

Hypertherm®

Freedom 38 PPA™

Large Autonomous Plasma Cutting System



Service Manual

809010 | Revision 0 | English

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Freedom 38 PPA

Service Manual

809010
Revision 0

English

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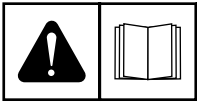
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ENGLISH

WARNING! Before operating any Hypertherm equipment, read the safety instructions in your product's manual and in the *Safety and Compliance Manual* (80669C). Failure to follow safety instructions can result in personal injury or in damage to equipment.

Copies of the manuals may accompany the product in electronic and printed formats. You can also obtain copies of the manuals, in all languages available for each manual, from the "Documents library" at www.hypertherm.com.

DEUTSCH / GERMAN

WARNUNG! Bevor Sie ein Hypertherm-Gerät in Betrieb nehmen, lesen Sie bitte die Sicherheitsanweisungen in Ihrer Bedienungsanleitung sowie im *Handbuch für Sicherheit und Übereinstimmung* (80669C). Das Nichtbefolgen der Sicherheitsanweisungen kann zu Verletzungen von Personen oder Schäden am Gerät führen.

Bedienungsanleitungen und Handbücher können dem Gerät in elektronischer Form oder als Druckversion beiliegen. Alle Handbücher und Anleitungen können in den jeweils verfügbaren Sprachen auch in der „Dokumente-Bibliothek“ unter www.hypertherm.com heruntergeladen werden.

FRANÇAIS / FRENCH

AVERTISSEMENT! Avant d'utiliser tout équipement Hypertherm, lire les consignes de sécurité importantes dans le manuel de votre produit et dans le *Manuel de sécurité et de conformité* (80669C). Le non-respect des consignes de sécurité peut engendrer des blessures physiques ou des dommages à l'équipement.

Des copies de ces manuels peuvent accompagner le produit en format électronique et papier. Vous pouvez également obtenir des copies de chaque manuel dans toutes les langues disponibles à partir de la « Bibliothèque de documents » sur www.hypertherm.com.

ESPAÑOL / SPANISH

¡ADVERTENCIA! Antes de operar cualquier equipo Hypertherm, leer las instrucciones de seguridad del manual de su producto y del *Manual de Seguridad y Cumplimiento* (80669C). No cumplir las instrucciones de seguridad podría dar lugar a lesiones personales o daño a los equipos.

Pueden venir copias de los manuales en formato electrónico e impreso junto con el producto. También se pueden obtener copias de los manuales, en todos los idiomas disponibles para cada manual, de la "Biblioteca de documentos" en www.hypertherm.com.

ITALIANO / ITALIAN

AVVERTENZA! Prima di usare un'attrezzatura Hypertherm, leggere le istruzioni sulla sicurezza nel manuale del prodotto e nel *Manuale sulla sicurezza e la conformità* (80669C). Il mancato rispetto delle istruzioni sulla sicurezza può causare lesioni personali o danni all'attrezzatura.

Il prodotto può essere accompagnato da copie elettroniche e cartacee del manuale. È anche possibile ottenere copie del manuale, in tutte le lingue disponibili per ogni manuale, dall'"Archivio documenti" all'indirizzo www.hypertherm.com.

NEDERLANDS / DUTCH

WAARSCHUWING! Lees voordat u Hypertherm-apparatuur gebruikt de veiligheidsinstructies in de producthandleiding en in de *Veiligheids- en nalevingshandleiding* (80669C). Het niet volgen van de veiligheidsinstructies kan resulteren in persoonlijk letsel of schade aan apparatuur.

De handleidingen kunnen in elektronische en gedrukte vorm met het product worden meegeleverd. De handleidingen, elke handleiding beschikbaar in alle talen, zijn ook verkrijgbaar via de "Documentenbibliotheek" op www.hypertherm.com.

DANSK / DANISH

ADVARSEL! Inden Hypertherm udstyr tages i brug skal sikkerhedsinstruktionerne i produktets manual og i *Manual om sikkerhed og overholdelse af krav* (80669C), gennelæses. Følges sikkerhedsvejledningen ikke kan det resultere i personskade eller beskadigelse af udstyret.

Kopier af manualerne kan ledsage produktet i elektroniske og trykte formater. Du kan også få kopier af manualer, på alle sprog der er til rådighed for hver manuel, fra "Dokumentbiblioteket" på www.hypertherm.com.

PORTUGUÊS / PORTUGUESE

ADVERTÊNCIA! Antes de operar qualquer equipamento Hypertherm, leia as instruções de segurança no manual do seu produto e no *Manual de Segurança e de Conformidade* (80669C). Não seguir as instruções de segurança pode resultar em lesões corporais ou danos ao equipamento.

Cópias dos manuais podem acompanhar os produtos nos formatos eletrônico e impresso. Também é possível obter cópias dos manuais em todos os idiomas disponíveis para cada manual na "Biblioteca de documentos" em www.hypertherm.com.

日本語 / JAPANESE

警告! Hypertherm 機器を操作する前に、安全に関する重要な情報について、この製品説明書にある安全情報、および製品に同梱されている別冊の「安全とコンプライアンスマニュアル」(80669C)をお読みください。安全情報に従わないと怪我や装置の損傷を招くことがあります。

説明書のコピーは、電子フォーマット、または印刷物として製品に同梱されています。各説明書は、www.hypertherm.com の「ドキュメントライブラリ」から各言語で入手できます。

简体中文 / CHINESE (SIMPLIFIED)

警告! 在操作任何海宝设备之前, 请阅读产品手册和《安全和法规遵守手册》(80669C) 中的安全操作说明。若未能遵循安全操作说明, 可能会造成人员受伤或设备损坏。

随产品提供的手册可能提供电子版和印刷版两种格式。您也可从 "Documents library" (文档资料库) 中获取每本手册所有可用语言的副本, 网址为 www.hypertherm.com。

NORSK / NORWEGIAN

ADVARSEL! Før du bruker noe Hypertherm-utstyr, må du lese sikkerhetsinstruksjonene i produktets håndbok og i *Håndboken om sikkerhet og samsvar* (80669C). Unnlattelse av å følge sikkerhetsinstruksjoner kan føre til personskade eller skade på utstyr.

Eksemplarer av håndbøkene kan medfølge produktet i elektroniske og trykte utgaver. Du kan også få eksemplarer av håndbøkene i alle tilgjengelige språk for hver håndbok fra dokumentbiblioteket på www.hypertherm.com.

SVENSKA / SWEDISH

VARNING! Läs häftet *säkerhetsinformationen i din produkts säkerhets- och efterlevnadsmanual* (80669C) för viktig säkerhetsinformation innan du använder eller underhåller Hypertherm-utrustning. Underlåtenhet att följa dessa säkerhetsinstruktioner kan resultera i personskador eller skador på utrustningen.

Kopior av manualen kan medfölja produkten i elektronisk och tryckform. Du hittar även kopior av manualerna i alla tillgängliga språk i dokumentbiblioteket (Documents library) på www.hypertherm.com.

한국어 / KOREAN

경고! Hypertherm 장비를 사용하기 전에 제품 설명서와 안전 및 규정 준수 설명서 (80669C)에 나와 있는 안전 지침을 읽으십시오. 안전 지침을 준수하지 않으면 신체 부상이나 장비 손상을 초래할 수 있습니다.

전자 형식과 인쇄된 형식으로 설명서 사본이 제품과 함께 제공될 수 있습니다. www.hypertherm.com 의 'Documents library (문서 라이브러리)' 에서도 모든 언어로 이용할 수 있는 설명서 사본을 얻을 수 있습니다.

ČESKY / CZECH

VAROVÁNÍ! Před uvedením jakéhokoliv zařízení Hypertherm do provozu si přečtěte bezpečnostní pokyny v příručce k produktu a v *Manuálu pro bezpečnost a dodržování předpisů* (80669C). Nedodržování bezpečnostních pokynů může mít za následek zranění osob nebo poškození majetku.

Kopie příruček a manuálů mohou být součástí dodávky produktu, a to v elektronické i tištěné formě. Kopie příruček a manuálů ve všech jazykových verzích, v nichž byly dané příručky a manuály vytvořeny, naleznete v „Knihovně dokumentů“ na webových stránkách www.hypertherm.com.

POLSKI / POLISH

OSTRZEŻENIE! Przed rozpoczęciem obsługi jakiegokolwiek systemu firmy Hypertherm należy się zapoznać z instrukcjami bezpieczeństwa zamieszczonymi w podręczniku produktu oraz w *Podręczniku bezpieczeństwa i zgodności* (80669C). Nieprzestrzeganie instrukcji bezpieczeństwa może skutkować obrażeniami ciała i uszkodzeniem sprzętu.

Do produktu mogą być dołączone kopie podręczników w formie elektronicznej i drukowanej. Kopie podręczników, w każdym udostępnionym języku, można również znaleźć w „Bibliotece dokumentów” pod adresem www.hypertherm.com.

РУССКИЙ / RUSSIAN

БЕРЕГИСЬ! Перед работой с любым оборудованием Hypertherm ознакомьтесь с инструкциями по безопасности, представленными в руководстве, которое поставляется вместе с продуктом, а также в *Руководстве по безопасности и соответствию* (80669J). Невыполнение инструкций по безопасности может привести к телесным повреждениям или повреждению оборудования.

Копии руководств, которые поставляются вместе с продуктом, могут быть представлены в электронном и бумажном виде. Копии руководств на всех языках, на которые переведено то или иное руководство, можно также загрузить в разделе «Библиотека документов» на веб-сайте www.hypertherm.com.

SUOMI / FINNISH

VAROITUS! Ennen minkään Hypertherm-laitteen käyttöä lue tuotteen käyttöoppaassa olevat turvallisuusohjeet ja *turvallisuus- ja vaatimustenmukaisuusohje* (80669C). Turvallisuusohjeiden laiminlyönti voi aiheuttaa henkilökohtaisen loukkaantumisen tai laitevahingon.

Käyttöoppaiden kopiot voivat olla tuotteen mukana elektronisessa ja tulostetussa muodossa. Voit saada käyttöoppaiden kopiot kaikilla kielillä ”latauskirjastosta”, joka on osoitteessa www.hypertherm.com.

БЪЛГАРСКИ / BULGARIAN

ПРЕДУПРЕЖДЕНИЕ! Преди да работите с което и да е оборудване Hypertherm, прочетете инструкциите за безопасност в ръководството на вашия продукт и „Инструкция за безопасност и съответствие“ (80669C). Неспазването на инструкциите за безопасност би могло да доведе до телесно нараняване или до повреда на оборудването.

Копия на ръководствата може да придружават продукта в електронен и в печатен формат. Можете да получите копия на ръководствата, предлагани на всички езици, от „Documents library“ (Библиотека за документи) на адрес www.hypertherm.com.

ROMÂNĂ / ROMANIAN

AVERTIZARE! Înainte de utilizarea oricărui echipament Hypertherm, citiți instrucțiunile de siguranță din cadrul manualului produsului și din cadrul *Manualului de siguranță și conformitate* (80669C). Nerespectarea instrucțiilor de siguranță pot rezulta în vătămare personală sau în avarierea echipamentului.

Produsul poate fi însoțit de copii ale manualului în format tipărit și electronic. De asemenea, dumneavoastră puteți obține copii ale manualelor, în toate limbile disponibile pentru fiecare manual, din cadrul secțiunii „Bibliotecă documente” aflată pe site-ul www.hypertherm.com.

TÜRKÇE / TURKISH

UYARI! Bir Hypertherm ekipmanını çalıştırmadan önce, ürün kullanımı kılavuzunda ve *Güvenlik ve Uyumluluk Kılavuzu'nda* (80669C) yer alan güvenlik talimatlarını okuyun. Güvenlik talimatlarına uyulmaması durumunda kişisel yaralanmalar veya ekipman hasarı meydana gelebilir.

Kılavuzların kopyaları, elektronik ve basılı formatta ürünle birlikte verilebilir. Her biri tüm dillerde yayınlanan kılavuzların kopyalarını www.hypertherm.com adresindeki “Documents library” (Dosyalar kitaplığı) başlığından da elde edebilirsiniz.

MAGYAR / HUNGARIAN

VIGYÁZAT! Mielőtt bármilyen Hypertherm berendezést üzemeltetne, olvassa el a biztonsági információkat a termék kézikönyvében és a *Biztonsági és szabálykövetési kézikönyvben* (80669C). A biztonsági utasítások betartásának elmulasztása személyi sérüléshez vagy a berendezés károsodásához vezethet.

A termékhez a kézikönyv példányai elektronikus és nyomtatott formában is mellékelve lehetnek. A kézikönyvek példányai (minden nyelven) a www.hypertherm.com weboldalon a „Documents library” (Dokumentum könyvtár) részben is beszerezhetők.

ΕΛΛΗΝΙΚΑ / GREEK

ΠΡΟΕΙΔΟΠΟΙΗΣΗ! Πριν θέσετε σε λειτουργία οποιονδήποτε εξοπλισμό της Hypertherm, διαβάστε τις οδηγίες ασφαλείας στο εγχειρίδιο του προϊόντος και στο *Εγχειρίδιο ασφάλειας και συμμόρφωσης* (80669C). Η μη τήρηση των οδηγιών ασφαλείας μπορεί να επιφέρει σωματική βλάβη ή ζημία στον εξοπλισμό.

Αντίγραφα των εγχειριδίων μπορεί να συνοδεύουν το προϊόν σε ηλεκτρονική και έντυπη μορφή. Μπορείτε, επίσης, να λάβετε αντίγραφα των εγχειριδίων σε όλες τις γλώσσες που διατίθενται για κάθε εγχειρίδιο από την ψηφιακή βιβλιοθήκη εγγράφων (Documents library) στη διαδικτυακή τοποθεσία www.hypertherm.com.

繁體中文 / CHINESE (TRADITIONAL)

警告！在操作任何 Hypertherm 設備前，請閱讀您產品手冊和《安全和法務遵從手冊》(80669C) 內的安全指示。不遵守安全指示可能會導致人身傷害或設備損壞。

手冊複本可能以電子和印刷格式隨附產品提供。您也可以在此 www.hypertherm.com 的「文檔資料庫」內獲取所有手冊的多語種複本。

SLOVENŠČINA / SLOVENIAN

OPOZORILO! Pred uporabo katerekoli Hyperthermove opreme preberite varnostna navodila v priročniku vašega izdelka ter v *Priročniku za varnost in skladnost* (80669C). Neupoštevanje navodil za uporabo lahko povzroči telesne poškodbe ali materialno škodo.

Izdelku so lahko priloženi izvodi priročnikov v elektronski ali tiskani obliki. Izvode priročnikov v vseh razpoložljivih jezikih si lahko prenesete tudi iz knjižnice dokumentov “Documents library” na naslovu www.hypertherm.com.

SRPSKI / SERBIAN

UPOZORENJE! Pre rukovanja bilo kojom Hyperthermovom opremom pročitajte uputstva o bezbednosti u svom priručniku za proizvod i u *Priručniku o bezbednosti i usaglašenosti* (80669C). Oglašavanje o praćenje uputstava o bezbednosti može da ima za posledicu ličnu povredu ili oštećenje opreme.

Može se dogoditi da kopije priručnika prate proizvod u elektronskom i štampanom formatu. Takođe možete da pronađete kopije priručnika, na svim jezicima koji su dostupni za svaki od priručnika, u “Biblioteci dokumenata” (“Documents library”) na www.hypertherm.com.

SLOVENČINA / SLOVAK

VÝSTRAHA! Pred použitím akéhokolvek zariadenia od spoločnosti Hypertherm si prečítajte bezpečnostné pokyny v návode na obsluhu vášho zariadenia a v *Manuáli o bezpečnosti a súlade s normami* (80669C). V prípade nedodržania bezpečnostných pokynov môže dôjsť k ujme na zdraví alebo poškodeniu zariadenia.

Kópia návodu, ktorá je dodávaná s produktom, môže mať elektronickú alebo tlačенú podobu. Kópie návodov, vo všetkých dostupných jazykoch, sú k dispozícii aj v sekcii z „knžnice Dokumenty“ na www.hypertherm.com.

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Attention

Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage or injury caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty, and will constitute misuse of the Hypertherm Product.

You are solely responsible for the safe use of the Product. Hypertherm does not and cannot make any guarantee or warranty regarding the safe use of the product in your environment.

General

Hypertherm Inc. warrants that its Products shall be free from defects in materials and workmanship for the specific periods of time set forth herein and as follows: if Hypertherm is notified of a defect (i) with respect to the plasma power supply within a period of two (2) years from the date of its delivery to you, with the exception of Powermax brand power supplies, which shall be within a period of three (3) years from the date of delivery to you, and (ii) with respect to the torch and leads within a period of one (1) year from its date of delivery to you, with the exception of the HPRXD short torch with integrated lead, which shall be within a period of six (6) months from the date of delivery to you, and with respect to torch lifter assemblies within a period of one (1) year from its date of delivery to you, and with respect to Automation products one (1) year from its date of delivery to you, with the exception of the EDGE Connect CNC, EDGE Connect T CNC, EDGE Connect TC CNC, EDGE Pro CNC, EDGE Pro Ti CNC, MicroEDGE Pro CNC, and ArcGlide THC, which shall be within a period of two (2) years from the date of delivery to you, and (iii) with respect to HyIntensity fiber laser components within a period of two (2) years from the date of its delivery to you, with the exception of laser heads and beam delivery cables, which shall be within a period of one (1) year from its date of delivery to you.

All third-party engines, engine accessories, alternators, and alternator accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

This warranty shall not apply to any Powermax brand power supplies that have been used with phase converters. In addition, Hypertherm does not warranty systems that have been damaged as a result of poor power quality, whether from phase converters or incoming line power. This warranty shall not apply to any product which has been incorrectly installed, modified, or otherwise damaged.

Hypertherm provides repair, replacement or adjustment of the Product as the sole and exclusive remedy, if and only if the warranty set forth herein properly is invoked and applies. Hypertherm, at its sole option, shall repair, replace, or adjust, free of charge, any defective Products covered by this warranty which shall be returned with Hypertherm's prior authorization (which shall not be unreasonably withheld), properly packed, to Hypertherm's place of business in Hanover, New Hampshire, or to an authorized Hypertherm repair facility, all costs, insurance and freight pre paid by the customer. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph and with Hypertherm's prior written consent.

The warranty set forth above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty.

Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

Patent indemnity

Except only in cases of products not manufactured by Hypertherm or manufactured by a person other than Hypertherm not in strict conformity with Hypertherm's specifications and in cases of designs, processes, formulae, or combinations not developed or purported to be developed by Hypertherm, Hypertherm will have the right to defend or settle, at its own expense, any suit or proceeding brought against you alleging that the use of the Hypertherm product, alone and not in combination with any other product not supplied by Hypertherm, infringes any patent of any third party. You shall notify Hypertherm promptly upon learning of any action or threatened action in connection with any such alleged infringement (and in any event no longer than fourteen (14) days after learning of any action or threat of action), and Hypertherm's obligation to defend shall be conditioned upon Hypertherm's sole control of, and the indemnified party's cooperation and assistance in, the defense of the claim.

Limitation of liability

In no event shall Hypertherm be liable to any person or entity for any incidental, consequential direct, indirect, punitive or exemplary damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranty, failure of essential purpose, or otherwise, and even if advised of the possibility of such damages. Hypertherm shall not be liable for any losses to Distributor based on down time, lost production or lost profits. It is the intention of the Distributor and Hypertherm that this provision be construed by a court as being the broadest limitation of liability consistent with applicable law.

National and local codes

National and local codes governing plumbing and electrical installation shall take precedence over any instructions contained in this manual. In no event shall Hypertherm be liable for injury to persons or property damage by reason of any code violation or poor work practices.

Warranty

Liability cap

In no event shall Hypertherm's liability, if any, whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise, for any claim, action, suit or proceeding (whether in court, arbitration, regulatory proceeding or otherwise) arising out of or relating to the use of the Products exceed in the aggregate the amount paid for the Products that gave rise to such claim.

Insurance

At all times you will have and maintain insurance in such quantities and types, and with coverage sufficient and appropriate to defend and to hold Hypertherm harmless in the event of any cause of action arising from the use of the products.

Transfer of rights

You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty. Within thirty (30) days before any such transfer occurs, you agree to notify in writing Hypertherm, which reserves the right of approval. Should you fail timely to notify Hypertherm and seek its approval as set forth herein, the Warranty set forth herein shall be null and void and you will have no further recourse against Hypertherm under the Warranty or otherwise.

Waterjet product warranty coverage

Product	Parts coverage
HyPrecision pumps	27 months from the ship date, or 24 months from the date of proven installation, or 4,000 hours, whichever occurs first
PowerDredge abrasive removal system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
EcoSift abrasive recycling system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Abrasive metering devices	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
On/off valve air actuators	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Diamond orifices	600 hours of use with the use of a thimble filter and compliance with Hypertherm's water quality requirements

Consumable parts are not covered by this warranty. Consumable parts include, but are not limited to, high-pressure water seals, check valves, cylinders, bleed-down valves, low-pressure seals, high-pressure tubing, low- and high-pressure water filters and abrasive collection bags. All third-party pumps, pump accessories, hoppers, hopper accessories, dryer boxes, dryer box accessories and plumbing accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

Section 1

Troubleshooting

This section provides an overview of the most common problems that may arise when using this system and explains how to solve them.

Where to go for help

If you cannot fix the problem by following the troubleshooting guidelines in this section, or if you need further assistance:

1. Call your authorized Hypertherm Freedom 38 PPA distributor or repair facility.
2. For engine support, locate the nearest authorized Deutz service dealer at www.deutzamericas.com.
3. Call the nearest Hypertherm office listed in the front of this manual.
4. For warranty claims or questions:
 - ❑ Contact Hypertherm regarding claims for the plasma supply.
 - ❑ Contact Hypertherm regarding system-level claims and claims for the air compressor, alternator, and digital controller. Hypertherm will connect you to the proper manufacturer, if needed.
 - ❑ Contact Deutz regarding claims for the engine:
 - Telephone: 770-564-7100
 - Website: www.deutzamericas.com




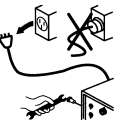






DANGER!
TOXIC GAS CAN BE FATAL


DO NOT OPERATE THIS SYSTEM INDOORS!

Exhaust from the generator contains carbon monoxide, which is an invisible, odorless gas. Inhaling too much carbon monoxide will result in serious injury or death.

Only operate this system outdoors, away from windows and vents.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.

		<p style="text-align: center;">CAUTION!</p> <p style="text-align: center;">FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT</p>
<p>Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.</p> <p>Wash thoroughly if your skin comes in contact with fuel or oil from the engine.</p>		

<p style="text-align: center;"><i>NOTICE</i></p>	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

System components

Figure 1 – Front panel



- | | |
|---|---|
| 1 Plasma supply | 9 Alternator lamp |
| 2 Plasma torch connection | 10 12 V circuit breaker (RESET button) |
| 3 Work lead connection | 11 ON (I)/OFF (O) power switch |
| 4 Air pressure gauge | 12 Circuit breaker to reset 120 V auxiliary outlet |
| 5 Machine interface (CPC) connection | 13 120 V auxiliary – 2 GFCI receptacles (1-phase, 20 A) (neutral bonded to frame) |
| 6 Emergency Stop button | 14 480 V auxiliary – 1 receptacle (3-phase, 60 A, 4-pole, 5-wire) |
| 7 System controller | 15 Lever to drain condensate from air tank |
| 8 Main circuit breaker (60 A) and transformer circuit breaker (10 A)* | 16 Auxiliary air hose connector |

* The main circuit breaker provides power to the on-board plasma cutting system and the 480 V auxiliary outlet. The transformer circuit breaker provides power to the 120 V auxiliary outlet.

Figure 2 – Plasma side

- 1 Oil fill level for air compressor
- 2 Service panel
- 3 Lift truck slots

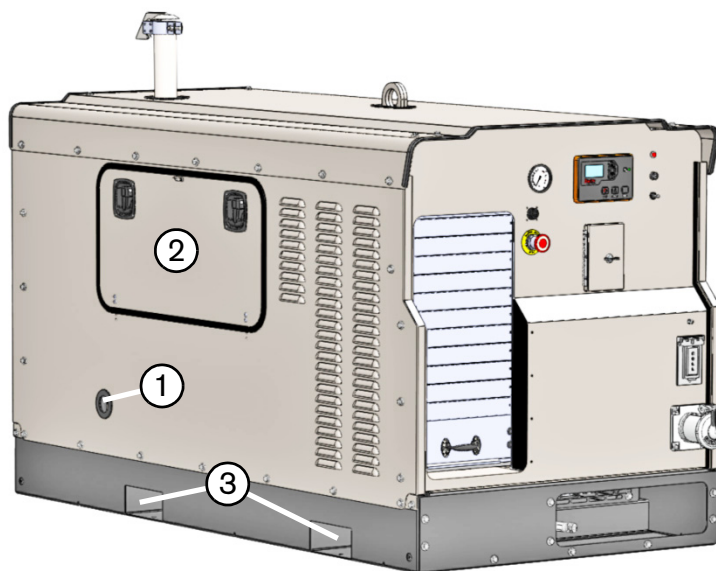
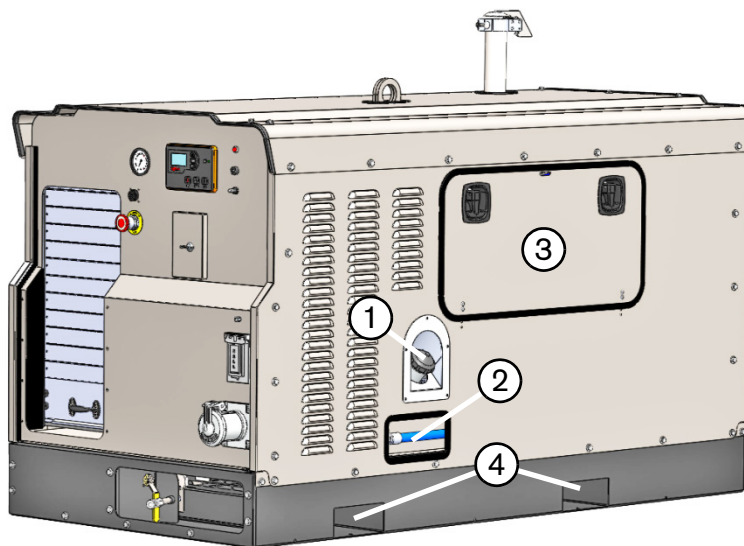


Figure 3 – Generator side

- 1 Fuel fill cap (diesel fuel only)
- 2 Oil drain hose caps for:
 - ❑ Oil pan drain hose
 - ❑ Heat exchanger drain hose
- 3 Service panel
- 4 Lift truck slots



Controls and indicators

Familiarize yourself with the controls and indicators on the system before you start the engine and begin cutting.

System controller

Figure 4 – Primary system controls



1 LCD screen

Use the LCD screen to view engine and generator operating information as well as warning and failure notifications. From this screen you can view, navigate, and update system status, engine parameters, and settings.

2 Navigation buttons

Use the **UP** and **DOWN** arrow buttons to navigate through menus on the LCD screen, to change the values for some settings, and to change the parameter screen.

Use the **ENTER** button to display the menu system on the LCD screen and to confirm settings you changed. You can also use this button to lock the LCD screen when you view parameters.

3 System status LED indicator

The LED indicator displays the current status of the system:

- Solid **green** = engine is running
- Solid **amber** = warning
- Solid **red** = failure

For example, the LED indicator displays **amber** if the engine oil approaches its maximum temperature. If the engine oil exceeds its maximum temperature, the LED indicator displays **red**, and the engine shuts off.



For information on how to clear faults, see *System faults* on page 22.

4 OFF button

Use the **OFF** button to turn OFF the engine.

5 AUTO button

Use the **AUTO** button to view engine status details without turning on the engine, such as fuel remaining, oil pressure, engine hours, engine temperature, and battery voltage.

The **AUTO** button does not start the engine. Press the **OFF** button to exit AUTO mode.

6 RUN button

Use the **RUN** button to start the engine. When you press the **RUN** button, the engine continues to run until you press the **OFF** button or activate an emergency stop, or until a failure occurs.

7 Alternator lamp

The alternator lamp monitors the charging current of the engine's battery. This lamp illuminates if the alternator is not properly charging the system.

8 12 V circuit breaker (RESET button)

The 12 V (10 A) circuit breaker protects DC circuits against shorted or overloaded circuits.

When the breaker is tripped, the **RESET** button in the center of the circuit breaker extrudes. Correct the fault condition, then press the **RESET** button to reset the circuit breaker.

9 ON/OFF power switch

Use the power switch to turn ON (**I**) and OFF (**O**) 12 VDC power to control the system. You cannot start the engine when the power switch is in the OFF (**O**) position.

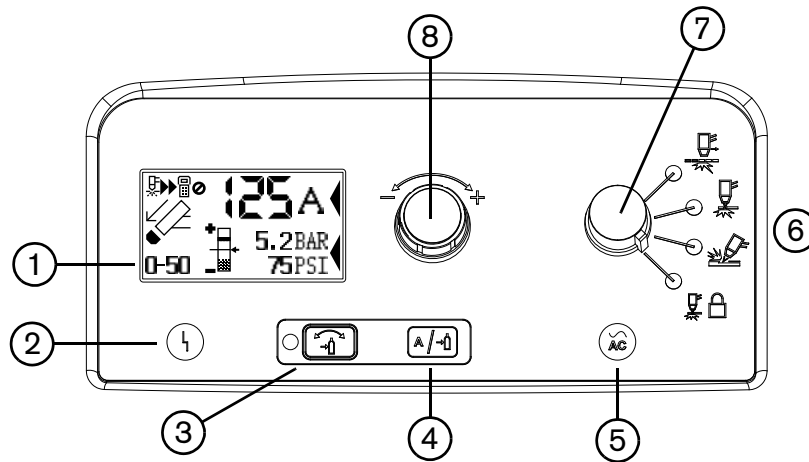


The ON/OFF power switch should remain in the OFF (**O**) position when the unit is not being used. When this switch is in the ON (**I**) position and the unit is not running, the 12 VDC control system drains the battery over time.

Plasma cutting system

Figure 5 shows the controls and indicators for the plasma cutting system. For an explanation of these controls, refer to the *Basic System Operations* section in the *Powermax125 Operator Manual*.

Figure 5 – Plasma cutting system controls



- | | |
|---|-------------------------|
| 1 Status screen | 5 Power ON LED (green) |
| 2 Fault LED (yellow) | 6 Operating modes |
| 3 Automatic/manual pressure setting mode selector | 7 Operating mode switch |
| 4 Current/gas selector | 8 Adjustment knob |

Check engine and generator status

Several engine and generator status details display on the system controller's LCD screen when the engine is running, such as:

- Total operating hours for the engine
- Oil pressure
- Percentage of fuel remaining
- Battery voltage
- Engine temperature
- Total time the engine has been running since it was started
- Generator current (A)



The transformer circuit breaker must be ON (I) in order to view the output current on the system controller.

- Generator voltage (V)
- AC frequency (Hz)

You can also view the following engine status details without starting the engine by pressing the **AUTO** button:

- Total operating hours for the engine
- Oil pressure
- Percentage of fuel remaining
- Battery voltage
- Engine temperature

Press the **OFF** button to exit AUTO mode.

Reset the control system

When a system fault condition occurs, the engine shuts OFF and the LED indicator on the front panel illuminates solid red.

To clear the fault, reset the control system:

1. Examine the LCD screen for the notification that describes why the engine shut down. Correct the fault before continuing.
2. Press the **OFF** button on the system controller.
3. Press the **RUN** button to start the engine.
4. If the control system still needs to be reset, turn the main power switch OFF (O) and then back ON (I).

System faults

Active faults and cleared faults

Active faults display on the system controller's LCD screen when they occur. The fault notification remains on the LCD screen until the fault is cleared.

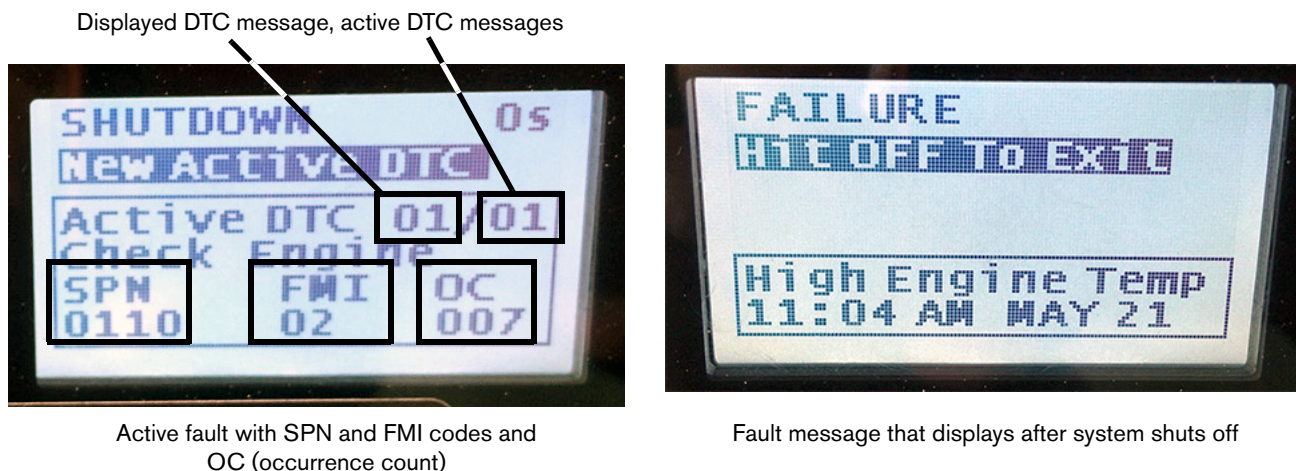
An active DTC (diagnostic trouble code) displays along with the fault codes. Engine-related faults may include numeric fault codes called an SPN (suspect parameter number) and FMI (failure mode indicator). Make note of these codes when they display. You may be asked to provide the codes if you contact an authorized Deutz service dealer for support. The OC (occurrence count) appears with SPN and FMI codes. The OC identifies the number of times the failure has occurred.

Non-active faults, or faults that have been cleared, are saved in the system's events history. For instructions on how to view faults that occurred in the past, see *Find system fault codes in events history* on page 27.

In some cases, you may see a combination of fault notifications. For example, if the temperature sensor in the engine is faulty, you may first see a "Check Engine" fault with SPN code 0110 and FMI code 02. The system continues to operate until the engine reaches a predefined temperature. At that point, the system shuts off, and the "High Engine Temp" fault message displays. See *Figure 6*.

- ❑ For more information on predefined conditions that trigger faults, see *System faults triggered by predefined thresholds* on page 23.
- ❑ For more information on SPN and FMI codes, see *Engine faults (SPN and FMI codes)* on page 25.

Figure 6 – Active faults



System faults triggered by predefined thresholds

Several preset thresholds are programmed into the system to define acceptable operating parameters.

- When the system reaches a **warning** threshold:
 - ❑ A warning message displays.
 - ❑ The LED indicator illuminates solid **amber**.
 - ❑ You can continue to operate the system.
- When the system reaches a **failure** threshold:
 - ❑ A fault message displays.
 - ❑ The LED indicator illuminates solid **red**.
 - ❑ The system shuts off.

The following table lists the conditions that trigger these warning and failure notifications and suggests how to clear each fault:

Fault condition	Warning threshold	System failure threshold	Solutions
Air compressor overheated	None	110°C (230°F)	<ul style="list-style-type: none"> ▪ Turn the system OFF, and allow the air compressor components to cool. ▪ Make sure the air compressor has enough oil. See page 63. ▪ Change the oil and oil filter in the air compressor. See page 78. ▪ Replace the temperature switch for the air compressor. See page 167.
Crank failed	2 failed attempts	None	<ul style="list-style-type: none"> ▪ This warning message displays when the system fails to start the engine after 2 consecutive attempts. See <i>Engine will not start</i> on page 29.
High battery voltage	15 V	None	<ul style="list-style-type: none"> ▪ Turn the system OFF. Replace the battery. See page 89. ▪ If a new battery does not clear the fault, have an authorized service dealer examine the alternator.
High engine temperature	127°C (260°F)	129°C (265°F)	<ul style="list-style-type: none"> ▪ Make sure the system has adequate ventilation. Do not block the ventilation screens or louvers. ▪ Check engine oil level. See page 62. ▪ Change the oil and oil filter in the engine. See page 70. ▪ If the problem persists, have an authorized Deutz service dealer examine the engine.

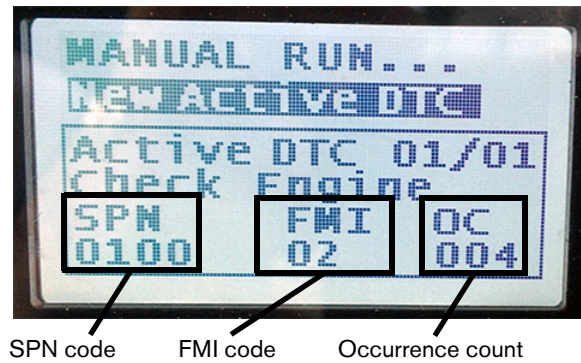
1 – Troubleshooting

Fault condition	Warning threshold	System failure threshold	Solutions
Low battery voltage	11 V	None	<ul style="list-style-type: none">▪ Check the connections on the battery. Clean and tighten the connectors as needed. See page 69.▪ Jump-start or charge the battery. See page 32.▪ Replace the battery. See page 89.▪ If a new battery does not clear the fault, have an authorized service dealer examine the alternator.
Low fuel level	25%	None	<ul style="list-style-type: none">▪ Add clean, low-sulfur diesel fuel. Do not overfill the fuel tank.
Loss of ECM communication	Communication with the electronic control module (ECM) was interrupted	6 seconds after loss of ECM communication	<ul style="list-style-type: none">▪ Examine the wiring harnesses. Replace as needed. See page 138.
Low oil pressure	1.4 bar (20 psi)	1 bar (15 psi)	<ul style="list-style-type: none">▪ Make sure the engine has enough oil. See page 62.▪ Install a new Deutz-brand oil filter. See <i>Change the oil and oil filter in the engine</i> on page 70.▪ If the problem persists, have an authorized Deutz service dealer examine the engine.
Over current	55 AAC	None	<ul style="list-style-type: none">▪ The generator's amperes alternating current (AAC) is too high. See <i>Troubleshoot power-related issues (generator/alternator)</i> on page 38.
Over speed	1,980 RPM	2,160 RPM	<ul style="list-style-type: none">▪ Combustible gas in the air may cause the engine to exceed operating speed. Make sure there are no combustible or flammable gases in the area.▪ Have an authorized Deutz service dealer examine the engine.
Under speed	1,620 RPM	1,530 RPM	<ul style="list-style-type: none">▪ This fault can be triggered by a low fuel level. Check the fuel level. See page 21. Add clean, low-sulfur diesel fuel. Do not overfill the fuel tank.▪ The system may be overloaded. Remove or disconnect equipment from the 120 V and 480 V auxiliary outlets to reduce load on the system.▪ If the problem persists, have an authorized Deutz service dealer examine the engine.

Engine faults (SPN and FMI codes)

SPN and FMI codes (or suspect parameter number and failure mode indicator, respectively) in a fault notification indicate that the fault is engine-related. The following table lists a few common SPN and FMI codes and suggests how to clear each fault.

If you see an SPN or FMI code not listed in this table, have an authorized Deutz service dealer examine the system.



SPN	FMI	Description	Solutions
23	7	Injection pump or actuator warning. The injection pump/actuator is stuck or is not connected properly. The actuator is not calibrated properly.	<ul style="list-style-type: none"> Make sure the actuator is connected properly. Have an authorized Deutz service dealer check the fault limits for the actuator and reprogram them as needed. Have an authorized Deutz service dealer examine the injection pump, actuator, actuator rods, and actuator cable and replace as needed. Have an authorized Deutz service dealer examine the engine.
24	12 or 13	Actuator warning. The actuator is not connected properly or is faulty.	<ul style="list-style-type: none"> Make sure the actuator is connected properly. Have an authorized Deutz service dealer examine the engine.
51 or 60	2	Digital output fault due to a short circuit or damaged cable.	<ul style="list-style-type: none"> Have an authorized Deutz service dealer examine the engine.
84	8	Tachometer failed or tachometer cable connection interrupted.	<ul style="list-style-type: none"> Have an authorized Deutz service dealer examine the engine.
100	1 or 2	Oil pressure warning. The oil pressure is too low, or the oil pressure sensor is faulty.	<ul style="list-style-type: none"> Check the oil level in the engine. Add oil as needed. See page 62. Change the oil and oil filter in the engine. See page 70. Have an authorized Deutz service dealer examine the engine.
108	12	Atmospheric pressure warning. The atmospheric pressure is too high or too low.	<ul style="list-style-type: none"> Turn OFF the system. Allow the system to cool. Turn ON the system. If the fault persists, have an authorized Deutz service dealer examine the engine.
110	0 or 2	Coolant temperature warning. The coolant temperature is too high, or the coolant sensor is faulty.	<ul style="list-style-type: none"> This engine is oil-cooled, so first check the oil level in the engine. Add oil as needed. See page 62. Change the oil and oil filter in the engine. See page 70. Have an authorized Deutz service dealer examine the engine.

1 – Troubleshooting


SPN	FMI	Description	Solutions
171	12	The electronic control unit is too hot or too cold.	<ul style="list-style-type: none">▪ Turn OFF the system. Allow the system to cool. Turn ON the system. If the fault persists, have an authorized Deutz service dealer examine the engine.
190	0 or 8	Engine speed warning. The engine is running too far under or over 1800 RPMs.	<ul style="list-style-type: none">▪ An under speed issue can be triggered by a low fuel level. Add clean, low-sulfur diesel fuel. Do not overfill the fuel tank.▪ Have an authorized Deutz service dealer examine the engine.
231	12, 9, or 14	Controller area network (CAN) bus communication fault.	<ul style="list-style-type: none">▪ Have an authorized Deutz service dealer examine the engine.
240, 253, or 254	2 or 12	Program logic or memory fault.	<ul style="list-style-type: none">▪ Turn OFF the system, then turn ON the system. If the fault persists, have an authorized Deutz service dealer examine the engine.
524287	31	No fault present.	<ul style="list-style-type: none">▪ No active faults are still present. Reset the control system if needed. See page 21.

Find system fault codes in events history

The system records and saves faults that occur – even those that cause the engine to shut off. You can access the fault details via the system controller's LCD screen when you need that information for troubleshooting.

1. Turn ON (I) the power switch.

2. Press the **ENTER** button to display the menu commands on the LCD screen.

 If AUTO mode is enabled on the system controller, press the **OFF** button. Then press the **ENTER** button to display the menu commands.

3. Use the arrow buttons to navigate to the **Events History** command.

4. Press the **ENTER** button to display the system's events history, which includes fault notifications. The most recent events are listed first. Use the arrow buttons to scroll through the list.

As shown in Figure 7, 2 types of fault notifications display in events history:

- ❑ **WARNING** and **FAULTS** notifications represent predefined operating thresholds that were met or exceeded. See *System faults triggered by predefined thresholds* on page 23.
- ❑ **Check Engine** notifications include SPN and FMI codes and are specific to the engine. See *Active faults and cleared faults* on page 22 and *Engine faults (SPN and FMI codes)* on page 25.

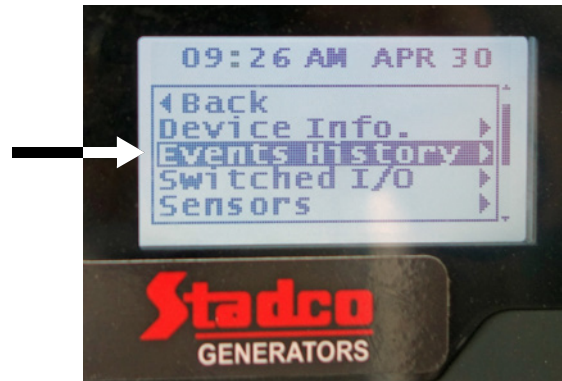
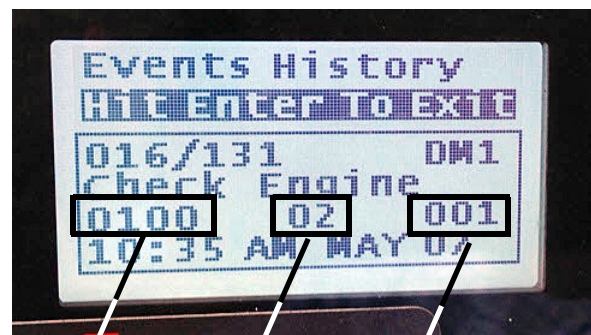
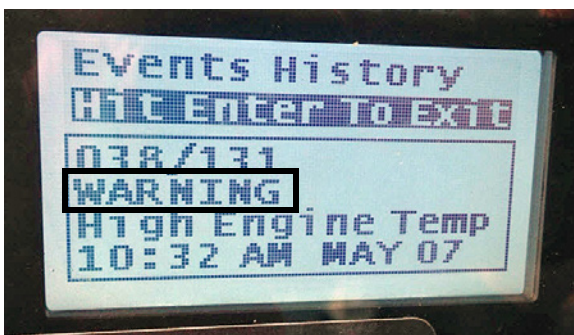


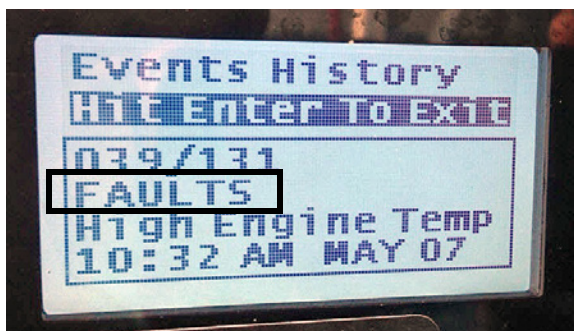
Figure 7 – Faults recorded in events history



SPN code

FMI code

Occurrence count



Troubleshoot engine issues

Reset emergency air intake shutoff valve (if equipped)

Your system may include an emergency air intake shutoff valve that stops the flow of air to the engine in case of a “runaway engine.”

If the air intake shutoff valve was engaged (closed), use the following procedure to reset (open) the valve:

1. Make sure the system is OFF.
2. Remove the service panel on the plasma side of the system.
3. Pull down the black handle at the bottom of the shutoff valve, and hold it in place. Turn the **RESET** switch at the top of the valve 90° counterclockwise. Release the black handle.
4. Put the service panel back in place.

Figure 8 – Air intake shutoff valve CLOSED

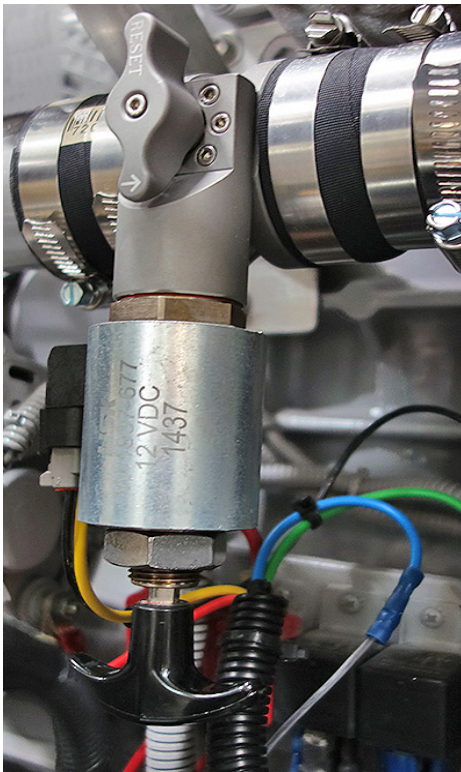
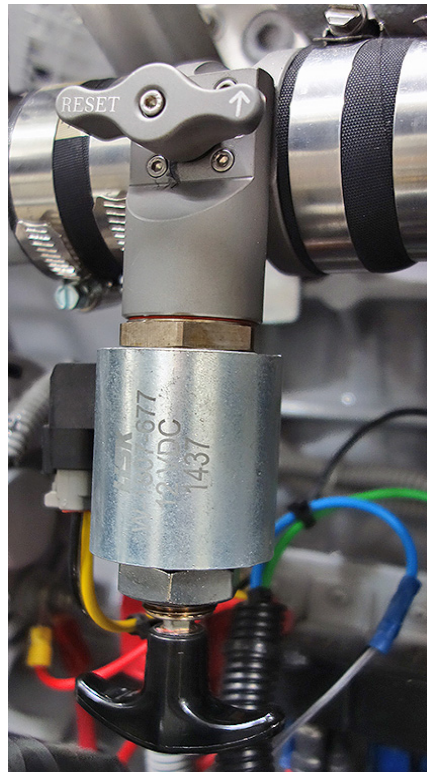


Figure 9 – Air intake shutoff valve OPEN



Engine will not start

By default, the system cranks for 15 seconds, then pauses for 15 seconds before it tries to start the engine again.

If the engine fails to start at the end of a second consecutive 15-second crank cycle:

- The engine stops cranking.
- The “Crank failed” warning notification displays on the LCD screen.

When this fault condition occurs, the control system must be reset. See *Reset the control system* on page 21.

If the engine still will not start, do the following checks in the order listed:

1. Does the engine crank but not start, or does the engine make a clicking sound and not crank at all?
 - If the engine cranks but does not start, continue with the next step.
 - If the engine makes a clicking sound and does not crank (and battery voltage is good), the starter may be faulty. First clean and tighten the connections on the battery, then jump-start the battery. See page 32. If the engine still does not crank, have an authorized Deutz service dealer examine the starter.

2. Are you trying to start the engine in very cold temperatures?

- If yes, use winter-grade diesel fuel. Summer-grade fuel can “gel” and clog the fuel filter. Install a new Deutz-brand fuel filter, if needed. See *Change the fuel filter in the engine* on page 73.


A lighter grade oil can be used in cold climates to help maintain sufficient lubrication and ease of engine starting. Refer to the Deutz engine operator manual for winter lubricating oil specifications.

- Run 2 preheat cycles. After the first cycle starts but before the engine cranks press **STOP** on the controller. Press **RUN** to initiate another cycle and then let the engine start. This extended heating of the manifold should help the engine start in very cold conditions.

Do not use ether to help start the engine in extremely cold temperatures. Doing so can result in severe damage to the engine.

- If no, continue with the next step.

3. Check the fuel level. See page 21. Make sure the engine has enough fuel. Add clean, low-sulfur diesel fuel as needed. Do not overfill the fuel tank.

 The “Under Speed” fault notification can indicate that the engine is low on fuel.

4. Does the system controller turn ON?

- If yes, continue with the next step.
- If no, check the 12 V circuit breaker on the front panel to see if it tripped. Reset the circuit breaker by pressing the extruded **RESET** button in the center of the circuit breaker.



5. Do any fault notifications display on the system controller’s LCD screen?

- If yes, clear the fault condition before starting the engine. Some faults cause the engine to shut off (for example, if the engine temperature is too high or the oil pressure is too low). See *System faults* on page 22.
- If no, continue with the next step.

1 – Troubleshooting

6. Check the electrical connectors on the battery. Tighten as needed. See page 69.
7. Does the battery have enough power (12 V) to start the engine?
 - ❑ If yes, continue with the next step.
 - ❑ If no, jump-start or replace the battery. See *Jump-start the battery* on page 32 or *Replace the battery* on page 89.
8. Use the hand pump to bleed the fuel system. See page 31.
9. Check the fuel filter. If it is clogged or damaged, install a new one. See page 73.
10. Clean the fuel pump screen. See page 75.
11. If none of these steps resolve the issue, have an authorized Deutz service dealer examine the engine.

Keep the fuel system clean

Many common problems with diesel engines are caused by the following fuel-related problems:

- Using the wrong fuel



Bio-diesel fuel is not recommended for this engine.

- Using poor quality fuel
- Allowing water to enter the fuel line
- Using the wrong fuel filter
- Using a fuel filter for too long without replacing it

To keep the fuel system clean and the engine running properly:

- Use only clean, low-sulfur diesel fuel.
- Keep fuel storage containers clean and free from water and other contaminants.
- Use only Deutz-brand fuel filters.
- Replace the fuel filter regularly. See *Maintenance schedules* on page 53.

Use the hand pump to bleed the fuel system

You may have trouble starting the engine if:

- The fuel level in the engine is very low.
- You recently worked on some part of the fuel system.
- The system has not been used for a long period of time.

If you have trouble starting the engine, use the hand pump to bleed the fuel system.






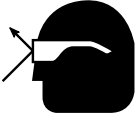
If you frequently need to bleed the fuel system in order to start the engine, this may indicate an air leak in the fuel line. Have an authorized Hypertherm Freedom 38 PPA repair facility examine the fuel supply lines, or have an authorized Deutz service dealer examine the engine.



1. Turn OFF the system.
2. Remove the service panel on the generator side of the system.
3. Push in the hand pump several times in quick succession until you feel a resistance and until you no longer hear fuel moving through the fuel supply lines.
4. Start the engine, but leave the main circuit breaker and the transformer circuit breaker off. Run the engine without load for 2–3 minutes. This allows air to return to the fuel tank via the return fuel line.
5. Put the service panel back in place.










Hand pump

Jump-start the battery

		WARNING! RISK OF EXPLOSION – WEAR EYE PROTECTION
		Always wear eye protection when jump-starting or charging the battery. When a lead acid battery is charged or discharged, an explosive chemical change occurs. If anything is present that ignites this explosive gas, the explosion can throw sulfuric acid into your eyes, causing blindness.

		CAUTION!
<p>Follow these precautions when jump-starting or charging the battery.</p> <p>ALWAYS:</p> <ul style="list-style-type: none"><input type="checkbox"/> Make sure the system and all electrical accessories are OFF before attaching jump-start cables.<input type="checkbox"/> Attach the negative (-) ground cable last, and remove it first.<input type="checkbox"/> Use ONLY equal voltage for jump-starting. Using higher voltage will damage the electrical system. <p>NEVER:</p> <ul style="list-style-type: none"><input type="checkbox"/> Reverse the battery cables. Doing so can damage the alternator.<input type="checkbox"/> Remove the vent caps from the battery.<input type="checkbox"/> Check the battery by producing sparks between the positive (+) and negative (-) posts.		

	WARNING!
     	<p>RISK OF FIRE OR EXPLOSION – WEAR PROTECTIVE CLOTHING</p> <ul style="list-style-type: none"> ■ Turn OFF the engine before performing any battery checks or maintenance. ■ Avoid contact with sulfuric acid from the engine's battery. It can cause serious injury if it comes in contact with eyes or skin. ■ Always wear protective glasses, gloves, and clothing when servicing the battery. ■ Wash your hands thoroughly after touching the battery and its connectors. ■ Examine the battery regularly to make sure: <ul style="list-style-type: none"> ❑ All electrical connections are clean and secure. Loose connections can cause sparks that result in a fire. See Check the battery and cable connectors on page 69. ❑ None of the electrical wires are frayed. Replace any frayed wires before starting the engine. ■ When the battery is charged or discharged, an explosive chemical change occurs. Avoid all conditions that can ignite this explosive gas: <ul style="list-style-type: none"> ❑ Keep any open flames or sparks away from the top of the battery. ❑ Do not smoke cigarettes near a battery that is being charged. ❑ Never place a metal object across the battery's terminal posts to check its charging status. Instead, use a voltmeter or hydrometer. ❑ Never charge a frozen battery. ❑ Never charge a battery in an enclosed room that lacks proper ventilation. ❑ Never disconnect any charging unit circuit or battery circuit cable from the battery while it is being charged. Doing so can produce dangerous sparks. ■ Apply the cable connections correctly if you jump-start the battery. Attach the negative (-) ground cable last, and remove it first. ■ Always dispose of old batteries in compliance with local and national regulations. ■ Examine the chassis ground strap connection regularly. Without a solid ground strap connection, electrical discharge can damage the engine and electrical system.

This system requires a 12 VDC battery with a capacity of 750 cold cranking amperes (CCA).

If the battery is severely discharged, the alternator may not be able to fully recharge the battery, even after jump-starting. In this case, fully charge the battery to the correct voltage with a battery charger (with the engine turned off), or install a new battery. See *Replace the battery* on page 89.

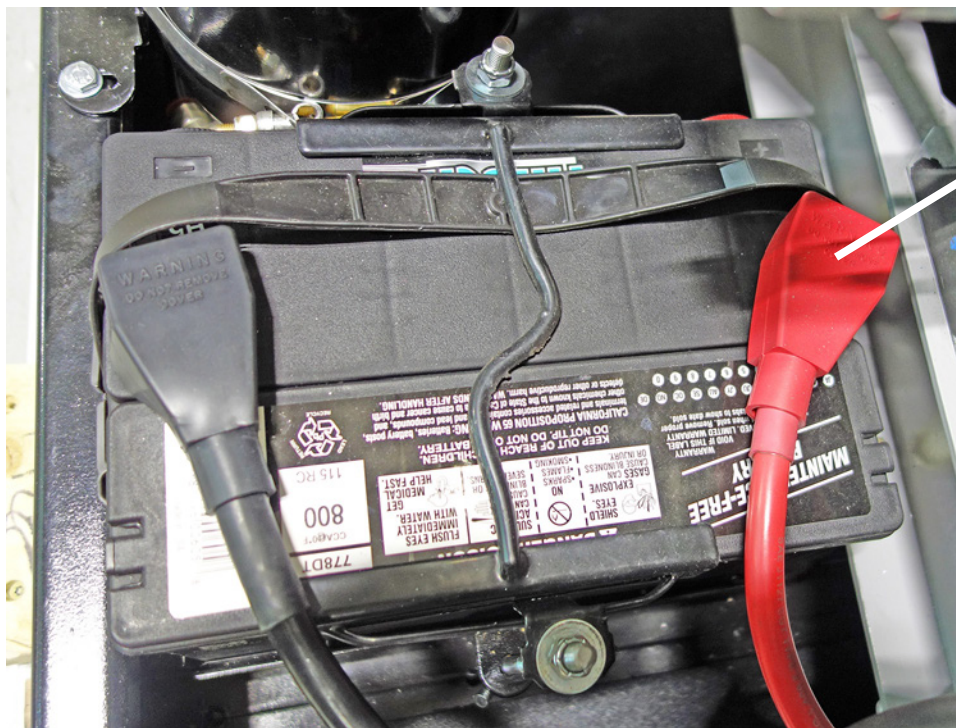


Always dispose of old batteries in compliance with local and national regulations.

1 – Troubleshooting

1. Turn OFF the system.
2. Remove the service panel on the plasma side of the system.
3. Connect one positive (+) end of the jump-start cable to the positive (+) cable terminal of the battery in the system. See *Figure 10*. Connect the other positive (+) end of the jump-start cable to the positive (+) cable terminal of the electrical source.
4. Connect one negative (-) end of the jump-start cable to the negative (-) cable terminal of the electrical source. Connect the other negative (-) end of the jump-start cable to the engine block or to the chassis ground.
5. Turn ON the system and start the engine.
6. As soon as the engine starts, disconnect the jump-start cables in the reverse order of that listed in *step 3* and *step 4*. **Make sure the first cable you disconnect is the negative (-) cable connected to the engine block or chassis ground.**
7. Put the service panel back in place.

Figure 10



Connect positive (+) cable here

Common engine and generator issues

Problem	Solutions
The engine emits a lot of black smoke.	<ul style="list-style-type: none"> Black smoke indicates a fuel-related issue. There is too much fuel in the fuel system or not enough air. The engine is wet stacking and should be run under a heavy load. The diesel engine is meant to operate optimally at moderate to heavy loads. Running under a light load or no load for extended periods of time may cause wet stacking or other engine damage. Do not idle the engine longer than necessary. If the problem persists, have an authorized Deutz service dealer examine the engine.
The engine emits blue smoke.	<ul style="list-style-type: none"> In many cases, blue smoke indicates that the engine is burning oil. This problem can be caused, or made worse, by using the wrong engine oil and oil filter. Use only Deutz-brand oil and filters. Alternately, the following oils from Shell can also be used: ROTELLA® T Triple Protection®, ROTELLA T3, or ROTELLA T4 Triple Protection. See page 70. If the problem persists after changing the oil and filter, have an authorized Deutz service dealer examine the engine.
The fuel filter gets clogged in cold weather.	<ul style="list-style-type: none"> If the fuel tank contains summer-grade fuel, the cold temperatures can cause some of this fuel to “gel.” This thicker fuel can clog the fuel filter. Add winter-grade diesel fuel to the fuel tank, and install a new Deutz-brand fuel filter. See <i>Change the fuel filter in the engine</i> on page 73.
When you try to turn on the system, the engine clicks but does not crank. Voltage is present.	<ul style="list-style-type: none"> Check the connections on the battery. Clean and tighten the connectors as needed. See page 69. Jump-start or charge the battery. See page 32. Have an authorized Deutz service dealer examine the engine.
The 120 V auxiliary outlet is not working.	<ul style="list-style-type: none"> Make sure the transformer circuit breaker on the front panel is turned ON (I). This switch must be turned on before you can use the 120 V auxiliary outlet. Test the GFCI protection on the 120 V auxiliary outlet. See page 66. If the outlet still does not work, it may be faulty. Replace the 120 V auxiliary outlet.
The system controller LCD screen does not display output current (amperage) for the generator.	<ul style="list-style-type: none"> Make sure the transformer circuit breaker on the front panel is turned ON (I). This switch must be turned on in order to view the generator's output current on the system controller.

Troubleshoot air flow issues (air compressor)

The air pressure for this system must be between 5.9 bar – 9.3 bar (85 psi – 135 psi) to operate the on-board plasma cutting system.



If needed, you can use the plasma cutting system to test whether proper air flow is reaching the torch. See *Run a gas test* on page 46.

If the system's air pressure is too low, if there is no air pressure at all, or if the 0-12, 0-20, or 0-22 fault code displays on the plasma cutting system's LCD screen, do the following checks in the order listed:

1. Does the 0-12 fault code display on the plasma cutting system's LCD screen?

- ☐ If yes, install a new air filter element in the plasma cutting system. See page 114.
- ☐ If no, continue with the next step.

2. Turn off the system. Inspect the consumables in the torch. Are they installed incorrectly?

- ☐ If yes, remove the consumables, then install them properly.
- ☐ If no, continue with the next step.

3. Inspect the torch. Are there any signs of damage that might be causing air to leak?

- ☐ If yes, have a Hypertherm distributor or authorized repair facility examine the torch and torch lead.
- ☐ If no, continue with the next step.



If you have another torch available, you can also connect that to the plasma supply to see if the same problem occurs.

4. Is the valve open that is used to drain condensate from the air tank?

- ☐ If yes, rotate the lever underneath the front panel to close the valve. See *Drain the condensate from the air tank* on page 61.
- ☐ If no, continue with the next step.

5. Is the valve open that is used to drain condensate from the air/oil separation tank?

- ☐ If yes, close the valve underneath the tank. See *Drain the condensate from the air compressor's air/oil separation tank* on page 65.
- ☐ If no, continue with the next step.

6. Check the oil level in the air compressor. Is the oil level too low?

- ☐ If yes, add oil to the compressor's air/oil separation tank, as needed. See *Check the oil level in the air compressor* on page 63.
- ☐ If no, continue with the next step.

7. Is the primary filter in the engine air cleaner clogged or damaged?

- ☐ Filtered air from the primary and safety filters is used by both the engine and the compressor. If the engine primary filter is clogged or dirty, use moisture-free compressed air to gently clean it. Do not remove the safety filter. See *Service the engine air cleaner* on page 76.

If the primary filter is damaged, install a new one. If the safety filter is damaged, replace it too; otherwise, do not remove the safety filter. See *Service the engine air cleaner* on page 76.

- ☐ If no, continue with the next step.

8. Is the air drying filter clogged or damaged?

- ☐ If yes, install a new filter. See *Replace the air drying filter* on page 67.
- ☐ If no, continue with the next step.

9. Is the air compressor's oil separation filter clogged or damaged?

- ☐ If yes, install a new filter. See *Change the oil separation filter in the air compressor* on page 81.
- ☐ If no, continue with the next step.

10. Is the air compressor's oil filter clogged or damaged?

- ☐ If yes, install a new filter. See *Change the oil and oil filter in the air compressor* on page 78.
- ☐ If no, continue with the next step.

11. Is the air pressure between 5.9 bar – 9.3 bar (85 psi – 135 psi)?

- ☐ If yes, continue with the next step.
- ☐ If no, replace the unloader valve. See page 172.

12. Is the air compressor's belt loose, worn, or damaged?

- ☐ If yes, tighten or replace the belt. See page 160.
- ☐ If no, continue with the next step.

13. Is the scavenge orifice loose or missing?

- ☐ If yes, tighten or install the scavenge orifice. See page 166 and page 169.
- ☐ If no, continue with the next step.

14. Is the separation tank release valve releasing air but there is no pressure on the front panel gauge?

- ☐ If yes, check for clogged airlines. Check the unloader valve and scavenger line orifices for blockage or ice. Check the minimum pressure relief valve on the separation tank manifold.
- ☐ If no, continue with the next step.

15. Is the ambient temperature cold enough for water in the system to freeze?

- ☐ If yes, allow the system to thaw. Ice can impede the compression system's operation.
- ☐ If none of these steps resolve the issue, the air compressor itself may be faulty. Replace the air compressor. See page 161.

Troubleshoot power-related issues (generator/alternator)

To troubleshoot possible power-related issues with the generator/alternator, do the following checks in the order listed:


1. Is the engine running, and are the main circuit breaker (top) and the transformer circuit breaker (bottom) turned ON (I)?
 - ❑ If yes, continue with the next step.
 - ❑ If no, make sure the main circuit breaker (top) and the transformer circuit breaker (bottom) are turned ON (I). If the engine is not running, check the engine to see if it requires maintenance. See *Troubleshoot engine issues* on page 28.

2. Are you using the auxiliary outlets to power external devices?

- ❑ If yes, disconnect the devices from the auxiliary outlets. You can exceed the generator's output capacity if you power external devices from the auxiliary outlets while running the on-board plasma cutting system at full output.
- ❑ If no, continue with the next step.

3. Did the circuit breaker for the 120 V auxiliary outlet trip?

- ❑ If yes, reset the circuit breaker by pressing the button above the 120 V outlet.
- ❑ If no, continue with the next step.

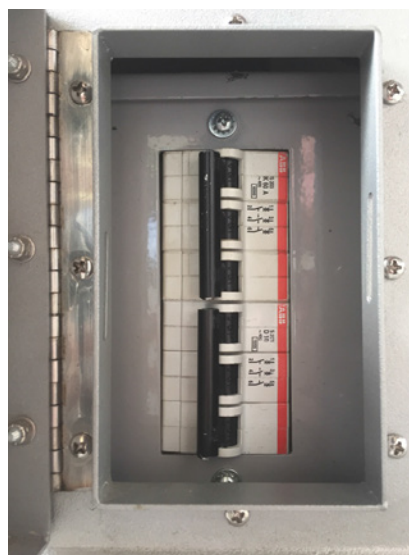
 The transformer circuit breaker on the front panel must be turned ON (I) in order to use the 120 V auxiliary outlet.

4. Did the main circuit breaker or the transformer circuit breaker trip?

- ❑ If yes, turn OFF the on-board plasma cutting system by turning OFF (O) its power switch. Remove any source of external load from the generator. Reset the main circuit breaker and the transformer circuit breaker. Turn the plasma cutting system back ON (I).
- ❑ If no, continue with the next step.

5. Is the system controller displaying a generator voltage of 480 V for each phase, AC frequency of 60 Hz, and an engine speed of 1800 RPM? Use the LCD screen on the system controller to check. See *Check engine and generator status* on page 21.

- ❑ If yes, continue with the next step.
- ❑ If no, have an Hypertherm Freedom 38 PPA repair facility examine the system.



OFF (O) ↔ ON (I)



6. Is the automatic voltage regulator (AVR) configured properly for this system? See page 134.

- ❑ If yes, continue with the next step.
- ❑ If no, examine all settings on the AVR to make sure they are correct.

7. Is the automatic voltage regulator (AVR) faulty?

- ❑ If yes, replace the AVR. See page 133.
- ❑ If no, have an Hypertherm Freedom 38 PPA repair facility examine the generator/alternator.



If the problem is isolated to the 120 V auxiliary outlet the transformer may be faulty.



Troubleshoot plasma cutting issues

The following table provides an overview of the most common problems that can arise when using the plasma cutting system and explains how to solve them.



Fault icons and corresponding fault codes appear in the LCD screen on the plasma cutting system. See *Plasma cutting system fault codes and solutions* on page 41.



If a fault occurs, turn OFF the system, wait 60 to 70 seconds, and turn ON the system.

If you are unable to fix the problem by following this basic troubleshooting guide, or if you need further assistance:

1. Call your Hypertherm distributor or authorized Hypertherm repair facility.
2. Call the nearest Hypertherm office listed in the front of this manual.

Common cutting issues

Problem	Solutions
The arc does not transfer to the workpiece.	<ul style="list-style-type: none">▪ Clean the area where the ground clamp contacts the workpiece to ensure a good metal-to-metal connection.▪ Inspect the ground clamp for damage, and repair as necessary.▪ The pierce-height distance may be too large. Move the torch closer to the workpiece and fire the torch again.
The arc blows out, but re-ignites when the torch trigger is pressed again.	<ul style="list-style-type: none">▪ Inspect the consumable parts and replace them if they are worn or damaged. See <i>Inspect the plasma torch consumables</i> on page 60.▪ Replace the air filter element in the back of the plasma supply if it is contaminated. See page 114.
The cut quality is poor.	<ul style="list-style-type: none">▪ Make sure the torch is being used correctly. Refer to the <i>Hand Cutting or Mechanized Cutting</i> section in the <i>Powermax125 Operator Manual</i>.▪ Inspect the consumables for wear and replace as necessary. See <i>Inspect the plasma torch consumables</i> on page 60.▪ Make sure the cutting mode switch is in the proper position for the cutting operation.▪ Make sure the correct consumables are installed.

Plasma cutting system fault codes and solutions

The following table provides suggestions for solving several common faults related to plasma power and air flow.

A label with descriptions for these common fault codes can be found inside the front cover of the *Powermax125 Operator Manual*. You can peel off the label and place it on the system's top cover or side panel for reference.









For a complete list of all fault codes, and for additional troubleshooting guidelines related to the plasma cutting system, refer to the *Powermax125 Service Manual* (808070). You can download this manual from www.hypertherm.com.









If a fault occurs, turn OFF the system, wait 60 to 70 seconds, and turn ON the system.

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-12	Low input air pressure or unstable air pressure: Warning (the system continues to operate)	On	Off		<ul style="list-style-type: none"> The air inlet pressure is below the minimum 5.9 bar (85 psi) required to operate the plasma cutting system. Check the system's air flow components. You may need to install a new air filter element in the plasma cutting system. See <i>Troubleshoot air flow issues (air compressor)</i> on page 36.
0-13	AC input unstable: Warning (the system continues to operate)	Blinks (3 Hz)	Off		<ul style="list-style-type: none"> Check the generator/alternator for possible power-related issues. See <i>Troubleshoot power-related issues (generator/alternator)</i> on page 38.
0-19	Power board hardware protection. One or more power board hardware faults (or noise) detected.	On	On		<ul style="list-style-type: none"> The inverter shuts down and does not fire again for several seconds. If the fault is caused by electrical noise, the fault clears in a few seconds and the machine operates normally. A true 0-19 fault may display for up to 60 seconds before fault code 0-99 displays on the operator screen. A qualified service technician must service the plasma cutting system. Contact your Hypertherm distributor or authorized repair facility. 0-19 can indicate a fault that occurs 10 times without removing power. Fault code 0-99 displays. A qualified service technician must service the plasma cutting system. Contact your Hypertherm distributor or authorized repair facility.

1 – Troubleshooting

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-20	Low air pressure	On	On		<ul style="list-style-type: none"> Make sure the compressed air hose is connected to the back of the plasma supply. Adjust the air pressure to the acceptable range using Manual mode. Refer to the <i>Basic System Operations</i> section in the <i>Powermax125 Operator Manual</i>. Perform a quick restart. Make sure the air compression system is working. See <i>Troubleshoot air flow issues (air compressor)</i> on page 36.
0-21	Excessive arc voltage change: check consumables, air flow	On	On		<ul style="list-style-type: none"> Restore the air inlet pressure and restart the plasma supply. Check the torch lead for leaks or kinking. Change consumables.
0-22	No air input	On	On		<ul style="list-style-type: none"> Connect the compressed air hose to the back of the plasma supply, then restart the plasma supply. Make sure the air compression system is working. See <i>Troubleshoot air flow issues (air compressor)</i> on page 36.
0-30	Torch consumables stuck This indicates either a “torch stuck open” or a “torch stuck closed” situation.	On	On		<ul style="list-style-type: none"> If the consumables became loose or were removed while the plasma supply was ON, turn OFF the power, correct the problem and then turn ON the power to clear this fault. Change consumables. If the consumables appear to be installed correctly, the torch may be damaged. Contact your Hypertherm distributor or authorized repair facility.
0-32	End of consumable life	On	On		<ul style="list-style-type: none"> Replace the electrode and nozzle. Check the remaining consumables for wear and replace as needed.
0-40	Over/under temperature	On	On		<ul style="list-style-type: none"> Leave the system ON to allow the fan in the plasma supply to cool the plasma supply. If the internal temperature of the plasma supply approaches -30°C (-22°F), move the system to a warmer location.

Fault code	Description	Power LED	Fault LED	Fault icon	Solutions
0-50	Retaining cap off	On	On		<ul style="list-style-type: none"> Turn OFF (O) the system. Verify that the consumables are installed correctly in the plasma torch. Turn the system back ON (I). If the consumables appear to be installed correctly, the torch may be damaged. Contact your Hypertherm distributor or authorized repair facility.
0-51	Start/trigger signal on at power up This situation indicates that the plasma supply is receiving a start signal. It is sometimes referred to as a “stuck start.”	On	On		<ul style="list-style-type: none"> If the system is turned on while the torch trigger is pressed, the plasma cutting system is disabled. Release the trigger and recycle the power switch on the back of the plasma supply (or turn the system OFF and then back ON again).
0-52	Torch not connected	On	On		<ul style="list-style-type: none"> Plug a torch lead into the FastConnect receptacle on the front of the plasma supply and recycle the power switch on the back of the plasma supply.
0-60	AC input voltage error	On	On		<ul style="list-style-type: none"> This fault code displays when you turn OFF (O) the main circuit breaker and the transformer circuit breaker while the engine and generator are running. Wait approximately 1 minute to allow the fault to clear on its own before turning ON (I) the main circuit breaker and the transformer circuit breaker and starting to cut again. If the fault persists, check the generator/alternator for possible power-related issues. See <i>Troubleshoot power-related issues (generator/alternator)</i> on page 38.
0-61	AC input unstable: Shutdown	On	On		<ul style="list-style-type: none"> Check the generator/alternator for possible power-related issues. See <i>Troubleshoot power-related issues (generator/alternator)</i> on page 38.
0-99	System hardware fault – service required Indicates a major fault with the system.	On	On		<ul style="list-style-type: none"> A qualified service technician must service the plasma cutting system. Contact your Hypertherm distributor or authorized repair facility.

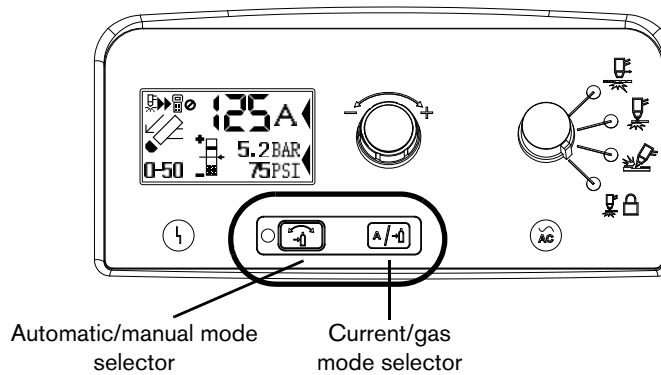
1 – Troubleshooting

Display the service screen on the plasma cutting system

You can view system information that aids troubleshooting by accessing the service screen on the plasma cutting system. This screen displays recent fault codes, arc hours, the software version your system is running, and several additional details. You can also run a gas test from this screen.

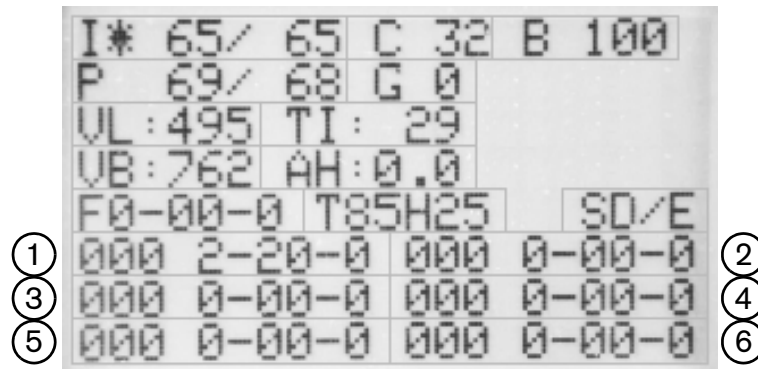
For example, if a fault code displays on the status screen (in the format *N-nn*) while you are operating the system, you can check the service screen for an additional four-digit fault code (in the format *N-nn-n*). If qualified service technicians must service the system, these four-digit fault codes help them diagnose the problem.

To display the service screen, simultaneously press the **automatic/manual** and **current/gas** mode selectors for approximately two seconds.



To navigate the service screen, move the field selector (*) between fields by pressing the **current/gas** mode selector. The asterisk (*) indicates the selected field.

To exit the service screen, simultaneously press the **automatic/manual** and **current/gas** mode selectors. The operator screen displays.



Designator	Description
I	Current set/read
C	LCD contrast
B	LCD brightness (percent)
P	Pressure set/read
G	Gas test enable (1)/disable (0)
VL	Incoming AC line voltage
TI	Inverter module temperature (°C)
VB	DC bus voltage
AH	Arc hours
F	Live four-digit fault code for diagnosing system errors
T	Torch identifier (amperage/hand (H) or machine (M)/lead length in feet)
S	DSP/control board software versions
(callouts 1 – 6)	Fault log of recent fault codes recorded by the system (0-00-0) and the last three digits of the arc hour count when the fault occurred (000).

1 – Troubleshooting

Run a gas test

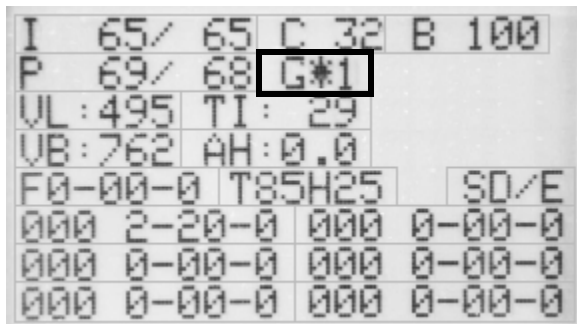


CAUTION!

Point the torch away from you before performing a gas test. Always keep hands, clothes, and objects clear of the torch tip, and never point the torch toward yourself or others.

1. Display the service screen on the plasma cutting system by simultaneously pressing the **automatic/manual** and **current/gas** mode selectors for approximately two seconds.
2. Select the gas test field by pressing the **current/gas** mode selector until the asterisk (*) is next to the "G."
3. Use the adjustment knob to set the gas test field from 0 to 1.

If gas does not flow, call your Hypertherm distributor or authorized repair facility, or call the nearest Hypertherm office listed in the front of this manual.



4. Use the adjustment knob to set the gas test field back to 0.
5. Simultaneously press the **automatic/manual** and **current/gas** mode selectors to exit the service screen.

Find serial numbers

The system has its own serial number. Each major component also has its own serial number.






The following topics show where to find each serial number. You may need these numbers if you contact the manufacturers with warranty or support questions.

For instructions on how to remove the cover from the system, see *Remove and install the system's cover* on page 86.

Serial number for the system

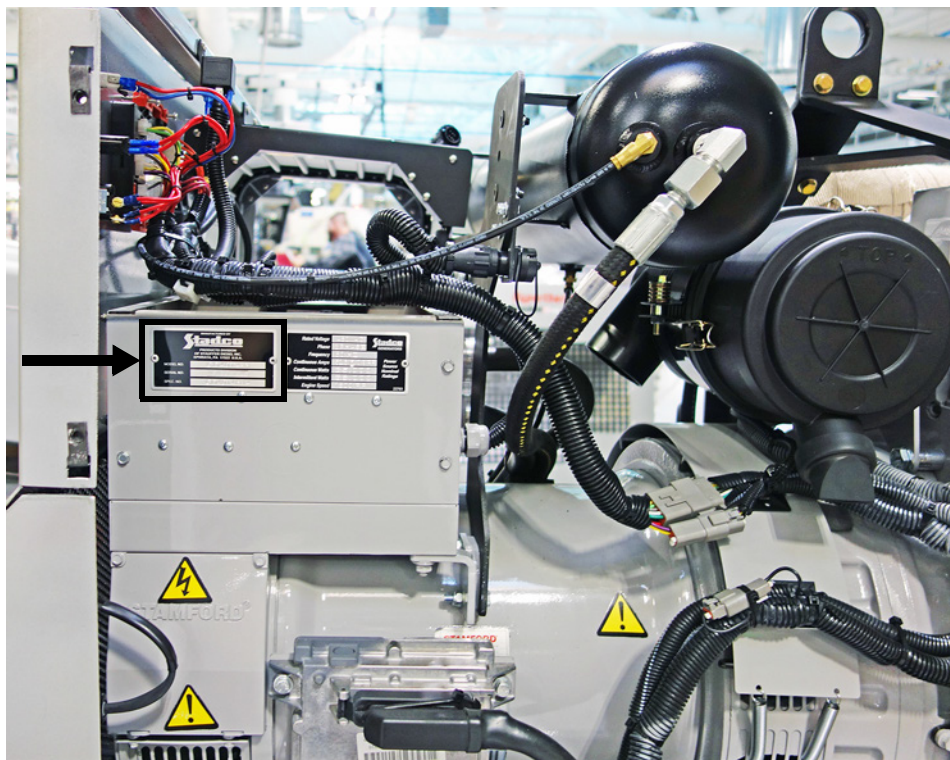
The serial number for the system is located on the system's data plate. The data plate is located in 2 places:

- On the system's front panel
- On the lift-eye frame on the generator side of the system.

Hypertherm		30A / 92V- 125A / 130V			
Freedom38 PPA™ P/N: 062XXX		 U_o 320V	X@40°C	100%	
Engine-driven plasma cutting system 2010 May, 30 East Westerville, OH 43081-9999, USA			HYP I ₂	125A	
Engineered and assembled in USA Country of origin: USA Système de coupe au plasma à moteur 2010 May, 30 East Westerville, OH 43081-9999, États-Unis			HYP U ₂	175V	
Conçu et assemblé aux États-Unis Pays d'origine: États-Unis			IEC I ₂	125A	
S/N FRD38-999999XX		 U_o 320V	X@40°C	100%	
ANSI / IEC 60974-1			IEC I ₂	125A	
UL60974-1			IEC U ₂	150V	
		IP23CS 210383 REV1			
		 3~60 Hz	n =		
			n _o =	n _i =	P _{1max} =
		PATENTS: CURRENT LIST AT WWW.HYPERTHERM.COM/PATENTS/			
		 			

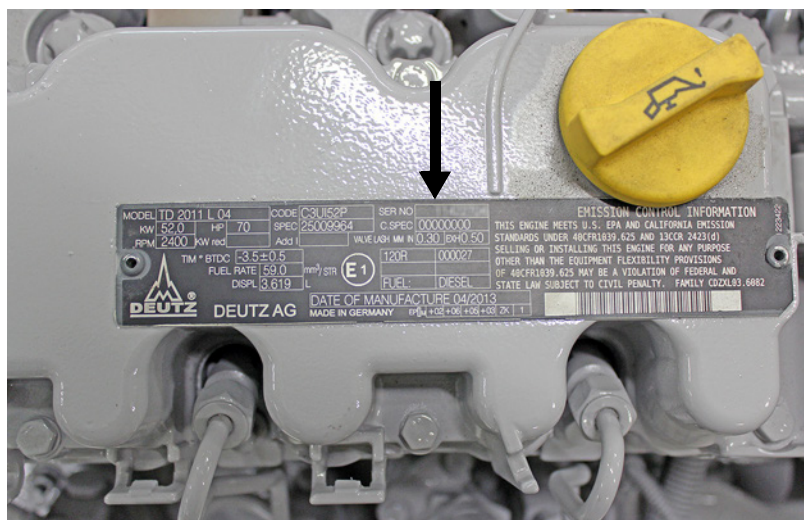
Serial number for the generator

The serial number for the generator is located on the generator near the front panel. You may need to remove the cover on the generator side of the system to see the serial number.



Serial number for the engine

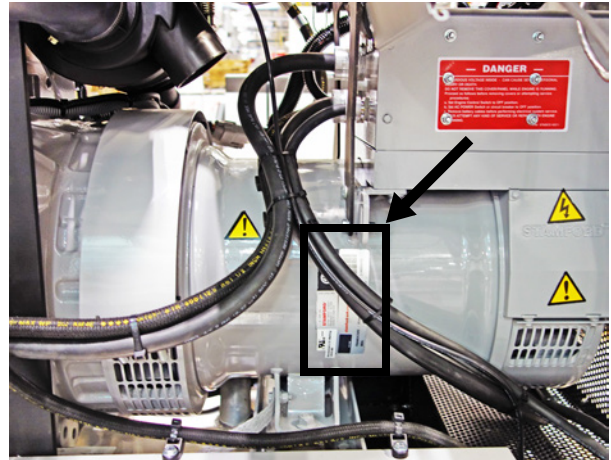
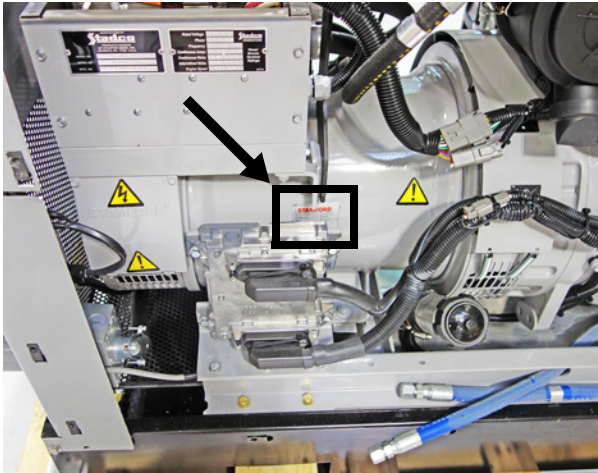
The serial number for the engine is located on top of the engine near the rear panel. Remove the top cover from the system to see the serial number.



Serial number for the alternator

The serial number for the alternator is located in 2 places:

- On the outer side of the alternator behind the fuel tank fill valve. You may need to remove the cover on the generator side of the system to see this serial number.
- On the inner side of the alternator behind the plasma cutting system. Move the plasma cutting system to see this serial number. You may also need to remove the cover on the plasma side of the system.



Serial number and version numbers for the system controller

When you select the device information command on the system controller's LCD screen, you can see the controller's:

- Serial number
- Hardware version
- Software version



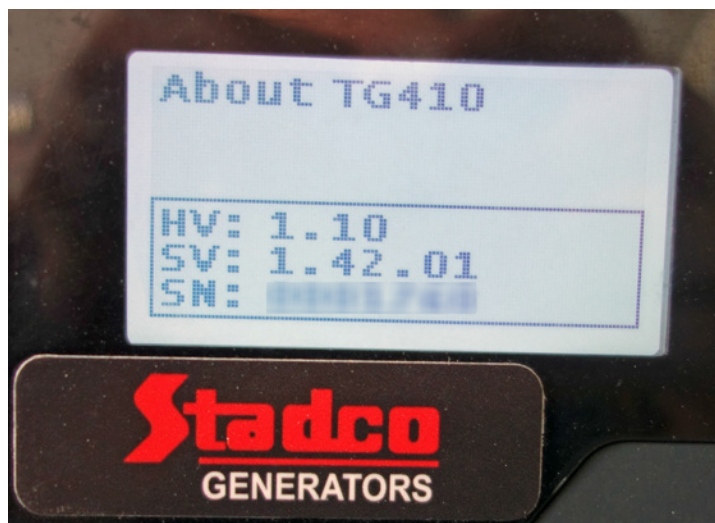
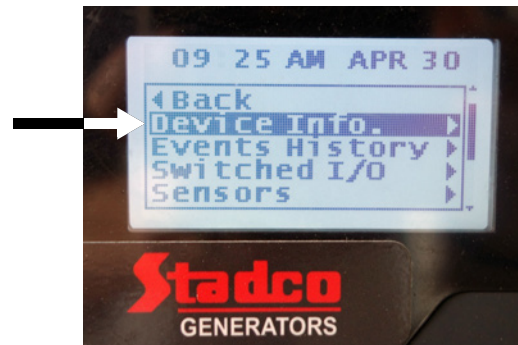
You can also find the serial number on the back of the system controller. Lift up or remove the top cover to see this serial number.

1. Set the power switch to the ON (I) position.
2. Press the **ENTER** button to display the menu commands on the LCD screen.



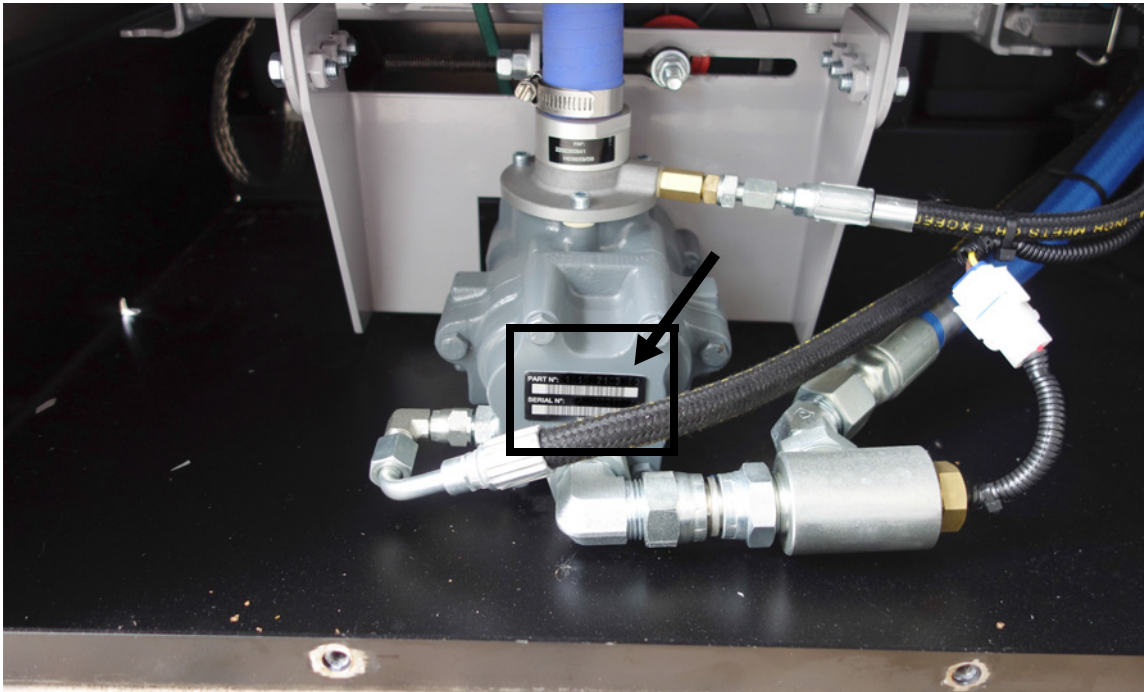
If AUTO mode is enabled on the system controller, press the **OFF** button. Then press **ENTER** to display the menu commands.

3. Use the arrow buttons to navigate to the **Device Info** command.
4. Press the **ENTER** button to display the system controller's hardware version (HV), software version (SV), and serial number (SN).



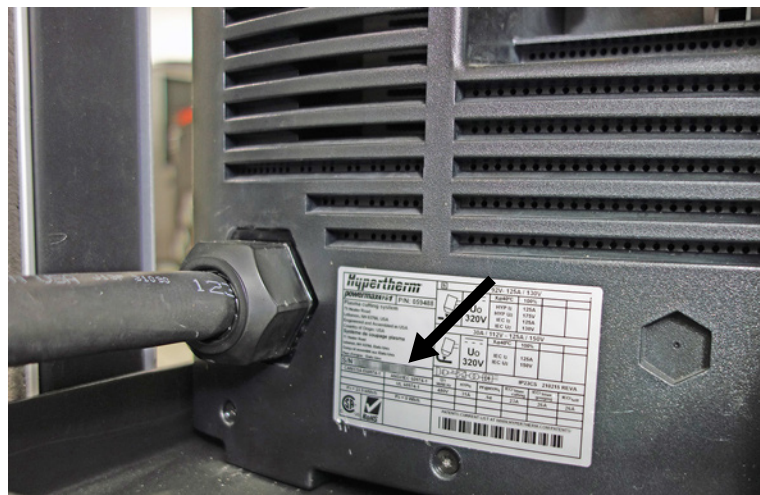
Serial number for the air compressor

The serial number for the air compressor is located on the air compressor at the base of the system behind the rear panel. Remove the rear panel to see the serial number.



Serial number for the plasma cutting system

The serial number for the plasma cutting system is located on the data plate on the system's rear panel, next to its power cord.



Section 2

Routine Maintenance

Maintenance schedules

The maintenance intervals in this section apply for normal system use in normal environmental conditions. Adjust these intervals as needed to match the workload and conditions under which you are operating the system.

For example, clean or replace items more frequently if you operate the system in conditions that are extremely humid, extremely dusty or dirty, or at very high altitudes.



CAUTION!

To ensure safe operation of the system at all times, and to maximize the life of the product, use only replacement parts that are approved by the manufacturers.



CAUTION!




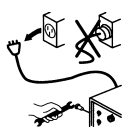



FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT

Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.

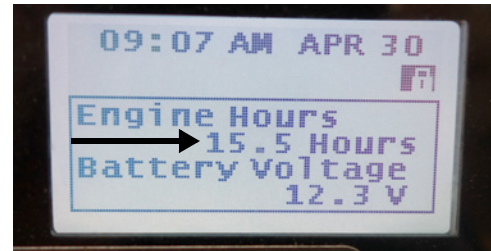
Wash thoroughly if your skin comes in contact with fuel or oil from the engine.

NOTICE

Do not use a pressure washer to clean the outside of the system.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system or from the plasma supply. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.
NOTICE	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

This system includes a service hour meter. You can view the engine's total operating hours on the system controller's LCD screen. See *Check engine and generator status* on page 21.



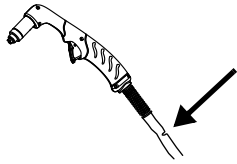
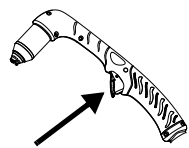
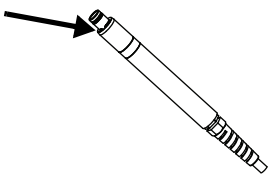
Every use	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"> ❑ Check the system controller for any fault LEDs or notifications. Correct any fault conditions.
Plasma cutting system	<ul style="list-style-type: none"> ❑ Check the plasma supply's front panel for any fault LEDs and its LCD screen for any fault icons. Correct any fault conditions. ❑ Inspect the consumables on the plasma torch for proper installation and wear. See page 60.
Air compressor	<ul style="list-style-type: none"> ❑ Drain condensate from the air tank. See page 61.

Every day	
System component	Recommended maintenance
System	<ul style="list-style-type: none"> ❑ Inspect the system for signs of wear or damage.
Engine/generator	<ul style="list-style-type: none"> ❑ Check the oil level in the engine. See page 62. ❑ Check the fuel level. The percentage of fuel remaining displays on the system controller's LCD screen. See page 21.

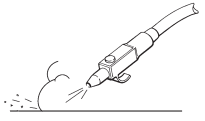
Every week	
System component	Recommended maintenance
Air compressor	<ul style="list-style-type: none"> ❑ Drain condensate from the air/oil separation tank. See page 65. ❑ Check the oil level in the air compressor. See page 63.

Every month	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"> ❑ Test the GFCI protection on the 120 V auxiliary outlet. See page 66.
Air compressor	<ul style="list-style-type: none"> ❑ Replace the air drying filter. See page 67.

2 – Routine Maintenance


Every 3 months (or 500 operating hours)	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"> ❑ Check the battery and electrical cable connectors. Tighten as needed. Replace any cracked or broken wires. See page 69. ❑ Change the oil and oil filter in the engine. At a minimum, change the oil and filter once per year. See page 70. Use only Deutz-brand oil and filters. Alternately, the following oils from Shell can also be used: ROTELLA T Triple Protection, ROTELLA T3, or ROTELLA T4 Triple Protection.
Air compressor	<ul style="list-style-type: none"> ❑ Adjust the tension of the air compressor belt.*
Plasma cutting system	<ul style="list-style-type: none"> ❑ Inspect the plasma torch lead. Replace if damaged.  ❑ Inspect the plasma torch trigger for damage. Inspect the torch body for cracks and exposed wires. Replace any damaged parts.  ❑ If applicable, inspect the screws on the machine torch that connect the torch body to the mounting sleeve. Tighten the screws, if needed. 

* Hypertherm strongly recommends that only authorized service technicians do this maintenance.

Every 6 months (or 1,000 operating hours)	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"> ❑ Change the fuel filter. See page 73. Use only Deutz-brand fuel filters. ❑ Clean the fuel pump screen. See page 75. ❑ Change the air cleaner filter.* At a minimum, change the primary filter once per year. Change the safety filter once for every 3 primary filter changes. See <i>Service the engine air cleaner</i> on page 76. ❑ Adjust the tension of the engine belt. ❑ Check the air hose clamps and connectors. Tighten as needed. ❑ Check the clearance of the valves. Adjust as needed.† ❑ Check the electrical heater plugs. At a minimum, replace the heater plugs once every 2 years. ❑ Check the mounting hardware and engine mounts. Tighten as needed.
Plasma cutting system	<ul style="list-style-type: none"> ❑ Clean the inside of the plasma supply with moisture-free compressed air or a vacuum. To do this maintenance, remove the plasma supply from the system. See page 115. 

* In very dusty or dirty environments, check the primary filter approximately once every 2 weeks. Use moisture-free compressed air to gently clean the filter, as needed. Do not remove the safety filter unless you are installing a new one.

† Have an authorized Deutz service dealer do this maintenance.

Every year (or 2,000 operating hours)	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"> ❑ Check the fuel tank. ❑ Clean the dust discharge valve. For optimum performance, clean the dust discharge valve any time you service the engine air cleaner. See page 76. ❑ Clean the heat exchanger. ❑ Check the electrical wiring and AC load cables. Tighten as needed. Replace any cracked or broken wires.
Air compressor	<ul style="list-style-type: none"> ❑ Change the oil and the oil filter in the air compressor.* At a minimum, change the oil and filter once per year. See page 78. <p> In very dusty or dirty environments, change the oil more than once per year.</p>

* Hypertherm strongly recommends that only authorized service technicians do this maintenance.

2 – Routine Maintenance

Every 3,000 operating hours	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"><input type="checkbox"/> Change the fuel injector nozzles.*<input type="checkbox"/> Make sure the electrical engine protection and monitoring devices are functioning properly.

* Have an authorized Deutz service dealer do this maintenance.

Every 4,000 operating hours	
System component	Recommended maintenance
Air compressor	<ul style="list-style-type: none"><input type="checkbox"/> Change the oil separation filter.* See page 81.<input type="checkbox"/> Clean the finned surface of the air/oil cooler.*

* Hypertherm strongly recommends that only authorized service technicians do this maintenance.

Every 6,000 operating hours	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"><input type="checkbox"/> Change the timing belt.* At a minimum, replace the timing belt once every 5 years.

* Have an authorized Deutz service dealer do this maintenance.

Every 12,000 operating hours	
System component	Recommended maintenance
Engine/generator	<ul style="list-style-type: none"><input type="checkbox"/> Overhaul the engine.*

* Have an authorized Deutz service dealer do this maintenance.

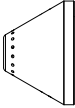

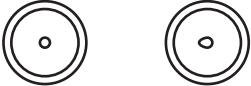
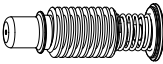
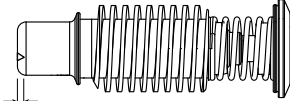
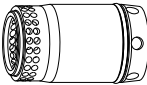
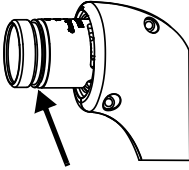
Routine maintenance procedures

		<p>WARNING!</p> <p>ELECTRIC SHOCK CAN KILL</p>
		<p>Disconnect or turn OFF electrical power before doing any maintenance that involves removing the cover from the system or the consumables from the plasma torch.</p> <p>Read the separate <i>Safety and Compliance Manual</i> included with your system for more safety precautions pertaining to plasma cutting.</p>
		<p>CAUTION!</p>
<p>FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT</p> <p>Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.</p> <p>Wash thoroughly if your skin comes in contact with fuel or oil from the engine.</p>		

- See *Every use* on page 60.
- See *Every day* on page 62.
- See *Every week* on page 63.
- See *Every month* on page 66.
- See *Every 3 months (or 500 operating hours)* on page 69.
- See *Every 6 months* on page 73.
- See *Every year* on page 78.
- See *Every 4,000 operating hours* on page 81.

Every use

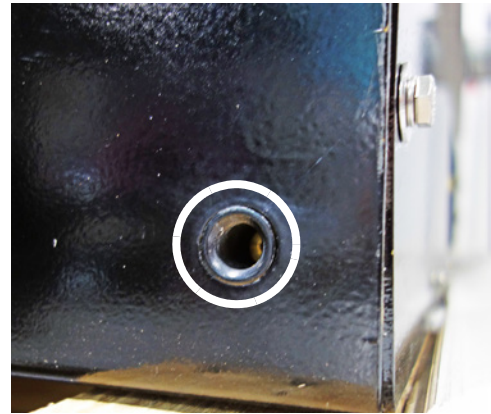
Inspect the plasma torch consumables

Part	Inspect	Action
 Shield	The center hole for roundness.	Replace the shield if the hole is no longer round.
	The gap between the shield and the nozzle for accumulated debris.	Remove the shield and clean away any material.
 Nozzle	The center hole for roundness.  Good Worn	Replace nozzle if the center hole is not round.
 Electrode	 Max. 1.6 mm (1/16 inch)	Replace electrode if the surface is worn or the pit depth is greater than 1.6 mm (1/16 inch) deep.
 Swirl ring	The surface inside the swirl ring for damage or wear and the gas holes for blockages.	Replace swirl ring if the surface is damaged or worn or any of the gas holes are blocked.
	The O-ring for damage or wear.	If the O-ring is worn or damaged, replace the swirl ring.
	The length of the swirl ring.	If the length of the swirl ring is less than 32 mm (1.27 inches), replace it.
 Torch O-ring	The surface for damage, wear, or a lack of lubrication.	If the O-ring is dry, lubricate it and the threads with a thin layer of silicone lubricant. If the O-ring is worn or damaged, replace it.

Drain the condensate from the air tank**CAUTION!**

**Drain condensate from the compressed air tank to make sure the tank operates safely.
Condensation inside the tank causes corrosion over time and weakens the integrity of the tank walls.**

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Facing the plasma side of the system, make sure the pressure release opening near the front corner of the base is not obstructed. Air and condensate exit from the air tank through this opening.
3. Facing the front of the system, slowly rotate the lever so that it is facing down. The lever is in the recessed cutout under the generator. See *Figure 11*.
4. When the air draining from the tank is clear, close the valve by rotating the lever towards you until it is parallel with the bottom of the system.

**Figure 11**

Rotate lever down to drain air tank

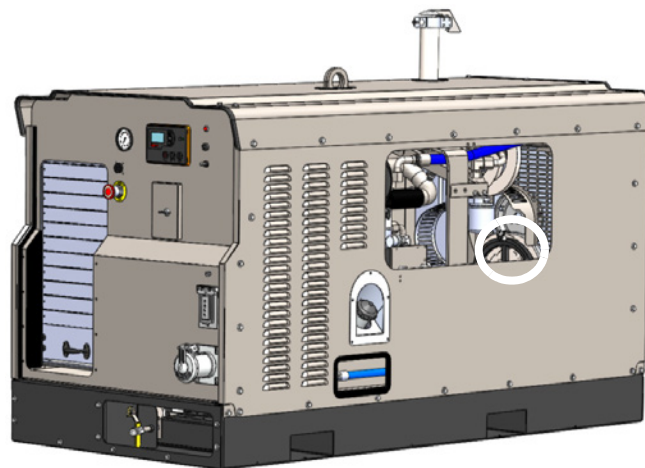
Every day

Check the oil level in the engine

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Leave the system at rest for 2 minutes. This allows the oil to drain back into the oil pan.
4. Remove the service panel on the generator side of the system.
5. Remove the oil dipstick from the engine. See *Figure 12*. Wipe any oil off the dipstick.
6. Fully insert the dipstick back into the engine.
7. Remove the dipstick from the engine. Make sure the oil level is between the low and high marks.
8. Reconnect the negative (-) ground cable to the battery.
9. Put the service panel back in place.

Do not exceed the maximum fill level. For details on how to add oil to the engine, see *Change the oil and oil filter in the engine* on page 70.

Figure 12 – Engine oil dipstick



Every week

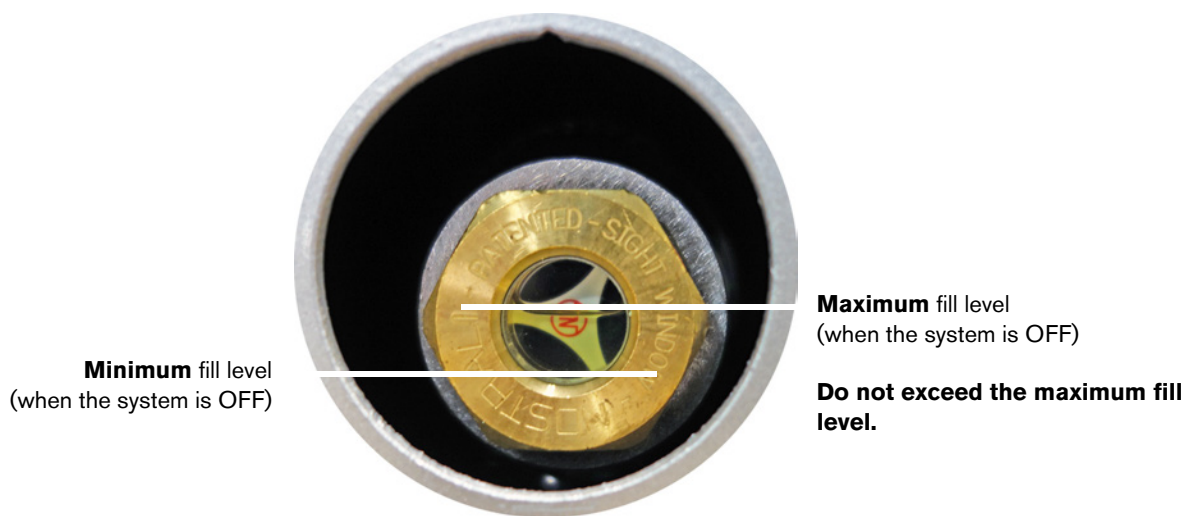
- Check the oil level in the air compressor, below
- Drain the condensate from the air compressor's air/oil separation tank on page 65

Check the oil level in the air compressor

Check the air compressor's oil level only when the system is:

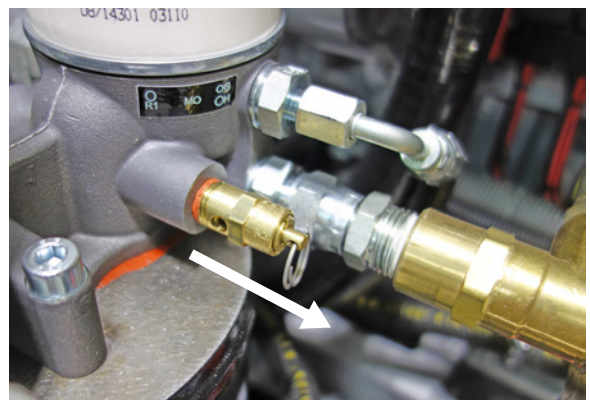
- Turned OFF and any foam in the air/oil separation tank has had time to subside.
- Positioned on level ground, not at an incline.

Figure 13



To add oil to the air compressor:

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the top cover and the plasma-side panel from the system.
3. Slowly pull the pressure relief valve above the air/oil separation tank straight out approximately 5 mm (1/4 inch). Use the ring at the end of the valve. This discharges internal pressure from the air compressor.
4. Drain the air tank to release pressure. See page 61.



2 – Routine Maintenance

5. Unscrew the fill cap from the top of the air/oil separation tank to remove it. See *Figure 14*.

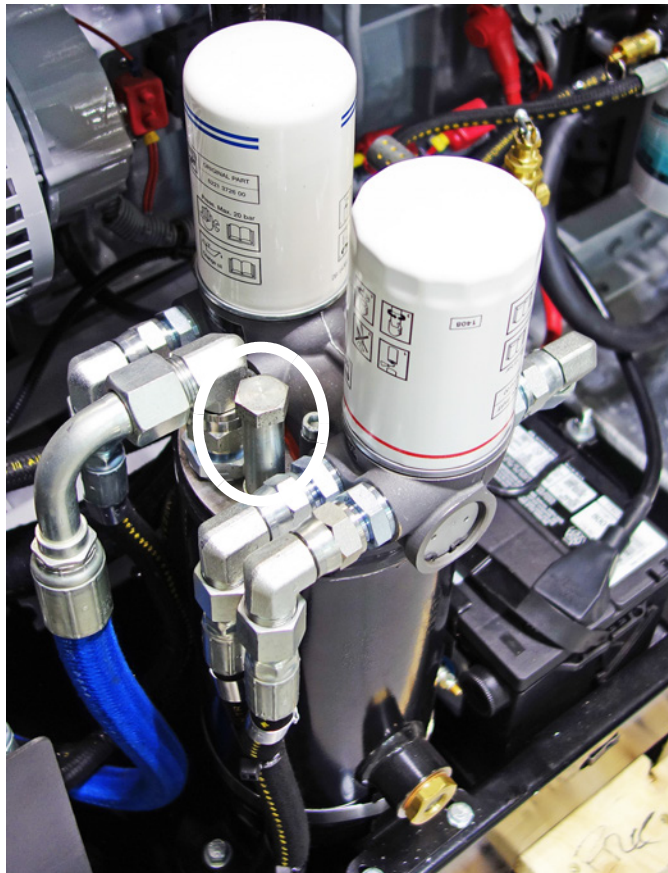
NOTICE

Use oil of the same type as that already in the machine. Do not mix different oils from different manufacturers and different viscosities (grades).

The unit ships with Chicago Pneumatic Rotair Plus synthetic oil (manufacturer's part number 1630144405).

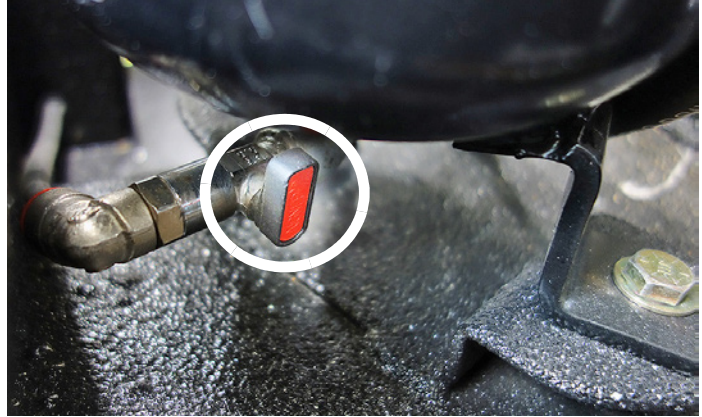
6. Pour new oil into the air/oil separation tank to the recommended fill line:
- ☐ Use oil of the same type as that already in the machine. Do not mix different oil types.
 - ☐ Use a funnel to direct the flow of oil.
 - ☐ **Do not exceed the maximum fill level.** See *Figure 13* on page 63.
7. Screw the fill cap back onto the top of the air/oil separation tank.
8. Put the system's panels back in place. See *Install the cover* on page 88.

Figure 14



Drain the condensate from the air compressor's air/oil separation tank

1. Make sure the system has been turned OFF for a minimum of 8 consecutive hours.
2. Remove the service panel on the plasma side of the system.
3. Slowly turn the valve on the bottom of the air/oil separation tank to gradually discharge the condensate.



4. When you see the first traces of oil, close the valve. The condensate exits through the baseboard on the plasma side of the system by the rear panel.
5. Dispose of the condensate in compliance with local and national regulations.
6. Put the service panel back in place.




2 – Routine Maintenance


Every month

- *Test the GFCI outlet, below*
- *Replace the air drying filter on page 67*

Test the GFCI outlet

The 120 V auxiliary outlet on the generator is GFCI-protected. GFCI (ground fault circuit interrupter) outlets protect the operator from electric shock in case a machine plugged into one of the receptacles experiences a ground fault.


 The GFCI outlet provides protection only for ground faults. A chance of electric shock is still present if a short circuit occurs.

 The transformer circuit breaker on the front panel must be turned ON (I) in order to use the 120 V auxiliary outlet.

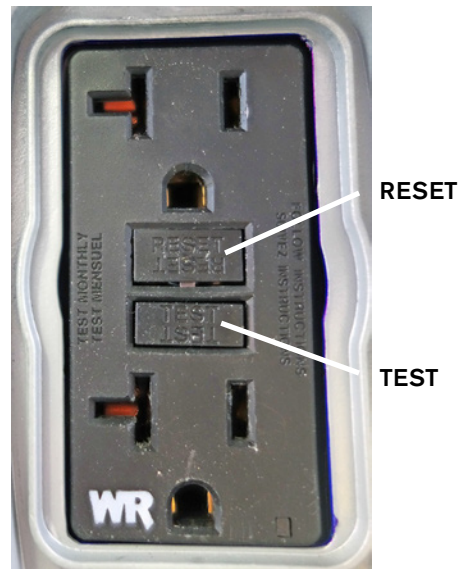
In the 120 V GFCI outlet, the neutral conductor is bonded to the frame.

Test the GFCI protection on the 120 V auxiliary outlet once per month:

1. Unplug any external tools from the 120 V auxiliary receptacles.
2. Set the power switch to the ON (I) position, then press the **RUN** button on the system controller.
3. Set the main circuit breaker and the transformer circuit breaker on the front panel to the ON (I) position.

 The transformer circuit breaker provides power to the 120 V auxiliary outlet. It must be turned ON to perform this test.

4. Press the **Test** button on the GFCI outlet.
5. Did the GFCI **Reset** button extrude?
 - ❑ If yes, press the **Reset** button. GFCI protection is working properly.
 - ❑ If no, have an authorized service technician replace the GFCI outlet.



Replace the air drying filter

		<p style="text-align: center;">WARNING!</p> <p style="text-align: center;">RISK OF INJURY – HANDLE COMPRESSED AIR WITH CARE</p>
	<p>When servicing air compressor components:</p> <ul style="list-style-type: none"> ❑ Discharge internal pressure from the air compressor before performing maintenance on any compressor parts. Trapped air pressure can discharge violently and cause serious injury. ❑ Do not inhale compressed air. Serious injury can result. ❑ If air that was under pressure pierces your skin, seek medical treatment immediately. ❑ Never disable or disconnect any safety mechanisms for the air compressor. ❑ Check all air compressor hoses and connections for leaks and damage before operating the system again. 	

NOTICE

Replace the air drying filter regularly. When the cartridge inside an overused filter begins to deteriorate, small pieces of the cartridge can get into the plasma cutting's system air supply and cause damage to the plasma supply.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the service panel on the plasma side of the system.
3. Slowly pull the pressure relief valve above the air drying filter straight out approximately 5 mm (1/4 inch). Use the ring at the end of the valve. This discharges internal pressure from the air compressor.
4. Drain the air tank to release pressure. See page 61.
5. Unscrew the air drying filter to remove it. See *Figure 15*. Dispose of old filters in compliance with local and national regulations.
6. Use a clean, dry cloth to wipe away any dirt or other contaminants from the threads and mounting surface where the new filter will be installed.
7. Lightly apply clean oil to the seal on the new air drying filter.
8. Screw the air drying filter into place. Tighten by hand plus a 3/4 turn.



2 – Routine Maintenance

9. Put the service panel back in place.








Figure 15 – Air drying filter



Every 3 months (or 500 operating hours)

- Check the battery and cable connectors, below
- Change the oil and oil filter in the engine on page 70

Check the battery and cable connectors

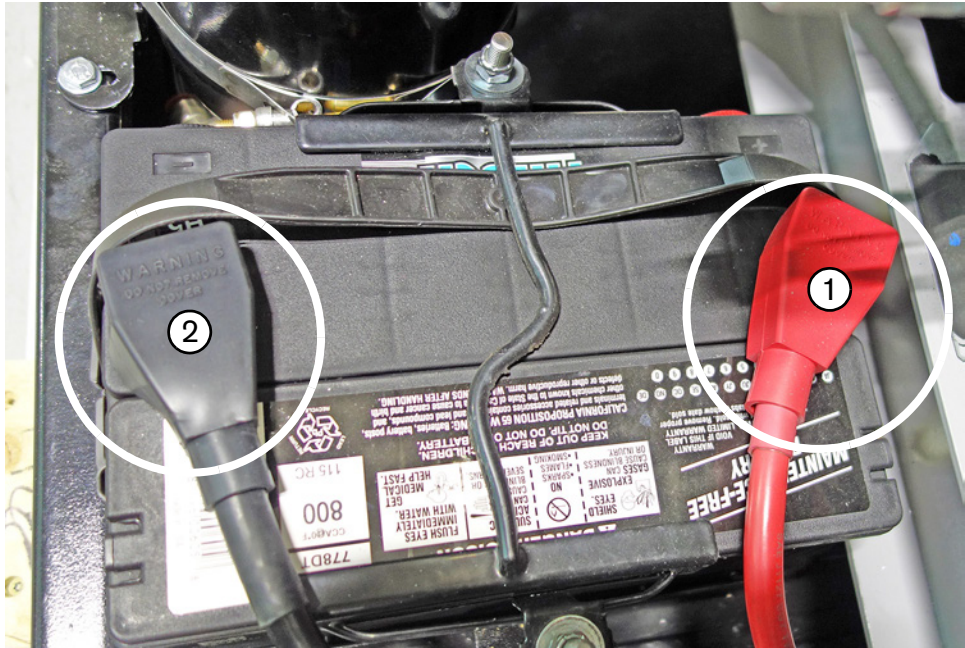
	WARNING!
     	<p>RISK OF FIRE OR EXPLOSION – WEAR PROTECTIVE CLOTHING</p> <ul style="list-style-type: none"> ■ Turn OFF the engine before performing any battery checks or maintenance. ■ Avoid contact with sulfuric acid from the engine's battery. It can cause serious injury if it comes in contact with eyes or skin. ■ Always wear protective glasses, gloves, and clothing when servicing the battery. ■ Wash your hands thoroughly after touching the battery and its connectors. ■ Examine the battery regularly to make sure: <ul style="list-style-type: none"> ❑ All electrical connections are clean and secure. Loose connections can cause sparks that result in a fire. ❑ None of the electrical wires are frayed. Replace any frayed wires before starting the engine. ■ When the battery is charged or discharged, an explosive chemical change occurs. Avoid all conditions that can ignite this explosive gas: <ul style="list-style-type: none"> ❑ Keep any open flames or sparks away from the top of the battery. ❑ Do not smoke cigarettes near a battery that is being charged. ❑ Never place a metal object across the battery's terminal posts to check its charging status. Instead, use a voltmeter or hydrometer. ❑ Never charge a frozen battery. ❑ Never charge a battery in an enclosed room that lacks proper ventilation. ❑ Never disconnect any charging unit circuit or battery circuit cable from the battery while it is being charged. Doing so can produce dangerous sparks. ■ Apply the cable connections correctly if you jump-start the battery. Attach the negative (-) ground cable last, and remove it first. See Jump-start the battery on page 32. ■ Always dispose of old batteries in compliance with local and national regulations. ■ Examine the chassis ground strap connection regularly. Without a solid ground strap connection, electrical discharge can damage the engine and electrical system.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the service panel on the plasma side of the system.

2 – Routine Maintenance


- 3. Check the positive (+) ① and negative (-) ② cable connections on the battery. Tighten as needed.
- 4. Put the service panel back in place.

Figure 16



Change the oil and oil filter in the engine

		<p>WARNING!</p> <p>HOT OIL CAN CAUSE BURNS</p>
	<p>Avoid contact with the oil as you drain it from the engine. Engine oil can become very hot and can cause scalding or severe burns if it comes in contact with skin.</p>	
<p>NOTICE</p>		
<p>When changing the oil in the engine, always use the same type of oil. Do not mix different types of oil. Use only Deutz-brand oil filters.</p>		

 This engine is cooled by the lubricating oil, so the oil must be drained from both the oil pan and the heat exchanger.

1. Turn ON the system, and allow it to run for 2–3 minutes to warm the oil in the engine.



Do not drain the oil when the engine is cold. Waste particles in the oil settle on the bottom of the oil pan when the oil is cold and do not get removed during the oil change.

2. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Leave the system at rest for 2 minutes. This allows the oil to drain back into the oil pan.
4. Remove the service panel on the generator side of the system.
5. Place a container underneath the oil filter to catch any oil that spills as you remove the filter. See *Figure 17* on page 72.



If needed, remove the top cover and the generator-side panel to better access the filter. See *Remove the cover* on page 86.

6. Use a band-type gripping tool to unscrew the oil filter from the engine. Dispose of the old oil and filter in compliance with local and national regulations.
7. Use a clean, dry cloth to wipe away any dirt or other contaminants from the threads and mounting surface where the new filter will be installed.



Make sure the rubber seal from the old filter did not stick to the mounting surface when you removed the filter.

8. Lightly apply clean oil to the seal on the new oil filter.
9. Screw the new oil filter into place. Tighten to 15–17 N·m (11–12.5 foot-pounds).
10. Remove the oil fill cap. See *Figure 17* on page 72. Clean the cap, and set it aside.
11. Pull one of the drain hoses out from the system, and place a container underneath the end of the hose. See *Figure 17*.



One hose drains the oil from the oil pan. The other hose drains the oil from the heat exchanger. **The oil pan and heat exchanger must both be drained at every oil change.**

12. Remove the cap from the end of the drain hose to drain the oil into the container.
13. When the oil has drained, put the cap back on the end of the drain hose. Push the hose back inside the system.
14. Pull the other drain hose out from the system, and move the container underneath the end of the hose. Repeat *step 12* and *step 13* to drain the oil from the second hose.
15. Dispose of the old oil in compliance with local and national regulations.

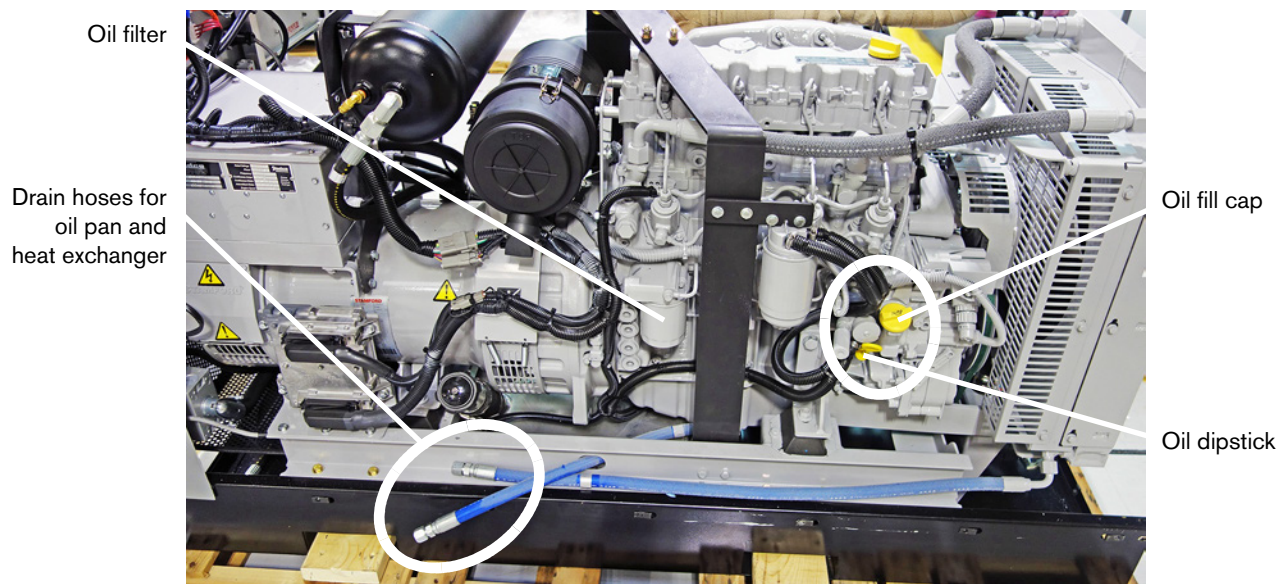
2 – Routine Maintenance

16. Pour new oil into the engine where you removed the oil fill cap in *step 10*. Use only Deutz-brand oil and filters. Alternately, the following oils from Shell can also be used: ROTELLA T Triple Protection, ROTELLA T3, or ROTELLA T4 Triple Protection.

Fill the oil to the “high” mark on the oil dipstick – approximately 14 liters (14.8 quarts). Remove the dipstick as needed to check the oil level. **Do not exceed the maximum fill level.**

17. Put the oil fill cap back in place.
18. Reconnect the negative (-) ground cable to the battery.
19. Turn ON the system. Allow the engine to run for 3–5 minutes to circulate the oil.
20. Turn OFF the system.
21. Leave the system at rest for 2 minutes to allow the oil to drain back into the oil pan.
22. Remove the dipstick to check the oil level. Add more oil as needed, but do not exceed the maximum fill level.
23. Put the top cover and the generator-side panel back in place, if you removed them. See *Install the cover* on page 88.
24. Put the service panel back in place.





Figure 17



Every 6 months

- Change the fuel filter in the engine, below
- Clean the fuel pump screen on page 75
- Service the engine air cleaner on page 76

Change the fuel filter in the engine

		WARNING!
		RISK OF FIRE OR EXPLOSION
Do not allow any open flames or sparks near the system when working on fuel system components. Do not smoke cigarettes when working on fuel system components. Serious injury can result from fire or explosion.		

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the service panel on the generator side of the system.
4. Place a container underneath the fuel filter to catch any fuel that spills as you remove the filter. See *Figure 18* on page 74.
5. Use a band-type gripping tool to unscrew the fuel filter from the engine. Dispose of the old fuel and filter in compliance with local and national regulations.
6. Use a clean, dry cloth to wipe away any dirt or other contaminants from the threads and mounting surface where the new filter will be installed.



Make sure the rubber seal from the old filter did not stick to the mounting surface when you removed the filter.

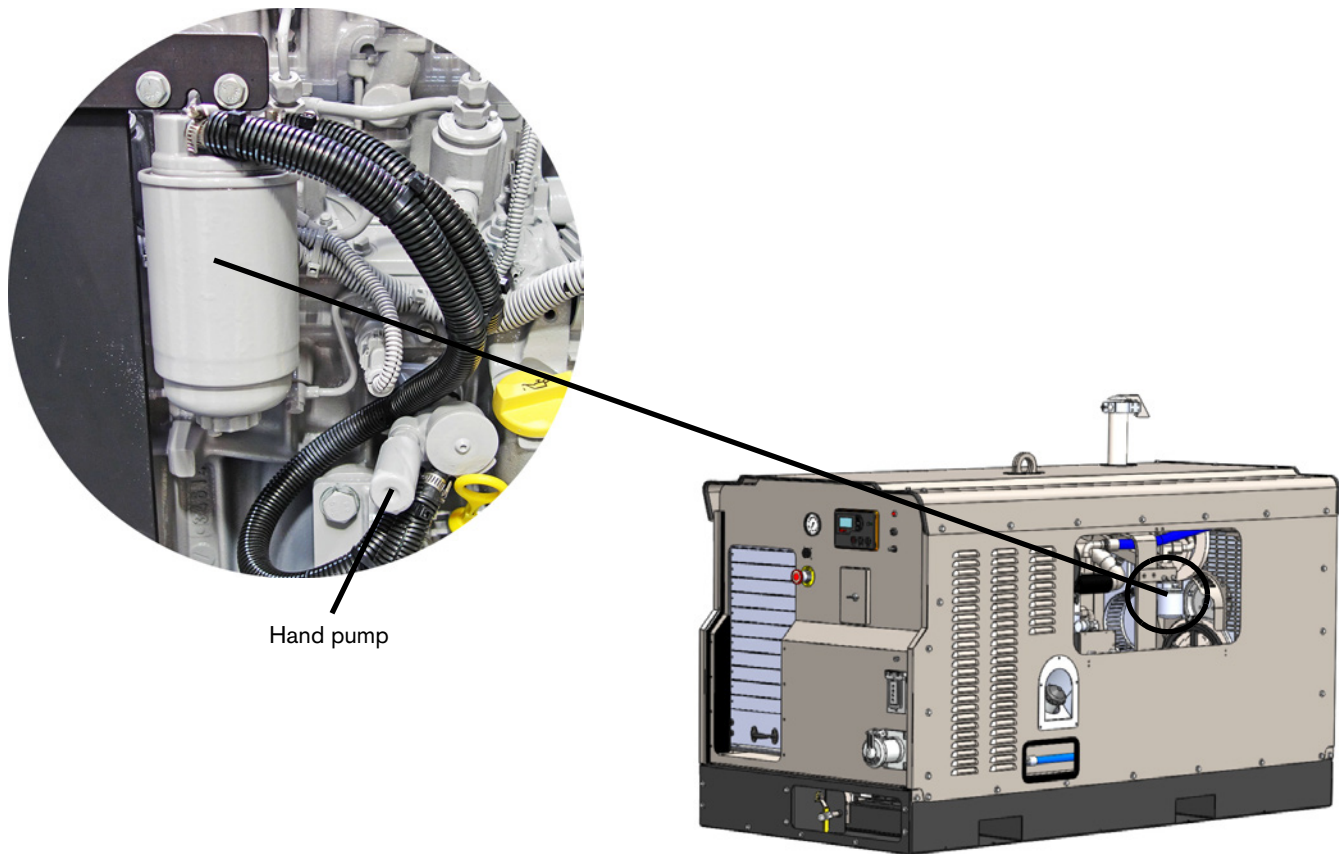
7. Lightly apply clean diesel fuel to the seal on the new fuel filter.
8. Screw the new fuel filter into place on the engine. Tighten to 10–12 N·m (7.4–8.9 foot-pounds).
9. Push in the hand pump several times in quick succession until you feel resistance and until you no longer hear fuel moving through the fuel supply lines. This circulates fuel through the new filter. See *Figure 18*.







You may need to push in the hand pump as many as 20 times.

10. Reconnect the negative (-) ground cable to the battery.
11. Put the service panel back in place.

Figure 18 – Engine fuel filter



Clean the fuel pump screen

		<p align="center">WARNING!</p> <p align="center">RISK OF FIRE OR EXPLOSION</p>
		

Do not allow any open flames or sparks near the system when working on fuel system components. Do not smoke cigarettes when working on fuel system components. Serious injury can result from fire or explosion.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the service panel on the generator side of the system.
4. Place a container underneath the fuel pump screen to catch any fuel that spills as you remove the screen.
5. Remove the cover from the fuel pump screen by removing the screw that holds it in place.
6. Remove the fuel pump screen. Dispose of any spilled fuel in compliance with local and national regulations.
7. Is the fuel pump screen damaged in any way?
 - ☐ If yes, obtain a new fuel pump screen. Continue with the next step.
 - ☐ If no, clean the fuel pump screen and the O-ring with clean diesel fuel. Continue with the next step.
8. Install the fuel pump screen. Make sure the O-ring is positioned correctly.
9. Install the cover to the fuel pump screen. Tighten the screw you removed in *step 5*.
10. Push in the hand pump several times in quick succession until you feel resistance and until you no longer hear fuel moving through the fuel supply lines.
11. Reconnect the negative (-) ground cable to the battery.
12. Put the service panel back in place.
13. Turn ON the system. Make sure there are no fuel leaks.



Hand pump

Cover of fuel pump screen

2 – Routine Maintenance

Service the engine air cleaner

NOTICE

Replace the air cleaner filters regularly. Never run the engine when the air cleaner filters are missing or damaged. The air cleaner filters prevent airborne debris from entering the air inlet. Dirt or other debris that enters the engine can cause premature wear and damage to engine components that is difficult and expensive to repair.

The engine air cleaner contains 2 filters:

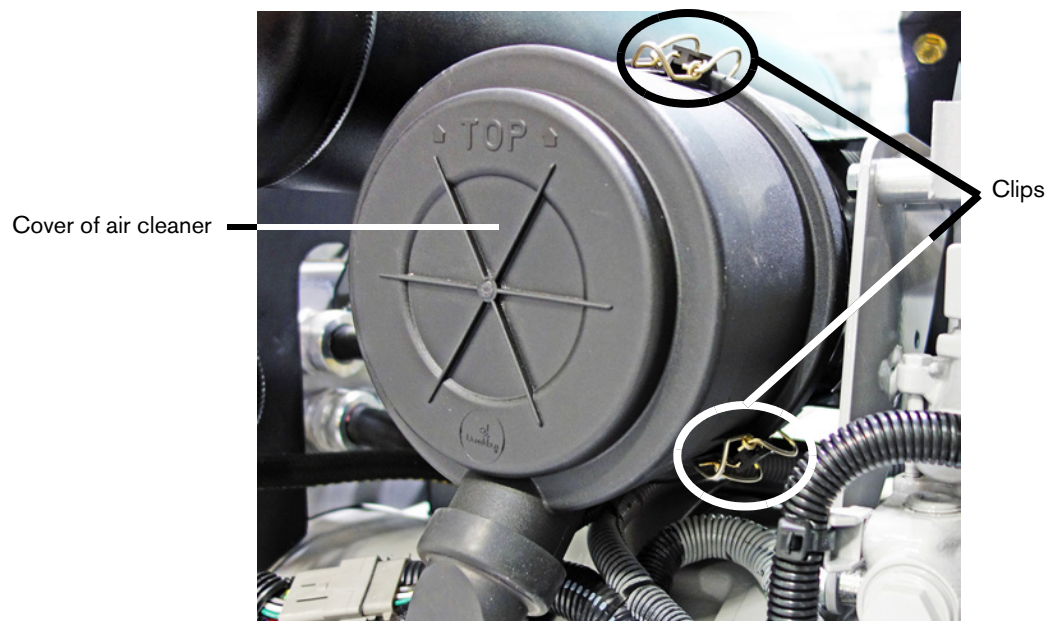
- ❑ A **primary filter** that fits over the outlet tube, which creates a critical seal on the inside diameter of the filter endcap
- ❑ A **safety filter** that fits inside the outlet tube, which creates a critical seal on the outside diameter of the filter endcap

Replace the safety filter every 3 air cleaner services or every 2 years, whichever interval is less.

In very dusty or dirty environments, check the primary filter approximately once every 2 weeks. Use moisture-free compressed air to gently clean the filter, as needed. Never remove the safety filter except to install a new one.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the service panel on the generator side of the system.
4. Pull back the 3 clips, and remove the cover from the air cleaner. See *Figure 19*.

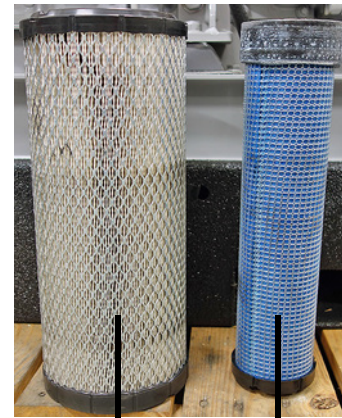
Figure 19



5. Carefully remove the primary filter by gently moving it side-to-side to break the seal.
6. Are you replacing the safety filter?
 - ❑ If yes, carefully remove the safety filter by gently moving it side-to-side to break the seal.
 - ❑ If no, continue with the next step.
7. Use a clean, dry cloth to wipe away any dirt or other contaminants from the sealing surfaces of the outlet tube.



Do not leave any dirt on the sealing surfaces of the outlet tube because it can prevent a good seal with the new filters or enter the engine.



Primary filter

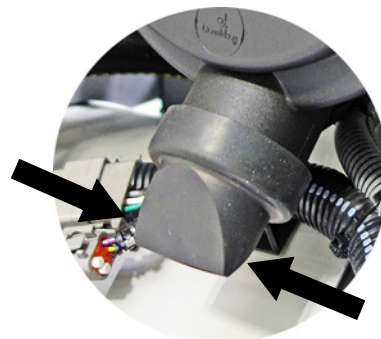
Safety filter

8. Examine the old filters for signs of damage. For example, a streak of dust on the inside surface of the filter indicates a possible leak. Remove or repair any possible causes of leaks in the air cleaner before installing new filters.
9. Examine the new filters for signs of damage. Do not install damaged filters.
10. Are you installing a new safety filter?
 - ❑ If yes, insert the safety filter into the air cleaner housing. Make sure it sits fully in the housing.
 - ❑ If no, continue with the next step.
11. Insert the new primary filter over the safety filter in the air cleaner housing. Insert the filter by hand, and make sure it sits fully in the housing.
12. Put the cover back on the air cleaner, and hold it in place by folding down the 3 clips.






The cover should go on easily, with no added force required. If the cover hits the primary filter before it is in place, push the filter further into the housing before putting the cover back on.

13. Empty the air cleaner's dust discharge valve by pinching the discharge slot. After the valve is empty, clean the discharge slot.
14. Reconnect the negative (-) ground cable to the battery.
15. Put the service panel back in place.



Every year

Change the oil and oil filter in the air compressor

		WARNING! RISK OF INJURY – HANDLE COMPRESSED AIR WITH CARE
	THIS PROCEDURE MUST BE PERFORMED ONLY BY EXPERIENCED SERVICE TECHNICIANS. When servicing air compressor components: <ul style="list-style-type: none">❑ Discharge internal pressure from the air compressor before performing maintenance on any compressor parts. Trapped air pressure can discharge violently and cause serious injury.❑ Do not inhale compressed air. Serious injury can result.❑ If air that was under pressure pierces your skin, seek medical treatment immediately.❑ Never disable or disconnect any safety mechanisms for the air compressor.❑ Check all air compressor hoses and connections for leaks and damage before operating the system again.	

NOTICE
<p>Use oil of the same type as that already in the machine. Do not mix different oils from different manufacturers and different viscosities (grades).</p> <p>The unit ships with Chicago Pneumatic Rotair Plus synthetic oil (manufacturer's part number 1630144405).</p>

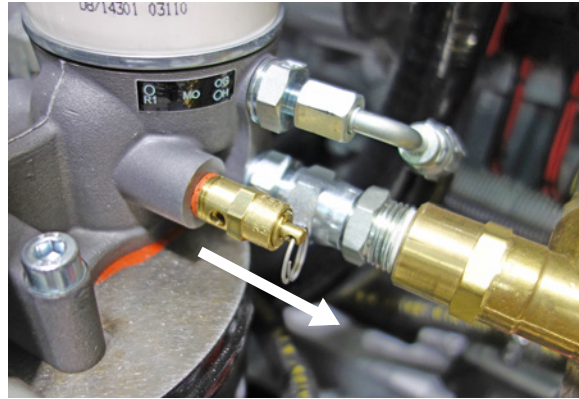
For best performance use Rotair Plus (or Roto-inject fluid) oils. Mineral oil can be used provided the following precautions are taken:

- Old oil is drained and the system is flushed. This should be done by a qualified Chicago Pneumatic technician. Contact your local Chicago Pneumatic service center.
- Both the compressor oil filter and oil separation filter are changed.
- The oil meets the following properties: high quality mineral oil with oxidation inhibitors and anti-foam and anti-wear properties. The viscosity grade must correspond to the ambient temperature and ISO 3448:

Ambient temperature	Viscosity grade	Viscosity index
Consistently above 25°C (77°F)	ISO VG 68	Minimum 95
Between 25°C (77°F) and 0°C (32°F)	ISO VG 46	Minimum 95

1. Discharge internal pressure from the air compressor:

- a. Turn ON the system, and allow it to run for 2–3 minutes. This warms the oil in the air compressor.
- b. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
- c. Slowly pull the pressure relief valve above the air/oil separation tank straight out approximately 5 mm (1/4 inch). Use the ring at the end of the valve. This discharges internal pressure from the air compressor.
- d. Drain the air tank to release pressure. See page 61.



2. Drain the oil from the air/oil separation tank:

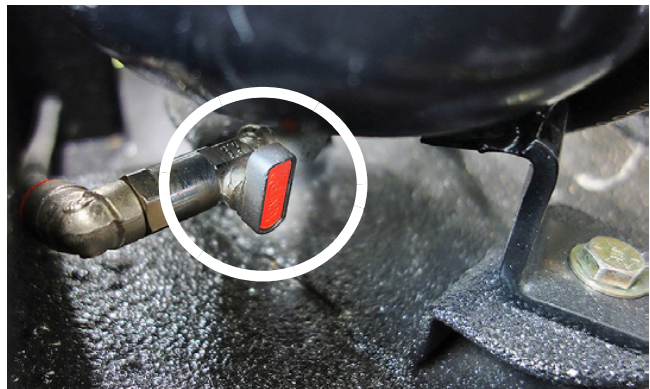
- a. Connect a hose with a fitting or place a container under the small black hole at the bottom rear corner of the plasma side panel. The oil drains through this hole.



This aperture is threaded with 1/4 inch NPT female threads.



- b. Slowly turn the valve on the bottom of the air/oil separation tank. Condensate may discharge from the tank before the oil starts to drain.
- c. After the oil drains from the tank, close the valve. Dispose of the old oil in compliance with local and national regulations.



2 – Routine Maintenance

3. Replace the oil filter:

- a. Unscrew the oil filter ① to remove it. See *Figure 20*. Dispose of the old filter in compliance with local and national regulations.
- b. Lightly apply clean oil to the seal on the new oil filter.
- c. Screw the oil filter into place. Tighten by hand.

4. Add new synthetic oil to the air/oil separation tank:

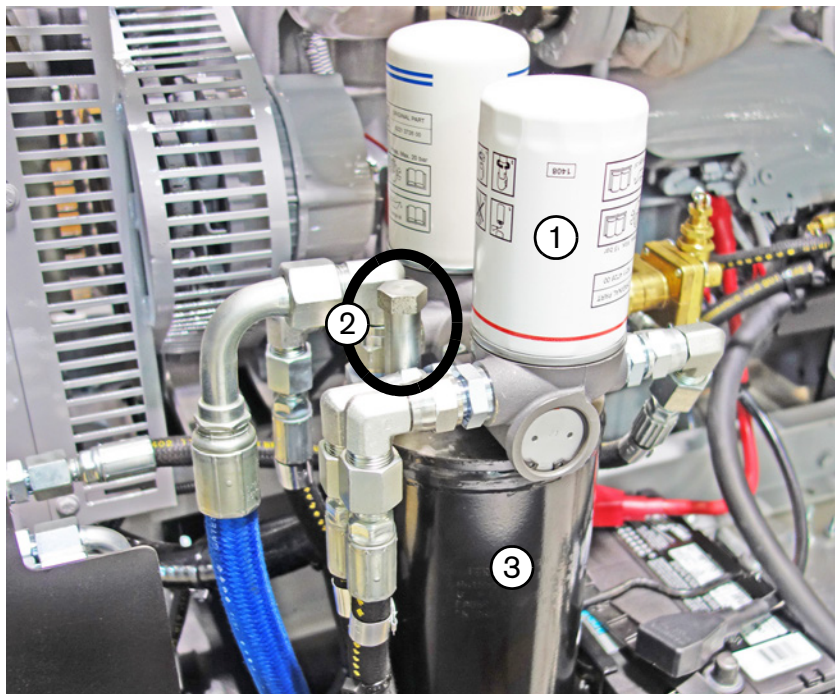
- a. Unscrew the fill cap ② from the top of the air/oil separation tank ③ to remove it. See *Figure 20*. Set the fill cap and its washer aside.



If needed, remove the top cover and the plasma-side panel to better access the tank.
See *Remove the cover* on page 86.


- b. Pour new oil into the air/oil separation tank to the recommended fill line:
 - Use oil of the same type as that already in the machine. Do not mix different oil types.
 - Use a funnel to direct the flow of oil.
 - **Do not exceed the maximum fill level.** See *Check the oil level in the air compressor* on page 63.
- c. Screw the fill cap and its washer back onto the top of the air/oil separation tank.
- d. Put the top cover and the plasma-side panel back in place, if you removed them. See *Install the cover* on page 88.
- e. Turn ON the system, and allow it to run until the cooler unit is hot. Shut down the system and check the oil level.

Figure 20 – Air compressor's oil filter and air/oil separation tank



Every 4,000 operating hours

Change the oil separation filter in the air compressor

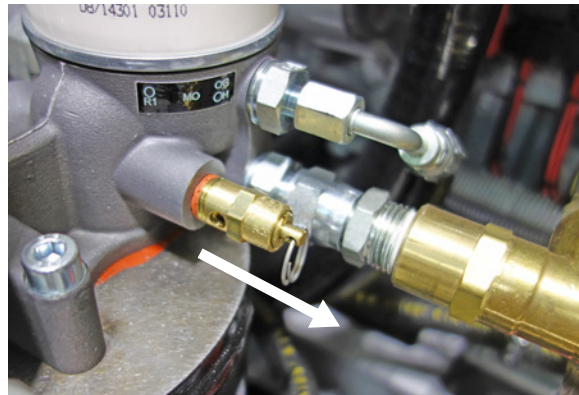
		<p style="text-align: center;">WARNING!</p> <p style="text-align: center;">RISK OF INJURY – HANDLE COMPRESSED AIR WITH CARE</p>
	<p>When servicing air compressor components:</p> <ul style="list-style-type: none"> ❑ Discharge internal pressure from the air compressor before performing maintenance on any compressor parts. Trapped air pressure can discharge violently and cause serious injury. ❑ Do not inhale compressed air. Serious injury can result. ❑ If air that was under pressure pierces your skin, seek medical treatment immediately. ❑ Never disable or disconnect any safety mechanisms for the air compressor. ❑ Check all air compressor hoses and connections for leaks and damage before operating the system again. 	

NOTICE

Use oil of the same type as that already in the machine. Do not mix different oils from different manufacturers and different viscosities (grades).

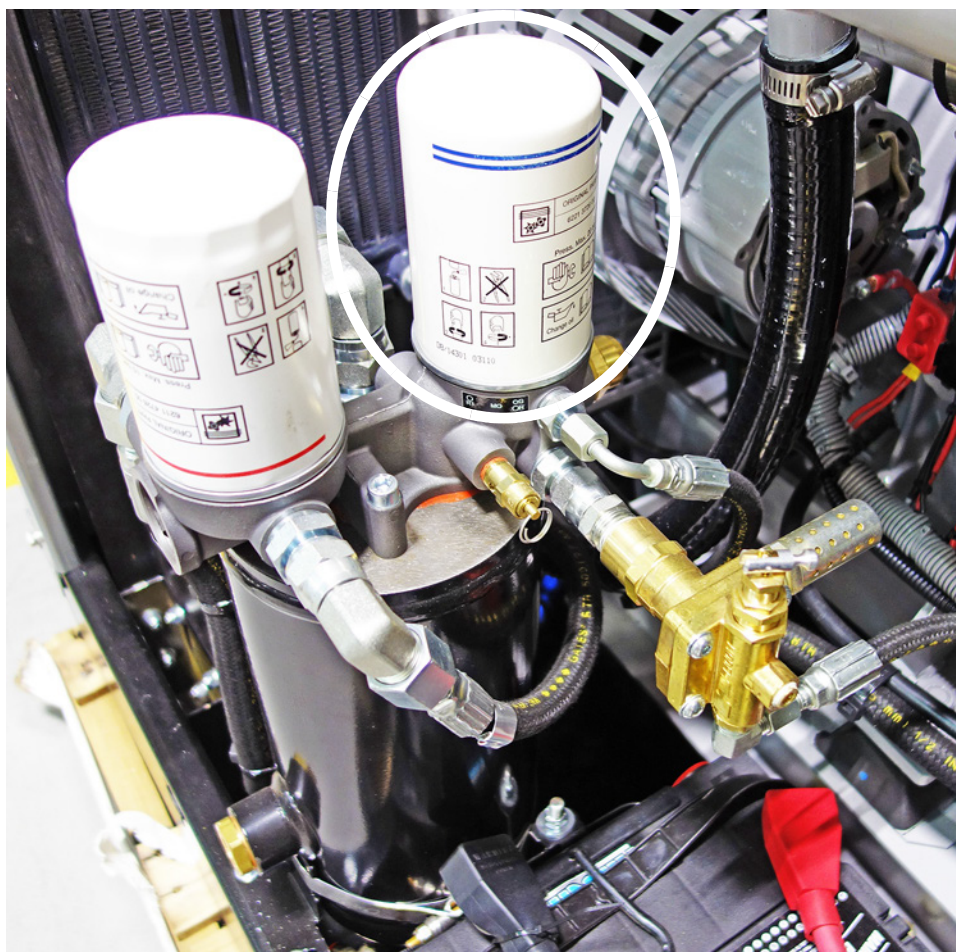
The unit ships with Chicago Pneumatic Rotair Plus synthetic oil (manufacturer's part number 1630144405).

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the service panel on the plasma side of the system.
3. Slowly pull the pressure relief valve above the air/oil separation tank straight out approximately 5 mm (1/4 inch). Use the ring at the end of the valve. This discharges internal pressure from the air compressor.
4. Drain the air tank to release pressure. See page 61.
5. Unscrew the oil separation filter to remove it. See *Figure 21*. Dispose of old oil and filters in compliance with local and national regulations.
6. Lightly apply clean oil to the seal on the new oil separation filter.
7. Screw the oil separation filter into place. Tighten by hand.



8. Put the service panel back in place.

Figure 21 – Air compressor's oil separation filter



Section 3

System-Level Components



CAUTION!

To ensure safe operation of the system at all times, and to maximize the life of the product, use only replacement parts that are approved by the manufacturers.




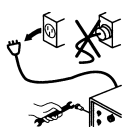







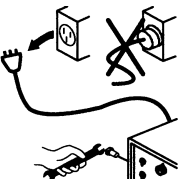
CAUTION!

FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT

Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.

Wash thoroughly if your skin comes in contact with fuel or oil from the engine.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system or from the plasma supply. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.
NOTICE	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>



		<p style="text-align: center;">WARNING! ELECTRIC SHOCK CAN KILL</p>
	<p>Disconnect or turn OFF electrical power before performing any maintenance that involves removing the cover from the system or the consumables from the plasma torch.</p> <p>Read the separate <i>Safety and Compliance Manual (80669C)</i> included with your system for more safety precautions pertaining to plasma cutting.</p>	

The system-level components cover the removal of the top cover and panels to access the internal components. System-level components also include the front panel controls, indicators, and connections.

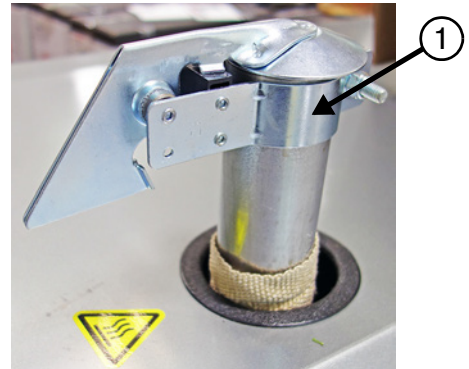
- *Remove and install the system's cover on page 86*
- *Replace the battery on page 89*
- *Replace the Dynagen system controller on page 92*
- *Replace the alternator lamp on page 94*
- *Replace the 12 V circuit breaker on the front panel on page 95*
- *Replace the ON/OFF power switch on page 96*
- *Replace emergency stop contact block on page 98*
- *Replace emergency stop button on page 99*
- *Replace front panel circuit breaker on page 100*
- *Replace the 480 V auxiliary outlet on page 102*
- *Replace the service panel compression latch on page 104*
- *Replace the 120 V auxiliary outlet on page 105*
- *Replace 120 V auxiliary outlet circuit breaker on page 106*
- *Replace the front panel on page 107*

Remove and install the system's cover

Remove the cover

		<p>WARNING! RISK OF SEVERE BURNS</p>
<p>Allow the exhaust pipe and top cover to cool before starting this procedure. This area gets extremely hot when the engine is running.</p>		

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. When the exhaust pipe on the top of the system is cool enough to touch, remove the cap from the exhaust pipe ①.
3. Remove both service panels.
4. Remove the screws and washers from the top cover.
5. Remove the top cover. Make sure you lift it above the exhaust pipe. Carefully set aside the cover and all of its screws and washers.
6. Remove the screws and washers from the back, engine-side, or plasma-side panels as needed.






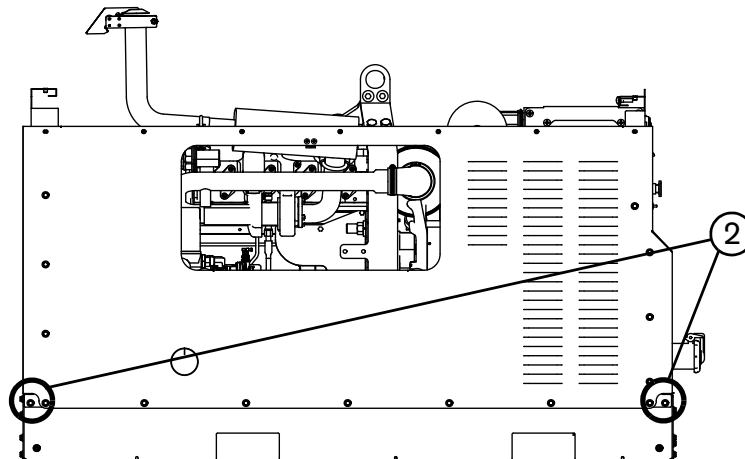
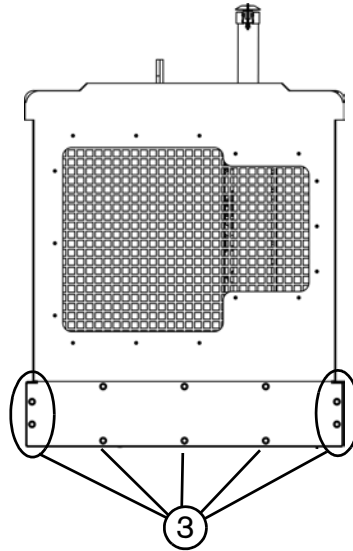
-  You may need to remove the fuel fill cap in order to remove the engine-side panel. If you do, be sure to put the cap back in place as soon as the panel is removed.
-  You must remove both side panels before you can remove the rear panel.
-  Remove only the screws and washers that attach the side panels. Leave the front panel and rear panel screws ② that secure the bottoms to the chassis until removing those assemblies.

Figure 22



7. To remove the rear panel and black base plate, remove 7 screws ③. Remove the rear panel and baseplate as one assembly. Set aside with all the screws and washers.

Figure 23



NOTICE

Do not remove the front panel unless absolutely necessary.

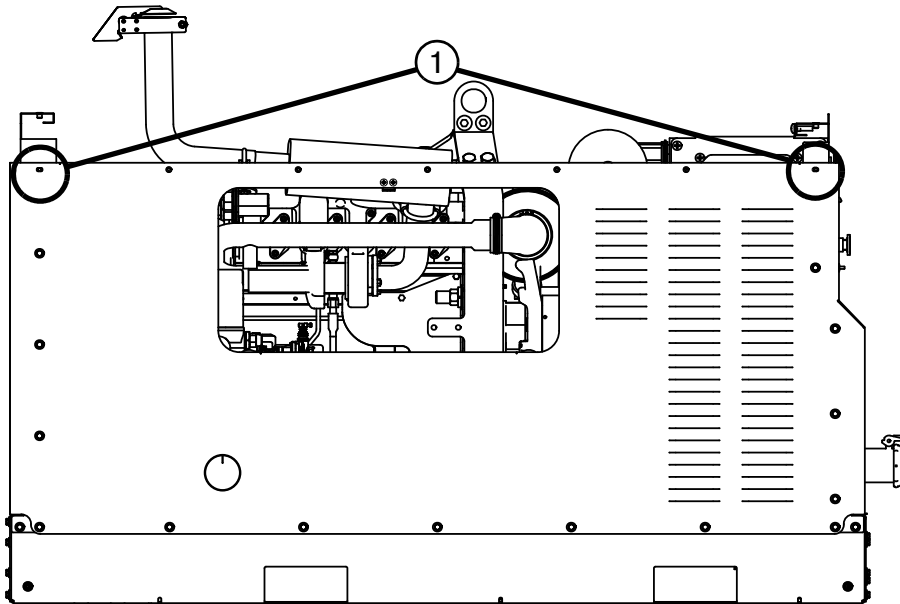
All of the front panel controls must be disconnected before the front panel can be removed. See page 107.

3 – System-Level Components

Install the cover

1. Before replacing any panels, clean off any dirt or debris to avoid contaminating the engine compartment.
2. If you removed the rear panel, put it back in place first. Hand tighten all screws and washers first, then tighten when the panel is properly in place.
3. Attach the side panels. The bottom corners of the panel should rest on the corners of the base boards.
4. Hand tighten all screws and washers first, then tighten when the panel is properly in place. Do not install screws in the top-most slots ① – these slots are used to install the top cover. See *Figure 24*.

Figure 24














5. Make sure the fuel fill cap is in place.
6. Set the top cover in place. Hand tighten all screws and washers first, then tighten when the cover is properly in place.
7. Put both service panels back in place.
8. Install the cap on top of the exhaust pipe.

NOTICE

The cap must be put back in place on the exhaust pipe. If it is left off, water, debris, and other contaminants can enter the pipe and cause severe damage to the engine.

Replace the battery

	<p style="text-align: center;">WARNING!</p>
     	<p>RISK OF FIRE OR EXPLOSION – WEAR PROTECTIVE CLOTHING</p> <ul style="list-style-type: none"> ■ Turn OFF the engine before performing any battery checks or maintenance. ■ Avoid contact with sulfuric acid from the engine's battery. It can cause serious injury if it comes in contact with eyes or skin. ■ Always wear protective glasses, gloves, and clothing when servicing the battery. ■ Wash your hands thoroughly after touching the battery and its connectors. ■ Examine the battery regularly to make sure: <ul style="list-style-type: none"> ❑ All electrical connections are clean and secure. Loose connections can cause sparks that result in a fire. See Check the battery and cable connectors on page 69. ❑ None of the electrical wires are frayed. Replace any frayed wires before starting the engine. ■ When the battery is charged or discharged, an explosive chemical change occurs. Avoid all conditions that can ignite this explosive gas: <ul style="list-style-type: none"> ❑ Keep any open flames or sparks away from the top of the battery. ❑ Do not smoke cigarettes near a battery that is being charged. ❑ Never place a metal object across the battery's terminal posts to check its charging status. Instead, use a voltmeter or hydrometer. ❑ Never charge a frozen battery. ❑ Never charge a battery in an enclosed room that lacks proper ventilation. ❑ Never disconnect any charging unit circuit or battery circuit cable from the battery while it is being charged. Doing so can produce dangerous sparks. ■ Apply the cable connections correctly if you jump-start the battery. Attach the negative (-) ground cable last, and remove it first. See Jump-start the battery on page 32. ■ Always dispose of old batteries in compliance with local and national regulations. ■ Examine the chassis ground strap connection regularly. Without a solid ground strap connection, electrical discharge can damage the engine and electrical system.

		WARNING! WEAR PROTECTIVE CLOTHING
		Turn OFF the engine before performing any battery checks or maintenance. Always wear protective glasses and gloves when servicing the battery. Avoid contact with sulfuric acid from the engine's battery. It can cause serious injury if it comes in contact with eyes or skin.

Remove the battery

The Freedom 38 PPA requires a 12 VDC battery with a capacity of 750 cold cranking amperes (CCA).

The system ships with a Battery Charging Indicator (BCI) group 34/78 12 V battery. Replace it with a battery of comparable specifications and size. Approximate dimensions for replacement batteries:

- Length: 26 cm (10.25 inches)
- Width: 18 cm (7 inches)
- Height: 18 cm (7 inches)

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the service panel on the plasma side of the system.
3. **Disconnect the negative (-) cable ① from the battery first to prevent electric shock.** Pull back the black cover to expose the negative (-) terminal. See *Figure 25* on page 91.
4. Disconnect the positive (+) cable from the battery ②. Pull back the red cover to expose the positive (+) terminal. Remove the connection from the fan harness ③, then remove the positive cable.
5. Remove the nuts and washers ④ from the long screws that hold the battery in place. Set the nuts and washers aside.



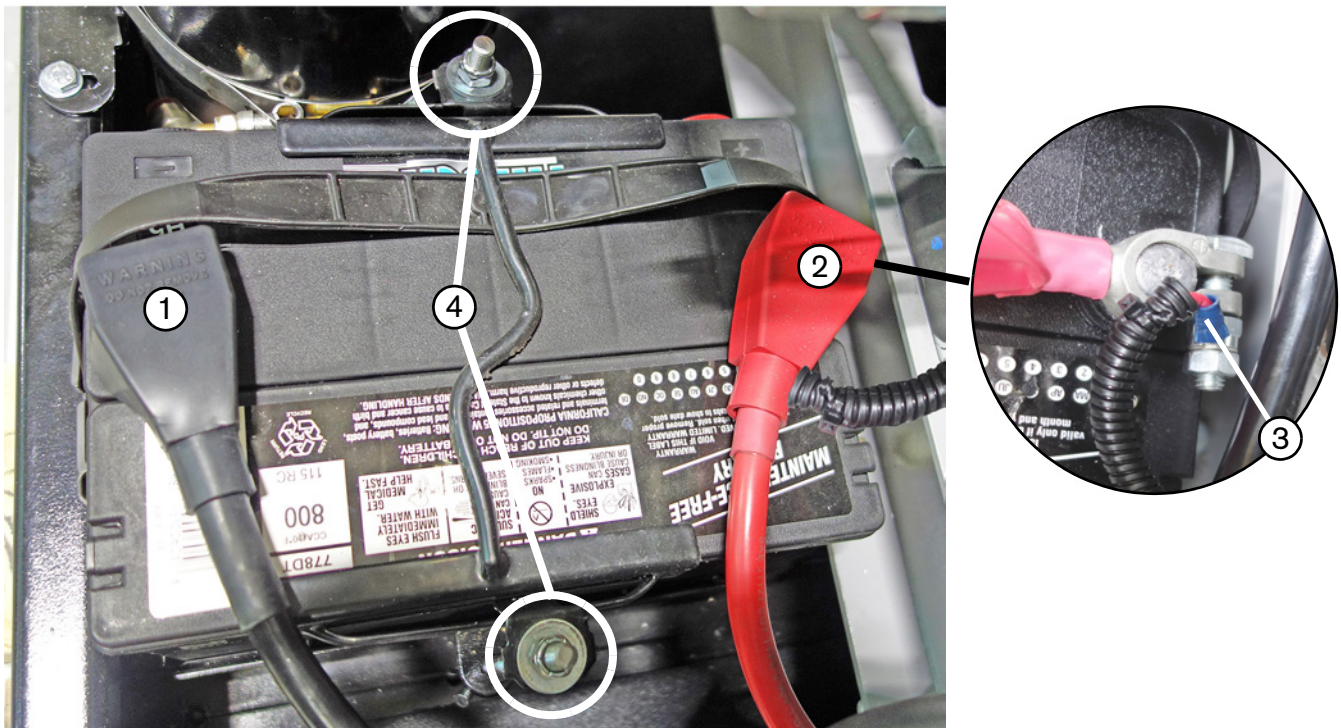
The washers in your system may differ slightly from those shown in *Figure 25*.

6. Use the handle on top of the battery to lift the battery straight up. Keep in mind the battery can weigh 30–40 pounds. As you lift the battery straight up, make sure both sides of the support bracket come off the long screws.
7. Set the support bracket aside.
8. Dispose of the old battery in compliance with local and national regulations.

Install the battery

1. Set the new battery in place next to the air compressor's air/oil separation tank. Make sure:
 - ❑ The battery's negative (-) terminal is nearest the outside edge of the system.
 - ❑ The battery sits flat and is not angled up in any direction.
2. Set the support bracket in place over the battery. The bracket should fit over the long screws. See *Figure 25*.
3. Install the washers and nuts ④ over the long screws. Tighten by hand.
4. Attach the positive (+) cable to the positive (+) terminal on the battery ②. Attach the ring terminal from the fan harness ③. Cover the terminal with the red sleeve from the cable, as shown in *Figure 25*.
5. Attach the negative (-) cable to the negative (-) terminal on the battery ①. **Connect the negative (-) cable last to prevent electric shock.** Cover the terminal with the black sleeve from the cable, as shown in *Figure 25*.
6. Make sure both battery cable connections are tightened securely before starting the system.
7. Put the service panel back in place.

Figure 25



Replace the Dynagen system controller

Kit number	Description
428545	Dynagen® system controller

The system controller is preprogrammed and ready to install into the system.

Remove the Dynagen system controller

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. From behind the front panel, disconnect the J6, J4, J3, J7, and J5 wire connectors from the back of the system controller. Press down the tab on each connector to remove it. See *Figure 26*.



This system does not use the J1 USB connector.

5. Remove the 2 screws from the bracket at the top of the controller. Slide the bracket forward towards the panel, then upward to remove it from the controller.
6. Remove the 2 screws from the bracket at the bottom of the controller. Slide the bracket forward towards the panel, then downward to remove it from the controller.
7. Facing the front of the system, slide the system controller straight out to remove it from the front panel.

Install the Dynagen system controller

1. Set the new system controller in place in the front panel.
2. From behind the front panel, slide the bracket into place at the top of the controller. Secure the bracket to the front panel using the 2 screws.
3. Slide the bracket into place at the bottom of the controller. Secure the bracket to the front panel using the 2 screws.
4. Plug the 5 wire connectors into the back of the system controller as shown in *Figure 26*. Be careful to plug the J7 and J5 wire groups into the correct connectors:
 - ❑ Plug the **J7** generator supply voltage wire group (4 orange wires) into the **top right** connector.
 - ❑ Plug the **J5** current draw (amperes) wire group (4 pink wires) into the **bottom right** connector.
5. Reconnect the negative (-) ground cable to the battery.
6. Put the system's top cover back in place. See *Install the cover* on page 88.
7. Set the power switch on the front panel to the ON (I) position. Examine the LCD screen to make sure the new system controller is working properly.

Replace the alternator lamp

Kit number

428546

Description*Kit: Alternator lamp*

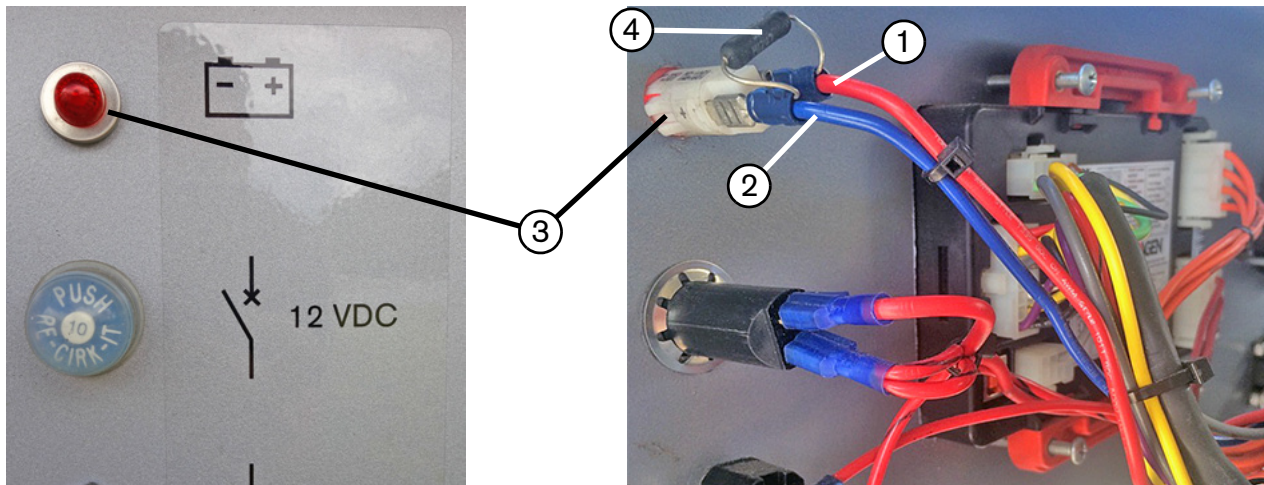
Remove the alternator lamp

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. From behind the front panel, disconnect the red wire ① and the blue wire ② from the back of the alternator lamp ③. See *Figure 27*. Be careful not to damage the resistor ④ as you disconnect the wires.
5. Push in the tabs on both sides of the alternator lamp, and push the lamp through the front panel to remove it.

Install the alternator lamp

1. Push the new alternator lamp ③ into the hole in the front panel until it clicks into place. See *Figure 27*.
2. Connect the red wire ① to the negative (-) tab on the alternator lamp.
3. Connect the blue wire ② to the positive (+) tab on the alternator lamp.
4. Make sure the resistor ④ is securely connected to both wires.
5. Put the system's top cover back in place. See *Install the cover* on page 88.
6. Reconnect the negative (-) ground cable to the battery.

Figure 27



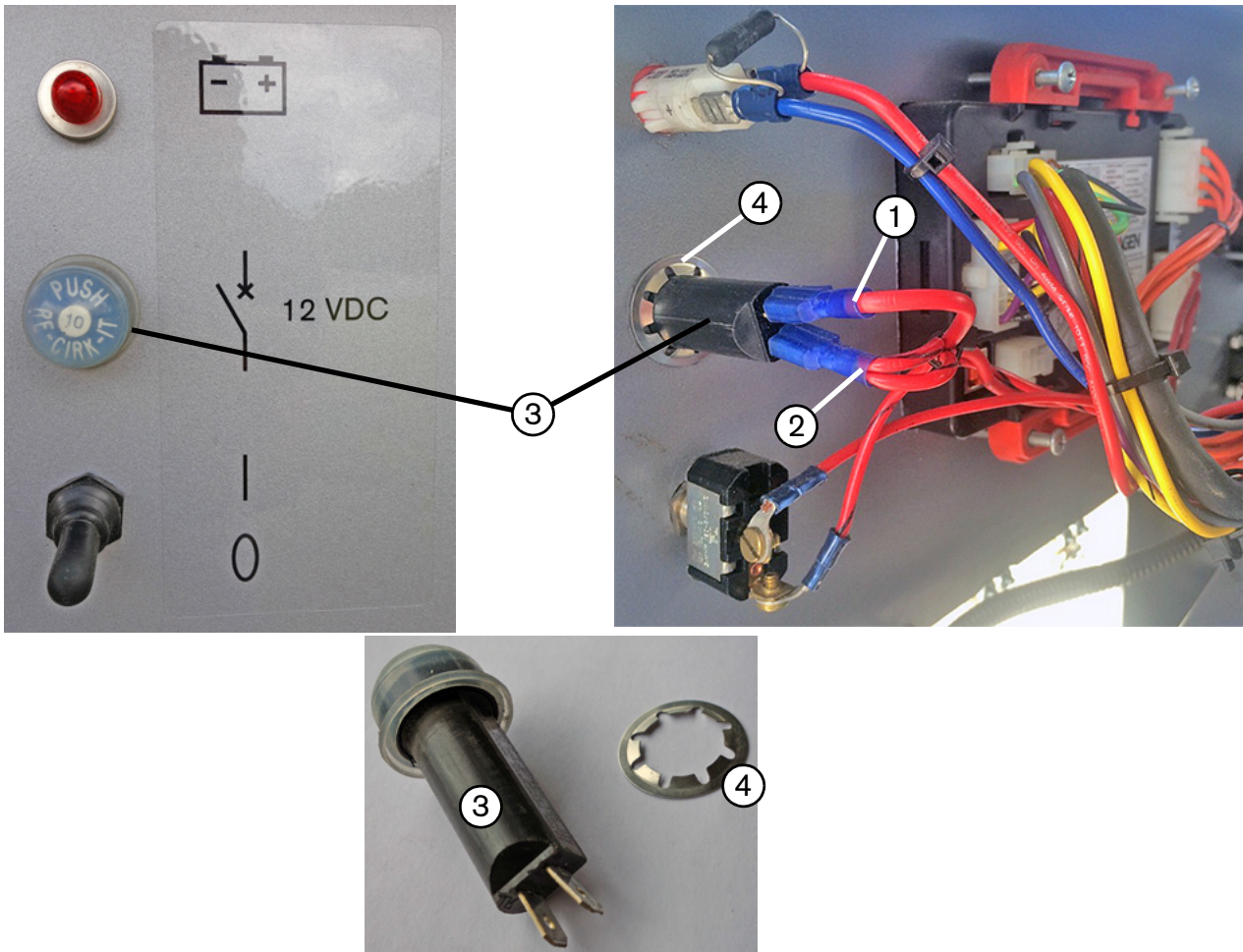
Replace the 12 V circuit breaker on the front panel

Kit number	Description
428743	Kit: 12 V circuit breaker 10 A

Remove the 12 V circuit breaker

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. From behind the front panel, disconnect the red wire ① and the red and red/black wire pair ② from the back of the 12 V circuit breaker ③.

Figure 28



5. Gently pull on the circuit breaker from outside the front panel. At the same time, slowly push the back of the circuit breaker through the lock washer ④.

3 – System-Level Components

Install the 12 V circuit breaker

1. Put the new 12 V circuit breaker ③ into place in the front panel. See *Figure 28* on page 95.
 - ❑ Orient the circuit breaker right side up.
 - ❑ Make sure the flat side is on the bottom.
2. Firmly press the circuit breaker against the front panel. At the same time, push the lock washer ④ over the back of the circuit breaker until it sits up against the front panel. Make sure the internal teeth of the lock washer point away from the front panel.
3. Connect the red and red/black wire pair ② to the bottom tab on the back of the circuit breaker.
4. Connect the single red wire ① to the top tab on the back of the circuit breaker.
5. Put the system's top cover back in place. See *Install the cover* on page 88.
6. Reconnect the negative (-) ground cable to the battery.

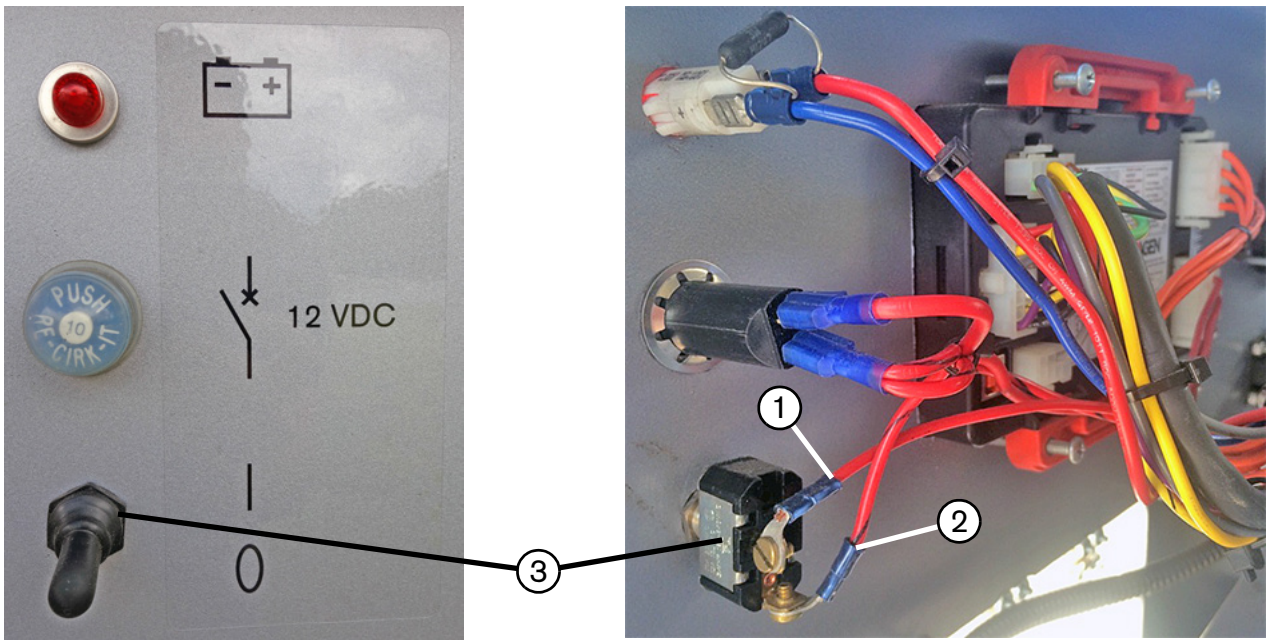
Replace the ON/OFF power switch

Kit number	Description
428510	Kit: ON/OFF power switch, 12 V

Remove the ON/OFF power switch

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. From behind the front panel, disconnect the red wire ① and the red/black wire ② from the back of the power switch ③. Set the screws aside. See *Figure 29* on page 97.
5. Carefully remove the rubber cover from the front of the power switch. To do this, hold the back of the power switch in place. At the same time, unscrew the base of the rubber cover until you can remove it from the power switch. Set the rubber cover aside.

Figure 29



Install the ON/OFF power switch

1. Put the new power switch ③ into place in the front panel. Orient the power switch vertically with one of the screw tabs at the bottom of the switch.
2. Slide the rubber cover over the front of the power switch.
3. Firmly press the power switch against the back of the front panel. At the same time, screw the base of the rubber cover onto the power switch until the rubber cover presses up against the front panel.
4. Make sure the power switch is still positioned vertically with the screw tab at the bottom of the switch.
5. Make sure the rubber cover is not twisted.
6. Connect the red/black wire ② to the bottom prong on the back of the power switch. See *Figure 29*.
7. Connect the red wire ① to the top prong on the back of the power switch.
8. **Make sure the power switch is in the OFF (O) position (pointing down).**
9. Put the system's top cover back in place. See *Install the cover* on page 88.
10. Reconnect the negative (-) ground cable to the battery.

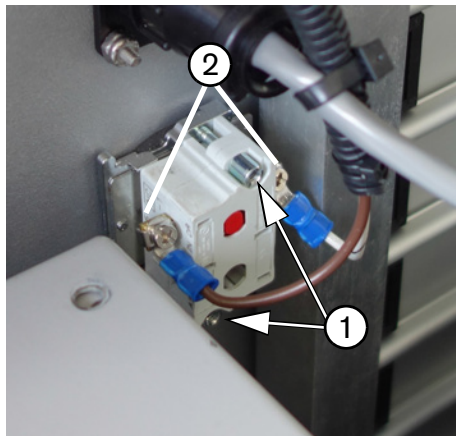
Replace emergency stop contact block

Kit number	Description
428497	<i>Kit: Contactor for Emergency Stop button</i>

Remove the emergency stop contact block

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (●) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. Loosen the 2 screws ① that secure the emergency stop contact block.
5. Unscrew the terminals ② from the contact block. Mark the locations in reference to the assembly.

Figure 30



Install the emergency stop contact block

1. Connect the 2 terminal wires ② to the new contact block.
2. Secure the contact block to the emergency stop plate by tightening the 2 screws ①.
3. Put the system's top cover back in place. See *Install the cover* on page 88.
4. Reconnect the negative (-) ground cable to the battery.

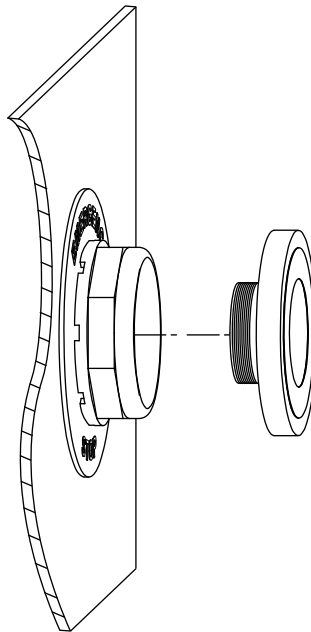
Replace emergency stop button

Kit number	Description
428498	<i>Kit: Emergency Stop button</i>

Remove the emergency stop button

1. Loosen and remove the emergency stop button by turning counterclockwise.

Figure 31



Install the emergency stop button

1. Tighten the new emergency stop button by turning clockwise.

Replace front panel circuit breaker

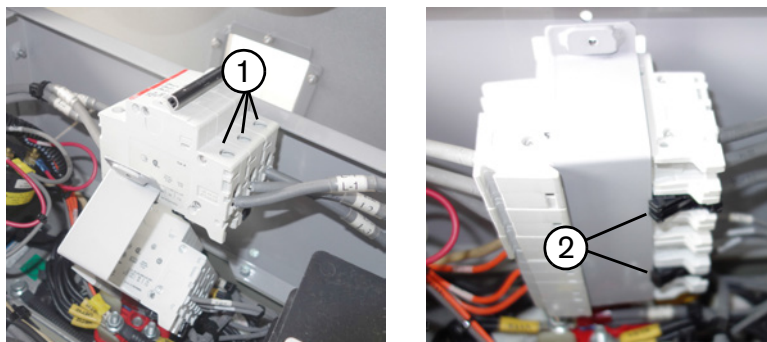
Kit number	Description
428514	<i>Kit: Main circuit breaker, 60 A, 3 pole (top)</i>
428578	<i>Kit: Transformer circuit breaker, 10 A, 3 pole (bottom)</i>

There are 2 front panel circuit breakers, one 60 A (top) and one 10 A (bottom). This procedure can be used to replace either one.

Remove the front panel circuit breaker

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Detach the front panel. See *Unfasten the front panel* on page 124.
3. Remove the cover from the top of the AC connection cabinet that is located on top of the generator. See *Figure 42* on page 115.
4. Remove the 2 screws that secure the circuit breaker bracket to the AC connection cabinet.
5. Remove the circuit breaker that needs replacement from the bracket. (The top breaker is 60 A. The bottom breaker is 10 A.) Unscrew the wires from the breaker by loosening the terminal screws ① and pulling the wires out. See *Figure 32*.

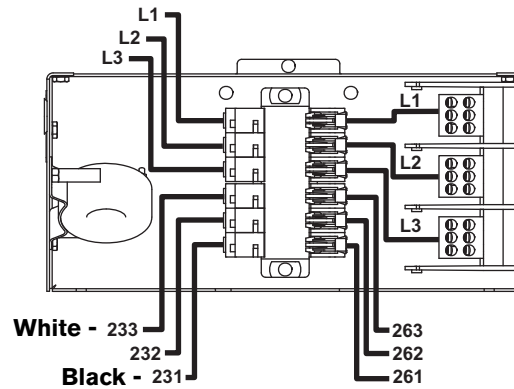
Figure 32



Install the front panel circuit breaker

1. Connect the wires to the circuit breaker by inserting the wire into the terminal. Make sure there are no stray/loose strands. Secure the wires by tightening the terminal screws. Make sure the wires are in the correct terminal slots.

Figure 33 – Circuit breaker wiring connections



2. Mount the circuit breaker to the bracket. (The top breaker is 60 A. The bottom breaker is 10 A.) Make sure the black DIN rail holder ② secures the circuit breaker to the bracket. See *Figure 32* on page 100.
3. Reinstall the circuit breaker bracket to the AC connection cabinet.
4. Reinstall the cover to the top of the AC connection cabinet.
5. Reinstall the front panel. See *Reattach the front panel* on page 125.

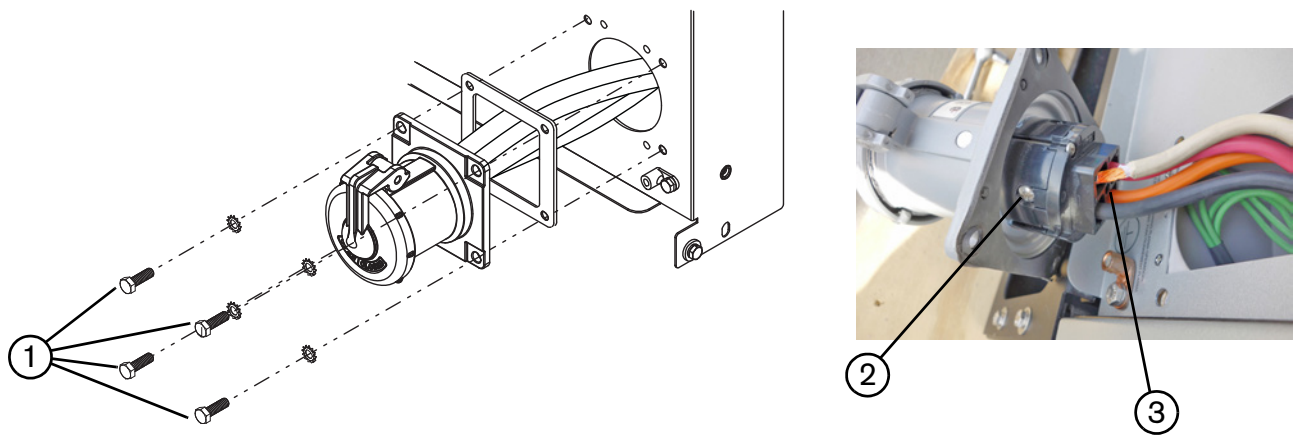
Replace the 480 V auxiliary outlet

Kit number	Description
428525	Kit: 480 V (60 A) auxiliary outlet replacement

Remove the 480 V auxiliary outlet

- 1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
- 2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
- 3. Remove the 4 screws and washers ① that secure the 480 V receptacle to the front panel.

Figure 34

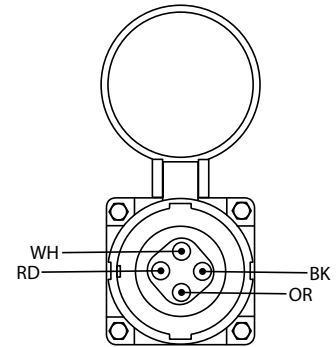


- 4. Pull the receptacle out from the front panel and loosen the box terminal screws ② to disconnect the wires from the receptacle. Mark the order of the wire colors and location to the receptacle. Check that the wires are stripped clean and there are no stray wire strands ③.

Ground/neutral	White	WH
L1	Black	BK
L2	Red	RD
L3	Orange	OR

Install the 480 V auxiliary outlet

1. Run the wires through the new gasket. Make sure the wire ends are stripped clean. Do not tin the wire ends.
2. Loosen the box terminal screws ② in the interior assembly of the receptacle until the screws start to apply pressure to the walls.
3. Insert each of the 4 wires (red, black, white, and orange) into the proper box terminal on the receptacle. Tighten the box terminal screws for each wire to 34.56 kg·cm (30 in·lb minimum).
4. Make sure there are no stray wire strands.
5. Set the receptacle and gasket into the front panel with the hinge facing up. Secure using the 4 screws and torque to 34.56 kg·cm (30 in·lb minimum) / 46.08 kg·cm (40 in·lb maximum).



Replace the service panel compression latch

Kit number

428586

Description

Kit: Replacement twist-lock latch for service panels

Remove the service panel compression latch

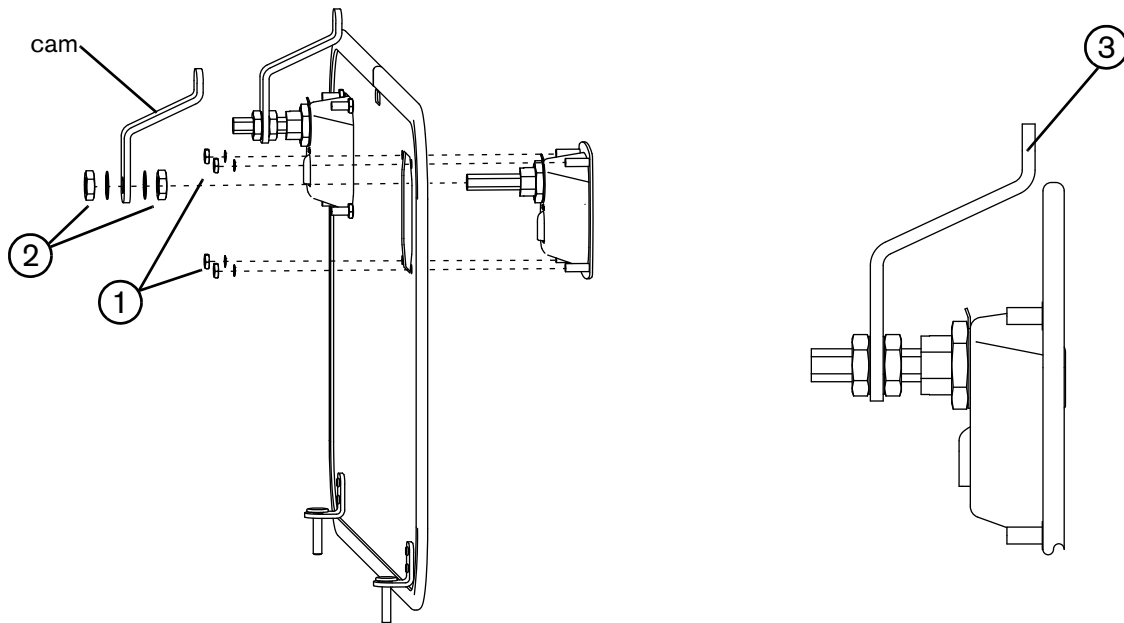
1. Remove the service panel from the unit.
2. Loosen and remove 4 nuts and lock washers from the rear of the compression latch assembly ①. See *Figure 35*.
3. Remove the bolts and lock washers that secure the cam ②.

Install the service panel compression latch

1. Insert the compression latch into the service panel. Secure with 4 nuts and lock washers ①.
2. With the latch in the closed position, adjust the jam nut to position the cam to point toward the top of the panel ③. See *Figure 35*. Secure with nuts and lock washers.

When you put the service panel in place, you may need to adjust the cam position by positioning the jam nuts and lock washers. With the cam properly positioned, tighten the nuts to secure it in place.

Figure 35



Replace the 120 V auxiliary outlet

Kit number	Description
428528	Kit: 120 V (20 A) auxiliary outlet replacement

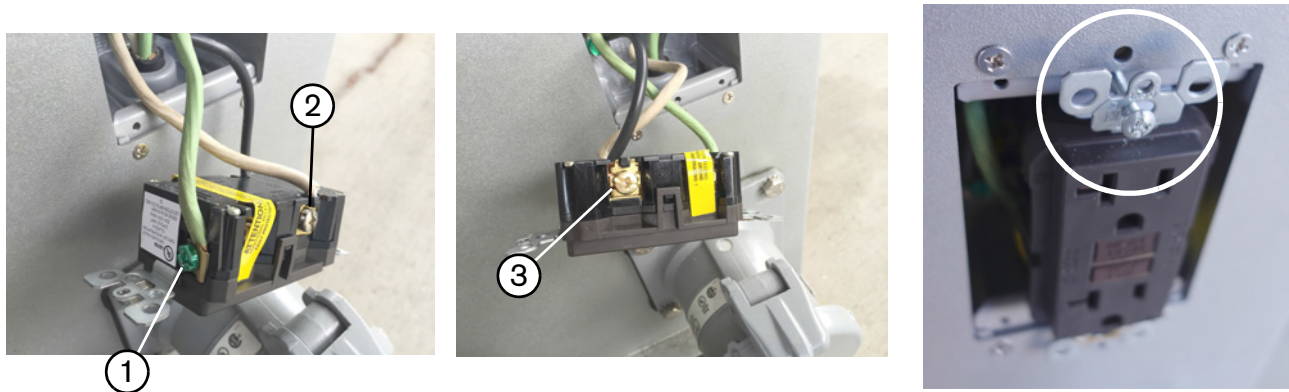
Remove the 120 V auxiliary outlet

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the 2 screws that secure the 120 V cover and gasket.
4. Remove the 2 screws that secure the 120 V outlet. Pull the outlet out and loosen the terminal screws to disconnect the wires from the outlet.

Install the 120 V auxiliary outlet

1. On the new outlet connect the green wire ① to the ground (green screw). Connect the white wire ② to the silver screw. Connect the black wire ③ to the brass screw.

Figure 36



2. Insert the new outlet into the electrical box. Secure using 2 screws. Make sure the screws make contact with the threaded holes of the electrical box, not the holes of the metal front panel.
3. Put the cover and gasket back in place and secure with 2 screws.
4. Reconnect the negative (-) ground cable to the battery.
5. Test the GFCI circuit. See *Test the GFCI outlet* on page 66.

Replace 120 V auxiliary outlet circuit breaker

Kit number

428530

Description

Kit: Circuit breaker for the 120 V (20 A) auxiliary outlet

Remove the 120 V auxiliary outlet circuit breaker

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and engine-side panel from the system. See *Remove the cover* on page 86.
4. Loosen and remove the water resistant cover ① over the circuit breaker's button. Pull the breaker out from the rear of the panel ②.

Figure 37



5. Disconnect the 2 blade connectors ③ from the circuit breaker.

Install the 120 V auxiliary outlet circuit breaker

1. Push the 2 blade connectors onto the new circuit breaker.
2. Push the circuit breaker through the hole on the front panel. Make sure the nomenclature on the button is oriented correctly as viewed from the front panel. Secure by tightening the water resistant cover over the button.
3. Put the system's top cover and engine-side panel back in place. See *Install the cover* on page 88.
4. Reconnect the negative (-) ground cable to the battery.

Replace the front panel

Kit number	Description
428518	<i>Kit: Front panel (hardware not included)</i>
428506	<i>Kit: Labels for front panel controls</i>
428507	<i>Kit: Freedom 38 PPA decal for front and rear panels</i>
428508	<i>Kit: Yellow warning sticker for Emergency Stop button</i>

Remove the front panel

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and side panels from the system. See *Remove the cover* on page 86.
4. Release pressure from the air tank by turning the air condensate lever. See page 61. Release the pressure at the separation tank by pulling the tab on the pressure relief valve.
5. Remove the 4 screws and nuts to disconnect the CPC connector from the front panel.
6. Remove the following components from the front panel.
 - ❑ Dynagen controller. See *Remove the Dynagen system controller* on page 92.
 - ❑ Air pressure gauge. See *Remove the air pressure gauge* on page 171.
 - ❑ Fuel shutoff relay. See *Remove the fuel shutoff relay* on page 151.
 - ❑ 12 V circuit breaker. See *Remove the 12 V circuit breaker* on page 95.
 - ❑ Alternator lamp. See *Remove the alternator lamp* on page 94.
 - ❑ ON/OFF power switch. See *Remove the ON/OFF power switch* on page 96.
 - ❑ 120 V outlet. See *Remove the 120 V auxiliary outlet* on page 105.
 - ❑ 120 V circuit breaker. See *Remove the 120 V auxiliary outlet circuit breaker* on page 106.
 - ❑ 480 V outlet. See *Remove the 480 V auxiliary outlet* on page 102.
7. Remove the emergency stop button by turning it counterclockwise. Remove the large nut that secures the emergency stop assembly to the front panel.

Figure 38 – Emergency stop button exploded view

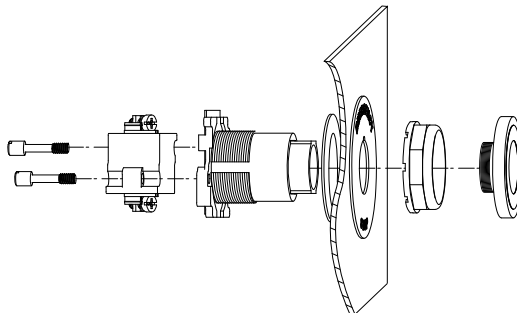
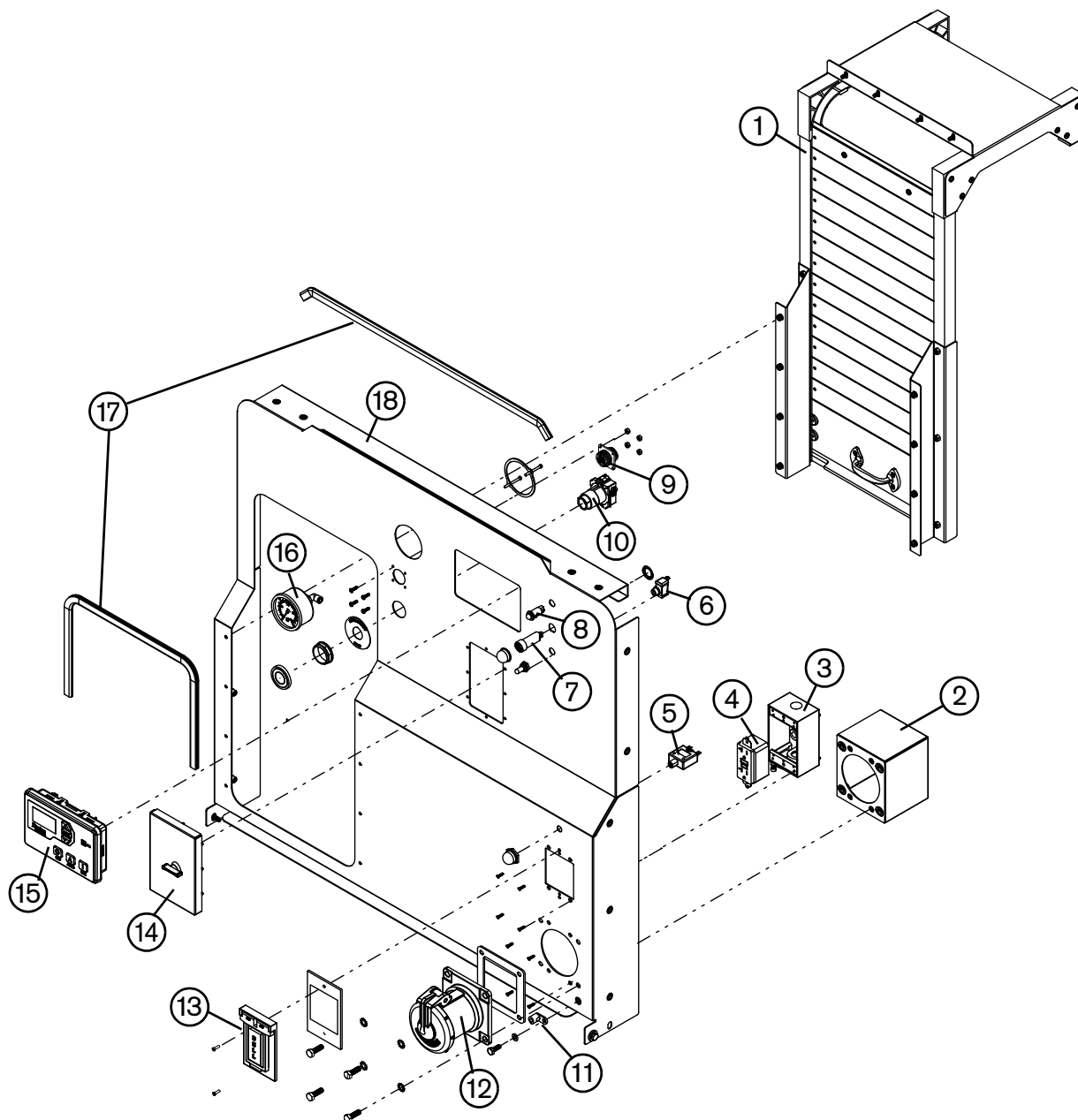


Figure 39 – Front panel assembly exploded view (cables not shown)



- | | | | |
|---|-----------------------------|----|--|
| 1 | Plasma supply door assembly | 10 | Emergency stop contact assembly and button |
| 2 | 480 V outlet electrical box | 11 | Ground terminal |
| 3 | 120 V outlet electrical box | 12 | 480 V outlet |
| 4 | 120 V outlet | 13 | 120 V outlet cover |
| 5 | 120 V circuit breaker | 14 | Front panel breaker cover |
| 6 | ON/OFF power switch | 15 | Dynagen controller |
| 7 | 12 V circuit breaker | 16 | Air pressure gauge |
| 8 | Alternator lamp | 17 | Edge trim |
| 9 | CPC connector | 18 | Front panel |

8. Remove the 2 screws that secure the 120 V outlet cover and gasket. Remove the 2 screws that secure the 120 V outlet. Remove the 4 screws that secure the electrical box to the front panel. Work the outlet out of the rear of the panel (keep the wires attached) with the electrical box.
9. Remove the 4 screws that secure the 480 V electrical box to remove it with the wires from the front panel.
10. Remove the screw and washer that secure the ground terminal.

Figure 40



11. Remove the plasma supply door assembly by removing the 12 screws and washers that secure it to the panel.
12. Remove the 3 screws and nuts that secure the front panel main circuit breaker door.
13. Remove the edge trim from the top of the panel and from the plasma supply door slot.
14. The front panel is now stripped of all components and can be replaced. Remove the 2 bottom screws securing the front panel to the base (one on each side). See *Figure 48* on page 124.

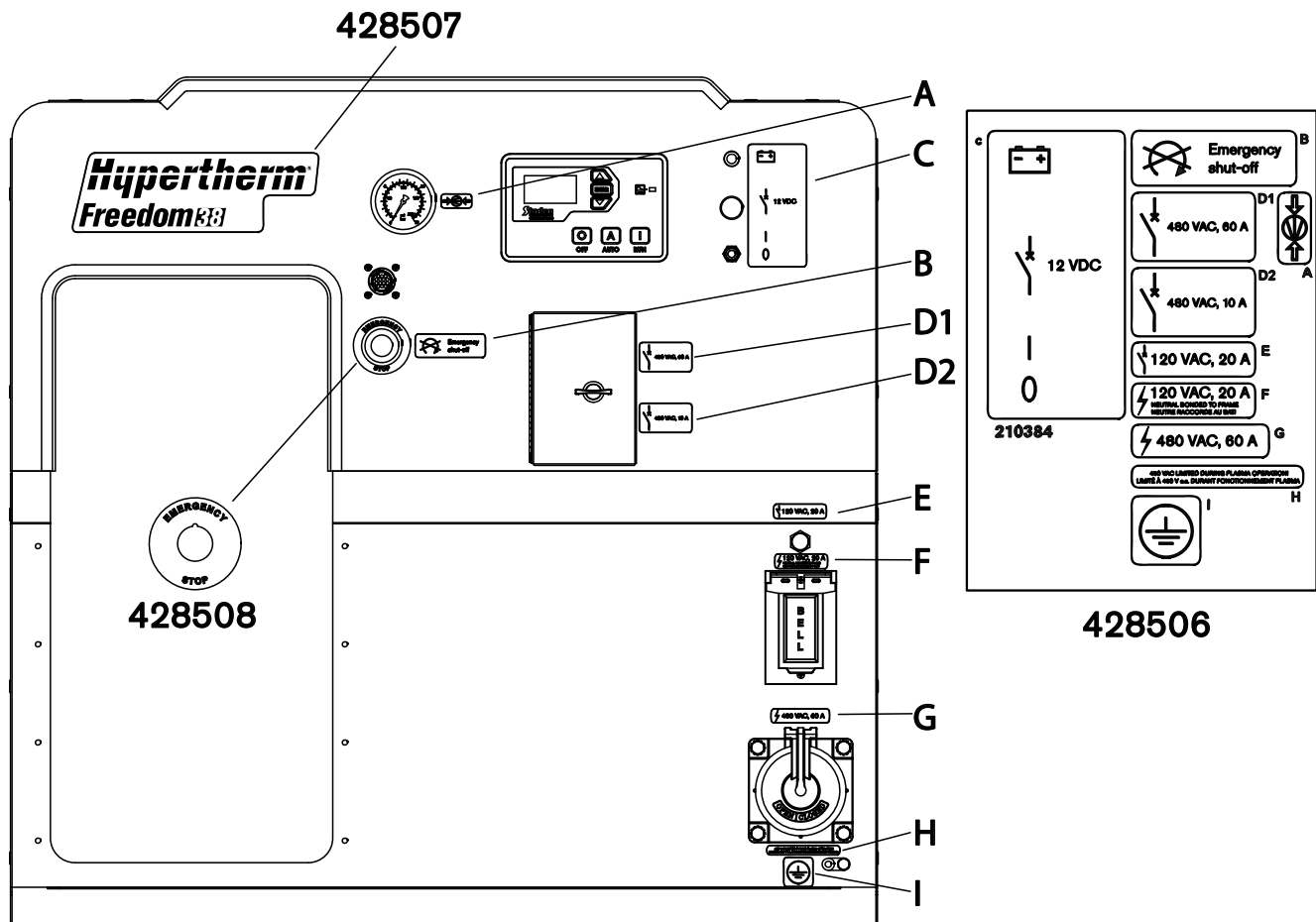
Install the front panel

1. On the new front panel, replace the edge trim on the top of the panel and on the plasma supply door slot.
2. Place the yellow emergency stop sticker in place. See *Figure 41* on page 110.
3. Reinstall the plasma door assembly and the front panel circuit breaker door.
4. Place the new front panel in place. Secure it with the 2 bottom screws and washers to hold it in place.
5. Reconnect the CPC connector to the front panel. Secure it with the 4 screws and nuts.
6. Reinstall the following components.
 - ❑ Dynagen controller. See *Install the Dynagen system controller* on page 92.
 - ❑ Air pressure gauge. See *Install the air pressure gauge* on page 172.
 - ❑ Fuel shutoff relay. See *Install the fuel shutoff relay* on page 151.
 - ❑ 12 V circuit breaker. See *Install the 12 V circuit breaker* on page 96.
 - ❑ Alternator lamp. See *Install the alternator lamp* on page 94.
 - ❑ ON/OFF power switch. See *Install the ON/OFF power switch* on page 97.
 - ❑ 120 V circuit breaker. See *Install the 120 V auxiliary outlet circuit breaker* on page 106.

3 – System-Level Components

7. Place the emergency stop assembly firmly against the front panel from the rear. Secure it with the large nut. Make sure the yellow plate is oriented correctly. Screw on the emergency stop button by turning it clockwise. See *Figure 38* on page 107.
8. Work the 120 V outlet out to the front of the panel from the rear. Secure the 120 V electrical box to the front panel using 4 screws. Reinstall the 120 V outlet. See *Install the 120 V auxiliary outlet* on page 105.
9. Place the 480 V electrical box and wires against the rear of the front panel. Run the wires through to the front, and secure the electrical box using 4 screws. Reinstall the 480 V outlet. See *Install the 480 V auxiliary outlet* on page 103.
10. Put the ground terminal in place on the front panel. Secure with the screw and washer. Make sure all metal-to-metal contact areas are clean.
11. Apply the labels. Refer to *Figure 41* for placement.

Figure 41



12. Put the system's top cover and side panels back in place. See *Install the cover* on page 88.
13. Reconnect the negative (-) ground cable to the battery.

Section 4

Plasma Components



CAUTION!

To ensure safe operation of the system at all times, and to maximize the life of the product, use only replacement parts that are approved by the manufacturers.




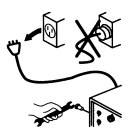





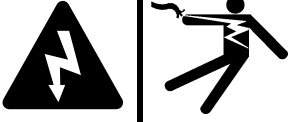
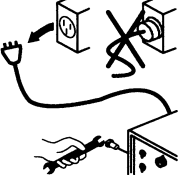
CAUTION!

FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT

Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.

Wash thoroughly if your skin comes in contact with fuel or oil from the engine.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system or from the plasma supply. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.
NOTICE	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

	WARNING! ELECTRIC SHOCK CAN KILL
	Disconnect or turn OFF electrical power before performing any maintenance that involves removing the cover from the system or the consumables from the plasma torch. Read the separate <i>Safety and Compliance Manual</i> (80669C) included with your system for more safety precautions pertaining to plasma cutting.

The plasma components cover the air filter element and filter bowl. For procedures that explain how to replace all of the internal components in the on-board plasma cutting system, refer to the *Powermax125 Service Manual* (808070). You can download this manual from www.hypertherm.com.

- *Replace the air filter element and air filter bowl in the plasma supply* on page 114.
- *Detach the plasma supply power cord* on page 115.
- *Unfasten the plasma supply* on page 118.

Replace the air filter element and air filter bowl in the plasma supply

Kit number	Description
428415	<i>Kit: Nylon air filter bowl for plasma cutting system (includes O-ring) (in rear panel recess)</i>
228695	<i>Kit: Air filter element for plasma cutting system (inside filter bowl – includes O-ring for filter bowl)</i>

Remove the air filter element and air filter bowl

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Drain the air tank to release pressure. See page 61.
3. Remove the service panel on the plasma side of the system.
4. Disconnect the compressed air hose from the back of the plasma supply.



5. Locate the air filter bowl in the plasma cutting system's rear panel. The air filter element is inside the filter bowl.



The air filter bowl in your plasma supply may differ slightly from the one shown in this picture.

Install the air filter element and air filter bowl

1. Refer to the *Maintenance and Repair* chapter in the *Powermax125 Operator Manual* to install a new air filter element and air filter bowl.
2. Reconnect the compressed air hose to the back of the plasma supply.
3. Put the service panel back in place.

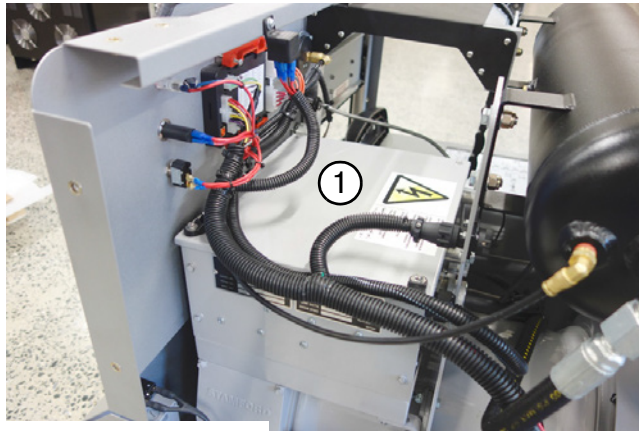
Detach the plasma supply power cord

The plasma supply's power cord is wired directly to the system and must be disconnected to remove the plasma supply.

Disconnect the plasma supply power cord

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Turn OFF (O) the plasma supply power switch located on the rear panel of the plasma supply.
3. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
4. Remove the top cover and both side panels from the system. See *Remove the cover* on page 86.
5. Remove the connections from the rear of the plasma supply. See *Detach the plasma supply* on page 118.
6. Remove the cover ① from the top of the AC connection cabinet that is located on top of the generator.

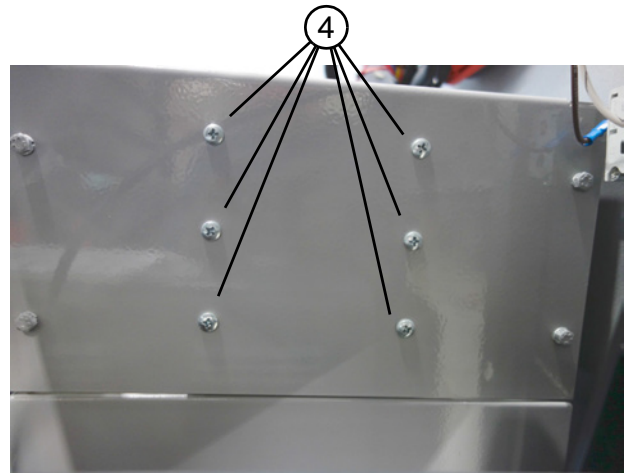
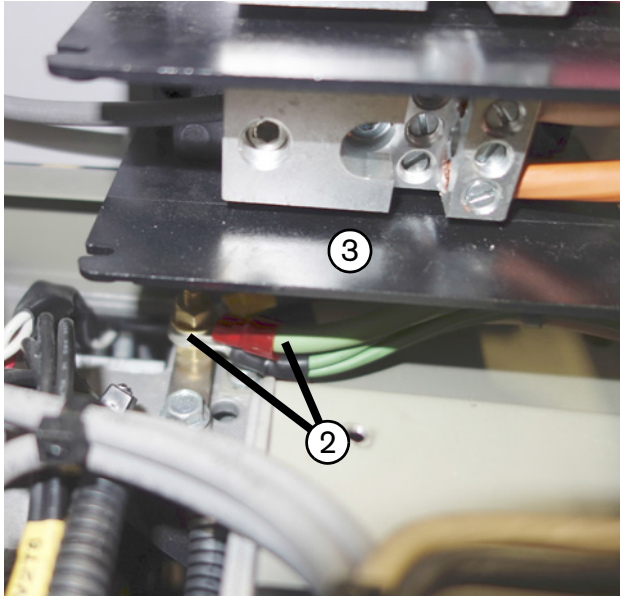
Figure 42



4 – Plasma Components

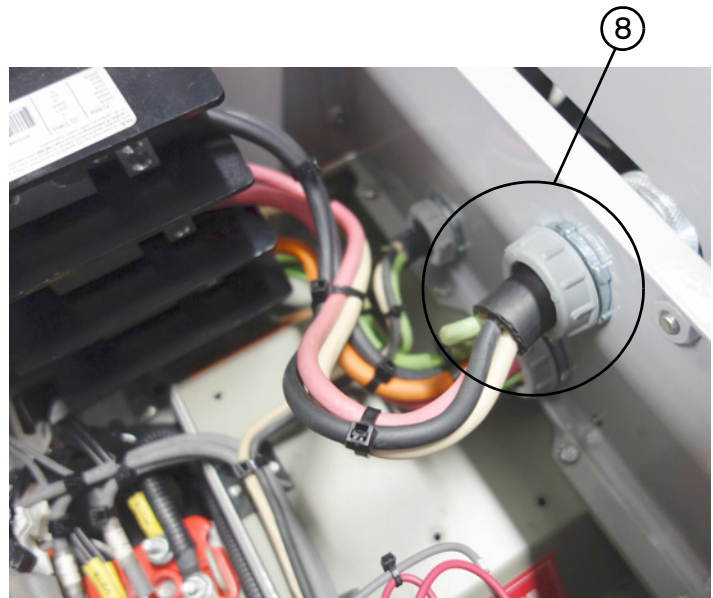
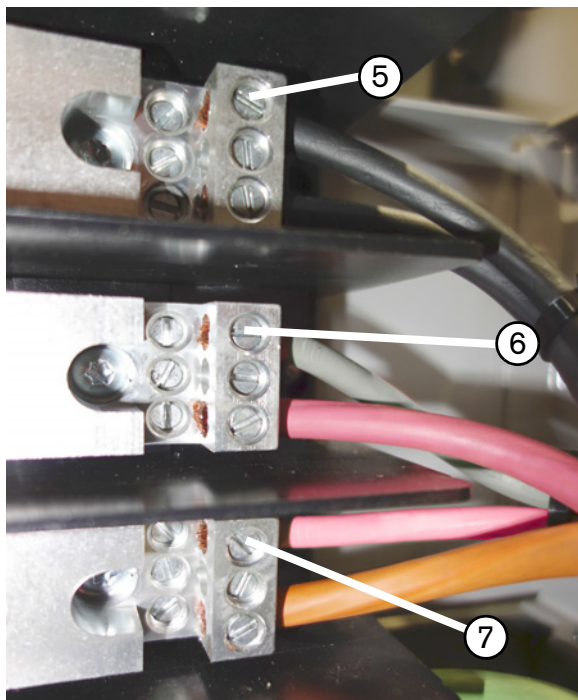
7. Disconnect the power cord's green ground wire ② from the ground stud. See *Figure 43*. Remove the terminal block ③ to access the ground stud. Remove the 6 screws ④ that secure the terminal block. These are located outside the AC connection cabinet on the plasma side.

Figure 43



8. Disconnect the power cord's black ⑤, white ⑥, and red ⑦ wires. See *Figure 44*.

Figure 44



9. Loosen the top-most strain relief at the back of the AC connection cabinet ⑧. Slowly pull the power cord's wires through the strain relief.
10. Cut any cable ties that secure the power cord. Remove the power cord.

Reconnect the plasma supply power cord

1. Make sure the system is OFF.
2. Make sure the power switch on the back of the plasma supply is set to OFF (O).
3. Route the plasma supply's power cord wires through the top-most strain relief in the back of the AC connection cabinet. See ⑧ in *Figure 44*.
4. Connect the green ground wire to the ground stud in the AC connection cabinet. See *Figure 43* on page 116.



Reconnect any ground wires that were removed to access the plasma supply ground.
Secure remaining ground wires with nut.

5. Reinstall the terminal block. See *Figure 43* on page 116.
6. Connect the black ⑤, red ⑥, and white ⑦ wires as shown in *Figure 44* on page 116.
7. Tighten the strain relief ⑧. See *Figure 44* on page 116.
8. Reinstall the cover on the AC connection cabinet. Secure the power cord with cable ties.
9. Reconnect the plasma supply. See *Reattach the plasma supply* on page 120.
10. Put the system's top cover and side panels back in place. See *Install the cover* on page 88.
11. Reconnect the negative (-) ground cable to the battery.

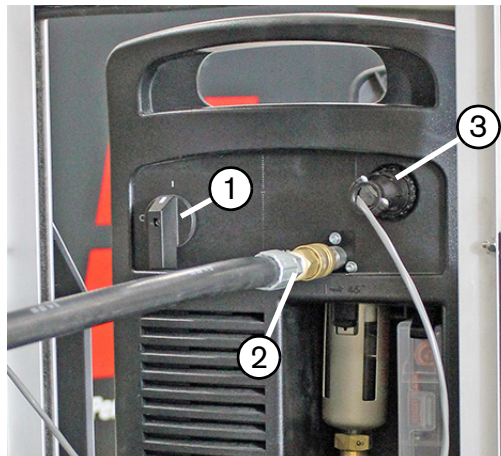
Unfasten the plasma supply

Detach the plasma supply

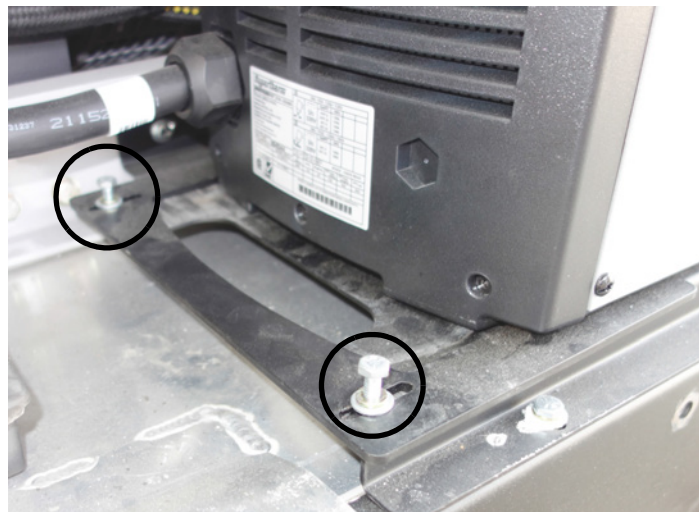
This procedure is to move but not disconnect the plasma supply in order to gain access to parts otherwise inaccessible. To fully disconnect the plasma supply from the system the power cord must be disconnected. See *Detach the plasma supply power cord* on page 115.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
4. Set the power switch ① on the back of the plasma supply to OFF (O).
5. Disconnect the compressed air hose ②.
6. Disconnect the machine interface (CPC) connector ③.

Figure 45

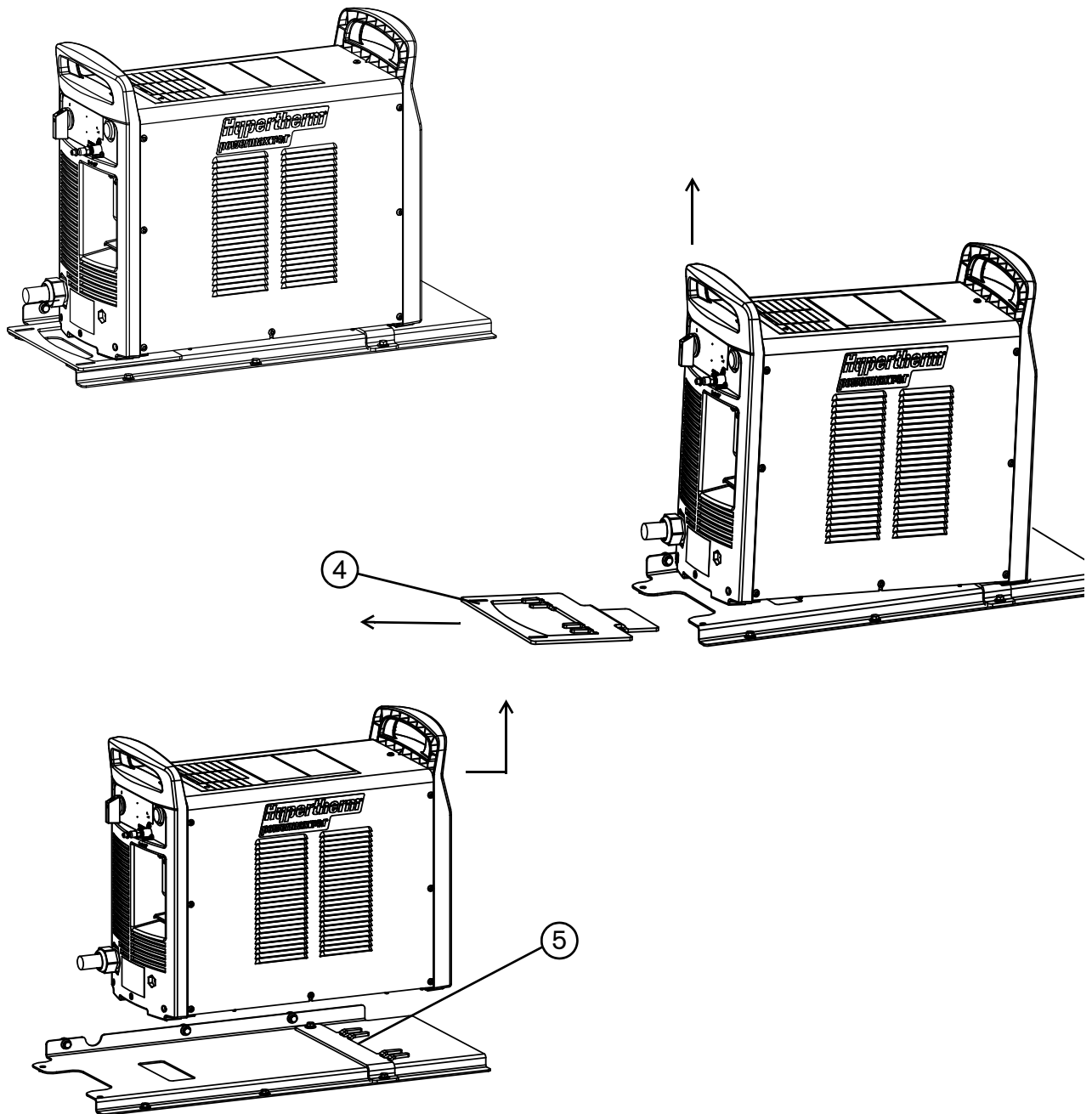


7. Remove the 2 screws that secure the rear bracket of the plasma supply.



8. Lift the rear of the plasma supply and work the rear bracket ④ free from the plasma supply and mounting plate.

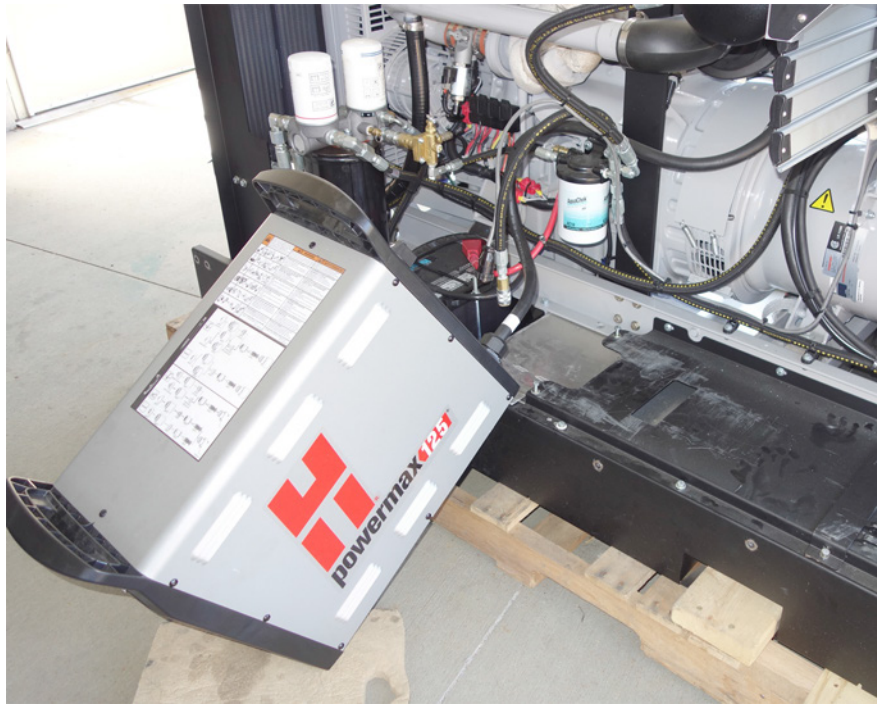
Figure 46



9. Grip the front and rear handles at the top of the plasma supply. Slide the plasma supply forward to free it from the front bracket ⑤.

10. Set aside the plasma supply so that it is clear of the mounting bracket.

Figure 47



Reattach the plasma supply

1. Make sure the system is OFF.
2. Make sure the power switch on the back of the plasma supply is set to OFF (O).
3. Slide the front of the plasma supply so that the bottom cover engages the front bracket ⑤. See *Figure 46*. Lift the rear of the plasma supply and work the rear bracket ④ into place. Make sure the bracket is seated correctly. Secure the rear bracket with 2 screws. See page 118.
4. Reconnect the compressed air hose and machine interface (CPC) connector to the back of the plasma supply. See *Figure 45* on page 118.
5. Set the power switch on the back of the plasma supply to ON (I).
6. Reconnect the negative (-) ground cable to the battery.
7. Put the system's top cover and plasma-side panel back in place. See *Install the cover* on page 88.

Section 5

Generator and Engine Components



CAUTION!

To ensure safe operation of the system at all times, and to maximize the life of the product, use only replacement parts that are approved by the manufacturers.




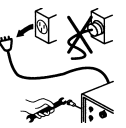







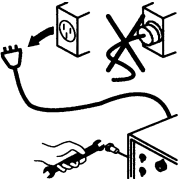
CAUTION!

FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT

Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.

Wash thoroughly if your skin comes in contact with fuel or oil from the engine.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system or from the plasma supply. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.
NOTICE	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

		<p style="text-align: center;">WARNING! ELECTRIC SHOCK CAN KILL</p>
	<p>Disconnect or turn OFF electrical power before performing any maintenance that involves removing the cover from the system or the consumables from the plasma torch.</p> <p>Read the separate <i>Safety and Compliance Manual</i> included with your system for more safety precautions pertaining to plasma cutting.</p>	

This section details the components associated with the generator and engine.

- *Unfasten the front panel* on page 124.
- *Replace the transformer* on page 126.
- *Replace the emergency air intake shut-off valve* on page 130.
- *Replace the automatic voltage regulator (AVR)* on page 133.
- *Replace the fuel-level sensor* on page 136.
- *Replace the AC sensor wiring harnesses* on page 138.
- *Replace the control system wiring harness* on page 140.
- *Replace the generator wiring harness* on page 142.
- *Replace the engine wiring harness* on page 148.
- *Replace the relays* on page 150.
- *Replace the fuel shutoff relay* on page 151.
- *Replace the cooling unit fan relay* on page 152.
- *Replace the generator rectifiers* on page 153.

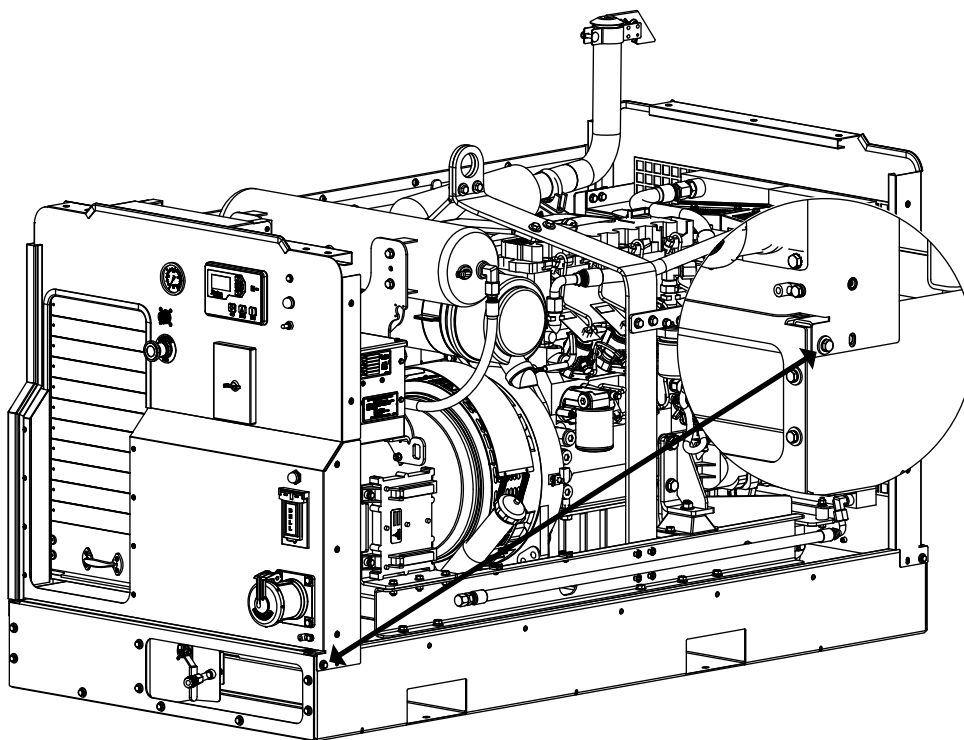
Unfasten the front panel

Detach the front panel

This procedure covers the removal of the front panel to gain access to components otherwise inaccessible. Some items are removed to allow the panel to be detached and set aside with many of the connections remaining intact.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and both side panels from the system. See *Remove the cover* on page 86.
4. Remove the 4 screws and nuts that secure the CPC connector to the front panel.
5. Remove the 2 bottom screws securing the front panel to the base.

Figure 48



6. Position the front panel against the generator side of the unit. Disconnect the air pressure line from the air pressure gauge or air tank if necessary. Route the wires for the 120 V and 480 V outlets under the generator. Removal of the plasma supply sliding door may be necessary.

Figure 49




Reattach the front panel



1. Place the front panel back in position. Secure with 2 screws near the base board. See *Figure 48* on page 124. Make sure all the wires are connected securely on the back of the panel.
2. Reconnect the air line from the air tank to the pressure gauge if detached.
3. Reconnect the CPC connector to the front panel using the 4 screws and nuts.
4. Put the system's top cover and panels back in place. See *Install the cover* on page 88.
5. Reconnect the negative (-) ground cable to the battery.

Replace the transformer

Kit number	Description
428549	Kit: Transformer, 120 VAC

The 120 VAC transformer is located underneath the on-board plasma supply. Access to the transformer requires removing the plasma supply and bracket, the front panel, and front base plate.

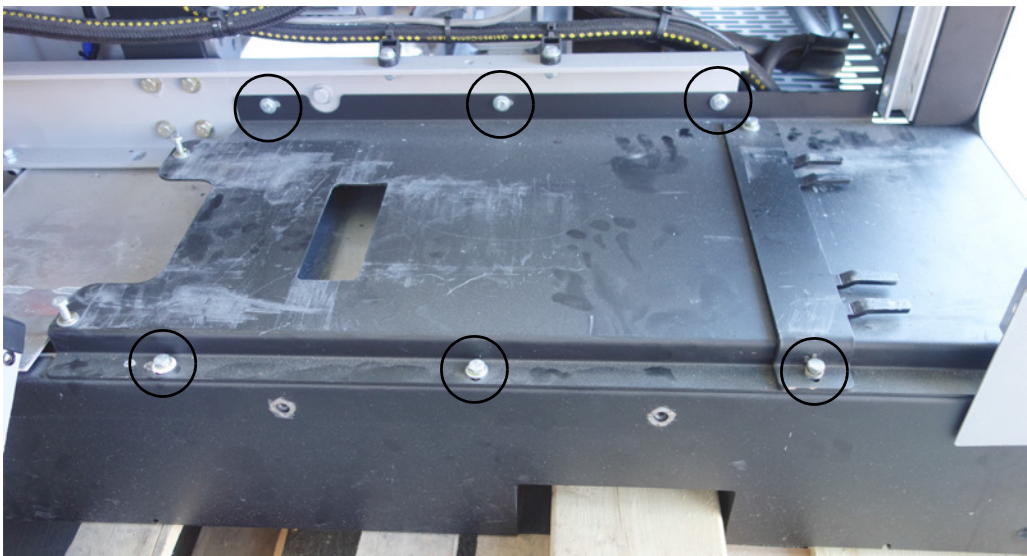
 This procedure requires 2 people to complete.

		<p>WARNING!</p> <p>HEAVY EQUIPMENT – LIFT CAREFULLY</p>
<p>The transformer in this system can weigh up to 18 kg (40 pounds) or more. Use appropriate lifting aids and techniques when lifting or moving the transformer.</p>		

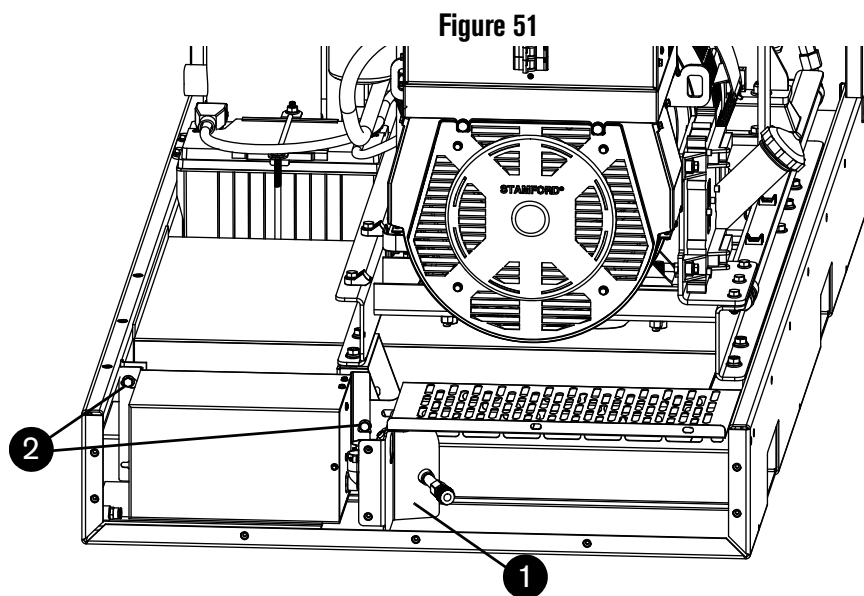
Remove the transformer

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the top cover and both side panels from the system. See *Remove the cover* on page 86.
3. Detach the front panel from the system. See *Unfasten the front panel* on page 124.
4. Remove the plasma supply. See *Detach the plasma supply* on page 118.
5. Remove the 6 screws and washers that secure the plasma supply bracket. Set aside the bracket and hardware.

Figure 50



6. Remove the front black base board.
7. Remove the condensate valve and auxiliary air bracket ①. Disconnect the hoses on the condensate valve if necessary.
8. Remove the transformer screws ②.

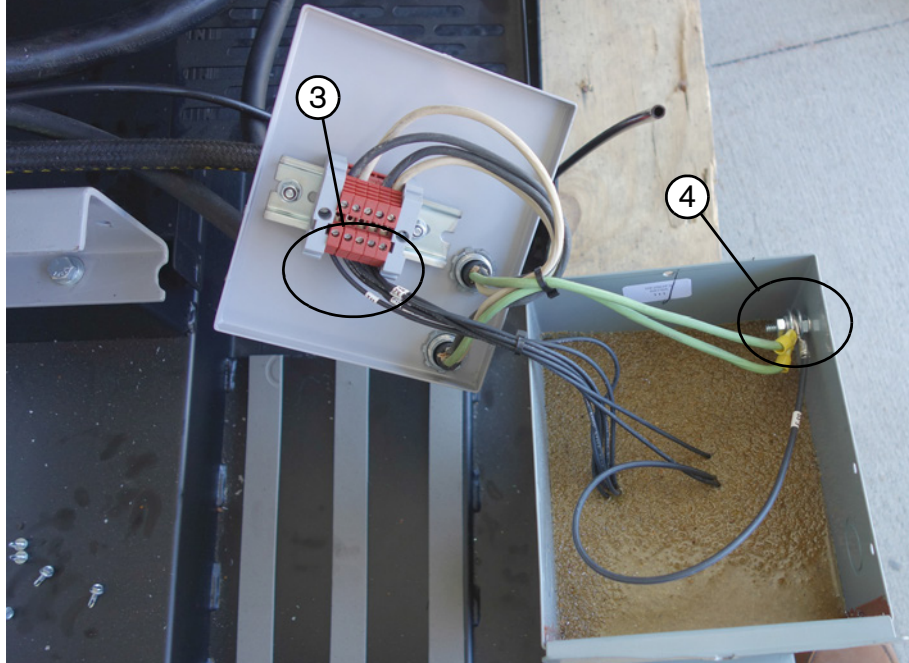


9. Have another person help to carefully lift the transformer out of the system.

5 – Generator and Engine Components

10. Remove the cover with the cable entry points on the transformer. See *Figure 52*.
11. Disconnect the transformer wires from the terminal block ③. Disconnect the ground stud wires ④. The cover with the terminal block will be wired to the new transformer.

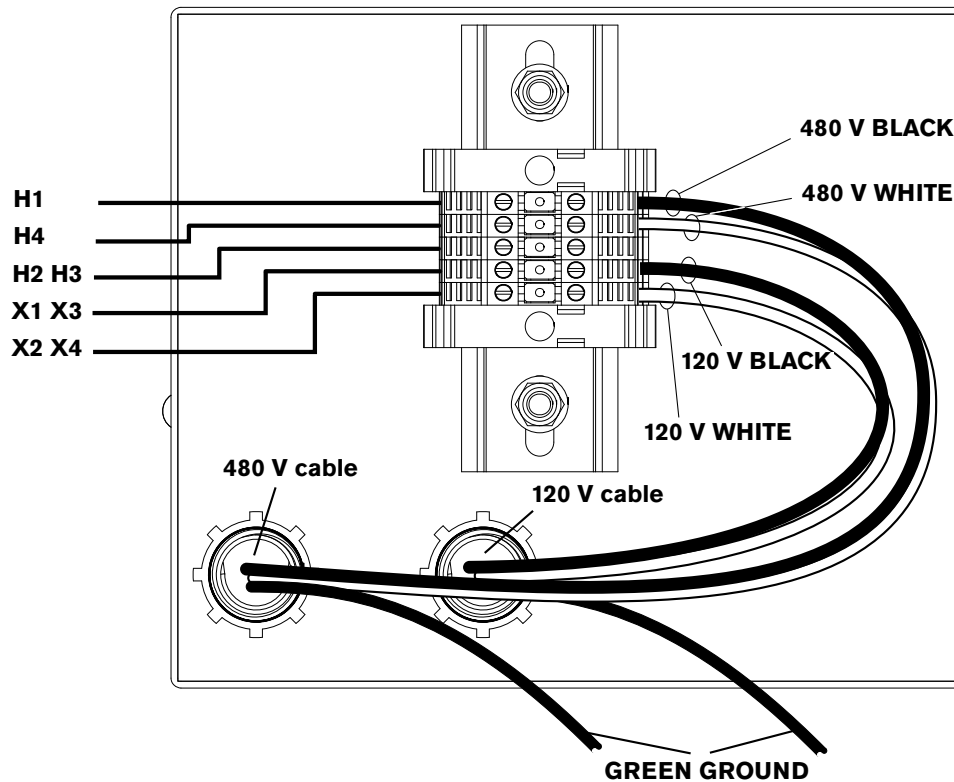
Figure 52



Install the transformer

1. Remove the cover panel from the new transformer. This will be replaced by the old cover panel with the terminal block and cables.
2. Connect the 2 ground wires from the old cover to the new transformer box chassis ground stud. See *Figure 52*. Connect the ground from the new transformer (black wire E-SS) to the same spot.
3. Connect the wires (H1, H2, H3, H4, X1, X2, X3, X4) from the new transformer to the terminal block. See *Figure 53*. In case the cable wires become disconnected:
 - ❑ The 120 V cable is the one that connects to the 120 V outlet on the front panel.
 - ❑ The 480 V cable comes from the front panel 10 A circuit breaker in the AC connection cabinet.

Figure 53 – 120 VAC transformer terminal block wiring



4. Install the newly wired cover panel on the new transformer.
5. Have another person help to carefully place the transformer into position. Orient the transformer so that the tabs align with the screw holes in the chassis.
6. Secure the transformer using the 2 screws.
7. Attach the drain hoses to the air condensate valve if removed. Reconnect the condensate valve and auxiliary air bracket.
8. Put the front black base board back into place. Hand tighten only to position the board in place. When the black base board is set correctly tighten all the screws.
9. Reinstall the plasma supply bracket with the 6 screws and washers.
10. Reinstall the plasma supply. See page 120.
11. Reattach the front panel. See page 125.
12. Put the system's top cover and panels back in place. See *Install the cover* on page 88.

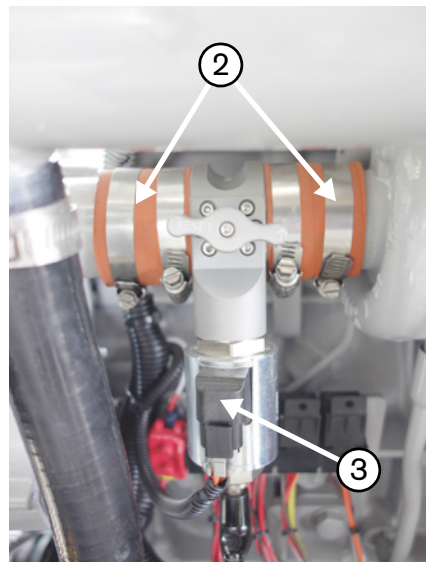
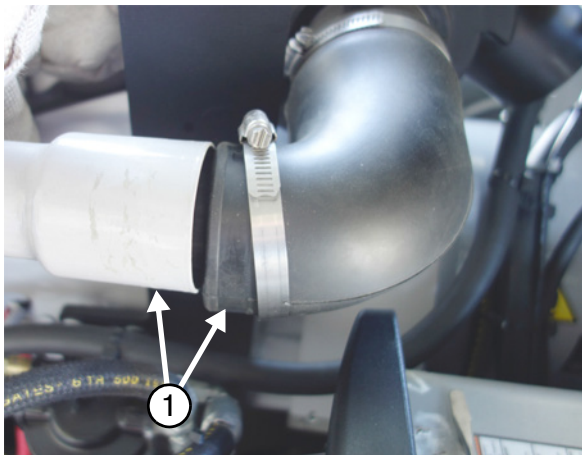
Replace the emergency air intake shut-off valve

Kit number	Description
428509	<i>Kit: Emergency air intake shutoff valve</i>

Remove the emergency air intake shut-off valve

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and the plasma-side panel from the system. See *Remove the cover* on page 86.
4. Loosen the hose clamp on the rubber elbow ① located after the air filter housing. Work the pipe loose from the elbow.
5. Loosen the hose clamps on both sides of the air intake shut-off valve ②. Unplug the wire harness connection ③.

Figure 54

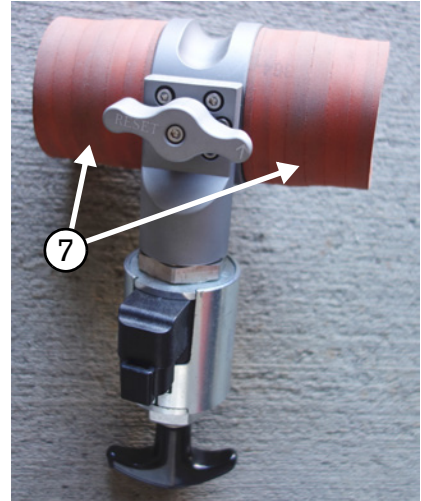
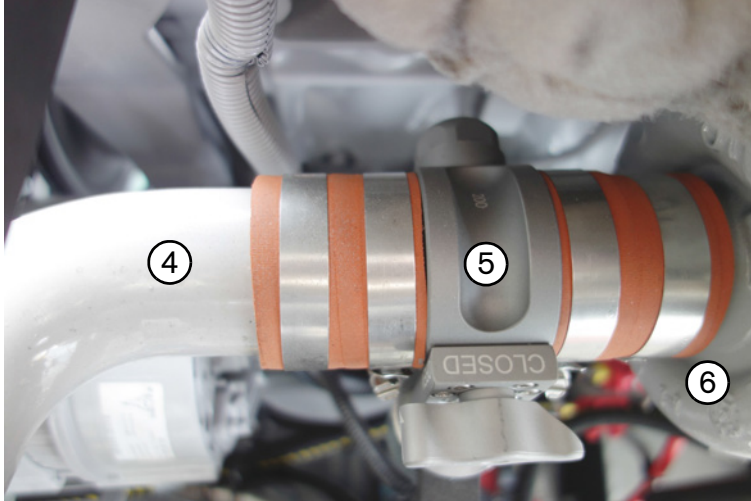


6. Remove the emergency air intake shut-off valve ⑤ from the air intake pipe ④ and the air intake opening ⑥.



Set aside the rubber hose and hose clamps if they detach.

Figure 55



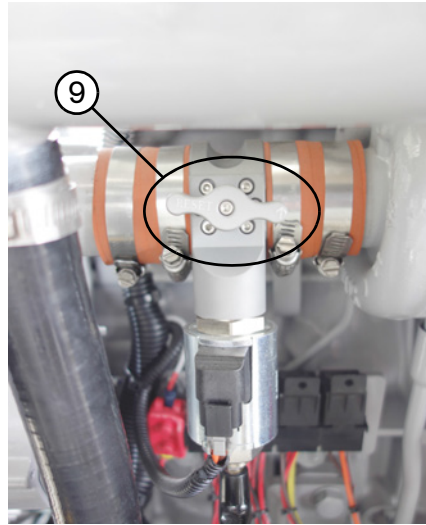
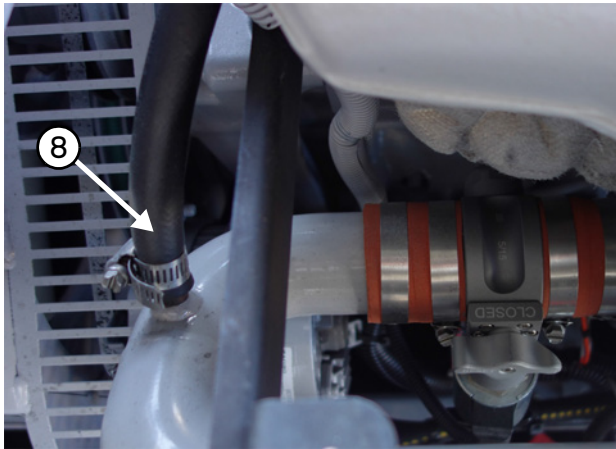
Install the emergency air intake shut-off valve

1. Remove the rubber hoses ⑦ from both sides of the old emergency air intake shut-off valve. Install the rubber hoses on the new valve.
2. Place 2 hose clamps removed earlier on each rubber hose section on the emergency air intake shut-off valve.
3. Put the assembly back into place between the air intake pipe and the air intake opening.
4. Tighten the 4 hose clamps. Reconnect the plug from the wiring harness.
5. Place the air intake pipe back into the rubber elbow. Tighten the hose clamp to secure it.

5 – Generator and Engine Components

6. Make sure the hose ⑧ connected to the air intake pipe has not worked itself free. Reconnect if necessary.

Figure 56



7. Make sure the emergency air intake shut-off valve is set to the OPEN position ⑨.
8. Put the system's top cover and plasma-side panel back in place. See *Install the cover* on page 88.
9. Reconnect the negative (-) ground cable to the battery.

Replace the automatic voltage regulator (AVR)

Kit number

428548

Description

Kit: Automatic voltage regulator (AVR) for generator/alternator, 480 VAC

Remove the AVR

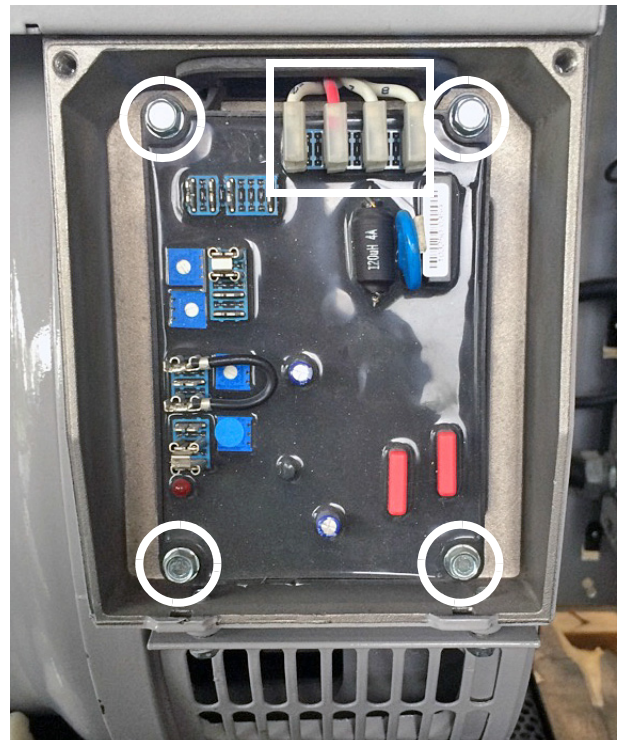
1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the on-board plasma supply to gain access to the AVR. See *Detach the plasma supply* on page 118.



When the plasma supply is removed, you can access the AVR through that opening in the front panel.

4. Remove the cover panel from the AVR. See *Figure 57*.
5. Remove the 4 screws that secure the AVR.
6. Disconnect the 4 wire connections from the top of the AVR.
7. Remove the AVR from the alternator.

Figure 57




5 – Generator and Engine Components

Install and configure the AVR

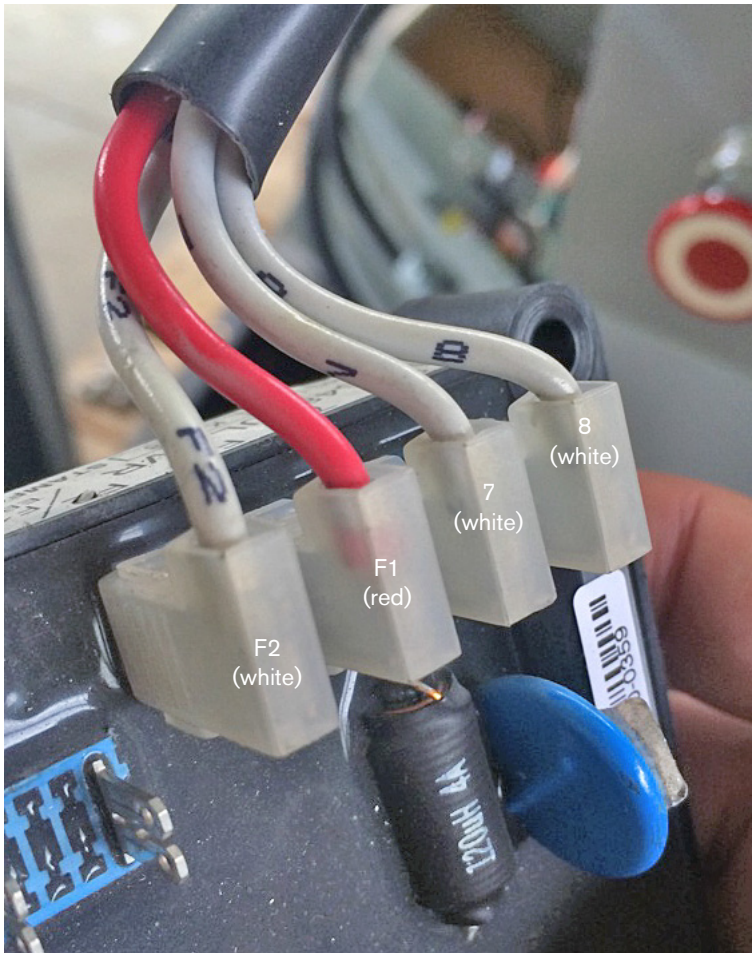
1. Before installing the new AVR, make sure the voltage tab, the stability selection wire, and the frequency tab are set exactly as shown in *Figure 59* on page 135.

- ❑ ① Set the voltage tab to the 2–1 connection.
- ❑ ② Set the stability selection wire to the D–B link.
- ❑ ③ Set the frequency tab to 60 Hz.

 The label ④ on the inside of the AVR cover panel identifies all the configurable components on the AVR, as shown in *Figure 59* on page 135.

2. Connect the 4 wire connections to the top of the AVR exactly as shown in *Figure 58*.

Figure 58




3. Install the 4 screws to secure the AVR to the alternator.

4. Reconnect the negative (-) ground cable to the battery.

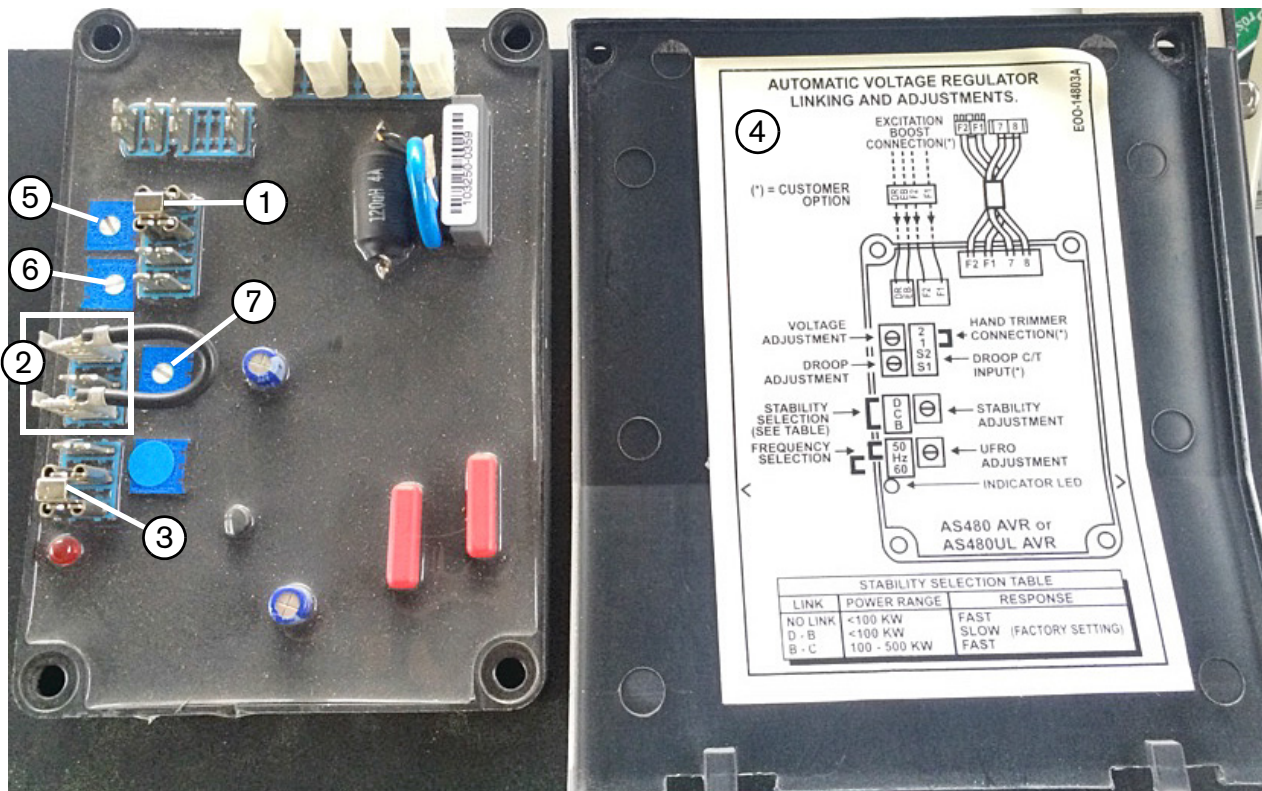
5. Turn ON (I) the power switch.

6. Press the **RUN** button to start the engine and generator.
7. Use the 3 potentiometers shown in *Figure 59* to correctly configure the AVR for this system. **These controls must be adjusted carefully to avoid damaging the generator/alternator.** Refer to the "Automatic Voltage Regulator (AVR)" section in the *STAMFORD® Installation, Service and Maintenance Manual* included with your system.

 You can find the STAMFORD manual in the same PDF file as the Stadco® *Operation and Maintenance Manual*.

- ❑ ⑤ Use the top adjustment to set the voltage:
 - Turn clockwise to increase the voltage.
 - Turn counterclockwise to decrease the voltage.
- ❑ ⑥ Use the middle adjustment to set the drooping effect:
 - Turn clockwise to increase the drooping effect.
 - Turn counterclockwise to decrease the drooping effect.
- ❑ ⑦ Use the bottom adjustment to set the stabilization effect:
 - Turn clockwise to increase the stabilization effect.
 - Turn counterclockwise to decrease the stabilization effect.

Figure 59



5 – Generator and Engine Components

8. Press the **OFF** button to turn off the engine and generator.
9. Turn OFF (**O**) the power switch.
10. Put the cover panel in place over the AVR.
11. Put the plasma supply back in the system and reconnect it. See *Reattach the plasma supply* on page 120.
12. Put the system's panels back in place. See *Install the cover* on page 88.

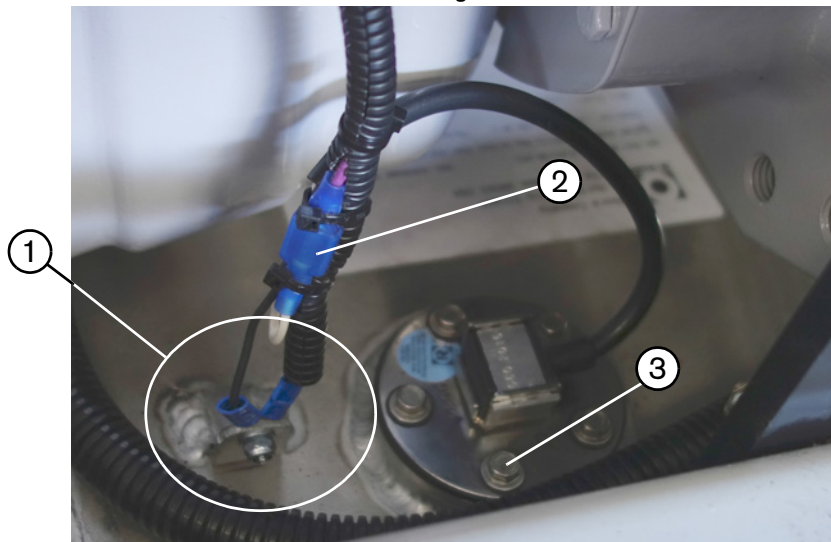
Replace the fuel-level sensor

Kit number	Description
428735	Kit: Fuel-level sensor

Remove the fuel-level sensor

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (**O**) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and the plasma-side panel from the system. See *Remove the cover* on page 86.
4. Remove the screw and nut ① from the grounding bracket to remove the 2 ring terminals. Unplug the blade connector ② from the fuel sensor to the wiring harness. Cut cable ties if necessary.

Figure 60



5. Clean the area around the fuel-sensor of dirt and debris so that nothing can fall into the opening when removing the sensor.
6. Remove the 5 screws ③ to disconnect the fuel-level sensor from the fuel tank.

7. Lift the fuel-level sensor up and out of the system.

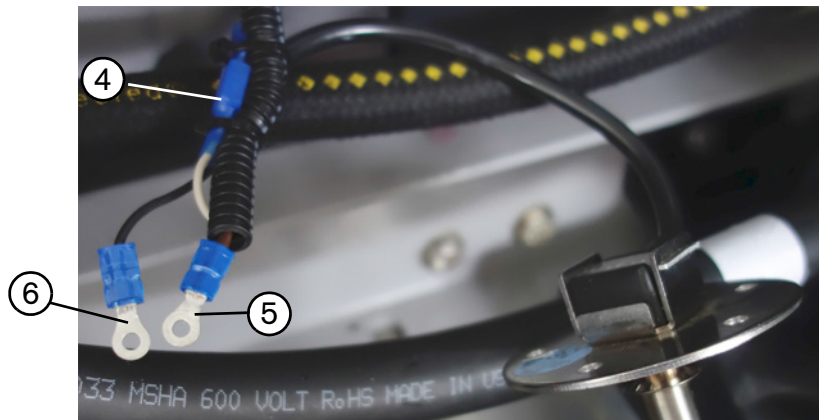
NOTICE

Make sure no water, dirt, or other debris gets into the fuel tank while you have the fuel-level sensor removed. These contaminants can cause severe damage to the engine over time.

Install the fuel-level sensor

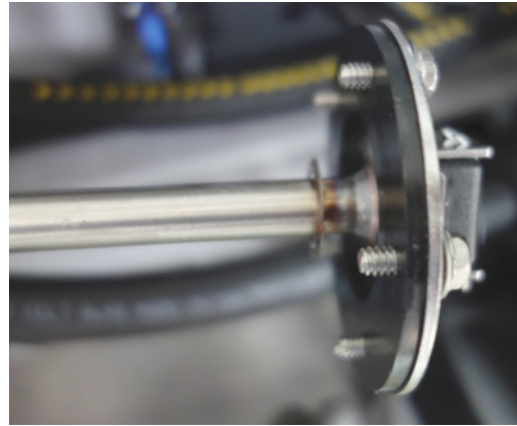
1. On the new fuel-level sensor:
 - ❑ Terminate the black ground wire with a ring connector. The ring terminal should fit an M4 screw.
 - ❑ Terminate the white positive (+) wire with a blade connector.
 - ❑ Use connectors that are insulated.
 - ❑ Use connectors that accommodate 16 AWG wire (blue).
2. Make sure the area around the fuel sensor opening is clean and that nothing can fall into the opening when replacing the sensor.
3. Plug the blade connector ④ from the new fuel sensor into the wire harness. Secure with cable ties. Reconnect the ring terminals from the wiring harness ⑤ and the new fuel sensor ⑥ to the grounding bracket on the fuel tank.

Figure 61



5 – Generator and Engine Components

4. Place the rubber gasket against the fuel sensor and push through all 5 screws and washers. This will make it easier to thread the screws when replacing the sensor. Make sure the rubber portion of the flat washers makes contact with the fuel sensor's metal plate.
5. Insert the new fuel-level sensor with gasket and screws in place.
6. Thread each screw by hand before tightening. Make sure all screws thread correctly and are not cross-threaded. Do not tighten the screws sequentially but in a criss-cross pattern.
7. Put the system's top cover and plasma-side panel back in place. See *Install the cover* on page 88.
8. Reconnect the negative (-) ground cable to the battery.



Replace the AC sensor wiring harnesses

Kit number	Description
428712	Kit: Wiring harness for AC sensors

Remove AC sensor wiring harness

The AC sensor wiring harness connects to the circuit breaker and current sensors (Dynagen system controller, 10 A circuit breaker, and current sensors). Removing this harness requires access into the AC connection cabinet located on top of the generator.

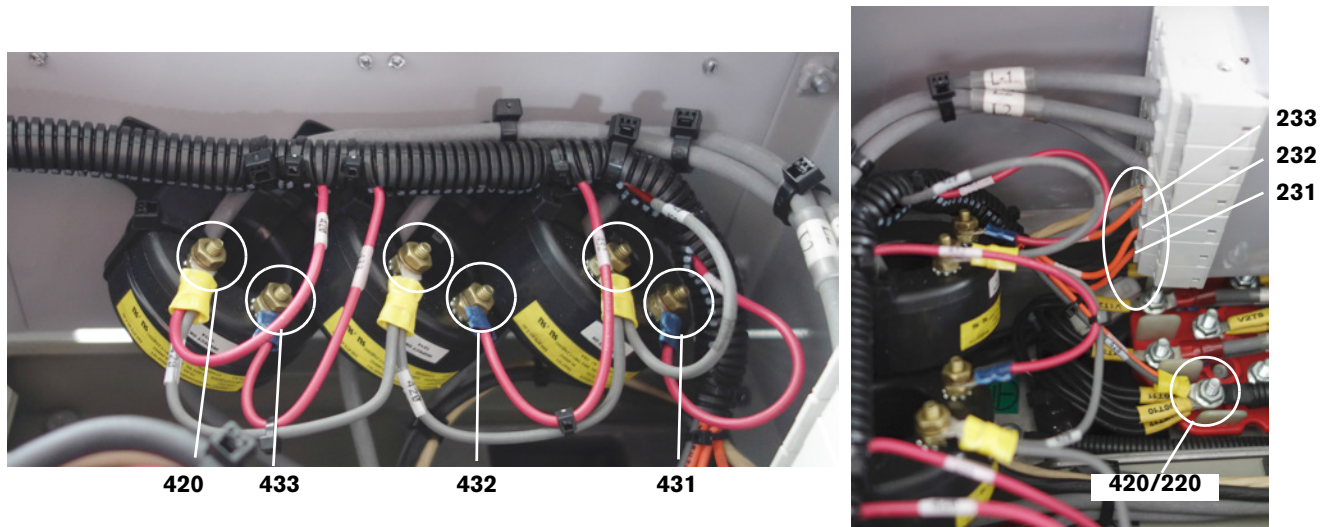
1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the top cover and both side panels from the system. See *Remove the cover* on page 86.
3. Detach the front panel. See page 124.
4. Remove the bottom circuit breaker (10 A) from the AC connection cabinet. See *Remove the front panel circuit breaker* on page 100.
5. Unscrew the orange wires (231, 232, 233) from the breaker by loosening the terminal screws and pulling the wires out.



There are 2 additional wires also connected to the circuit breaker. These should remain in place. They are not part of the wire harness.

6. Remove the 6 wire connections (431, 432, 433, 420 X 3) from the current sensors. Remove the wires from the neutral stud (420/220).

Figure 62



7. Disconnect the J7 and J5 wire connectors from the back of the system controller.
8. Loosen the strain relief in the AC connection cabinet by unscrewing the outer nut. Pull the harness through the strain relief to remove. Cut any cable ties necessary to release the harness.

Install the AC sensor wiring harness

1. Run the loose wire end through the strain relief in the AC connection cabinet.
2. Connect the 6 wire connections (431, 432, 433, 420 X 3) to the current sensors. Connect the wires to the neutral stud (420/220). See *Figure 62* on page 139.
3. Connect the wires to the circuit breaker. See *Install the front panel circuit breaker* on page 101.
 - ❑ Make sure there are no stray/loose strands.
 - ❑ Make sure the wires are in the correct terminal slots (231, 232, and 233).
 - ❑ Make sure the black and white wires are also properly connected to the terminal slots.
4. Check that there are no unconnected wires. Make sure that the ground wires are all connected and secure.
5. Tighten the strain relief in the AC connection cabinet by tightening the outer nut. Secure the wiring harness with cable ties as necessary.
6. Reattach the front panel. See page 125.
7. Replace the cover and panels. See *Install the cover* on page 88.

Replace the control system wiring harness

Kit number	Description
428573	<i>Kit: Wiring harness for control panel</i>

Remove the control system wiring harness

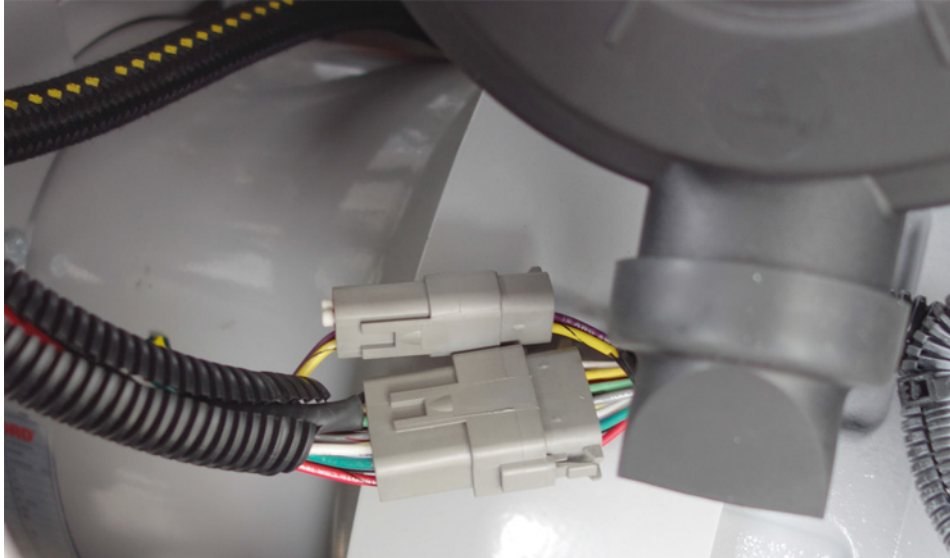
1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. Unplug the J6, J4, and J3 wire connectors from the back of the system controller.
5. Disconnect the following components.
 - ❑ Alternator lamp. See *Remove the alternator lamp* on page 94.
 - ❑ 12 V circuit breaker. See *Remove the 12 V circuit breaker* on page 95.
 - ❑ ON/OFF power switch. See *Remove the ON/OFF power switch* on page 96.
 - ❑ Emergency stop contact block. See *Remove the emergency stop contact block* on page 98.
 - ❑ Fuel shutoff relay. See *Remove the fuel shutoff relay* on page 151.
6. Remove the diagnose plug.

Figure 63



7. Unplug the 2 gray connectors near the engine block.

Figure 64



8. Remove the wiring harness. Cut any cable ties necessary to free the harness.

Install the control system wiring harness

1. With the new harness connect the J6, J4, and J3 wire connectors to the back of the system controller.
2. Make the following connections.
 - ❑ Emergency stop contact block. See *Install the emergency stop contact block* on page 98.
 - ❑ ON/OFF power switch. See *Install the ON/OFF power switch* on page 97.
 - ❑ 12 V circuit breaker. See *Install the 12 V circuit breaker* on page 96.
 - ❑ Alternator lamp. See *Install the alternator lamp* on page 94.
 - ❑ Fuel shutoff relay. See *Install the fuel shutoff relay* on page 151.
3. Reconnect the diagnose plug.
4. Reconnect the 2 gray connectors near the engine block.
5. Secure the harness assembly with cable ties.
6. Put the system's top cover back in place. See *Install the cover* on page 88.
7. Reconnect the negative (-) ground cable to the battery.

Replace the generator wiring harness

Kit number	Description
428574	Kit: Wiring harness for generator

Remove the generator wiring harness

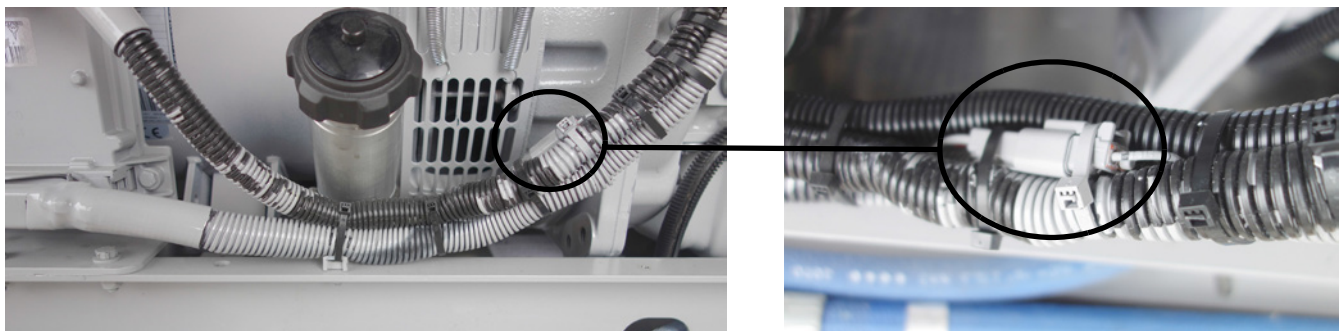
1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover, both side panels, and rear panel from the system. See *Remove the cover* on page 86.
4. Start from the engine side. Cut the cable tie and unplug the top large gray connector from the generator.

Figure 65



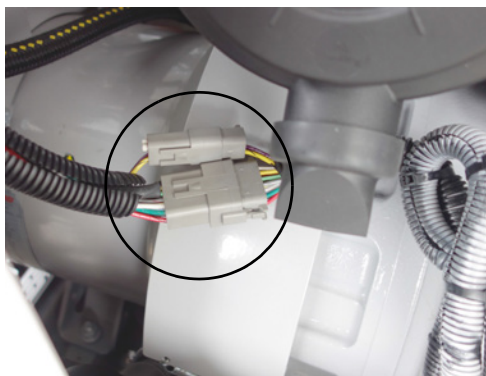
5. Unplug the connection to the engine wire harness located near the gas port. Cut the cable ties to free the connectors.

Figure 66



6. Located on the generator below the air filter housing is the interconnect between the generator and control harnesses. Disconnect the 2 gray connectors.

Figure 67



7. Move to the plasma side. Remove the nut and washer to disconnect the ground terminal wires from the engine.

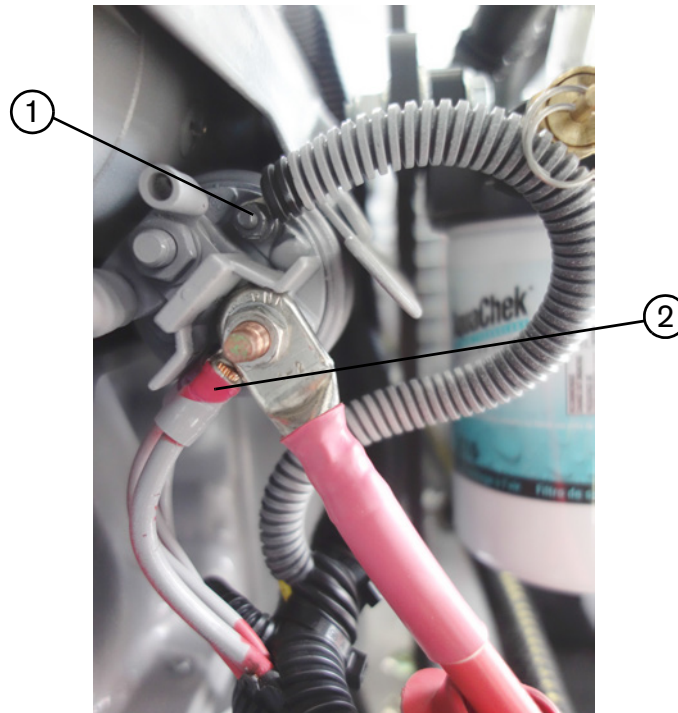
Figure 68



5 – Generator and Engine Components

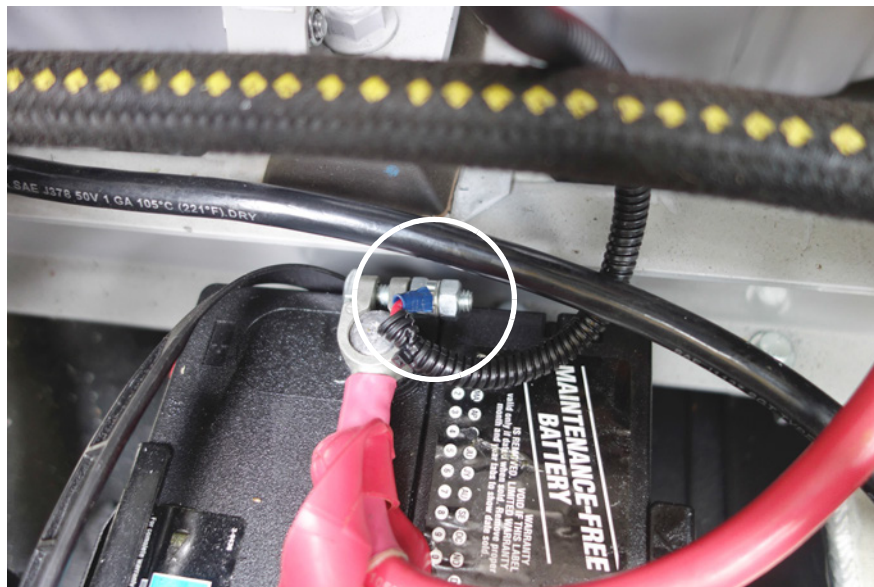
8. Disconnect the yellow wire ① and red wires ② from the starter motor. The red power cable from the battery will need to be removed to disconnect the red wires from the starter.

Figure 69 – Starter motor connections



9. Disconnect the red wire from the battery positive (+) terminal connection.

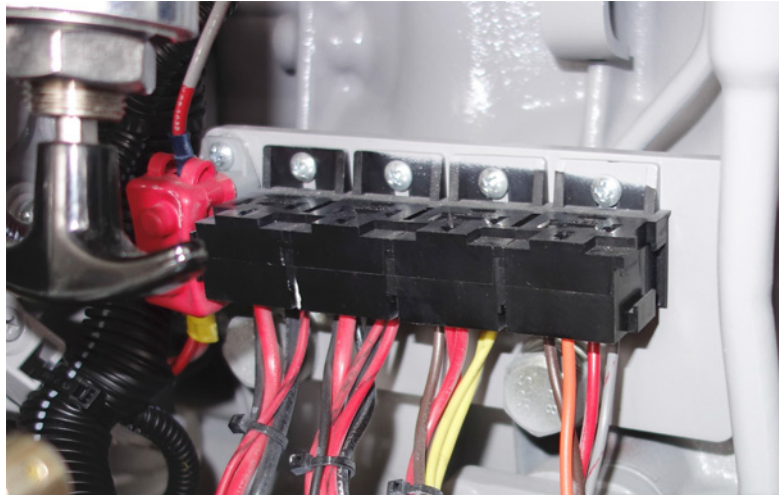
Figure 70



10. Disconnect the fuel-level sensor. See *Remove the fuel-level sensor* on page 136.

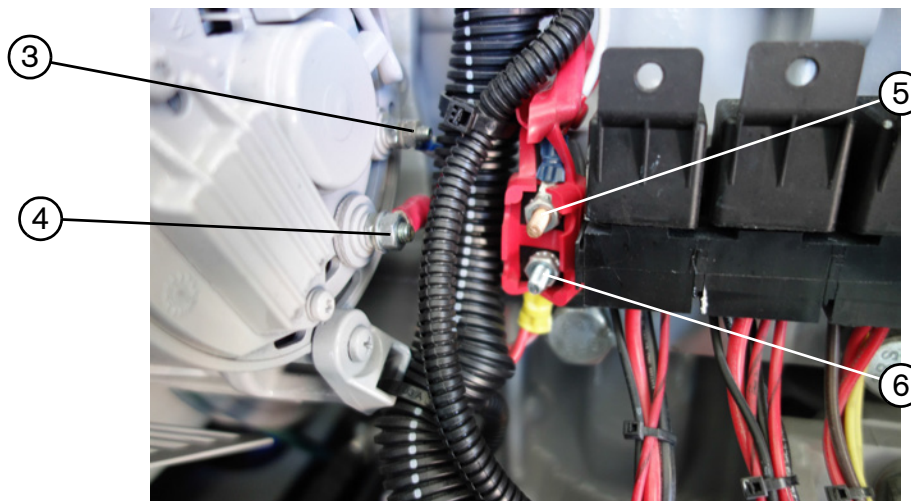
11. Remove the 4 engine relays, then unscrew the relay housings from the bracket.

Figure 71



12. Lift the protective red cover from the circuit breaker located next to the relay housings. Disconnect the single red wire ⑤ and the double red wire ⑥ harness connections.
13. Disconnect the red ④ and blue ③ wires connected to the alternator.

Figure 72 – Alternator and circuit breaker connections

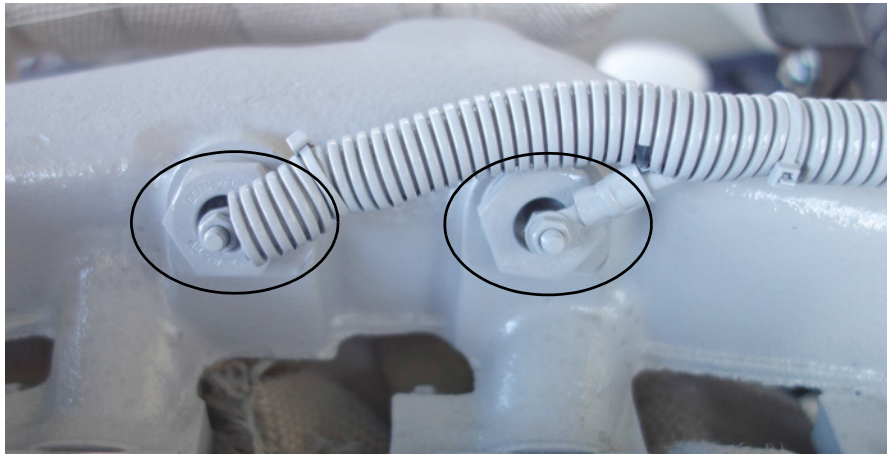


14. Unplug the connector from the emergency air shutoff relay if installed. (This is an option.) See *Figure 54* on page 130.
15. Disconnect the yellow/brown wire from the air compressor's temperature switch. See *Remove the temperature switch, tee fitting, elbow fitting, and adapter* on page 167.

5 – Generator and Engine Components

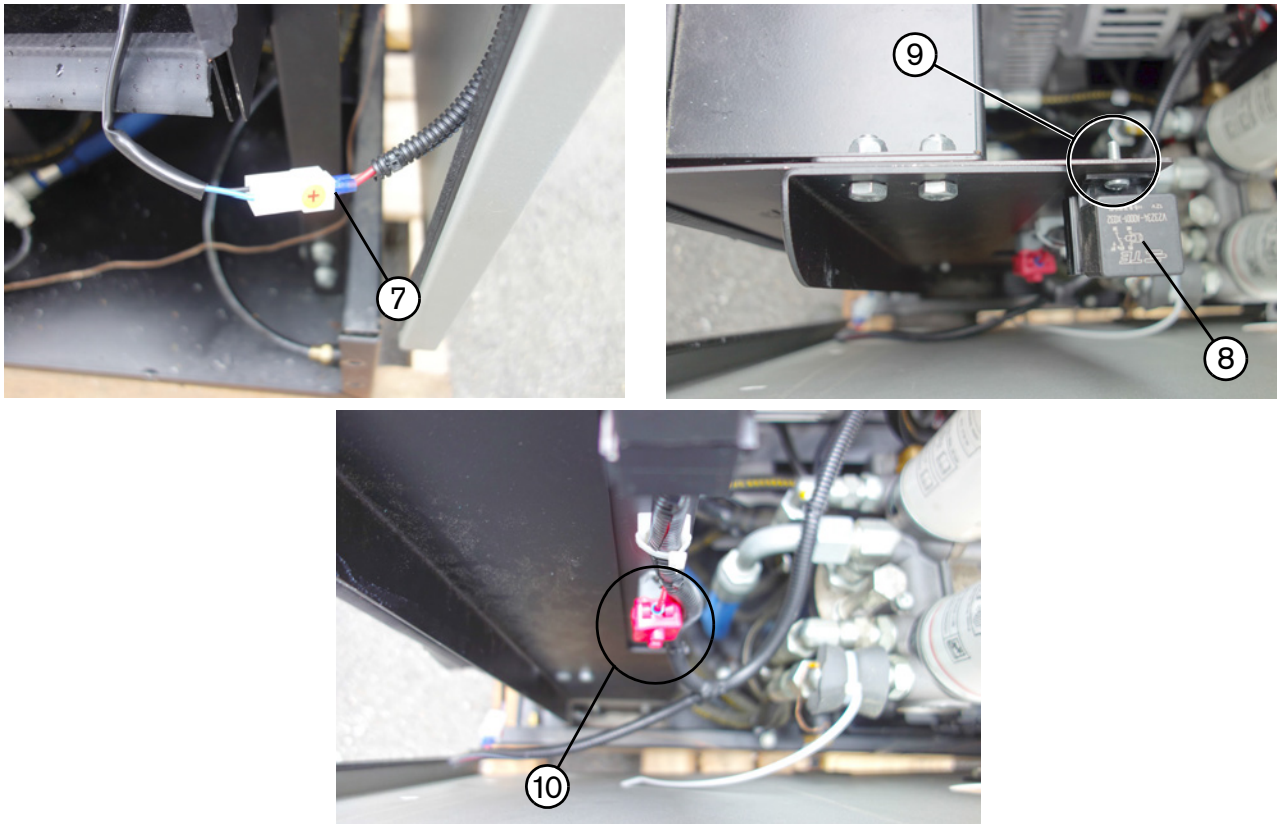
16. Disconnect the 2 ring terminals from the heater plugs on the engine manifold.

Figure 73 – Heater plug harness connections



17. Unplug the 2 wires ⑦ from the cooling unit fan connector.

Figure 74 – Cooling unit fan wiring harness connections



18. Unplug the relay ⑧ on the cooling unit fan harness. Remove the screw ⑨ and remove the relay socket from the fan bracket assembly.
19. Remove the red protective cover ⑩ on the circuit breaker and disconnect the 2 wires.

20. Remove the wiring harnesses from the unit, cutting any cable ties that may still be connected.

Install the generator wiring harness

1. Plug the large connector from the new harness into the top receptacle on the generator. Secure with a cable tie. See *Figure 65* on page 142.
2. Plug the small gray connector into the receptacle from the engine wire harness located near the gas port. Secure with cable ties. See *Figure 66*.
3. Connect the 2 gray connectors to the receptacles located on the generator below the air filter housing. See *Figure 67*.
4. Connect the 2 ground terminals to the chassis bracket using the nut and washer. Make sure the contact areas are clear of dirt and paint and there is good metal-to-metal contact. See *Figure 68*.
5. Connect the yellow wire and red wires to the starter motor. Connect the red power cable (+) from the battery to the same terminal as the red wires. See *Figure 69*.
6. Reconnect the fuel sensor. See *Install the fuel-level sensor* on page 137.
7. Remove the 4 relays from the new harness. Connect the relay housings to the engine bracket. Reinstall the relays. See *Figure 71*.
8. Screw the red wire harness connections to the circuit breaker located next to the relay housings. Connect the red and blue wires to the alternator. See *Figure 72*.
9. Plug the connector to the emergency air shutoff relay if installed. (This is an option.) If this option is not installed check that there is a cover over the plug to protect the connections. See *Figure 54* on page 130.
10. Connect the red wire terminal to the battery positive (+) terminal. See *Figure 70*.
11. Connect the yellow/brown wire to the air compressor's temperature switch. See *Install the temperature switch, tee fitting, elbow fitting, and adapter* on page 169.
12. Plug the 2 wires from the wire harness into the cooling unit fan connector. Connect the red wire from the harness to the blue wire or "+" on the fan connector. Connect the black wire to the black wire on the fan connector. See *Figure 74*.
13. Unplug the relay from the new harness to screw the relay housing to the fan bracket assembly. Replace the relay into the housing. See *Figure 74*.
14. Connect the 2 wires to the circuit breaker on the fan bracket assembly. Replace the red protective cover. See *Figure 74*.
15. Connect the 2 ring terminals to the heater plugs on the engine manifold. See *Figure 73*.
16. Secure the generator wiring harness with cable ties as necessary.
17. Put the system's top cover, side panels, and rear panel back in place. See *Install the cover* on page 88.
18. Reconnect the negative (-) ground cable to the battery.

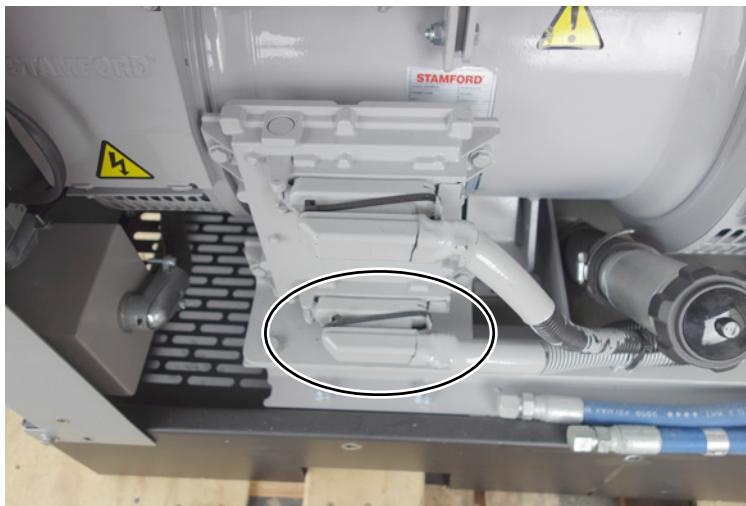
Replace the engine wiring harness

Kit number	Description
428711	<i>Kit: Wiring harness for engine</i>

Remove the engine wiring harness

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover and engine-side panel. See *Remove the cover* on page 86.
4. Cut the cable tie and unplug the lower large gray connector from the generator.

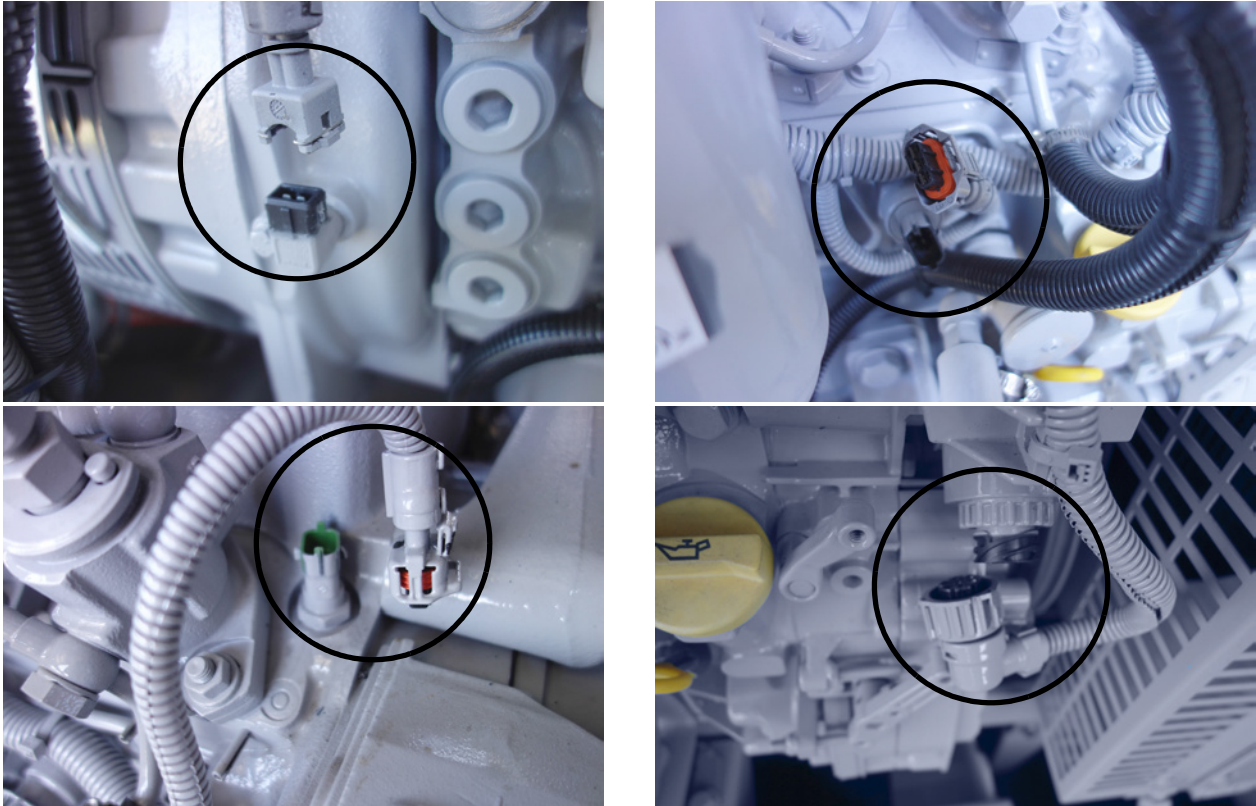
Figure 75



5. Unplug the connection to the engine wire harness located near the gas port. Cut the cable ties to free the connectors. See *Figure 66* on page 142.

6. Follow the cable and disconnect the 4 plugs from the various engine sensors.

Figure 76



7. Remove the harness.

Install the engine wiring harness

1. Plug the connector from the new harness into the receptacle on the generator. Secure with a cable tie. See *Figure 75*.
2. Connect the plug to the engine harness near the gas port. See *Figure 66* on page 142.
3. Connect the 4 remaining plugs into the appropriate connections on the engine. See *Figure 76*.
4. Put the system's top cover and engine-side panel back in place. See *Install the cover* on page 88.
5. Reconnect the negative (-) ground cable to the battery.

Replace the relays

Kit number	Description
428575	Kit: Electrical relay, 12 VDC, 40 A

There are 6 relays located within the system. Four relays are located in a housing mounted on the plasma side of the engine. These relays control the air shutoff to the engine, the preheat plugs and the engine starter motor. The fifth is mounted behind the front panel and controls the fuel shutoff to the engine. To access the fifth relay the top cover must be removed. The sixth relay controls the cooling unit fan and is mounted near the air compressor cooling unit.

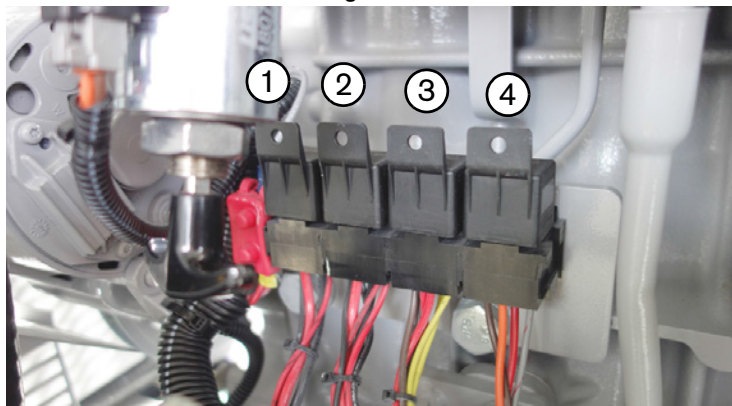
To replace the fuel shutoff relay see *Replace the fuel shutoff relay* on page 151.

To replace the cooling unit fan relay see *Replace the cooling unit fan relay* on page 152.

Remove engine mounted relay

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the plasma side service panel.
3. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
4. There are 4 relays mounted on the engine towards the left looking in from the plasma side service panel access. Remove the required relay by pulling it up and out of the housing.

Figure 77



- | | |
|-------------|---------------|
| 1 Preheat 1 | 3 Crank |
| 2 Preheat 2 | 4 Air shutoff |

Install the engine mounted relay

1. Place the new relay in the appropriate slot in the housing.
2. Reconnect the negative (-) ground cable to the battery.
3. Put the plasma side service panel back in place.

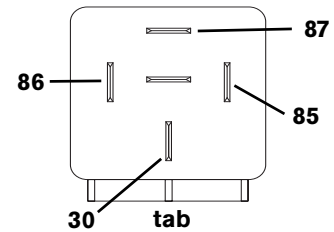
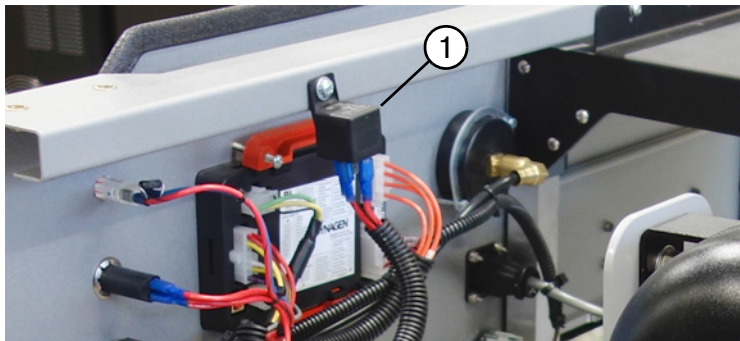
Replace the fuel shutoff relay

Kit number	Description
428575	Kit: Electrical relay, 12 VDC, 40 A

Remove the fuel shutoff relay

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. Unscrew the relay from the front panel ①. Disconnect the 4 wires from the relay's tabs.

Figure 78



Install the fuel shutoff relay

1. Attach the 4 wires from the cable harness to the new fuel shutoff relay as previously marked.
 - ❑ Connect red with black stripe to the terminal marked "86."
 - ❑ Connect brown to the terminal marked "85."
 - ❑ Connect red to the terminal marked "30."
 - ❑ Connect the 2-wire red with black stripe to the terminal marked "87."
2. Secure the relay to the rear of the front panel using the washer, toothed washer, and screw.
3. Put the system's top cover back in place. See *Install the cover* on page 88.
4. Reconnect the negative (-) ground cable to the battery.

Replace the cooling unit fan relay

Kit number	Description
428575	Kit: Electrical relay, 12 VDC, 40 A

Remove the cooling unit fan relay

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. Unplug the relay from the relay housing.

Figure 79




Install the cooling unit fan relay

1. Plug the new relay into the relay housing.
2. Put the system's top cover back in place. See *Install the cover* on page 88.
3. Reconnect the negative (-) ground cable to the battery.

Replace the generator rectifiers

Kit number	Description
428486	<i>Kit: Service parts generator rectifiers</i>

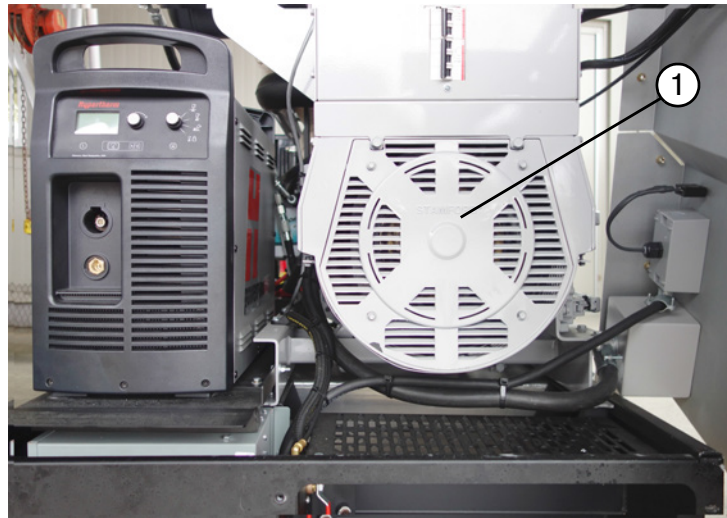
Replacing the rectifiers and varistor requires gaining access to the rectifier assembly on the generator. The engine must be rotated to gain access to each component through a cutout on the generator's bearing housing. A soldering iron is needed for the wire connections on the rectifiers.

 This procedure requires 2 people to complete.

Remove the generator rectifiers

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the front panel. See *Unfasten the front panel* on page 124.
3. Remove the plastic end cover ① on the generator.

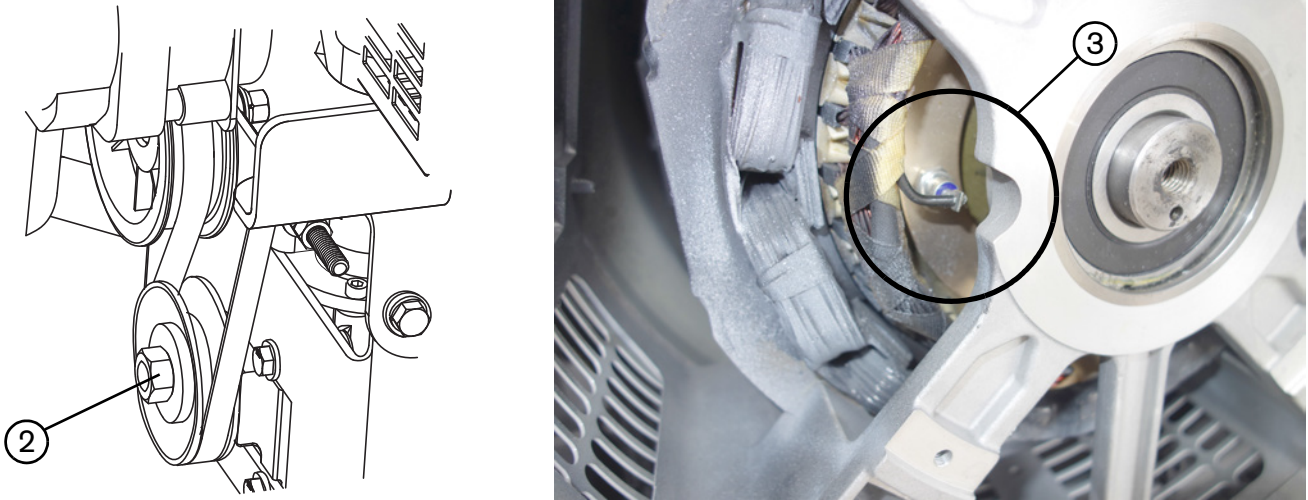
Figure 80



5 – Generator and Engine Components

4. Place a wrench on the compressor's pulley ② (rear of the unit). Have another person rotate the engine slowly with the wrench to align each diode with the cutout on the bearing housing ③. Turn the wrench toward the engine side.

Figure 81



5. Unsolder the wire from the diode's tab. Remove the diode using a deep socket wrench.



There are 3 forward and 3 reverse diode types. Make sure to replace with the proper type.

6. Rotate the engine to align the varistor with the cutout on the bearing housing. Remove the varistor.

Install the generator rectifiers

1. Smear Dow® Corning® 340 heatsink compound (or equivalent heatsink compound) on the underside of the replacement diode. **Do not apply heatsink compound to the threads.** Install the new diode and torque from 20.7 – 24.16 kg·cm (17.97 – 21 inch·pounds). Solder the wire to the diode's tab. Make sure there are no loose wire ends.
2. Repeat for each diode, then replace the varistor. The varistor is secured with 2 screws.
3. Reconnect the generator's plastic cover and secure with screws.
4. Replace the front panel. See *Reattach the front panel* on page 125.

Section 6

Air Compression Components



CAUTION!

To ensure safe operation of the system at all times, and to maximize the life of the product, use only replacement parts that are approved by the manufacturers.




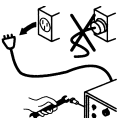
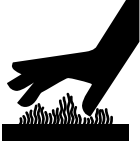






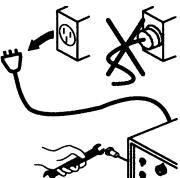
CAUTION!




FILTERS, FUEL, AND LUBRICATING OILS CAN CAUSE DISCOMFORT

Handle all engine filters, fuel, and lubricating oils with care. Fuel and lubricating oils can irritate skin. Some filters can cause discomfort if they come in contact with the eyes or mouth.

Wash thoroughly if your skin comes in contact with fuel or oil from the engine.

	WARNING!
  	<p>ELECTRIC SHOCK CAN KILL</p> <p>Turn OFF the power before removing the cover from the system or from the plasma supply. In the U.S., use a “lock-out / tag-out” procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.</p> <p>Before servicing the engine or generator, turn OFF the system, wait for 30 seconds, then disconnect the battery’s negative (-) ground cable.</p> <p>Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the system that can cause serious injury or death.</p> <p>Do not attempt to repair printed circuit boards. Do not cut away or remove any protective conformal coating from circuit boards. To do so will risk a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.</p>
	<p>HOT PARTS CAN CAUSE SEVERE BURNS</p> <p>Allow the system’s internal components to cool before servicing.</p> <p>Do not remove the pressure cap from the radiator while the engine is still hot.</p>
	<p>MOVING PARTS CAN CAUSE INJURY</p> <p>Use extreme caution if you need to work on a running engine.</p> <ul style="list-style-type: none"> ❑ Keep hands, clothing, jewelry, and tools away from moving parts. ❑ Keep your hands away from the engine’s fan. ❑ Do not wear loose clothing or jewelry that can catch on moving parts. ❑ Remove safety guards only when necessary. Replace the safety guards as soon as maintenance is complete. ❑ Close the service panels when maintenance is complete. Repair or replace the panels if they are damaged.
NOTICE	
	<p>STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS</p> <p>Put on a grounded wrist strap before handling printed circuit boards.</p>

		WARNING! ELECTRIC SHOCK CAN KILL
		<p>Disconnect or turn OFF electrical power before performing any maintenance that involves removing the cover from the system or the consumables from the plasma torch.</p> <p>Read the separate <i>Safety and Compliance Manual</i> (80669C) included with your system for more safety precautions pertaining to plasma cutting.</p>

		WARNING! RISK OF INJURY – HANDLE COMPRESSED AIR WITH CARE
		<p>THESE PROCEDURES MUST BE PERFORMED ONLY BY EXPERIENCED SERVICE TECHNICIANS.</p> <p>When servicing air compressor components:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Discharge internal pressure from the air compressor before performing maintenance on any compressor parts. Trapped air pressure can discharge violently and cause serious injury. <input type="checkbox"/> Do not inhale compressed air. Serious injury can result. <input type="checkbox"/> If air that was under pressure pierces your skin, seek medical treatment immediately. <input type="checkbox"/> Never disable or disconnect any safety mechanisms for the air compressor. <input type="checkbox"/> Check all air compressor hoses and connections for leaks and damage before operating the system again.

NOTICE
<p>Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.</p>

The air compression components section covers the air compressor system.

- Replace the air compressor belt on page 160
- Replace the air compressor and drive pulley on page 161
- Replace the compressor tension pulley on page 165
- Replace the compressor inlet valve on page 166
- Replace the air compressor temperature switch, tee fitting, elbow fitting, and adapter on page 167
- Replace the air compressor check valve and scavenge line orifice on page 169

6 – Air Compression Components

- *Replace the air pressure gauge on page 171*
- *Replace the unloader valve on page 172*
- *Replace the muffler and orifice adapter on page 174*
- *Replace the separation tank on page 175*
- *Replace the separation tank manifold on page 178*
- *Replace the cooler unit on page 181*
- *Replace the compressor cooling fan on page 183*
- *Replace the pressure relief valve on the separation tank on page 185*
- *Replace the oil level gauge on page 186*
- *Replace the air drying filter assembly on page 187*
- *Replace the pressure relief valve on the air drying filter assembly on page 190*
- *Replace the ball valve, elbow fitting, and elbow coupler on the separation tank on page 191*
- *Replace the condensate release lever on page 193*

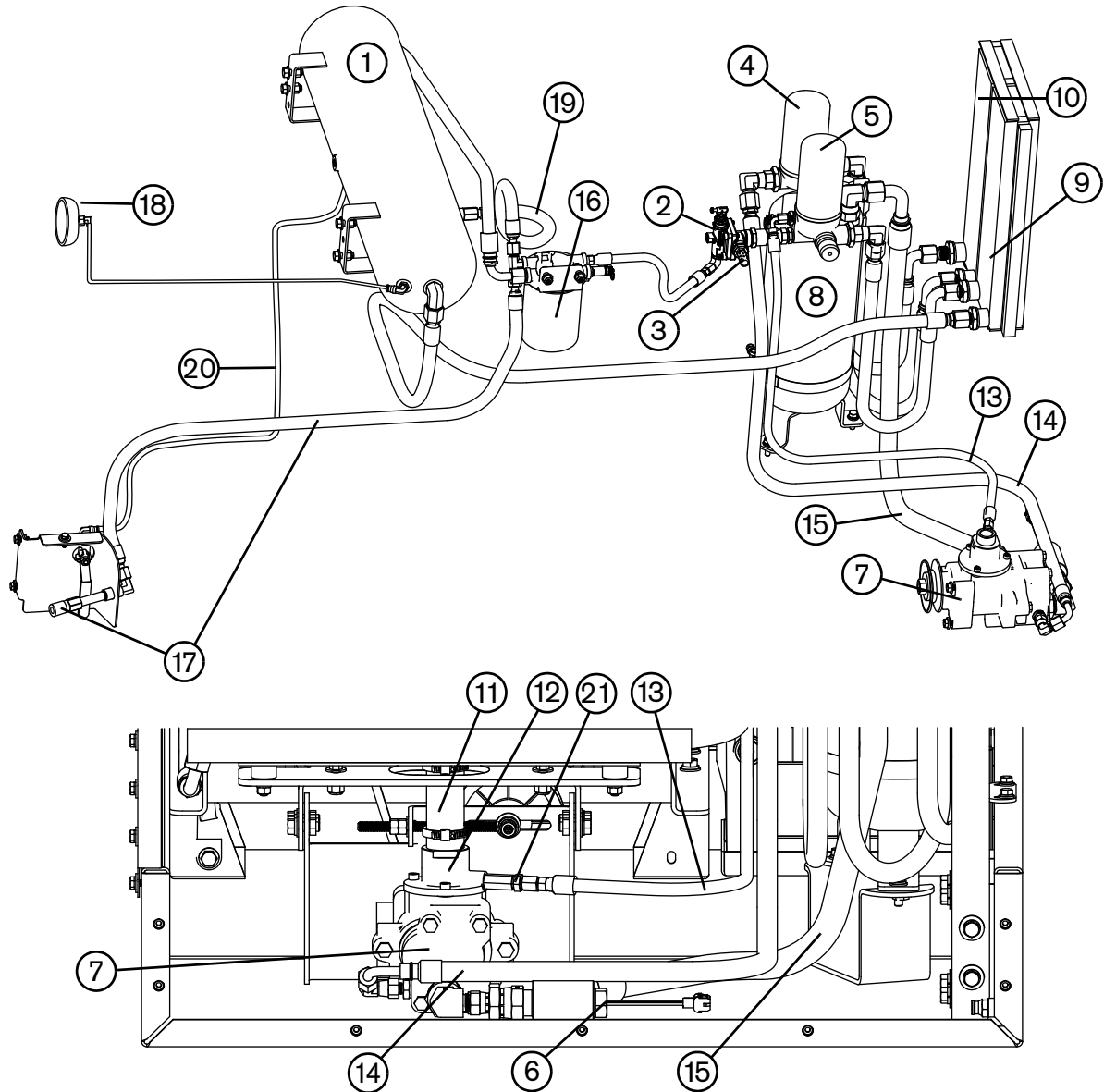
The air compression components are identified in *Figure 82*. A rotary screw compressor with oil injection is belt-driven by the engine and supplies the compressed air for the plasma power supply and the auxiliary compressed air port at the front panel.

The compressed air and oil output are separated by the oil separation tank and then the oil separation filter. The air is cooled by the air cooler and stored in the air tank. An air drying filter removes moisture from the compressed air, which is then available for the plasma supply and auxiliary air port. The pressure level can be read from the front panel air pressure gauge. Air pressure is maintained by the pilot unloader valve. When the pressure exceeds the maximum level the pilot unloader valve vents excess pressure through the muffler. This maintains the pressure within desired levels. The orifice adapter in the pilot unloader valve maintains enough pressure in the system when venting to allow oil to flow back to the compressor through the oil mist line. The pilot unloader valve has been specially calibrated for the system and must not be adjusted.

A temperature switch monitors the compressor for overheating. A thermostatic valve allows the oil to be circulated through the oil cooling unit when it reaches temperature. The majority of the oil in the separation tank falls to the bottom and is cooled and returned to the compressor head. Some oil filtered out by the separation filter is returned to the compressor intake through the mist line. The scavenge orifice, located at the junction of the inlet valve and mist line, controls the rate of oil drawn from the separation filter. If the orifice becomes clogged the system cannot remove oil mist from the compressed air. If the orifice is missing the system will not build up pressure correctly.

Condensate is removed by valves that are located on the oil separation tank and at the front panel for the air tank. A relief valve is located on the separation tank manifold to release pressure within the separation tank. A safety relief valve on the air drying filter manifold releases air pressure in the system should the pressure exceed 175 psi. All pressure should be released from the system from the condensate relief valve whenever servicing the unit. Pressure in the separation tank manifold should be released by the valve on the separation tank manifold prior to servicing any air compression lines or hoses.

Figure 82 – Air compression components



- | | | |
|-------------------------|-------------------------------|---------------------------|
| 1 Air tank | 10 Oil cooler | 19 Plasma supply air line |
| 2 Unloader valve | 11 Air intake | 20 Condensate drain |
| 3 Muffler | 12 Compressor inlet valve | 21 Scavenge orifice |
| 4 Oil filter | 13 Oil mist line | |
| 5 Oil separation filter | 14 Oil return line | |
| 6 Temperature switch | 15 Compressed air and oil out | |
| 7 Compressor | 16 Air drying filter | |
| 8 Separation tank | 17 Auxiliary air line | |
| 9 Air cooler | 18 Pressure gauge | |

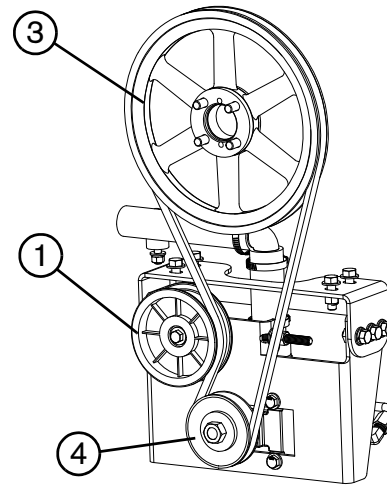
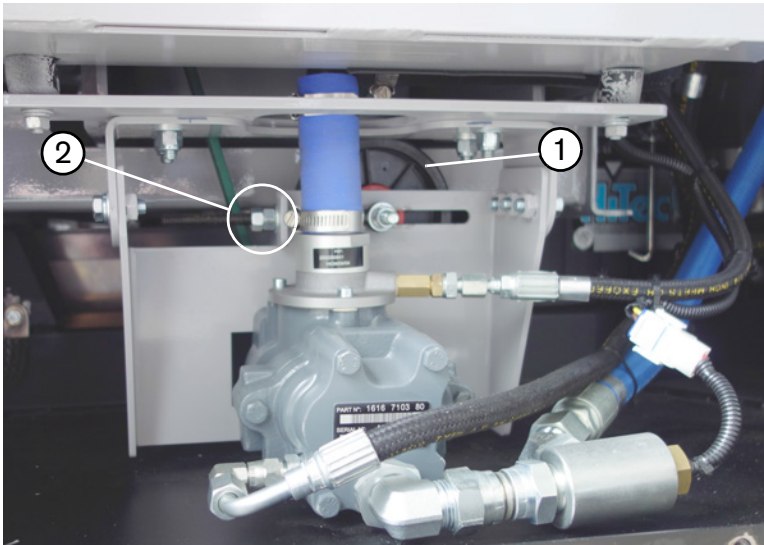
Replace the air compressor belt

Kit number	Description
428500	Kit: Air compressor belt

Remove the air compressor belt

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove the top cover, generator-side panel, and rear panel from the system. See *Remove the cover* on page 86.
5. The tension pulley ① must be loosened to facilitate removal of the compressor belt. Loosen the nuts ② that adjust the tension pulley to relieve pressure on the belt. Start with the outer nut. Then loosen the inner nut until the belt can be removed from the compressor drive pulley ④.
6. Remove the belt from the engine pulley ③.

Figure 83



Replace the air compressor belt

1. Work the replacement belt onto the engine pulley ③, then down onto the compressor drive pulley ④.
2. Position the tension pulley ① to apply pressure from the outside of the belt inwards. Adjust using the inner nut ② first so that the belt is tight but has a little slack in it. Set the tension to 227 – 245 N (51 – 55 pound-force) for a new belt. For a used belt set the tension to 196 – 209 N (44 – 47 pound-force). When the tension pulley is set correctly tighten the outer nut onto the first nut to lock it in place.

3. Reconnect the negative (-) ground cable to the battery.
4. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
5. After the system starts up let it run for 5 minutes.
6. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
7. Check the belt tension. Make sure it is within the tolerance listed in *step 2* on page 160.
8. Put the system top cover, generator-side panel, and rear panel back in place. See *Install the cover* on page 88.

Replace the air compressor and drive pulley

Kit number	Description
428537	<i>Kit: Air compressor</i>
428541	<i>Kit: Air compressor drive pulley</i>
428580	<i>Kit: Nut for air compressor pulley (includes spacer)</i>

The air compressor kit consists of only the air compressor unit and is supplied in a raw state. The apertures are sealed for protection and need to be cleared and cleaned before installation.

Remove the air compressor and drive pulley

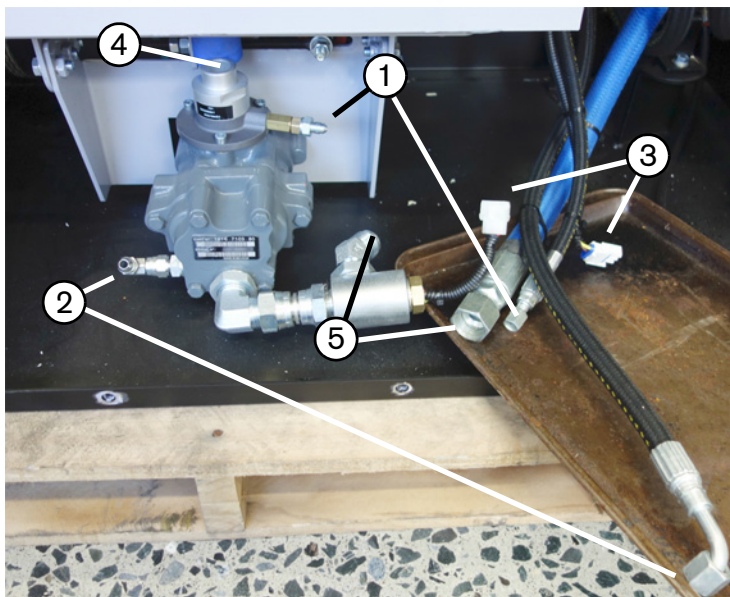
When loosening or tightening hose connections use 2 wrenches: one to hold the fitting stationary and the other to loosen or tighten the compression nut.

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove the top cover, side panels, and rear panel from the system. See *Remove the cover* on page 86.
5. Remove pressure from the separation tank by pulling the relief valve on the separation tank manifold. See page 79.
6. Remove the air compressor belt. See *Remove the air compressor belt* on page 160.
7. Place a tray or container next to the compressor to catch any oil that drips from the hoses.

6 – Air Compression Components

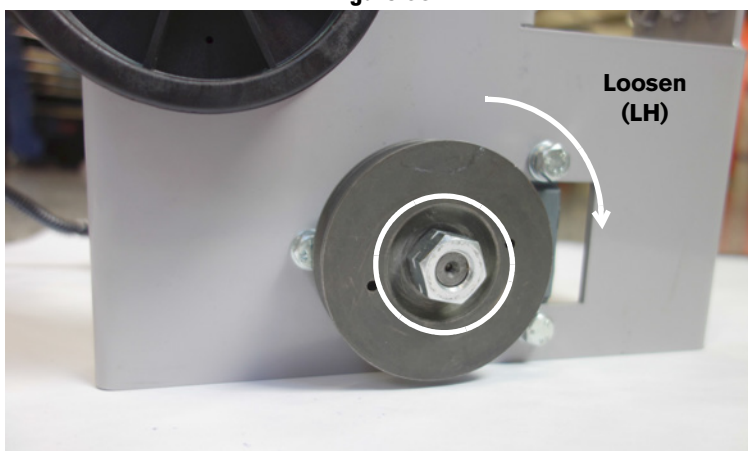
8. Disconnect the oil mist line ①, oil line ②, and the temperature switch connection ③.

Figure 84



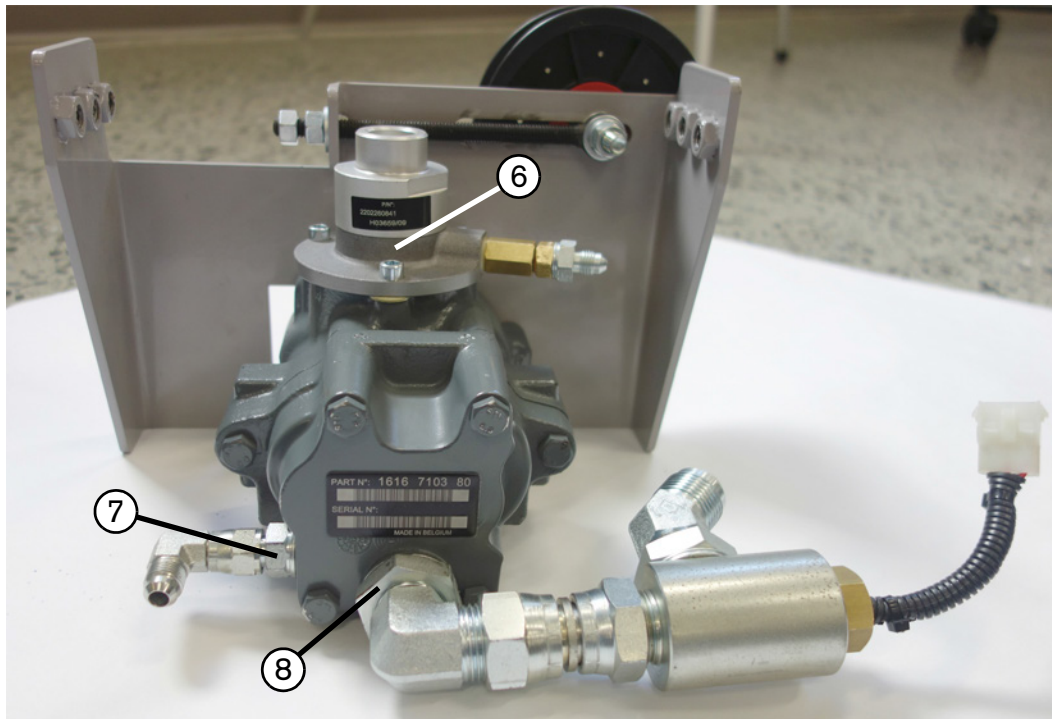
9. Disconnect the air intake hose ④ and the output hose ⑤.
10. Loosen and remove 6 screws that secure the compressor/bracket assembly. Remove the assembly.
11. With the compressor assembly out of the system remove the drive pulley from the compressor. Note that this nut is reverse threaded.

Figure 85




12. Remove the compressor inlet valve ⑥, oil line elbow fitting ⑦, and tee elbow fitting ⑧.
13. Remove 3 screws and washers that secure the compressor to the bracket.

Figure 86



Install the air compressor

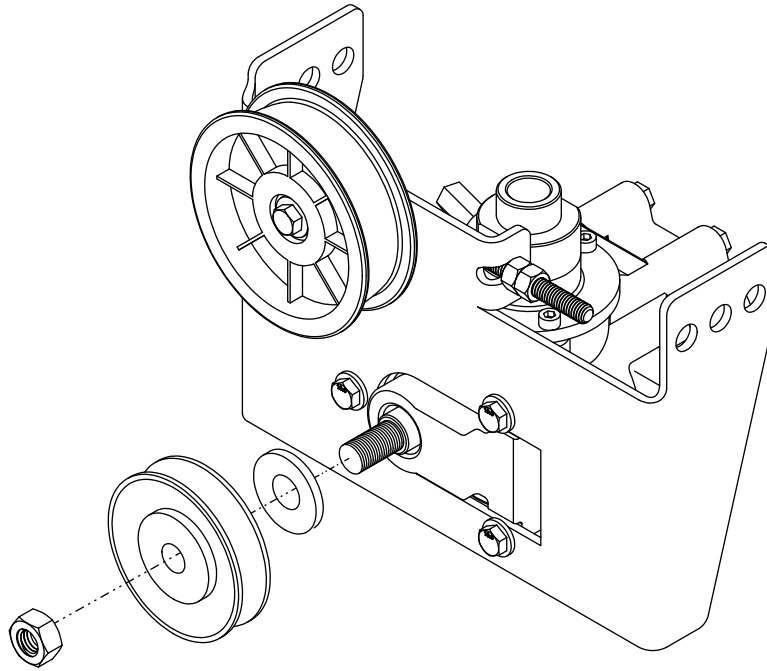
1. Mount the new compressor to the bracket with 3 screws and washers.
2. Install the compressor inlet valve ⑥ and gasket.
3. Replace the oil line elbow fitting ⑦ and tee fitting ⑧. Refer to figure *Figure 86*.
4. Reconnect or install the new drive pulley. Note that this nut is reverse threaded. The thin washer goes behind the pulley, not between the pulley and the nut. The side of the pulley with the nubs must be facing out, towards the nut (away from the compressor and bracket). See *Figure 85* on page 162. Torque the nut to 40.7 N·M (30 foot-pounds).

 The compressor shaft is free-spinning. There is no way to grip the shaft when tightening the nut. Use an impact tool to obtain the correct torque setting for the nut.

NOTICE

Proper torque of the nut is critical. Too tight and the shaft may break. Too loose and the pulley may slip.

Figure 87 – Air compressor drive pulley assembly



5. Mount the compressor and bracket assembly back in place and secure with 6 screws.
6. Make the following connections. Refer to *Figure 84* on page 162.
 - ❑ Connect the oil mist line ①, oil line ②, and temperature switch ③.
 - ❑ Connect the air intake ④ to the compressor inlet valve and secure with the hose clamp.
 - ❑ Connect the output hose ⑤ to the tee fitting.
7. Reattach the compressor belt. See *Replace the air compressor belt* on page 160.
8. Clean up any oil that spilled inside the system. Dispose of the old oil in compliance with local and national regulations.
9. Put the system's cover, both side panels, and rear panel back in place. See *Install the cover* on page 88.
10. Reconnect the negative (-) ground cable to the battery.
11. Turn ON the system, and allow it to run for 2–3 minutes so that oil can circulate through the new air compressor.
12. Turn OFF the system, and check the oil level in the air compressor after the oil has had time to settle. See page 63.
13. Periodically check the air compressor to make sure there are no oil leaks.

Replace the compressor tension pulley

Kit number	Description
428524	<i>Kit: Air compressor drive pulley (tension)</i>

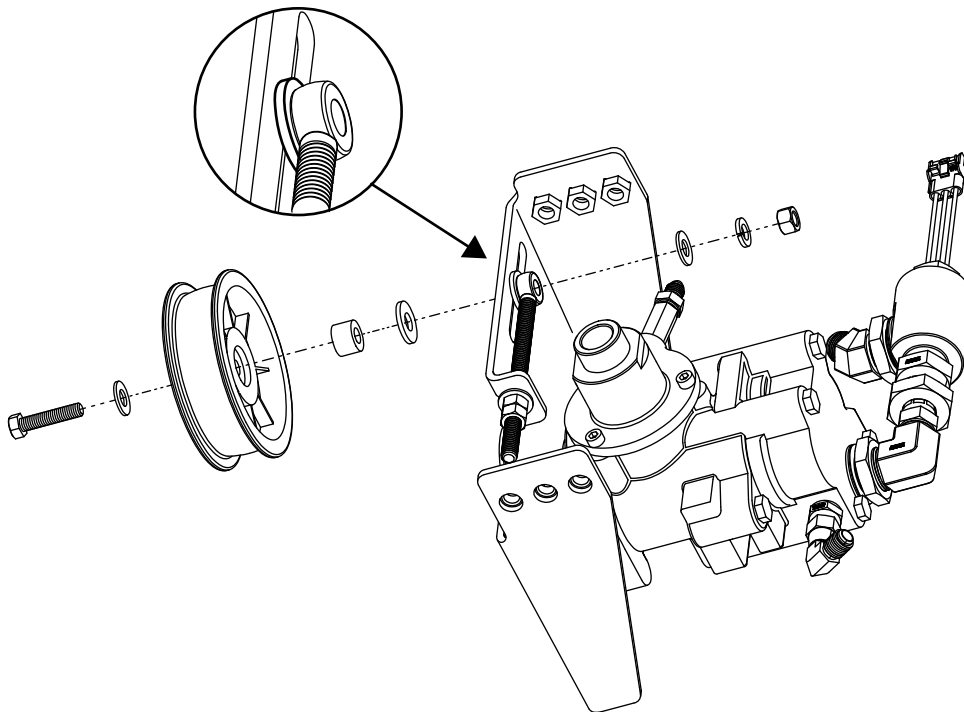
Remove the compressor tension pulley

1. Perform the following procedure to the point of removing the compressor assembly.
 - ❑ *Remove the air compressor and drive pulley on page 161.*
2. Remove the tension pulley from the compressor assembly. Retain the screw, nut, spacer, and all the washers.

Install the compressor tension pulley

1. Attach the new tension pulley to the compressor assembly using the screw, nut, spacer, and washers. Make sure to place a flat washer between the bracket and shaft.

Figure 88 – Air compressor tension pulley assembly



2. Perform the following procedure starting at the installation of the compressor assembly.
 - ❑ *Install the air compressor on page 163.*

Replace the compressor inlet valve

Kit number	Description
428535	<i>Kit: Compressor inlet valve (includes O-ring and screws)</i>

The compressor inlet valve kit includes a new O-ring and screws. In addition LOCTITE® 573™ is needed for sealing the control valve and compressor contact surfaces.

Remove the compressor inlet valve

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove pressure from the separation tank by pulling the relief valve on the separation tank manifold. See page 79.
5. Remove the black base board that is under the rear panel.
6. Disconnect the oil mist line and check valve from the control valve. See *Remove the air compressor check valve and scavenge line orifice* on page 169.
7. Loosen the hose clamp, and disconnect the air intake hose from the control valve.
8. Remove the 3 screws from the control valve, and remove the valve from the compressor. Remove the O-ring between the control valve and the compressor. Clean the exposed surface of the compressor.



Be careful not to get any dirt or debris in the compressor while the control valve is removed.

Install the compressor inlet valve

1. Apply a continuous bead of LOCTITE 573 to the connecting compressor surface. Surround the outer edge of the surface. Do not over apply.
2. Place the O-ring between where the compressor and the control valve connect. Make sure the surface area where the gasket lies on the compressor is clean and free of debris.
3. Install the new compressor inlet valve. Make sure the oil mist line connection is facing to the right. Refer to *Figure 84* on page 162.
4. Connect the oil mist line and check valve. See *Install the air compressor check valve and scavenge line orifice* on page 170.
5. Connect the air intake hose to the control valve. Tighten the hose clamp to secure the hose.
6. Reinstall the black base board under the rear panel.
7. Reconnect the negative (-) ground cable to the battery.

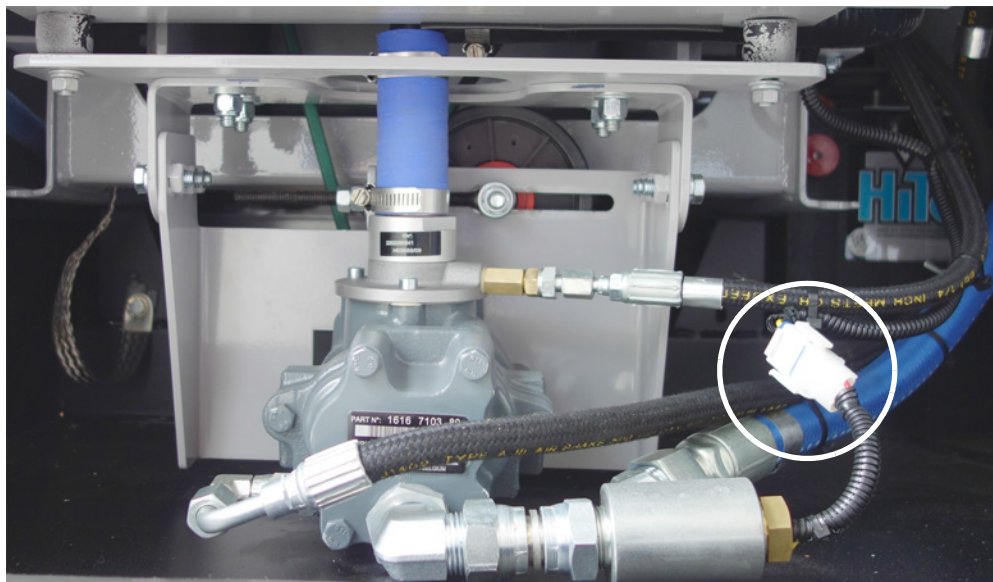
Replace the air compressor temperature switch, tee fitting, elbow fitting, and adapter

Kit number	Description
428536	<i>Kit: Temperature switch for air compressor (includes washer)</i>
428739	<i>Kit: Adapter straight</i>
428740	<i>Kit: Elbow fitting compressor output</i>
428741	<i>Kit: Tee fitting temperature switch</i>

Remove the temperature switch, tee fitting, elbow fitting, and adapter

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove pressure from the separation tank by pulling the relief valve on the separation tank manifold. See page 79.
5. Remove the black base board that is under the rear panel.
6. Disconnect the wire connector from the temperature switch.

Figure 89 – Temperature switch connector



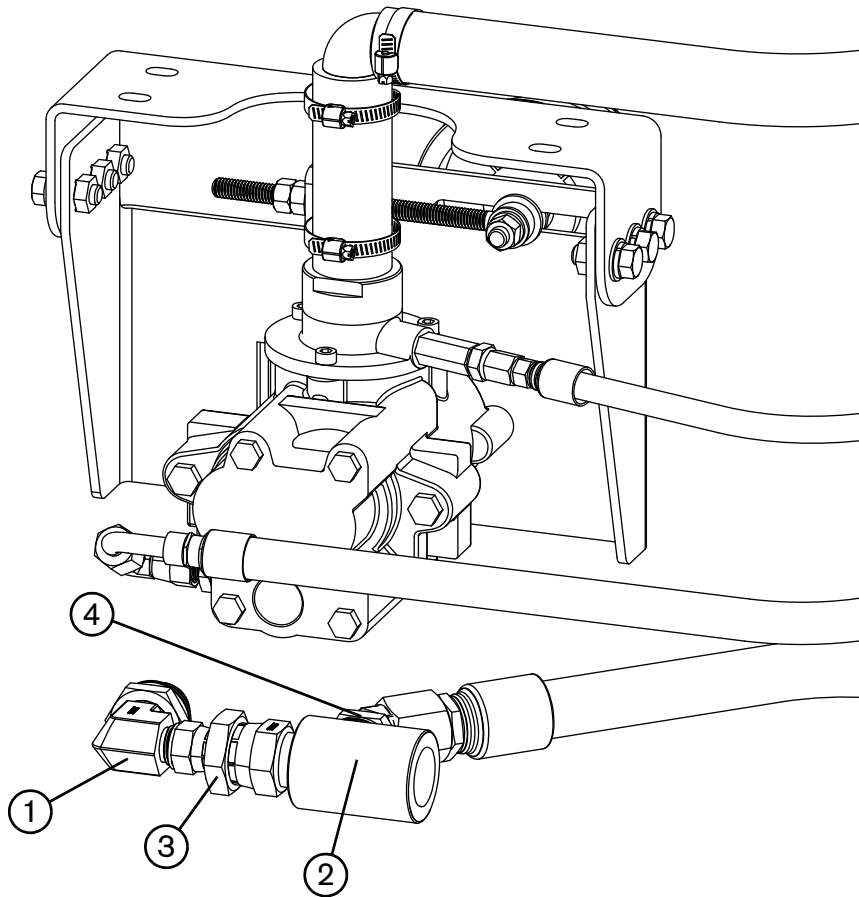
7. Place a small container or pan under the front of the air compressor to catch any oil that spills.
8. Use a large adjustable wrench to remove the temperature switch from the fitting on the air compressor. Remove the washer.

Figure 90 – Temperature switch and washer removed from fitting



9. Remove the elbow fitting ① from the compressor.
10. Remove the tee fitting ②, elbow fitting ①, or straight adapter ③ as needed. Disconnect the 45° fitting ④ when replacing the tee fitting.
11. Dispose of any oil that spilled in compliance with local and national regulations.

Figure 91



Install the temperature switch, tee fitting, elbow fitting, and adapter

1. Connect the new tee fitting, elbow fitting, or straight adapter as needed. Connect the 45° fitting from the air compressor output hose if replacing the tee fitting.
2. Connect new temperature switch and washer to the tee fitting.
3. Connect the wire connector to the temperature switch.
4. Clean up any oil that spilled inside the system. Dispose of the old oil in compliance with local and national regulations.
5. Put the black base board back in place under the rear panel.
6. Reconnect the negative (-) ground cable to the battery.
7. Turn ON the system, and allow it to run for 2–3 minutes.
8. Turn OFF the system, and check the oil level in the air compressor after the oil has had time to settle. See page 63.

Replace the air compressor check valve and scavenge line orifice

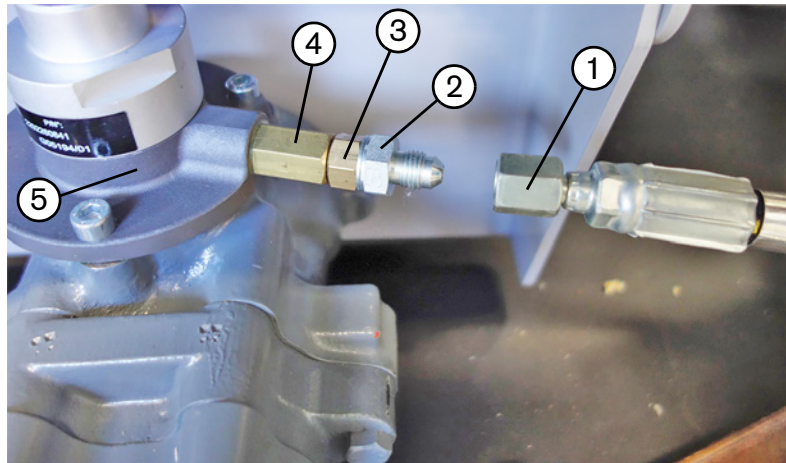
Kit number	Description
428534	<i>Kit: Check valve for air compressor</i>
428742	<i>Kit: Orifice, scavenge line</i>

When loosening or tightening hose connections use two wrenches: one to hold the fitting stationary and the other to loosen or tighten the compression nut.

Remove the air compressor check valve and scavenge line orifice

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove pressure from the separation tank by pulling the relief valve on the separation tank manifold. See page 79.
5. Remove the black base board that is below the rear panel.
6. Remove the oil mist line ① from the adapter. Place in a container to catch oil drippings. See *Figure 92* on page 170.
7. Remove the adapter ② from the scavenge line orifice ③.
8. Unscrew the check valve ④ from the compressor inlet valve ⑤. Dispose of oil according to local and national regulations.

Figure 92



Install the air compressor check valve and scavenge line orifice

1. Install the new check valve. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each threaded connection. Do not over-apply to avoid air line contamination.
2. Install the new scavenge line orifice. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each threaded connection. Do not over-apply to avoid air line contamination.
3. Install the adapter on the scavenge line orifice. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each threaded connection. Do not over-apply to avoid air line contamination.
4. Connect the oil mist line to the adapter. Clean up any oil drippings.
5. Replace the black base plate that is below the rear panel.
6. Reconnect the battery's negative (-) ground cable.
7. Run the system to distribute the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
8. After the unit starts up allow it to run for approximately 5 minutes.
9. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
10. Check for leaks and check the oil level. See *Check the oil level in the air compressor* on page 63.

Replace the air pressure gauge

Kit number	Description
428496	<i>Kit: Air pressure gauge</i>

Remove the air pressure gauge

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Drain the air tank to release pressure. See page 61.
3. Remove the top cover from the system. See *Remove the cover* on page 86.
4. From behind the front panel, disconnect the air hose from the 90° fitting at the back of the air pressure gauge. Cut any cable ties if necessary.

Figure 93



5. Loosen the 2 screws in the bracket that secure the air pressure gauge to the front panel. The screws do not need to be removed from the bracket. When loose the bracket can be removed with a twist.
6. Remove the air pressure gauge from the front panel.
7. Disconnect the 90° fitting from the back of the air pressure gauge.

Install the air pressure gauge

1. Connect the 90° fitting to the back of the air pressure gauge. Apply part number 330116 thread sealant on 2-3 middle threads of the fitting at the back of the new air pressure gauge. Do not over-apply to avoid air line contamination.
2. Set the new air pressure gauge in place.
3. Check the front of the air pressure gauge to make sure it is oriented correctly. Twist the bracket onto the air gauge from the back. Secure the gauge in place with 2 screws.
4. Connect the air hose to the 90° fitting. Replace any cable ties that were removed during the installation.
5. Put the system's top cover back in place. See *Install the cover* on page 88.

Replace the unloader valve

Kit number	Description
428540	Kit: Air pressure unloader valve (includes fittings, orifice, and muffler)

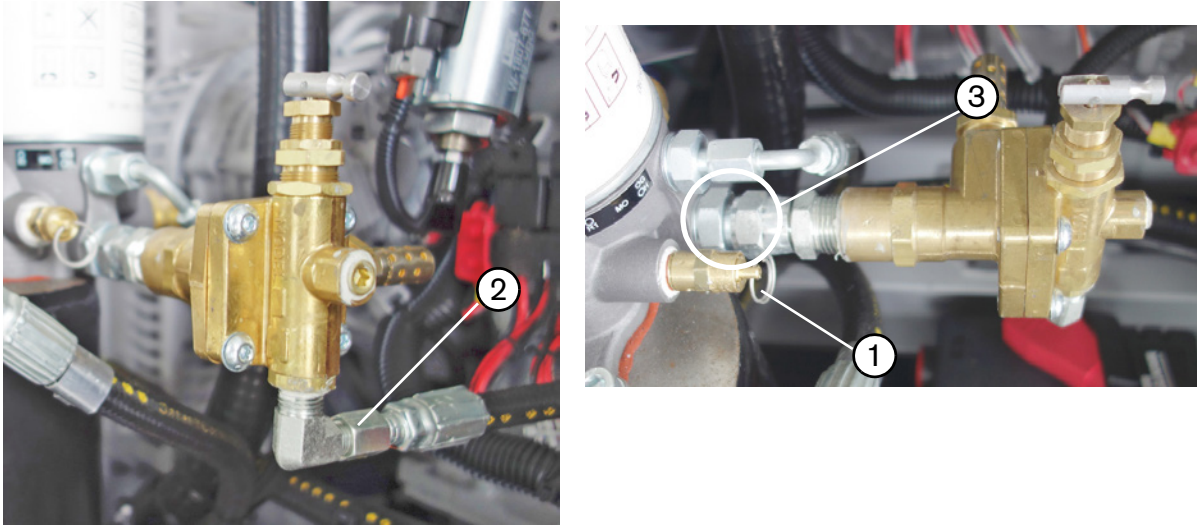
NOTICE

The unloader valve is factory calibrated to operate with this system. Do not attempt to adjust or break the tamper-proof seal on the unloader valve. Attempting to adjust the unloader valve will void the warranty.

Remove the unloader valve

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove the plasma-side service panel.
5. Release pressure from the separation tank by pulling the ring on the pressure relief valve ①. See *Figure 94* on page 173.
6. Use 2 wrenches remove the output hose from the valve's elbow fitting ②. Use 2 wrenches to remove the valve assembly from the separation tank manifold ③.

Figure 94



Install the unloader valve

1. Use 2 wrenches to connect the valve assembly to the separation tank manifold.
2. Use 2 wrenches to connect the output hose to the valve's elbow fitting.
3. Reconnect the battery's negative (-) ground cable.
4. Replace the plasma-side service panel.

Replace the muffler and orifice adapter

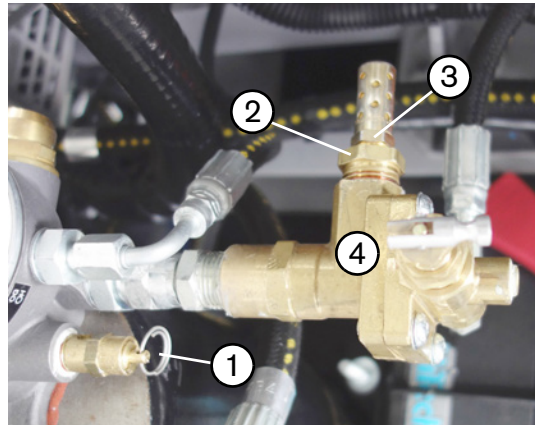
Kit number	Description
428547	<i>Kit: Muffler</i>
428638	<i>Kit: Orifice adapter</i>

When replacing the orifice adapter replace the muffler also. To replace only the muffler, do not remove the orifice adapter from the unloader valve.

Remove the muffler and orifice adapter

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the plasma-side service panel.
3. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
4. Drain the air tank to release pressure. See page 61.
5. Release pressure from the separation tank by pulling the ring ① on the pressure relief valve.
6. To remove only the muffler proceed to *step 7*. Use 2 wrenches to remove the muffler and orifice adapter from the unloader valve. Place one wrench on the orifice adapter ②. Place the other wrench on the unloader valve ④ to hold it steady. Turn the orifice adapter wrench to remove it.

Figure 95



7. To remove the muffler from the orifice adapter use 2 wrenches. Place one wrench on the orifice adapter ② to hold it steady. Place the other wrench on the muffler ③, and turn the muffler wrench to remove it.

Install the muffler and orifice adapter

1. To replace only the muffler proceed to *step 3*. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of the orifice adapter. Do not over-apply to avoid air line contamination.
2. Use 2 wrenches to attach the orifice adapter. Place one wrench on the unloader valve to hold it steady. Use the other wrench to attach the orifice adapter to the unloader valve.
3. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of the muffler. Do not over-apply to avoid air line or orifice contamination.
4. Use 2 wrenches to attach the muffler. Place one wrench on the orifice adapter to hold it steady. Place the other wrench on the muffler, and turn the muffler wrench to attach.
5. Reconnect the battery's negative (-) ground cable.
6. Put the plasma-side service panel back in place.

Replace the separation tank

Kit number	Description
428533	<i>Kit: Air compressor oil tank</i>

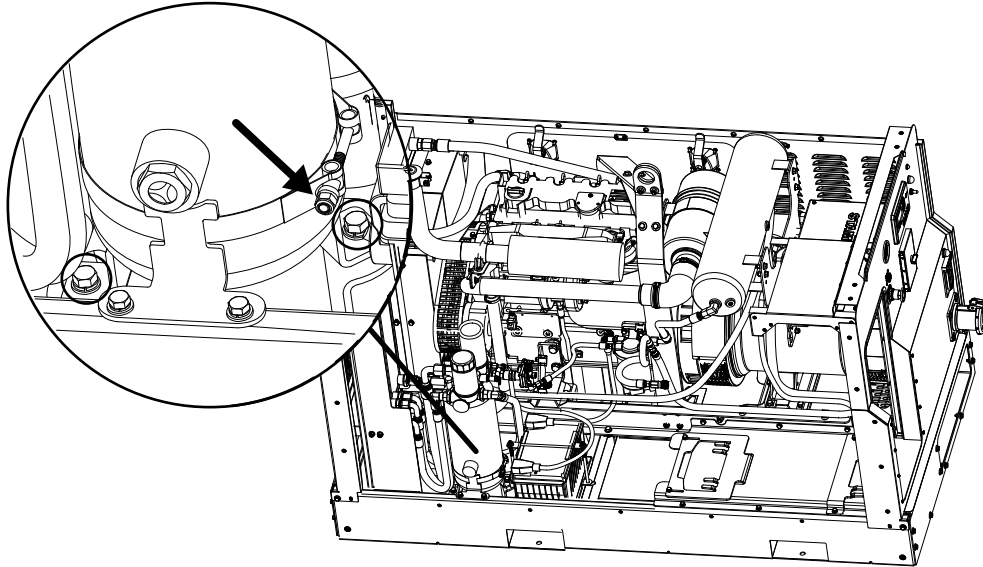
Remove the separation tank

1. Run the system to heat the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
2. After the unit starts up allow it to run for approximately 5 minutes.
3. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
4. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
5. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
6. Drain the air tank to release pressure. See page 61.
7. Drain the oil from the separation tank. See page 79.
8. Remove the screws and washers that secure the manifold. Remove the manifold from the separation tank. Retain the O-rings for installation on the new tank.

6 – Air Compression Components

9. Remove the large hose clamp from the separation tank.
10. Remove 2 screws and washers that secure the tank to the system's chassis. The tank can be removed at this point.

Figure 96

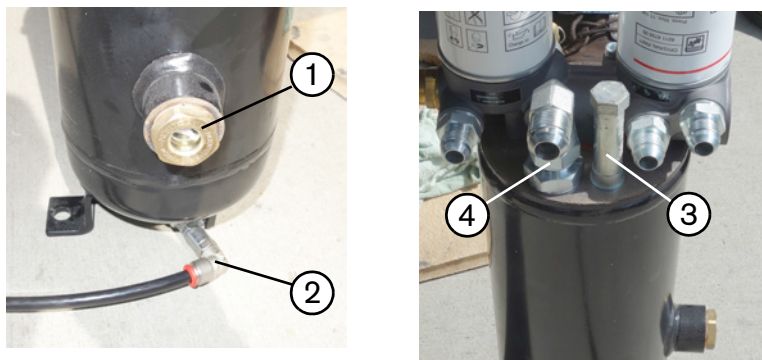


11. Remove the oil gauge and washer ①, valve and elbows ②, oil cap ③, and input elbow connector ④ from the old tank.



The valve and elbows need to be disassembled to remove them from the bottom of the tank.

Figure 97



Install the separation tank

1. Install the following components. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each fitting. Do not over-apply to avoid air line contamination. Refer to *Figure 97*.
 - ❑ Install the ball valve with the 2 elbow fittings ②.
 - ❑ Attach the oil gauge and washer ①, oil cap ③, and input elbow connector ④ onto the new tank.
2. Place the tank into the unit. Align the brackets at the bottom with the mounts in the chassis. Secure using screws and washers.
3. Connect the large hose clamp around the tank and the chassis bracket. Tighten the hose clamp to secure the tank. Make sure that the hose clamp's tightening screw location will not interfere with the side panel when installed.
4. Make sure the ball valve at the bottom of the tank is closed.
5. Install the manifold to the top of the tank. See *Install the separation tank manifold* on page 179.
6. Pour oil into the separation tank. See page 80.
7. Reconnect the battery's negative (-) ground cable.
8. Run the system to distribute the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
9. After the unit starts up allow it to run for approximately 5 minutes.
10. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
11. Check for leaks and check the oil level. See *Check the oil level in the air compressor* on page 63.
12. Replace the top cover and plasma-side panel on the system. See *Install the cover* on page 88.

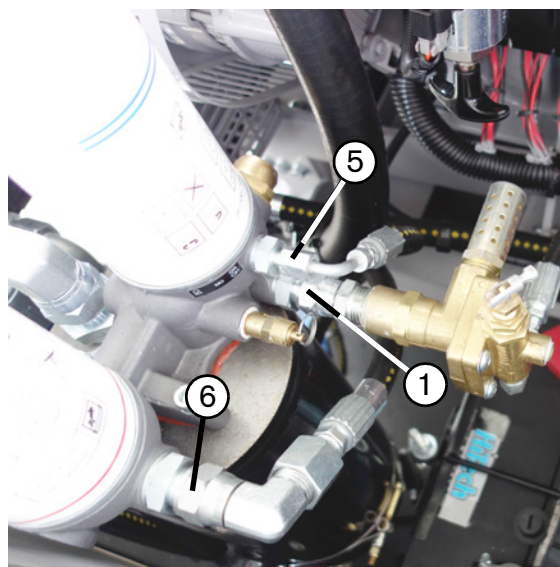
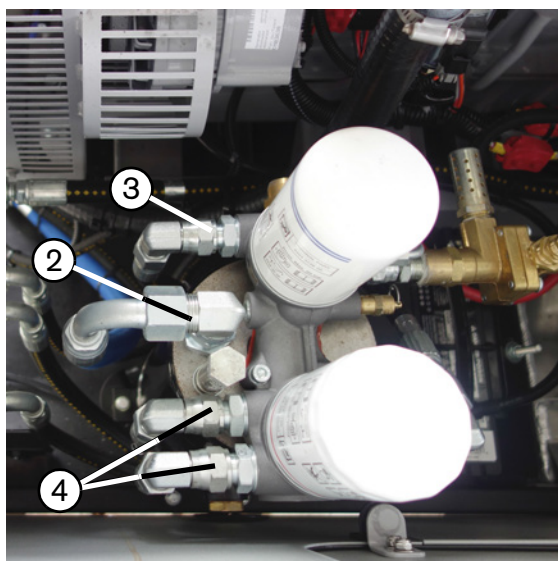
Replace the separation tank manifold

Kit number	Description
428538	Kit: Air compressor manifold

Remove the separation tank manifold

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Release pressure from the separation tank by pulling the ring on the pressure relief valve. See page 79.
5. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
6. Remove the pilot unloader valve ①. See *Remove the unloader valve* on page 172.
7. Disconnect the following hoses. Position the hoses in a vertical position with the disconnected fittings facing upward to avoid spilling oil.
 - ❑ Air/oil line from the compressor ②
 - ❑ Air cooler hose ③
 - ❑ 2 oil cooler hoses ④
 - ❑ Oil mist line to the compressor ⑤
 - ❑ Oil return line the compressor ⑥

Figure 98

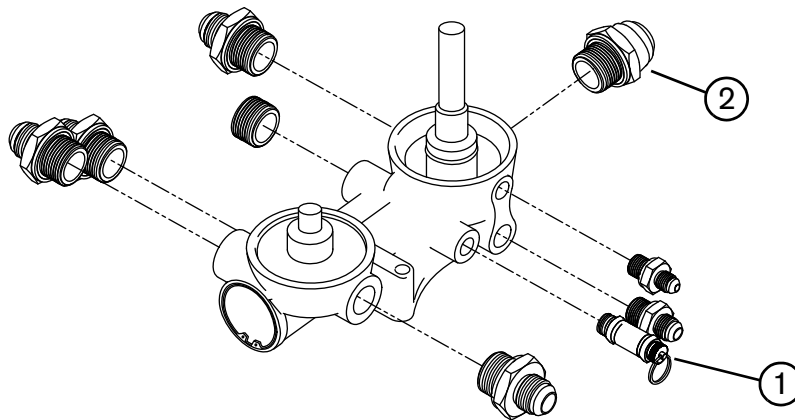


8. Remove the screws and washers that secure the manifold to the separation tank.
9. Remove the manifold from the separation tank. Clean any sealant residue from the manifold contact area. Make sure the contact area on the tank is clean. Avoid getting any dirt or debris in the tank.

Install the separation tank manifold

1. Make sure the mating surfaces of the tank and manifold are dry and free of residue. Use Permatex® #81182 Gasket Maker and apply a continuous 2 mm to 6 mm (1/16 inch to 1/4 inch) bead of silicone to the tank surface. Surround all orifices. Do not over apply.
2. Put the 2 O-rings in place. Mount the new manifold and hand-tighten the screws until the silicone begins to squeeze out around the manifold.
3. Allow the silicone to dry for one hour. Lube and torque the screws to 184 kg-cm (160 in-lb). Torque the screws alternately to 1/3 the torque value, then 2/3, then the final value. Allow 24 hours for the silicone to fully cure.
4. Remove the relief valve ① and minimum pressure valve ② from the old manifold. Install these items onto the new manifold. Use part number 330116 thread sealant on the relief valve. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination.
5. Remove the remaining fittings from the old manifold. Install each fitting to the appropriate location on the new manifold. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each fitting. Do not over-apply to avoid air line contamination.

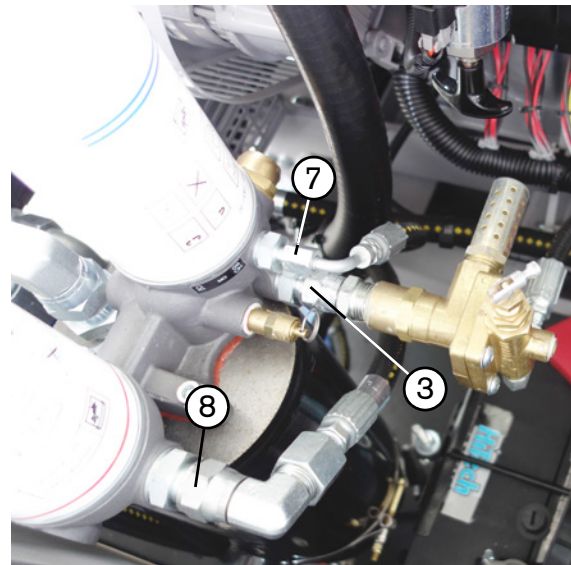
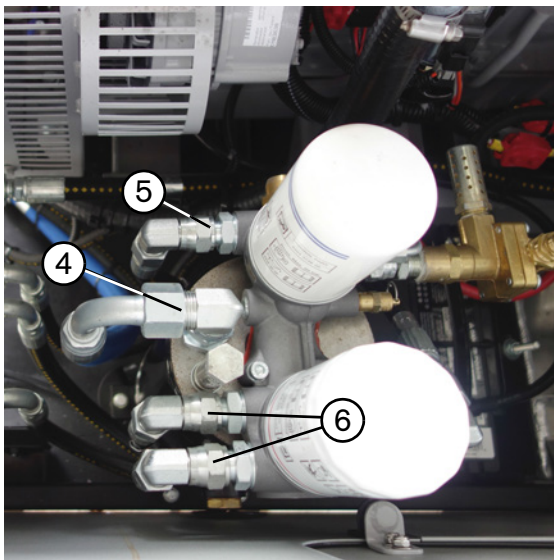
Figure 99 – Separation tank manifold fittings



6 – Air Compression Components

6. Connect the pilot unloader valve ③. See *Install the unloader valve* on page 173.
7. Connect the following hoses to the new manifold. Make sure the compression fittings to the tank manifold are vertical and will not interfere with the system's cover when installed.
 - ❑ Air/oil line from the compressor ④
 - ❑ Air cooler hose ⑤
 - ❑ 2 oil cooler hoses ⑥
 - ❑ Oil mist line ⑦
 - ❑ Oil return line ⑧

Figure 100



8. Install a new oil separation filter. See *Change the oil separation filter in the air compressor* on page 81.
9. Install a new oil filter. Lightly apply clean oil to the seal. Screw the oil filter into place. Tighten by hand. See page 78.
10. Reconnect the battery's negative (-) ground cable.
11. Run the system to distribute the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
12. After the unit starts up allow it to run for approximately 5 minutes.
13. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
14. Check for leaks and check the oil level. See *Check the oil level in the air compressor* on page 63.
15. Replace the top cover and plasma-side panel on the system. See *Install the cover* on page 88.

Replace the cooler unit

Kit number	Description
428532	<i>Kit: Air compressor oil cooler</i>

The 2 cooler units are identical. One cools the air and the other cools the compressor oil. They are secured in the chassis with rubber foam and adhesive. To replace a unit cut it loose from the chassis after disconnecting the hoses as instructed. When replacing a unit apply the foam and adhesive to secure the unit so that it cannot vibrate loose.

Remove the cooler unit


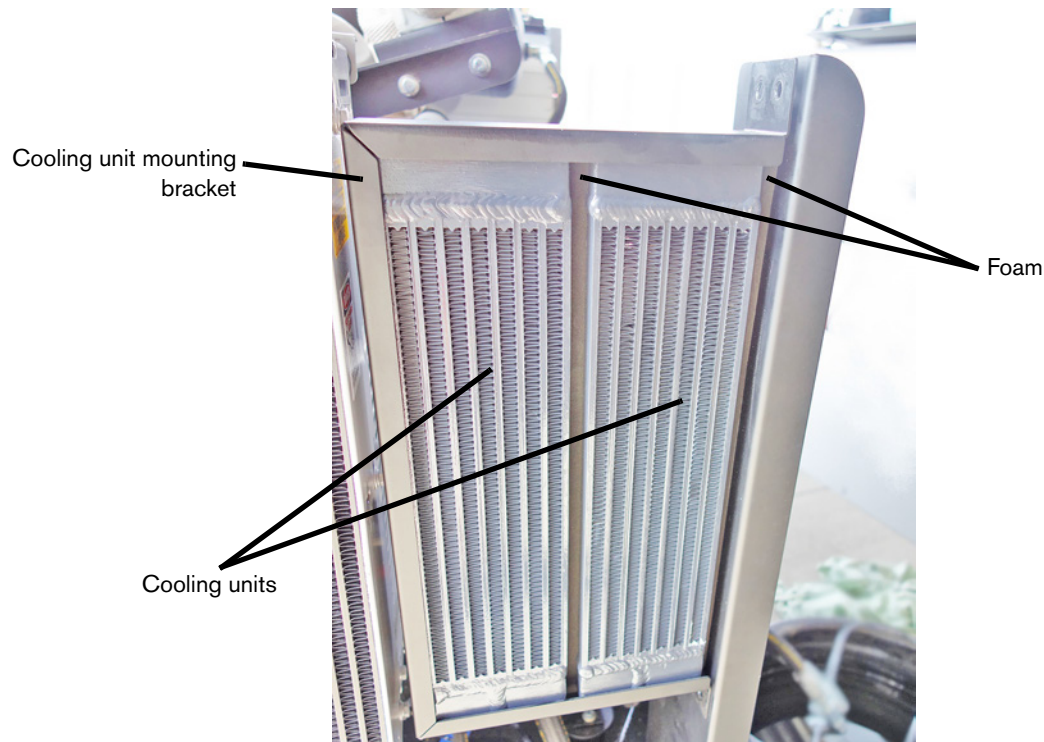
1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove the top cover, side panels, and rear panel from the system. See *Remove the cover* on page 86.
5. Release pressure from the separation tank by pulling the ring on the pressure relief valve. See page 79.
6. Disconnect the pressure fittings from the cooling unit being replaced. Position the oil cooler unit hoses so no oil leaks out.
7. Remove the 4 screws and nuts that secure the outer shroud, fan assembly, and the mounting bracket that enclose the cooling units. The cooler units are secured by foam and adhesive. Carefully cut the foam and adhesive on the cooling unit mounting bracket from the fan assembly. Separate the fan assembly from the cooling unit mounting bracket.
 Cut the foam loose from a metal surface where the adhesive joint is. Carefully pull the foam loose to avoid damage. If any foam sections need replacing use 1.6 cm by 1.9 cm (5/8 inch by 3/4 inch) foam rubber.
8. Remove the cooling unit being replaced by cutting it out of the mounting bracket and free from the other unit. Leave the foam on the good unit.

Figure 101 – Cooling unit assembly shown without shroud and fan assembly



Install the cooler unit

1. Secure the new cooling unit to the existing unit. Make sure the contact area for the foam is clean and dry. Apply a thin coat of adhesive (3M™ 08008) to both surfaces and allow to dry. Apply a second thin coat of adhesive to the foam and bond immediately. Do not attempt to bond too many surfaces at the same time.
2. When the adhesive has fully dried make sure the cooler units are secure and cannot vibrate in place.
3. Set the fan assembly in place, then the cooler unit mounting bracket followed by the outer shroud. Set the lower screws in place to secure the assemblies.
4. Align the outer shroud to the upper mounting holes and assemblies. Set the upper screws in place. Press the cooling assembly together to maximize effectiveness of the fan.
5. Secure the assemblies together with the 4 nuts on the upper and lower screws.
6. Make sure the 2 wires from the wire harness are connected to the fan connector. These may have come loose during the disassembly. Check that the red wire from the harness connects to the blue wire on the fan connector. Check that the brown wire from the harness connects to the black wire on the fan connector.
7. Reconnect the pressure fittings from the hoses.
8. Reconnect the battery's negative (-) ground cable.
9. If replacing the air cooling unit proceed to *step 13*. If replacing the oil cooler unit, run the system to distribute the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
10. After the unit starts up allow it to run for approximately 5 minutes.

11. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
12. Check for leaks and check the oil level. See *Check the oil level in the air compressor* on page 63.
13. Replace the top cover, side panels, and rear panel on the system. See *Install the cover* on page 88.

Replace the compressor cooling fan

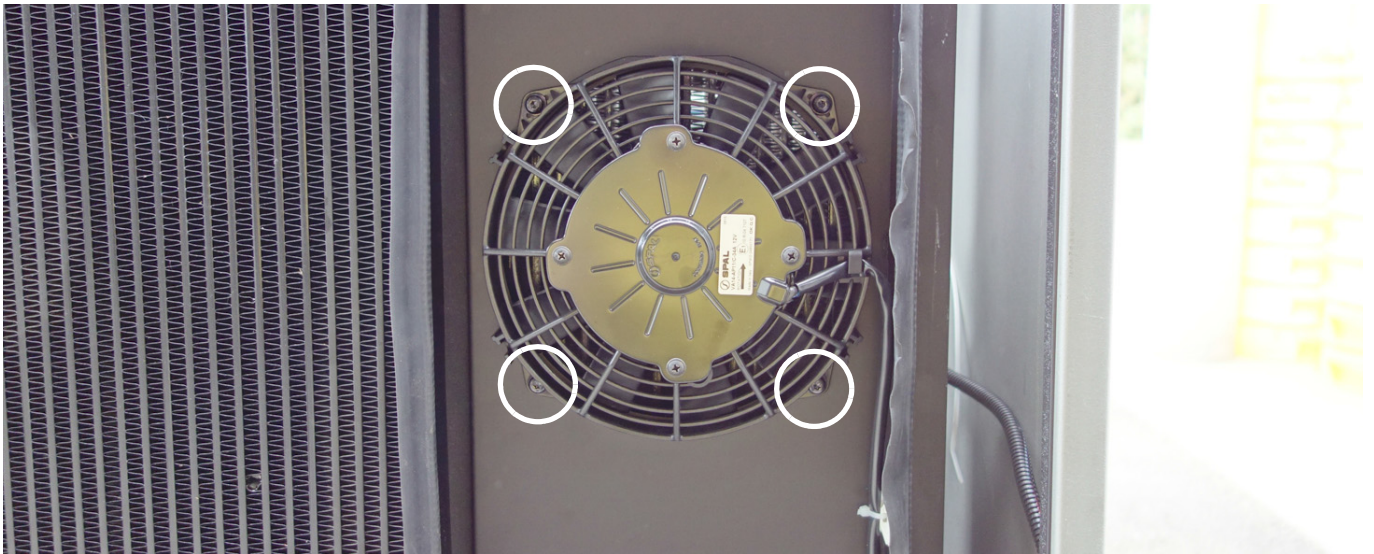
Kit number	Description
428733	Kit: Cooling unit fan

Some early units may not have weld nuts on the fan plenum. These require disassembly of the fan and cooling unit assembly to replace the fan.

Remove the compressor cooling fan

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Remove the top cover, side panels, and rear panel from the system. See *Remove the cover* on page 86.
4. Unplug the 2 wiring harness connectors from the fan connector.
5. Remove the 4 screws that secure the fan to the bracket.

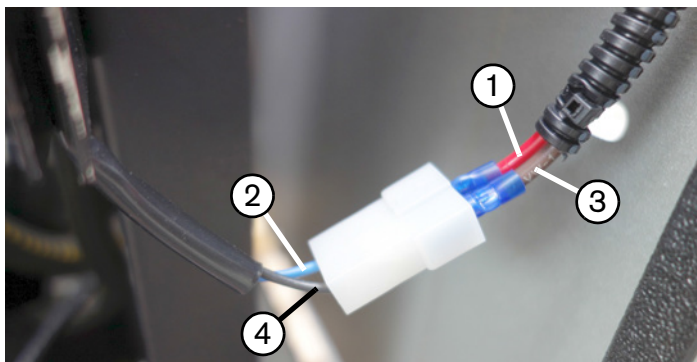
Figure 102 – Fan Assembly



Install the compressor cooling fan

1. Attach the new fan to the bracket and secure with 4 screws.
2. Plug the 2 wires from the wire harness into the fan connector. Connect the red wire ① from the harness to the blue wire ② on the fan connector. Connect the brown wire ③ to the black wire ④ on the fan connector.

Figure 103



3. Reconnect the battery's negative (-) ground cable.
4. Replace the top cover, side panels, and rear panel on the system. See *Install the cover* on page 88.
5. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
6. Make sure the fan blows air out the back of the unit. If the fan is blowing air into the unit check the polarity of the wires on the fan connector.
7. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.

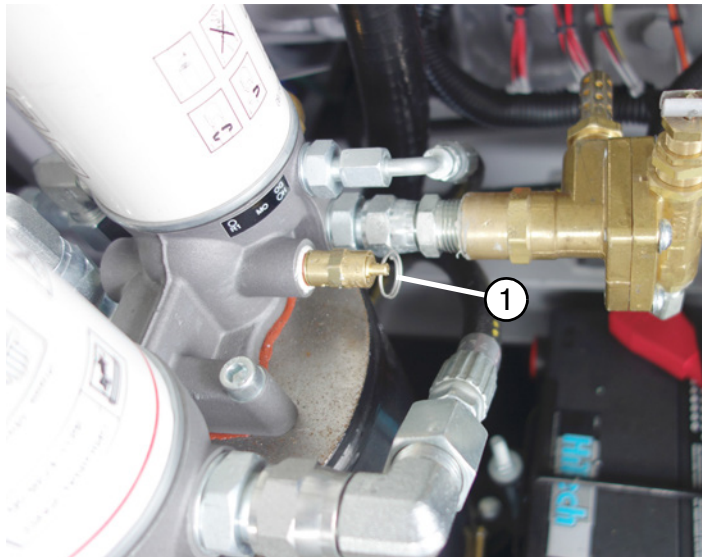
Replace the pressure relief valve on the separation tank

Kit number	Description
428543	<i>Kit: Manifold relief valve for the air compressor</i>

Remove the pressure relief valve on the separator tank

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the plasma-side service panel.
3. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
4. Drain the air tank to release pressure. See page 61.
5. Release pressure from the separation tank by pulling the ring ① on the pressure relief valve.

Figure 104



6. Unscrew the pressure relief valve from the manifold.

Install the pressure relief valve on the separator tank

1. Install the new pressure relief valve. Use part number 330116 thread sealant on the relief valve. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination.
2. Reconnect the battery's negative (-) ground cable.
3. Replace the plasma-side service panel.

Replace the oil level gauge

Kit number	Description
428542	<i>Kit: Oil level gauge for the air compressor (includes washer)</i>

Remove the oil level gauge

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (●) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Release pressure from the separation tank by pulling the ring on the pressure relief valve. See *Figure 104* on page 185.
5. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
6. Remove 2 screws and the large hose clamp that secure the tank to the system's chassis. See *Figure 96* on page 176.
7. Tilt the tank towards the engine so the oil in the tank accumulates opposite the oil level gauge.
8. Remove the gauge and washer from the separation tank.

Install the oil level gauge

1. Install the new oil level gauge and washer. Use part number 330116 thread sealant on the threads. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid oil contamination.
2. Set the tank back in place. Align the brackets at the bottom with the mounts in the chassis. Secure using screws and washers. See *Figure 96* on page 176.
3. Reconnect the large hose clamp around the tank and the chassis bracket. Tighten the hose clamp to secure the tank. Ensure that the hose clamp's tightening screw location will not interfere with the side panel when installed.
4. Reconnect the battery's negative (-) ground cable.
5. Replace the top cover and plasma-side panel on the system. See *Install the cover* on page 88.

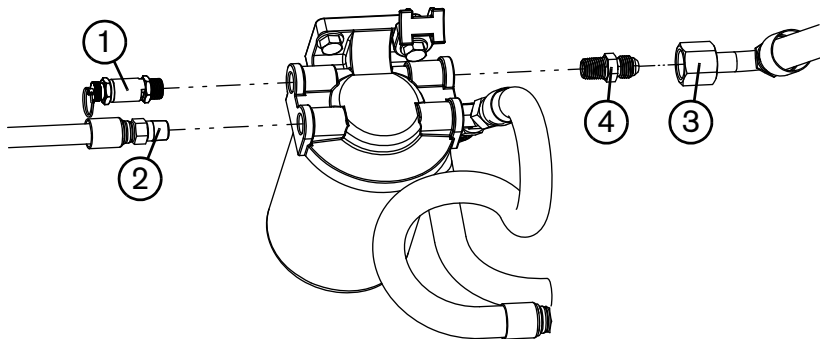
Replace the air drying filter assembly

Kit number	Description
428441	Kit: Air drying filter assembly for air compressor (includes filter)

Remove the air drying filter assembly

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Release pressure from the separation tank by pulling the ring on the pressure relief valve. See *Figure 104* on page 185.
5. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
6. Remove the pressure relief valve ①. See *Remove the pressure relief valve on the air drying filter assembly* on page 190.
7. Disconnect the unloader valve hose ②.
8. Disconnect the air tank hose ③.
9. Remove the adapter from the air drying filter assembly where the air tank hose was attached ④.

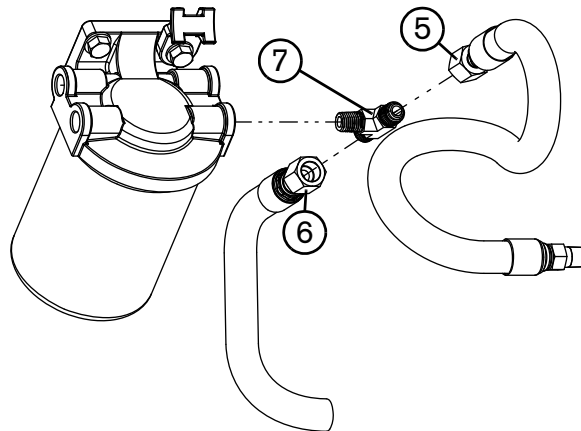
Figure 105



6 – Air Compression Components

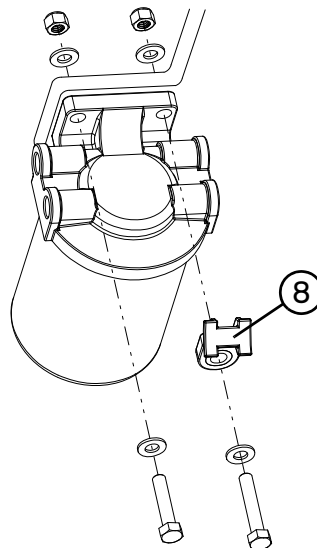
10. Disconnect the 2 hoses at the tee fitting. One hose is from the plasma power supply ⑤ and the other hose is from the auxiliary air outlet ⑥.
11. Remove the tee fitting from the air drying filter assembly ⑦.

Figure 106



12. Remove the screws, nuts, and washers that secure the air drying filter assembly to the chassis. Remove the air drying filter assembly from the unit. Cut any cable ties necessary to free the part.

Figure 107



Install the air drying filter assembly

- 1.** Attach the new air drying filter assembly and cable tie mount ⑧ to the chassis with screws, washers, and nuts. See *Figure 107*.
- 2.** Install the pressure relief valve. Use part number 330116 thread sealant on the relief valve. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination.
- 3.** Connect the hose from the unloader valve.
- 4.** Install the tee fitting to the front right port on the air drying filter assembly. See *Figure 106* on page 188. Use part number 330116 thread sealant on the fitting. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination. Make sure the final position does not interfere with the adjacent port.
- 5.** Connect the hose from the plasma power supply to the tee fitting.
- 6.** Connect the hose from the auxiliary air outlet to the tee fitting.
- 7.** Install the adapter to the right rear port where the air tank hose was attached. Use part number 330116 thread sealant on the adapter. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination. See *Figure 105* on page 187.
- 8.** Connect the hose from the air tank to the adapter.
- 9.** Install a new air drying filter. See *Replace the air drying filter* on page 67.
- 10.** Redress any hoses and replace any cable ties cut from the removal process.
- 11.** Reconnect the battery's negative (-) ground cable.
- 12.** Replace the top cover and plasma-side panel on the system. See *Install the cover* on page 88.

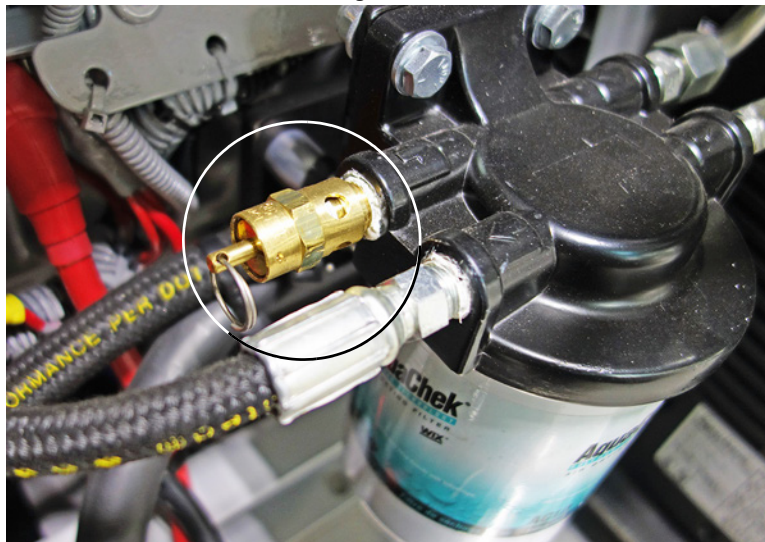
Replace the pressure relief valve on the air drying filter assembly

Kit number	Description
428581	Kit: Pressure relief valve

Remove the pressure relief valve on the air drying filter assembly

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Remove the plasma-side service panel.
3. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
4. Drain the air tank to release pressure. See page 61.
5. Pull the ring on the air drying filter relief valve to ensure there is no pressure left.
6. Unscrew the pressure relief valve from the air drying filter assembly.

Figure 108



Install the air pressure relief valve on the air drying filter assembly

1. Install the new pressure relief valve. Use part number 330116 thread sealant on the relief valve. Apply a thread seal bead on 2–3 threads. Do not over-apply to avoid air line contamination.
2. Reconnect the battery's negative (-) ground cable.
3. Replace the plasma-side service panel.

Replace the ball valve, elbow fitting, and elbow coupler on the separation tank

Kit number	Description
428553	<i>Kit: Ball valve for air compressor</i>
428554	<i>Kit: Elbow fitting for air compressor</i>
428555	<i>Kit: Elbow coupler for air compressor</i>

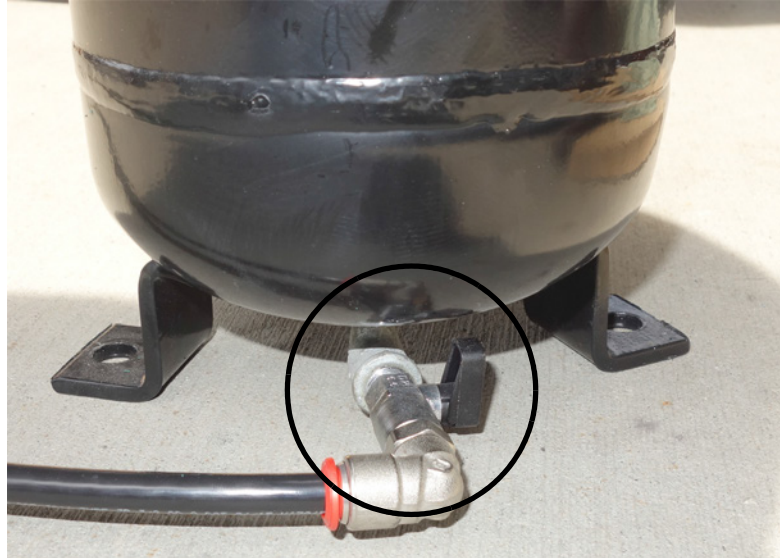
Remove the ball valve, elbow fitting, and elbow coupler on the separation tank

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Release pressure from the separation tank by pulling the ring on the pressure relief valve. See *Figure 104* on page 185.
5. Remove the top cover and plasma-side panel from the system. See *Remove the cover* on page 86.
6. Drain the oil from the separation tank. See page 79.
7. Remove the drain hose from the elbow fitting attached to the ball valve.
8. Loosen and remove the large hose clamp around the separation tank. Remove 2 bolts and washers that secure the tank to the system chassis. The tank can be moved to access the ball valve, elbow fitting, and elbow coupler. See *Figure 96* on page 176.
9. Disconnect the ball valve from the two elbow fittings.

Install the ball valve, elbow fitting, and elbow coupler on the separation tank

1. Connect the ball valve to the 2 elbow fittings. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each fitting. Make sure the orientation of the valve and elbow fitting is correct.

Figure 109



2. Place the tank into the unit. Align the brackets at the bottom with the mounts in the chassis. Secure using screws and washers.
3. Connect the drain hose to the elbow fitting attached to the ball valve.
4. Reconnect the large hose clamp around the tank and the chassis bracket. Tighten the hose clamp to secure the tank. Make sure that the hose clamp's tightening bolt location will not interfere with the side cover when installed.
5. Make sure the ball valve is closed.
6. Clean up any oil that spilled. Dispose of the old oil in compliance with local and national regulations.
7. Pour oil into the separation tank. See page 80.
8. Reconnect the battery's negative (-) ground cable.
9. Run the system to distribute the oil. Set the power switch on the front panel to ON (I) and press the **RUN** button on the system controller.
10. After the unit starts up allow it to run for approximately 5 minutes.
11. Press the OFF (O) button on the system controller to turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
12. Check for leaks and check the oil level. See *Check the oil level in the air compressor* on page 63.
13. Replace the top cover and plasma-side panel on the system. See *Install the cover* on page 88.

Replace the condensate release lever

The condensate release lever is a standard 1/4 inch brass 600 WOG (water, oil, gas) ball valve, Lance Supply® part number 21-021. This is not available as a kit from Hypertherm and can be sourced locally if needed. This procedure guides you through the replacement if necessary.

Remove the condensate release lever

1. Turn OFF the system. Make sure the power switch on the front panel is in the OFF (O) position.
2. Wait for 30 seconds, then disconnect the battery's negative (-) ground cable.
3. Drain the air tank to release pressure. See page 61.
4. Remove the top cover and engine-side panel from the system. See *Remove the cover* on page 86.
5. Remove 7 screws from the front panel base plate. Unscrew 2 screws accessed from behind the front panel. These are located near the 480 V auxiliary outlet electrical box. Set aside the front panel base plate and screws.

Figure 110



6 – Air Compression Components

6. Remove the 2 screws that secure the condensate valve to the bracket. Remove the valve from the bracket.

Figure 111

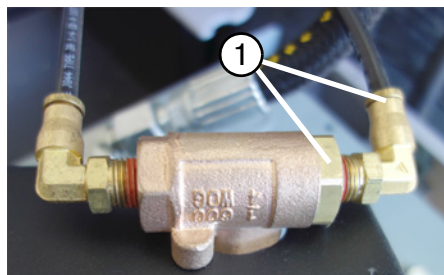


7. Disconnect the 2 hoses from the elbow fittings. Remove the elbow fittings from the valve.

Install the condensate release lever

1. Install the elbow fittings on the new lever. Use part number 330116 thread sealant. Apply a thread seal bead on 2–3 threads of each threaded connection. Do not over-apply to avoid air line contamination.

Figure 112



2. Connect the 2 hoses to the elbow fittings. The line from the air tank connects to the machined brass fitting side of the lever assembly ①.
3. Secure the lever assembly to the bracket using 2 screws.
4. Replace the front panel black base plate.
5. Replace the 2 screws behind the front panel. These are located near the 480 V auxiliary outlet electrical box. See *Figure 110* on page 193.
6. Replace the top cover and engine-side panel. See *Install the cover* on page 88.
7. Reconnect the negative (-) ground cable to the battery.

Section 7

Parts

Use the part and kit numbers in this section to order replacement parts, accessories, plasma torches, and consumables for your system.

Refer to the *Powermax125 Service Manual* (808070) for a complete list of replacement parts for the Powermax125 plasma supply and Duramax® Hyamp hand torches and machine torches. You can download this manual from the “Documents library” at www.hypertherm.com.

System parts

Exterior, front panel

Figure 113

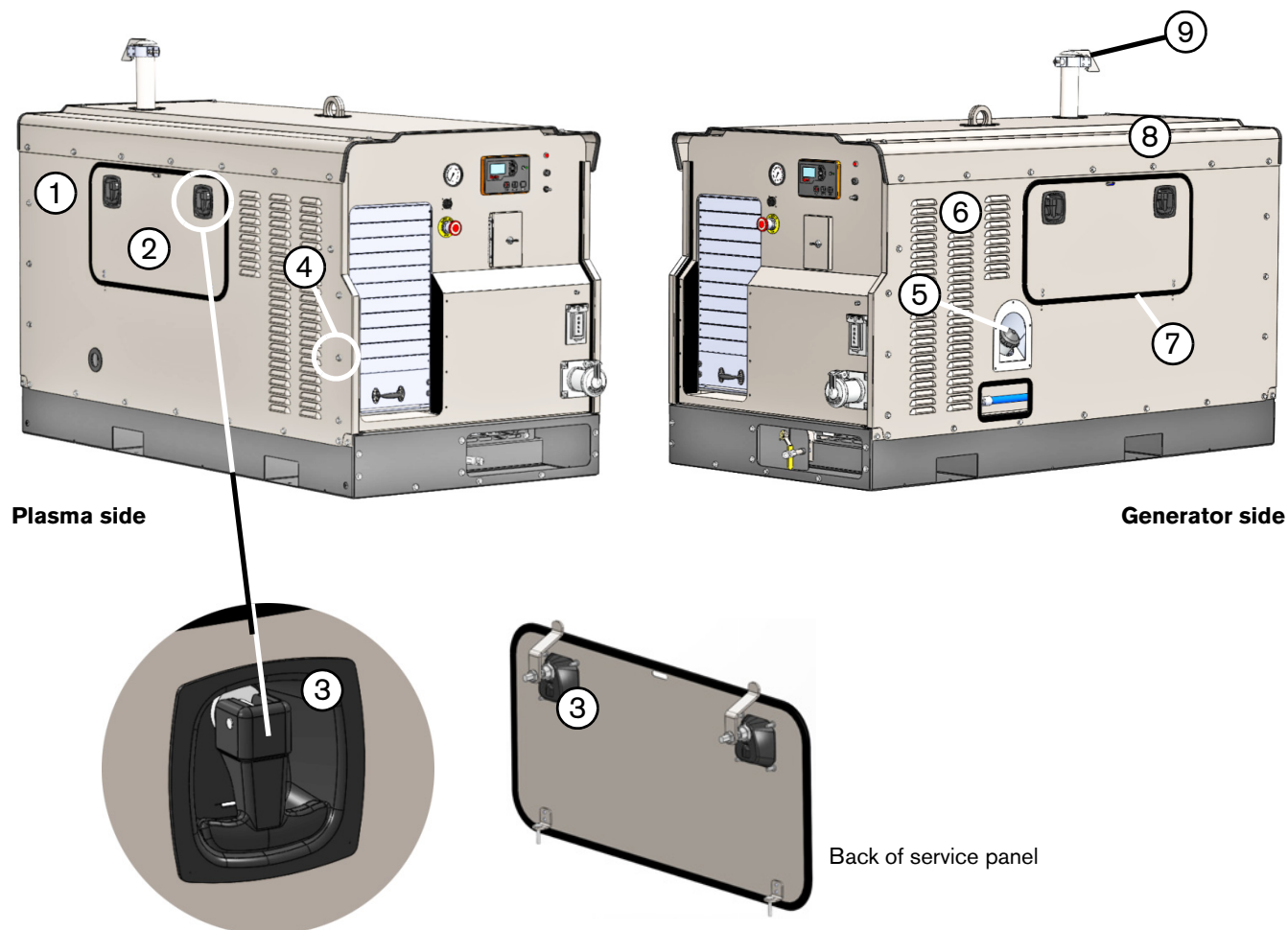


Description	Part number
1 Kit: Air pressure gauge	428496
2 Kit: Machine interface cable with CPC receptacle	428557
Protective cover for machine interface (CPC) receptacle (not shown)	127204
3 Kit: Emergency Stop button	428498
Kit: Contactor for Emergency Stop button	428497
Kit: Yellow warning sticker for Emergency Stop button	428508
4 Kit: Protective panel for main circuit breaker and transformer circuit breaker	428523
Kit: Main circuit breaker, 60 A, 3 pole (top)	428514
Kit: Transformer circuit breaker, 10 A, 3 pole (bottom)	428578

	Description	Part number
5	Kit: Alternator lamp	428546
6	Kit: 12 V circuit breaker 10 A	428743
7	Kit: ON/OFF power switch, 12 V	428510
8	Kit: Circuit breaker for the 120 V (20 A) auxiliary outlet	428530
9	Kit: Replacement cover for the 120 V auxiliary outlet	428531
	Kit: 120 V (20 A) auxiliary outlet replacement	428528
	Kit: Replacement screws and washers for cover panels (contains a set of 15 screws, washers, and lock washers)	428587
10	Kit: 480 V (60 A) auxiliary outlet replacement	428525
11	Dynagen® system controller	428545
12	Kit: Front panel (hardware not included)	428518
	Kit: Rear panel (hardware not included) (not shown)	428517
	Kit: Ventilation screen for rear panel (not shown)	428515
	Kit: Freedom 38 PPA decal for front and rear panels (not shown)	428507
	Kit: Labels for front panel controls (not shown)	428506
	Freedom 38 PPA safety label (not shown)	210385
	“Hot surface” warning label (near exhaust pipe – not shown)	210393

Exterior, sides

Figure 114



Description

Part number

- | | |
|---|--|
| 1 | Kit: Side panel, plasma side (hardware not included) |
| 2 | Kit: Service panel (twist-lock latches not included) |
| 3 | Kit: Replacement twist-lock latch for service panels |
| 4 | Kit: Replacement screws and washers for cover panels (contains a set of 15 screws, washers and lock washers) |
| 5 | Kit: Fill cap for fuel tank |
| 6 | Kit: Side panel, generator side (hardware not included) |
| 7 | Kit: Protective edge lining for cover panels and service panels |
| 8 | Kit: Top cover (hardware not included) |
| 9 | Kit: Cap for engine exhaust pipe |
| | Kit: Freedom 38 PPA decal for side panel (not shown) |

428520

428551

428586

428587

428550

428516

428558

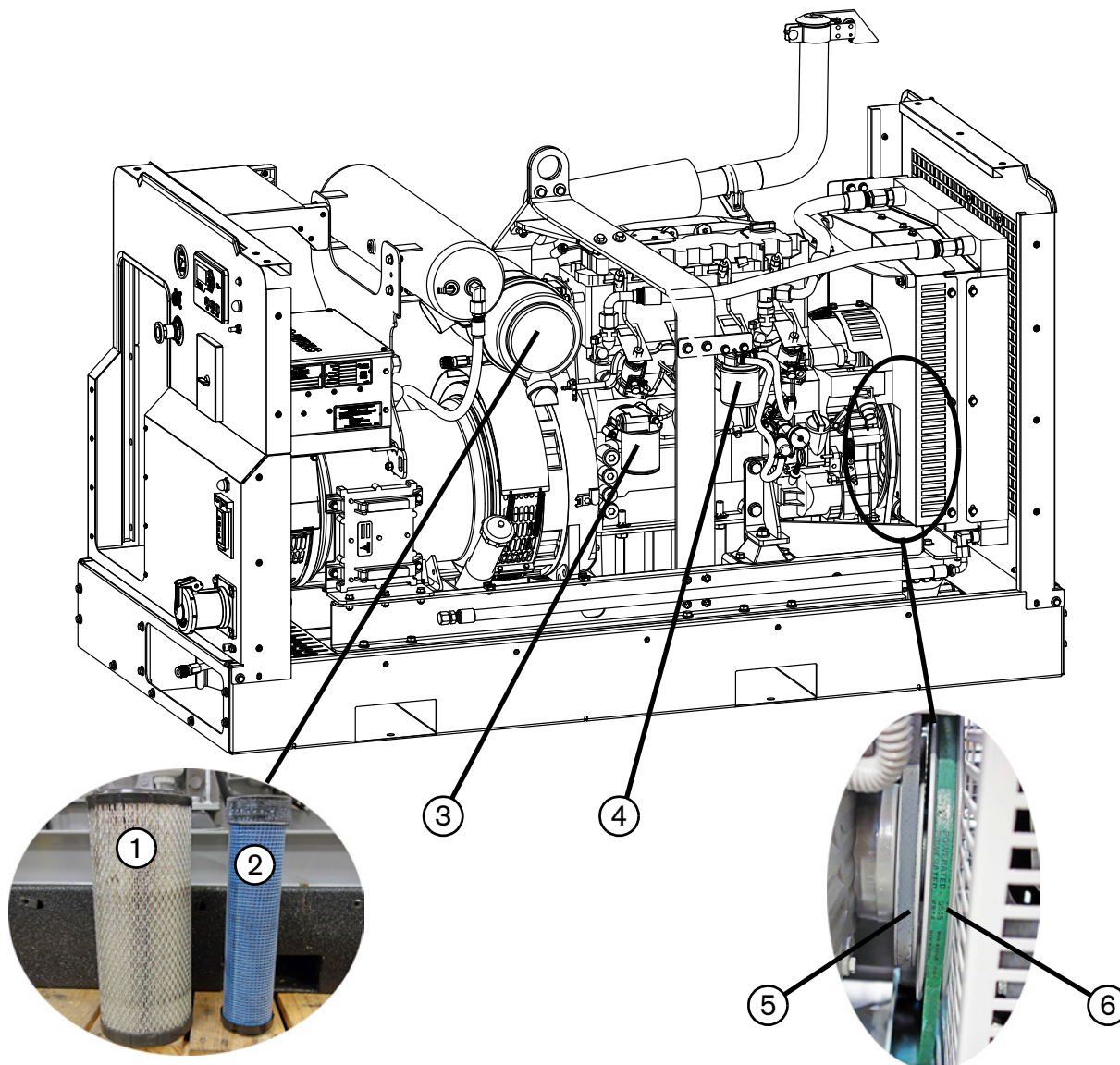
428519

428499

428505

Interior, engine and generator

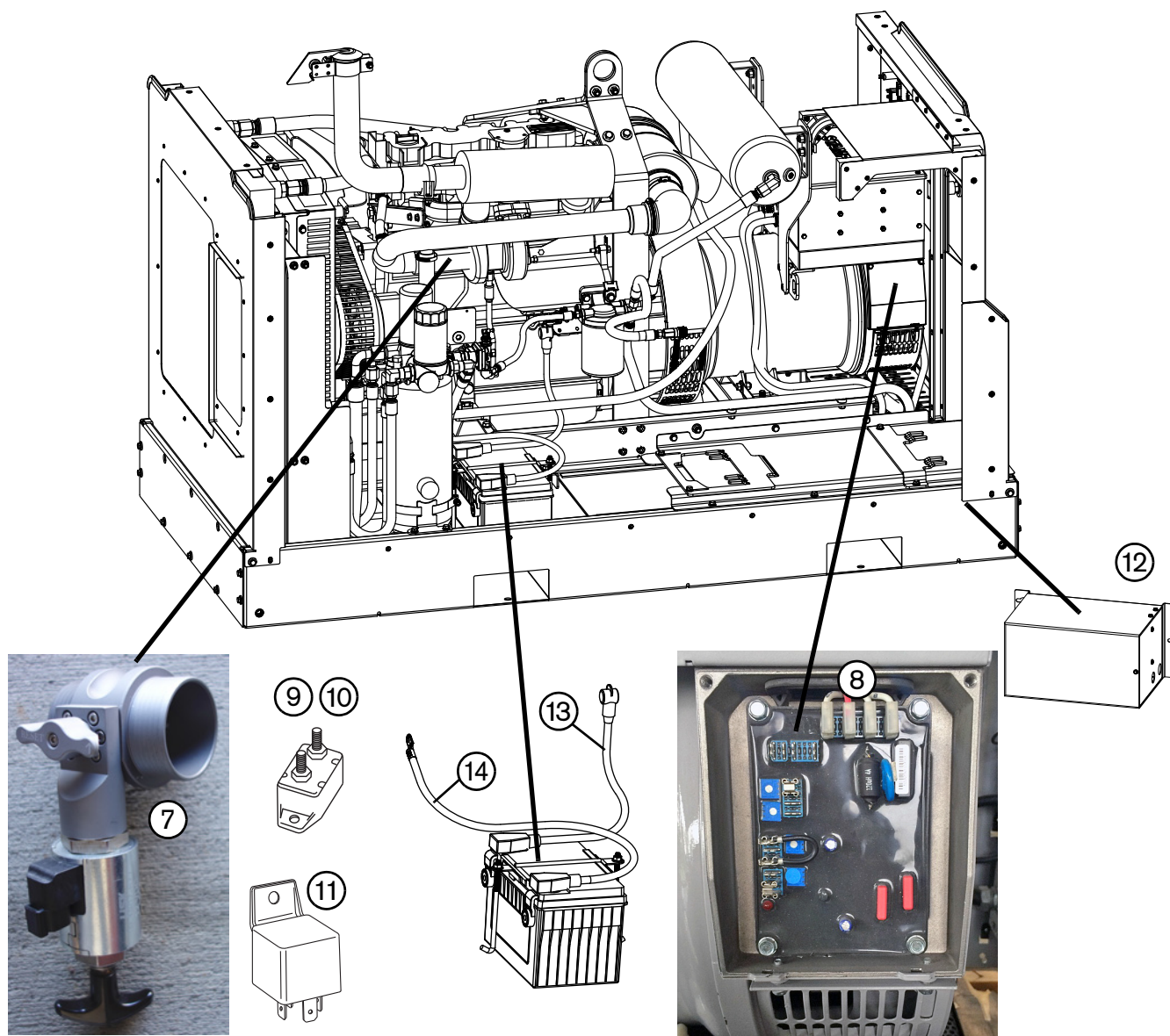
Figure 115 – Engine side components



Description	Part number
1 Kit: Primary filter for engine air cleaner (Donaldson® P827653)	428503
2 Kit: Safety filter for engine air cleaner (Donaldson® P829332)	428504
3 Kit: Deutz-brand oil filter for engine (Deutz 01174416)	428613
4 Kit: Deutz-brand fuel filter for engine (Deutz 01174482)	428511

	Description	Part number
5	Kit: Engine belt (available from Deutz)	05069139 (Deutz part number)
6	Kit: Air compressor belt (Gates Corporation® 6846)	428500

Figure 116 – Plasma side components



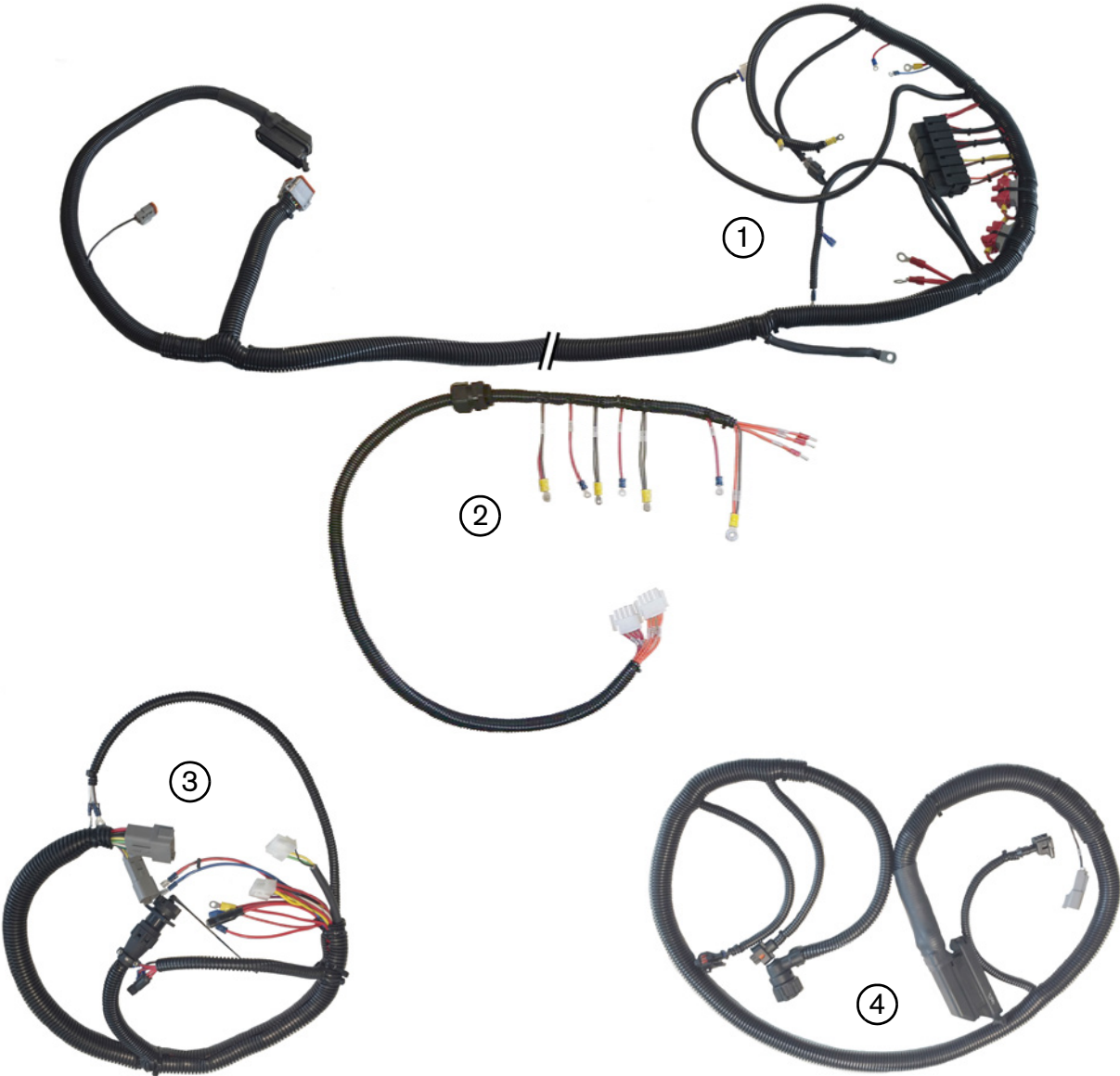
	Description	Part number
7	Kit: Emergency air intake shutoff valve	428509
8	Kit: Automatic voltage regulator (AVR) for generator/alternator, 480 VAC	428548

	Description	Part number
9	Kit: Circuit breaker, 14 VDC, 30 A	428576
10	Kit: Circuit breaker, 14 VDC, 40 A	428577
11	Kit: Electrical relay, 12 VDC, 40 A	428575
12	Kit: Transformer, 120 VAC	428549
13	Kit: Battery cable, positive (+)	428522
14	Kit: Battery cable, negative (-)	428521
	Kit: Service parts generator rectifiers	428486
	Kit: Fuel-level sensor	428735

Wiring harnesses

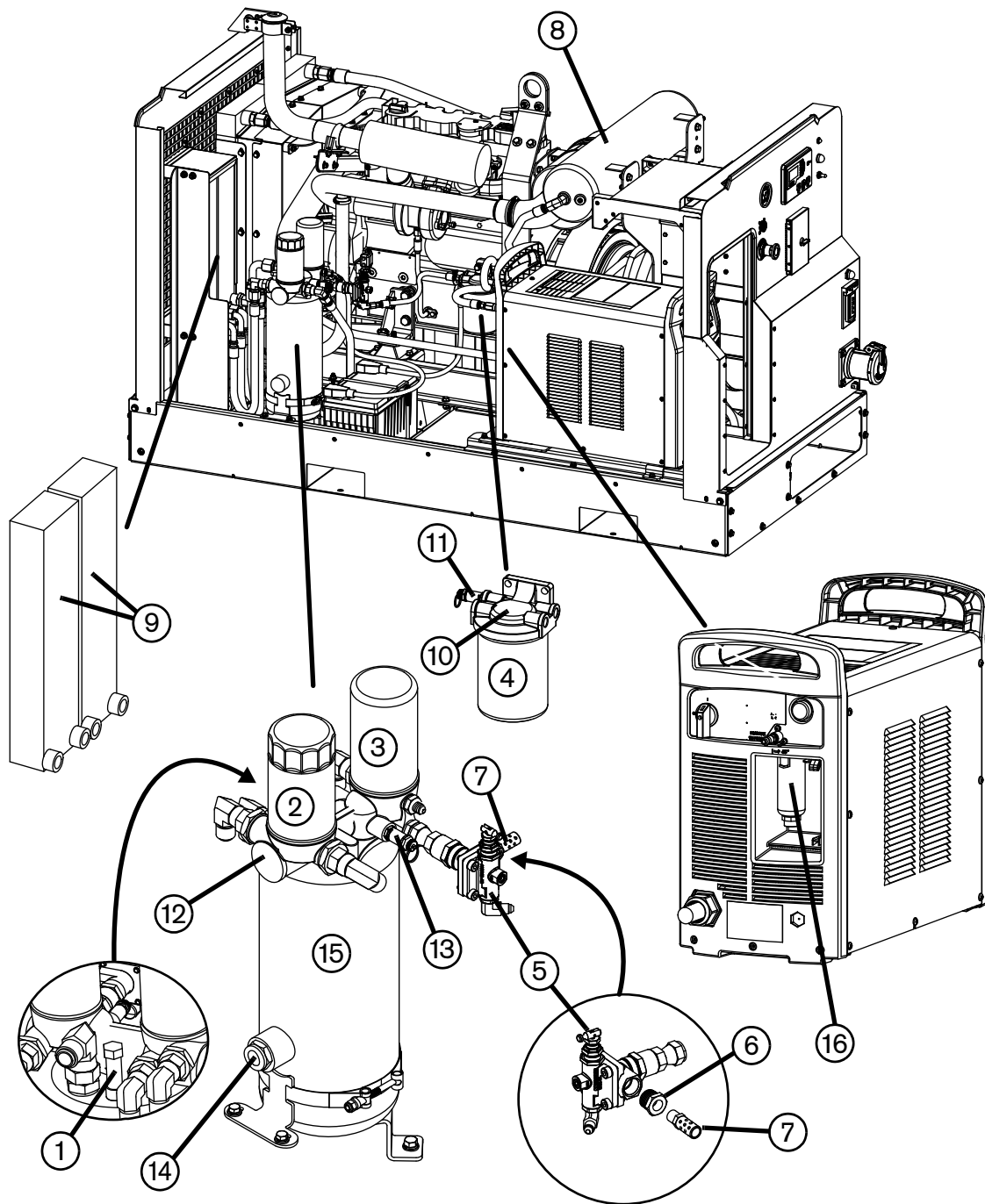
There are 4 wiring harnesses available through Hypertherm as replaceable parts. To replace the other wiring harnesses for the engine, contact an authorized Deutz service dealer.

Figure 117



	Description	Part number
1	Kit: Wiring harness for engine	428711
2	Kit: Wiring harness for AC sensors	428712
3	Kit: Wiring harness for control panel	428573
4	Kit: Wiring harness for generator	428574

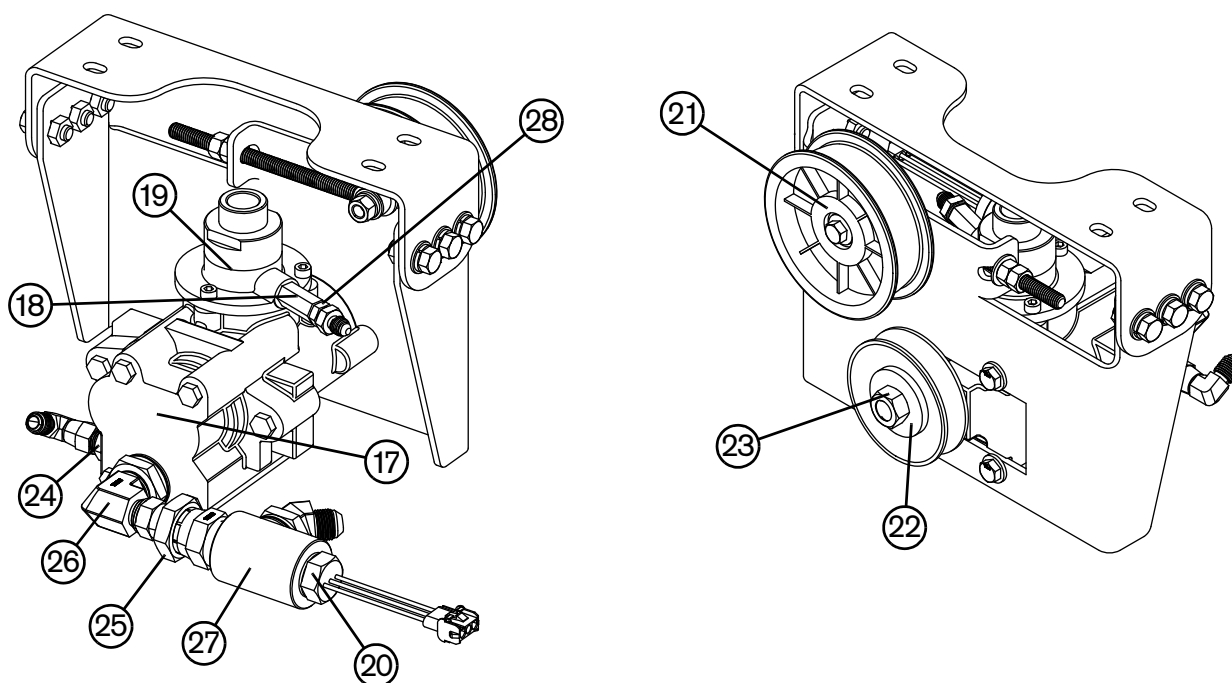
Figure 118 – Air compression system kits



Interior, air compression system

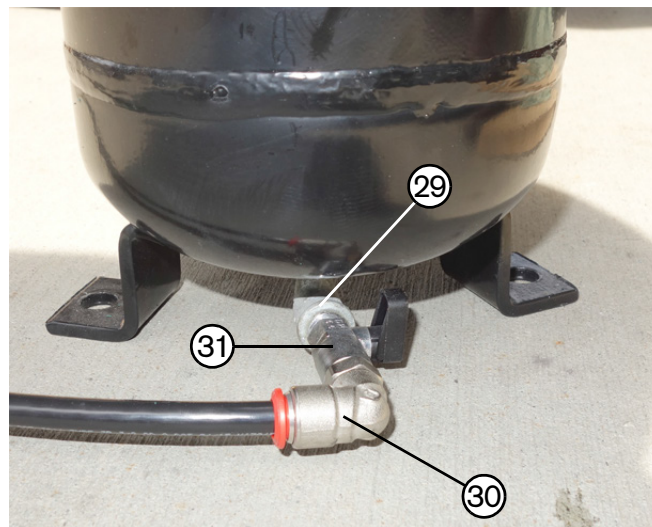
	Description	Part number
1	Kit: Fill cap for air/oil separation tank (includes washer)	428556
2	Kit: Oil filter for air compressor (Chicago Pneumatic 6211472600 or 6211472650)	428501
3	Kit: Oil separation filter for air compressor (Chicago Pneumatic 6221372600 or 6221372650)	428502
4	Kit: Air drying filter for air compressor (WIX®: AC10)	428544
5	Kit: Air pressure unloader valve (includes fittings, orifice, and muffler)	428540
6	Kit: Orifice adapter	428638
7	Kit: Muffler	428547
8	Kit: Air tank	428539
9	Kit: Air compressor oil cooler	428532
10	Kit: Air drying filter assembly for air compressor (includes filter)	428441
11	Kit: Pressure relief valve	428581
12	Kit: Air compressor manifold	428538
13	Kit: Manifold relief valve for the air compressor	428543
14	Kit: Oil level gauge for the air compressor (includes washer)	428542
15	Kit: Air compressor oil tank	428533
16	Kit: Nylon air filter bowl for plasma cutting system (includes O-ring) (in rear panel recess)	428415
	Kit: Air filter element for plasma cutting system (inside filter bowl – includes O-ring for filter bowl)	228695
	Kit: Cooling unit fan (not shown)	428733

Figure 119 – Air compressor kits



	Description	Part number
17	Kit: Air compressor	428537
18	Kit: Check valve for air compressor	428534
19	Kit: Compressor inlet valve (includes O-ring and screws)	428535
20	Kit: Temperature switch for air compressor (includes washer)	428536
21	Kit: Air compressor drive pulley (tension)	428524
22	Kit: Air compressor drive pulley	428541
23	Kit: Nut for air compressor pulley (includes spacer)	428580
24	Kit: Adapter straight oil line	428738
25	Kit: Adapter straight	428739
26	Kit: Elbow fitting compressor output	428740
27	Kit: Tee fitting temperature switch	428741
28	Kit: Orifice, scavenge line	428742

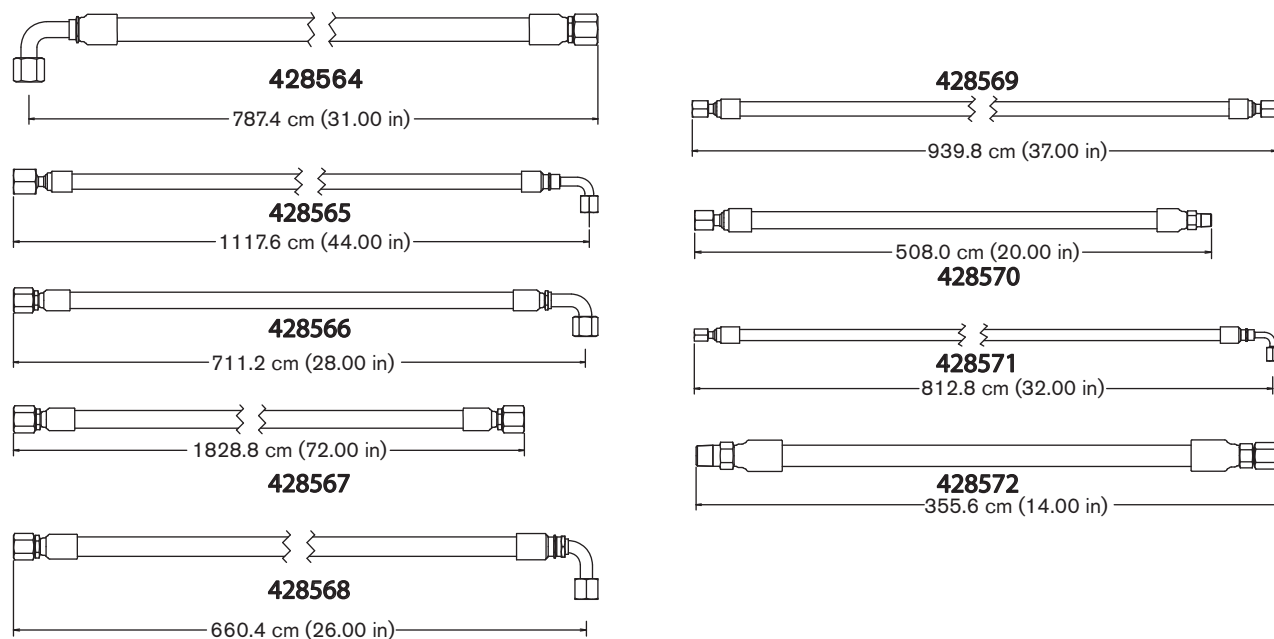
Figure 120



	Description	Part number
29	Kit: Elbow fitting for air compressor	428554
30	Kit: Elbow coupler for air compressor	428555
31	Kit: Ball valve for air compressor	428553

Air compression hoses

Figure 121 – Air compression hoses (not to scale)



	Description	Part number
1	Kit: Air compressor output hose	428564
2	Kit: Discharge hose for air compressor	428565
3	Kit: Heat exchanger hose for air compressor	428566
4	Kit: Air compressor hose from heat exchanger to air tank	428567
5	Kit: Air compressor hose from air tank to water separation	428568
6	Kit: Access air line hose	428569
7	Kit: Air line hose for on-board plasma cutting system	428570
8	Kit: Check valve hose for air compressor	428571
9	Kit: Pilot hose unloader	428572


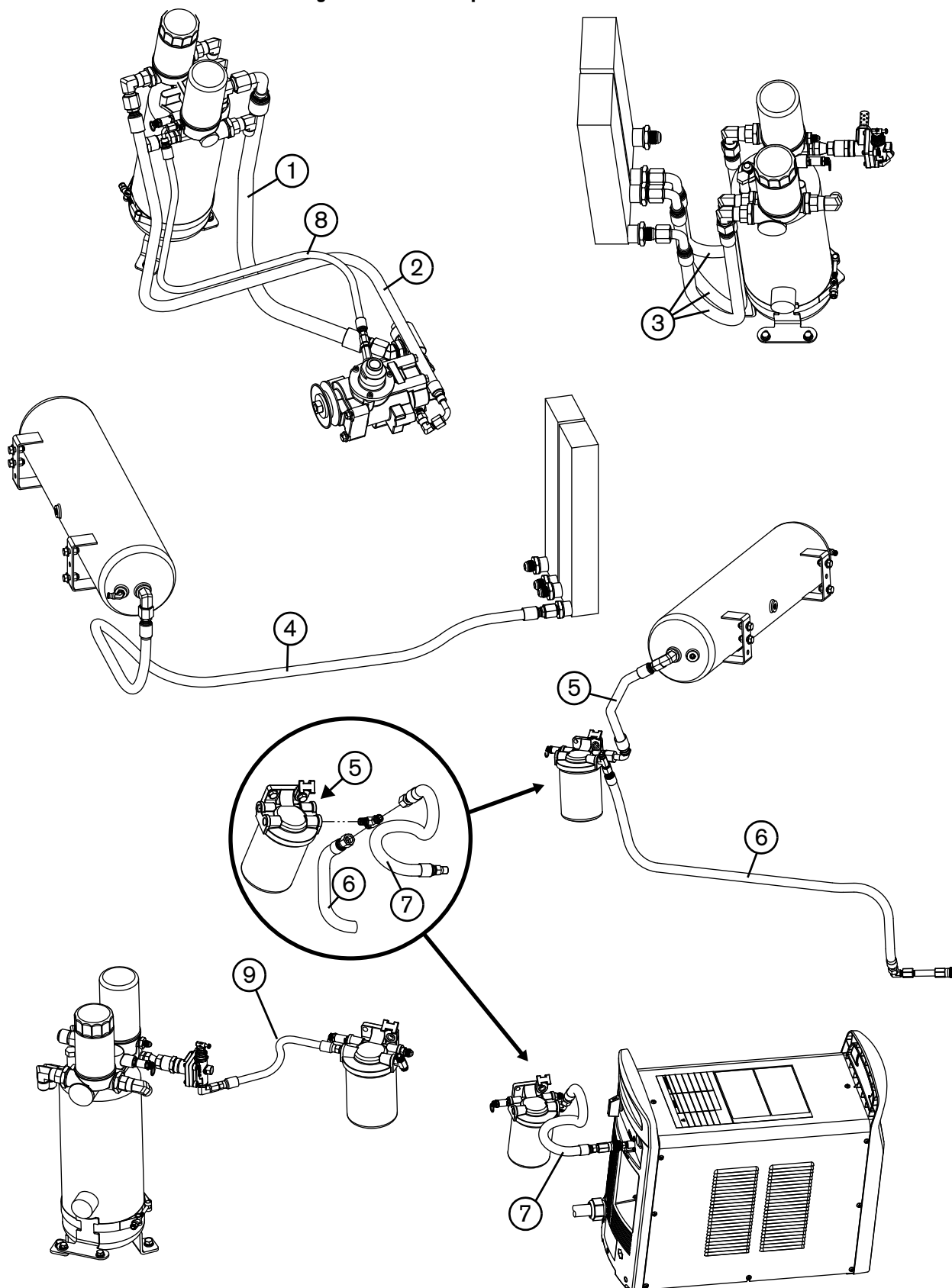
 See Figure 122 on page 208 for the location of each hose.

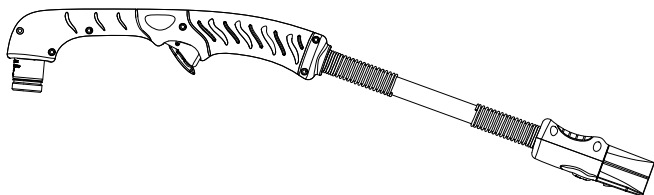
Figure 122 – Air compression hose locations



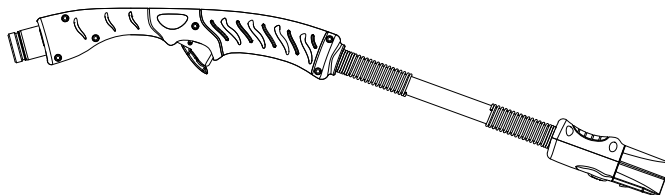
Plasma torches

Hand torches

The following torch assemblies do not include consumables. See page 211 for a list of consumable part numbers.



85° hand torch



15° hand torch

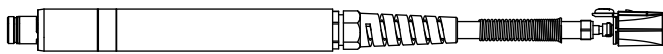
Part Number	Description
059492	Duramax Hyamp 85° hand torch assembly with 7.6 m (25 foot) lead
059493	Duramax Hyamp 85° hand torch assembly with 15 m (50 foot) lead
059494	Duramax Hyamp 85° hand torch assembly with 23 m (75 foot) lead
059495	Duramax Hyamp 15° hand torch assembly with 7.6 m (25 foot) lead
059496	Duramax Hyamp 15° hand torch assembly with 15 m (50 foot) lead
059497	Duramax Hyamp 15° hand torch assembly with 23 m (75 foot) lead



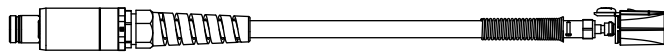
Hypertherm also offers longer torches in 0.6 m (2 foot) and 1.2 m (4 foot) configurations. See the *Duramax Hyamp Long Handheld Torches Service Manual* (808290). Download the manual from www.hypertherm.com.

Machine torches

The following torch assemblies do not include consumables. See page 212 for a list of consumable part numbers.



Full-length machine torch



Mini machine torch

Part Number	Description
059519	Duramax Hyamp 180° full-length machine torch assembly with 4.6 m (15 foot) lead
059520	Duramax Hyamp 180° full-length machine torch assembly with 7.6 m (25 foot) lead
059521	Duramax Hyamp 180° full-length machine torch assembly with 10.7 m (35 foot) lead
059522	Duramax Hyamp 180° full-length machine torch assembly with 15 m (50 foot) lead
059523	Duramax Hyamp 180° full-length machine torch assembly with 23 m (75 foot) lead
059514	Duramax Hyamp 180° mini machine torch assembly with 4.6 m (15 foot) lead
059515	Duramax Hyamp 180° mini machine torch assembly with 7.6 m (25 foot) lead
059516	Duramax Hyamp 180° mini machine torch assembly with 10.7 m (35 foot) lead
059517	Duramax Hyamp 180° mini machine torch assembly with 15 m (50 foot) lead



Hypertherm also offers robotic torches in 45°, 90°, and 180° configurations. See the *Duramax/Duramax Hyamp Robotic Torches Service Manual* (807460). Download the manual from www.hypertherm.com.

Plasma torch consumables

Hand cutting



For illustrations of many of these consumables, see the *Machine Torch Setup* section in the *Powermax125 Operator Manual*.

Drag cutting

Part Number	Description
420172	Duramax Hyamp shield 45/65 A
420000	Duramax Hyamp shield 105/125 A
220977	Duramax Hyamp retaining cap
420158	Duramax Hyamp nozzle 45 A
420169	Duramax Hyamp nozzle 65 A
220975	Duramax Hyamp nozzle 105/125 A
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

Gouging

Part Number	Description
420112	Duramax Hyamp gouging shield for maximum removal (standard)
420509	Duramax Hyamp gouging shield for maximum control (optional)
220977	Duramax Hyamp retaining cap
420001	Duramax Hyamp gouging nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

FineCut

Part Number	Description
420152	Duramax Hyamp FineCut shield
220977	Duramax Hyamp retaining cap
420151	Duramax Hyamp FineCut nozzle
220971	Duramax Hyamp electrode
420159	Duramax Hyamp FineCut swirl ring

Mechanized cutting



For illustrations of many of these consumables, see the *Machine Torch Setup* section in the *Powermax125 Operator Manual*.

Shielded

Part Number	Description
420168	Duramax Hyamp shield 45/65 A
220976	Duramax Hyamp shield 105/125 A
220977	Duramax Hyamp retaining cap
420156	Duramax Hyamp Ohmic retaining cap
420158	Duramax Hyamp nozzle 45 A
420169	Duramax Hyamp nozzle 65 A
220975	Duramax Hyamp nozzle 105/125 A
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

Gouging

Part Number	Description
420112	Duramax Hyamp gouging shield
220977	Duramax Hyamp retaining cap
420001	Duramax Hyamp gouging nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

FineCut

Part Number	Description
420152	Duramax Hyamp FineCut shield
220977	Duramax Hyamp retaining cap
420156	Duramax Hyamp Ohmic retaining cap
420151	Duramax Hyamp FineCut nozzle
220971	Duramax Hyamp electrode
220997	Duramax Hyamp swirl ring

Accessory parts for plasma cutting

Part Number	Description
223292	Kit: 125 A work lead with hand clamp, 7.6 m (25 feet)
223293	Kit: 125 A work lead with hand clamp, 15 m (50 feet)
223294	Kit: 125 A work lead with hand clamp, 23 m (75 feet)
223298	Kit: 125 A work lead with C-style clamp, 7.6 m (25 feet)
223299	Kit: 125 A work lead with C-style clamp, 15 m (50 feet)
223300	Kit: 125 A work lead with C-style clamp, 23 m (75 feet)
223295	Kit: 125 A work lead with ring terminal, 7.6 m (25 feet)
223296	Kit: 125 A work lead with ring terminal, 15 m (50 feet)
223297	Kit: 125 A work lead with ring terminal, 23 m (75 feet)
008539	Ground hand clamp: 500 A
024548	Brown leather torch sheathing, 7.6 m (25 foot)
024877	Black leather torch sheathing with Hypertherm logo, 7.6 m (25 foot)
017053	Hyamp deluxe circle cutting guide
428348	Gouging heat shield for Duramax Hyamp torches
017031	Hyamp helmet: face shield with automatic dimming, shades 8–12
017025	Leather cutting gloves – medium (M)
017026	Leather cutting gloves – large (L)
017027	Leather cutting gloves – extra large (XL)
017028	Leather cutting gloves – extra, extra large (XXL)
017032	Fiberglass cutting blanket, 1.5 m X 1.8 m (5 feet X 6 feet), rated for 538°C (1000°F)

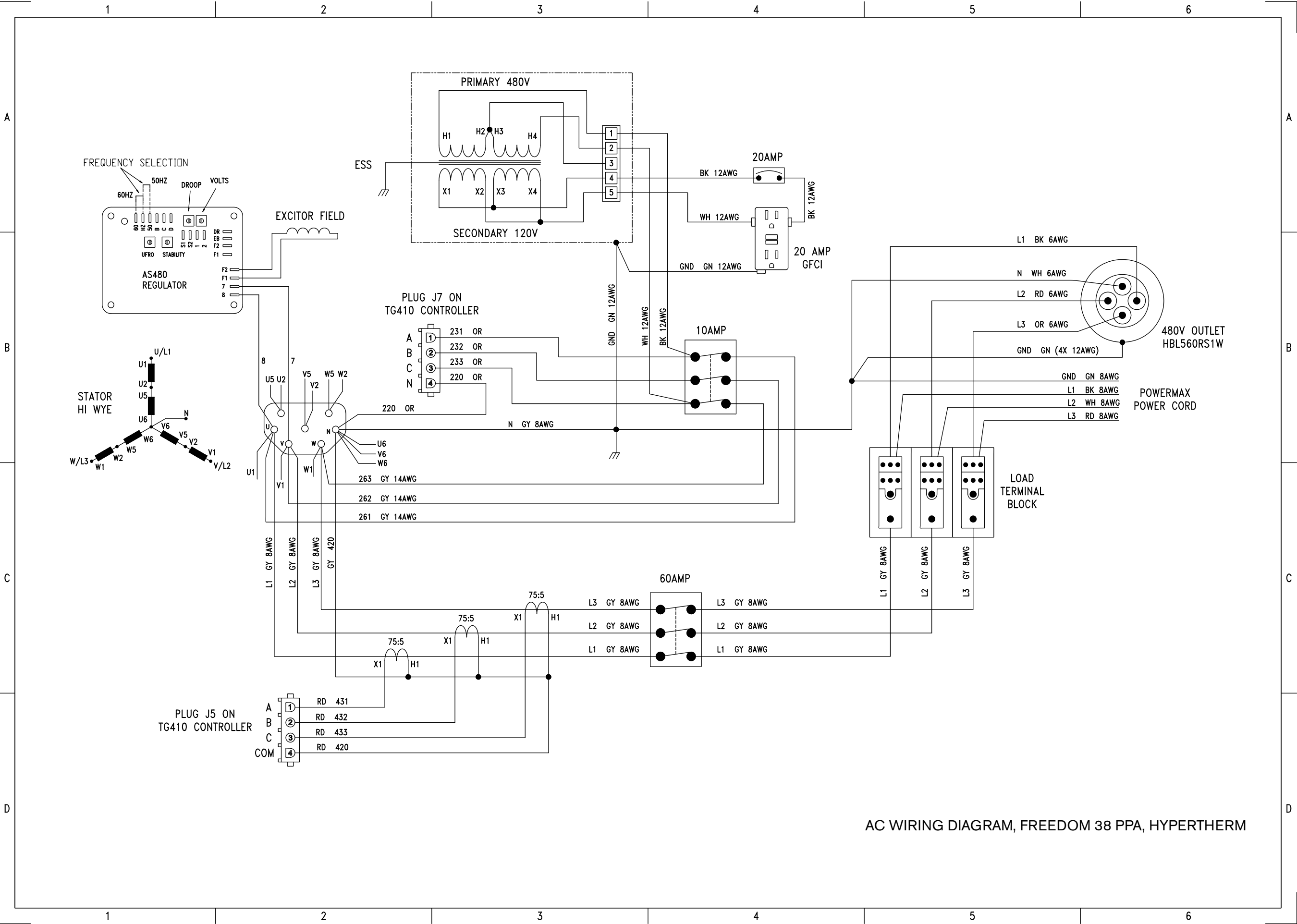
Section 8

Wiring Diagrams

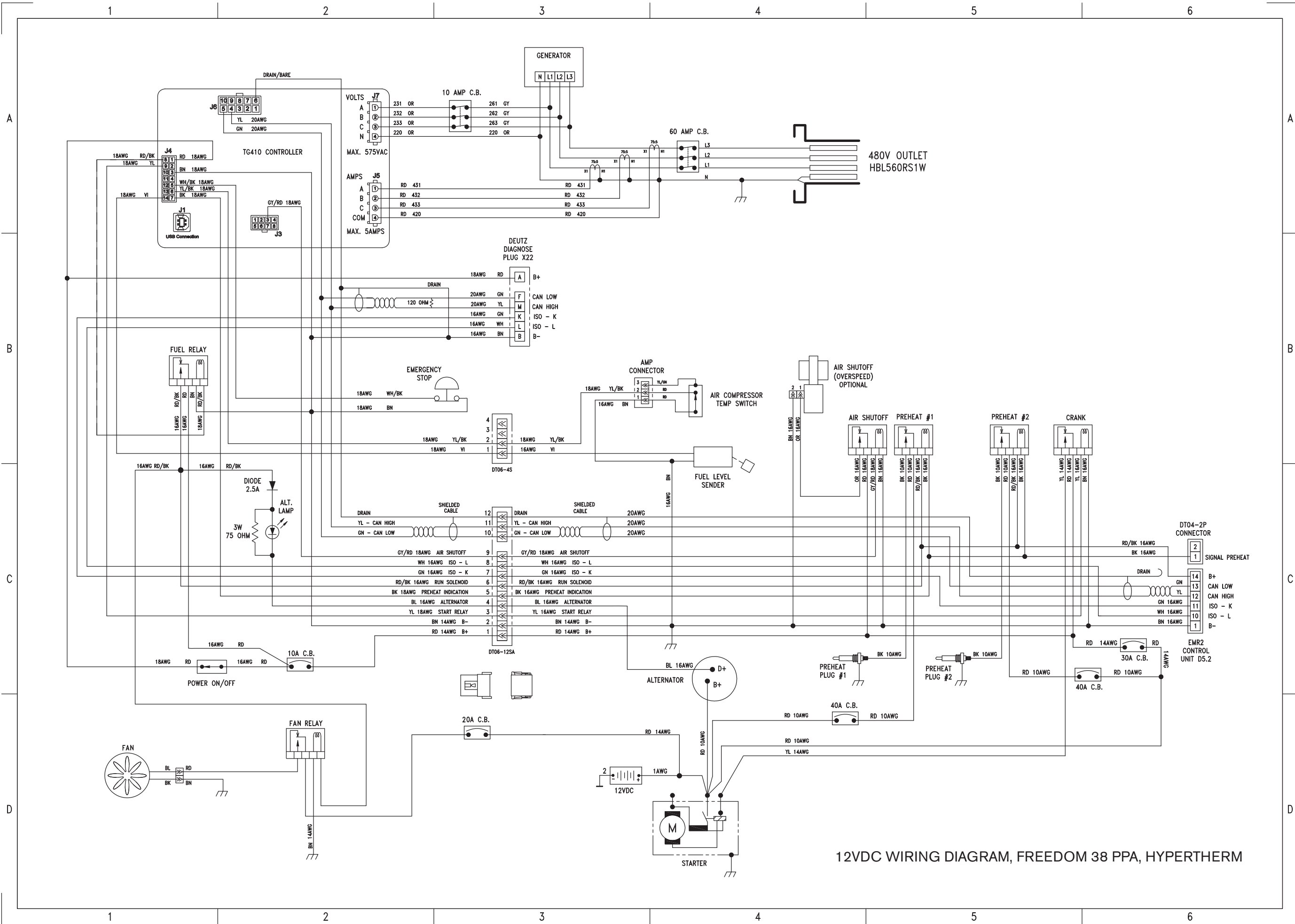
This section contains the following wiring diagrams:

- ❑ *AC wiring diagram*, Freedom 38 PPA, Hypertherm
- ❑ *12 VDC wiring diagram*, Freedom 38 PPA, Hypertherm

AC wiring diagram



12 VDC wiring diagram



12VDC WIRING DIAGRAM, FREEDOM 38 PPA, HYPERTHERM