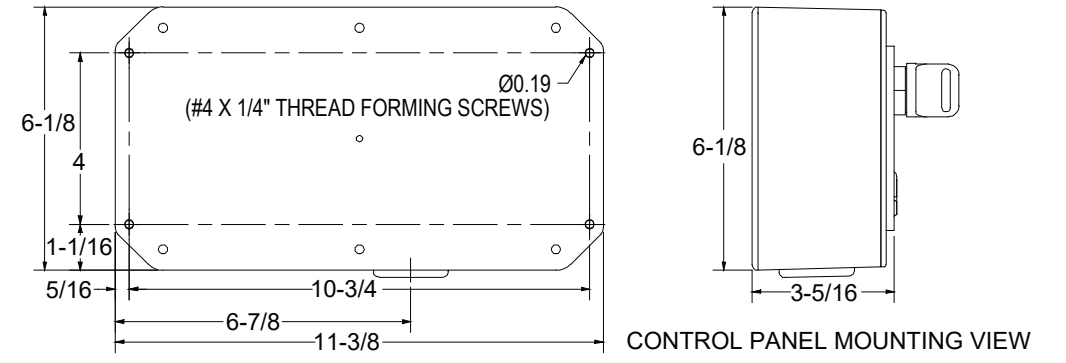
7.9 TENSIONER AND BELT ASSEMBLY



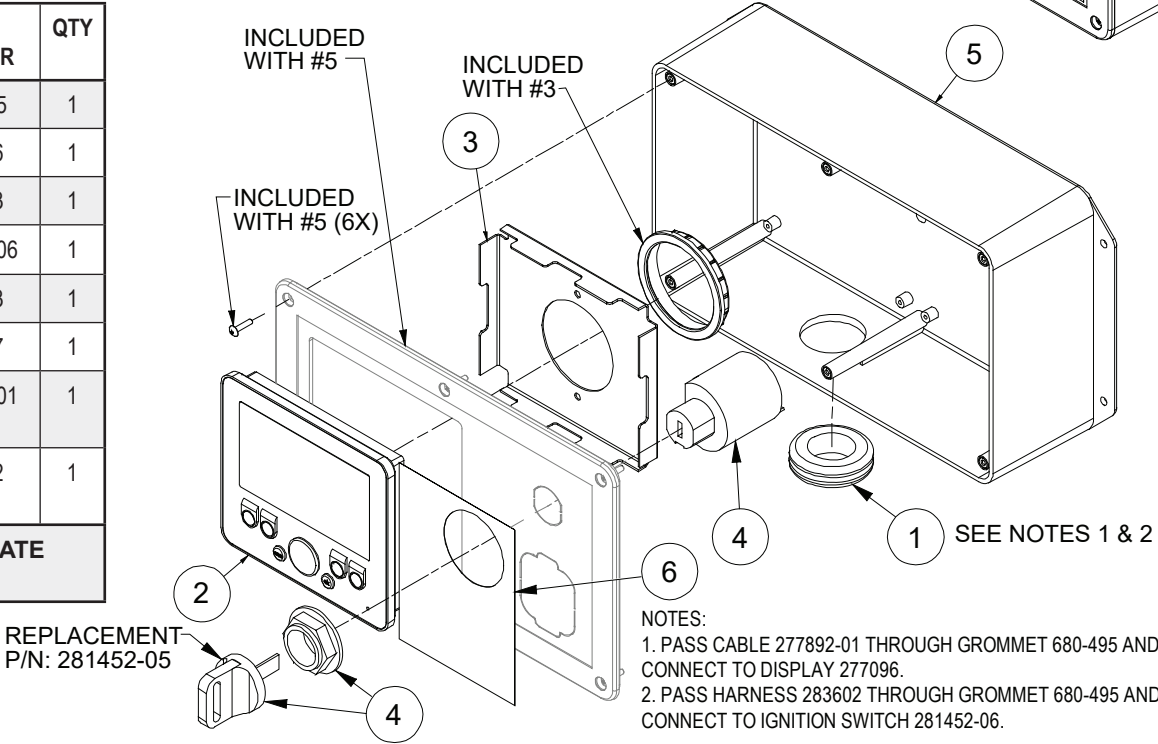
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7.9 TENSIONER AND BELT ASSEMBLY			
ITEM	DESCRIPTION	PART NUMBER	QTY
1	BELT, SERPENTINE 8K RIB X 43.5 LG	273459	1
2	BRACKET, TENSIONER	275136	1
3	BELT, DRIVE 2 GROOVE A-SECTION BANDED	278813-680	1
4	TENSIONER, ROTARY MODIFIED W/ IDLER 3/8-16 MOUNT	279757	1
5	TENSIONER, MAIN BODY CS3K	280503	1
6	TENSIONER, SLIDE PLATE CS3k	280520	1
7	SPRING, 3.5IN SS	280858	1
8	CAPSCREW, HEX GR8 3/8-16 X 4.5 FULLY THREADED	281386	1
9	SPACER, CS3K TENSIONER STAINLESS	286836	1
10	NUT, HEX 3/8-16	825206-337	1
11	NUT, HEX LOCKING 1/2-13	825508-262	1
12	CAPSCREW, S.H. BLACK 1/4-20 x 1/2	828204-050	1
13	CAPSCREW, HEX GR5 3/8-16 x 1	829106-100	2
14	CAPSCREW, HEX GR5 3/8-16 x 1.25	829106-125	1
15	CAPSCREW, HEX GR8 5/16-18 x 1	829405-100	5
16	CAPSCREW, HEX GR8 1/2-13 x 3	829408-300	1
17	WASHER, FLAT 5/16	838205-071	5
18	WASHER, FLAT 3/8	838206-071	4
19	WASHER, FLAT 1/2	838208-112	2
20	WASHER, LOCK 1/4	838504-062	1
21	WASHER, LOCK 5/16	838505-078	6
23	IDLER, 1.375 WIDTH, 3 3/8DIA	DR46584	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.			

7.10 CONTROL PANEL

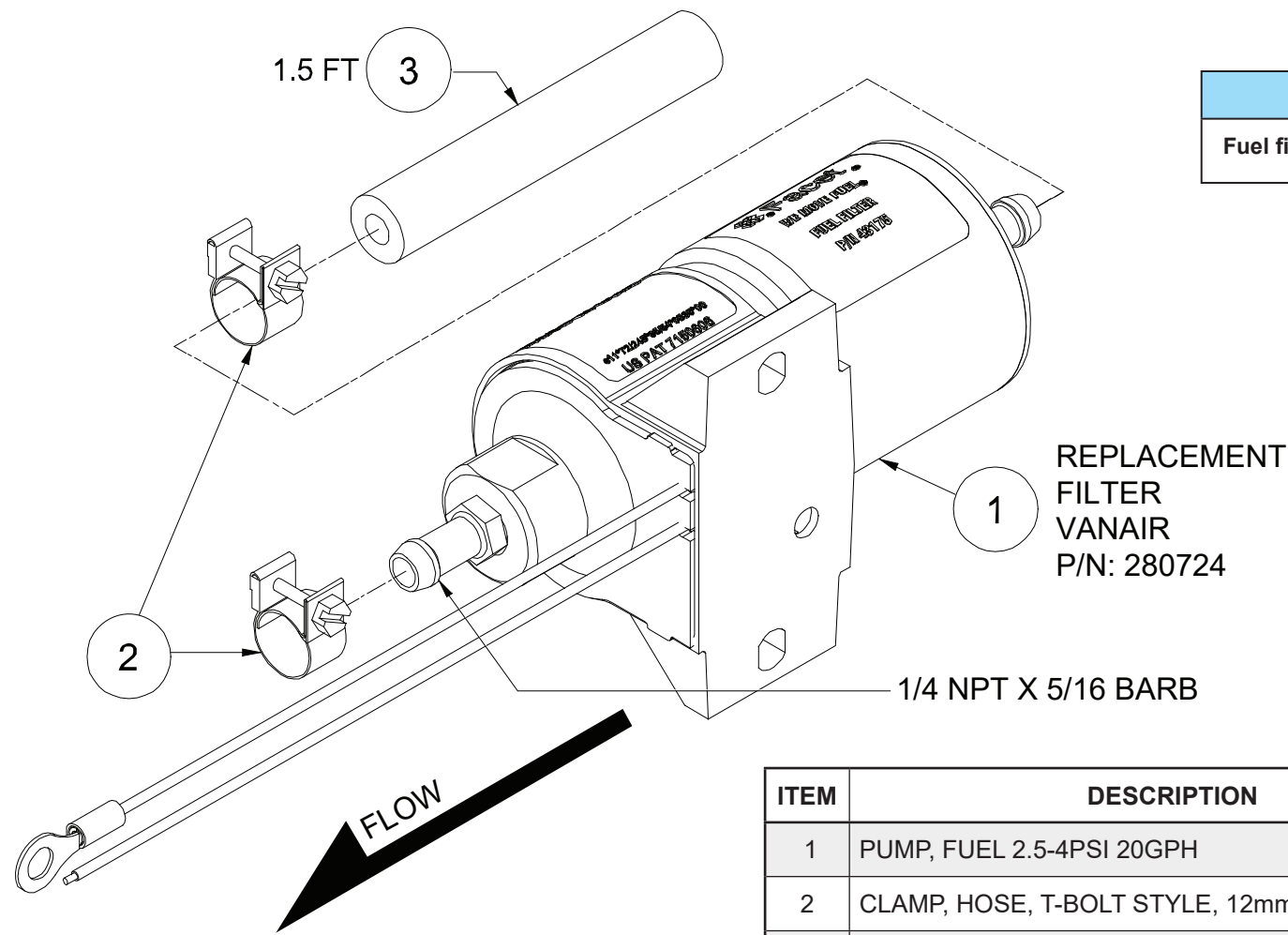


ITEM	DESCRIPTION	PART NUMBER	QTY
1	GROMMET, RUBBER 1-3/4 OD	680-495	1
2	DISPLAY, BASIC XL 4.3 INCH CR0452	277096	1
3	BRACKET, DISPLAY MOUNTING XL 4.3 INCH	279893	1
4	SWITCH, IGN ASSY HONDA IGX800 IGX700	281452-06	1
5	BOX, CONTROL PANEL ABS	281653	1
6	DECAL, CONTROL PANEL CS3K-HONDA	283427	1
NS	CABLE, M12 MALE/FEMALE PATCH 90/ STRAIGHT 1 FT	277892-01	1
NS	HARNESS, ENG START ADAPTER 1 FT CS3K-HONDA	283602	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.			



NOTES:
1. PASS CABLE 277892-01 THROUGH GROMMET 680-495 AND CONNECT TO DISPLAY 277096.
2. PASS HARNESS 283602 THROUGH GROMMET 680-495 AND CONNECT TO IGNITION SWITCH 281452-06.

7.11 FUEL PUMP ASSEMBLY - REMOTE FUEL



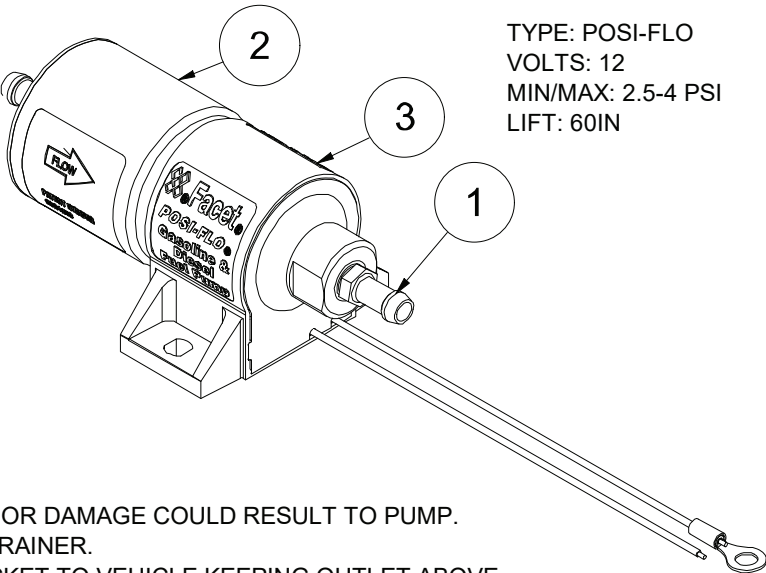
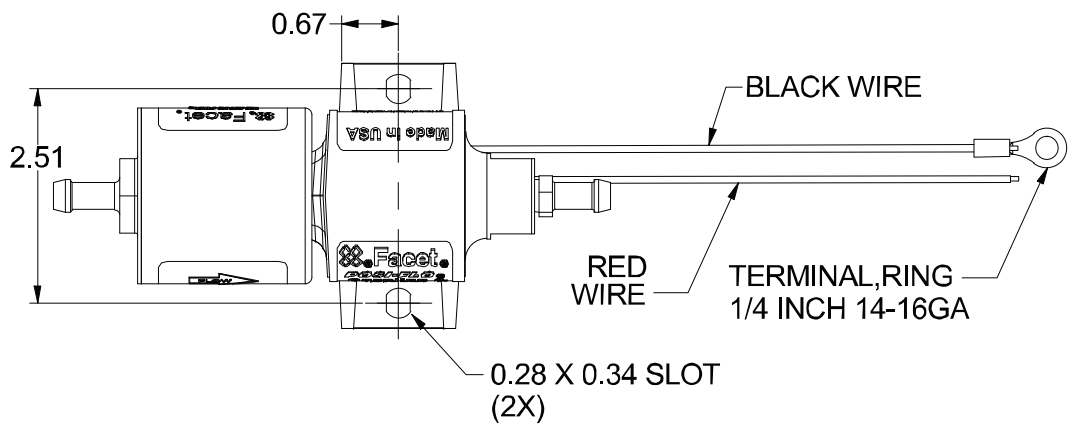
NOTE

Fuel filter to be placed within 18" of fuel pickup.

ITEM	DESCRIPTION	PART NUMBER	QTY
1	PUMP, FUEL 2.5-4PSI 20GPH	280722	1
2	CLAMP, HOSE, T-BOLT STYLE, 12mm	FA86779	2
3	HOSE, FUEL 1/4 INCH SAEJ30R14T2 APPRVD	TU269439	1.5 ft

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.

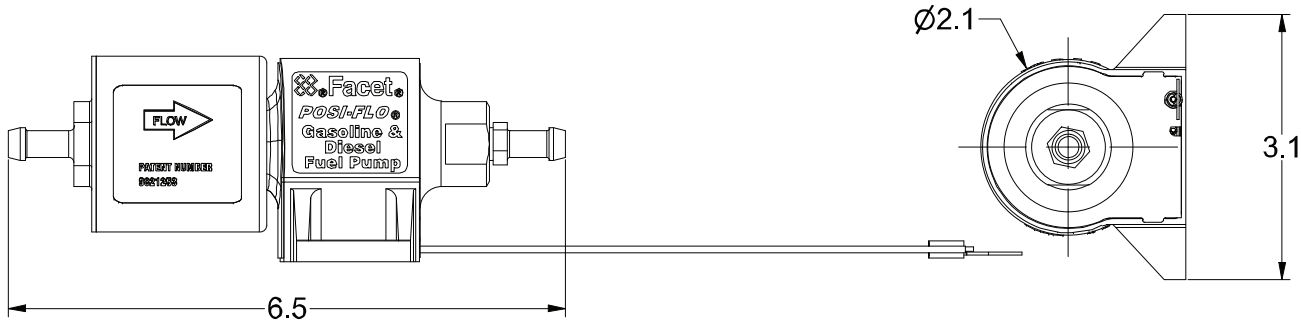
7.12 FUEL PUMP 2.5 - 4 PSI 20 GPH



TYPE: POSI-FLO
VOLTS: 12
MIN/MAX: 2.5-4 PSI
LIFT: 60IN

ITEM	DESCRIPTION	PART NUMBER	QTY
1	5/16 BARB STRAIGHT FUEL FITTINGS	41199 (FACET)	1
2	FUEL PUMP FILTER 1/8NPT X 5/16 HOSE 74 MICRON	43175 (FACET)	1
3	FUEL PUMP 1/8 - 27 NPT	60300 (FACET)	1
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.			

- NOTE:
1. DO NOT RUN PUMP DRY OR DAMAGE COULD RESULT TO PUMP.
 2. DO NOT REUSE FUEL STRAINER.
 3. MOUNT PUMP AND BRACKET TO VEHICLE KEEPING OUTLET ABOVE HORIZONTAL LEVEL.
 4. THIS PUMP CAN REPLACE MA277170 IN APPLICATIONS WHERE MACHINE USES TRUCK FUEL TANK.
 5. MOUNT PUMP AS CLOSE TO FUEL TANK AS POSSIBLE, BUT AWAY FROM HEAT.
 6. REPLACEMENT FILTER: 280724



7.13 DECALS - LOCATIONS AND IDENTIFICATIONS - 1 OF 4

WARNING
DO NOT TAMPER with any electrical harness in this machine.
Tampering with any electrical system harness may cause harm, damage the system, and/or void the warranty. For electrical assistance, consult the Vanair Service Department. 271510_r4

WARNING
DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

WARNING: EQUIPMENT MAY ONLY BE SERVICED BY QUALIFIED PERSONNEL

WARNING
Cancer and Reproductive Harm
www.P65Warnings.ca.gov

DANGER
DO NOT OPERATE IN AN ENCLOSED SPACE.
Running any combustion engine in an enclosed space will result in Carbon Monoxide (CO) poisoning and may cause overheating, which may result in fire and/or explosion.
CO build-up can cause death!
Overheating can ignite surrounding materials resulting in fire and/or explosion which may cause injury, death and equipment damage. 282458_XX

GASOLINE ONLY

PILOT PRESSURE

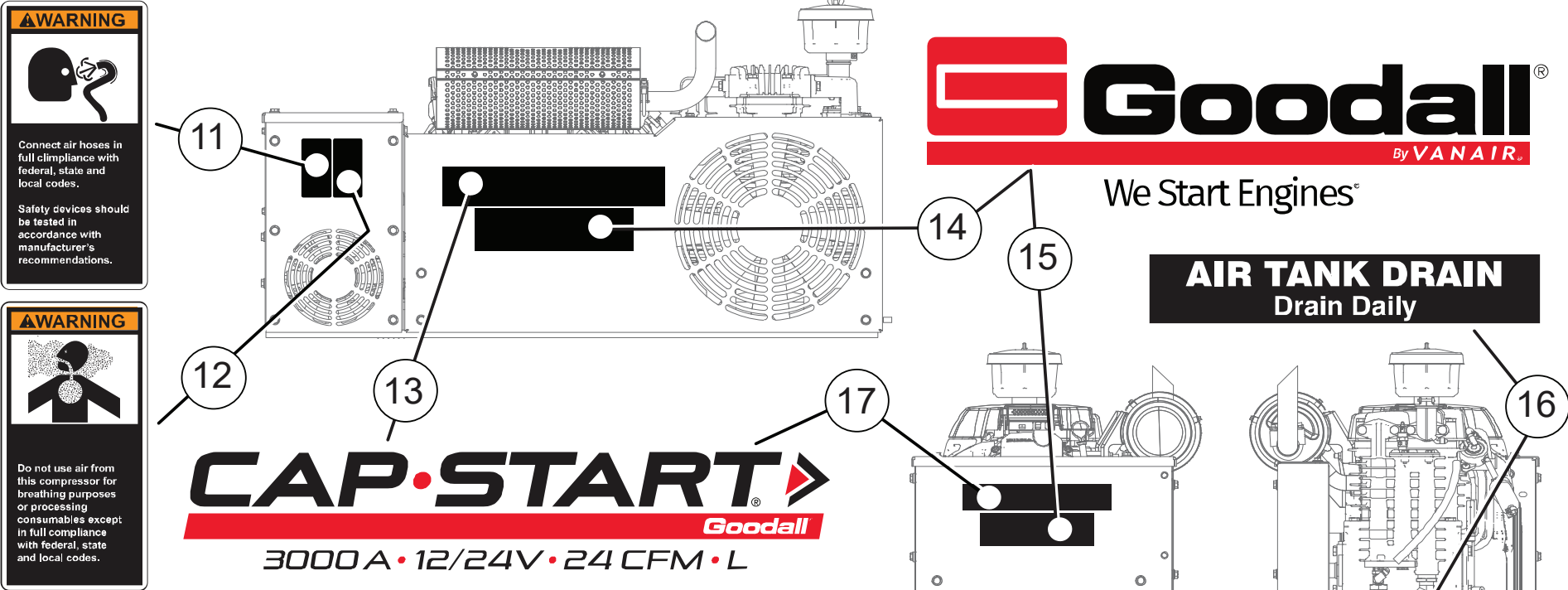
E85 85% Ethanol

WARNING
DO NOT LIFT WITHOUT LIFT BAIL P/N 281168.

ITEM	DESCRIPTION	PART NO.	QTY	ITEM	DESCRIPTION	PART NO.	QTY
1	DECAL, WARNING ELECTRIC TAMPER	271510	1	4	DECAL, GOODALL WARNINGS	279408	1
2	DECAL, WARNING HOT TRIANGLE 2.0"	280032	1	5	PLATE, SERIAL VANAIR	281373-01	1
3	DECAL, WARN QUALIFIED PERSONNEL	271535	1	6	DECAL, GASOLINE ONLY	275977	1
7	DECAL, PILOT PRESSURE	281433	1	8	DECAL, NO E85 GAS CAP LOGO	DL270183	1
9	DECAL, WARNING DO NOT SLING	281139	1	10	DANGER DO NOT OPERATE IN AN ENCLOSED SPACE (4" X 2")	282459	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.

7.13 DECALS - LOCATIONS AND IDENTIFICATIONS - 2 OF 4



ITEM	DESCRIPTION	PART NUMBER	QTY
11	DECAL, CONNECT AIR HOSE	261885	1
12	DECAL, DO NOT USE AIR	261886	1
13	LOGO, CAP-START 3000A 12/24V 24CFM L (16.40 X 2.92)	282086-A	1
14	LOGO, GOODALL WE START ENGINES (14 X 4.1)	277884-A	1
15	LOGO, GOODALL WE START ENGINES (16 X 4.6)	277884-A	1
16	DECAL, LABEL AIR TANK DRAIN BLACK	DL269677	1
17	LOGO, CAP-START 3000A 12/24V 24CFM L (11.019 X 1.96)	282086-A	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

WARNING
DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

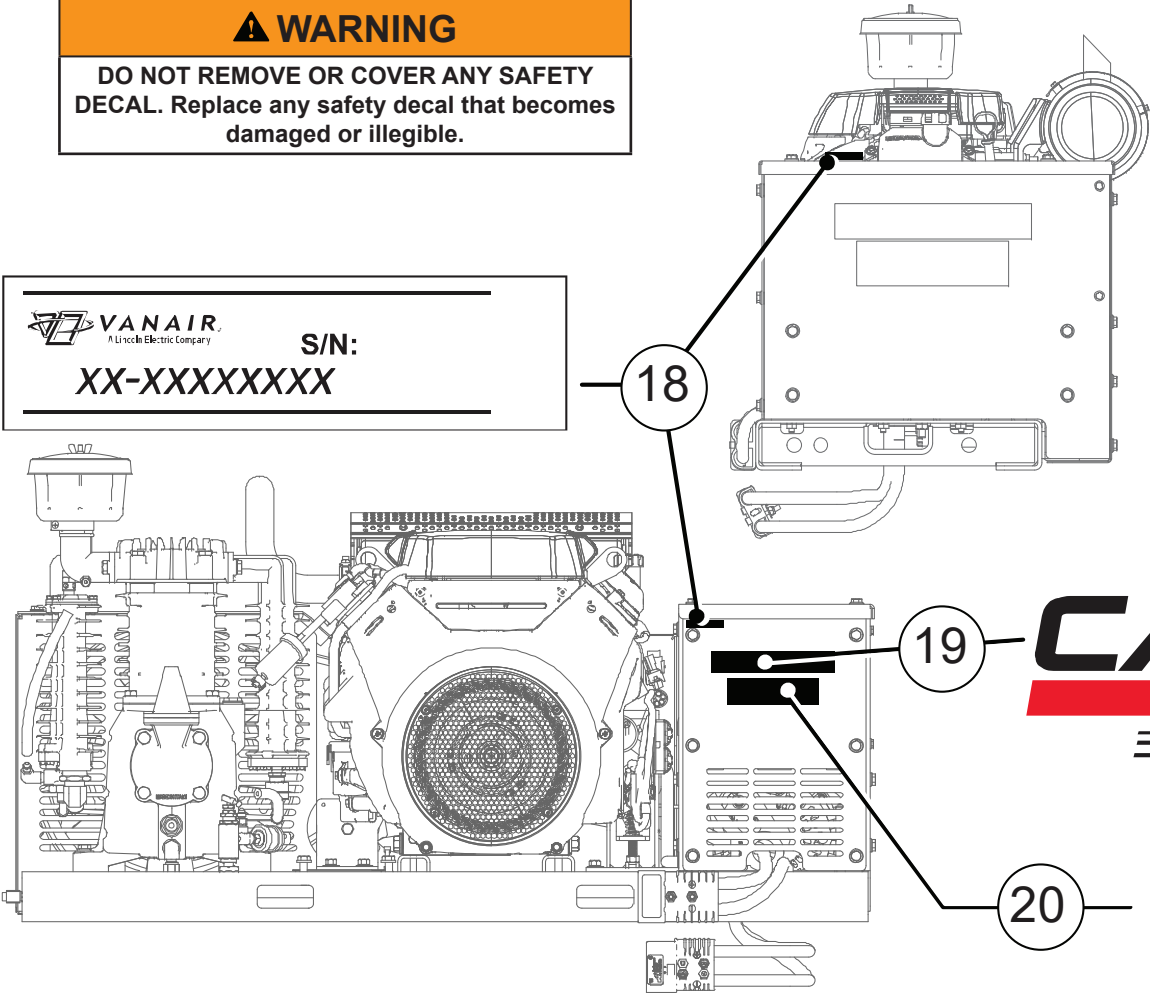
7.13 DECALS - LOCATIONS AND IDENTIFICATIONS - 3 OF 4

⚠ WARNING

DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.

 **VAN AIR**
A Lincoln Electric Company

S/N:
XX-XXXXXXXX



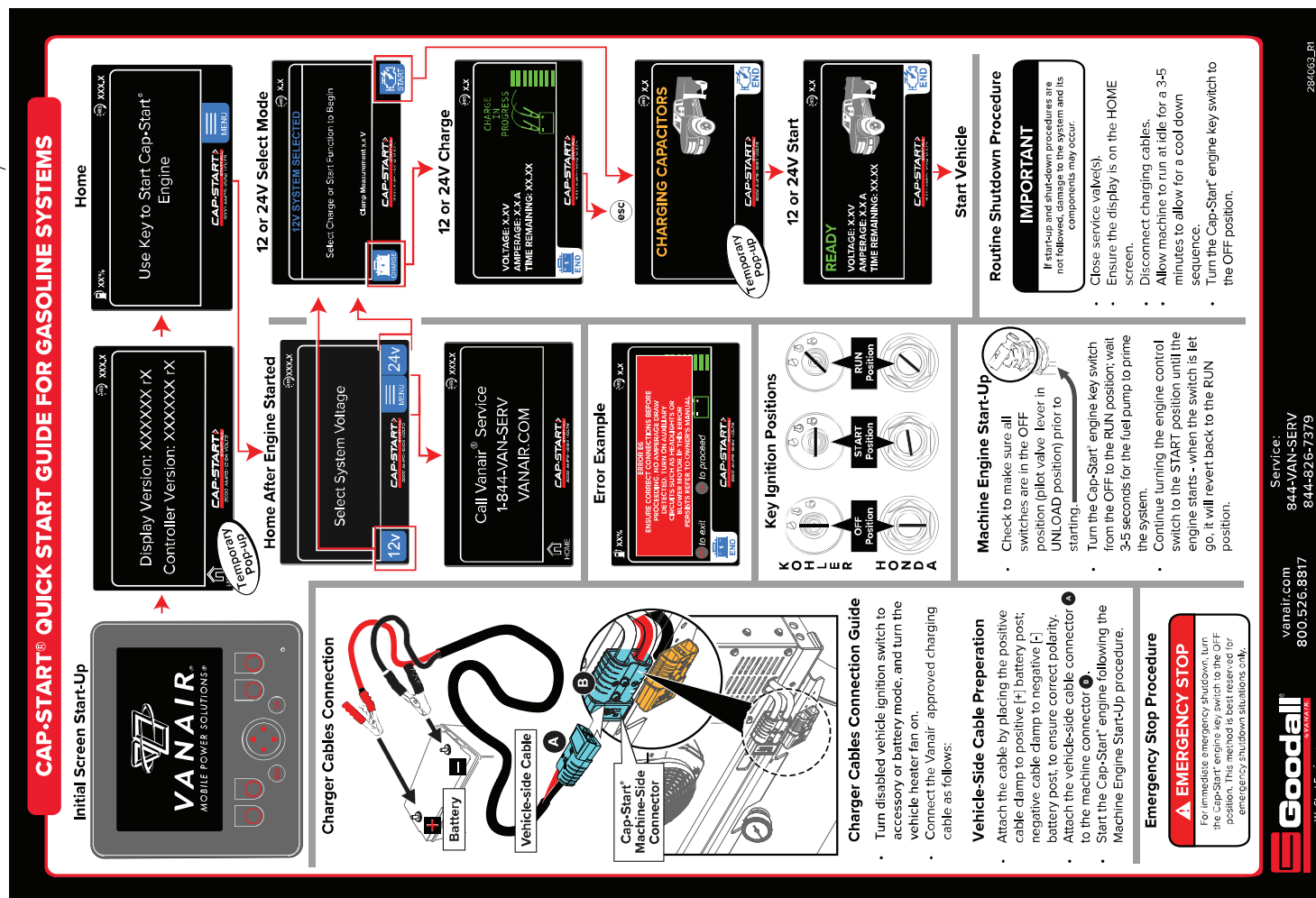
ITEM	DESCRIPTION	PART NUMBER	QTY
18	DECAL,VAN AIR SERIAL TAG (MODEL/ SERIAL # ONLY)	281373-02	2
19	LOGO,CAP-START 3000A 12/24V 24CFM L (6.59 X 1.173)	282086-A	1
20	LOGO,GOODALL WE START ENGINES (4.849 X 1.4)	277884-A	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER

CAP•START
Goodall
3000 A • 12/24V • 24 CFM • L

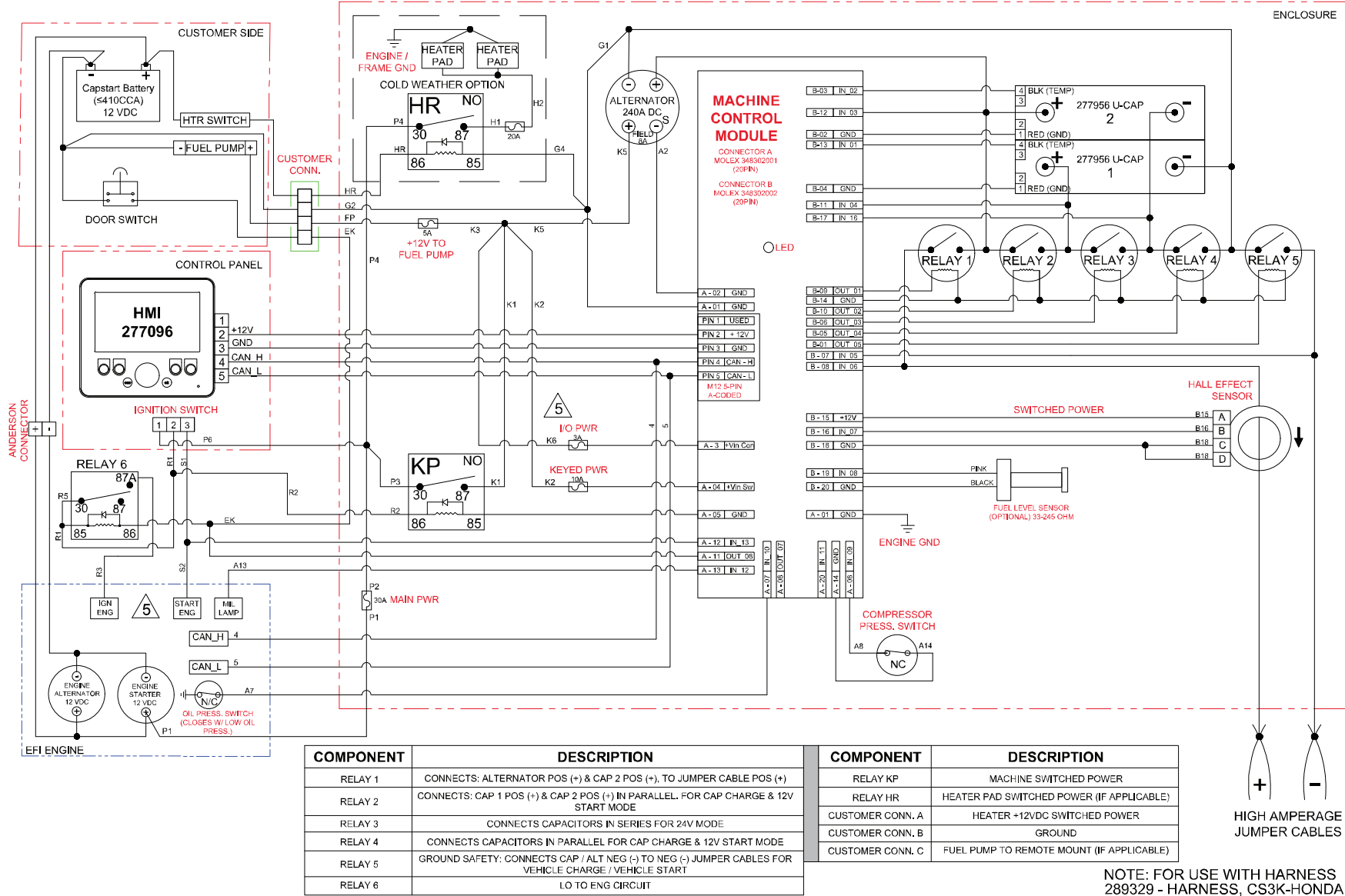
 **Goodall**
By VAN AIR
We Start Engines™

(17)



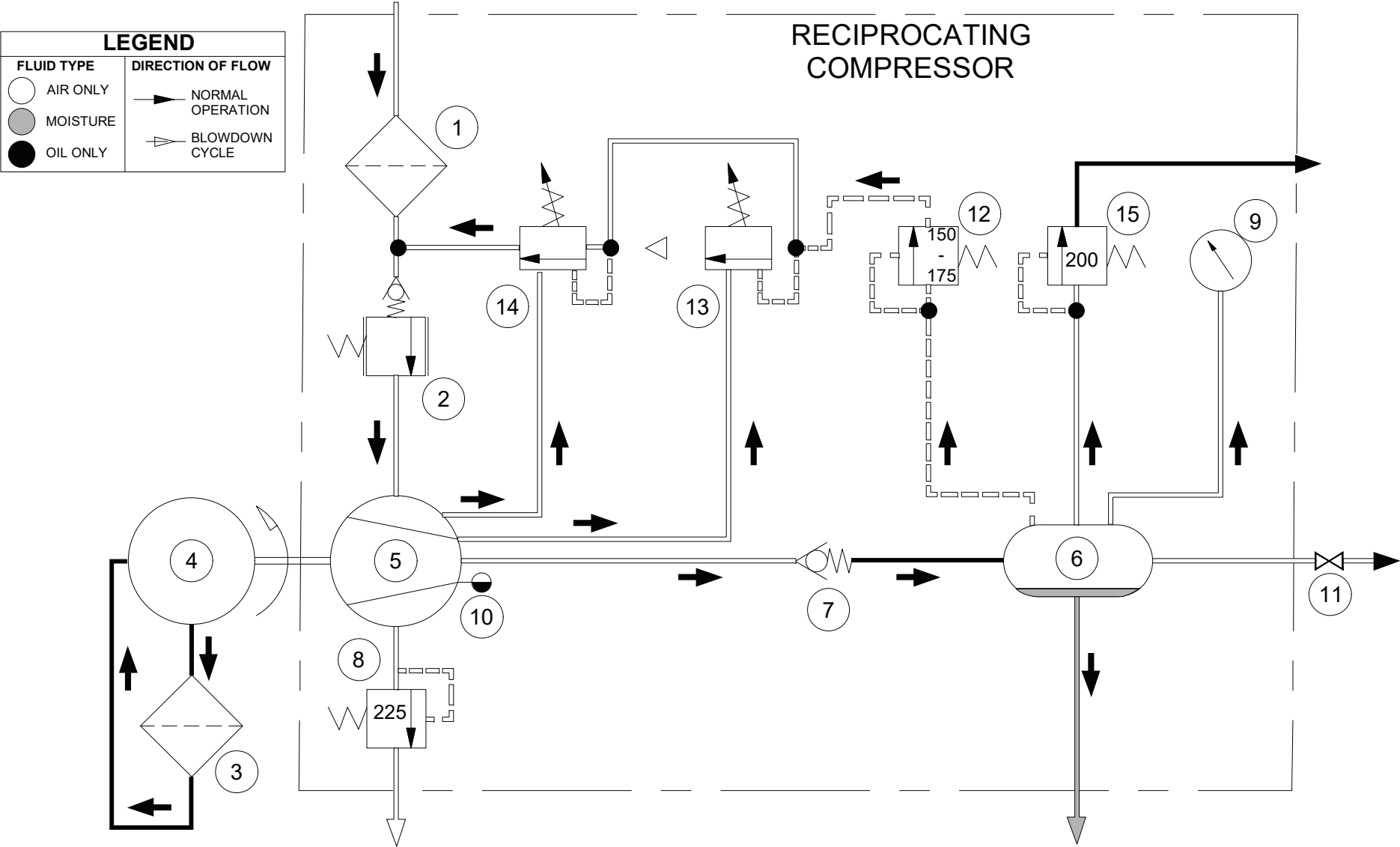
ITEM	DESCRIPTION	PART NUMBER	QTY	 WARNING x Quickstart guide is shipped loose with the unit. Place in convenient location for reference on machine operation.	 WARNING DO NOT REMOVE OR COVER ANY SAFETY DECAL. Replace any safety decal that becomes damaged or illegible.
17	DECAL,QUICKSTART GUIDE CAP•START 3000 GAS x	284063	1		
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE MACHINE SERIAL NUMBER.					

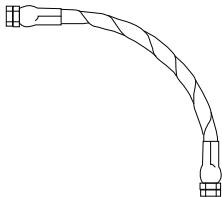
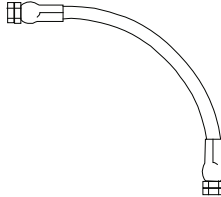
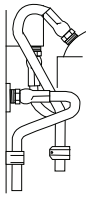
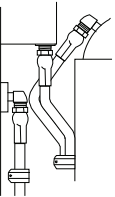
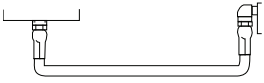
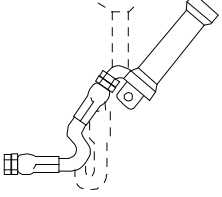
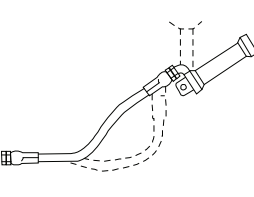
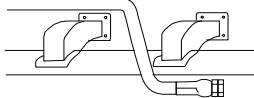
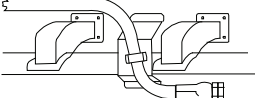
7.14 WIRING DIAGRAM - 12V/24V



NOTE: FOR USE WITH HARNESS
289329 - HARNESS, CS3K-HONDA

7.15 FLOW SCHEMATIC



7.16 HOSE INSTALLATION GUIDE					
HOSE LAYOUT CONSIDERATION	WRONG	RIGHT	HOSE LAYOUT CONSIDERATION	WRONG	RIGHT
1. Hose is weakened when installed in twisted position. Pressure in twisted hose tends to loosen fitting connections. Design so that machine motion produces bending rather than twisting.			4. Use elbows or other adapters as necessary to eliminate excess hose length and to insure neater installation for easier maintenance.		
2. Ample bend radius should be provided to avoid collapsing of line and restriction of flow.			5. When hose assembly is installed in a flexing application, remember that metal hose fittings are not part of the flexible portion. Allow ample free length for flexing.		
3. Exceeding minimum bend radius will greatly reduce hose assembly life.			6. When properly routing, use clamps to secure the hose in its proper position.		

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FEBRUARY 11, 2026