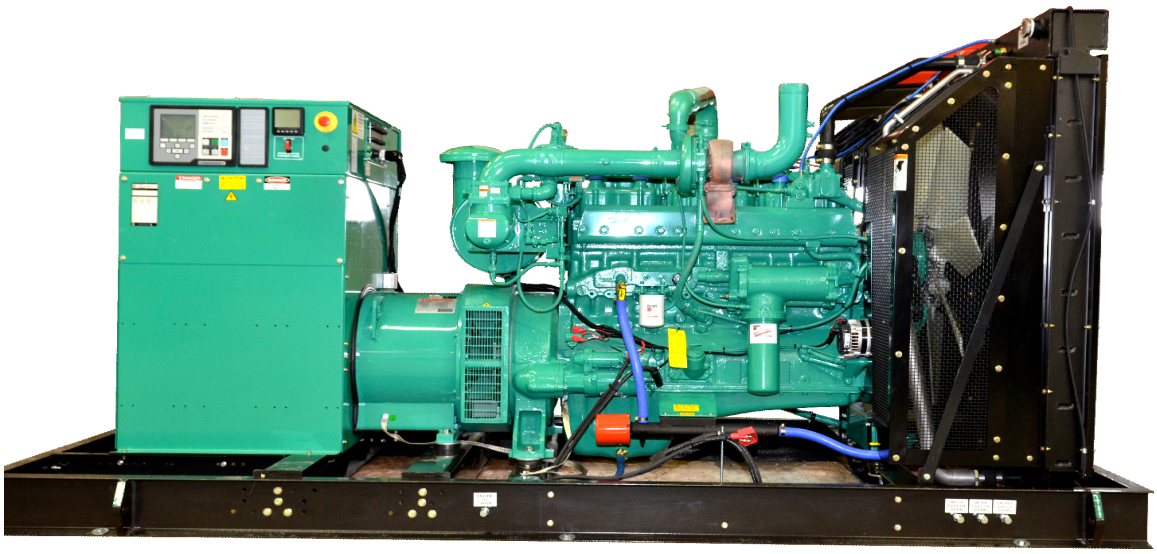
Natural Gas Generator Sets Manufactured in De Pere, Wisconsin

Operation and Maintenance Manual



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English Version

This manual contains proprietary information to equipment produced by Cummins Sales and Service and Cummins Inc. and is being supplied solely for the purpose of operating, maintaining, and servicing the natural gas Generator Set (GenSet) purchased from Cummins Sales and Service in De Pere, Wisconsin.

Sales and Service

Cummins Sales and Service Generator Sets
Limited Warranty

June 2016

Commercial Generating Set

This limited warranty applies to all Cummins Sales and Service branded commercial generating sets and associated accessories (hereinafter referred to as "Product"). This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date for stationary Product is the date of initial startup, demonstration or 18 months after factory ship date, whichever is sooner. The warranty start date for rental or oil and gas products is the date of receipt of Product by the end customer. See table for details.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a reliable utility power outage. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP. For applications supporting an unreliable utility service, the Prime Power (PRP) rating should be used.

Unlimited Time Prime Power (UPRP) is defined as being the maximum power which a generator set is capable of delivering while supplying a variable electrical load not to exceed to exceed 70% average of Unlimited Prime power rating during any operating period of 250 hours. Total operating time at 100%UPRP rating shall not exceed 500 hours/year.

Limited Time Prime Power (LPRP) is defined as being a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 500 hours/year at power levels never to exceed the LPRP rating.

Continuous Power (CRP) is defined as being able to supply utility power at a constant 100 percent load for an unlimited number of hours per year. No overload capability is available for this rating.
Reference Cummins Bulletin # 3381307

Base Warranty Duration
(Whichever occurs first)

Rating	Months	Maximum Hours
Emergency Standby Power (ESP)	**12**	**200**
Unlimited Time Prime Power (UPRP)	**12**	**Unlimited**
Limited Time Prime Power (LPRP)	**12**	**750**
Continuous Power (CRP)	**12**	**Unlimited**

Cummins Sales and Service Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Sales and Service will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying the Cummins Sales and Service distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Sales and Service's published policies and guidelines.
- Providing evidence for date of commissioning.
- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.

In addition, the owner will be responsible for:

- Incremental costs and expenses associated with Product removal and reinstallation resulting from difficult or non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating or application guidelines.
- Normal wear and tear, negligence, accidents or misuse.
- Improper and/or unauthorized installation.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Sales and Service published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.
- Replacement parts and accessories not authorized by Cummins Sales and Service.
- Use of Battle Short Mode.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; over-fueling; over-speeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.
- Accelerated corrosion damage from debris and road de-icing material while being transported.

This Limited Warranty **does not** apply to:

- Costs of maintenance, adjustments, installation, commissioning or start-up.
- Starting batteries, battery chargers, heating elements, trailers and enclosures. (These components shall be covered by the respective manufacturer's warranty.)
- Components added to the Product after shipment from Cummins Sales and Service.

Please contact your local Cummins Sales and Service Distributor for clarification concerning these limitations.

Sales and Service

Extended Warranty

Extended Coverage may be purchased to include parts and labor for a two-year, 400 hour period.
***NOTE**: Coverage does not include travel expenses.*

OR

Extended Coverage may be purchased to include parts and labor for the engine and generator for a five-year, 1500 hour period. The extended engine warranty is outlined as described in Cummins Bulletin #3624423 for the Cummins ENCOMPASS Extended Coverage program.

Warranty Options
(Whichever occurs first)

Rating	Months	Maximum Hours
Emergency Standby Power (ESP) – Two-year Basic Extension	**24**	**400**
Emergency Standby Power (ESP) – Five-year ENCOMPASS Extension	**60**	**1500**

NOTES:

- For Base Engine Warranty Only, reference Cummins Bulletin # 3381307.
- The A/C Generator (Alternator) carries a two-year / 1000 hours warranty, limited to 500 hours per year for two years, whichever is shorter for Emergency or Standby use.

Cummins Sales and Service Right to Failed Components:

Failed components claimed under warranty remain the property of Cummins Sales and Service. Cummins Sales and Service has the right to reclaim any failed component that has been replaced under warranty.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS SALES AND SERVICE IN REGARD TO THE PRODUCT. CUMMINS SALES AND SERVICE MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT IS CUMMINS SALES AND SERVICE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

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Section 1 - Safety

1.1 Introduction

Cummins Sales and Service GenSet (GenSet) manuals should be considered part of the equipment. Keep the manuals with the equipment. If the equipment is traded or sold, give the manuals to the new owner.

The GenSet has been carefully designed to provide safe and efficient service when properly installed, maintained, and operated. However, the overall safety and reliability of the complete system is dependent on many factors outside the control of the GenSet manufacturer. To avoid possible safety hazards, make all mechanical and electrical connections to the GenSet exactly as specified in this manual.

All systems external to the generator (fuel, exhaust, electrical, etc.) must comply with all applicable codes. Make certain all required inspections and tests have been completed and all code requirements have been satisfied before certifying the installation is complete and ready for service. All personnel responsible for operation and maintenance of the equipment should read and thoroughly understand this manual.

SAVE THESE INSTRUCTIONS.

Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

1.2 Use of Advisory and Cautionary Statements

1.2.1 Advisory Statements

Advisory statements are used throughout this manual to call attention to special information and correct operating procedures. Throughout this manual, these Advisory Statements are delineated by the terms “NOTE” and “IMPORTANT” in uppercase letters:

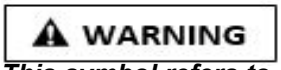
NOTE: *A general advisory statement relating to equipment operation and maintenance procedures.*

IMPORTANT: *A specific advisory statement intended to prevent damage to the equipment or its associated components.*

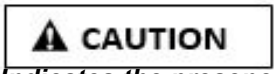
1.2.2 Cautionary Statements

Cautionary Statements highlight particular safety precautions pertaining to personal injury and/or damage to the equipment. Cautionary Statements are always preceded by the following symbols:

This symbol warns of immediate hazards which will result in severe personal injury or death.



This symbol refers to a hazard or unsafe practice which CAN result in severe personal injury or death.



Indicates the presence of a hazard or unsafe practice which can result in personal injury, or cause product or property damage.

1.3 General Safety Precautions

Read and understand all of the safety precautions and warnings before performing any repair. Special safety precautions are included in the procedures when they apply. This list contains the general safety precautions that **must** be followed to provide personal safety:

- Perform a walk around inspection and alert all area personnel that the equipment will be starting before manual operation.
- Do not operate faulty or damaged equipment. Ensure that all hoses, pipe connections, clamps and guards are in place and securely fastened. Electrical components should be kept in good working condition and repaired immediately by qualified personnel.

- Exposed in-running belt nips can cause severe personal injury or dismemberment. Ensure that guards are in place and securely fastened before operation.
- Rotating drive shafts can lacerate, dismember or cause strangulation. Keep hands, body parts, long hair, or loose-fitting clothing clear at all times.
- Never attempt to manually clean a machine while it is operating or in standby mode.
- Never open ports on tanks or piping while the engine is operating. Contact with pressurized agents can cause severe personal injury.
- Relieve all pressure in the air, oil, and the cooling systems before any lines, fittings, or related items are removed or disconnected.
- Always use the same fastener part number (or equivalent) when replacing fasteners.
- Some state and federal agencies in the United States have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil. Dispose of waste oil in accordance with applicable code requirements.
- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator or heat exchanger pressure cap while the engine is running. Allow the GenSet to cool and bleed the system pressure first.
- Make sure that rags are not left on or near the engine.
- Keep the GenSet and the surrounding area clean and free from obstructions. Remove any debris from the GenSet and keep the floor clean and dry. After performing maintenance, remove all tools and foreign materials and reinstall and securely fasten ALL guards, covers and protective devices.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.
- Do not store any flammable liquids, such as fuel, cleaners, oil, etc., near the GenSet. A fire or explosion could result.
- Wear hearing protection when going near an operating GenSet.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, turbo charger, and exhaust system.

⚠ DANGER

Fuel And Fumes Are Flammable.

Fire, explosion, and personal injury or death can result from improper practices.

- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires involve combustible and flammable liquid fuels and gaseous fuels; Class C fires involve live electrical equipment. (Refer to National Fire Protection Association (NFPA) No. 10 Standard for Portable Fire Extinguishers.)
- Make sure the GenSet is mounted in a manner to prevent combustible materials from accumulating under the unit.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage which present a potential fire hazard.
- DO NOT fill fuel tanks while the engine is running unless the tanks are outside the engine compartment. Fuel contact with the hot engine or exhaust is a potential fire hazard.
- DO NOT permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the GenSet, fuel tank, or battery area.
- Fuel lines must be adequately secured and free of leaks. The fuel connection at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will become brittle if continuously vibrated or repeatedly bent.
- Natural gas is lighter than air, and will tend to gather under hoods. Propane is heavier than air, and will tend to gather in sumps or low areas.

NFPA code requires all persons handling propane to be properly trained and qualified.

- Be sure all fuel supplies have a positive shut-off valve.
- Be sure the battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

⚠ CAUTION

Exhaust gases are deadly. The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

⚠ DANGER

Moving Parts Can Cause Severe Personal Injury or Death.

- Keep your hands, clothing, and jewelry away from the vicinity of moving parts, or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- Prevent accidental starting of the GenSet. Before starting work on the GenSet, disconnect the battery charger from its AC source, depress the **Emergency Stop** button, and then disconnect the starting batteries, negative (-) cable first.

NOTE: *Electronic engines can sustain damage if not Keyed Off when the battery is disconnected. Press the **Emergency Stop** button to Key Off the Electronic Control Module (ECM).*

- Neutral connection must be bonded in accordance with the National Electrical Code.
- Make sure that the fasteners on the GenSet are secure. Tighten supports and clamps. Keep guards in position over fans, drive belts, etc.
- If an adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

⚠ CAUTION

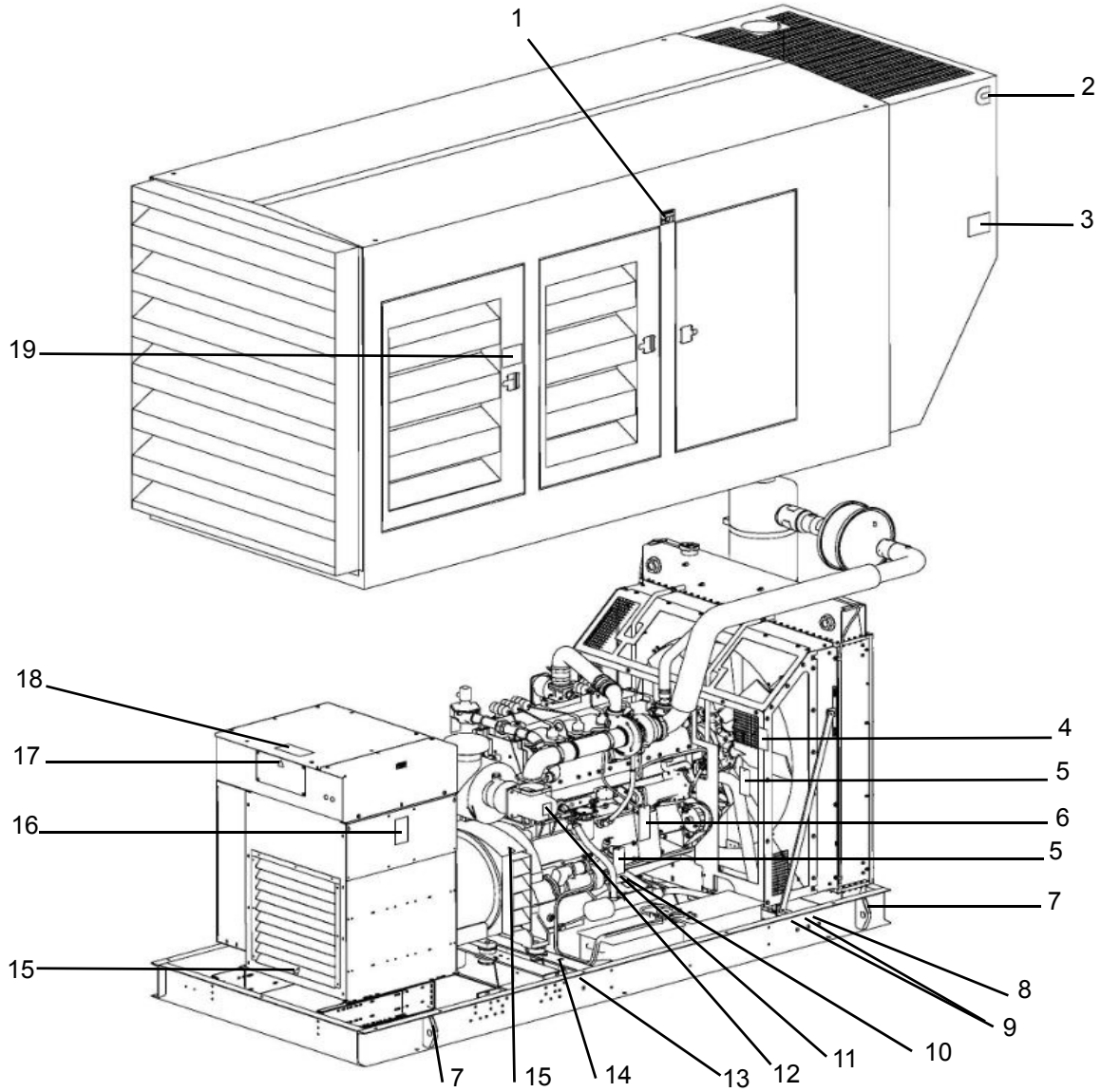
The unit is to be installed so that the risk of contact by people near hot surfaces is minimized.

⚠ DANGER

Electrical Shock Can Cause Severe Personal Injury or Death.

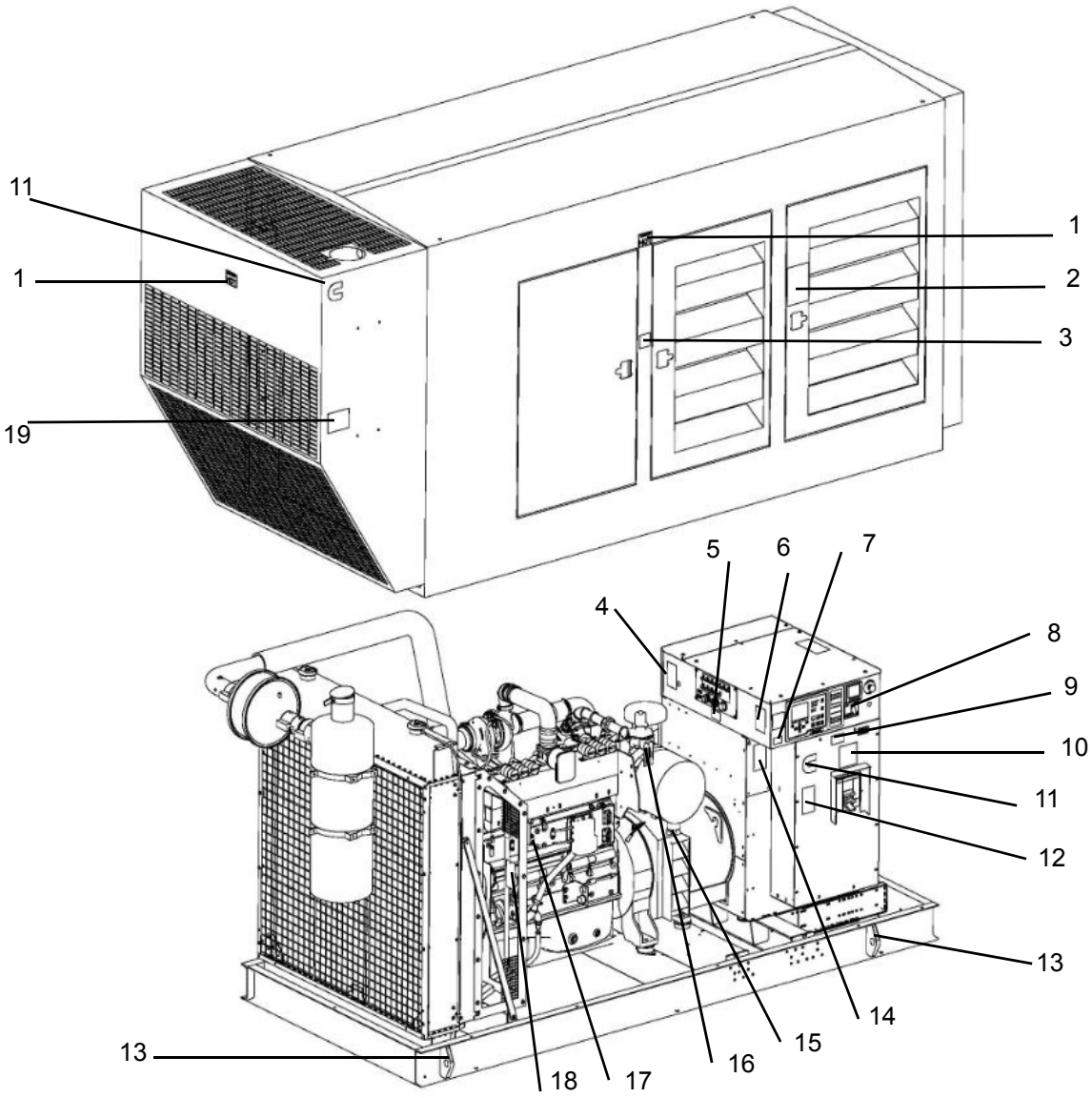
- Disconnect the electric power before removing protective shields or touching electrical equipment. Use rubber insulating mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag and lock open switches to avoid accidental closure.
- DO NOT CONNECT GENSET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the GenSet into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved isolation switch or an approved paralleling device.
- This GenSet (with optional control for paralleling) includes features intended to support operation in parallel with the utility grid, but these features have not been evaluated for compliance with specific utility interconnection protection standards or requirements.

1.4 Safety Decals



1. Caution, Hot (P/N 6940-13)
2. Cummins 4” Black Logo
3. Danger Burn (P/N A030Z096)
4. Warning, Rotating Fan (P/N 6940-06)
5. Fluids Tag (P/N 6940-17)
6. Emissions Tag
7. Lifting Point (P/N 9526-13)
8. Jacket Water Drain (P/N 16564) (model-specific)
9. Low Temperature Aftercooler (LTA) Drain (P/N 16563)
10. Caution, Hot (P/N 6940-02)
11. Warning, Disconnect Battery (P/N A042E928)
12. Operation Maintenance and Service (P/N 0098-6074-02)
13. Engine Oil Drain (P/N 16565)
14. Ground (P/N 9526-07)
15. Warning (Triangle Exclamation Point) (Label_C)
16. Warning, Equipment Voltage (P/N A042E925)
17. Danger, High Voltage (Lightning Bolt) (Label_B)
18. Danger, Refer to Manual (Label_A)
19. Danger, Electricity (P/N A042Z074)

Figure 1-1 Generator Set Decal Locations (typical) Right Side



1. Caution, Hot (P/N 6940-13)
2. Warning, Danger Lockout/Tagout (P/N A042E929)
3. Danger (P/N A034C535)
4. Cummins Emissions Solution (CES) Catalyst Tag
5. Service and Installation Decal (P/N 6940-50)
6. GenSet Data Tag
7. Decal, Maximum Imbalance (P/N 98-8875)
8. Electronic Control Module (ECM) Reset Switch Decal (17282)
9. Warning, Disconnect Battery (P/N A042E928)
10. Danger, Multi-warning (P/N A042E924)
11. Cummins 4” Black Logo
12. Feature Code Tag (099-2433)
13. Lifting Point (P/N 9526-13)
14. Warning, Equipment Voltage (P/N A042E925)
15. Warning (Triangle Exclamation Point) (Label_C)
16. Warning, NG Contaminants (P/N 11071)
17. Warning, Rotating Fan (P/N 6940-06)
18. Fluids Tag (P/N 6940-17)
19. Danger, Burn (P/N A030Z096)

Figure 1-2 Generator Set Decal Locations (typical) Left Side

KEEP THIS MANUAL NEAR THE GENSET FOR EASY REFERENCE

Section 2 - Introduction

2.1 Introduction

To ensure safe and reliable operation, each operator should read this manual before operating the generator set (GenSet) for the first time. This manual includes:

- procedures for operation;
- troubleshooting charts;
- maintenance schedules;
- recommendations for optimal operation; and
- service information for component parts and specifications.

⚠ WARNING

Improper operation and maintenance can lead to severe personal injury or loss of life and property by fire, electrocution, mechanical breakdown, or exhaust gas asphyxiation. Read and follow the safety precautions in Section 1 - Safety and carefully observe all instructions and precautions in this manual.

2.2 How to Obtain Service

When the GenSet requires servicing, contact your nearest Authorized Cummins Distributor. Factory-trained Parts and Service representatives are ready to handle all your service needs.

To contact your local Authorized Cummins Distributor in the United States or Canada, call 1-800-DIESELS (this automated service utilizes touch-tone phones only). By selecting Option 1 (press 1), you will be automatically connected to the nearest distributor.

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

GENERATORS-ELECTRIC or
ELECTRICAL PRODUCTS

For outside North America, call your nearest Authorized Cummins Distributor, or visit our website at www.cummins.com for distributor information.

When contacting your distributor, always supply the complete Model, Specification, and Serial Number as shown on the GenSet nameplate - see Figure 7-1 GenSet Nameplate (Typical).

⚠ WARNING

Incorrect service or parts replacement can result in severe personal injury, death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and /or mechanical service.

NOTE: *For Cummins engine-related inquiries, please contact a Cummins technical service support representative at 1-800-DIESELS (1-800-343-7357) for more information. For questions about the generator controls on this model please contact Cummins Sales and Service at 1-866-831-7620. For Power Solutions International (PSI) engine-related inquiries, please contact a PSI technical service support representative at 1-888-331-5764, or e-mail service@powergreatlakes.com for more information.*

2.3 Product Modification Disclaimer

Agency-certified products purchased from Cummins Sales and Service comply only with those specific requirements and as noted on company product specification sheets. Subsequent modifications must meet commonly accepted engineering practices and/or local, state and national codes and standards. Product modifications must be submitted to the local authority having jurisdiction (AHJ) for approval. The information, specifications, and recommended guidelines in this manual are based on information in effect at the time of printing. Cummins Sales and Service and Cummins, Inc. reserves the right to make changes at any time without obligation. If you find differences between your engine and the information in this manual, contact your local Cummins Authorized Repair Location or call 1-800-DIESELS (1-800-343-7357) toll free in the U.S. and Canada.

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Section 3 - Operation

3.1 Introduction

This section covers pre-start checks and starting and stopping the Generator Set (GenSet). Each operator should read through this entire section before attempting to start the GenSet. It is essential that the operator be completely familiar with the GenSet and the PowerCommand® Control (PCC).

⚠ WARNING

Safe and efficient operation can only be achieved if the unit is operated correctly. Before operating the GenSet, become familiar with the equipment and how it is operated (including all controls, manually operated valves, and alarm devices).

NOTE: *It is the owner/operator's responsibility to complete site-specific emission requirements to ensure compliance with the United States (US) Environmental Protection Agency (EPA) Stationary Spark-Ignited (SI) New Source Performance Standards (NSPS).*

Prior to operation, the emissions on the GenSet must be checked and tuned (dialed-in), if necessary, at the job-site per the following requirements:

- *AEB 24.51 Industrial Natural Gas Startup Procedure for Commissioning of Electronic Air Fuel Ratio (AFR) Controlled Engines with Catalyst - Emission-related Installation Instructions,*
- *AEB 24.52 Three-Way Catalyst (TWC), Three-Way Catalyst XL and Three-Way Catalyst XLS Installation Requirements.*
- *[For GTA855E] Manual 4325956 GTA855E CM558/2358 G101 Operation and Maintenance Manual and AEB 10.124 GTA 855 and GTA 855e Gas Compression and G-Drive Technical Package.*
- *[For KTA19SLB and QSK19] AEB 28.07 KTA19G Power Generation Natural Gas Startup Procedure.*

To obtain a copy of these engineering bulletins, contact your local service representative.

3.2 Paralleling Operation

Paralleling operation is available with control PCC 3.3. Refer to the PCC 3.3 (3300) Owner Manual for specifics.

NOTE: *This GenSet may include features intended to support operation in parallel with the utility grid, but these features have not been evaluated for compliance with specific utility interconnection protection standards or requirements.*

3.3 Low-Load Operation

Refer to Cummins AEB 16.01 Natural Gas Engine Guidelines for Low-Load Operations for instructions regarding low-load conditions of operation for Cummins Natural Gas engines.

3.4 Pre-Start Checklist

Before starting the GenSet, be sure the following checks have been made and the unit is ready for operation.

3.4.1 Lubrication

Check the engine oil level. Keep the oil level as near as possible to the dipstick high mark without overfilling.

NOTE: *GenSets may be shipped dry. They must be filled with the correct type and quantity of oil before use. Be sure to check the oil level before initial start. Failure to fill to the recommended level can result in equipment damage.*

3.4.2 Coolant

GenSets are normally shipped with coolant already added. Check the engine coolant level at the expansion tank and ensure that the appropriate level is always maintained. Fill the cooling system to the bottom of the fill neck in the radiator fill or expansion tank. Do not check coolant levels while the engine is hot.

NOTE: *Some radiators have two fill necks, both of which must be filled after the cooling system has*

been drained. Remove all air from the system and recheck the coolant level.

⚠ CAUTION

It is essential to comply with Cummins Power Generation's recommendations for the correct type and concentration of anti-freeze and deposit control additive (DCA) inhibitor. Warranty claims for damage will be rejected if the incorrect mix has been used. Consult your authorized Cummins distributor for the correct anti-freeze specifications and concentration for your operating conditions.

⚠ DANGER

Do not attempt to remove a radiator pressure cap while the GenSet is running, or is still hot. Hot coolant is under pressure in the radiator system. Contact with hot coolant can result in severe burns. Always allow it to cool before releasing the pressure and removing the cap.

3.4.3 Fuel

Verify that the fuel piping, flex, and strainer are installed correctly. Make sure that there are no leaks and that all fittings are tight. Verify that the fuel pressure to the engine fuel solenoid is between 3.75 and 5 kPa (15 to 20 in. WC). For models C130L6 and C200N6 (GFPC), C140L6 and C150N6 (GFPA), C180N6 (GCDC), C55L6 and C55N6 (GCMC), and GCMLD without a secondary regulator, the recommended gas pressure is 1.7 to 2.7 kPa (7 to 11 in. WC).

3.4.4 Ventilation

Verify that the GenSet cooling inlet/outlet and exhaust ventilation openings are unobstructed and operational.

Remove all loose debris from the surrounding area of the GenSet. Air flow from the radiator fan can blow loose items around and into ventilation openings.

Ensure that the exhaust components are secured and not warped. Clear the area of all combustible materials. Clear the ventilation and exhaust outlets of any snow buildup or other obstructions. Ensure that gases are to be discharged away from building openings. Make sure that there are no exhaust outlet leaks and that all fittings are tight.

⚠ DANGER

Exhaust gas is deadly! Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:

- ***Dizziness or inability to think coherently***
- ***Nausea or vomiting***
- ***Headache***
- ***Weakness and sleepiness***
- ***Throbbing in temples***
- ***Muscular twitching***

If you, or anyone else, experience any of these symptoms, get out into the fresh air immediately! If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.

Protection against carbon monoxide inhalation includes proper installation and regular, frequent visual and audible inspection of the complete exhaust system.

3.4.5 Batteries

Make sure that the batteries are charged, that the electrolyte is at the correct level and that all connections are correct.

⚠ WARNING

A battery presents a risk of electrical shock and high circuit current. The following precautions are to be observed when working on batteries:

- ***Remove watches, rings, or other metal objects.***
- ***Use tools with insulated handles.***
- ***Wear rubber gloves and boots.***
- ***Do not lay tools or metal parts on top of batteries.***
- ***Disconnect the charging source prior to connecting or disconnecting battery terminals.***

- ***Determine if the battery is inadvertently grounded. When inadvertently grounded, remove the source of the ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of such shock is reduced when such grounds are removed during installation and maintenance (applicable to a generator not having a grounded supply circuit).***

3.4.6 Emergency Stop Button

Become familiar with the **Emergency Stop** button for emergency shutdown of the GenSet. The **Emergency Stop** button stops the GenSet immediately and prevents starting of the GenSet from any location (local or remote).

To activate the **Emergency Stop** button, press the large red knob located at the front of the GenSet near the Operator Panel.

To reset the **Emergency Stop** button:

1. Pull - or twist and pull - the red **Emergency Stop** button and allow it to pop out.
2. Press the **Stop** button on the Operator Panel to acknowledge this action.
3. Press the **Reset** button on the Operator Panel.
4. Press the **Stop**, **Manual**, **or Auto** button on the Operator Panel for the desired mode of operation.

IMPORTANT: *Emergency Stop shutdown can only be reset at the Operator Panel.*

3.5 Local and/or Remote Operation

The GenSet may be operated manually using the GenSet Operator Panel (or HMI) buttons or automatically using a remote start signal. Access and operation of the GenSet must be restricted to qualified service personnel who have been instructed of the reasons for the restrictions applied to the location of the GenSet and any precautions that must be taken. Access and operation of the GenSet must be governed by the use of a special tool, or lock and key, or other means of security that is monitored by the authority responsible for that location.

LEDs are provided on the Operator Panel to indicate the operating (**Manual Run** or **Auto**) mode of the GenSet. Authorized personnel must decide whether to choose **Manual Run** or **Auto** during the GenSet initial setup. If the GenSet requires an access password for operation, the **Mode Change Access Code** display screen will appear. This access password permission can only be granted or denied by the authorized personnel during operation of the GenSet.

For more information on entering access codes, refer to the specific PCC manual (see Table 3-1. PowerCommand® Control (PCC) References) for this GenSet.

NOTE: *For cold starting with loads, use an oil pan heater and a coolant heater, if a separate source of power is available. The optional heater will help provide reliable starting under adverse weather conditions. Be sure the voltage of the separate power source is correct for the heater element rating.*

Cummins recommends equipping natural gas standby GenSets (life safety systems) with engine water jacket coolant heaters to maintain the coolant at a minimum of 32 °C (90 °F) and, for most applications, accept the emergency load in ten seconds or less. Although most Cummins GenSets will start in temperatures down to -32 °C (-25 °F) when equipped with engine water jacket coolant heaters, it might take more than ten seconds to warm the engine up before a load can be applied when ambient block temperatures are below 0 °C (32° F).

*A **Low Coolant Temp (code 1435)** message, in conjunction with illumination of the **Warning** LED, will advise the operator of a possible delay in accepting the load. The engine cold sensing logic initiates a warning when the engine water jacket coolant temperature falls below 21 °C (70 °F). In applications where the ambient temperature falls below 0 °C (32 °F), a cold engine may be indicated even though the coolant heaters are connected and functioning correctly. Under these conditions, although the GenSet may start, it may not be able to accept the load within ten seconds. When this condition occurs, check the coolant heaters for correct operation. If the coolant heaters are operating correctly, other precautions may be necessary to warm the engine before applying a load.*

3.6 The PowerCommand® Control (PCC)

The PCC controls the starting and stopping sequence of the engine through the Electronic Control Module (ECM) mounted on the engine. There are several PCC options available. For specific operating proce-

dures, refer to the PCC manual shipped with the unit. Table 3-1. PowerCommand® Control (PCC) References lists each option available. Figure 3-1, Figure 3-2, and Figure 3-3 depict each of the PCC optional displays.

Table 3-1. PowerCommand® Control (PCC) References

Description	Part Numbers	Figure Number
PCC 1.1 (1302) Owner Manual	900-0661	Figure 3-1
PCC 2.2 (2300) Operator Manual	900-0665	Figure 3-2
PCC 3.3 (3300) Owner Manual	A029M414	Figure 3-3

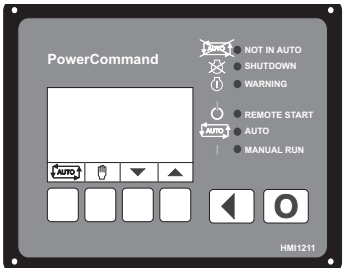

Figure 3-1 PCC 1.1 (1302)

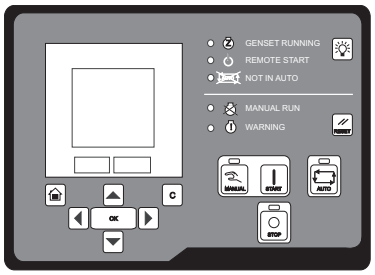

Figure 3-2 PCC 2.2 (2300)

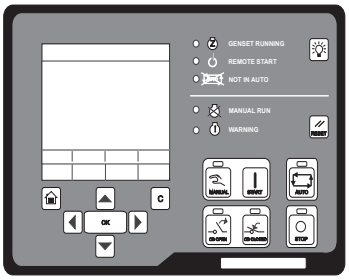

Figure 3-3 PCC3.2 (3300)

NOTE: *The 1302 Control with HMI211 (Figure 3-1) is provided on GTA855 Engines as standard. The 1302 Control with HMI220 (Figure 3-2) is provided on GTA28, 38, and 50 Mechanical Engines as standard. The 3300 Control (Figure 3-3) is used in paralleling applications only.*

⚠ DANGER

Contacting high voltage components can cause severe personal injury or death by electrocution. Do not open the control output box while the GenSet is running. Read and observe all warning and cautions in your GenSet manuals.

⚠ WARNING

Only technically qualified personnel should open the control housing. Voltages are present which can cause electrical shock, resulting in personal injury. Even with the power removed, improper handling of components can cause electrostatic discharge and damage circuit board components.

3.7 Starting the Generator Set

Before attempting to start the GenSet, the operator should read through this entire manual, together with the Health and Safety manual and the specific engine manual provided either as part of the documentation package supplied with the GenSet or on Quick Serve Online (QSOL). It is essential that the operator be completely familiar with the GenSet and the PCC.

The following sub-sections cover the procedures used to start and stop the GenSet. Before starting the GenSet, make sure that the proper maintenance and pre-start checks have been performed.

⚠ CAUTION

One operator should be in complete charge, or working under the direction of someone who is in complete charge. Remember that, upon starting the GenSet, cables and switchgear will become energized, possibly for the first time. Furthermore, equipment that does not form part of the GenSet installation may become electronically charged. Only authorized and competent personnel should carry out this work.

⚠ CAUTION

Avoid off-load running for other than short periods. A minimum loading of 30% is recommended. This loading will help to prevent the build up of carbon deposits. The engine must be shut down as soon as possible after the appropriate functions have been checked.

The PCC controls the starting and stopping sequence of the engine. On electrical engines, the ECM drives and monitors engine functions and energizes the starter solenoid through start relay K4 and disconnects the starter. The ECM governs engine speed and performs all engine control, monitoring, and diagnostic functions.

During starting, automatic checks are carried out for the integrity of various protection systems. The PCC will not allow the GenSet to continue the starting sequence if the integrity of a sensor is considered to be in doubt.

NOTE: *The PCC initiates a starter cranking signal and will perform an automatically sequenced manual start under a complete engine protection system combined with full monitoring capability. If a fault is sensed at start-up, the engine will be locked out and will not start.*

NOTE: *The PCC displays engine oil pressure, coolant temperature, coolant level, and speed. The ECM also monitors engine coolant temperature using a different sensor.*

If the ECM shuts down the engine, it will send a signal to the PCC which will display **ENGINE WARNING (Code 1311)**. Each digit of the three digit numerical fault code will be displayed as flashes. There will be a brief pause between digits and a longer pause before the repetition. Refer to the appropriate PCC manual for information on troubleshooting fault codes.

NOTE: ***Code 123*** *may be indicating higher than expected engine coolant temperature. If overheating is suspected, measure coolant temperature with a gauge while the engine is warming up. If the temperature exceeds 107 °C (225 °F), service the cooling system as necessary. If the temperature is not higher than expected but shutdown recurs, the coolant sensor may be faulty.*

See your Authorized Cummins Distributor regarding the wiring harness and software required for performing engine diagnostics using a personal computer (laptop).

The GenSet can be configured for one to seven starting cycles with set times for crank and rest periods for all starting modes (manual/remote). The default setting is for three start cycles composed of fifteen seconds of cranking and thirty seconds of rest.

NOTE: *The number of starting cycles, and the crank and rest times are programmed from within the* ***Setup*** *menu. Trained and experienced service personnel are required to change the default setting. Contact your authorized Cummins distributor for more information.*

3.7.1 Manual Run Mode (Starting at the Operator Panel)

⚠ CAUTION

Make sure that all Pre-start Checks are carried out before starting the GenSet. Do not attempt to start the GenSet until it is safe to do so. Cummins Sales and Service recommends regular inspections and cleaning of discharge hoods. Snow buildup on or around the GenSet and other obstuctions can cause GenSet failure and possible damage to the equipment. Warn all others in the vicinity that the GenSet is about to start.

To start the GenSet in **Manual Run** mode:

1. Press the **Manual** button on the Operator Panel.
2. Then press the **Start** button within ten seconds. (Failure to press the **Start** button within this time will result in the GenSet changing to the **Off** mode.)

The PCC will initiate a starter cranking signal and will perform an automatically sequenced manual start under a complete engine protection system combined with full monitoring capability. This will activate the

engine control system and the starting procedure. The starter will begin cranking, and after a few seconds the engine will start and the starter will disconnect.

Should the engine fail to start, the starter will disengage after a specified period of time and the PCC will indicate a **Fail to Start** shutdown.

To clear a **Fail to Start** shutdown:

1. Press the **Stop** button.
2. Then press the **Reset** button.

Before attempting to re-start, wait a minimum of two minutes for the starter motor to cool and then repeat the starting procedure. If the engine does not run after a second attempt, refer to Section 4 - Troubleshooting of this manual. (Refer also to the appropriate PCC manual as shown in Table 3-1.)

To disable **Manual Run** mode:

- Press the **Auto** button. If the GenSet is running when it leaves **Manual** mode, it will continue to run if the remote start signal is active.

OR

- Press the **Stop** button. If there is no active remote start signal, the GenSet will stop.

3.7.2 Auto Mode (Starting from a Remote Location)

⚠ WARNING

Make sure that all Pre-start Checks are carried out before starting the GenSet. Do not attempt to start the GenSet until it is safe to do so. Warn all others in the vicinity that the generator is about to start.

To start the GenSet in the **Auto** mode:

1. Press the **Auto** button on the Operator Panel.
2. Upon receipt of the remote start signal, and after a **Time Delay to Start**, the PCC initiates the starting sequence.
3. The **Remote Start Indicator Lamp** will be illuminated.

To disable **Auto** mode, refer to Section 3.8.2 Switching to Off from Auto Mode of Operation.

3.8 Stopping the Generator Set

Halting the GenSet operation can be done manually from the Operator Panel, automatically from a remote location, or immediately from the Operator Panel using the **Emergency Stop** button.

NOTE: ***Do not use the Emergency Stop switch to shut down the GenSet unless a serious fault develops. The Emergency Stop push-switch must not be used for a normal shut-down. An emergency stop does not allow for proper cooldown (where the lubricating oil and engine coolant carry the heat away from the engine combustion chamber and bearings) of the GenSet in a safe manner.***

⚠ CAUTION

Be sure to run the GenSet at no load for three to five minutes before stopping. This allows the lubricating oil and engine coolant to carry heat away from the combustion chamber and bearings.

3.8.1 Switching to Off from Manual Mode of Operation

To stop operation of the GenSet when it has been running in **Manual** mode:

1. On the Operator Panel, press the **Stop** button once to put the GenSet into a cooldown run.
2. The GenSet will then enter the **Off** mode.

NOTE: *Pressing the **Stop** button twice will stop the GenSet immediately - without a cooldown run - and the GenSet will immediately enter the **Off** mode. If possible, hot shutdown under load should be avoided to help prolong the reliability of the GenSet. A hot shutdown may result in a **Hot Shutdown Warning**.*

3.8.2 Switching to Off from Auto Mode of Operation

There are two ways to stop the operation of the GenSet when it has been running in **Auto** mode. The operator can shut down the GenSet remotely from the transfer switch or remote panel, or manually from the Operator Panel.

To ***remotely*** stop operation of the GenSet from the transfer switch or remote panel, when it has been running in **Auto** mode:

1. The authorized operator sends a remote stop signal and the GenSet completes its normal shutdown sequence incorporating a cooldown run. (The remote stop signal is actually the removal of the remote start signal to the control).
2. The GenSet will remain in **Auto** mode (ready for a remote start signal).
3. To completely turn the GenSet off, press the **Stop** button on the Operator Panel.
4. The GenSet will then enter the **Off** mode.

To ***manually*** stop operation of the GenSet when it has been running in **Auto** mode:

1. On the Operator Panel, press the **Stop** button once to stop the GenSet immediately (without a cooldown run).
2. The GenSet will then enter the **Off** mode.
3. If possible, re-start the GenSet in **Manual** mode with the circuit breaker open, and then follow the **Manual** mode procedures to stop the GenSet to allow for the cooldown run.

NOTE: *Hot shutdown under load should be avoided to help prolong the reliability of the set. A hot shutdown may result in a* ***Hot Shutdown Warning****.*

3.8.3 Emergency Stopping

⚠ CAUTION

Do not use the Emergency Stop button to shut down an engine unless a serious fault develops. The Emergency Stop button must not be used for a normal shutdown as this will prevent a cooldown run in which the lubricating oil and engine coolant carry away heat from the engine combustion chamber and bearings in a safe manner.

The *local* **Emergency Stop** button is located on the front of the GenSet, in close proximity to the Operator Panel. This is a mechanically latched switch that will unconditionally stop the engine when pressed, bypassing any time delay to stop. Push this button **IN** for emergency shutdown of the engine.

NOTE: *If the engine is not running, pushing the button in will prevent the starting of the engine, regardless of the start signal source (manually or remotely).*

When the **Emergency Stop** button is pressed at the Operator Panel, the Operator Panel display will illuminate red at the **Shutdown Indicator Lamp** and the following message will appear on the graphical LCD display: “LOCAL EMERGENCY STOP”.

A **Remote Emergency Stop** button may be incorporated with the installation. If a **Remote Emergency Stop** button is activated, the Operator Panel display will illuminate red at the **Shutdown Indicator Lamp** and the following message will appear on the graphical LCD display: “REMOTE EMERGENCY STOP”.

⚠ CAUTION

Make sure the cause of the emergency stop is fully investigated and remedied before resetting the fault(s) and restarting the GenSet. Make sure the remote start control is not active or, when the Emergency Stop is reset, the GenSet could start running.

To reset the **Emergency Stop** button:

1. Pull - or twist and pull - the red **Emergency Stop** button and allow it to pop out.
2. Press the **Stop** button on the Operator Panel to acknowledge this action.
3. Press the **Reset** button on the Operator Panel.
4. Press the **Stop**, **Manual**, **or Auto** button on the Operator Panel for the desired mode of operation.

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Section 4 - Troubleshooting

4.1 Introduction

This section outlines basic troubleshooting measures for remedying Generator Set (GenSet) operational issues. For detailed instructions to assist in locating and identifying the possible causes of faults in the GenSet, refer to the specific PCC manual. Refer also to the engine-specific operator manual for engine specifications.

4.2 Basic Troubleshooting and Safety Considerations

Before starting any fault finding actions, perform the following general inspections:

- Ensure that all switches and controls are in their correct positions.
- Correct the fuel oil level.
- Check for adequate lubricating oil.
- Correct the coolant level.
- Ensure that the area around the radiator and the radiator core are free from obstruction.
- Check for adequate battery charge.
- Secure the battery connections.
- Secure the electronics and alternator connections.
- Secure the panel connections.
- Ensure that the protection circuits have been replaced.
- Ensure that blown fuses have been replaced.
- Reset any tripped contactors or circuit breakers.

4.3 Line Circuit Breaker Issues

The optional line circuit breaker mounts in the generator output box. If the load exceeds the circuit breaker rating, the line circuit breaker will open, preventing the generator from being overloaded. If the circuit breakers trip, locate the source of the overload and correct as necessary. Manually reset the breaker to reconnect the load to the GenSet.

4.4 Accidental Restart Prevention

When troubleshooting the GenSet, make certain the GenSet cannot be accidentally restarted by doing the following:

1. Press the **Stop** button on the Operator Panel.
2. Turn off or remove the AC power from the battery charger.
3. Depress the **Emergency Stop** button and wait thirty seconds.
4. Remove the negative (-) battery cable from the GenSet starting battery.

⚠ DANGER

Accidental starting of the GenSet can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (-) cable from the battery terminal.

⚠ DANGER

Contacting high voltage components can cause electrocution, resulting in severe personal injury or death. Keep the output box covers in place during troubleshooting. Do not open the control output box while the GenSet is running.

⚠ CAUTION

Lead-acid batteries present a risk of fire because they generate hydrogen gas. Follow all procedures as noted in this manual.

⚠ DANGER

Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switches, or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

Ventilate battery area before working on or near battery. Wear goggles. Stop the GenSet and disconnect the battery charger before disconnecting the battery cables. Disconnect the negative (-) cable first and reconnect last.

⚠ CAUTION

Disconnect the battery charger from the AC source before disconnecting battery cables. Otherwise, disconnecting the cables can result in voltage spikes which are damaging to the DC control circuits of the GenSet.

4.5 Controls and Diagnostics Issues

See your authorized Cummins Power Generation dealer regarding software, hardware and/or network requirements for control and diagnostics via computer or network.

4.6 Operator Panel Indicator Lamps

The Operator Panel digital display on the front of the GenSet includes five Indicator Lamps that illuminate when necessary. These Indicator Lamps do not illuminate if they are not called by the GenSet PCC.

When the **Lamp Test** button (the lightbulb icon) is depressed, all of the LED lamps should illuminate for five seconds indicating that all warning indicators are working properly. The Indicator Lamps include:

- **Genset Running** - illuminated green lamp when the GenSet is running at, or near, the rated speed and voltage. This Indicator Lamp is not illuminated when the GenSet is warming up or cooling down.
- **Remote Start** - illuminated green lamp when the control is receiving a **Remote Run** signal. The **Remote Run** signal has no effect unless the GenSet is in **Auto**.
- **Not in Auto** - illuminated red lamp when the GenSet is not in **Auto** mode. The GenSet is running in **Manual** mode.
- **Shutdown** - illuminated red lamp when the PCC detects a condition that prevents the GenSet from operating. The GenSet cannot be started when this lamp is on. After the condition has been corrected, the lamp can be reset by first pressing the **Stop** button and then the **Reset** button.
- **Warning** - illuminated yellow lamp whenever the PCC detects a condition in the operation of the GenSet that warrants attention. This lamp is automatically shut off when the problematic condition no longer exists.

4.7 Fault Codes

The PCC continuously monitors engine sensors for abnormal conditions, such as low oil pressure and high coolant temperature. If any of these conditions occur, the Operator Panel will illuminate the **Warning Indicator Lamp** (yellow) or the **Shutdown Indicator Lamp** (red) and display a **Fault Code** on the digital display.

Should a fault condition occur during operation, consult the appropriate PCC Manual to locate and correct the problem. Fault codes generally require an authorized service representative to correct the fault.

⚠ WARNING

Many troubleshooting procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures.

Shutdown faults must be acknowledged after the fault has been corrected. If the GenSet is in **Auto** or **Manual** mode, the control must first be set to **Stop** mode (off). Faults are cleared from the Operator Panel display by pressing the **Reset** button.

Faults are also acknowledged when in **Auto** mode and the remote start command is removed (remote stop signal is sent).

Faults are re-announced if they are detected again after being acknowledged.

NOTE: *Some warnings remain active after the condition is corrected and the control* ***Reset*** *button is pressed. This will require the GenSet to be shutdown to reset the warning indicator.*

4.8 Troubleshooting Tips

The following information is intended as a guide to troubleshooting some common non-technical equipment problems. Many problems can be resolved using corrective maintenance, adjustment, or minor repair. Refer to the vendor-supplied literature, electrical schematics, and mechanical prints for additional information. For engine-related issues, refer to the specific engine Operation and Maintenance Manual or contact the Cummins Customer Assistance Center at 1-866-831-7620.

⚠ WARNING

The status checks should be performed ONLY by a qualified technician. Contact with exposed electrical components could cause extreme personal injury or death.

⚠ WARNING

Before equipment operation, ALL guards, covers, and protective devices MUST BE in place and securely fastened. Serious personal injury could result from contact with exposed or moving components.

⚠ CAUTION

AVOID servicing complex components such as: printed circuit boards, programmable controllers and Electronic Control Modules (ECMs) not specifically authorized by Cummins Inc. Contact your local Cummins Sales and Service generator distributor before performing any extensive maintenance. In the United States or Canada, call 1-800-888-6626 (this automated service utilizes touch-tone phones only). By selecting Option 1 (press 1), you will be automatically connected to the nearest distributor.

⚠ WARNING

Never climb or stand on the equipment frame, guards, or enclosures. Contact with exposed or moving components can cause personal injury or equipment damage.

4.8.1 Engine Will Not Start

POSSIBLE CAUSE	SOLUTION
Low gas pressure.	Check the gas pressure on the utility side of the gas regulator. Have the gas regulator tested by the gas company. Have the gas company turn on the gas. For Cummins engines, verify that there is 16-20 inches of water pressure at the engine solenoid. For PSI engines, verify that there is 7-11 inches of water pressure at the engine solenoid. If not, check for gas pressure on the utility side of the gas regulator. Check if the gas is turned off.
No voltage at the gas solenoid.	Check for 12 or 24 volts to the gas solenoid. If no voltage is present, trouble-shoot the gas solenoid. Test the gauge panel for no voltage to the gas solenoid.
Low WC after the gas demand regulator.	For Cummins engines, verify that there is 5 inches of WC downstream from the engine mounted gas regulator while the engine is cranking. For PSI engines, verify that there is 7 inches of WC downstream from the engine mounted gas regulator while the engine is cranking. Check if the vent is blocked and clear the blockage. Check the regulator diaphragm for leaks.
Air cleaner is plugged or restricted.	Check the piping and inlet for restriction. Change the air filter.
Governor actuator not open-ing.	Check if there is switched battery voltage at the governor controller. If no volt-age, test the gauge panel for switched battery voltage.
	If switched battery voltage is present at the governor controller, check for magnetic pickup voltage of at least 2.5 A/C volts.
	If no magnetic pickup voltage, check the magnetic pickup adjustment to the flywheel is 1/2 to 3/4 turn out from the flywheel.
	Check for a pulse-width modulation (PWM) signal to the actuator while the engine is cranking.
	Readjust or replace the magnetic pickup, as necessary.
	Troubleshoot the actuator using the control panel drawing for that engine model.
	Check the harness from the actuator to the controller.
	Replace the actuator harness, if necessary.
	Replace the governor actuator, if necessary.
No spark.	Check if the timing mark is in the window on the Altronic® magneto.
	Remove the Altronic® magneto and check the coupler. Replace the coupler, as necessary.
	Check the CD2000 ignition module. If the red **Indicator** LED is illuminated (but not flashing), then it is powered. A ***flashing*** red I**ndicator** will indicate a fault condition. Refer to the CD2000 manual to troubleshoot this issue.
	Check the engine for mechanical problems.
	Check for voltage to the ignition coils.
	Test the ignition harness. Replace, as necessary.
	Test the ignition coils. Replace, as necessary.
	Test the spark plug wires. Remove the spark plugs and check for fouling. Replace bad spark plugs, as necessary.
Altronic® magneto timed to engine incorrectly.	Time the Altronic® magneto to the engine per the service manual.
	Check the engine for mechanical problems.

4.8.2 Engine Will Not Pull Load

POSSIBLE CAUSE	SOLUTION
Engine is running rough.	Check the engine for misfiring. Check the engine timing and adjust it to specification. Check the spark plugs. Replace bad spark plugs. Test the spark plug wires. Replace bad spark plug wires. Test the ignition coils. Replace bad ignition coils. Test the ignition wiring from the ignition module to the coils. Replace a bad ignition harness. Check the gas mixture. Check the magnetic pickup. Test the ignition module. Replace a bad ignition module. Check the air filter for restriction. Replace the air filter, as necessary.
Gas pressure dropping off at the inlet side of the utility gas regulator.	Have utility check the gas pressure volume. Check that the gas pressure to the engine gas regulator is at specification. Adjust, as necessary.
No gas pressure at the outlet side of the engine gas regulator.	Test the engine-mounted gas regulator.
Turbo boost is not within specifications.	Check the intake system for air leaks or restrictions. Repair any leak or restriction. Replace the turbo, as necessary.
Governor is not operating properly.	Check the engine for mechanical problems. Check the PWM converter, if used. Validate the PWM from the PCC output.

4.8.3 Failure of Emissions Certification

(Model-specific)

POSSIBLE CAUSE	SOLUTION
Gill AFR Controller Center Lamp Not Illuminated	The valve control may be in Open Loop mode. The Lambda Sensor Temperature may be out of range.
	The valve position may be out of range.

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Section 5 - Maintenance

5.1 Introduction

The engine and Generator Set (GenSet) are to be operated in accordance with all manufacturer's guidelines and recommendations. The following sections outline the steps and guidelines for scheduled maintenance, compliance with the Environmental Protection Agency (EPA), general inspections, and maintenance repairs.

5.2 Owner/Operator Unit Maintenance Compliance Requirements

Owner/Operator unit engine certification must be monitored and documented to remain in compliance with NFPA and the Environmental Protection Agency (EPA). Refer to NFPA 110 Standard for Emergency and Standby Power Systems. Reference to the EPA Spark-Ignited (SI) New Source Performance Standards (NSPS) final ruling can be found under Title 40 Code of Federal Regulation (CFR) 60.4243.

For complete information, the owner/operator should review the entire NFPA 110 and CFR 60.4243.

The following paragraphs highlight general maintenance record-keeping requirements:

- A permanent record of the Emergency Power Supply System (EPSS) inspections, tests, exercising, operation, and repairs shall be maintained and readily available.
- EPSSs, including all appurtenant components, shall be inspected weekly and exercised under load at least monthly.
- If the GenSet is used for standby power or for peak load shaving, such use shall be recorded and shall be permitted to be substituted for scheduled operations and testing of the GenSet.
- Equivalent loads used for testing shall be automatically replaced with the emergency loads in case of failure of the primary source.
- SI GenSets shall be exercised at least once a month with the available EPSS load for thirty minutes or until the water temperature and the oil pressure have stabilized.
- Load tests of GenSets shall include complete cold starts.
- Transfer switches shall be operated monthly.
- If you operate and maintain the certified stationary SI internal combustion engine and control device according to the manufacturer's emission-related written instructions, you must keep records of conducted maintenance to demonstrate emissions compliance. No performance testing is required if you are an owner or operator.
- If you do not operate and maintain the certified stationary SI internal combustion engine and control device according to the manufacturer's emission-related written instructions, your engine will be considered a non-certified engine, and you must demonstrate emissions compliance according to the EPA or the Authorities Having Jurisdiction (AHJs), as appropriate.
- If you are an owner or operator of a stationary SI internal combustion engine less than 100 horsepower (HP), you must keep a maintenance plan and records of conducted maintenance to demonstrate emissions compliance. To the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. No performance testing of a stationary SI internal combustion engine less than 100 HP is required if you are an owner or operator.
- If you are an owner or operator of a stationary SI internal combustion engine greater than or equal to 100 HP and less than or equal to 500 HP, you must keep a maintenance plan and records of conducted maintenance. To the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test

within one year of engine startup to demonstrate compliance.

- If you are an owner or operator of a stationary SI internal combustion engine greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance. To the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test within one year of engine startup and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.

5.3 Recommended Maintenance Schedules

Establish and adhere to a definite schedule for maintenance and service based on the application and severity of the environment. The recommended service intervals for a GenSet on STANDBY power is covered in Table 5-1. The recommended service intervals for a GenSet on PRIME power service is covered in Table 5-2. If the GenSet will be subjected to extreme operating conditions, the time between service intervals should be reduced accordingly. Some of the factors that can affect the maintenance schedule include:

- Extremes in ambient temperature
- Exposure to weather
- Exposure to salt water
- Exposure to dust, sand, or other airborne contaminates

If the GenSet will be subjected to any extreme operating conditions, consult with your local Authorized Cummins Distributor and determine a suitable schedule of maintenance. Use the running time meter to keep an accurate log of all service performed for warranty support. Perform all service at the time period indicated or after the number of operating hours indicated, whichever comes first. Use Table 5-1. (Standby) or Table 5-2. (Prime) to determine the maintenance required and then refer to the sections that follow for the correct service procedures.

Table 5-1. Periodic Maintenance Schedule For Standby Power GenSets

MAINTENANCE ITEMS	SERVICE TIME						
	* After First 24 Hours or 1 Year	Daily or after 8 Hours	*Monthly or after 100 Hours	After 150 Hours	* At 6 Months or after 250 Hours	* Yearly or after 500 Hours	After 1000 Hours
General GenSet inspection		X[1]					
Oil pan heater		X					
Engine oil level and reservoir (optional)		X					
Coolant level		X					
Coolant heater(s)		X					
Battery heater (optional)		X					
Control heater (optional)		X					
Breather heater (optional)		X					
Air cleaner			X[2]			X[3]	

Table 5-1. Periodic Maintenance Schedule For Standby Power GenSets

MAINTENANCE ITEMS	SERVICE TIME						
	* After First 24 Hours or 1 Year	Daily or after 8 Hours	*Monthly or after 100 Hours	After 150 Hours	* At 6 Months or after 250 Hours	* Yearly or after 500 Hours	After 1000 Hours
All hardware (fittings, clamps, fasteners, etc.)			X				
Battery electrolyte level			X				
Generator air outlet			X				
Change engine oil and filter	X			X[2]		X[8]	
Check radiator hoses for wear and cracks					X[4]		
Drive belt					X[5]		
Check antifreeze concentration					X		
AC generator and controls					X[6]		
Clean cooling systems						X	
Replace spark plugs							X[7]
Inspect or replace oxygen sensor						X[6,9]	
Overhaul cylinder heads							X[10]
Periodic Emissions Testing							X[11]

X[1] - Check for oil, fuel, cooling, and exhaust system leaks. Check exhaust system audibly and visually with GenSet running and repair any leaks immediately.
X[2] - Perform more often in extremely dusty conditions.
X[3] - Replace element after 500 hours.
X[4] - Replace if hard or brittle.
X[5] - Visually check belt for evidence of warping or slippage. Replace if hard or brittle.
X[6] - Must be performed by a qualified mechanic. Contact your authorized service center.
X[7] - Replace every 1000 hours.
X[8] - Perform at least once a year.
X[9] - Replace every 1500 hours (recommended).
X[10] - Refer to engine manufacturer's maintenance manual or contact technical support.
x[11] - Retesting on-site is required on compliant-capable GenSets per local, regional, and national codes.

* Whichever comes first.

Table 5-2. Periodic Maintenance Schedule For Prime Power GenSets

MAINTENANCE ITEMS	SERVICE TIME					
	After the First 24 Hours	Every 24 Hours	Every 100 Hours	Every 250 Hours	Every 500 Hours	After 1000 Hours
General GenSet inspection		X[1]				
Oil pan heater		X				
Battery heater (optional)		X				X
Check battery		X				X
Control heater		X				X
Breather heater (optional)		X				X
Check engine oil level and reservoir (optional)		X				
Check coolant level		X				
Coolant heater(s)		X				
Check air cleaner (heavy duty filter)			X[2,3]			
Check all hardware (fittings, clamps, fasteners, etc.)				X		
Check battery electrolyte level				X		
Check generator air outlet				X		
Change engine oil and filter	X			X[2]		
Check fuel filter element (optional)	X			X[2]		
Check radiator hoses for wear and cracks					X[4]	
Check drive belt					X[5]	
Check antifreeze concentration				X		
Check AC generator and controls					X[6]	
Clean cooling systems					X	
Inspect or replace oxygen sensor					X[6, 7]	
Replace spark plugs						X[7]

Table 5-2. Periodic Maintenance Schedule For Prime Power GenSets

MAINTENANCE ITEMS	SERVICE TIME					
	After the First 24 Hours	Every 24 Hours	Every 100 Hours	Every 250 Hours	Every 500 Hours	After 1000 Hours
Overhaul cylinder heads						X[8]
Periodic Emissions Testing						X[9]

X[1] - Check for oil, fuel, cooling, and exhaust system leaks. Check exhaust system audibly and visually with GenSet running and repair any leaks immediately.
X[2] - Perform more often in extremely dusty conditions.
X[3] - Replace every 2000 hours (recommended).
X[4] - Replace if hard or brittle.
X[5] - Visually check belt for evidence of warping or slippage. Replace if hard or brittle.
X[6] - Must be performed by a qualified mechanic. Contact your authorized service center.
X[7] - Replace every 1500 hours (recommended).
X[8] - Refer to engine manufacturer's maintenance manual or contact technical support.
X[9] - Retesting onsite is required on compliant-capable GenSets per local, regional, and national codes.

Table 5-3. Periodic Maintenance Schedule For Continuous Power GenSets

MAINTENANCE ITEMS	SERVICE TIME					
	Every Shift	Inspect Every 24 Hours	Weekly	Every 250 Hours	Every 500 Hours	After 2500 Hours
General GenSet inspection	X	X[1]				
Oil pan heater		X				
Engine oil level and reservoir (optional)	X	X				
Coolant level		X				
Coolant heater(s)		X				
Battery heater (optional)		X				
Control heater (optional)		X				
Breather heater (optional)			X			
Air cleaner		X[2]				
All hardware (fittings, clamps, fasteners, etc.)			X			
Battery electrolyte level			X			
Generator air outlet			X			
Change engine oil and filter				X[2]	X[8]	
Check radiator hoses for wear and cracks		X		X[4]		
Drive belt				X[5]		
Check antifreeze concentration (DCA)				X		
AC generator and controls			X	X[6]		
Clean (blow down) cooling systems			X		X[2]	
Replace spark plugs						X[7]
Inspect or replace oxygen sensor					X[6,9]	
Inspect cylinder heads						X[10]
Periodic emissions testing					X[1]	

Table 5-3. Periodic Maintenance Schedule For Continuous Power GenSets

MAINTENANCE ITEMS	SERVICE TIME					
	Every Shift	Inspect Every 24 Hours	Weekly	Every 250 Hours	Every 500 Hours	After 2500 Hours

X[1] - Check for oil, fuel, cooling, and exhaust system leaks. Check exhaust system audibly and visually with GenSet running and repair any leaks immediately.
X[2] - Perform more often in extremely dusty conditions.
X[3] - Replace element after 500 hours.
X[4] - Replace if hard or brittle.
X[5] - Visually check belt for evidence of warping or slippage. Replace if hard or brittle.
X[6] - Must be performed by a qualified mechanic. Contact your authorized service center.
X[7] - Replace every 1000 hours.
X[8] - Perform at least once a year.
X[9] - Replace every 1500 hours (recommended).
X[10] - Refer to engine manufacturer's maintenance manual or contact technical support.

5.4 General Maintenance Inspections While in Operation

During operation, be alert for mechanical problems that could create unsafe or hazardous conditions. The following sections cover several areas that should be frequently inspected for continued safe operation.

NOTE: *Some GenSets require a three-way or oxidation catalyst to meet emission requirements. There is a precious metals element inside the housing of the catalyst that converts exhaust to EPA requirements. Some catalysts have a removable element in the center (only available on some models) that can be replaced with a new element when required. Most catalysts come installed on the GenSet from the factory. Some catalysts require customer mounting. Check with your distributor or service technician for details on your product. Check the manufacturer's recommended maintenance or replacement schedule.*

5.4.1 Engine

Monitor fluid levels and oil pressure and coolant temperatures frequently. Most engine problems give an early warning. Look and listen for changes in engine performance, sound, or appearance that can indicate service or repair is needed. Some engine changes to look for are as follows:

- Misfire
- Vibration
- Unusual noises
- Sudden changes in engine operating temperatures or pressures
- Excessive exhaust smoke
- Loss of power
- An increase in oil consumption
- An increase in fuel consumption

5.4.2 Fuel System

With the GenSet operating, inspect the fuel supply lines, filters, and fittings for leaks. Check any flexible sections for cuts, cracks, and abrasions and make sure they are not rubbing against anything that could cause breakage. If any leaks are detected, shut down the GenSet, turn off the fuel supply valves, and have any fuel leaks corrected immediately.

⚠ WARNING

Ignition of fuel can cause severe personal injury or death by fire or explosion. Do not permit any flame, cigarette, arcing switch or equipment, pilot light, or other igniter near the fuel system or in any areas sharing ventilation.

- **Fuel Filters (Optional - Mobile Off-Highway (MOH) Models Only)** Our in-line fuel filters are designed for optimal performance of the Gen-

Set. They provide the best choice for customers who want to extend service intervals and increase GenSet uptime. Optional pressure indicators and automatic drains are available on some models. Check the installation and service manuals for your specific filter (models vary by unit) for details. Check the pressure differential across the filter to ensure restriction is within operating range. If the pressure loss is out of range, see the Owner Manual to change the filter.

- **Fuel Heater (Optional - MOH Models Only)** Fuel heaters are available on some MOH models. They are designed to provide heating of engine fuel for optimal performance of the GenSet. The fuel heater is designed to provide uninterrupted fuel flow in cold temperature environments when it is needed most. Check the heater for fuel flow to ensure minimal pressure loss during operation. See the Owner Manual for regular maintenance schedules.

- **Regulator (Optional)** Prime regulators are available on some models for fuel pressure reduction from the source. Regulators vary by manufacturer and model. Check with your distributor or service technician for details on the use and settings of your regulator. Be sure to follow the manufacturer's recommended maintenance schedule.

5.4.3 AC Electrical System

It is important to regularly check to see that all aspects of the GenSet are receiving adequate electricity. Be sure to check the following:

- **Frequency/RPM (Alternator/Engine Menu)**: The generator frequency should be stable under load and the reading should be the same as the GenSet nameplate rating (see Figure 7-1 GenSet Nameplate (Typical)).

- **AC Voltmeter (Alternator Menu):** At no load, the line-to-line or line-to-neutral voltage(s) should be the same as the GenSet nameplate rating (see Figure 7-1 GenSet Nameplate (Typical)).

- **AC Ammeter (Alternator Menu):** At no load, the current ratings should be zero. With a load applied, each line current should be about the same.

- **Lamp Test Button:** Press the **Lamp Test** button (the lightbulb icon)**.** All of the LED lamps should illuminate for five seconds to ensure that all warning indicators are working properly.

NOTE: *Class 1 wiring methods are to be used for field wiring connections to terminals of a Class 2 circuit.*

5.4.4 DC Electrical System

Check the terminals on the batteries for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Refer to Section 5.11 Battery Maintenance and Replacement for battery cleaning and maintenance instructions.

5.4.5 Exhaust System

With the GenSet operating, inspect the entire exhaust system visually and audibly, including the exhaust manifold, muffler, and exhaust pipe. Check for leaks at all connections, welds, gaskets, and joints and also make sure that exhaust pipes are not heating surrounding areas excessively. If any leaks are detected, shut down the GenSet and have the leaks corrected immediately.

⚠ DANGER

Inhalation of exhaust gases can result in severe personal injury or death. Be sure deadly exhaust gas is piped outside and away from any windows, doors, vents or other inlets to building. Do not allow exhaust gases to accumulate in habitable areas.

5.4.6 Heaters (Optional)

Check to ensure that all wiring is intact (no shorts or frayed wires) and there are no obstructions around all heaters:

- Battery Heater
- Control Heater
- Breather Heater

5.4.7 Base Drains (Optional)

Some units are equipped with drain extensions that allow for oil or coolant (or both) drains to be brought out to the base edge for convenient maintenance. These drains have an in-line ball valve or Fumoto™ valve installed for control. Remove the cap and open the valve to drain. Close the valve and restore the cap before refilling. Check the end of the drain line/ valve for obstructions. Check all drain connections for leaks or worn parts.

5.5 General Maintenance Inspections While Not in Operation - Accidental Restart Prevention

When troubleshooting the GenSet, make certain the GenSet cannot be accidentally restarted by doing the following:

1. Press the **Stop** button on the operator Panel.
2. Turn off or remove AC power from the battery charger.
3. Depress the **Emergency Stop** button.
4. Remove the negative (-) battery cable from the GenSet starting battery.

⚠ WARNING

Accidental starting of the GenSet can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (-) cable from the battery terminal.

⚠ DANGER

Contacting high voltage components can cause electrocution, resulting in severe personal injury or death. Keep the output box covers in place during troubleshooting.

⚠ WARNING

Lead-acid batteries present a risk of fire because they generate hydrogen gas. Follow all procedures as noted in this manual.

⚠ WARNING

Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switches, or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

Ventilate battery area before working on or near battery. Wear goggles. Stop the GenSet and disconnect the battery charger before disconnecting the battery cables. Disconnect the negative (-) cable first and reconnect last.

⚠ CAUTION

Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes which are damaging to DC control circuits of the GenSet.

With the GenSet stopped, E-stop depressed, check for loose belts and fittings, leaking gaskets and hoses, or any signs of mechanical damage. If any problems are found, have them corrected immediately.

5.6 Lubrication System Maintenance

To properly maintain the GenSet lubrication system, you must routinely check the engine oil level, change the engine oil at the recommended service interval, change the engine oil filter, and inspect the (optional) oil resevoir.

⚠ CAUTION

Do not use 5W-30 engine oil in ambient temperatures above 0 °C (32 °F) because it may not provide adequate lubrication.

5.6.1 Checking the Engine Oil Level

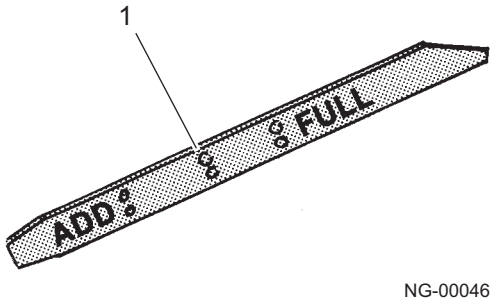
Check the engine oil level during engine shutdown periods at the intervals specified in Table 5-1. or

Table 5-2. The dipstick is stamped with **FULL** and **ADD** to indicate the level of oil in the crankcase. For accurate readings, shut off the engine and wait approximately ten minutes before checking the engine oil level. This allows oil in the upper portion of the engine to drain back into the crankcase.

⚠ WARNING

Crankcase pressure can blow out hot oil and cause severe burns. DO NOT check the oil while the GenSet is operating.

As shown in Figure 5-1, check the oil level while the engine is cold and keep the oil level ***halfway*** between the **FULL** and **ADD** marks on the dipstick. Remove the oil fill cap and add 15W40 Low Ash oil, when necessary.



1. Normal Oil Level (Cold Engine)

Figure 5-1 Oil Level Dipstick

⚠ CAUTION

Do not operate the engine with the oil level below the ADD mark or above the FULL mark. Overfilling can lead to oil foaming and expulsion from the breather cap. Operation below the ADD mark can cause loss of oil pressure.

5.6.2 Changing the Engine Oil

Disconnect the oil pan heater and the coolant heater (if equipped) prior to changing the oil. Reconnect the heaters once the oil change is complete.

To change the oil:

1. Run the engine until thoroughly warm before draining the oil.
2. Stop the GenSet.
3. Place a pan under the drain outlet and remove the oil drain plug or open the drain valve.
4. After the oil is completely drained, replace the drain plug or close the drain valve.
5. Refill to the proper level with 15W40 Low Ash oil.

⚠ DANGER

Hot crankcase oil can cause burns if it is spilled or splashed on skin. Keep fingers and hands clear when removing the oil drain plug and wear protective clothing.

⚠ WARNING

State or federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Do not contact oil or breathe vapors. Use rubber gloves and wash exposed skin.

⚠ WARNING

Used oil and filters must be disposed of properly to avoid environmental damage and clean-up liability. Check all federal, state and local regulations for disposal requirements.

5.6.3 Changing the Engine Oil Filter

Figure 5-2 shows the location of the oil filter.To change the oil filter, follow these steps:

1. Spin off the oil filter and discard it in accordance with local environmental regulations.
2. Thoroughly clean the filter mounting surface.
3. Fill the oil filter with clean lubricating oil. To fill, pour the oil into the center hole of the filter.
4. Apply a thin film of oil to the filter gasket and install a new element.
5. Spin the element on by hand until the gasket just touches the mounting pad and then turn an additional 1/2 to 3/4 turn. Do not over tighten.
6. With oil in the crankcase, start the engine and check for leaks around the filter element. Retighten only as much as is necessary to eliminate leaks. Do not over tighten.

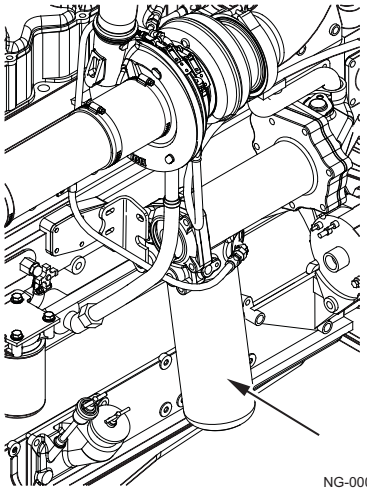


Figure 5-2 Oil Filter

5.6.4 Inspecting the Oil Reservoir (Optional)

Five- or ten-gallon oil tanks are optional on some units to allow for extended service intervals between maintenance. These tanks are typically plumbed to an **Oil Maintainer Switch** that controls the flow into the engine oil pan. It is imperative that this switch is functioning properly without obstruction and (if the switch is vented) the vent is not obstructed. The tank should be filled with oil per the engine manufacturer guidelines. Check all of the connections to the oil reservoir for leaks or worn parts.

5.7 Cooling System Maintenance

Satisfactory engine coolant inhibits corrosion and protects against freezing, if necessary. Use a 50/50 (50% deionized (DI) water and 50% antifreeze) coolant solution. Cummins, Inc. recommends using Fleetguard E-G Complete antifreeze.

5.7.1 Checking the Coolant Level

Check the coolant level during shutdown periods at the maintenance intervals shown in Table 5-1. or Table 5-2. Remove the pressure cap after allowing the engine to cool and add coolant as necessary to keep the fluid level visible in the sight glass.

⚠ WARNING

To prevent severe scalding, let the engine cool before removing the coolant pressure cap. Turn the cap slowly, and do not open it fully until the pressure has been relieved.

⚠ CAUTION

Loss of coolant can allow the engine to overheat without protection of a shutdown device and cause severe damage to the engine. Maintain the coolant level for proper operation of the high engine temperature shutdown system.

5.7.2 Adding Coolant

⚠ CAUTION

The engine can overheat and be damaged if coolant is filled improperly.

Check to make sure that all drain cocks are closed and all hose clamps secure. Remove the pressure cap (shown in Figure 5-3) and slowly fill the cooling system with the recommended coolant.

Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50 °C (120 °F) before adding coolant. When the engine is first started, monitor the coolant level. As trapped air is expelled from the system, the coolant level may drop and additional coolant must be added. Replace the pressure cap after coolant has been added.

5.7.3 Changing the Coolant Filter

Replace the coolant filter every two years with a Zero Unit Cartridge.

5.7.4 Draining and Flushing the Cooling System

⚠ WARNING

Some coolant is toxic. Keep coolant away from children and animals. Follow local environmental regulations for disposal.

To maintain adequate corrosion protection and remove rust and scale deposits, drain and flush radiator at the recommended interval.

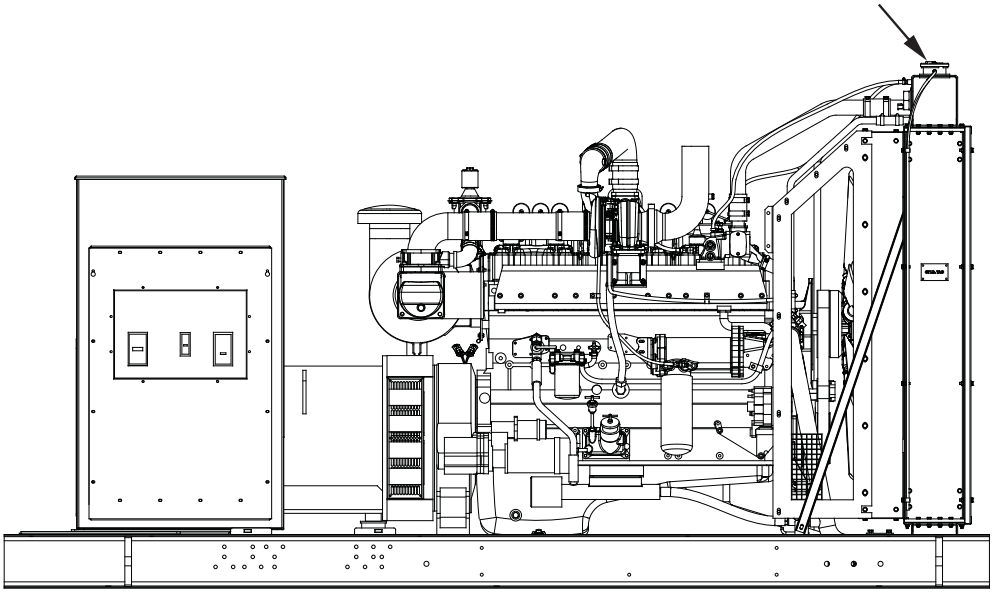


Figure 5-3 Coolant Pressure Cap (Typical)

⚠ CAUTION

The heater element will burn out if the engine coolant is removed with the heater connected to a power source.

To drain and flush the cooling system, follow these steps:

1. Disconnect the engine coolant heater from the power source (if equipped).
2. Allow the engine to cool and then remove the radiator pressure cap.
3. Open the radiator drain cock and remove the water drain plugs (one on each side of engine). When the coolant is drained, place the end of a water hose into the radiator fill port and turn on the water supply.
4. Regulate the flow of water into the radiator until it is equal to the outflow from the drain openings.
5. Continue flushing until the outflow from the drains is clear of rust sediment.

NOTE: *If the engine is equipped with an engine coolant heater, drain the coolant by removing the hose and clamp from the bottom of the heater.*

6. Replace the water drain plugs and close the radiator drain cock when flushing is complete.
7. Refill the cooling system with the recommended coolant (refer to 5.7.1 Checking the Coolant Level).
8. With the cooling system properly filled and the engine has been run, connect the heater plug to the receptacle.

⚠ CAUTION

The heater element will burn out if the power is connected before it is filled with coolant or if straight antifreeze solution is used for coolant. Before connecting the power, fill the engine with coolant and run it for a while to circulate the coolant through the heater.

5.7.5 Inspecting the Radiator

Inspect the exterior of the radiator for obstructions. Remove all dirt or foreign material with a soft brush or cloth. Use care to avoid damaging the fins. If available, use a low pressure compressed air or stream of water (maximum of 242 kPa [35 psi]) in the opposite direction of normal air flow to clean the radiator. If using water, protect the engine and the generator from overspray.

5.7.6 Inspecting the Coolant Heater

Check the operation of the coolant heater by verifying that hot coolant is being discharged from the outlet hose. ***Do not touch the outlet hose***. If the heater is operational, radiant heat should be felt with a hand held close to outlet hose.

⚠ DANGER

Contact with the cooling system or the engine can result in serious burns. Do not touch the cooling system or the engine during GenSet maintenance until they have cooled.

5.8 Air Filter Maintenance

Clean the air filter every 100 hours of operational time, and more often in extremely dusty conditions. Replace the air filter as needed by doing the following:

1. Remove the cover and the filter. Tap the filter on a flat surface to remove dirt.
2. Place a light source inside the filter and inspect it for air passage. If necessary, apply a low pressure air source (207 kPa [30 psi]) to the inside of filter to remove as much of the dirt as possible.
3. Install (or replace) the air filter, reposition the cover and secure.

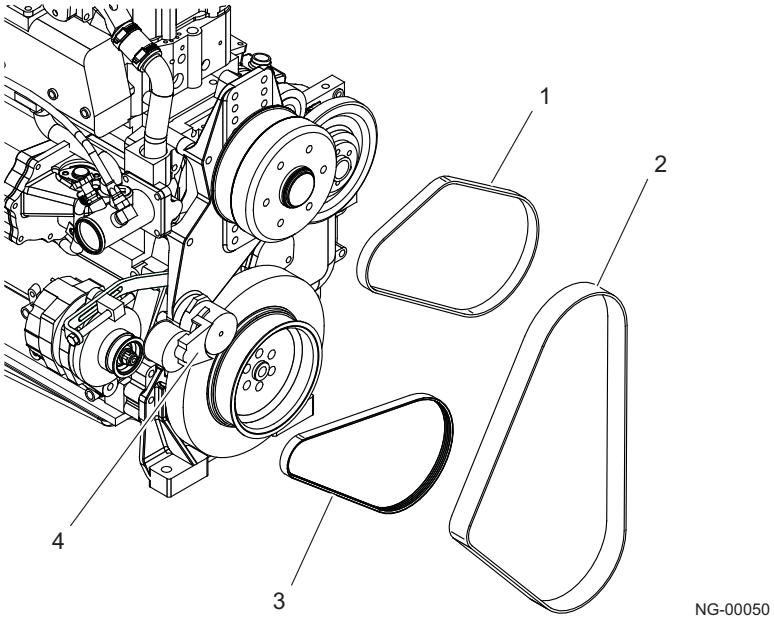
5.9 Belt Replacement

This section identifies how to install replacement belts. Figure 5-4. depicts the location of the GenSet belts.

5.9.1 Spring Tensioner Belt Replacement

To ***remove*** a spring tensioner belt for replacement:

1. Depress the **Emergency Stop** button.
2. Disconnect the negative (-) cable from the battery to prevent accidental starting.
3. Remove the belt guard or side fan guard (between the engine and the radiator) to gain access to the belt.
4. Using a socket wrench, rotate the tensioner pulley arm away from the belt and remove the belt(s).



1. Auxiliary Drive Belt (if equipped)
2. Fan Drive Belt(s)
3. Alternator Drive Belt(s)
4. Tensioner Arm

Figure 5-4 Belt Replacement (Typical)

⚠ WARNING

The belt idler is under tension. Do not allow your hands to get between the belt and pulley. Personal injury will result.

NOTE: *Always wear proper protective eyewear when starting and checking GenSet.*

To i***nstall*** a new spring tensioner belt:

1. Slip the belt onto all but one pulley.
2. Rotate the tensioner pulley arm away from the belt and position the belt over the alternator pulley. Slowly release the belt tensioner pulley arm onto the belt. *NOTE: The spring-loaded idler used on this design maintains the correct belt tension.*
3. Install the belt guard or the fan guard.
4. Connect the negative (-) cable to the battery.
5. Reset the **Emergency Stop.**
6. Start the GenSet and visually check the belt for proper alignment with the engine running.

5.9.2 Manual Tensioner Belt Replacement

To ***remove*** a manual tensioner belt for replacement:

1. Depress the **Emergency Stop** button.
2. Disconnect the negative (-) cable from the battery to prevent accidental starting.
3. Remove the belt guard or side fan guard (between the engine and the radiator) to gain access to the belt.
4. Loosen the jam nut on the sliding pulley assembly.
5. Loosen the tightener bolt to allow the sliding pulley to move (releasing the belt tension) and remove the belt(s).

NOTE: *Always wear proper protective eyewear when starting and checking GenSet.*

To ***install*** a new manual tensioner belt:

1. Slip belt(s) onto all pulleys.
2. Tighten the tensioner bolt to the correct amount of belt tension. Measure the tension on the belt(s) using a Cummins ST1138 belt tension gauge. (Refer to Section 7 - Component Parts and Specifications.)
3. Tighten the jam nut on the sliding pulley assembly. Torque to the appropriate value based on Figure 7-2 Cap Screw Markings and Torque Values in Section 7 - Component Parts and Specifications.
4. Re-check the belt tension using the Cummins ST1138 belt tension gauge.
5. Install the belt guard or the fan guard.
6. Connect the negative (-) battery cable to the battery.
7. Reset the **Emergency Stop**.
8. Start the GenSet and visually check the belt for proper alignment with the engine running.

5.10 Ignition System Maintenance

The ignition system consists of the ignition module, ignition coil packs, high tension wires, and spark plugs. Maintenance consists of periodic inspections to detect possible problems and replacement of worn or deteriorated parts. The ignition system must be completely functional or the GenSet may run poorly or be unable to carry a full load.

5.10.1 Spark Plug Replacement

Replace the spark plugs at the intervals specified in Table 5-1. and Table 5-2. The engine may require additional service if the spark plugs show any of the following conditions:

- Carbon Fouled - Overly Rich Mixture
- Oil Fouled - High oil consumption
- Burned - Excessive engine temperature

Contact your authorized service distributor for help.

Before installing new spark plugs:

1. Clean all dirt and grit away from the spark plug seats.
2. Check each spark plug gap and reset as necessary. Refer to Figure 5-5 and model specification

for part information. (See also Section 7 - Component Parts and Specifications for information on ordering replacement parts.)

3. Lightly lubricate spark plug threads with high temperature anti-seize compound.

4. Insert the replacement spark plug.

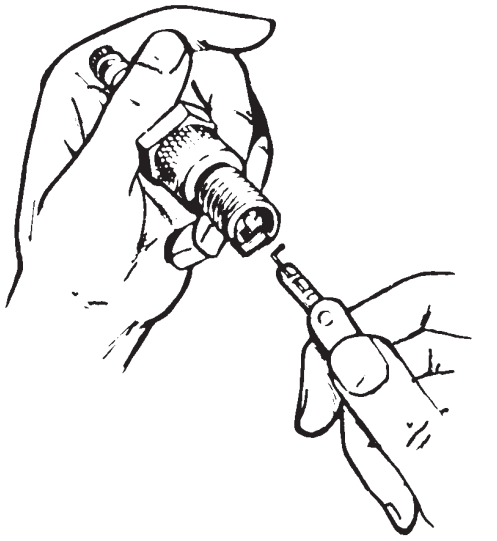


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Figure 5-5 Gapping Spark Plugs

5.10.2 High Tension Wire Maintenance

Check the spark plug wires for good contact at the ignition coil pack and spark plugs. Terminal connections should be tight and fully seated. All spark plug covers and cable end boots should be in good condition and fit tightly. There should be no breaks or cracks in the insulation. Replace the wire if any of these conditions are found.

5.10.3 Ignition Coil Pack Maintenance

Check for cracks, carbon tracks or corrosion on the ignition coil packs. Replace a coil pack if any of these conditions are found.

5.11 Battery Maintenance and Replacement

⚠ WARNING

A battery presents a risk of electrical shock and high short circuit current. The following precautions are to be observed when working on batteries:

- ***Remove watches, rings, or other metal objects.***
- ***Use tools with insulated handles.***
- ***Wear rubber gloves and boots.***
- ***Do not lay tools or metal parts on top of batteries.***
- ***Disconnect the charging source prior to connecting or disconnecting battery terminals.***
- ***Determine if the battery is inadvertently grounded. When inadvertently grounded, remove the source of the ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of such shock is reduced when such grounds are removed during installation and maintenance (applicable to a generator not having a grounded supply circuit).***

⚠ WARNING

Only personnel knowledgeable of batteries and the required precautions may service batteries. Keep unauthorized personnel away from batteries.

⚠ DANGER

Lead-acid batteries present a risk of fire because they generate hydrogen gas. Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

⚠ CAUTION

Ventilate battery area before working on or near battery. Wear goggles. Press the Emergency Stop button and disconnect the charger before disconnecting battery cables. Disconnect the negative (-) cable first and reconnect last.

⚠ CAUTION

Disconnect the battery charger from the AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes that could damage the DC control circuits of the set.

Check the condition of the starting batteries at the interval specified in Table 5-1. or Table 5-2. To prevent dangerous arcing, always depress the **Emergency Stop** button and then disconnect the negative ground cable from the battery before working on any part of the electrical system or the engine.

5.11.1 Cleaning the Batteries

⚠ WARNING

Do not open or mutilate the battery or batteries. Released electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. Do not get the substance in your eyes or contact with skin. Wear goggles and protective clothing, rubber gloves, and apron when servicing batteries.

To properly clean the batteries:

1. Keep the batteries clean by wiping them with a damp cloth whenever dirt appears excessive.
2. If corrosion is present around the terminal connections, remove battery cables and wash the terminals with a solution consisting of 1/4 lb. (11 Kg) of baking soda added to 1 quart (.94 Liter) of water. (This solution is also used for removing spilled electrolyte.)
3. Be sure the vent plugs are tight to prevent the cleaning solution from entering the cells.
4. After cleaning, flush the outside of the battery and surrounding areas with clean water.
5. Keep the battery terminals clean and tight. After making the connections, coat the terminals with a light application of petroleum jelly or non-conductive grease to retard corrosion.

5.11.2 Specific Gravity Inspection (not applicable for maintenance-free batteries)

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell:

1. Hold the hydrometer vertically and take the reading.
2. Correct the reading by adding four gravity points (0.004) for every ten degrees the electrolyte temperature is above 27 °C (80 °F). A fully charged battery will have a corrected specific gravity of 1.245.
3. Charge the battery, if the reading is below 1.200.

5.11.3 Electrolyte Level Inspection

⚠ CAUTION

Do not add water in freezing weather unless the engine will run long enough (two to three hours) to assure a thorough mixing of water and electrolyte.

Check the level of the electrolyte (acid and water solution) in the batteries at least every 200 hours of operation.

If necessary, fill the battery cells to the bottom of the filler neck with distilled water and recharge. If one cell is low, check the case for leaks. Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.

⚠ WARNING

The electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. It is electrically conductive and corrosive.

The following safety precautions are to be observed when replacing or replenishing electrolyte solution in the batteries:

- ***Wear full eye protection and protective clothing.***
- ***Where electrolyte contacts the skin, wash it off immediately with water.***

- ***Where electrolyte contacts the eyes, flush thoroughly and immediately with water and seek medical attention.***
- ***Spilled electrolyte is to be washed down with an acid neutralizing agent. A common practice is to use a solution of 500 grams (1 lb) bicarbonate of soda to 4 liters (1 gallon) of water. The bicarbonate of soda solution is to be added until the evidence of reaction (foaming) has ceased. The resulting liquid is to be flushed with water and the area dried.***

5.11.4 Battery Replacement

Always replace the starting battery with the same number and type (vented, lead acid, optional NiCad) of battery. See Table 7-2. Battery Replacement Information. for battery replacement information. Properly dispose of the expired battery in accordance with local environmental agency requirements.

⚠ WARNING

Electrolyte or explosion of battery can cause severe personal injury or death. Do not burn the battery in a fire for disposal. Do not open or mutilate batteries. Damage to the battery case will release electrolyte which is harmful to the skin and eyes and is also toxic. Burning of a battery may cause an explosion.

NOTE: *Nickel-cadmium (NiCad) battery systems are often required in extreme high or low ambient temperatures because their performance is less affected by temperature extremes than that of lead-acid batteries. NiCad batteries require special battery chargers in order to bring them to the full-charge level. These chargers must be provided with a filter to reduce "charge ripple" which can disrupt the engine and GenSet control systems.*

5.12 Out-of-Service Maintenance

When the GenSet will be stored or removed from operation for an extended period of time, preventative maintenance must be performed to avoid rust accumulation, corrosion of bearing surfaces within the engine, and gum formation in the fuel system. To prepare the GenSet for storage, be sure to do the following:

1. Start the GenSet and run the engine until it reaches the correct operating temperature. (See Section 3 - Operation for start-up procedures.)
2. Shut down the engine.
3. Depress the **Emergency Stop** button.
4. Turn off and disconnect the battery charger (if equipped).
5. Disconnect the battery (negative [-] first) and store the battery in a cool, dry place. Connect the battery to the charger every 30 days to maintain it at full charge.
6. Drain the engine oil while still warm and refill with new oil recommended for the GenSet. Attach a tag indicating the type of oil used.
7. Remove the spark plugs and pour two ounces of rust preventative oil into each spark plug opening. Barr engine over to complete three to four rotations of the crank shaft to distribute the oil on the cylinder walls and then reinstall the spark plugs.
8. Disconnect the engine coolant heater from the power source (if equipped).
9. Drain the cooling system, including the engine block.
10. Remove the air cleaner and seal off the carburetor air inlet opening and PVC hose.
11. Plug the exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
12. Disconnect the oil pan heater and engine coolant heater from power source (if equipped).
13. Clean and wipe the entire unit. Coat parts susceptible to rust with a light coat of oil.
14. Cover the entire GenSet loosely after the engine has cooled down.

5.13 Returning the Generator Set to Service Preparation

NOTE: *Always wear protective clothing and goggles before starting GenSet.*

1. Remove the protective cover.
2. Remove the exhaust plugs, as well as the seal from the carburetor and the PVC hose.
3. Replace the air cleaner.
4. Check the oil dipstick to make sure the crankcase is full.

5. Refill the cooling system per model specifications provided with the unit. (See model-specific engine manual or specification sheet for model specification information.)
6. Reconnect the battery (positive [+] cable first) and check the specific gravity.
7. Connect the battery charger (if applicable).
8. Connect the oil pan heater and engine coolant heater to the power supply (if equipped).
9. Clear the **Emergency Stop**.
10. Remove all loads before starting the GenSet.
11. Start the GenSet and apply a load of at least 50% of the nameplate rating (see Figure 7-1 GenSet Nameplate (Typical)).
12. Check the display for normal readings. The GenSet is now ready for service.

Section 6 - Operating Recommendations

6.1 Introduction

This section provides recommendations for exercising the GenSet, as well as low-temperature and high-temperature operations and no-load and low-load operations.

6.2 Exercise Periods

GenSets on continuous standby must be able to go from a cold start to being fully operational in a matter of seconds. This can impose a severe burden on engine parts.

Regular exercising keeps engine parts lubricated, prevents oxidation of electrical contacts, and in general, helps provide reliable engine starting.

Exercise the GenSet at least once a month - at a minimum of thirty percent of the nameplate rating - for a minimum of thirty minutes,

6.3 Low Temperature Operation

For low ambient temperatures, use an oil pan heater and/or coolant heater, if a separate source of power is available. The optional heater(s) will help provide reliable starting under adverse weather conditions. Be sure the voltage of the separate power source is correct for the heater element rating.

⚠ CAUTION

To avoid damage to heater(s), be sure that the oil and coolant systems are full before applying power to the heater(s).

6.4 High Temperature Operation

Refer to the model specification information provided with the unit (refer to Section 7 - Component Parts and Specifications for instructions on finding model-specific information) for the maximum ambient operating temperature, if applicable.

6.5 No-Load Operation

Periods of no load operation should be held to a minimum. If it is necessary to keep the engine running for long periods of time when no electric output is required, the best engine performance will be obtained by connecting a load bank of at least thirty percent of the nameplate rating.

6.6 Low-Load Operation

Cummins, Inc. natural gas engines can be operated at low loads as long as the time at low loads does not exceed the Cummins recommendations outlined in Table 6-1. Maximum Engine Run Times at Low-Load Conditions. Operating at low loads causes low intake manifold pressures which can result in higher-than-normal oil lubrications of the valves, rings, and liners. Excess oil consumption over long periods of time causes carbon deposits that will result in a misfire condition due to spark plug fouling or excessive carbon build up on the valves, head, and rings.

Table 6-1. details the maximum length of time that Cummins, Inc. engines should be run at various load conditions. For example, Cummins, Inc. natural gas engines should not be run for more than 4 hours at a 10% load. Similarly, an engine should not be run for more than 24 hours at a 40% load or 8 hours at a 20% load. Percent Load = Ratio of Actual Load to Rated Load X 100 during a specified time period of operation. After a period of low-load operation, the engine should be operated at higher loads as shown in Table 6-1.

NOTE: *The runtime hours at low-load operation are cumulative, i.e. stopping an engine after 2 hours at 10% load does not mean that an additional 4 hours at 10% load are available.*

NOTE: *At a load of greater than seventy percent, the engines can be run continuously without excessive oil consumption or excessive carbon deposits.*

Once the engine has reached the maximum time limit at any operation load, the engine should be run at greater than seventy percent load. The engine should be run at a minimum of seventy percent load for at least twice the length of time that it was run at the low-load level before operating again at a low-load level. (Refer to the last column of Table 6-1.).

For example, if the engine has been running 12 hours at 30% load, it should be run for at least 24 hours at a >70% rated load before a light load is applied. Running the engine for at least twice the length of time at the low-load levels allows the engine to burn off the excess oil deposits on the spark plugs, valves, heads, and rings.

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Table 6-1. Maximum Engine Run Times at Low-Load Conditions

Percent Load (%)	Maximum Low-Load Hours	Hours of Operation at >70% Load After a Period of Low-Load
Low Idle (no load)	1	2
High Idle (no load)	2	4
10	4	8
20	8	16
30	12	24
40	24	48
50	50	100
60	100	200
70	continuous	n/a
80	continuous	n/a
90	continuous	n/a
100	continuous	n/a

Section 7 - Component Parts and Specifications

7.1 Introduction

This section provides information for ordering parts, routine and emergency service contacts, recommended spare parts inventory, and general GenSet specifications for drive belt tension, cap screw markings and torque values, and battery replacement.

7.2 Ordering Replacement Parts

Replacement parts for the Cummins, Inc. equipment are manufactured to the same quality standards and specifications as the original equipment. Unapproved substitution may result in poor performance, reduced service life, lost production, or unsafe operation.

Cummins Inc. relies on the best and most cost-effective shipping methods, unless specific instructions or requirements are requested by the customer. When ordering parts, please refer to the GenSet nameplate (see Figure 7-1) and be prepared to provide the following information:

- Model and serial number.
- Part description by name or number.
- Quantity required.
- Purchase order number.

NOTE: *A purchase order number is desirable, even if the part(s) are supplied on a Returned Goods Authorization (RGA) issue number. A purchase order number helps Cummins Sales and Service and its customers track the parts and necessary credits.*

7.3 Routine Service

Personnel at Cummins, Inc. Authorized Repair Locations can assist you with the correct operation and service of your engine. Cummins, Inc. has a worldwide service network of more than 5,000 distributors and dealers who have been trained to provide sound advice, expert service, and complete parts support.

Check the telephone directory yellow pages or refer to Section 2.2 How to Obtain Service for the nearest Cummins Authorized Repair Location.

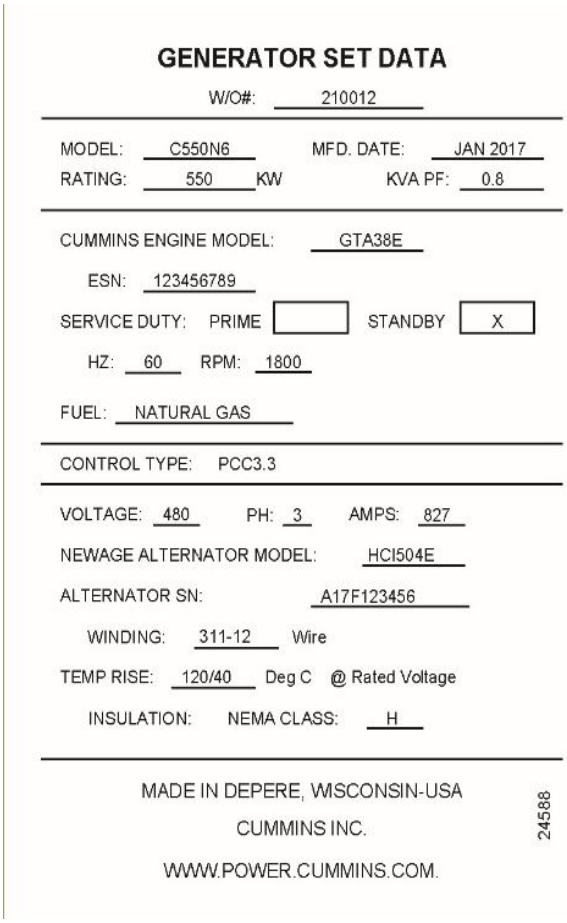


Figure 7-1 GenSet Nameplate (Typical)

7.4 Emergency Repairs and Technical Service

The Cummins, Inc. Customer Assistance Center provides a 24-hour, toll-free telephone number to aid in technical and emergency service when a Cummins, Inc. Authorized Repair Location cannot be reached or is unable to resolve an issue with a Cummins product.

If assistance is required, call toll-free: 1-800-DIESELS (1-800-343-7357) for all 50 states, Bermuda, Puerto Rico, the Virgin Islands, and the Bahamas.

Outside of North America, contact your Regional Office. Telephone numbers and addresses are listed in the International Directory on the Cummins, Inc. website at: www.cummins.com.

7.5 Recommended Spare Parts Inventory

To minimize downtime and increase productivity, Cummins, Inc. recommends maintaining a stock of spare parts critical to uninterrupted engine operation. Shipping costs can be lower using ground transportation rather than overnight or next day air freight. For this reason, Cummins, Inc. can provide a list of recommended spare parts. Contact the Cummins, Inc. Authorized Repair Location for additional information.

7.6 Specifications

For model specific information, see the specification data sheet provided with the GenSet. You can also view the specification data sheet and GenSet drawings by visiting our website at: www.power.cummins.com.

The following tables provide recommendations for drive belt tension; cap screw markings and torque values; and general model specifications.

Table 7-1. Drive Belt Tension Table

SAE Belt Size	Belt Tension New		Belt Tension Range Used	
	N	lbf	N	lbf
0.380 in	620	140	270 to 490	60 to 110
0.440 in	620	140	270 to 490	60 to 110
1/2 in	620	140	270 to 490	60 to 110
11/16 in	620	140	270 to 490	60 to 110
3/4 in	620	140	270 to 490	60 to 110
7/8 in	620	140	270 to 490	60 to 110
4 rib	620	140	270 to 490	60 to 110
5 rib	670	150	270 to 530	60 to 120
6 rib	710	160	290 to 580	65 to 130
8 rib	890	200	360 to 710	80 to 160
10 rib	1110	250	440 to 890	100 to 200
12 rib	1330	300	530 to 1070	120 to 240
12 rib K section	1330	300	890 to 1070	200 to 240
31 rib	1668	375	1330 to 1560	300 to 350

Figure 7-2 Cap Screw Markings and Torque Values

Cap Screw Markings and Torque Values

CAUTION

Always use a cap screw of the same measurement and strength as the cap screw being replaced. Using the wrong cap screws can result in engine damage.

Always use the torque values listed in the following tables when specific torque values are not available.

When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

Metric Cap Screw Identification

Sample:	M8-1.25 x 25		
Value:	**M8**	**1.25**	**X 25**
Meaning:	Major thread diameter in millimeters	Distance between threads in millimeters	Length in millimeters

Metric Cap Screw Head Markings

Metric cap screws and nuts are identified by the grade number stamped on the head of the cap screw or on the surface of the nuts.

Commercial Steel Class	8.8	10.9	12.9
Caps Screw Head Markings			

US Customary Cap Screw Identification

Sample:	5/16 x 18 x 1-1/2		
Value:	**5/16**	**18**	**1-1/2**
Meaning:	Major thread diameter in inches	Number of threads per inch	Length in inches

U.S. Customary Cap Screw Head Markings

U.S. Customary cap screws are identified by radial lines stamped on the head of the cap screw.

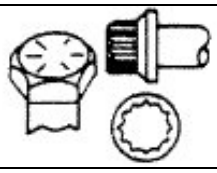
SAE Grade 5 w/ three lines	SAE Grade 8
	

Figure 7-3 Cap Screw Torque Values

Metric Cap Screw Torque Values (lubricated threads)

Class:	8.8				10.9				12.9			
Diameter	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	13	10	7	4	14	9	7	4
7	14	9	11	7	18	14	11	7	23	18	11	7
8	23	17	18	14	33	25	18	14	40	29	18	14
10	45	33	30	25	65	50	30	25	70	50	30	25
12	80	60	55	40	115	85	55	40	125	95	55	40
14	125	90	90	65	180	133	90	65	195	145	90	65
16	195	140	140	100	280	200	140	100	290	210	140	100
18	280	200	180	135	390	285	180	135	400	290	180	135
20	400	290	—	—	550	400	—	—	—	—	—	—

U.S. Customary Cap Screw Torque Values (lubricated threads)

Grade:	SAE Grade 5				SAE Grade 8			
Cap Screw Body Size	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4-20	9	7	8	6	15	11	8	6
1/4-28	12	9	9	7	18	13	9	7
5/16-18	20	15	16	12	30	22	16	12
5/16-24	23	17	19	14	33	24	19	14
3/8-16	40	30	25	20	55	40	25	20
3/8-24	40	30	35	25	60	45	35	25
7/16-14	60	45	45	35	90	65	45	35
7/16-20	65	50	55	40	95	70	55	40
1/2-13	95	70	75	55	130	95	75	55
1/2-20	100	75	80	60	150	110	80	60
9/16-12	135	100	110	80	190	140	110	80
9/16-18	150	110	115	85	210	155	115	85
5/8-11	180	135	150	110	255	190	150	110
5/8-18	210	155	160	120	290	215	160	120
3/4-10	325	240	255	190	460	340	255	190
3/4-16	365	270	285	210	515	380	285	210
7/8-9	490	360	380	280	745	550	380	280
7/8-14	530	390	420	310	825	610	420	310
1-8	720	530	570	420	1100	820	570	420
1-14	800	590	650	480	1200	890	650	480

Table 7-2. Battery Replacement Information.

Genset Model	Engine Model	KW Rating (kVa)	Duty Rating	Nominal Voltage Rating	Battery Type	Minimum Cold Cranking Amperes (CCA)	Charging Alternator
Regulated Models							
C130L6 (GFPC)	PSI 11.1	130 (163)	Standby	24V	4D x 2	1000 A@ 0 ◦C	75
C140L6 (GFPA)	PSI 8.8	140 (175)	Standby	12V	group 31	550 A@ 0 ◦C	75
C142L6	PSI 11.1	142 (177)	Standby	24V	4D x 2	1000 A@ 0 ◦C	75
C150N6 (GFPA)	PSI 8.8	150 (188)	Standby	12V	group 31	550 A@ 0 ◦C	75
C200N6 (GFPC)	PSI 11.1	200 (250)	Standby	24V	4Dx2	1000 A@ 0 ◦C	75
C225N6A	PSI 11.1	225 (281)	Standby	24V	4Dx2	1000 A@ 0 ◦C	75
C250N6 (GFBC)	GTA 855E	250 (312)	Standby	24V	8Dx2	1000 A@ 0 ◦C	65
C335L6	GTA 38E	335 (419)	Standby	24V	8D x2	1400 A@ 0 ◦C	65
C350N6 (GFEB)	KTA19G	350 (437)	Standby	24V	8Dx2	1400 A@ 0 ◦C	65
C450N6 (GFGA)	GTA28	450 (562)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C500N6A (GFGB)	GTA28	500 (625)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C500N6	GTA 38E	500 (625)	Standby	24V	8D x2	1400 A@ 0 ◦C	65
GFJC	GTA38	550 (688)	Standby	24V	8D x2	1400 A@ 0 ◦C	65
C550N6	GTA 38E	550 (688)	Standby	24V	8D x2	1400 A@ 0 ◦C	65
C600N6 (GFLA)	GTA50	600 (750)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C650N6 (GFLB)	GTA50	650 (813)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C750N6 (GFLC)	GTA50	750 (937)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C55L6/C55N6 (GCMC)	PSI 5.7	55 (69)	Prime	12V	group 24	630 A@ 0 ◦F	70
C150L6 (GCNC)	GTA 855E	150 (188)	Prime	24V	8D x 2	1400 A@ 0 ◦C	65
C180N6 (GCDC)	PSI 11.1	180 (225)	Prime	24V	4D x 2	1000 A@ 0 ◦C	75
C225N6	GTA 855E	225 (281)	Prime	24V	8D x 2	1400 A@ 0 ◦C	65
C225N6A (GCNC)	GTA 855E	225 (281)	Prime	24V	8D x 2	1400 A@ 0 ◦C	65
C250N6A (GCEC)	QSK19G	250 (312)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C250N6B (GCEB)	KTA19GC	250 (312)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65

Genset Model	Engine Model	KW Rating (kVa)	Duty Rating	Nominal Voltage Rating	Battery Type	Minimum Cold Cranking Amperes (CCA)	Charging Alternator
Non-regulated Models							
C175N6 (GFAC)	GTA 8.3G	175 (219)	Standby	24V	4D x 2	1000 A@ 0 ◦C	35
C230N6 (GFBB)	GTA 855	230 (288)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C485N6 (GFGA)	GTA28	485 (606)	Standby	24V	8D	850 A@ 0 ◦C	65
C580N6 (GFJA)	GTA38	580 (725)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C635N6 (GFJB)	GTA38	635 (793)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C690N6 (GFJC)	GTA38	690 (862)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C760N6 (GFLA)	GTA50	760 (950)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C815N6 (GFLB)	GTA50	815 (1018)	Standby	24V	8D x 2	1400 A@ 0 ◦C	65
C70N6A (GCCA)	G8.3GC	70 (88)	Continuous	24V	4D x 2	1000 A@ 0 ◦C	65
C115N6 (GCNA)	G855GC	115 (144)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C115N6A (GCCB)	GTA 8.3G	115 (144)	Continuous	24V	4D x 2	1000 A@ 0 ◦C	65
C150N5	GTA 855GC	150 (188)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C185N6 (GCNB)	GTA 855GC	185 (231)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C275N6 (GCEB)	KTA19GC	275 (343)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C500N6B (GCJC)	GTA38	500 (625)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65
C650N6A (GCLC)	GTA50	650 (812)	Continuous	24V	8D x 2	1400 A@ 0 ◦C	65

Section 8 - Wiring Diagrams

Table 8-1. Wiring Diagrams - Electronic Engines

Drawing Title	Drawing No.
Schematic, Controls Interface GTA855E Engine	A042H078
Schematic, Controls Interface KTA19SLB Engine	A042H074
Schematic, Controls Interface QSK19G MOH Engine	A042D408
Schematic, Controls Interface GTA38E Engine	A042F753
Schematic, Overall PSI Engine Models	22726

Table 8-2. Wiring Diagrams - Hydro-Mechanical Engines

Drawing Title	Drawing No.
Schematic, Controls Interface GTA855 / KTA19GC Engines	A042H089
Schematic, Controls Interface GTA28 Engine	A042H084
Schematic, Controls Interface GTA38/50 Engines	A042H086

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SHEET #	DESCRIPTION
2	LAYOUT, CONTROL PANEL & OPTIONS
3	SCHEMATIC, OVERALL
4	SCHEMATIC, CUSTOMER CONNECTIONS
5	SCHEMATIC, PARALLELING, ISOLATED BUS, GEN TO GEN
6	SCHEMATIC, PARALLELING, UTILITY SINGLE
7	SCHEMATIC, PARALLELING, UTILITY MULTIPLE
8	SCHEMATIC, OPTIONAL ACCESSORIES
9	SCHEMATIC, OPTIONAL AUX101 & AUX102
10	SCHEMATIC, ALTERNATOR, MCB, CT'S
11	SCHEMATIC, HARNESS, POWER AND SENSOR
12	SCHEMATIC, HARNESS, ENGINE INTERFACE

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

Cummins NPower

CUMMINS NPOWER LLC
CORPORATE OFFICE
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSNPOWER.COM

CUSTOM DESIGN AND
UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SCHEMATICS, ELECTRICAL
GTA855E W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 1 OF 12	DRAWING NO: A042H078
EST WEIGHT:		

CUSTOMER CONNECTIONS

TB2

RUN SHUTDOWN ALARM GFI

MAIN CONTROL PANEL

PCC3300

TB15 TB9 TB8 TB10 TB7 TB5 TB3 TB1 J14 CT1 CT2 CT3 J12 J25 J26 J20 J22

AUX103
AVR

J18 J17 J19

C6

SWITCHED MODE 24 VDC
TO 13.8 VDC CONVERTER

CR5 CR6 CR7

TB1

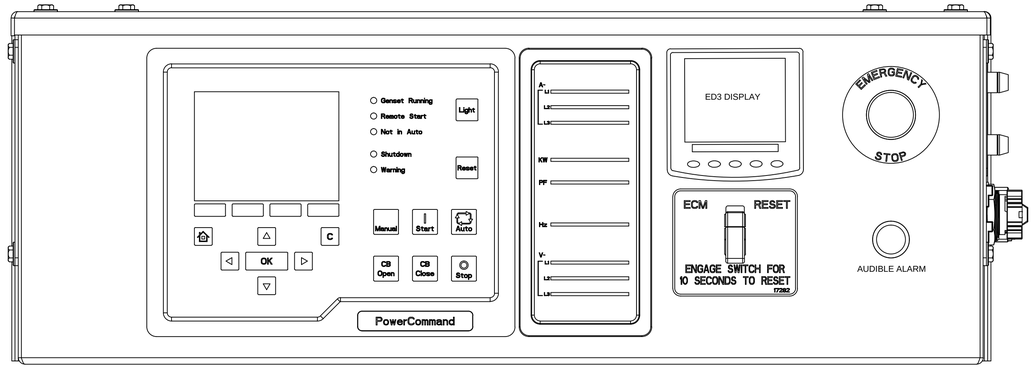
CUSTOMER CONNECTIONS

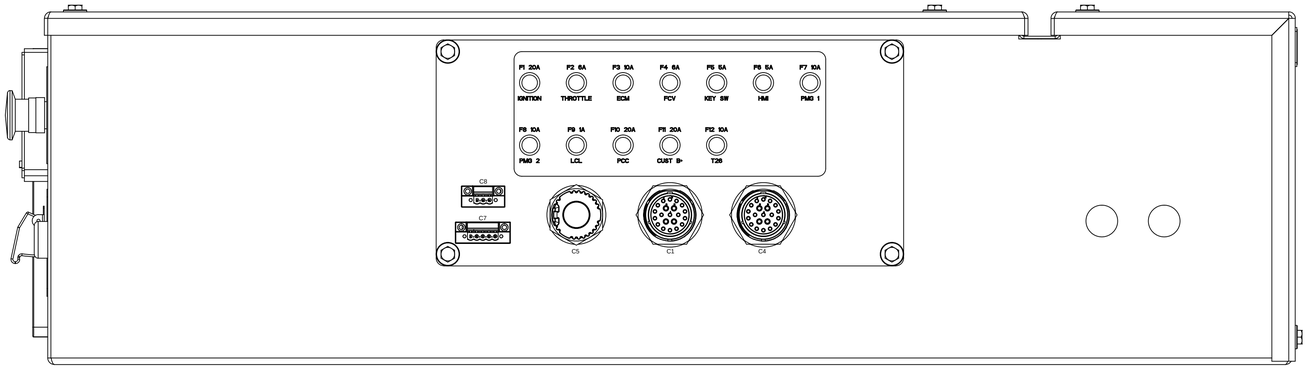
AUX102

AUX101

J4 J3 J2 J1 J10 J14

PROTONODE





UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
.X = ± 0.030	.X = ± 0.8
.XX = ± 0.010	.XX = ± 0.25
.XXX = ± 0.005	.XXX = ± 0.13
ANGLES = ± 1°	ANGLES = ± 1°

NPower

CUMMINS NPOWER LLC
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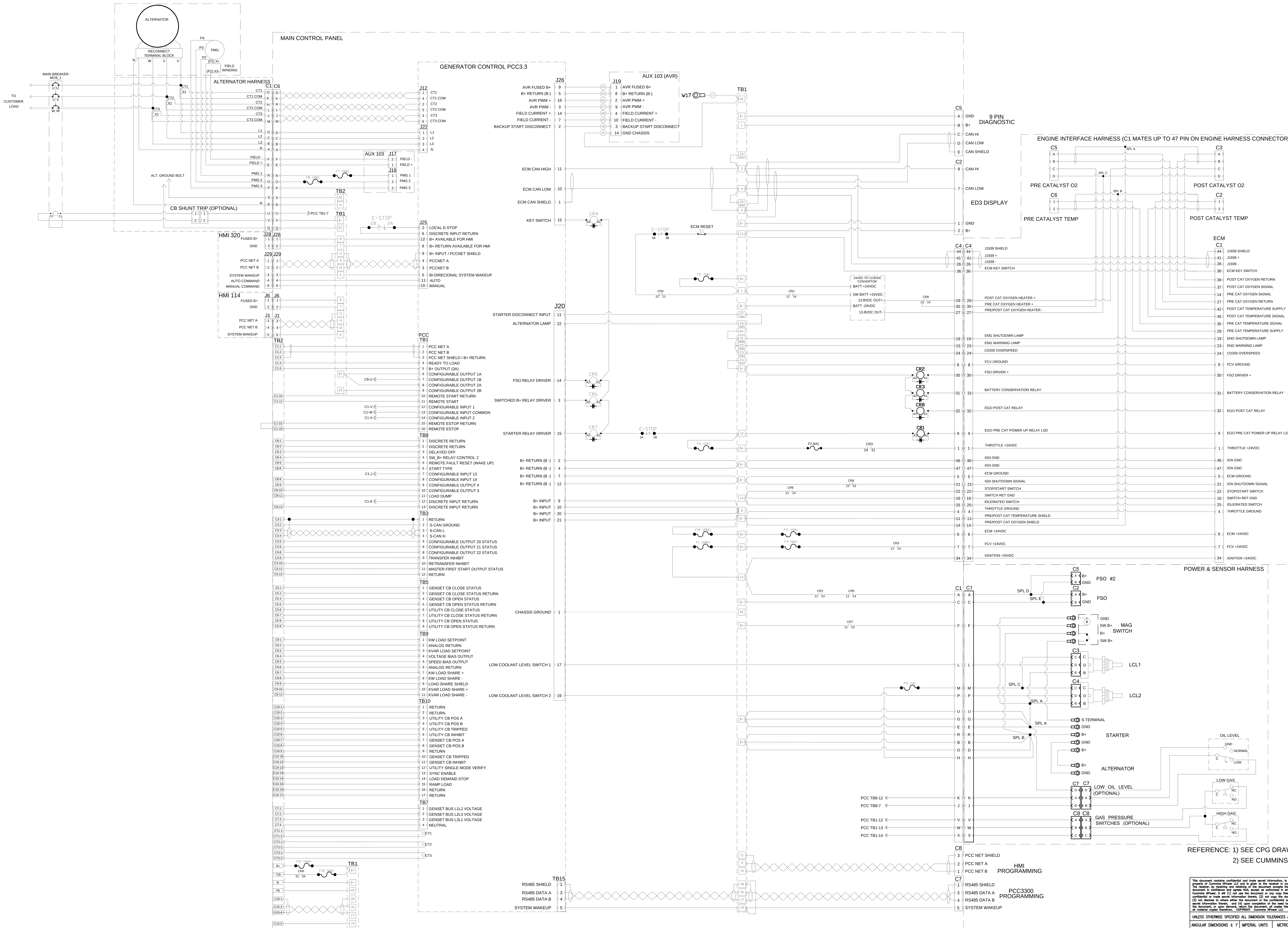
1600 BUERKLE ROAD
WHITE BEAR LAKE, MN
WWW.CUMMINSNPOWER.COM

CUSTOM DESIGN AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

LAYOUT, CONTROL PANEL AND OPTIONS
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 23 JUNE 2016
AUTO CAD
INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 20F12
DRAWING NO: A042H078

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B-	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED B+
2	20A FUSED PCC3300 B+
3	J1939 HIGH(+)
4	J1939 LOW(-)
5	J1939 SHIELD
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	20A FUSED IGNITION/FSO B+
14	IDLE / RATED SIGNAL
15	KEYSWITCH / 9 PIN DIAGNOSTIC B+
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+
21	SHUTDOWN LAMP COIL 1K OHM RESISTOR
22	WARNING LAMP COIL 1K OHM RESISTOR
23	CD200 COIL 1K OHM RESISTOR
24	RSVD COIL 1K OHM RESISTOR
25	J1939 120 OHM TERMINATING RESISTOR
26	STARTER DISCONNECT 240 OHM RESISTOR
27	1A, 1kV DIODE

CR1 = EGO PRE CAT POWER UP RELAY LSD
CR2 = ECM FSO RELAY
CR3 = BATTERY CONSERVATION RELAY
CR4 = KEYSWITCH RELAY
CR5 = PCC FSO RELAY
CR6 = RUN RELAY
CR7 = START RELAY
CR8 = POST CAT POWER UP RELAY

F1 = IGNITION 20A
F2 = THROTTLE 6A SLOW ACTING
F3 = ECM 10A
F4 = FCV 6A SLOW ACTING
F5 = KEY SWITCH/ ED3 5A
F6 = RELAYS 5A
F7 = PMG 1 10A
F8 = PMG 2 10A
F9 = LOW COOLANT LEVEL 1A
F10 = PCC3300 20A
F11 = CUSTOMER B+ 20A
F12 = T26 10A

S1 = CONTROLLER RESET

LEGEND

CR# = RELAY COIL
CR# = RELAY CONTACT
10 = TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE
2) SEE CUMMINS DRAWING #4021936-02 FOR ENGINE SIDE WIRING AND INTERFACE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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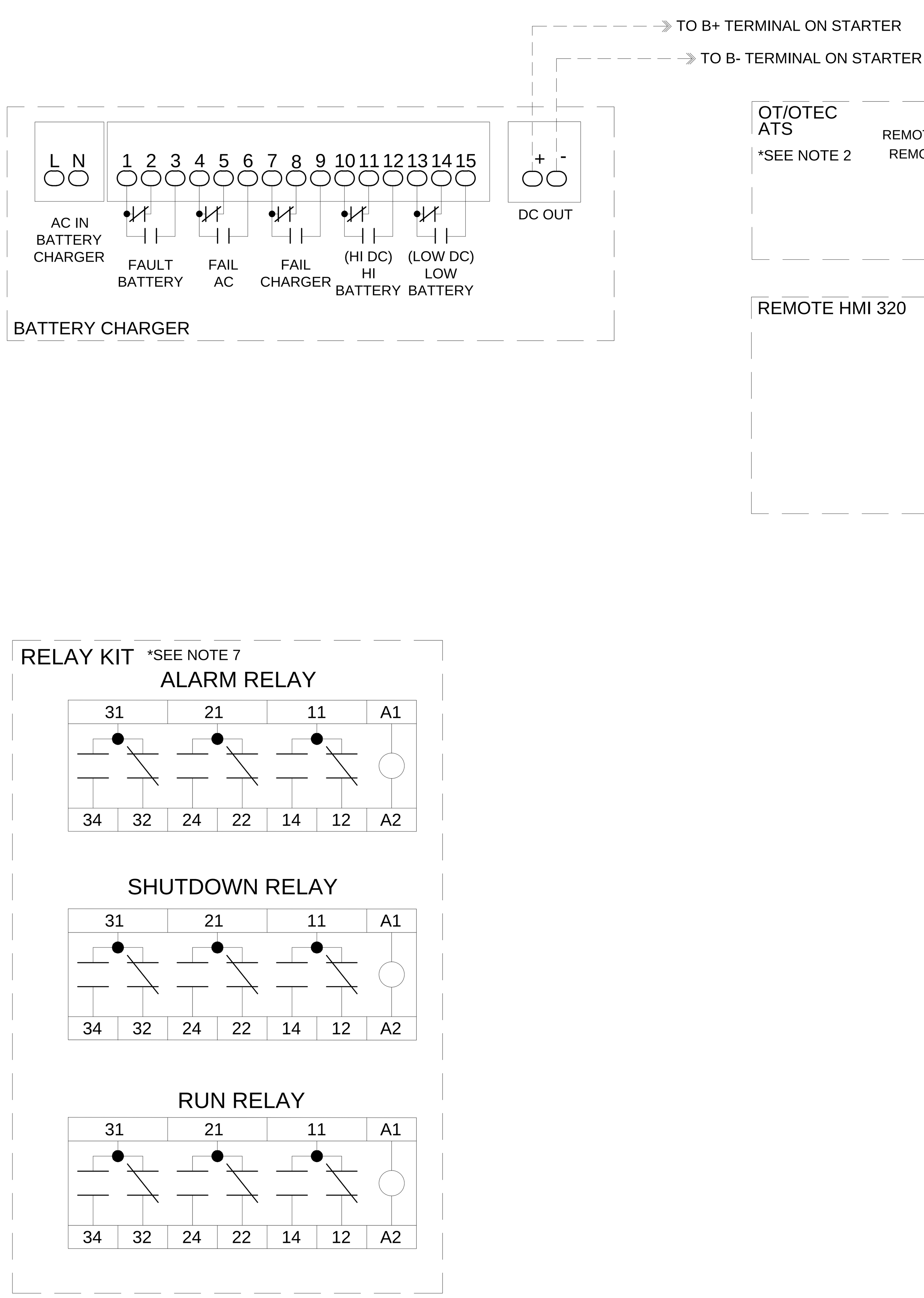
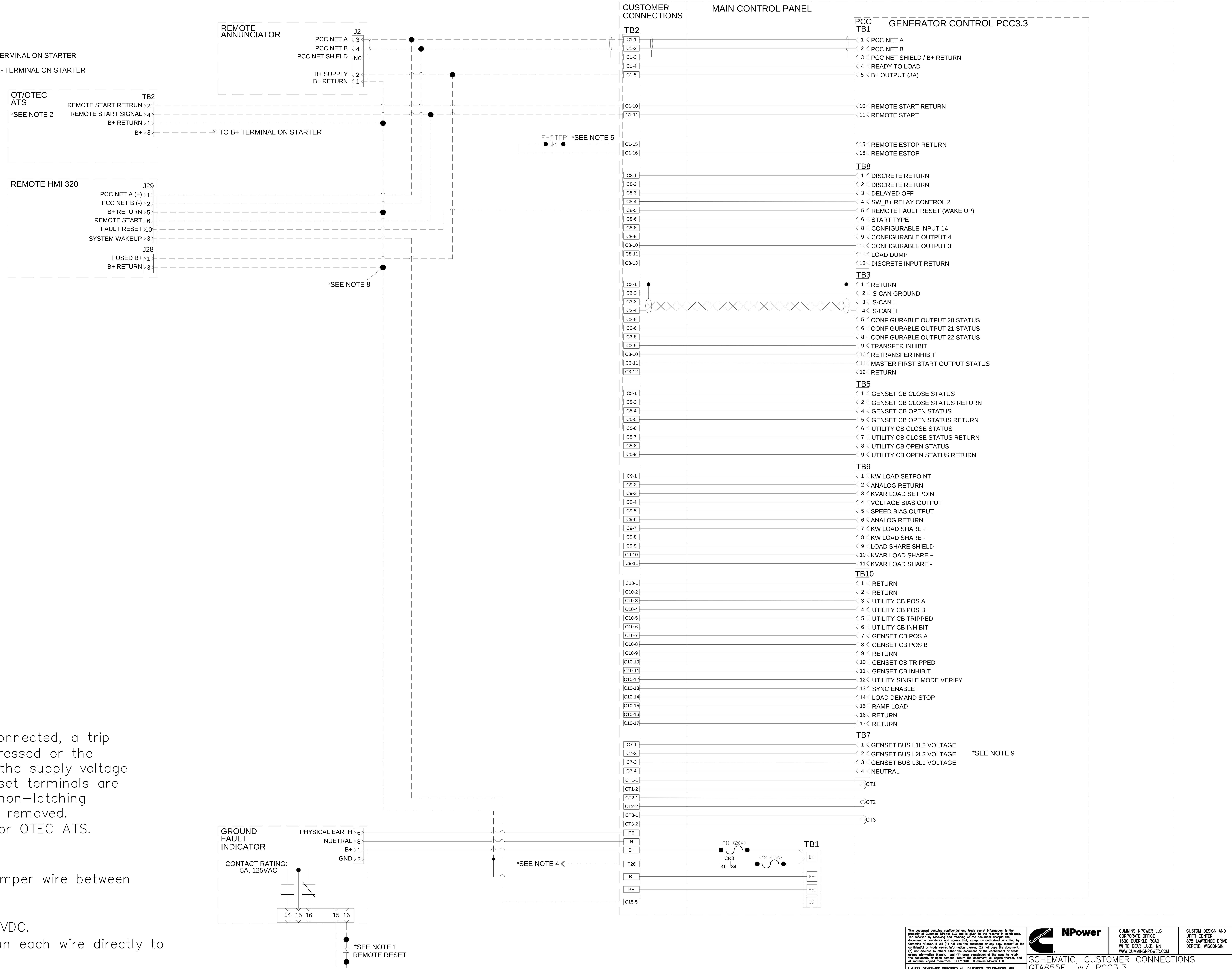
SCHEMATIC, OVERALL GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 3OF12	DRAWING NO: A042H078
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016





NOTES:

1) When remote–reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote–reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote–reset terminals are not connected, the module operates in the non–latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E–Stop, remove the jumper wire between terminals C1–15 and C1–16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line–line voltage is greater than 600VAC, power transformers must be used.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

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SCHEMATIC, CUSTOMER CONNECTIONS
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 23 JUNE 2016
INIT ECO: 2016–022
SCALE:
EST WEIGHT:
SHEET 4OF12
DRAWING NO: A042H078

THIS DRAWING IS FOR REFERNCE ONLY.
REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA

   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S-CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3-1 AT ONLY ONE END OF EACH S-CAN NETWORK BUS.

   THE CABLE SHALL MEET SAE J1939-11 STANDARDS AND HAVE A MAX LENGTH OF 200M.

   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.

   REFER TO INSTALLATION MANUAL FOR DETAILS.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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SCHEMATIC, PARALLELING, ISO BUS, GEN-GEN GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 5OF12	DRAWING NO: A042H078
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:
1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.
   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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SCHEMATIC, PARALLELING, UTILITY SINGLE
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 6OF12	DRAWING NO: A042H078
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:
1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3–11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

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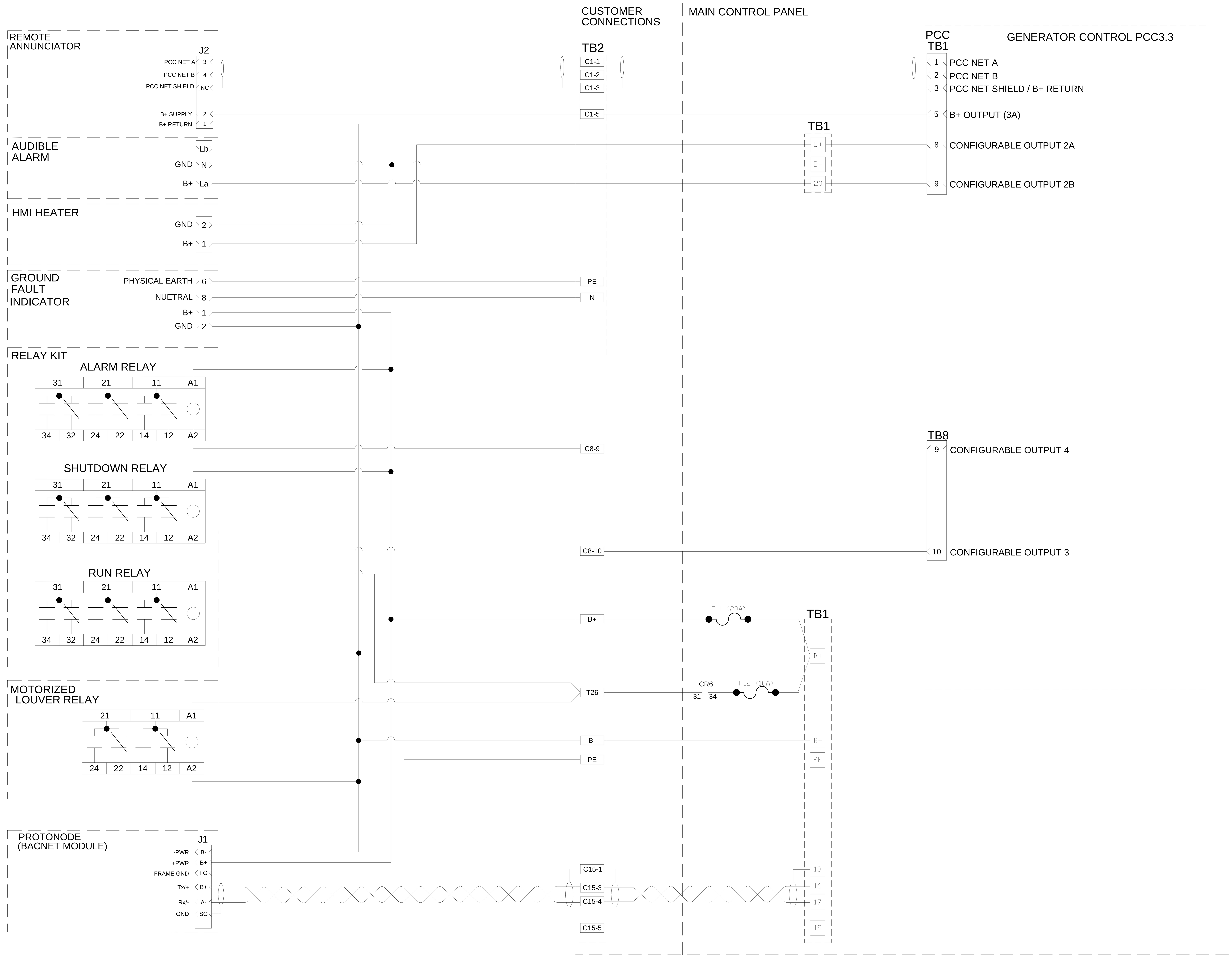
SCHEMATIC, PARALLELING, UTILITY MULTIPLE GTA855E W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 7OF12	DRAWING NO: A042H078
EST WEIGHT:		



REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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SCHEMATIC, OPTIONAL ACCESSORIES
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

AUTO CAD

DATE: 23 JUNE 2016

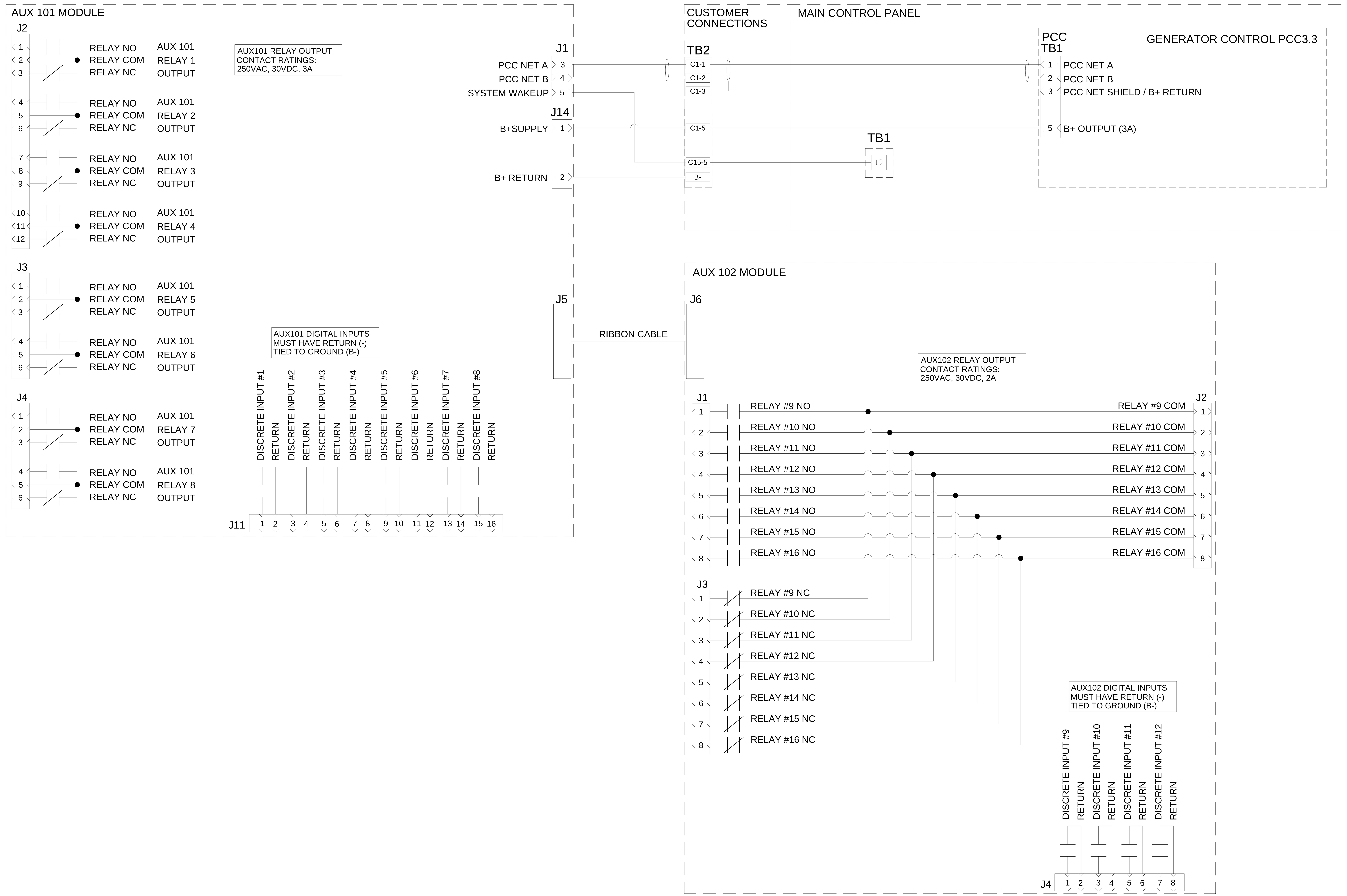
INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 8OF12

DRAWING NO: A042H078



NOTES:

1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

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SCHEMATIC, AUX101 & AUX102
GTA855E w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE				
ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS	DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
THIRD ANGLE PROJECTION			AUTO CAD	INIT ECO: 2016–022
			SCALE: / EST WEIGHT:	SHEET 9OF12	DRAWING NO: A042H078

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

MAIN CONTROL PANEL

ALTERNATOR

RECONNECT TERMINAL BLOCK

N W V U

P4

P3

PMG

P2

(F1) X+

(F2) XX-

FIELD WINDING

ALTERNATOR HARNESS

C1 C6

FIELD - F F

FIELD + E E

PMG 1 N N

PMG 2 O O

PMG 3 P P

F8 (10A)

F7 (10A)

AUX 103 (AVR)

J17

2 FIELD -

1 FIELD +

J18

1 PMG 1

2 PMG 2

3 PMG 3

J19

AVR FUSED B+ 1

B+ RETURN (B-) 8

AVR PWM + 2

AVR PWM - 9

FIELD CURRENT + 4

FIELD CURRENT - 10

BACKUP START DISCONNECT 3

GND CHASSIS 14

GENERATOR CONTROL PCC3.3

J26

9 AVR FUSED B+

5 B+ RETURN (B-)

16 AVR PWM +

3 AVR PWM -

14 FIELD CURRENT +

7 FIELD CURRENT -

2 BACKUP START DISCONNECT

MAIN BREAKER MCB_1

U U

V V

W W

TO CUSTOMER LOAD

C1 C2

CB SHUNT TRIPS (OPTIONAL)

2 2

1 1

Q Q

V V

U U

TB1

PE

B-

TB1

7 CB'S SHUNT TRIP B+ (OPTIONAL)

ALT. GROUND BOLT

S S

N

R R

TB2

PE

N

GFI CONNECTIONS (OPTIONAL)

CT1

X1

CT1 G G

CT1 COM K K

CT2

X1

CT2 H H

CT2 COM L L

CT3

X1

CT3 J J

CT3 COM M M

J12

1 CT1

4 CT1 COM

2 CT2

5 CT2 COM

3 CT3

6 CT3 COM

L1 D D

L2 C C

L3 B B

N A A

J22

1 L1

2 L2

3 L3

4 N

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
.XX ± .030	X.X ± 0.8
.XXX ± .005	X.XX ± 0.13
.XXXX ± .0005	X.XXX ± 0.013
ANGLES ± 1°	ANGLES ± 1°
SURFACE FINISH 125	SURFACE FINISH 3.2

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SCHEMATIC, ALTERNATOR, MCB, CT'S
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

DATE: 23 JUNE 2016

AUTO CAD

INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 10OF12

DRAWING NO: A042H078

MAIN CONTROL PANEL

POWER AND SENSOR HARNESS

GENERATOR CONTROL PCC3.3

TB1

CR2 11 14 ECM FSO RELAY

CR5 11 14 PCC FSO RELAY

CR7 11 14 START RELAY

F1 (20A)

F9 (1A)

J20

LOW COOLANT LEVEL SWITCH 1 — 17

LOW COOLANT LEVEL SWITCH 2 — 19

TB8

INPUT RETURN — 12

LOW OIL LEVEL SIGNAL — 7

TB1

LOW GAS PRESSURE SIGNAL — 12

INPUT COMMON — 13

HIGH GAS PRESSURE SIGNAL — 14

C1 C1

C5 "FSO #2"

C2 "FSO"

SPL D

SPL E

GND

SW B+

B+

S TERM

STARTER

S TERM

MOT

C3 "LCL1"

C4 "LCL2"

SPL C

SPL A

SPL A

SPL B

ENGINE ALTERNATOR

+ -

BATTERY

C7 C7 LOW OIL LEVEL (OPTIONAL)

OIL LEVEL

GND

NORMAL

C

LOW

LOW GAS

NC

C

NO

C8 C8 GAS PRESSURE SWITCHES (OPTIONAL)

HIGH GAS

NC

C

NO

A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016
REV	ECO	DESCRIPTION OF REVISION	BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

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SCHEMATIC, POWER & SENSOR HARNESS
GTA855E w/ PCC3.3

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

DATE: 23 JUNE 2016

AUTO CAD

INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 110F12

DRAWING NO: A042H078

MAIN CONTROL PANEL
GENERATOR CONTROL PCC3.3
J26
ECM CAN HIGH 11
ECM CAN LOW 10
ECM CAN SHIELD 1
KEY SWITCH 15
J20
STARTER DISCONNECT INPUT 11
ALTERNATOR LAMP 22
FSO RELAY DRIVER 14
SWITCHED B+ RELAY DRIVER 3
STARTER RELAY DRIVER 15
B+ RETURN (B -) 2
B+ RETURN (B -) 4
B+ RETURN (B -) 7
B+ RETURN (B -) 12
B+ INPUT 9
B+ INPUT 10
B+ INPUT 20
B+ INPUT 21
TB1
CR4
CR5
CR6
CR7
E-STOP
ECM RESET
S1
F5 (5A)
F6 (5A)
F2 (6A)
F10 (20A)
F1 (20A)
F3 (10A)
F4 (6A)
KEYSWITCH RELAY
EGO PRE CAT POWER UP
24VDC TO 13.8VDC CONVERTOR
BATT +24VDC
SW BATT +24VDC
13.8VDC OUT+
BATT -24VDC
13.8VDC OUT-
EGO POST CAT POWER UP
CR2
CR3
CR8
CR1
BATTERY CONSERVATION RELAY
RUN RELAY
INTERCONNECT HARNESS
C5
C3
SPL A
SPL C
SPL B
PRE CATALYST O2
POST CATALYST O2
C6
C2
PRE CATALYST TEMP
POST CATALYST TEMP
C4
J1939 +
J1939 -
ECM KEY SWITCH
POST CAT OXYGEN HEATER +
PRE CAT OXYGEN HEATER +
PRE/POST CAT OXYGEN HEATER -
ENG SHUTDOWN LAMP
ENG WARNING LAMP
CD200 OVERSPEED
FCV GROUND
FSO DRIVER +
BATTERY CONSERVATION RELAY
EGO POST CAT RELAY
EGO PRE CAT POWER UP RELAY LSD
THROTTLE +24VDC
IGN GND
IGN GND
ECM GROUND
IGN SHUTDOWN SIGNAL
STOP/START SWITCH
SWITCH RET GND
IDLE/RATED SWITCH
THROTTLE GROUND
PRE/POST CAT TEMPERATURE SHIELD
PRE/POST CAT OXYGEN SHIELD
ECM +24VDC
FCV +24VDC
IGNITION +24VDC
ENGINE HARNESS
ECM C1
POST CAT OXYGEN RETURN
POST CAT OXYGEN SUPPLY
PRE CAT OXYGEN SUPPLY
PRE CAT OXYGEN RETURN
SENSOR SUPPLY 2
POST CAT TEMPERATURE SIGNAL
PRE CAT TEMPERATURE SIGNAL
SENSOR SUPPLY 2
IGNITION CASE GND
INTAKE MANIFOLD AIR PRESSURE/TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
ECM CA
SENSOR SUPPLY 1
SENSOR RETURN 1
IMP SIGNAL
IMT SIGNAL
CRANKSHAFT SPEED POSITION SIGNAL
CRANKSHAFT SPEED POSITON RETURN
J1939 SHIELD
J1939 HIGH(+)
J1939 LOW(-)
KEYSWITCH
PRE CAT OXYGEN SUPPLY
PRE CAT OXYGEN RETURN
PRE CAT TEMPERATURE SIGNAL
ENG SHUTDOWN LAMP
ENG WARNING LAMP
FSO DRIVER +
ECM GROUND
ECM GROUND
ECM GROUND
ECM GROUND
EGO POST CAT RELAY
EGO PRE CAT POWER UP RELAY LSD
ECM BATTERY SUPPLY +
ECM BATTERY SUPPLY +
ECM BATTERY SUPPLY +
ECM BATTERY SUPPLY +
ECM BATTERY SUPPLY +
THROTTLE POSITION 1 SIGNAL
RUN / STOP SWITCH SIGNAL
SWITCH RET GND
IDLE / RATED SWITCH SIGNAL
ECM CB
RUN ENABLE RETURN
SENSOR RETURN 3
BATTERY CONSERVATION RELAY SUPPLY
POST CAT TEMPERATURE SIGNAL
POST CAT OXYGEN RETURN
POST CAT OXYGEN SUPPLY
F-SERIES THROTTLE BODY
THROTTLE COMMAND SUPPLY
THROTTLE COMMAND RETURN
SENSOR SUPPLY 3
ENGINE OIL RIFLE PRESSURE/TEMPERATURE SENSOR
SENSOR SUPPLY 2
OIL TEMPERATURE SIGNAL
OIL PRESSURE SIGNAL
COOLANT TEMPERATURE SENSOR
SENSOR RETURN 2
ENGINE COOLANT TEMPERATURE SIGNAL
ENGINE ELECTRONIC FUEL VALVE 1
FUEL VALVE COMMAND SUPPLY
FUEL VALVE COMMAND RETURN
FUEL VALVE 1 POSITION SIGNAL
IGNITION MODULE
OUTPUT
INPUT
COIL 1
COIL 2
COIL 3
COIL 4
COIL 5
COIL 6
GND
IGNITION TIMING ADJUST SIGNAL
IGNITION TIMING ADJUST RETURN
CAMSHAFT POSITION SENSOR

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SCHEMATIC, ENGINE INTERFACE
GTA855E w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

AUTO CAD

DATE: 23 JUNE 2016

INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 12OF12

DRAWING NO: A042H078

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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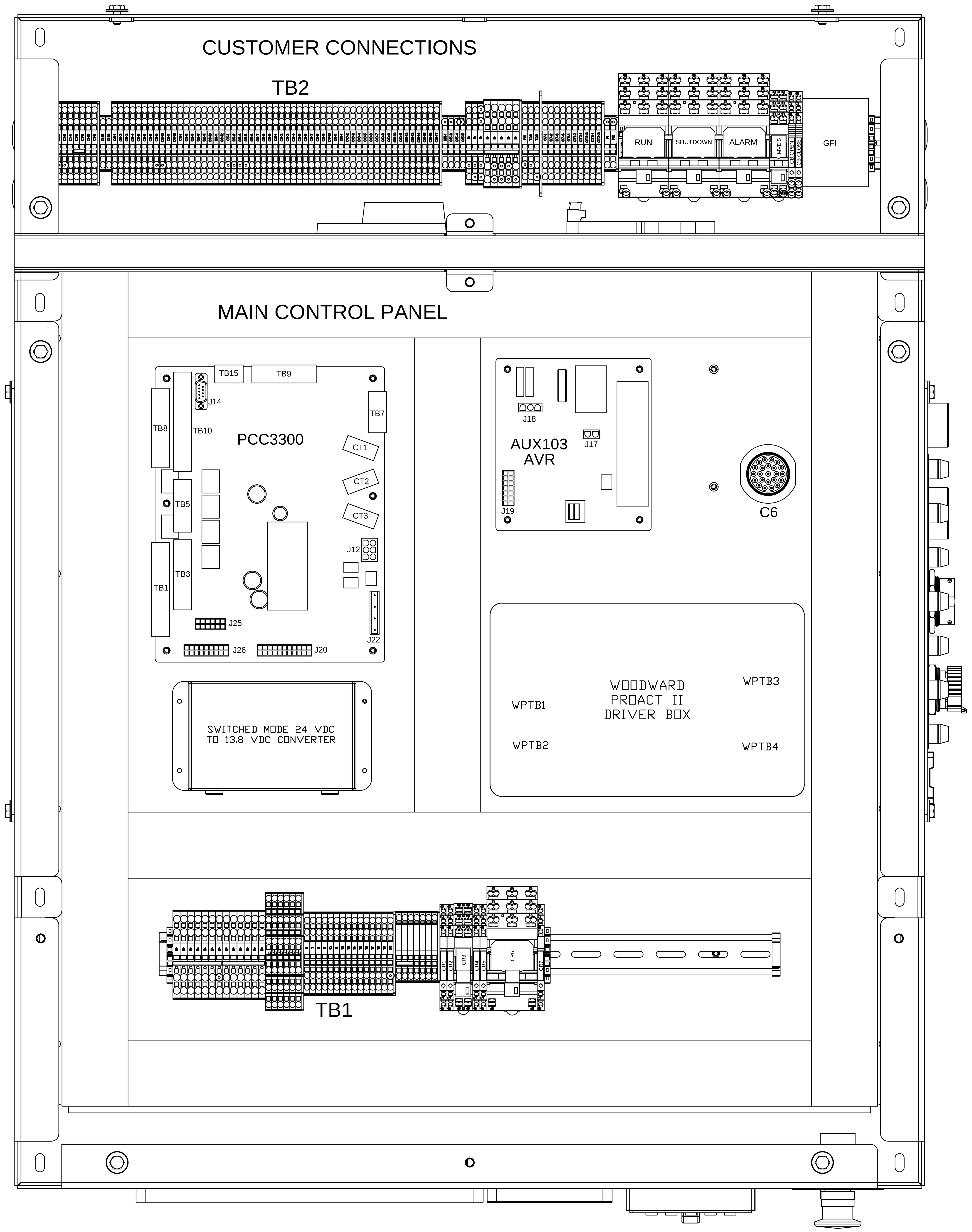
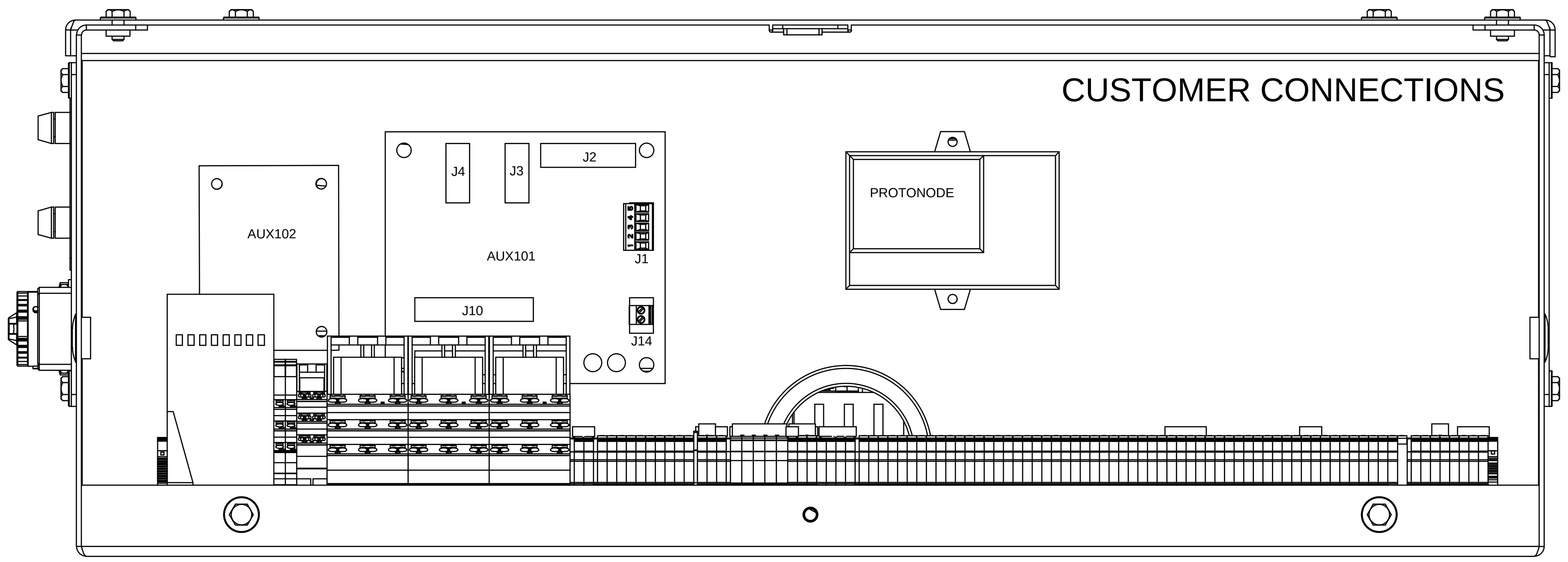
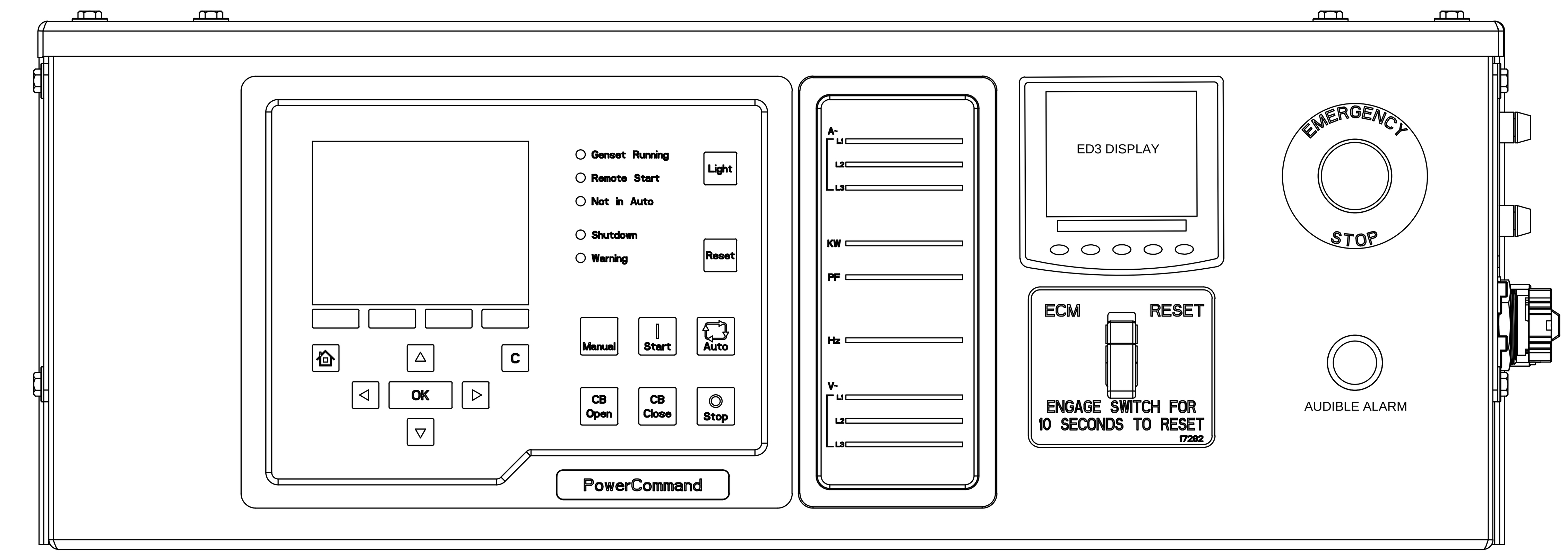
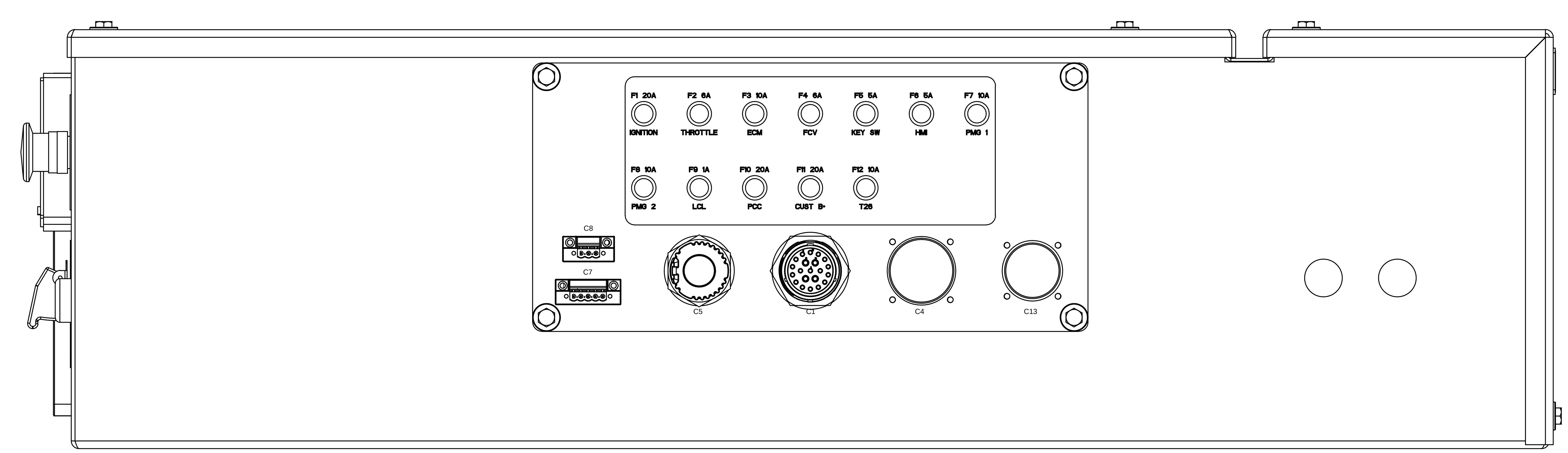
SCHEMATICS, ELECTRICAL
KTA19SLB W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 1 OF 12	DRAWING NO: A042H074
EST WEIGHT:		









REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
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	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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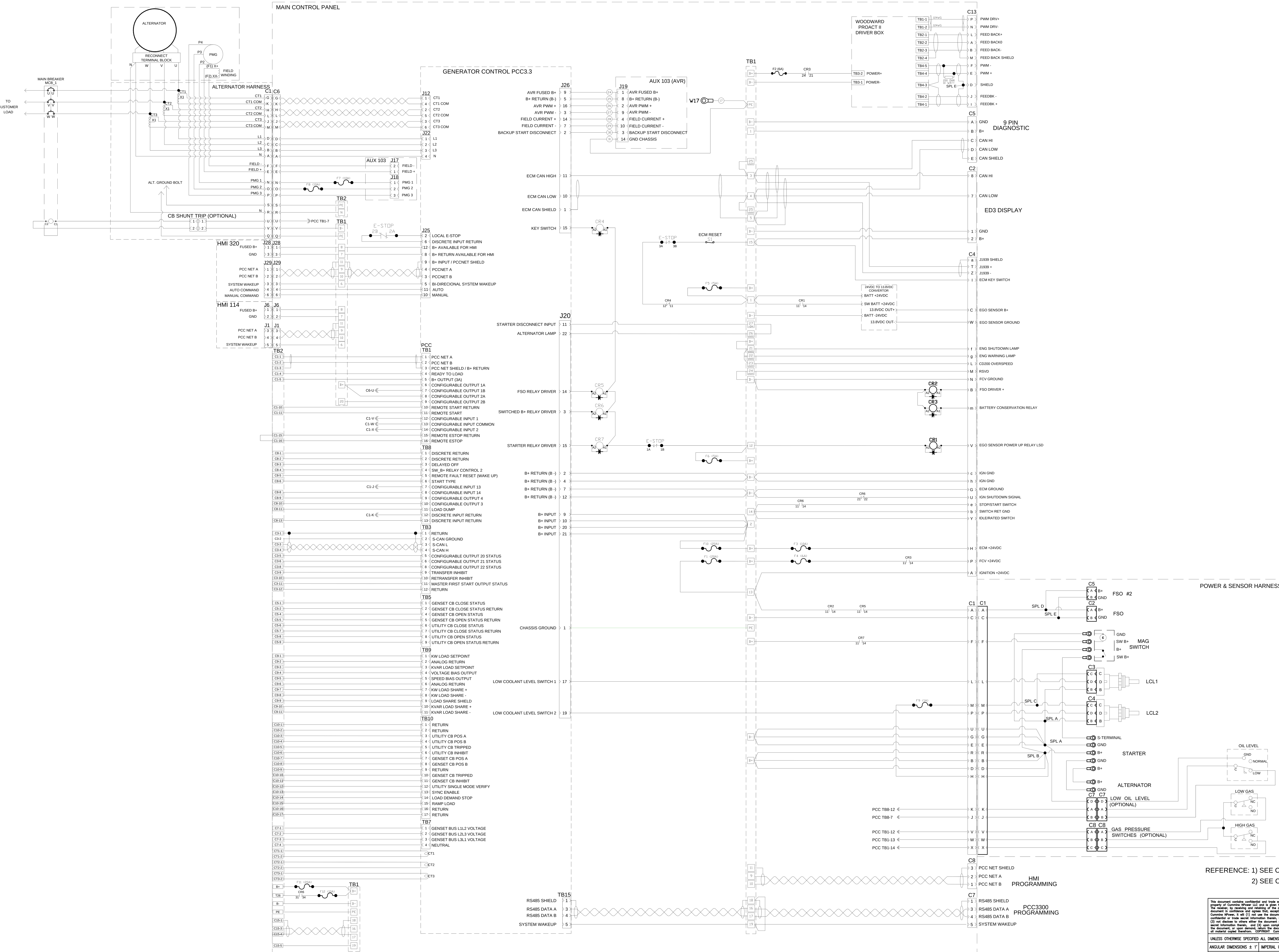
LAYOUT, CONTROL PANEL AND OPTIONS KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 2OF12	DRAWING NO: A042H074
EST WEIGHT:		



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B−	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED B+
2	20A FUSED PCC3300 B+
3	J1939 HIGH(+)
4	J1939 LOW(-)
5	J1939 SHIELD
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	20A FUSED IGNITION/FSO B+
14	IDLE / RATED SIGNAL
15	KEYSWITCH / 9 PIN DIAGNOSTIC B+
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+
21	SHUTDOWN LAMP COIL 1K OHM RESISTOR
22	WARNING LAMP COIL 1K OHM RESISTOR
23	CD200 COIL 1K OHM RESISTOR
24	RSVD COIL 1K OHM RESISTOR
25	J1939 120 OHM TERMINATING RESISTOR
26	STARTER DISCONNECT 240 OHM RESISTOR
27	1A, 1kV DIODE

CR1 = EGO PRE CAT POWER UP RELAY LSD
CR2 = ECM FSO RELAY
CR3 = BATTERY CONSERVATION RELAY
CR4 = KEYSWITCH RELAY
CR5 = PCC FSO RELAY
CR6 = RUN RELAY
CR7 = START RELAY

F1 = IGNITION 20A
F2 = THROTTLE 6A SLOW ACTING
F3 = ECM 10A
F4 = FCV 6A SLOW ACTING
F5 = KEY SWITCH/ ED3 5A
F6 = RELAYS 5A
F7 = PMG 1 10A
F8 = PMG 2 10A
F9 = LOW COOLANT LEVEL 1A
F10 = PCC3300 20A
F11 = CUSTOMER B+ 20A
F12 = T26 10A

S1 = CONTROLLER RESET

LEGEND

CR# = RELAY COIL
CR# = RELAY CONTACT
10 = TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE
2) SEE CUMMINS DRAWING #4021667-01 FOR ENGINE SIDE WIRING AND INTERFACE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
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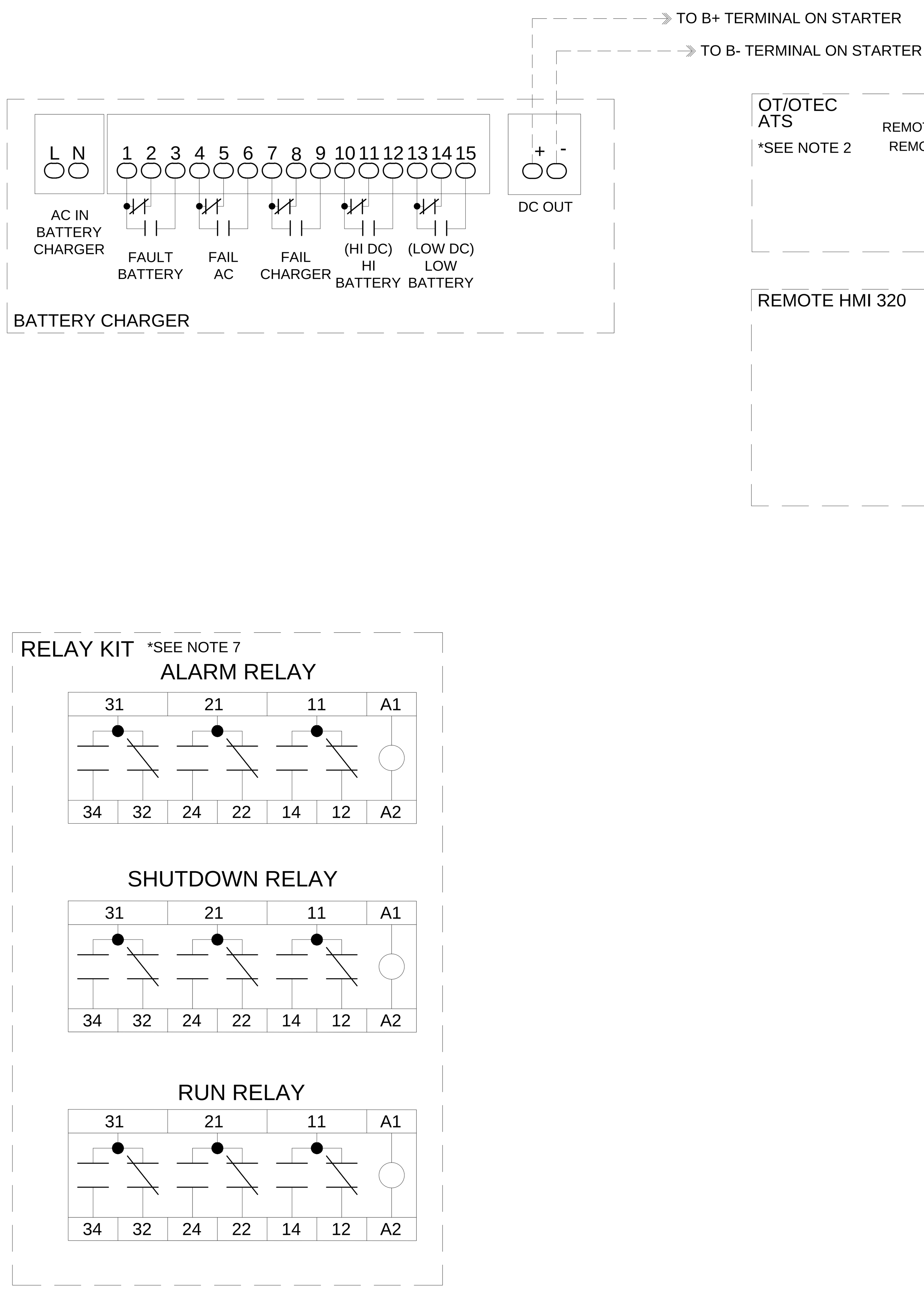
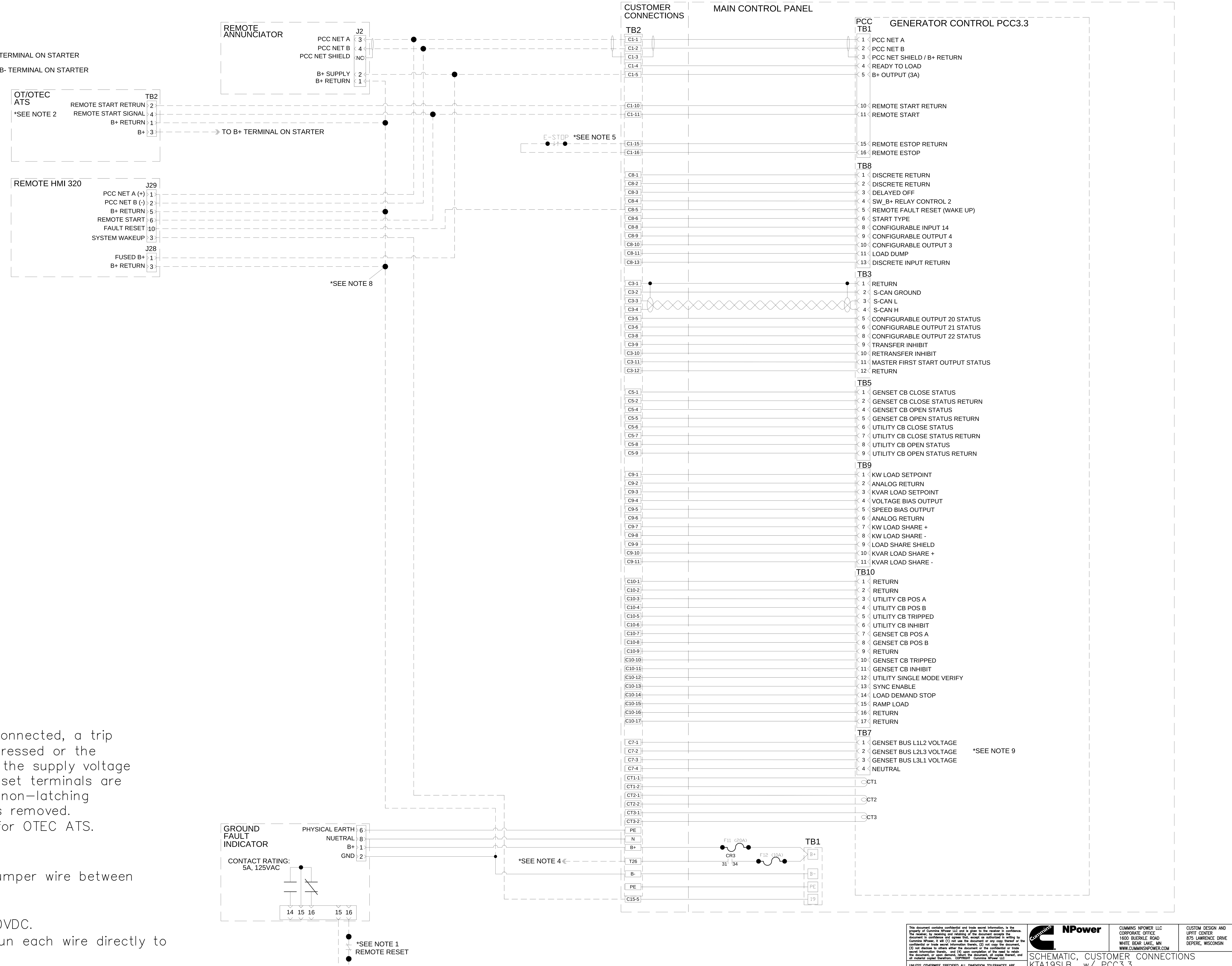
SCHEMATIC, OVERALL
KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 3OF12	DRAWING NO: A042H074
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016





NOTES:

1) When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote-reset terminals are not connected, the module operates in the non-latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E-Stop, remove the jumper wire between terminals C1-15 and C1-16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line-line voltage is greater than 600VAC, power transformers must be used.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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SCHEMATIC, CUSTOMER CONNECTIONS
KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 4OF12	DRAWING NO: A042H074
EST WEIGHT:		

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

THIS DRAWING IS FOR REFERNCE ONLY.
REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA

   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S-CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3-1 AT ONLY ONE END OF EACH S-CAN NETWORK BUS.

   THE CABLE SHALL MEET SAE J1939-11 STANDARDS AND HAVE A MAX LENGTH OF 200M.

   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.

   REFER TO INSTALLATION MANUAL FOR DETAILS.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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SCHEMATIC, PARALLELING, ISO BUS, GEN-GEN KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 5 OF 12	DRAWING NO: A042H074
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005; FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015; FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2; FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4; FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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SCHEMATIC, PARALLELING, UTILITY SINGLE
KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 6OF12	DRAWING NO: A042H074
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3–11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	ADDED S–CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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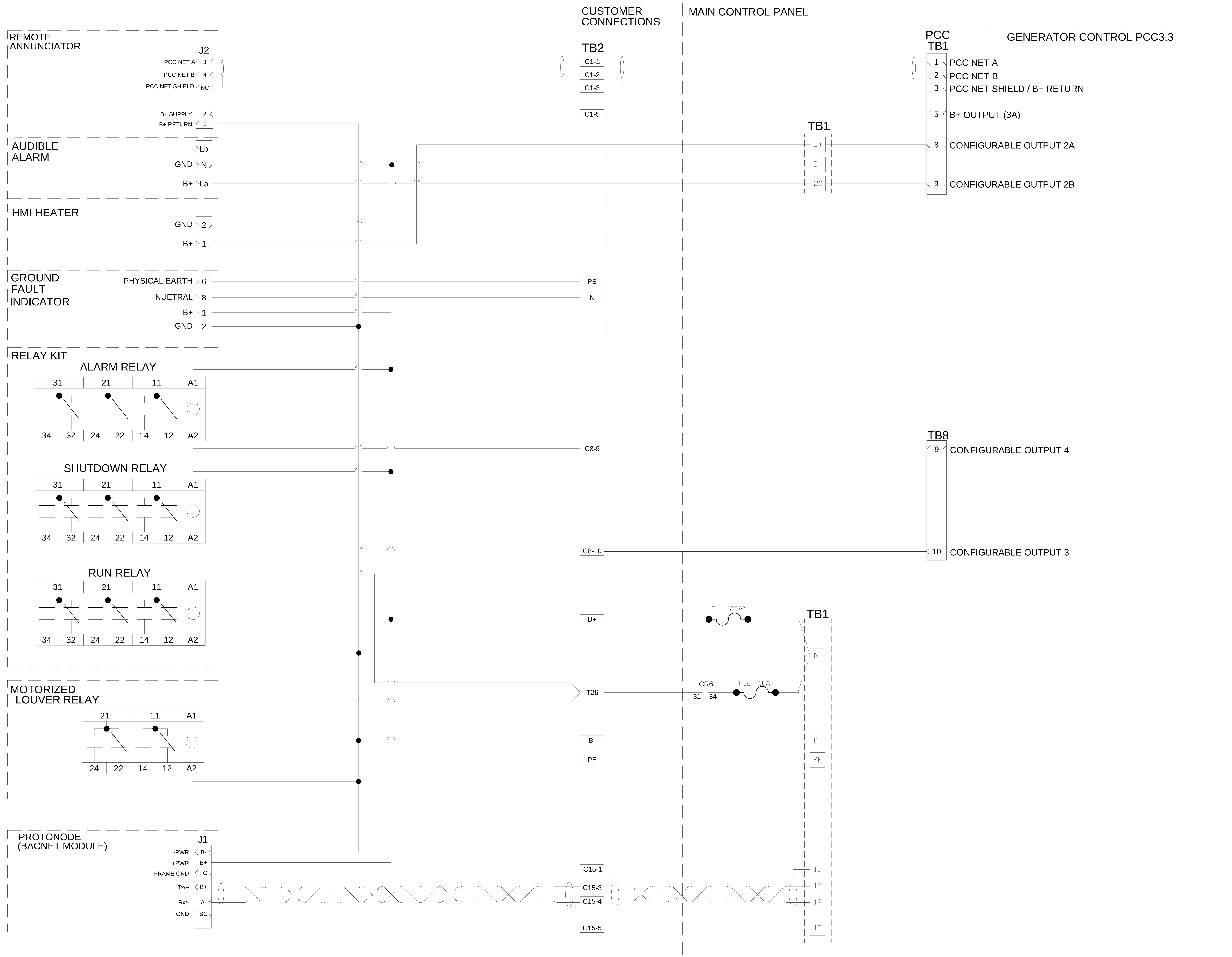
SCHEMATIC, PARALLELING, UTILITY MULTIPLE KTA19SLB W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016	
	AUTO CAD	INIT ECO: 2016–022	
SCALE:	SHEET 7OF12	DRAWING NO: A042H074	
EST WEIGHT:			



REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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SCHEMATIC, OPTIONAL ACCESSORIES
KTA19SLB w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

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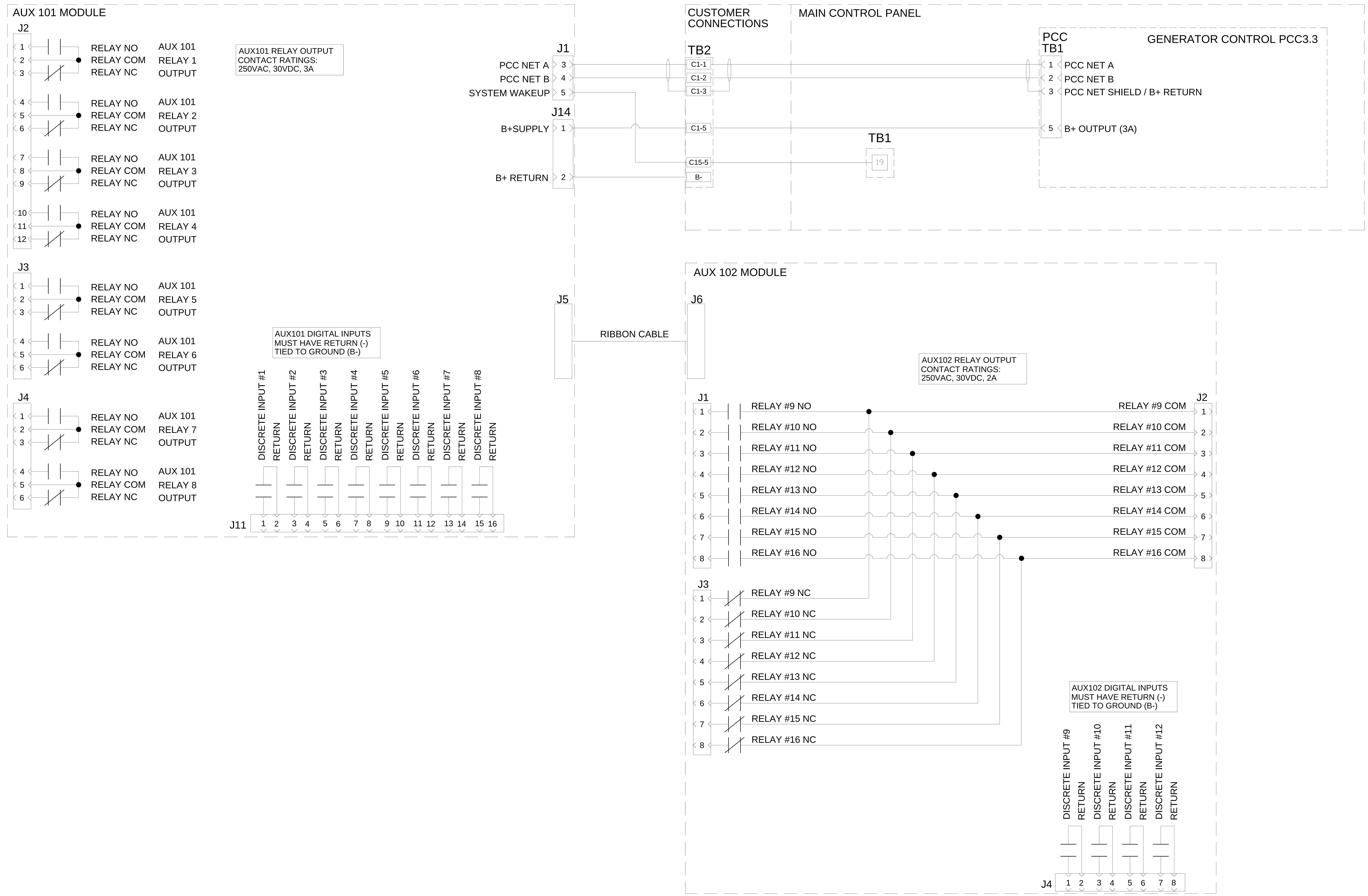
DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 8OF12	DRAWING NO: A042H074
EST WEIGHT:		



NOTES:

1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

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SCHEMATIC, AUX101 & AUX102
KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 23 JUNE 2016
INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 9OF12
DRAWING NO: A042H074

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

MAIN CONTROL PANEL

ALTERNATOR

RECONNECT TERMINAL BLOCK

N W V U

P4

P3

PMG

P2

(F1) X+

(F2) XX-

FIELD WINDING

ALTERNATOR HARNESS

C1 C6

FIELD - F F

FIELD + E E

PMG 1 N N

PMG 2 O O

PMG 3 P P

F8 (10A)

F7 (10A)

AUX 103 (AVR)

J17

2 FIELD -

1 FIELD +

J18

1 PMG 1

2 PMG 2

3 PMG 3

J19

AVR FUSED B+ 1

B+ RETURN (B-) 8

AVR PWM + 2

AVR PWM - 9

FIELD CURRENT + 4

FIELD CURRENT - 10

BACKUP START DISCONNECT 3

GND CHASSIS 14

GENERATOR CONTROL PCC3.3

J26

9 AVR FUSED B+

5 B+ RETURN (B-)

16 AVR PWM +

3 AVR PWM -

14 FIELD CURRENT +

7 FIELD CURRENT -

2 BACKUP START DISCONNECT

MAIN BREAKER MCB_1

U U

V V

W W

TO CUSTOMER LOAD

C1 C2

TB1

PE

B-

Q Q

CB SHUNT TRIPS (OPTIONAL)

2 2

1 1

V V

U U

TB1

7 CB'S SHUNT TRIP B+ (OPTIONAL)

ALT. GROUND BOLT

TB2

PE

N

S S

N R R

GFI CONNECTIONS (OPTIONAL)

CT1 X1

CT2 X1

CT3 X1

CT1 G G

CT1 COM K K

CT2 H H

CT2 COM L L

CT3 J J

CT3 COM M M

J12

1 CT1

4 CT1 COM

2 CT2

5 CT2 COM

3 CT3

6 CT3 COM

L1 D D

L2 C C

L3 B B

N A A

J22

1 L1

2 L2

3 L3

4 N

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
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SCHEMATIC, ALTERNATOR, MCB, CT'S
KTA19SLB w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S

AUTO CAD

DRAWN BY: KAK

DATE: 23 JUNE 2016

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SCALE:

EST WEIGHT:

SHEET 10OF12

DRAWING NO: A042H074

MAIN CONTROL PANEL

POWER AND SENSOR HARNESS

GENERATOR CONTROL PCC3.3

TB1

CR2 11 14 ECM FSO RELAY

CR5 11 14 PCC FSO RELAY

CR7 11 14 START RELAY

F1 (20A)

F9 (1A)

C1 C1

C5 "FSO #2"

C2 "FSO"

SPL D

SPL E

GND

SW B+

B+

S TERM

STARTER

S TERM

MOT

J20

LOW COOLANT LEVEL SWITCH 1 17

LOW COOLANT LEVEL SWITCH 2 19

C3 "LCL1"

C4 "LCL2"

SPL C

SPL A

SPL A

SPL B

ENGINE ALTERNATOR

+ -

BATTERY

TB8

INPUT RETURN 12

LOW OIL LEVEL SIGNAL 7

C7 C7 LOW OIL LEVEL (OPTIONAL)

OIL LEVEL

GND

NORMAL

C

LOW

LOW GAS

NC

C

NO

TB1

LOW GAS PRESSURE SIGNAL 12

INPUT COMMON 13

HIGH GAS PRESSURE SIGNAL 14

C8 C8 GAS PRESSURE SWITCHES (OPTIONAL)

HIGH GAS

NC

C

NO

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THIRD ANGLE PROJECTION

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SCHEMATIC, POWER & SENSOR HARNESS
KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

DATE: 23 JUNE 2016

AUTO CAD

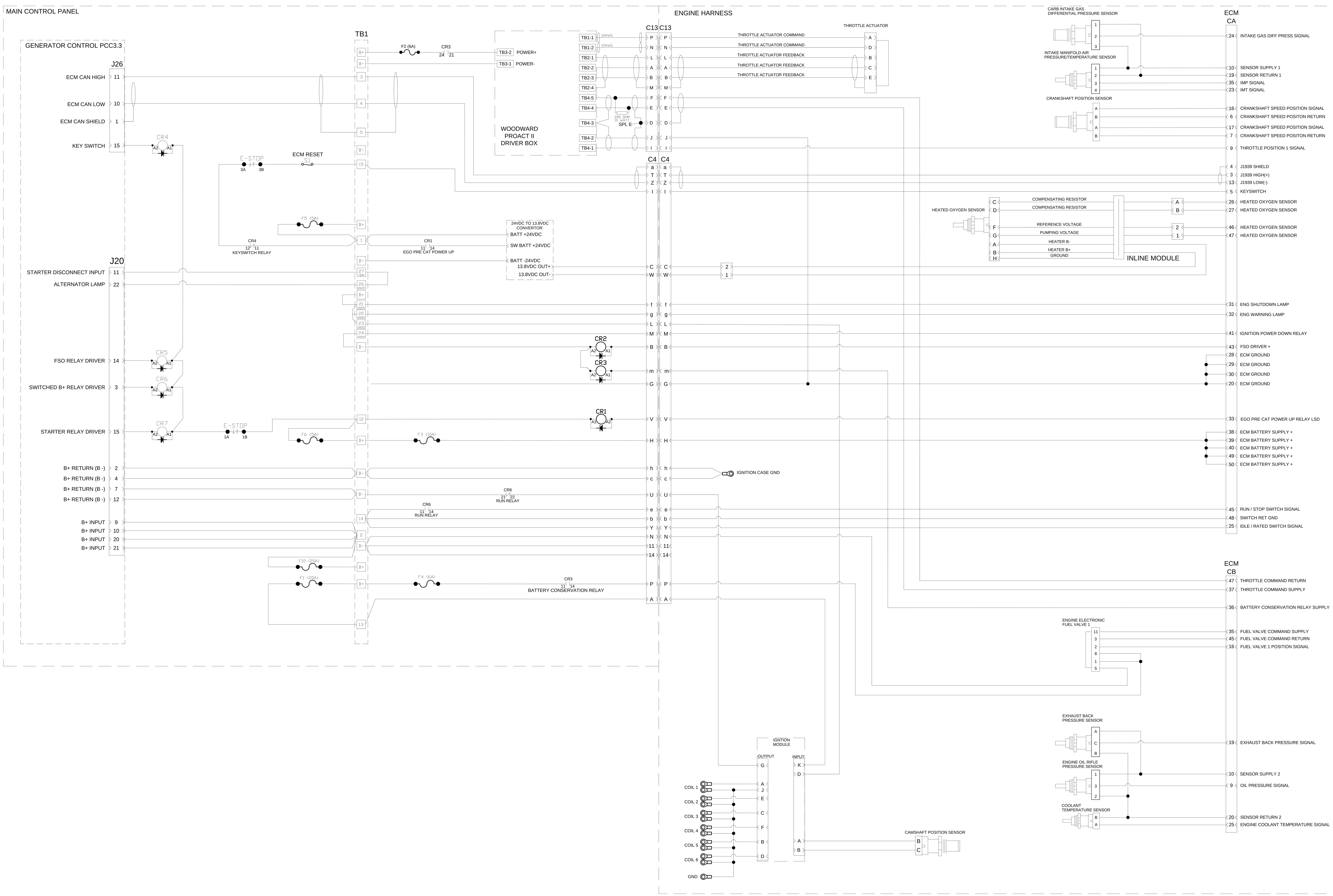
INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 110F12

DRAWING NO: A042H074



MAIN CONTROL PANEL
GENERATOR CONTROL PCC3.3
J26
ECM CAN HIGH
ECM CAN LOW
ECM CAN SHIELD
KEY SWITCH
J20
STARTER DISCONNECT INPUT
ALTERNATOR LAMP
FSO RELAY DRIVER
SWITCHED B+ RELAY DRIVER
STARTER RELAY DRIVER
B+ RETURN (B -)
B+ INPUT
TB1
E-STOP
ECM RESET
KEYSWITCH RELAY
EGO PRE CAT POWER UP
24VDC TO 13.8VDC CONVERTOR
BATT +24VDC
SW BATT +24VDC
BATT -24VDC
13.8VDC OUT+
13.8VDC OUT-
RUN RELAY
BATTERY CONSERVATION RELAY
WOODWARD PROACT II DRIVER BOX
POWER+
POWER-
ENGINE HARNESS
THROTTLE ACTUATOR
THROTTLE ACTUATOR COMMAND
THROTTLE ACTUATOR FEEDBACK
IGNITION CASE GND
IGNITION MODULE
OUTPUT
INPUT
COIL 1
COIL 2
COIL 3
COIL 4
COIL 5
COIL 6
GND
CAMSHAFT POSITION SENSOR
CARB INTAKE GAS DIFFERENTIAL PRESSURE SENSOR
INTAKE MANIFOLD AIR PRESSURE/TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
HEATED OXYGEN SENSOR
COMPENSATING RESISTOR
REFERENCE VOLTAGE
PUMPING VOLTAGE
HEATER B-
HEATER B+
GROUND
INLINE MODULE
ENGINE ELECTRONIC FUEL VALVE 1
EXHAUST BACK PRESSURE SENSOR
ENGINE OIL RIFLE PRESSURE SENSOR
COOLANT TEMPERATURE SENSOR
ECM CA
INTAKE GAS DIFF PRESS SIGNAL
SENSOR SUPPLY 1
SENSOR RETURN 1
IMP SIGNAL
IMT SIGNAL
CRANKSHAFT SPEED POSITION SIGNAL
CRANKSHAFT SPEED POSITON RETURN
THROTTLE POSITION 1 SIGNAL
J1939 SHIELD
J1939 HIGH(+)
J1939 LOW(-)
KEYSWITCH
HEATED OXYGEN SENSOR
ENG SHUTDOWN LAMP
ENG WARNING LAMP
IGNITION POWER DOWN RELAY
FSO DRIVER +
ECM GROUND
EGO PRE CAT POWER UP RELAY LSD
ECM BATTERY SUPPLY +
RUN / STOP SWITCH SIGNAL
SWITCH RET GND
IDLE / RATED SWITCH SIGNAL
ECM CB
THROTTLE COMMAND RETURN
THROTTLE COMMAND SUPPLY
BATTERY CONSERVATION RELAY SUPPLY
FUEL VALVE COMMAND SUPPLY
FUEL VALVE COMMAND RETURN
FUEL VALVE 1 POSITION SIGNAL
EXHAUST BACK PRESSURE SIGNAL
SENSOR SUPPLY 2
OIL PRESSURE SIGNAL
SENSOR RETURN 2
ENGINE COOLANT TEMPERATURE SIGNAL

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	ADDED S–CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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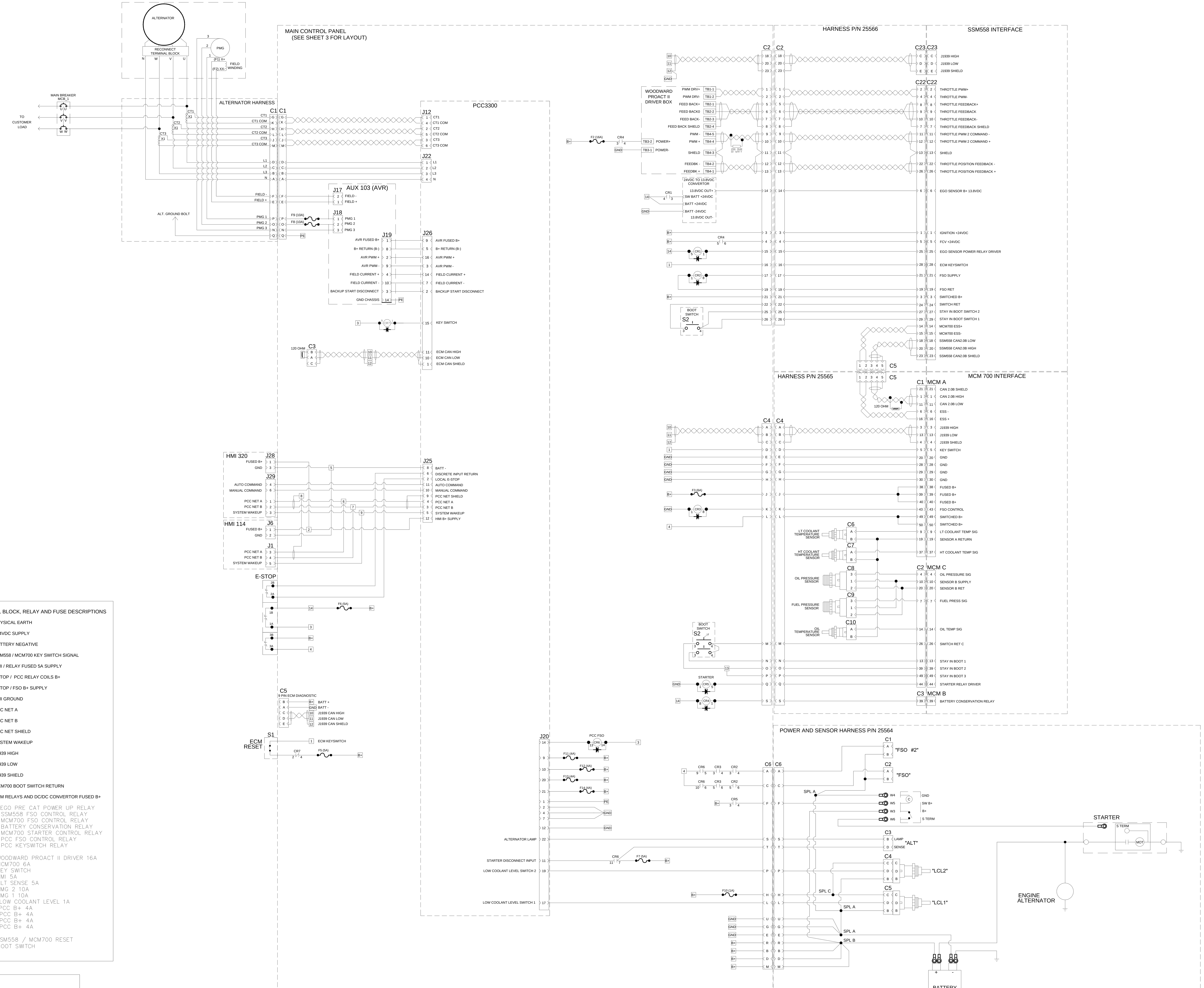
SCHEMATIC, ENGINE INTERFACE KTA19SLB w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 23 JUNE 2016
INIT ECO: 2016–022
SCALE:
EST WEIGHT:
SHEET 12OF12
DRAWING NO: A042H074



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

PE	PHYSICAL EARTH
B+	+24VDC SUPPLY
GND	BATTERY NEGATIVE
1	SSM558 / MCM700 KEY SWITCH SIGNAL
2	HMI / RELAY FUSED 5A SUPPLY
3	ESTOP / PCC RELAY COILS B+
4	ESTOP / FSO B+ SUPPLY
5	HMI GROUND
6	PCC NET A
7	PCC NET B
8	PCC NET SHIELD
9	SYSTEM WAKEUP
10	J1939 HIGH
11	J1939 LOW
12	J1939 SHIELD
13	MCM700 BOOT SWITCH RETURN
14	ECM RELAYS AND DC/DC CONVERTOR FUSED B+

CR1 = EGO PRE CAT POWER UP RELAY
CR2 = SSM558 FSO CONTROL RELAY
CR3 = MCM700 FSO CONTROL RELAY
CR4 = BATTERY CONSERVATION RELAY
CR5 = MCM700 STARTER CONTROL RELAY
CR6 = PCC FSO CONTROL RELAY
CR7 = PCC KEYSWITCH RELAY

F2 = WOODWARD PROACT II DRIVER 16A
F3 = MCM700 6A
F5 = KEY SWITCH
F6 = HMI 5A
F7 = ALT SENSE 5A
F8 = PMG 2 10A
F9 = PMG 1 10A
F10 = LOW COOLANT LEVEL 1A
F11 = PCC B+ 4A
F12 = PCC B+ 4A
F13 = PCC B+ 4A
F14 = PCC B+ 4A

S1 = SSM558 / MCM700 RESET
S2 = BOOT SWITCH

LEGEND

CR# = RELAY COIL
CR# = RELAY CONTACT
10 = TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC3300 SCHEMATICS AND INTERFACE
2) SEE CUMMINS DRAWING #4970620 FOR ENGINE SIDE WIRING AND INTERFACE
3) USE AEB 15.150 FOR SSM/MCM INFORMATION
4) THESE CONNECTIONS ARE ON A CUMMINS ATS

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SCHEMATIC, CONTROLS INTERFACE
QSK19G MOH W/PCC3300

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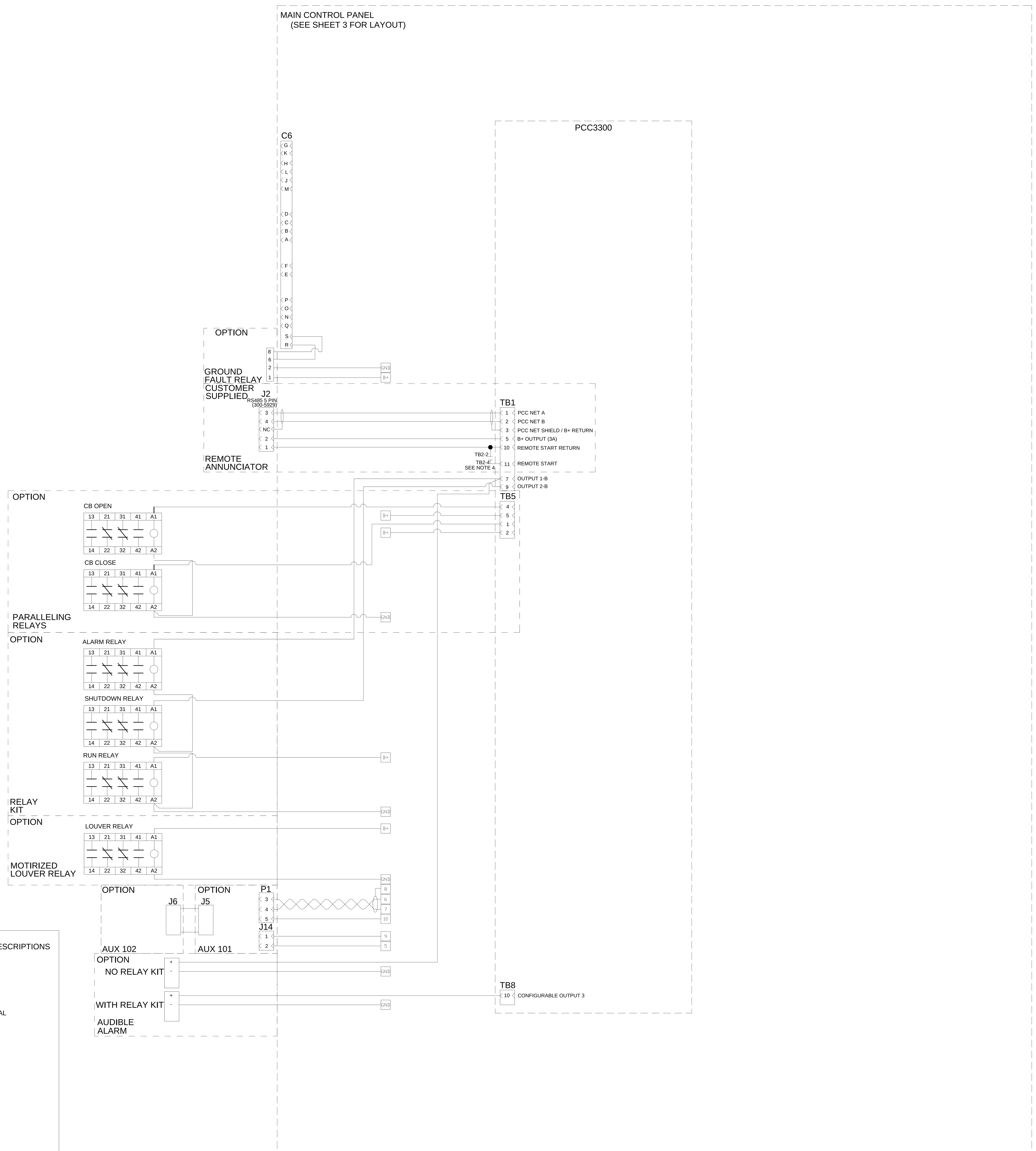
DWG UNITS: INCH/LB/S	DRAWN BY: RMJ	DATE: 23DEC2014
	AUTO CAD	INIT ECO: 2014-864
SCALE:	SHEET 1OF4	DRAWING NO: A042D408
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

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B+	+24VDC SUPPLY
GND	BATTERY NEGATIVE
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6	PCC NET A
7	PCC NET B
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9	SYSTEM WAKEUP
10	J1939 HIGH
11	J1939 LOW
12	J1939 SHIELD
13	MCM700 BOOT SWITCH RETURN
14	ECM RELAYS AND DC/DC CONVERTOR FUSED B+

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC3300 SCHEMATICS AND INTERFACE
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REV	ECO	DESCRIPTION OF REVISION	BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

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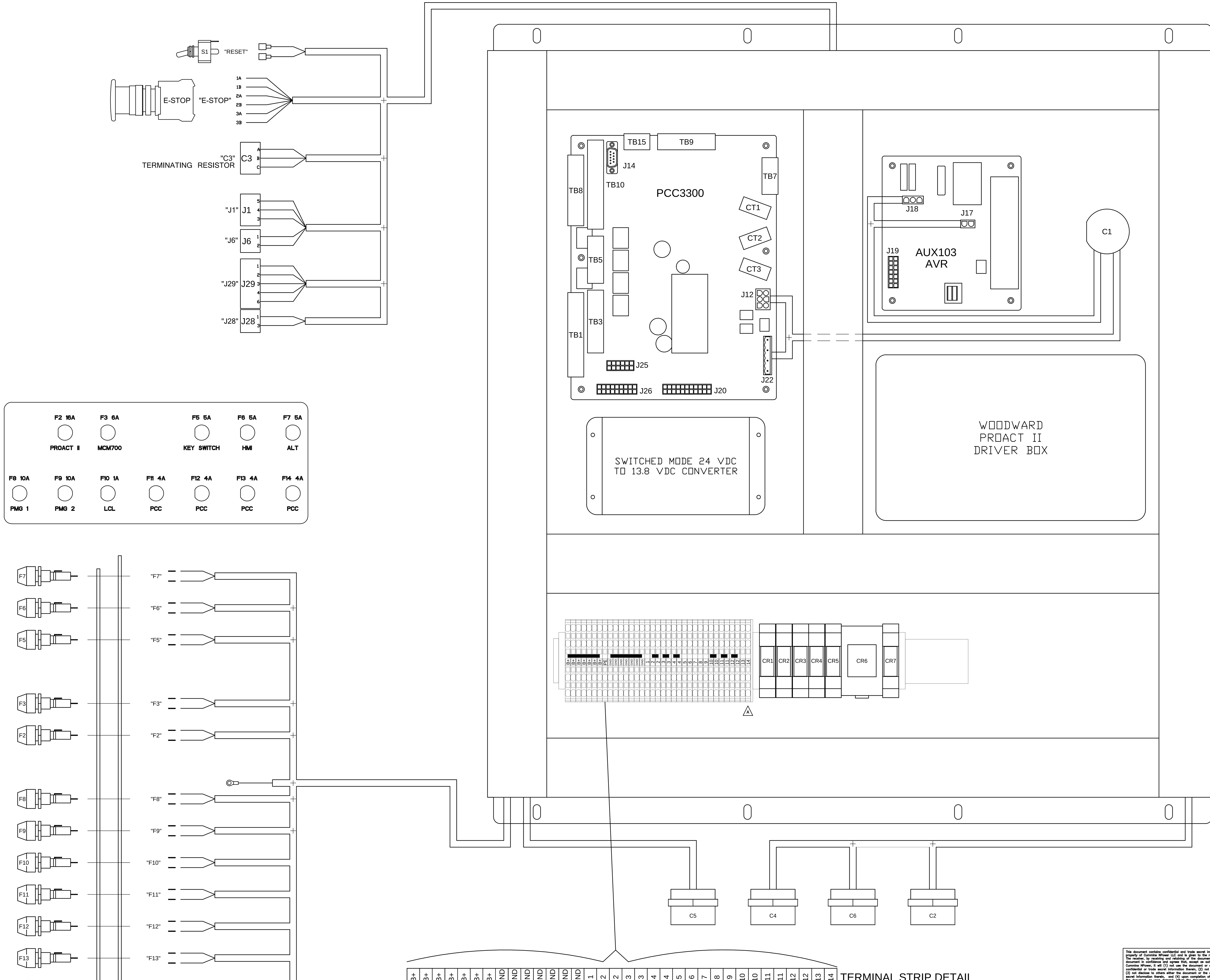
SCHEMATIC, CONTROLS INTERFACE
QSK19G MOH W/ PCC3300

DWG UNITS: INCH/LB/S	DRAWN BY: RMJ	DATE: 23DEC2014
	AUTO CAD	INIT ECO: 2014-864
SCALE:	SHEET 2OF4	DRAWING NO: A042D408
EST WEIGHT:		



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SCHEMATIC, CONTROLS INTERFACE
QSK19G MOH W/ PCC3300

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DWG UNITS: INCH/LB/S	DRAWN BY: RMJ	DATE: 23DEC2014
	AUTO CAD	INIT ECO: 2014-864
SCALE:	SHEET 3OF4	DRAWING NO: A042D408
EST WEIGHT:		

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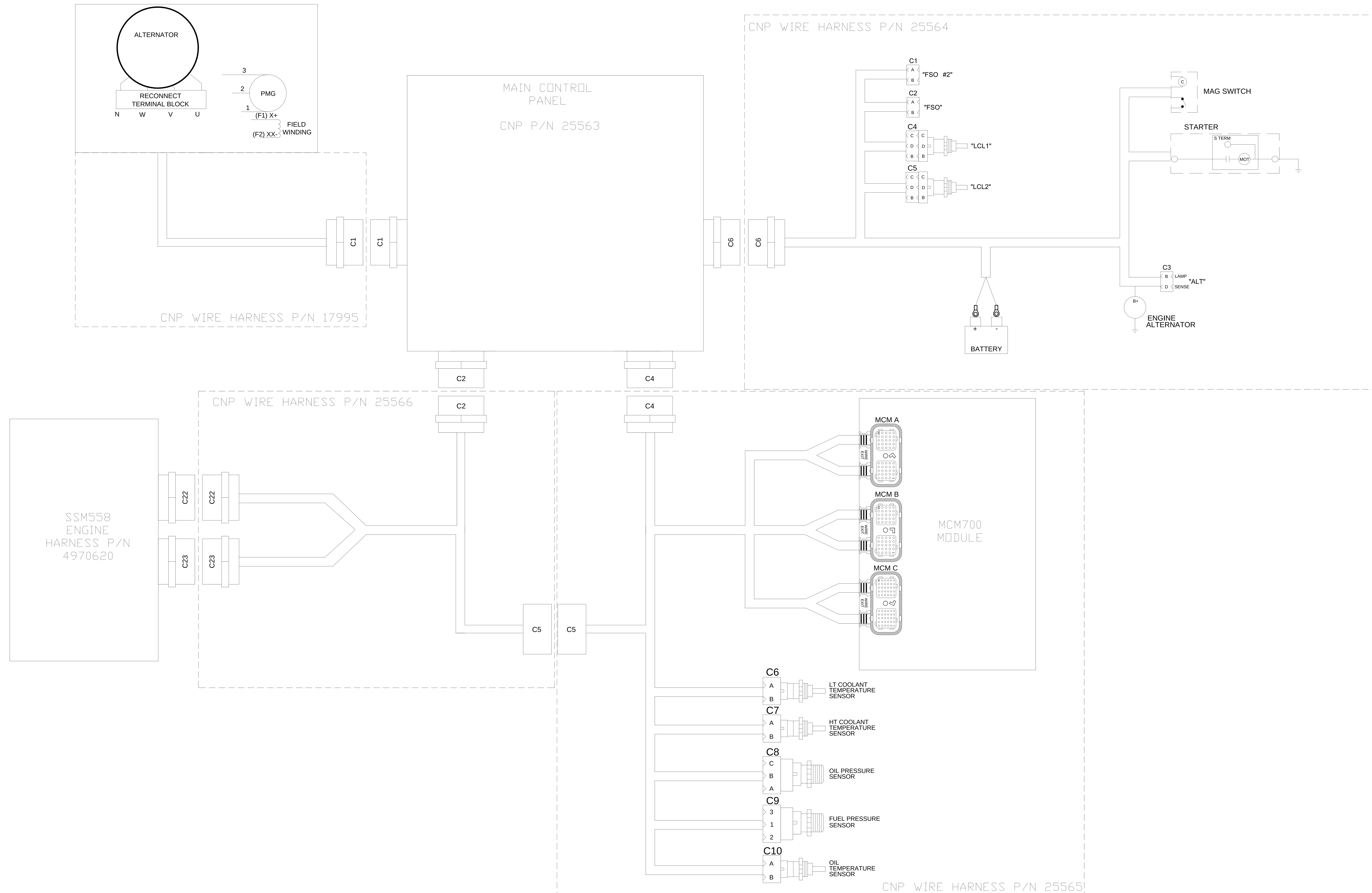

REV	ECO	DESCRIPTION OF REVISION	BY	DATE

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SCHEMATIC, CONTROLS INTERFACE
QSK19G MOH W/ PCC3300

DWG UNITS: INCH/LB/S	DRAWN BY: RMJ	DATE: 23DEC2014
	AUTO CAD	INIT ECO: 2014-864
SCALE:	SHEET 4OF4	DRAWING NO: A042D408
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REV	ECO	DESCRIPTION OF REVISION	BY	DATE
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	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
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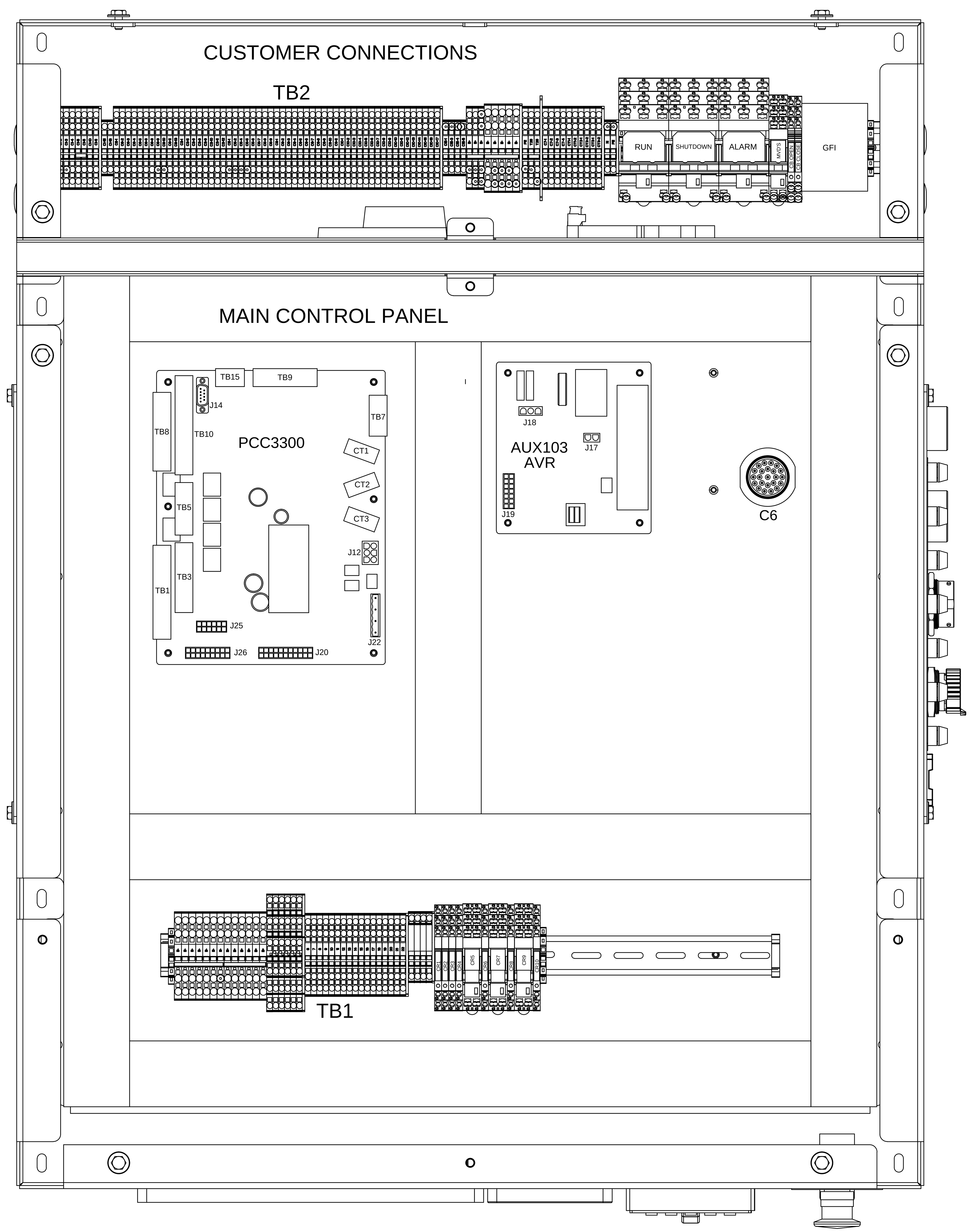
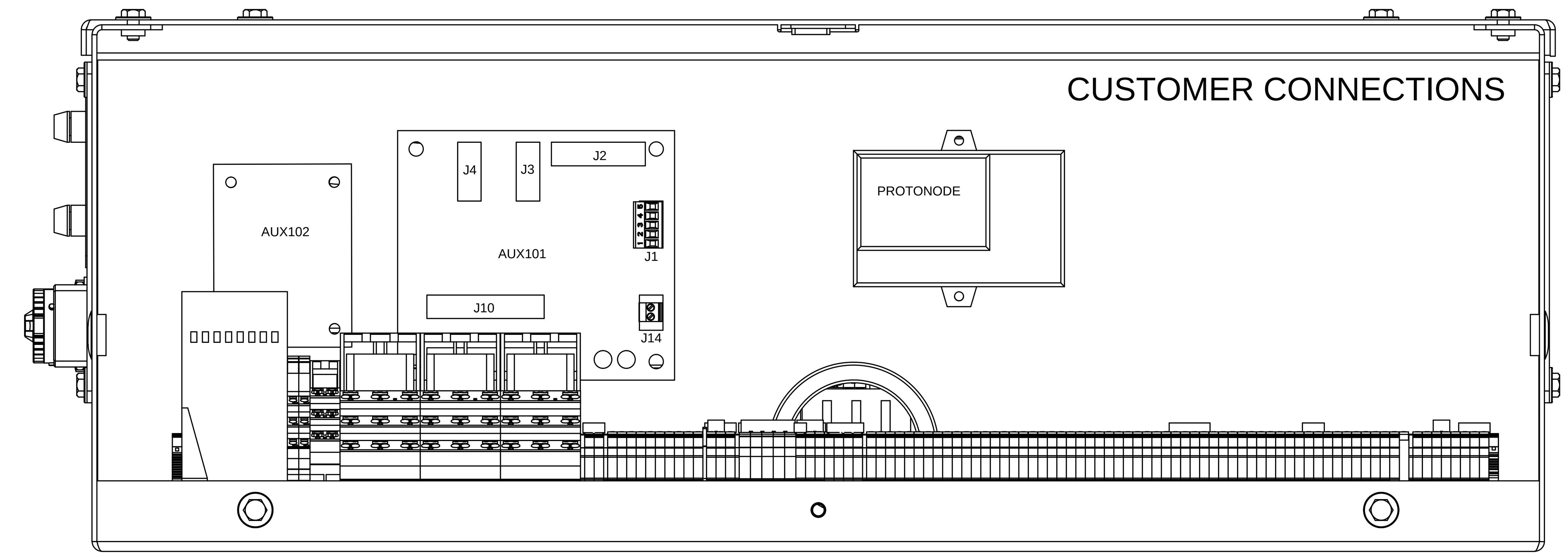
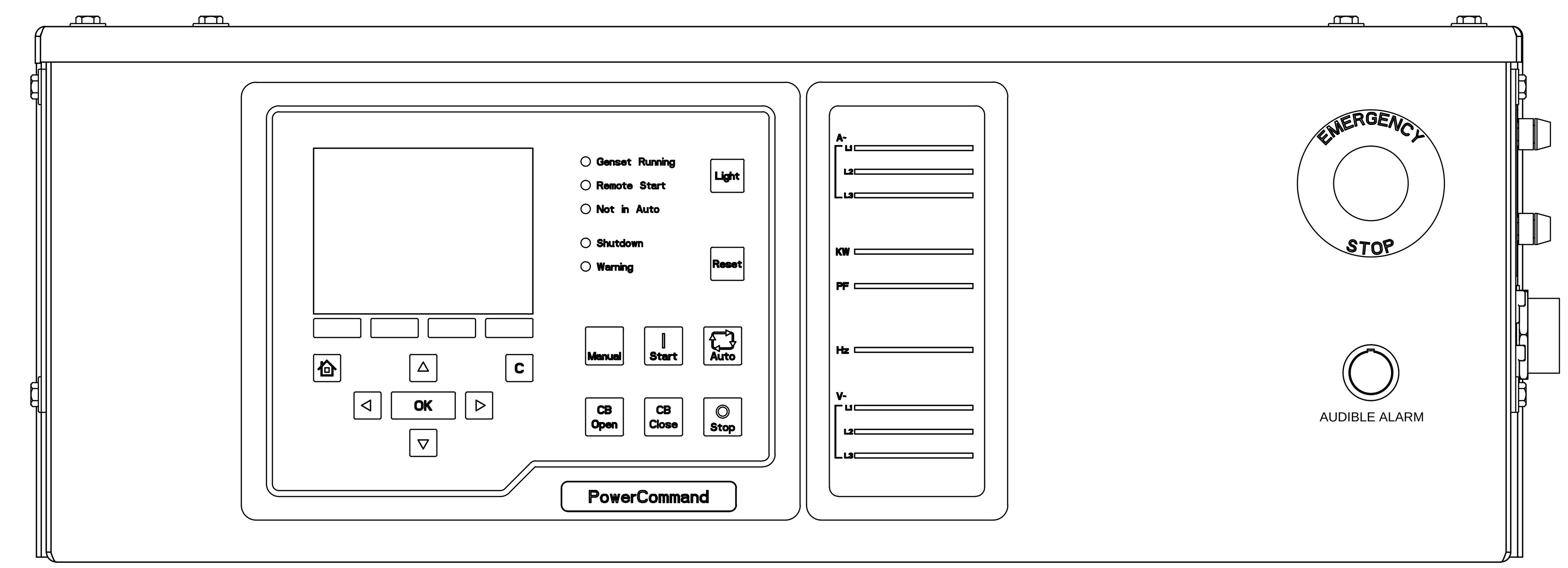
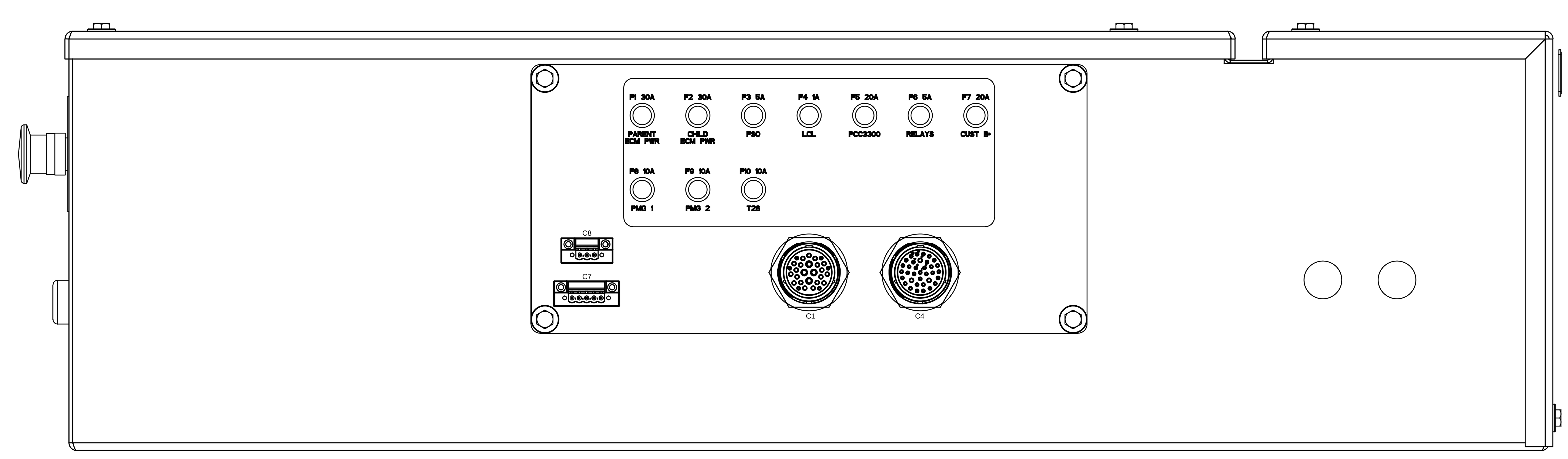
SCHEMATICS, ELECTRICAL
GTA38E W/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 29 AUG 2016
AUTO CAD
INIT ECO: 2016-617
SCALE:
EST WEIGHT:
SHEET 1 OF 12
DRAWING NO: A042F753









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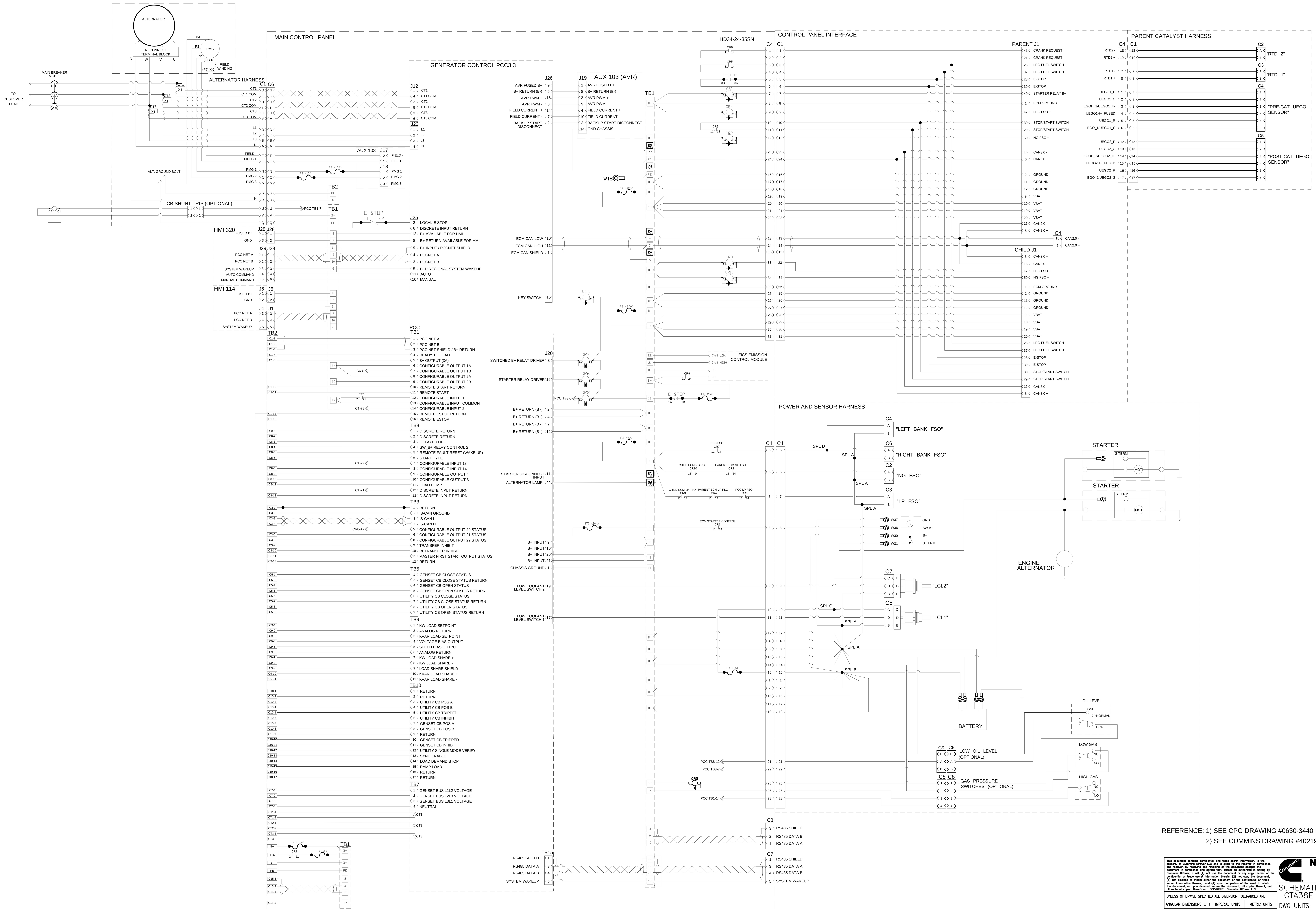
LAYOUT, CONTROL PANEL AND OPTIONS GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK AUTO CAD	DATE: 29 AUG 2016 INIT ECO: 2016-617
SCALE: EST WEIGHT:	SHEET 2OF12	DRAWING NO: A042F753

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B-	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED FSO B+
2	20A FUSED PCC3300 B+
3	J1939 + (CAN 2.0)
4	J1939 - (CAN 2.0)
5	J1939 SHIELD
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	30A FUSED PARENT ECM B+
14	30A FUSED CHILD ECM B+
15	PCC CONFIG INPUT COMMON
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+
21	CAN3.0 +
22	CAN3.0 -
23	CAN 3.0 120 OHM TERMINATING RESISTOR
24	CAN 2.0 120 OHM TERMINATING RESISTOR
25	1A, 1kV DIODE
26	STARTER DISCONNECT 240 OHM RESISTOR

CR1 = ECM STARTER RELAY COIL B+
CR2 = PARENT ECM NG FSO RELAY COIL B+
CR3 = CHILD ECM LPG FSO RELAY COIL B+
CR4 = PARENT ECM LPG FSO RELAY COIL B+
CR5 = LOW NG PRESSURE RELAY COIL GND
CR6 = PCC START RELAY COIL GND
CR7 = PCC RUN RELAY COIL GND
CR8 = PCC LPG FSO RELAY COIL GND
CR9 = PCC KEYSWITCH RELAY COIL GND
CR10 = CHILD ECM NG FSO RELAY COIL B+

F1 = PARENT ECM 30A B+
F2 = CHILD ECM 30A B+
F3 = FSO'S 5A B+
F4 = LOW COOLANT LEVEL 1A B+
F5 = PCC3300 20A B+
F6 = RELAY COILS 5A B+
F7 = CUSTOMER 20A B+
F8 = PMG 1 10A
F9 = PMG 2 10A
F10 = T26 10A

LEGEND

= RELAY COIL
= RELAY CONTACT
= TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE
2) SEE CUMMINS DRAWING #4021936-02 FOR ENGINE SIDE WIRING AND INTERFACE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
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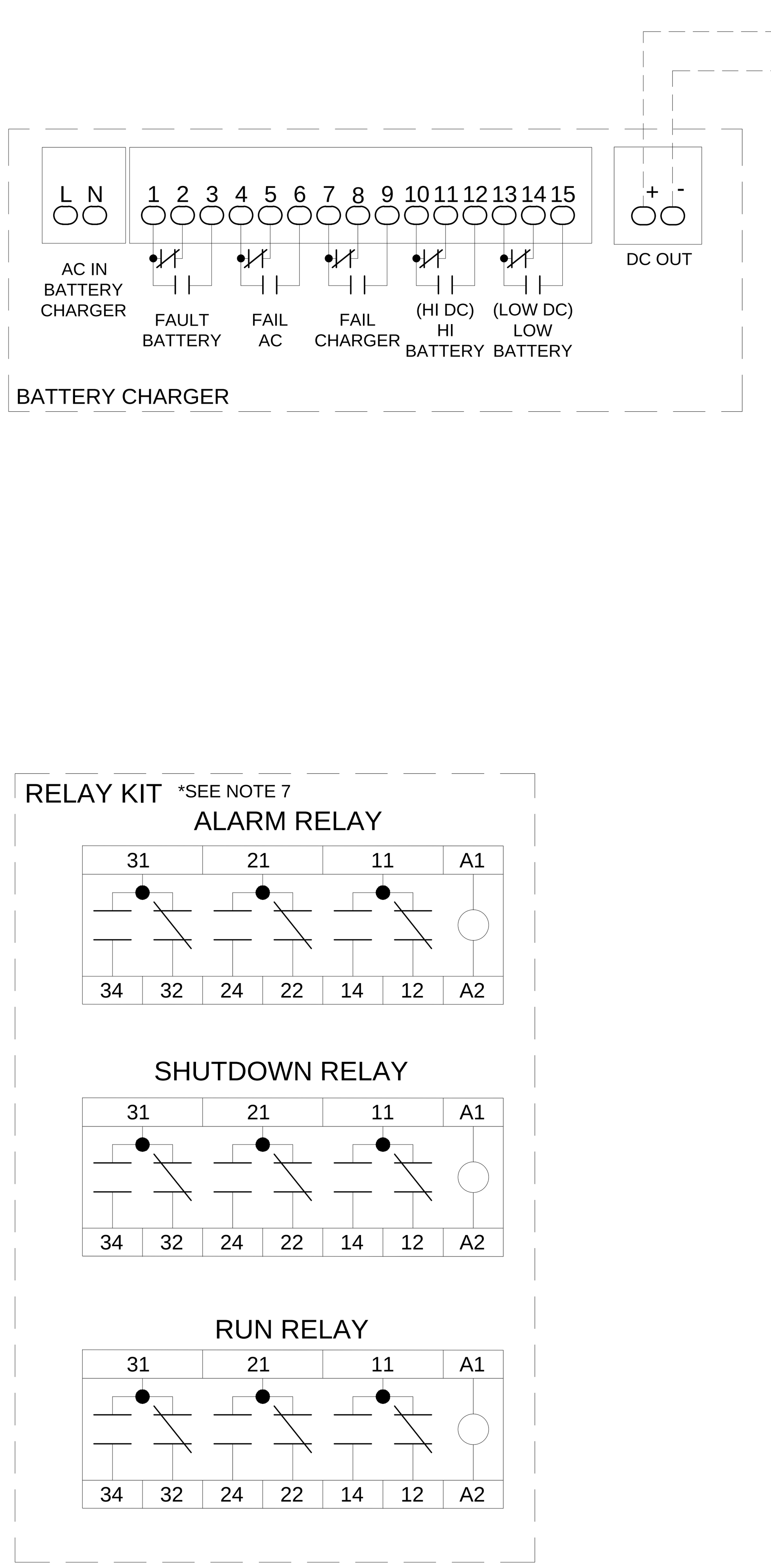
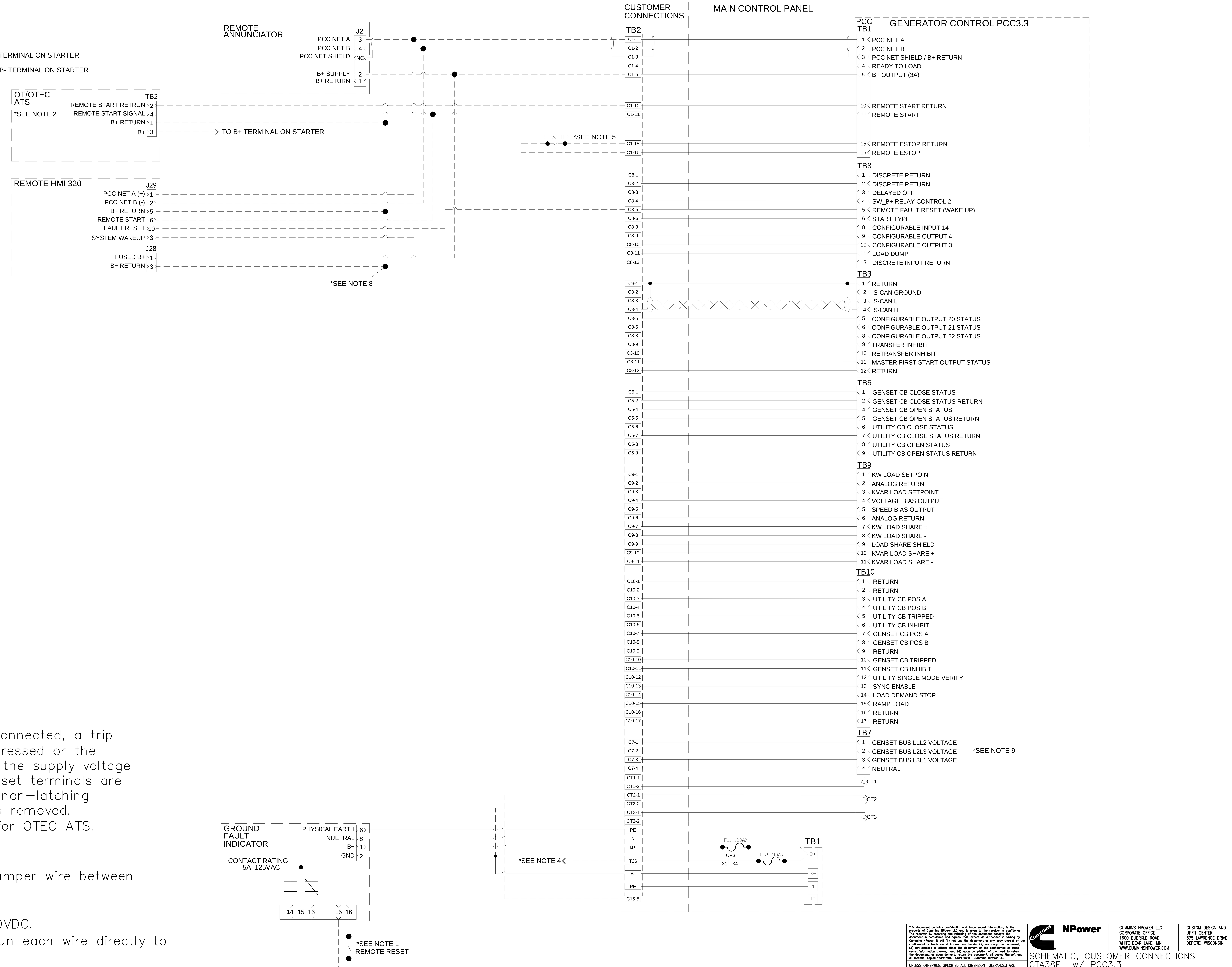
SCHEMATIC, OVERALL
GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 29 AUG 2016
	AUTO CAD	INIT ECO: 2016-617
SCALE:	SHEET 3OF12	DRAWING NO: A042F753
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	DATE





NOTES:

1) When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote-reset terminals are not connected, the module operates in the non-latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E-Stop, remove the jumper wire between terminals C1-15 and C1-16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line-line voltage is greater than 600VAC, power transformers must be used.

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SCHEMATIC, CUSTOMER CONNECTIONS
GTA38E w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 4OF12	DRAWING NO: A042F753
EST WEIGHT:		

A	2016-785	DESCRIPTION OF REVISION	BY	DATE
REV	ECO	DESCRIPTION OF REVISION	BY	DATE

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA

   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S-CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3-1 AT ONLY ONE END OF EACH S-CAN NETWORK BUS.

   THE CABLE SHALL MEET SAE J1939-11 STANDARDS AND HAVE A MAX LENGTH OF 200M.

   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.

   REFER TO INSTALLATION MANUAL FOR DETAILS.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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SCHEMATIC, PARALLELING, ISO BUS, GEN-GEN GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016	
	AUTO CAD	INIT ECO: 2016-022	
SCALE:	SHEET 5OF12	DRAWING NO: A042F753	
EST WEIGHT:			

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.


GEN 1 MAIN CONTROL PANEL
GENERATOR CONTROL PCC3.3
CUSTOMER CONNECTIONS
ATS OR DMC
RS RET
RS SIG
TB2
PCC TB1
REMOTE START RETURN 10 C1-10
REMOTE START 11 C1-11
TB5
GENSET CB CLOSE STATUS 1 C5-1
GENSET CB CLOSE STATUS RETURN 2 C5-2
GENSET CB OPEN STATUS 4 C5-4
GENSET CB OPEN STATUS RETURN 5 C5-5
GCB1 CLOSE
GCB1 OPEN
A1 A2
TB10
RETURN 1 C10-1
RETURN 2 C10-2
UTILITY CB POS A 3 C10-3
UTILITY CB POS B 4 C10-4
UTILITY CB TRIPPED 5 C10-5
GENSET CB POS A 7 C10-7
GENSET CB POS B 8 C10-8
RETURN 9 C10-9
GENSET CB TRIPPED 10 C10-10
GENSET CB INHIBIT 11 C10-11
UTILITY SINGLE MODE VERIFY 12 C10-12
SYNC ENABLE 13 C10-13
RETURN 16 C10-16
RETURN 17 C10-17
*SEE NOTE 3
*SEE NOTE 4
EMAX MCB1
*SEE NOTE 1
AUX
'A' STYLE
BELL ALARM
UVR
MOTOR SPRINGS
UTILITY BREAKER
RETURN
UTILITY CB POS A
UTILITY CB POS B
UTILITY CB TRIPPED
TB7
GENSET BUS L1L2 VOLTAGE 1 C7-1
GENSET BUS L2L3 VOLTAGE 2 C7-2
GENSET BUS L3L1 VOLTAGE 3 C7-3
NEUTRAL 4 C7-4
CT1 CT1-1 CT1-2
CT2 CT2-1 CT2-2
CT3 CT3-1 CT3-2
TB1
B+ B-
F7 (20A)
F10 (15A)
CR7
21 24
B+
T26
B-
GCB1 CLOSE 11 14
GCB1 OPEN 11 14
CLOSING
OPENING
FUSE
*SEE NOTE 5
IF LINE-LINE VOLTAGE IS GREATER THAN 600VAC, POWER TRANSFORMERS MUST BE USED.
UTILITY POWER
U V W N
GEN 1
RECONNECT TERMINAL BLOCK
N W V U
X1
EMAX GCB1
*SEE NOTE 1
UTILITY BREAKER
LOAD BUS

NOTES:

1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.
   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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CUSTOM DESIGN AND UPFIT CENTER 875 LAWRENCE DRIVE DEPERE, WISCONSIN

SCHEMATIC, PARALLELING, UTILITY SINGLE GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 29 AUG 2016
	AUTO CAD	INIT ECO: 2016-617
SCALE:	SHEET 6OF12	DRAWING NO: A042F753
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:
1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3–11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA
   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	ADDED S–CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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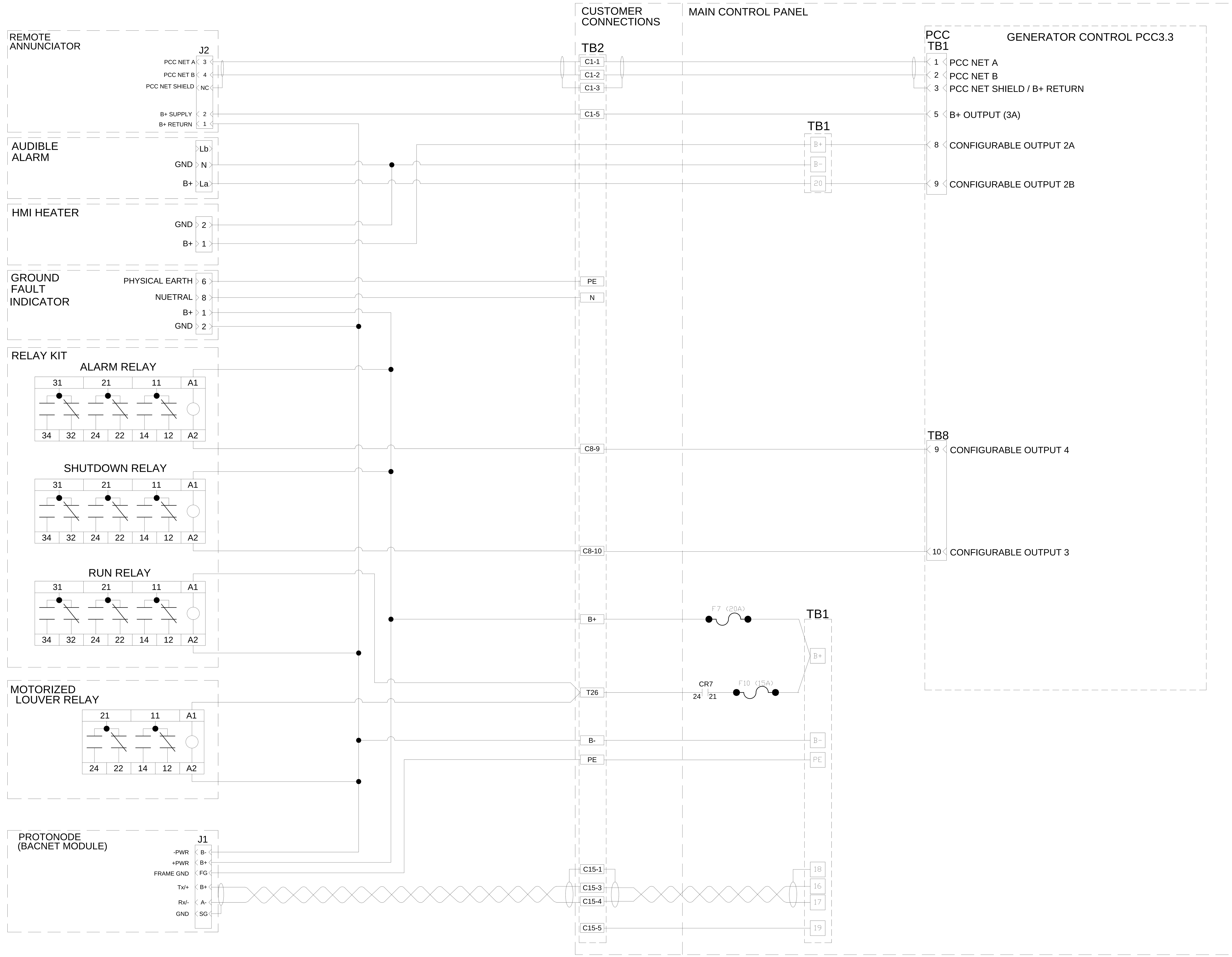
SCHEMATIC, PARALLELING, UTILITY MULTIPLE
GTA38E W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 29 AUG 2016
	AUTO CAD	INIT ECO: 2016–617
SCALE:	SHEET 7OF12	DRAWING NO: A042F753
EST WEIGHT:		



REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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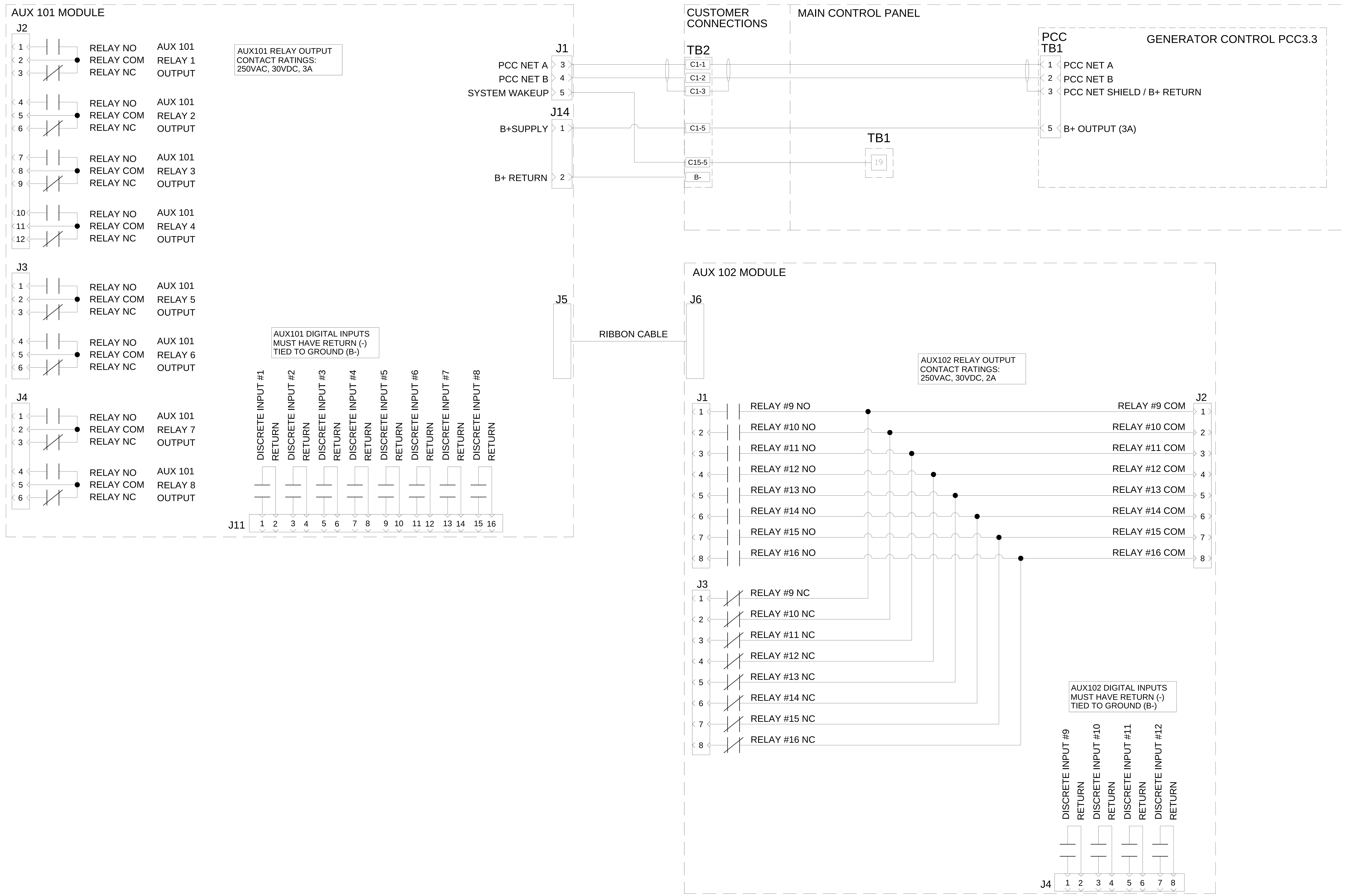
SCHEMATIC, OPTIONAL ACCESSORIES
GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 29 AUG 2016
INIT ECO: 2016-617
SCALE:
EST WEIGHT:
SHEET 8OF12
DRAWING NO: A042F753



NOTES:

1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
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SCHEMATIC, AUX101 & AUX102
GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 29 AUG 2016
	AUTO CAD	INIT ECO: 2016-617
SCALE:	SHEET 9OF12	DRAWING NO: A042F753
EST WEIGHT:		

MAIN CONTROL PANEL

ALTERNATOR

RECONNECT TERMINAL BLOCK

N W V U

P4

P3

PMG

P2

(F1) X+

(F2) XX-

FIELD WINDING

ALTERNATOR HARNESS

C1 C6

FIELD - F F

FIELD + E E

PMG 1 N N

PMG 2 O O

PMG 3 P P

F9 (10A)

F8 (10A)

AUX 103 (AVR)

J17

2 FIELD -

1 FIELD +

J18

1 PMG 1

2 PMG 2

3 PMG 3

J19

AVR FUSED B+ 1

B+ RETURN (B-) 8

AVR PWM + 2

AVR PWM - 9

FIELD CURRENT + 4

FIELD CURRENT - 10

BACKUP START DISCONNECT 3

GND CHASSIS 14

GENERATOR CONTROL PCC3.3

J26

9 AVR FUSED B+

5 B+ RETURN (B-)

16 AVR PWM +

3 AVR PWM -

14 FIELD CURRENT +

7 FIELD CURRENT -

2 BACKUP START DISCONNECT

MAIN BREAKER MCB_1

U U

V V

W W

TO CUSTOMER LOAD

C1 C2

CB SHUNT TRIPS (OPTIONAL)

2 2

1 1

Q Q

V V

U U

TB1

PE

B-

TB1

7 CB'S SHUNT TRIP B+ (OPTIONAL)

ALT. GROUND BOLT

S S

N R R

TB2

PE

N

GFI CONNECTIONS (OPTIONAL)

CT1

X1

CT1 G G

CT1 COM K K

CT2

X1

CT2 H H

CT2 COM L L

CT3

X1

CT3 J J

CT3 COM M M

J12

1 CT1

4 CT1 COM

2 CT2

5 CT2 COM

3 CT3

6 CT3 COM

L1 D D

L2 C C

L3 B B

N A A

J22

1 L1

2 L2

3 L3

4 N

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SCHEMATIC, ALTERNATOR, MCB, CT'S
GTA38E w/ PCC3.3

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ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S

DRAWN BY: KAK | DATE: 29 AUG 2016

AUTO CAD | INIT ECO: 2016-617

SCALE:

EST WEIGHT:

SHEET 10OF12 | DRAWING NO: A042F753

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016


MAIN CONTROL PANEL
POWER AND SENSOR HARNESS
GENERATOR CONTROL PCC3.3
TB1
CR7
PCC FSO RELAY
CR10
CHILD ECM NG FSO
CR2
PARENT ECM NG FSO
START RELAY
F3 (5A)
F4 (1A)
C1
C5
"FSO #2"
C2
"FSO"
SPL D
SPL A
SPL B
SPL C
GND
SW B+
B+
S TERM
STARTER
MOT
C3
"LCL1"
C4
"LCL2"
ENGINE
ALTERNATOR
BATTERY
J20
LOW COOLANT LEVEL SWITCH 1
LOW COOLANT LEVEL SWITCH 2
TB8
INPUT RETURN
LOW OIL LEVEL SIGNAL
LOW GAS PRESSURE SIGNAL
INPUT COMMON
HIGH GAS PRESSURE SIGNAL
C9
LOW OIL LEVEL
(OPTIONAL)
OIL LEVEL
NORMAL
LOW
C8
GAS PRESSURE
SWITCHES (OPTIONAL)
LOW GAS
HIGH GAS
NC
NO

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SCHEMATIC, POWER & SENSOR HARNESS
GTA38E w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
AUTO CAD
DATE: 29 AUG 2016
INIT ECO: 2016-617
SCALE:
EST WEIGHT:
SHEET 11OF12
DRAWING NO: A042F753

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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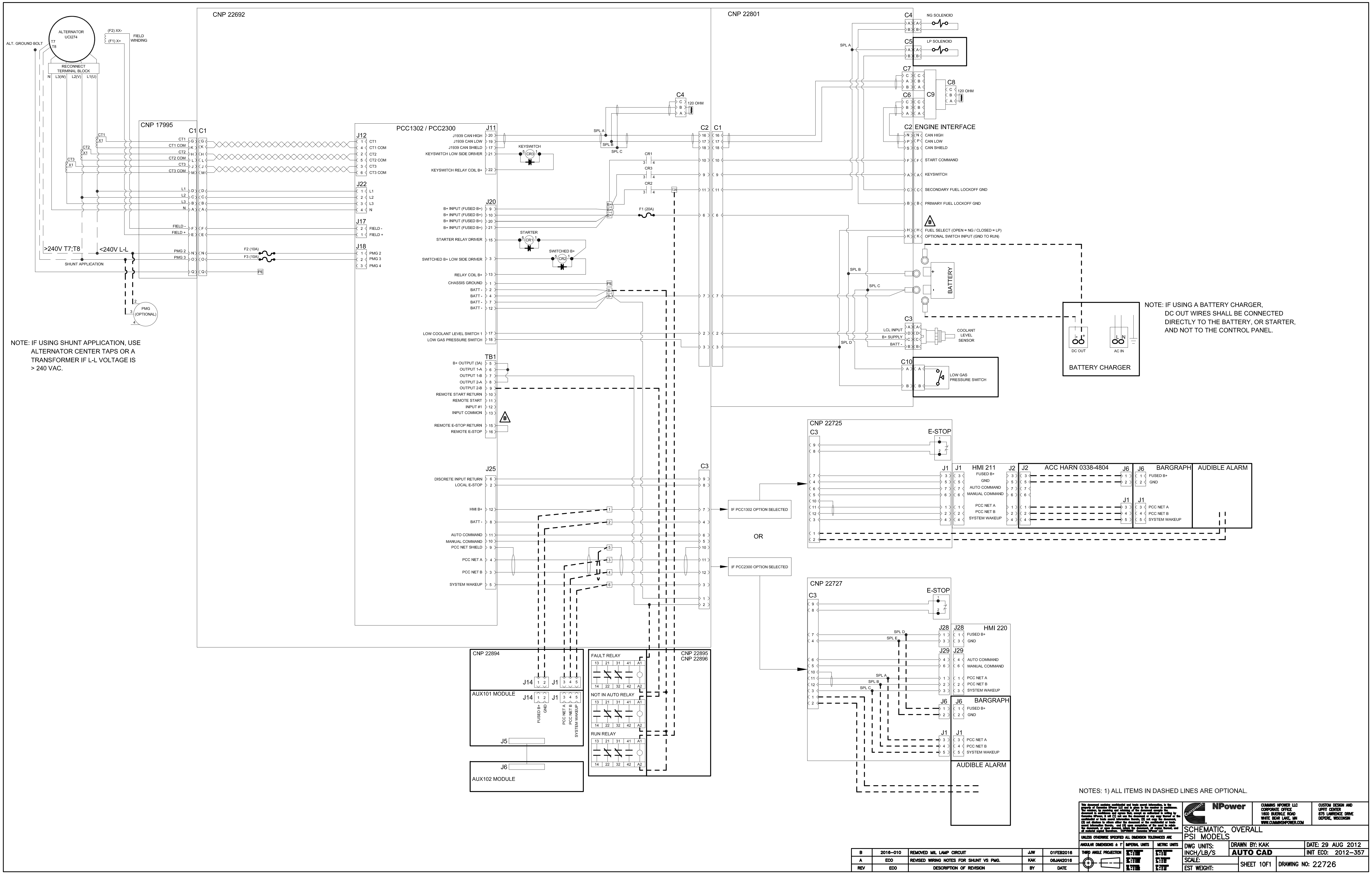
SCHEMATIC, ENGINE INTERFACE GTA38E w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 29 AUG 2016
	AUTO CAD	INIT ECO: 2016–617
SCALE:	SHEET 12OF12	DRAWING NO: A042F753
EST WEIGHT:		


CNP 22692
CNP 22801
CNP 17995
PCC1302 / PCC2300
ALTERNATOR UCI274
RECONNECT TERMINAL BLOCK
ALT. GROUND BOLT
FIELD WINDING
>240V T7;T8
<240V L-L
SHUNT APPLICATION
PMG (OPTIONAL)
NOTE: IF USING SHUNT APPLICATION, USE ALTERNATOR CENTER TAPS OR A TRANSFORMER IF L-L VOLTAGE IS > 240 VAC.
KEYSWITCH
STARTER
SWITCHED B+
F1 (20A)
F2 (10A)
F3 (10A)
120 OHM
NG SOLENOID
LP SOLENOID
ENGINE INTERFACE
CAN HIGH
CAN LOW
CAN SHIELD
START COMMAND
KEYSWITCH
SECONDARY FUEL LOCKOFF GND
PRIMARY FUEL LOCKOFF GND
FUEL SELECT (OPEN = NG / CLOSED = LP)
OPTIONAL SWITCH INPUT (GND TO RUN)
BATTERY
COOLANT LEVEL SENSOR
LOW GAS PRESSURE SWITCH
BATTERY CHARGER
DC OUT
AC IN
NOTE: IF USING A BATTERY CHARGER, DC OUT WIRES SHALL BE CONNECTED DIRECTLY TO THE BATTERY, OR STARTER, AND NOT TO THE CONTROL PANEL.
CNP 22725
E-STOP
HMI 211
ACC HARN 0338-4804
BARGRAPH
AUDIBLE ALARM
IF PCC1302 OPTION SELECTED
OR
IF PCC2300 OPTION SELECTED
CNP 22727
HMI 220
CNP 22894
AUX101 MODULE
AUX102 MODULE
CNP 22895
CNP 22896
FAULT RELAY
NOT IN AUTO RELAY
RUN RELAY
NOTES: 1) ALL ITEMS IN DASHED LINES ARE OPTIONAL.
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SCHEMATIC, OVERALL
PSI MODELS
UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1°
IMPERIAL UNITS
METRIC UNITS
THIRD ANGLE PROJECTION
DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 29 AUG 2012
AUTO CAD
INIT ECO: 2012-357
SCALE:
EST WEIGHT:
SHEET 1OF1
DRAWING NO: 22726
B 2016-010 REMOVED MIL LAMP CIRCUIT JJW 01FEB2016
A ECO REVISED WIRING NOTES FOR SHUNT VS PMG. KAK 06JAN2016
REV ECO DESCRIPTION OF REVISION BY DATE

SHEET #	DESCRIPTION
2	LAYOUT, CONTROL PANEL & OPTIONS
3	SCHEMATIC, OVERALL
4	SCHEMATIC, CUSTOMER CONNECTIONS
5	SCHEMATIC, PARALLELING, ISOLATED BUS, GEN TO GEN
6	SCHEMATIC, PARALLELING, UTILITY SINGLE
7	SCHEMATIC, PARALLELING, UTILITY MULTIPLE
8	SCHEMATIC, OPTIONAL ACCESSORIES
9	SCHEMATIC, OPTIONAL AUX101 & AUX102
10	SCHEMATIC, ALTERNATOR, MCB, CT'S
11	SCHEMATIC, HARNESS, POWER AND SENSOR

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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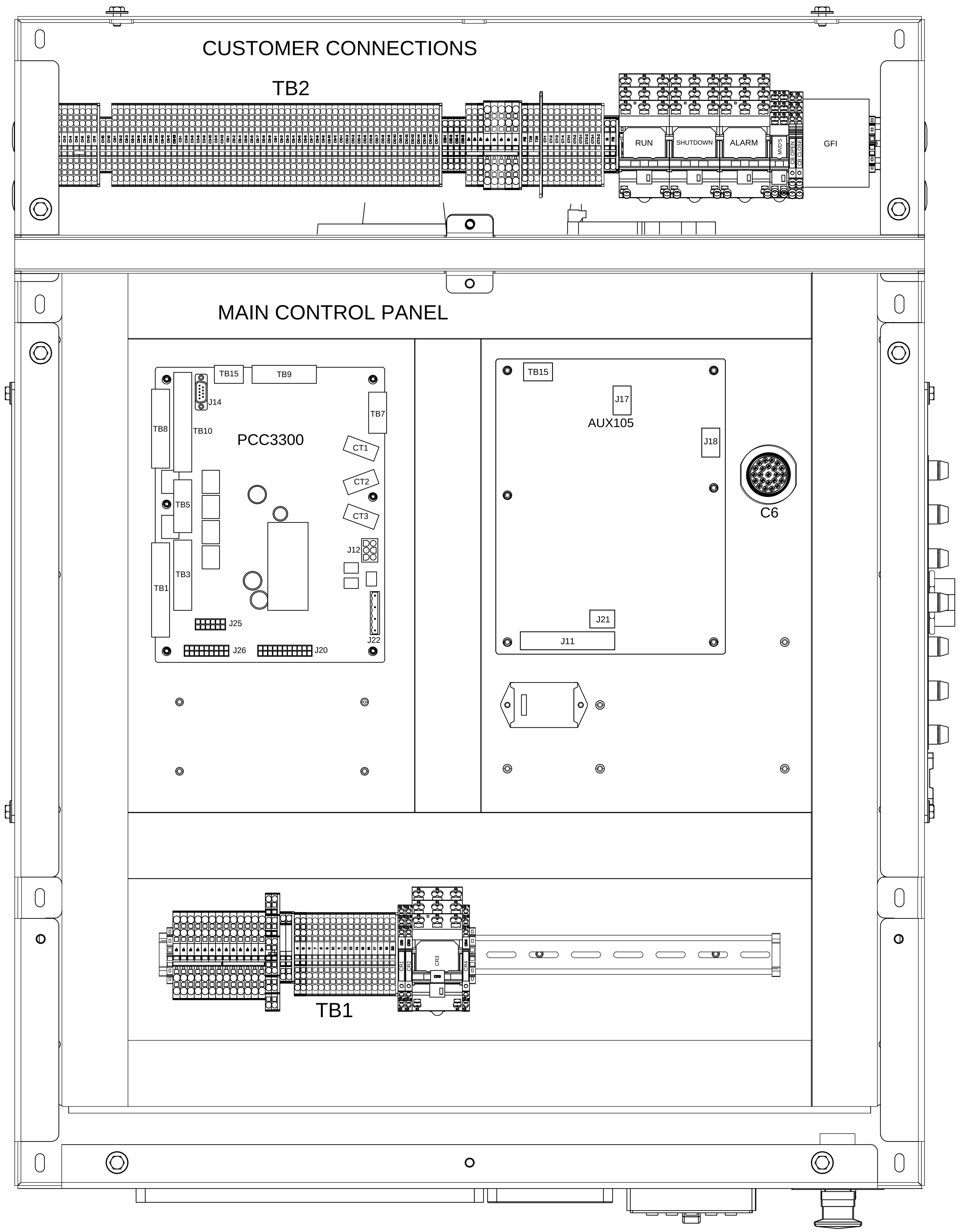
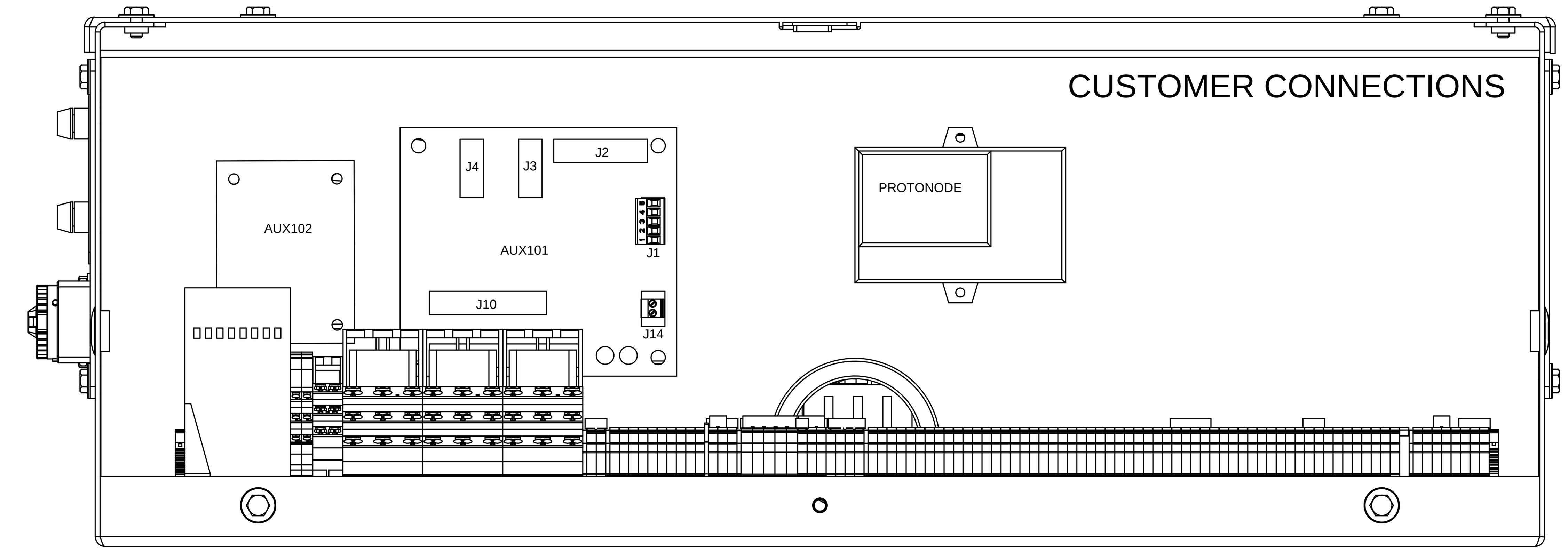
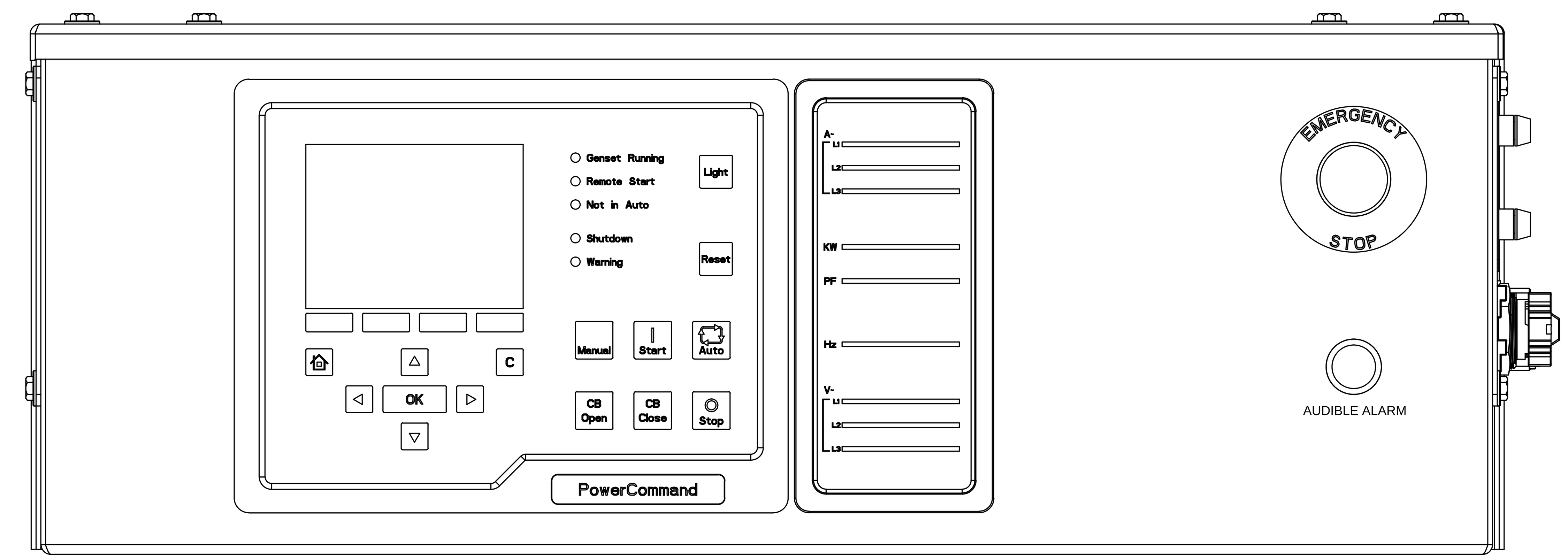
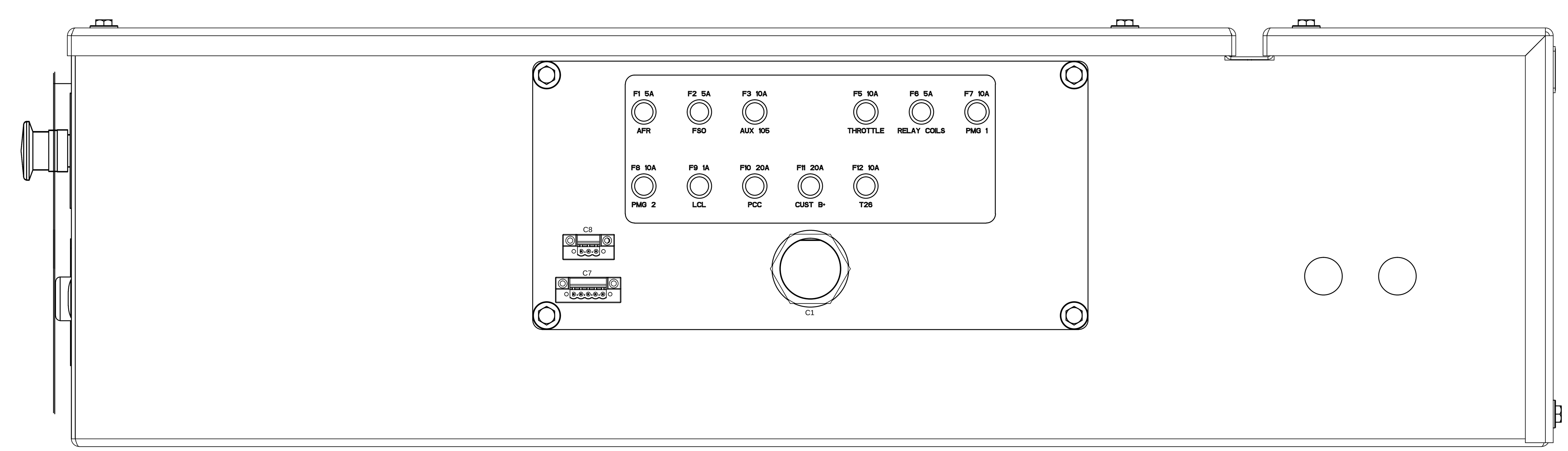
SCHEMATICS, ELECTRICAL
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 1 OF 11	DRAWING NO: A042H089
EST WEIGHT:		









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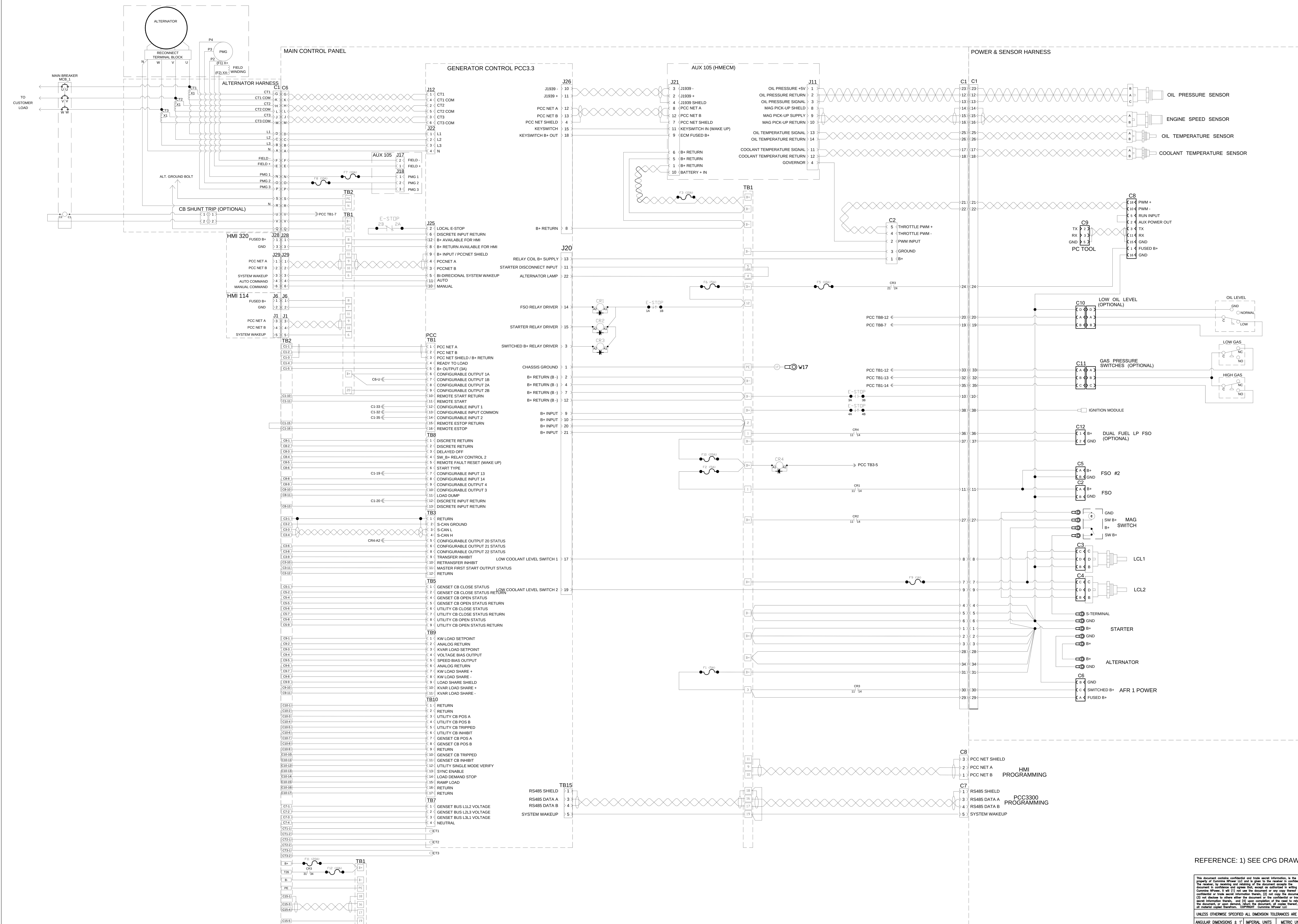
LAYOUT, CONTROL PANEL AND OPTIONS
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 2OF11	DRAWING NO: A042H089
EST WEIGHT:		



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B-	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED FSO B+
2	20A FUSED PCC3300 B+
3	5A FUSED AFR B+
4	STARTER DISCONNECT 240 OHM RESISTOR
5	1A, 1kV DIODE
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	SPARE
14	SPARE
15	SPARE
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+

CR1 = PCC FSO RELAY
CR2 = STARTER RELAY
CR3 = SWITCHED B+ RELAY
CR4 = PCC LP FSO RELAY

F1 = AFR 5A
F2 = FSO 5A
F3 = AUX105 10A
F4 =
F5 = F-SERIES THROTTLE 10A
F6 = RELAY COILS 5A
F7 = PMG 1 10A
F8 = PMG 2 10A
F9 = LOW COOLANT LEVEL 1A
F10 = PCC3300 20A
F11 = CUSTOMER B+ 20A
F12 = T26 10A

LEGEND

CR# = RELAY COIL
CR# = RELAY CONTACT
10 = TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE

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SCHEMATIC, OVERALL
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 3OF11	DRAWING NO: A042H089
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

NOTES:

1) When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote-reset terminals are not connected, the module operates in the non-latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E-Stop, remove the jumper wire between terminals C1-15 and C1-16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line-line voltage is greater than 600VAC, power transformers must be used.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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CUSTOM DESIGN AND UPFIT CENTER, 875 LAWRENCE DRIVE, DEPERE, WISCONSIN

SCHEMATIC, CUSTOMER CONNECTIONS
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 4OF11	DRAWING NO: A042H089
EST WEIGHT:		

NOTES:
1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA
   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S-CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3-1 AT ONLY ONE END OF EACH S-CAN NETWORK BUS.
   THE CABLE SHALL MEET SAE J1939-11 STANDARDS AND HAVE A MAX LENGTH OF 200M.
   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.
   REFER TO INSTALLATION MANUAL FOR DETAILS.

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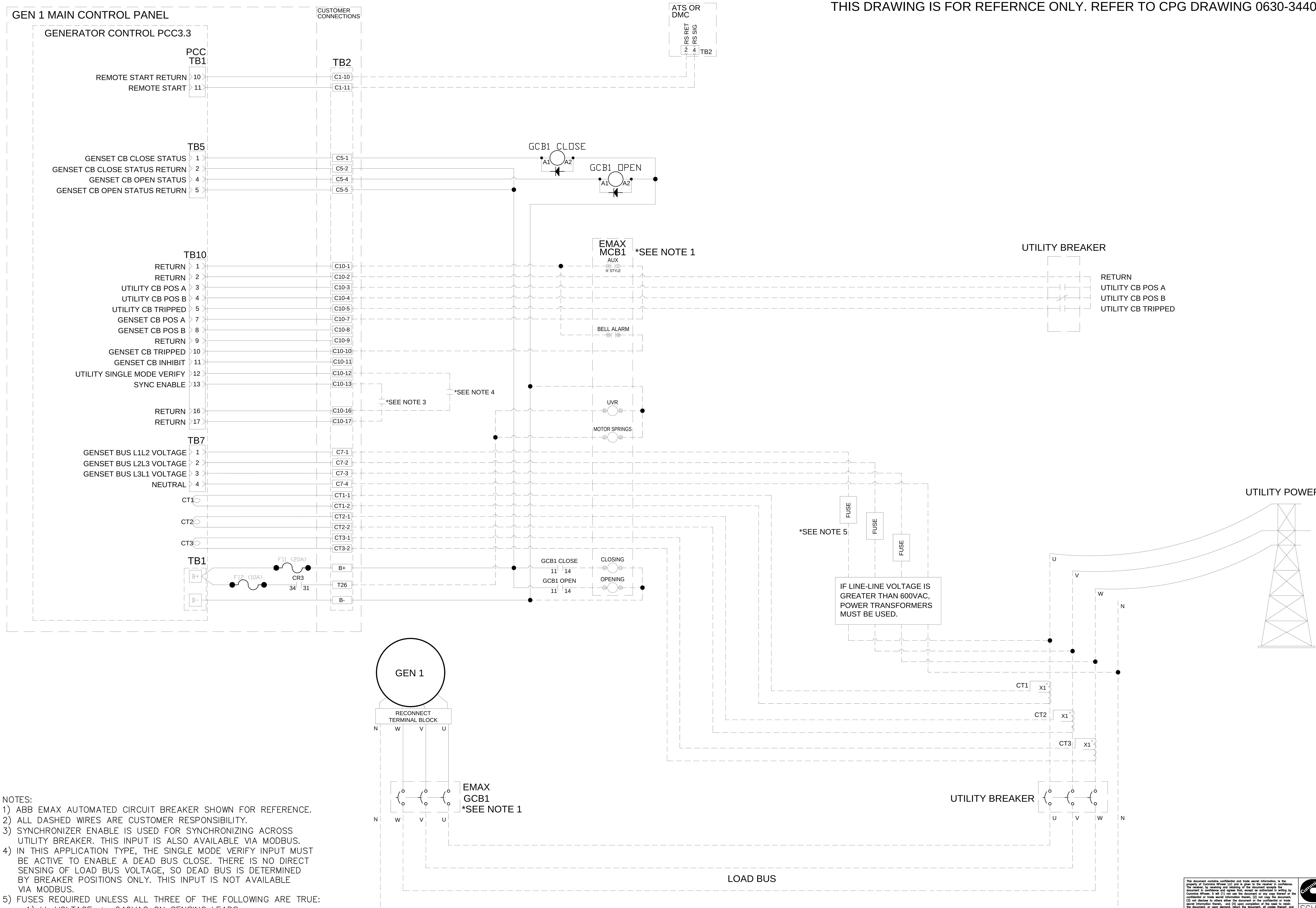
SCHEMATIC, PARALLELING, ISO BUS, GEN–GEN
GTA855/KTA19GC w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 5OF11	DRAWING NO: A042H089
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.



NOTES:

1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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SCHEMATIC, PARALLELING, UTILITY SINGLE
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016
AUTO CAD | INIT ECO: 2016-022
SCALE: | SHEET 6OF11 | DRAWING NO: A042H089
EST WEIGHT:

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

GEN 1 MAIN CONTROL PANEL

GENERATOR CONTROL PCC3.3

CUSTOMER CONNECTIONS

PCC TB1

REMOTE START RETURN 10 — C1-10
REMOTE START 11 — C1-11

TB3

MASTER FIRST START OUTPUT STATUS 11 — C3-11
RETURN 12 — C3-12

TB5

GENSET CB CLOSE STATUS 1 — C5-1
GENSET CB CLOSE STATUS RETURN 2 — C5-2
GENSET CB OPEN STATUS 4 — C5-4
GENSET CB OPEN STATUS RETURN 5 — C5-5

TB9

KW LOAD SHARE + 7 — C9-7
KW LOAD SHARE - 8 — C9-8
LOAD SHARE SHIELD 9 — C9-9
KVAR LOAD SHARE + 10 — C9-10
KVAR LOAD SHARE - 11 — C9-11

TB10

RETURN 1 — C10-1
RETURN 2 — C10-2
UTILITY CB POS A 3 — C10-3
UTILITY CB POS B 4 — C10-4
UTILITY CB TRIPPED 5 — C10-5
GENSET CB POS A 7 — C10-7
GENSET CB POS B 8 — C10-8
RETURN 9 — C10-9
GENSET CB TRIPPED 10 — C10-10
GENSET CB INHIBIT 11 — C10-11
SYNC ENABLE 13 — C10-13
LOAD DEMAND STOP 14 — C10-14
RAMP LOAD 15 — C10-15
RETURN 16 — C10-16
RETURN 17 — C10-17

TB7

GENSET BUS L1L2 VOLTAGE 1 — C7-1
GENSET BUS L2L3 VOLTAGE 2 — C7-2
GENSET BUS L3L1 VOLTAGE 3 — C7-3
NEUTRAL 4 — C7-4
CT1 — C7-1, C7-2
CT2 — C7-3, C7-4
CT3 — C1-1, C1-2

TB1

B+ — F11 (20A) — CR3 34 31 — T26
B+ — F12 (10A) — CR3 34 31 — T26
B- — B-

GCB1 CLOSE 11 14
GCB1 OPEN 11 14
CLOSING
OPENING

ATS OR DMC

RS RET 2
RS SIG 4
TB2

*SEE NOTE 2

GCB1 CLOSE
GCB1 OPEN
A1 A2

*SEE NOTE 1

EMAX *SEE NOTE 3

AUX
BELL ALARM
UVR
MOTOR SPRINGS

UTILITY BREAKER

RETURN
UTILITY CB POS A
UTILITY CB POS B
UTILITY CB TRIPPED

*SEE NOTE 5

*SEE NOTE 6

FUSE
FUSE
FUSE

IF LINE-LINE VOLTAGE IS GREATER THAN 600VAC, POWER TRANSFORMERS MUST BE USED.

GEN 1

RECONNECT TERMINAL BLOCK

N W V U

EMAX GCB1 *SEE NOTE 3

N W V U

X1 CT1
X1 CT2
X1 CT3

LOAD BUS

GEN 2

RECONNECT TERMINAL BLOCK

U V W N

EMAX GCB2

U V W N

UTILITY CB

U V W N

UTILITY POWER

GCB2 CLOSE
GCB2 OPEN
A2 A1

CUSTOMER CONNECTIONS

GEN 2 MAIN CONTROL PANEL

GENERATOR CONTROL PCC3.3

PCC TB1

10 REMOTE START RETURN
11 REMOTE START

TB3

11 MASTER FIRST START OUTPUT STATUS
12 RETURN

TB5

1 GENSET CB CLOSE STATUS
2 GENSET CB CLOSE STATUS RETURN
4 GENSET CB OPEN STATUS
5 GENSET CB OPEN STATUS RETURN

TB9

7 KW LOAD SHARE +
8 KW LOAD SHARE -
9 LOAD SHARE SHIELD
10 KVAR LOAD SHARE +
11 KVAR LOAD SHARE -

TB10

1 RETURN
2 RETURN
3 UTILITY CB POS A
4 UTILITY CB POS B
5 UTILITY CB TRIPPED
7 GENSET CB POS A
8 GENSET CB POS B
9 RETURN
10 GENSET CB TRIPPED
11 GENSET CB INHIBIT
13 SYNC ENABLE
14 LOAD DEMAND STOP
15 RAMP LOAD
16 RETURN
17 RETURN

TB7

1 GENSET BUS L1L2 VOLTAGE
2 GENSET BUS L2L3 VOLTAGE
3 GENSET BUS L3L1 VOLTAGE
4 NEUTRAL
CT1
CT2
CT3

TB1

B+ — F11 (20A) — CR3 31 34 — T26
B+ — F12 (10A) — CR3 31 34 — T26
B- — B-

CLOSING
OPENING
GCB2 CLOSE 14 11
GCB2 OPEN 14 11

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA

   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
X ± 1.000	X ± 25.00
.X ± .100	.X ± 2.50
.XX ± .050	.XX ± 1.25
.XXX ± .010	.XXX ± .250
.XXXX ± .005	.XXXX ± .125

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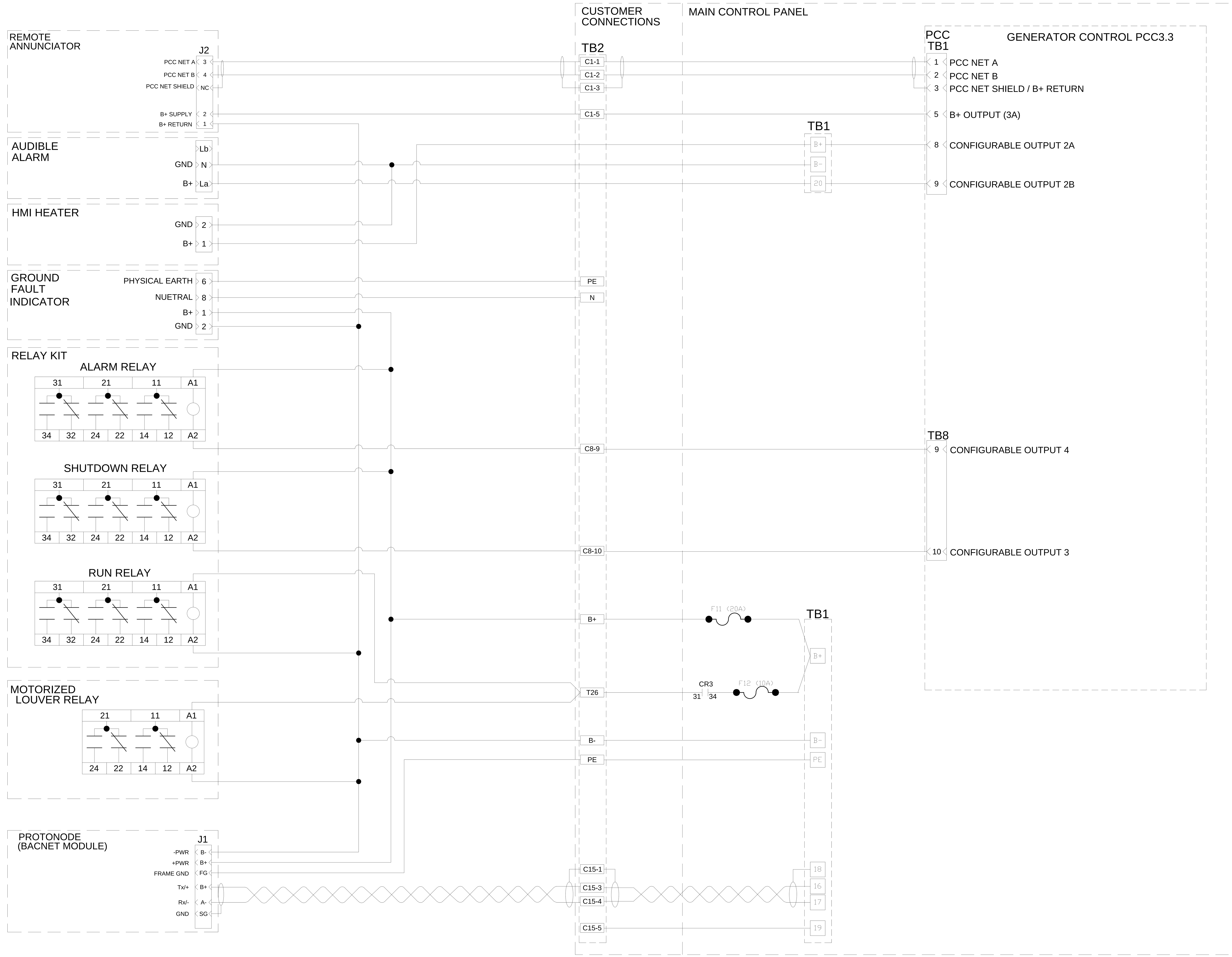
SCHEMATIC, PARALLELING, UTILITY MULTIPLE
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 23 JUNE 2016
AUTO CAD
INIT ECO: 2016-02
SCALE:
EST WEIGHT:
SHEET 7OF11
DRAWING NO: A042H089



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SCHEMATIC, OPTIONAL ACCESSORIES GTA855/KTA19GC w/ PCC3.3

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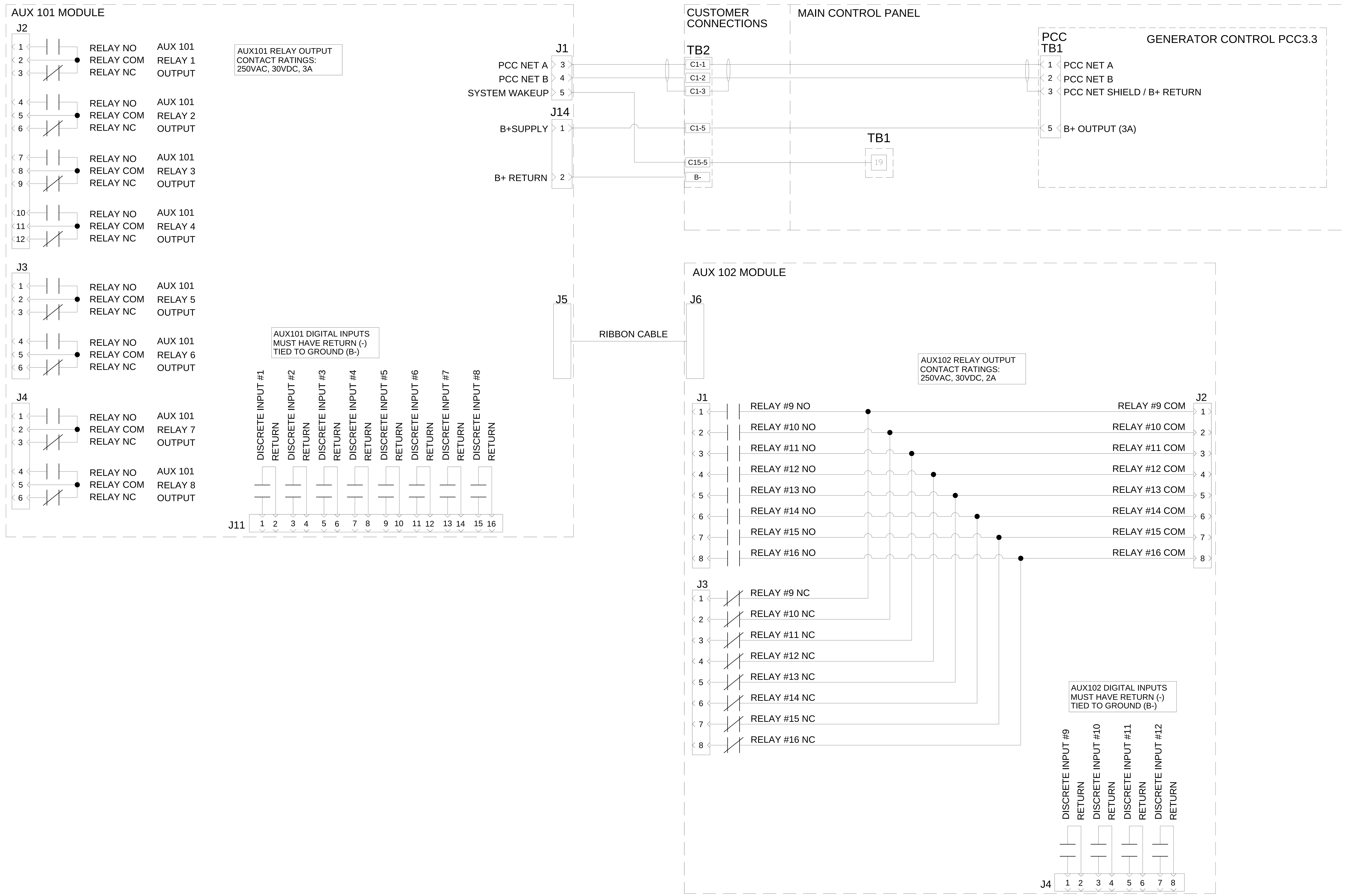
ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005; FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015; FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2; FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4; FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 8OF11	DRAWING NO: A042H089
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016



NOTES:

1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	ADDED S–CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

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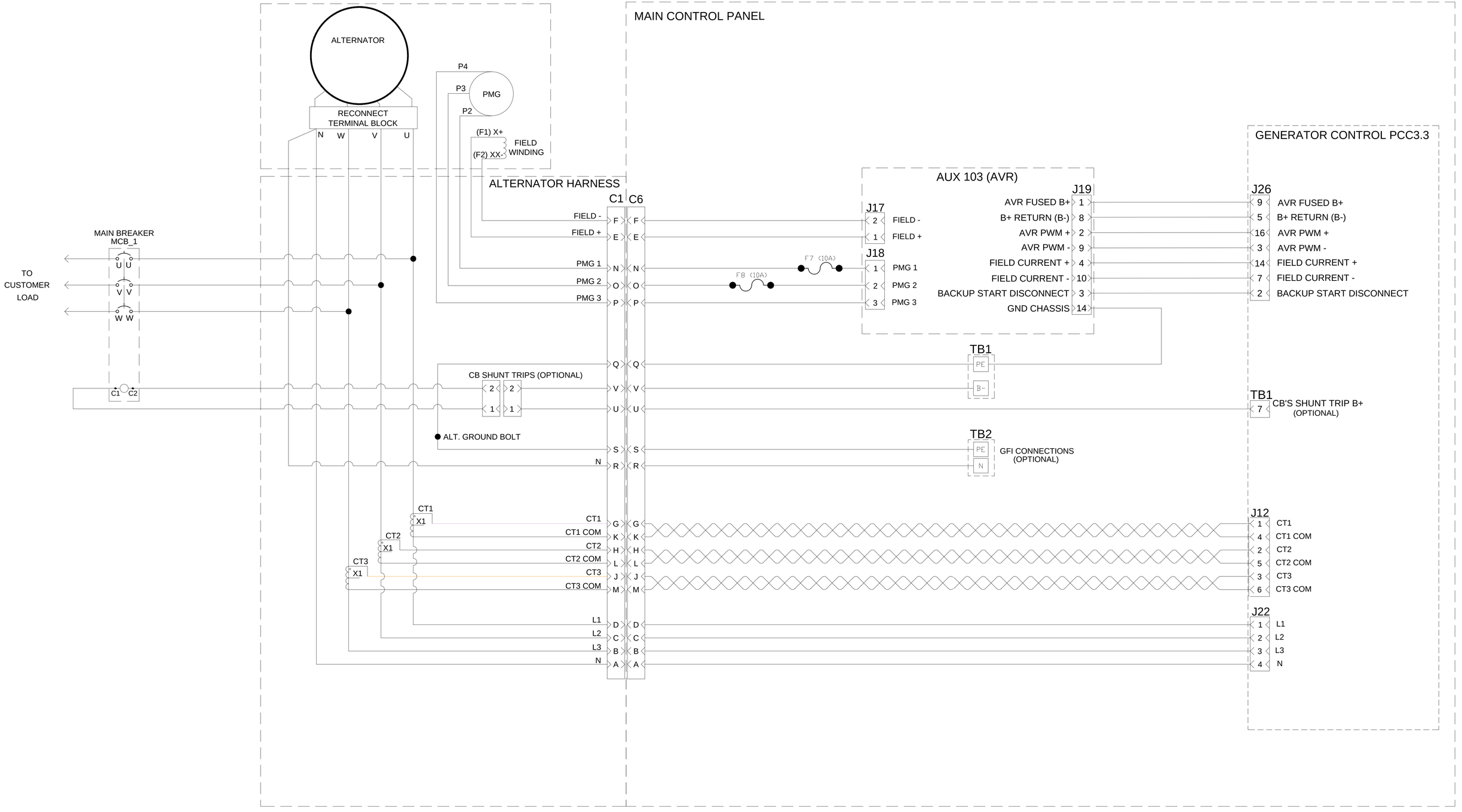
SCHEMATIC, AUX101 & AUX102
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016
AUTO CAD | INIT ECO: 2016–022
SCALE:
EST WEIGHT:
SHEET 9OF11 | DRAWING NO: A042H089



REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

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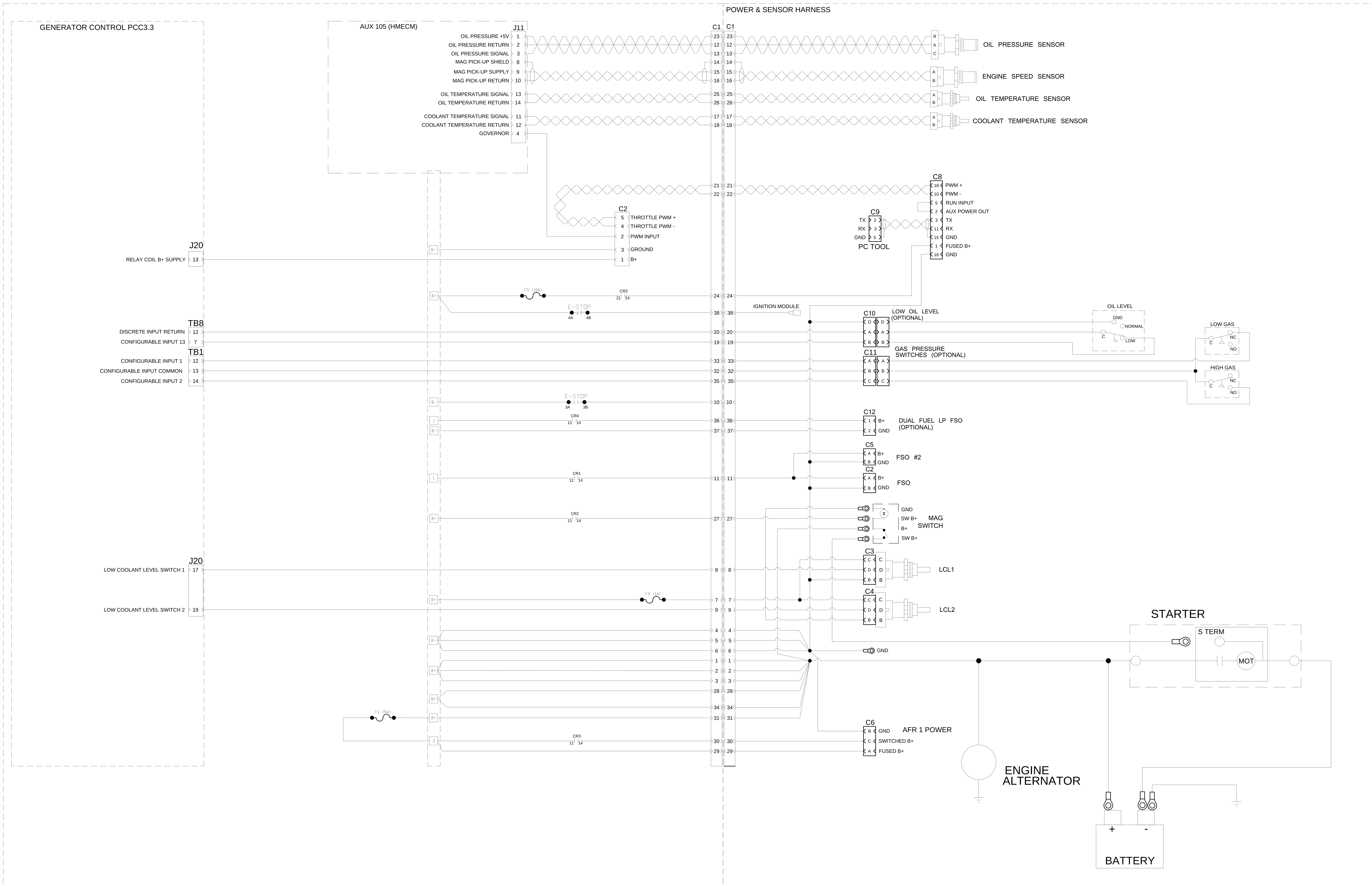
SCHEMATIC, ALTERNATOR, MCB, CT'S
GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
AUTO CAD		INIT ECO: 2016-022
SCALE:	SHEET 100F11	DRAWING NO: A042H089
EST WEIGHT:		



POWER & SENSOR HARNESS
GENERATOR CONTROL PCC3.3
AUX 105 (HMECM)
J11
OIL PRESSURE +5V
OIL PRESSURE RETURN
OIL PRESSURE SIGNAL
MAG PICK-UP SHIELD
MAG PICK-UP SUPPLY
MAG PICK-UP RETURN
OIL TEMPERATURE SIGNAL
OIL TEMPERATURE RETURN
COOLANT TEMPERATURE SIGNAL
COOLANT TEMPERATURE RETURN
GOVERNOR
C1
OIL PRESSURE SENSOR
ENGINE SPEED SENSOR
OIL TEMPERATURE SENSOR
COOLANT TEMPERATURE SENSOR
C8
PWM +
PWM -
RUN INPUT
AUX POWER OUT
TX
RX
GND
FUSED B+
C9
PC TOOL
C2
THROTTLE PWM +
THROTTLE PWM -
PWM INPUT
GROUND
B+
J20
RELAY COIL B+ SUPPLY
CR3
E-STOP
IGNITION MODULE
TB8
DISCRETE INPUT RETURN
CONFIGURABLE INPUT 13
TB1
CONFIGURABLE INPUT 1
CONFIGURABLE INPUT COMMON
CONFIGURABLE INPUT 2
C10
LOW OIL LEVEL
(OPTIONAL)
OIL LEVEL
NORMAL
LOW
C11
GAS PRESSURE
SWITCHES (OPTIONAL)
LOW GAS
HIGH GAS
NC
NO
CR4
C12
DUAL FUEL LP FSO
(OPTIONAL)
C5
FSO #2
CR1
C2
FSO
CR2
MAG
SWITCH
SW B+
LOW COOLANT LEVEL SWITCH 1
LOW COOLANT LEVEL SWITCH 2
C3
LCL1
C4
LCL2
STARTER
S TERM
MOT
GND
F1 (5A)
C6
AFR 1 POWER
SWITCHED B+
ENGINE
ALTERNATOR
BATTERY

A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016
REV	ECO	DESCRIPTION OF REVISION	BY	DATE

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SCHEMATIC, POWER & SENSOR HARNESS GTA855/KTA19GC w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 11OF11	DRAWING NO: A042H089
EST WEIGHT:		

SHEET #	DESCRIPTION
2	LAYOUT, CONTROL PANEL & OPTIONS
3	SCHEMATIC, OVERALL
4	SCHEMATIC, CUSTOMER CONNECTIONS
5	SCHEMATIC, PARALLELING, ISOLATED BUS, GEN TO GEN
6	SCHEMATIC, PARALLELING, UTILITY SINGLE
7	SCHEMATIC, PARALLELING, UTILITY MULTIPLE
8	SCHEMATIC, OPTIONAL ACCESSORIES
9	SCHEMATIC, OPTIONAL AUX101 & AUX102
10	SCHEMATIC, ALTERNATOR, MCB, CT'S
11	SCHEMATIC, HARNESS, POWER AND SENSOR

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
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THIRD ANGLE PROJECTION

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SCHEMATICS, ELECTRICAL
GTA28 W/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016

AUTO CAD | INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 1 OF 11 | DRAWING NO: A042H084

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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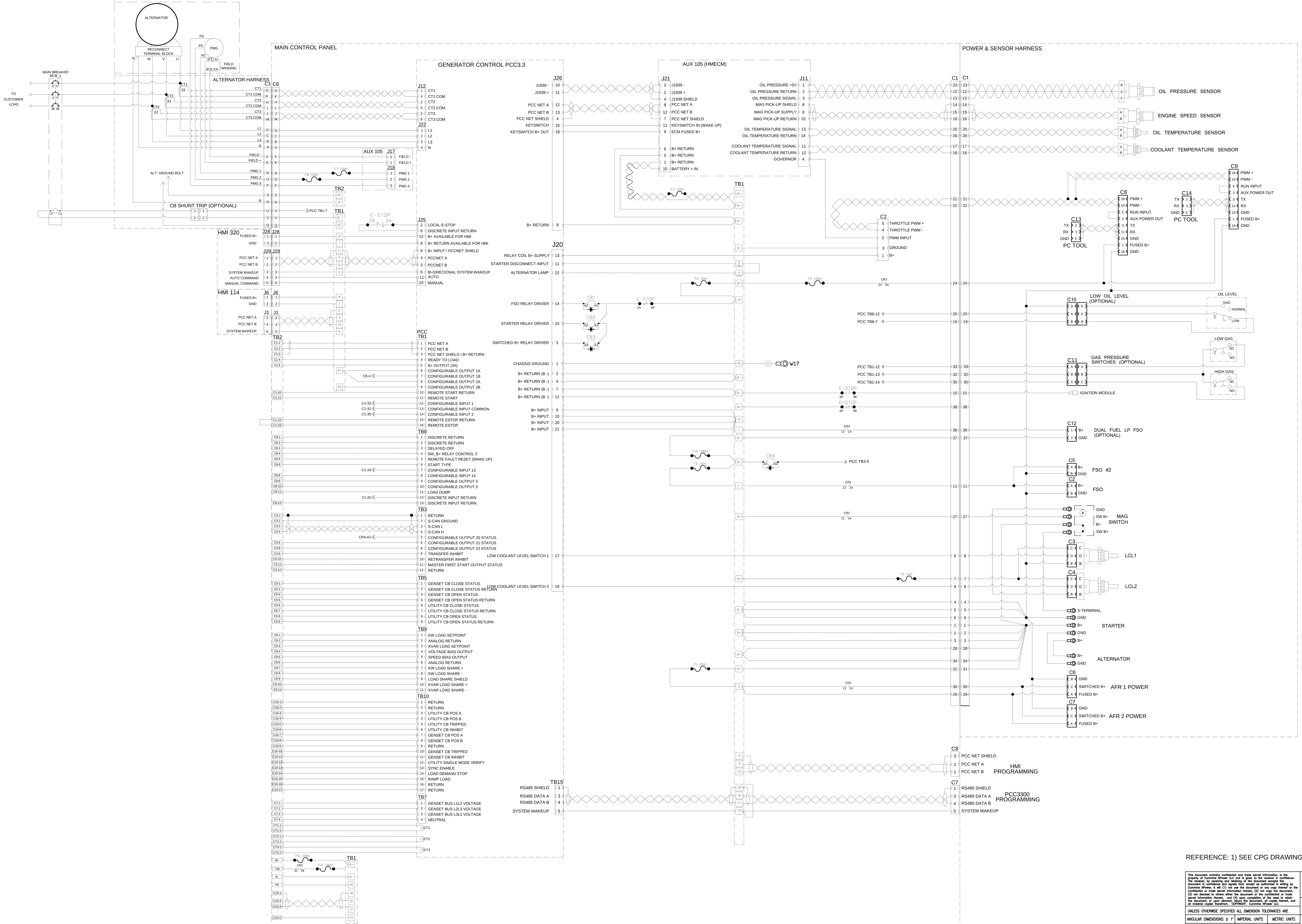
LAYOUT, CONTROL PANEL AND OPTIONS GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 2OF11	DRAWING NO: A042H084
EST WEIGHT:		



REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE

TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B-	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED FSO B+
2	20A FUSED PCC3300 B+
3	5A FUSED AFR B+
4	STARTER DISCONNECT 240 OHM RESISTOR
5	1A, 1kV DIODE
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	SPARE
14	SPARE
15	SPARE
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+

CR1 = PCC FSO RELAY
CR2 = STARTER RELAY
CR3 = SWITCHED B+ RELAY
CR4 = PCC LP FSO RELAY

F1 = AFR 5A
F2 = FSO 5A
F3 = AUX105 10A
F4 =
F5 = F-SERIES THROTTLE 10A
F6 = RELAY COILS 5A
F7 = PMG 1 10A
F8 = PMG 2 10A
F9 = LOW COOLANT LEVEL 1A
F10 = PCC3300 20A
F11 = CUSTOMER B+ 20A
F12 = T26 10A

LEGEND

= RELAY COIL
= RELAY CONTACT
= TERMINAL BLOCK

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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THIRD ANGLE PROJECTION

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SCHEMATIC, OVERALL GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 3OF11	DRAWING NO: A042H084
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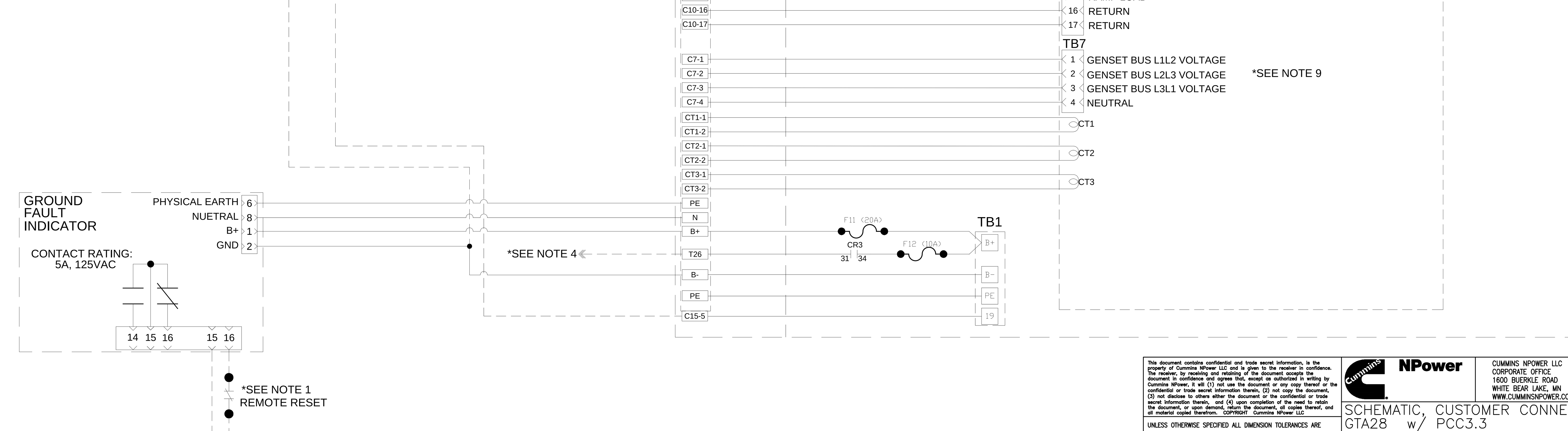

NOTES:

1) When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote-reset terminals are not connected, the module operates in the non-latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E-Stop, remove the jumper wire between terminals C1-15 and C1-16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line-line voltage is greater than 600VAC, power transformers must be used.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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CUSTOM DESIGN AND UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SCHEMATIC, CUSTOMER CONNECTIONS
GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 4OF11	DRAWING NO: A042H084
EST WEIGHT:		

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3–11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA
   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S–CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3–1 AT ONLY ONE END OF EACH S–CAN NETWORK BUS.
   THE CABLE SHALL MEET SAE J1939–11 STANDARDS AND HAVE A MAX LENGTH OF 200M.
   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.
   REFER TO INSTALLATION MANUAL FOR DETAILS.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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SCHEMATIC, PARALLELING, ISO BUS, GEN–GEN GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016
AUTO CAD | INIT ECO: 2016–022
SCALE:
EST WEIGHT:
SHEET 5OF11 | DRAWING NO: A042H084

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:
1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.
   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

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SCHEMATIC, PARALLELING, UTILITY SINGLE GTA28 w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016	
	AUTO CAD	INIT ECO: 2016–022	
SCALE:	SHEET 6OF11	DRAWING NO: A042H084	
EST WEIGHT:			

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3–11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005 FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015 FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2 FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4 FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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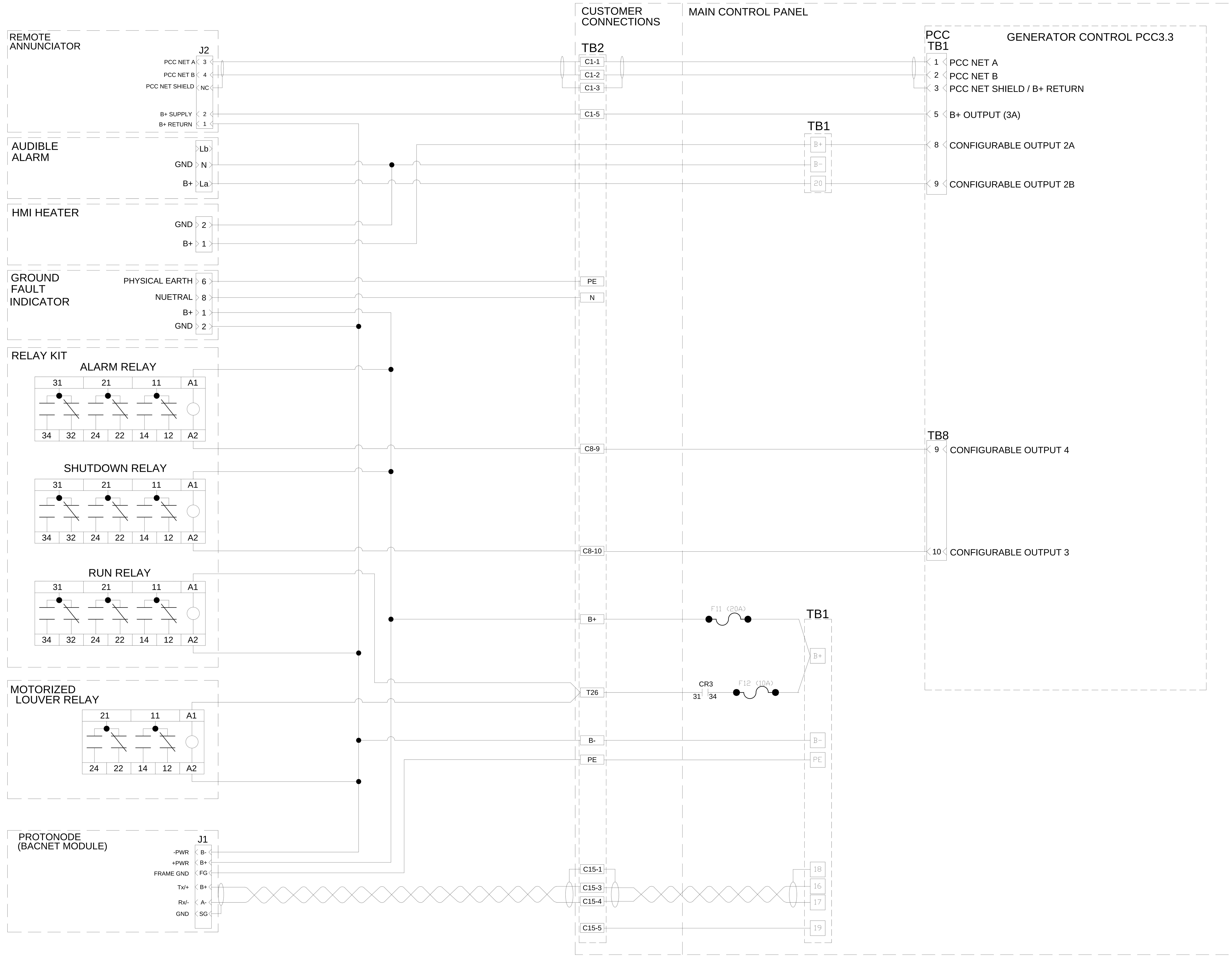
SCHEMATIC, PARALLELING, UTILITY MULTIPLE
GTA28 W/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 7OF11	DRAWING NO: A042H084
EST WEIGHT:		



A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016
REV	ECO	DESCRIPTION OF REVISION	BY	DATE

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005; FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015; FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2; FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4; FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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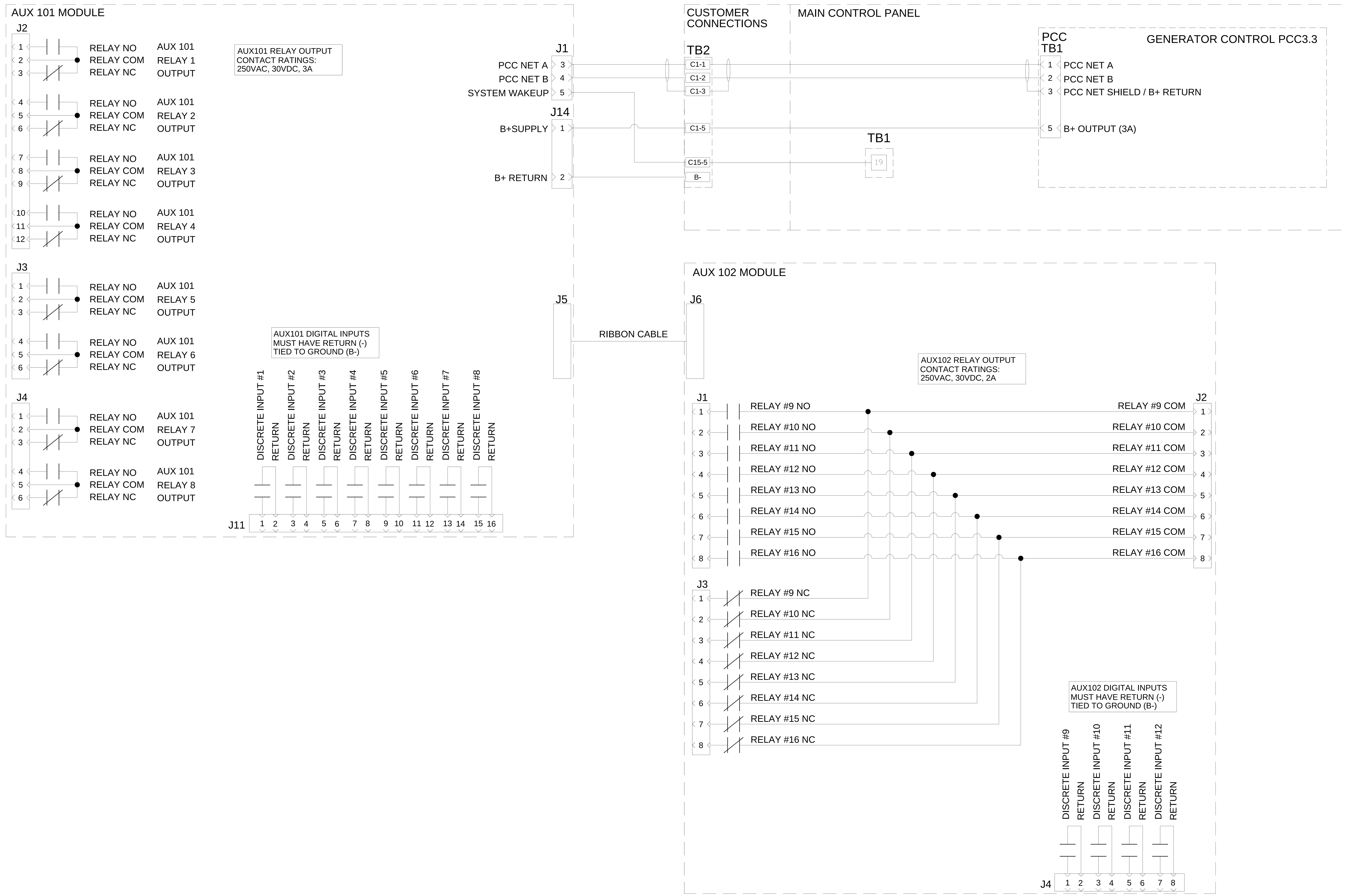
SCHEMATIC, OPTIONAL ACCESSORIES
GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 8OF11	DRAWING NO: A042H084
EST WEIGHT:		



NOTES:
1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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SCHEMATIC, AUX101 & AUX102
GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016
AUTO CAD | INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 9OF11 | DRAWING NO: A042H084

MAIN CONTROL PANEL

ALTERNATOR

RECONNECT TERMINAL BLOCK

N W V U

P4

P3

PMG

P2

(F1) X+

(F2) XX-

FIELD WINDING

ALTERNATOR HARNESS

C1 C6

FIELD - F F

FIELD + E E

PMG 1 N N

PMG 2 O O

PMG 3 P P

F8 (10A)

F7 (10A)

AUX 103 (AVR)

J17

2 FIELD -

1 FIELD +

J18

1 PMG 1

2 PMG 2

3 PMG 3

J19

AVR FUSED B+ 1

B+ RETURN (B-) 8

AVR PWM + 2

AVR PWM - 9

FIELD CURRENT + 4

FIELD CURRENT - 10

BACKUP START DISCONNECT 3

GND CHASSIS 14

GENERATOR CONTROL PCC3.3

J26

9 AVR FUSED B+

5 B+ RETURN (B-)

16 AVR PWM +

3 AVR PWM -

14 FIELD CURRENT +

7 FIELD CURRENT -

2 BACKUP START DISCONNECT

MAIN BREAKER MCB_1

U U

V V

W W

TO CUSTOMER LOAD

C1 C2

CB SHUNT TRIPS (OPTIONAL)

2 2

1 1

Q Q

V V

U U

TB1

PE

B-

TB1

7 CB'S SHUNT TRIP B+ (OPTIONAL)

ALT. GROUND BOLT

S S

N

R R

TB2

PE

N

GFI CONNECTIONS (OPTIONAL)

CT1

X1

CT1 G G

CT1 COM K K

CT2

X1

CT2 H H

CT2 COM L L

CT3

X1

CT3 J J

CT3 COM M M

J12

1 CT1

4 CT1 COM

2 CT2

5 CT2 COM

3 CT3

6 CT3 COM

L1 D D

L2 C C

L3 B B

N A A

J22

1 L1

2 L2

3 L3

4 N

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS

THIRD ANGLE PROJECTION

IMPERIAL UNITS	METRIC UNITS
.XX= ± 0.030	X.X= ± 0.8
.XXX= ± 0.005	X.XX= ± 0.13
FOR TAPERS .XX= ± 0.030	FOR TAPERS X.X= ± 0.8
FOR TAPERS .XXX= ± 0.005	FOR TAPERS X.XX= ± 0.13
FOR ANGLES ± 1°	FOR ANGLES ± 1°

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SCHEMATIC, ALTERNATOR, MCB, CT'S
GTA28 w/ PCC3.3

DWG UNITS: INCH/LB/S

DRAWN BY: KAK

DATE: 23 JUNE 2016

AUTO CAD

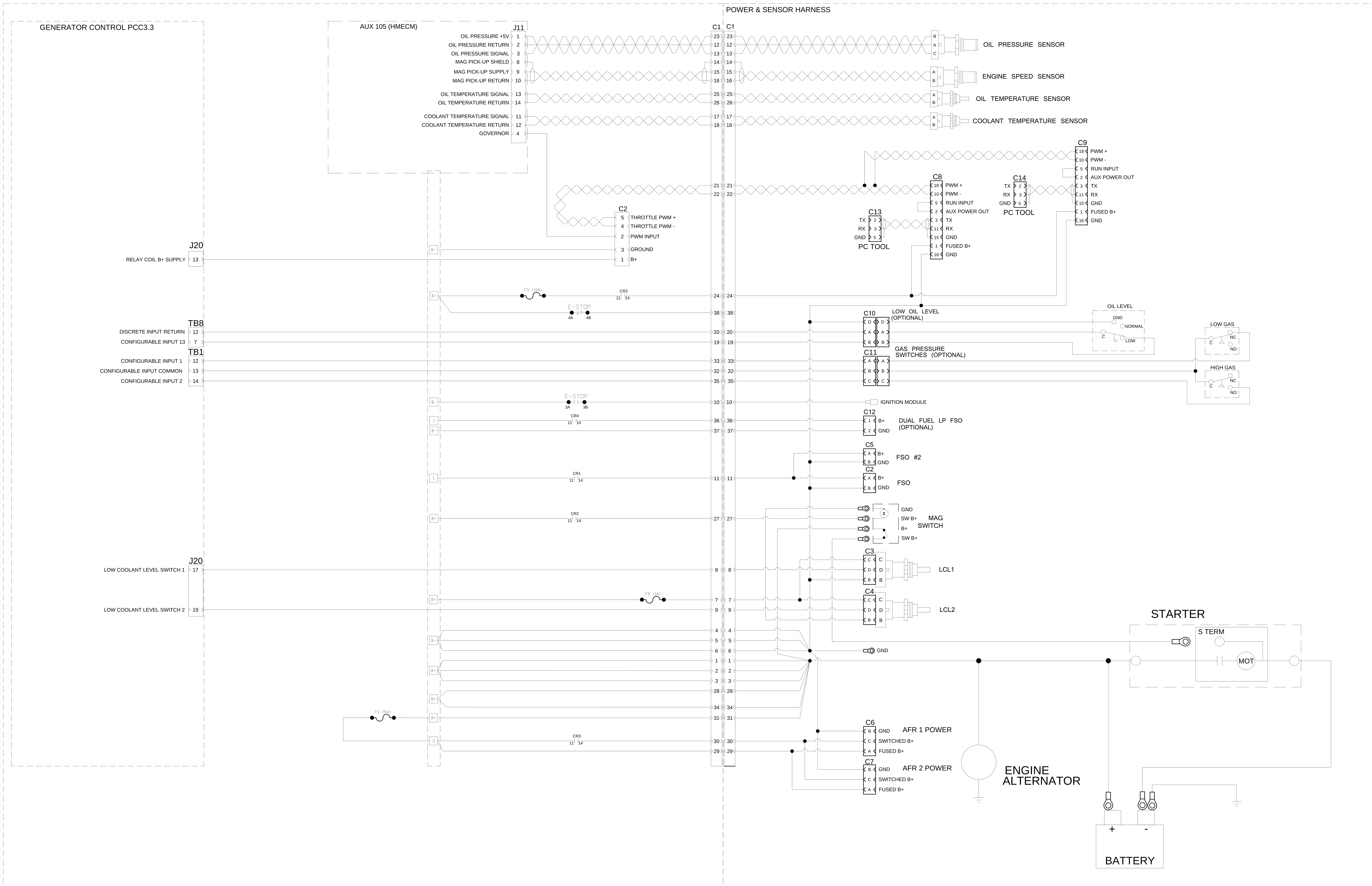
INIT ECO: 2016-022

SCALE:

EST WEIGHT:

SHEET 10OF11

DRAWING NO: A042H084



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SCHEMATIC, POWER & SENSOR HARNESS
GTA28 w/ PCC3.3

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016–022
SCALE:	SHEET 11OF11	DRAWING NO: A042H084
EST WEIGHT:		

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016–785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

SHEET #	DESCRIPTION
2	LAYOUT, CONTROL PANEL & OPTIONS
3	SCHEMATIC, OVERALL
4	SCHEMATIC, CUSTOMER CONNECTIONS
5	SCHEMATIC, PARALLELING, ISOLATED BUS, GEN TO GEN
6	SCHEMATIC, PARALLELING, UTILITY SINGLE
7	SCHEMATIC, PARALLELING, UTILITY MULTIPLE
8	SCHEMATIC, OPTIONAL ACCESSORIES
9	SCHEMATIC, OPTIONAL AUX101 & AUX102
10	SCHEMATIC, ALTERNATOR, MCB, CT'S
11	SCHEMATIC, HARNESS, POWER AND SENSOR

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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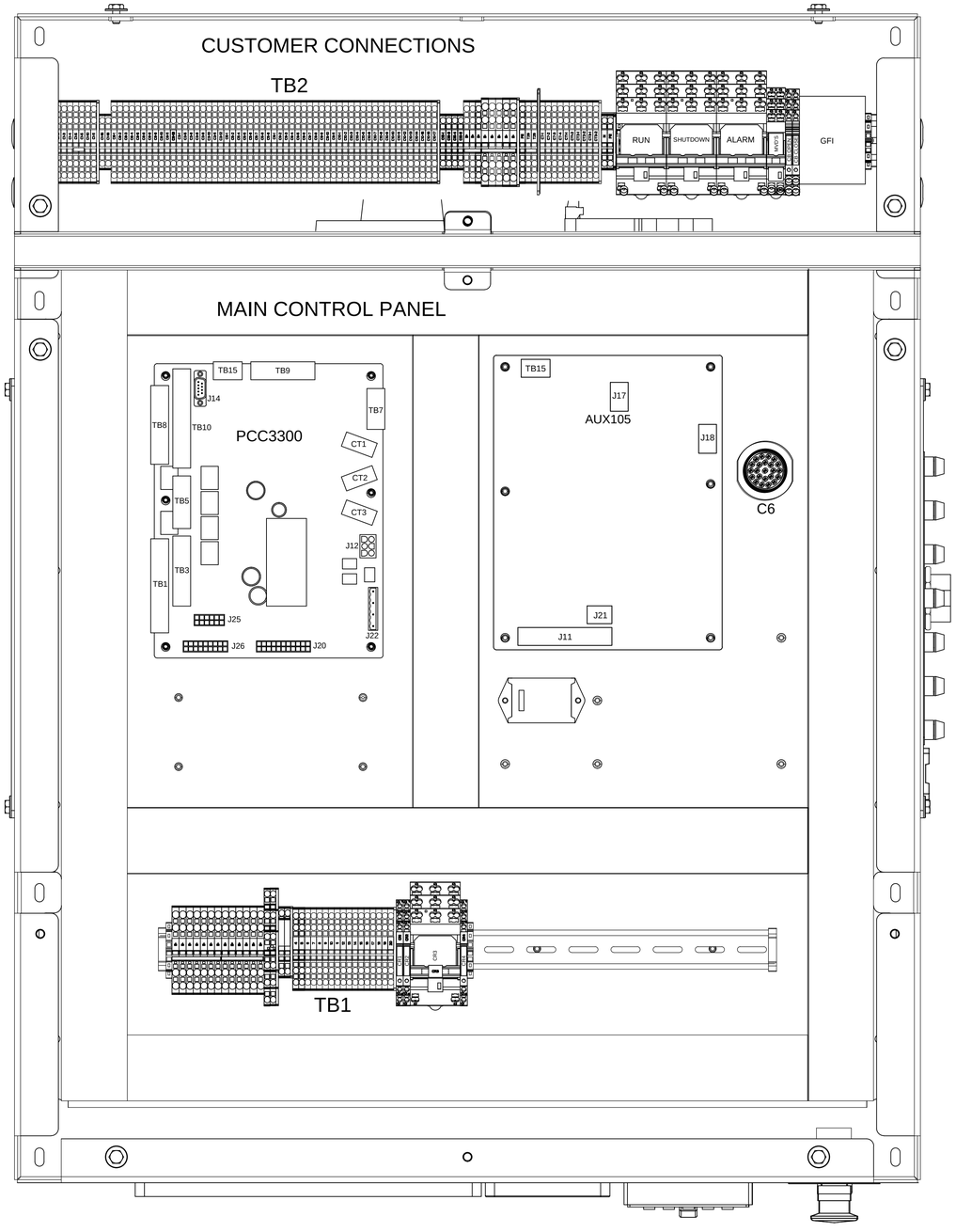
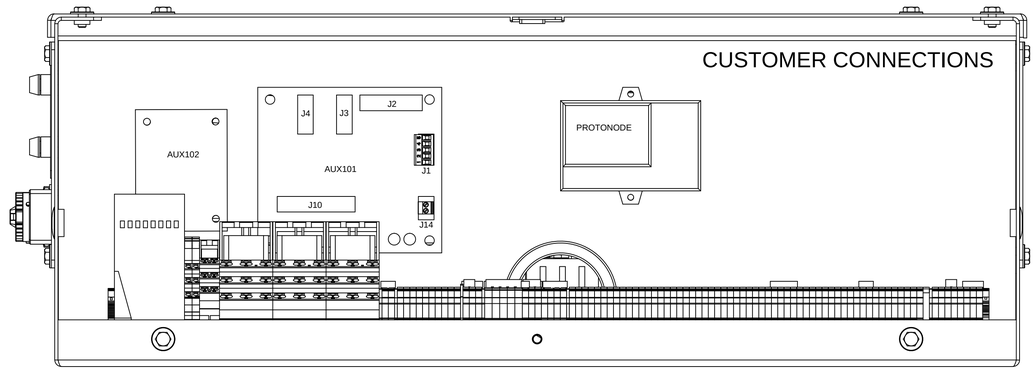
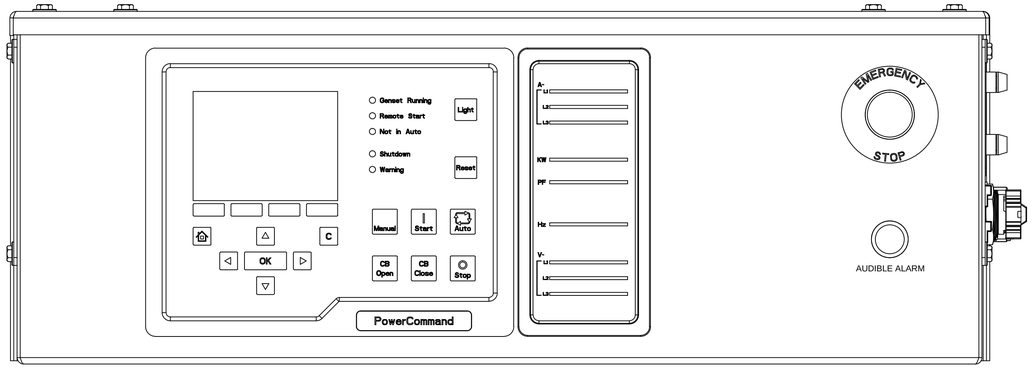
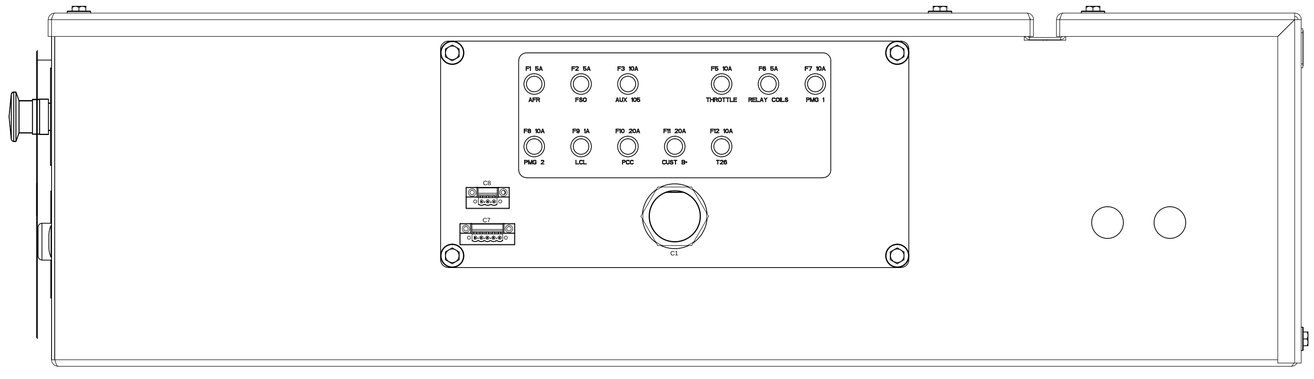
SCHEMATICS, ELECTRICAL
GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 1 OF 11	DRAWING NO: A042H086
EST WEIGHT:		









UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	.X = ± 0.030 .XX = ± 0.010 .XXX = ± 0.005	.X = ± 0.8 .XX = ± 0.25 .XXX = ± 0.13

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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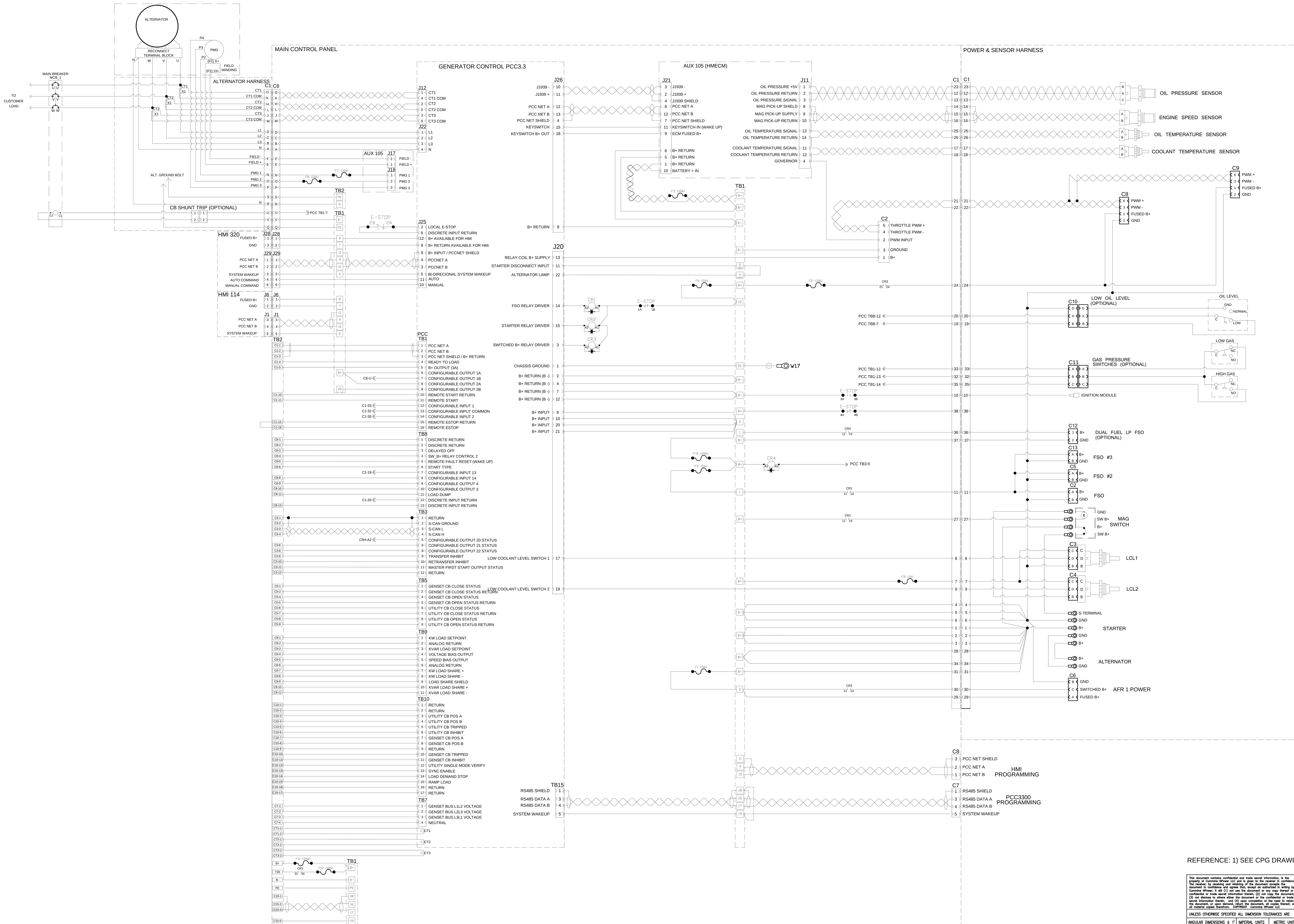
LAYOUT, CONTROL PANEL AND OPTIONS GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 23 JUNE 2016
AUTO CAD
INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 20F11
DRAWING NO: A042H086



TERMINAL BLOCK, RELAY AND FUSE DESCRIPTIONS

B+	+24VDC SUPPLY
B-	-24VDC SUPPLY
PE	CHASSIS GROUND
1	5A FUSED FSO B+
2	20A FUSED PCC3300 B+
3	5A FUSED AFR B+
4	STARTER DISCONNECT 240 OHM RESISTOR
5	1A, 1kV DIODE
6	SYSTEM WAKEUP
7	HMI B-
8	HMI B+
9	PCC NET A
10	PCC NET B
11	PCC NET SHIELD
12	5A FUSED RELAY COIL B+
13	SPARE
14	SPARE
15	SPARE
16	RS485 DATA A
17	RS485 DATA B
18	RS485 SHIELD
19	SYSTEM WAKEUP
20	AUDIBLE ALARM B+

CR1 = PCC FSO RELAY
CR2 = STARTER RELAY
CR3 = SWITCHED B+ RELAY
CR4 = PCC LP FSO RELAY

F1 = AFR 5A
F2 = FSO 5A
F3 = AUX105 10A
F4 =
F5 = F-SERIES THROTTLE 10A
F6 = RELAY COILS 5A
F7 = PMG 1 10A
F8 = PMG 2 10A
F9 = LOW COOLANT LEVEL 1A
F10 = PCC3300 20A
F11 = CUSTOMER B+ 20A
F12 = T26 10A

LEGEND

CR# = RELAY COIL
CR# = RELAY CONTACT
10 = TERMINAL BLOCK

REFERENCE: 1) SEE CPG DRAWING #0630-3440 FOR PCC SCHEMATICS AND INTERFACE

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

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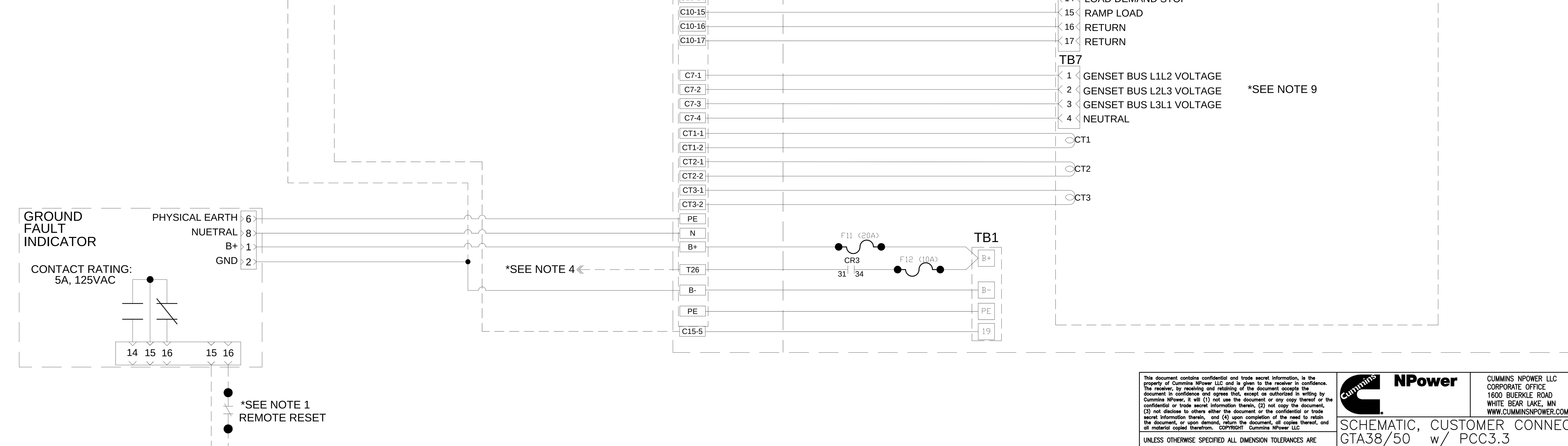
SCHEMATIC, OVERALL
GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 23 JUNE 2016
AUTO CAD
INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 3OF11
DRAWING NO: A042H086



NOTES:

1) When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the module. If the remote-reset terminals are not connected, the module operates in the non-latching mode and a trip will reset when the fault is removed.
2) B+ and GND connections are only required for OTEC ATS.
3) All dashed wires are customer responsibility.
4) T26 is a switched B+ circuit fused at 10A.
5) If installing a remote E-Stop, remove the jumper wire between terminals C1-15 and C1-16 first.
6) For PCC Net wiring, use Belden 9318 cable.
7) The Relay Kit contacts are rated at 10A, 30VDC.
8) Splices are shown for representation only. Run each wire directly to terminal block.
9) If line-line voltage is greater than 600VAC, power transformers must be used.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	SEE SHEET 1 FOR DETAILS.	KAK	17 NOV 2016

UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE

ANGULAR DIMENSIONS ± 1°	IMPERIAL UNITS	METRIC UNITS
THIRD ANGLE PROJECTION	MACHINE TOLERANCES .XX = ± 0.010 .XXX = ± 0.005	MACHINE TOLERANCES .X = ± 0.4 .XX = ± 0.2
	FORM TOLERANCES .XX = ± 0.030 .XXX = ± 0.015	FORM TOLERANCES .X = ± 0.8 .XX = ± 0.4
	FAB TOLERANCES .XX = ± 0.060 .XXX = ± 0.030	FAB TOLERANCES .X = ± 1.5 .XX = ± 0.8

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CUSTOM DESIGN AND
UPFIT CENTER
875 LAWRENCE DRIVE
DEPERE, WISCONSIN

SCHEMATIC, CUSTOMER CONNECTIONS
GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 4OF11	DRAWING NO: A042H086
EST WEIGHT:		

THIS DRAWING IS FOR REFERNCE ONLY.

REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) FUSING REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240 VAC ON SENSING LEADS
   B) NOT PARALLELED OR USING A SIGNAL TRANSFORMER
   C) SIZE <= 125kVA

   FUSE SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.
6) THE ENTIRE S-CAN NETWORK MUST BE SHIELDED TO PREVENT GROUND LOOPS. THE DRAIN WIRE MUST BE CONNECTED TO TB3-1 AT ONLY ONE END OF EACH S-CAN NETWORK BUS.

   THE CABLE SHALL MEET SAE J1939-11 STANDARDS AND HAVE A MAX LENGTH OF 200M.

   EACH END OF THE NETWORK BUS MUST BE TERMINATED WITH A 120 OHM RESISTOR.

   REFER TO INSTALLATION MANUAL FOR DETAILS.

THIS DRAWING IS FOR REFERNCE ONLY. REFER TO CPG DRAWING 0630-3440 FOR ALL DOCUMENTATION.

NOTES:
1) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
2) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
3) SYNCHRONIZER ENABLE IS USED FOR SYNCHRONIZING ACROSS UTILITY BREAKER. THIS INPUT IS ALSO AVAILABLE VIA MODBUS.
4) IN THIS APPLICATION TYPE, THE SINGLE MODE VERIFY INPUT MUST BE ACTIVE TO ENABLE A DEAD BUS CLOSE. THERE IS NO DIRECT SENSING OF LOAD BUS VOLTAGE, SO DEAD BUS IS DETERMINED BY BREAKER POSITIONS ONLY. THIS INPUT IS NOT AVAILABLE VIA MODBUS.
5) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA.

   FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

REV	ECO	DESCRIPTION OF REVISION	BY	DATE
A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016

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SCHEMATIC, PARALLELING, UTILITY SINGLE
GTA38/50 w/ PCC3.3

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DWG UNITS: INCH/LB/S
DRAWN BY: KAK
DATE: 23 JUNE 2016
AUTO CAD
INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 6OF11
DRAWING NO: A042H086

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NOTES:

1) ONLY CONNECT SHIELD AT ONE GENSET TO PREVENT GROUND LOOPS. SHIELD MUST MAINTAIN CONTINUITY OVER ENTIRE LENGTH OF CABLE. CABLE SHALL BE 18AWG, TWISTED, W/ SHIELD. MAXIMUM LENGTH OF 1000 METERS.
2) FOR SINGLE GENSET, USE A 10K PULLUP RESISTOR FROM FUSED B+ TO TB2 C3-11. THIS IS TO PREVENT FIRST START BACKUP FAULT.
3) ABB EMAX AUTOMATED CIRCUIT BREAKER SHOWN FOR REFERENCE.
4) ALL DASHED WIRES ARE CUSTOMER RESPONSIBILITY.
5) IN UTILITY MULTIPLE MODE, THE UTILITY BREAKER IS CONTROLLED BY AN EXTERNAL DEVICE.
6) FUSES REQUIRED UNLESS ALL THREE OF THE FOLLOWING ARE TRUE:
   A) LL VOLTAGE <= 240VAC ON SENSING LEADS.
   B) NOT PARALLELED OR USING SIGNAL TRANSFORMER.
   C) SIZE <= 125kVA

FUSES SHALL BE FERRAZ SHAWMUT ½A OR EQUIVALENT.

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UNLESS OTHERWISE SPECIFIED ALL DIMENSION TOLERANCES ARE
ANGULAR DIMENSIONS ± 1° | IMPERIAL UNITS | METRIC UNITS
THIRD ANGLE PROJECTION

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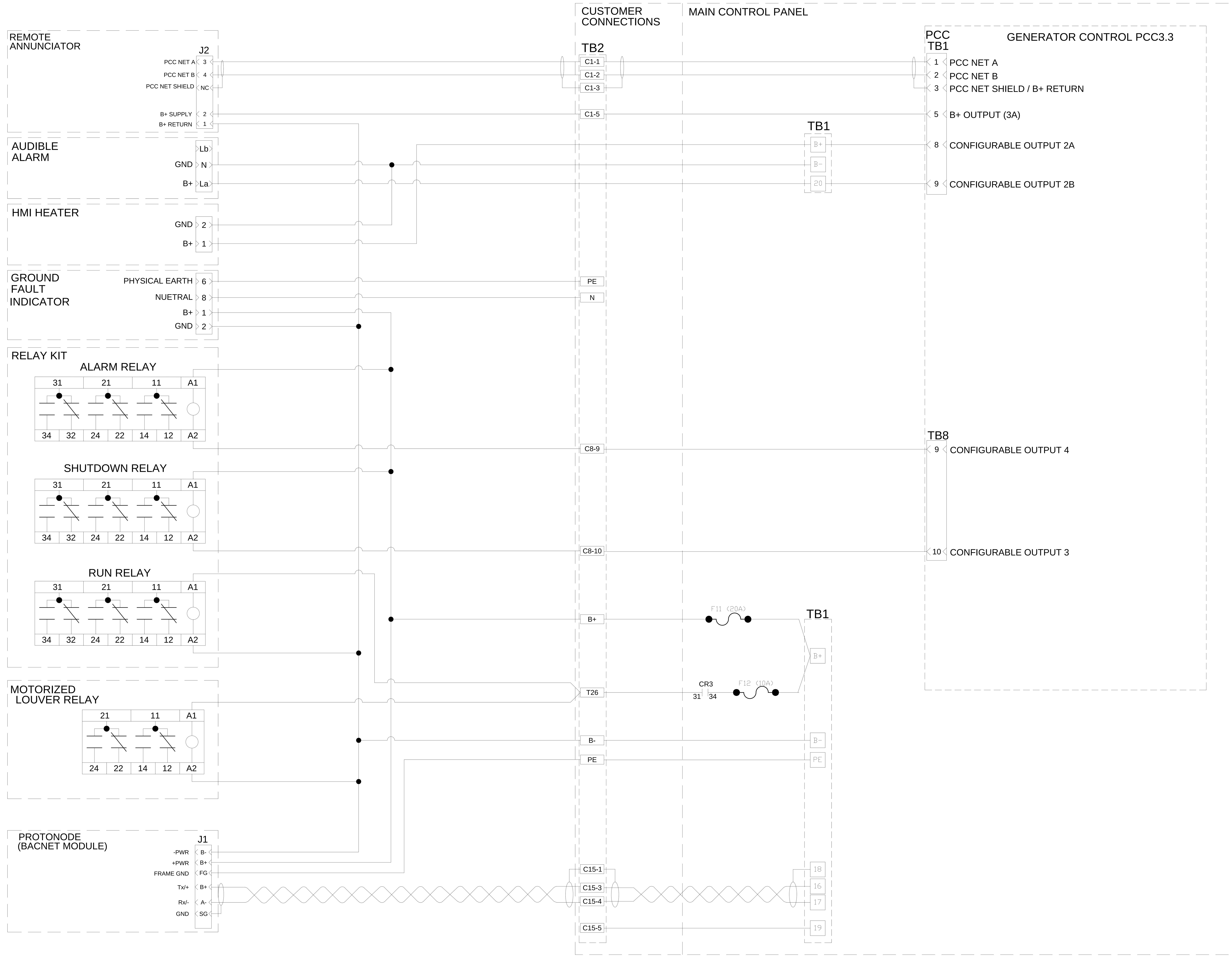
SCHEMATIC, PARALLELING, UTILITY MULTIPLE GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S | DRAWN BY: KAK | DATE: 23 JUNE 2016
AUTO CAD | INIT ECO: 2016-022
SCALE:
EST WEIGHT:
SHEET 7OF11 | DRAWING NO: A042H086



A	2016-785	ADDED S-CAN NETWORK FOR MLD.	KAK	17 NOV 2016
REV	ECO	DESCRIPTION OF REVISION	BY	DATE

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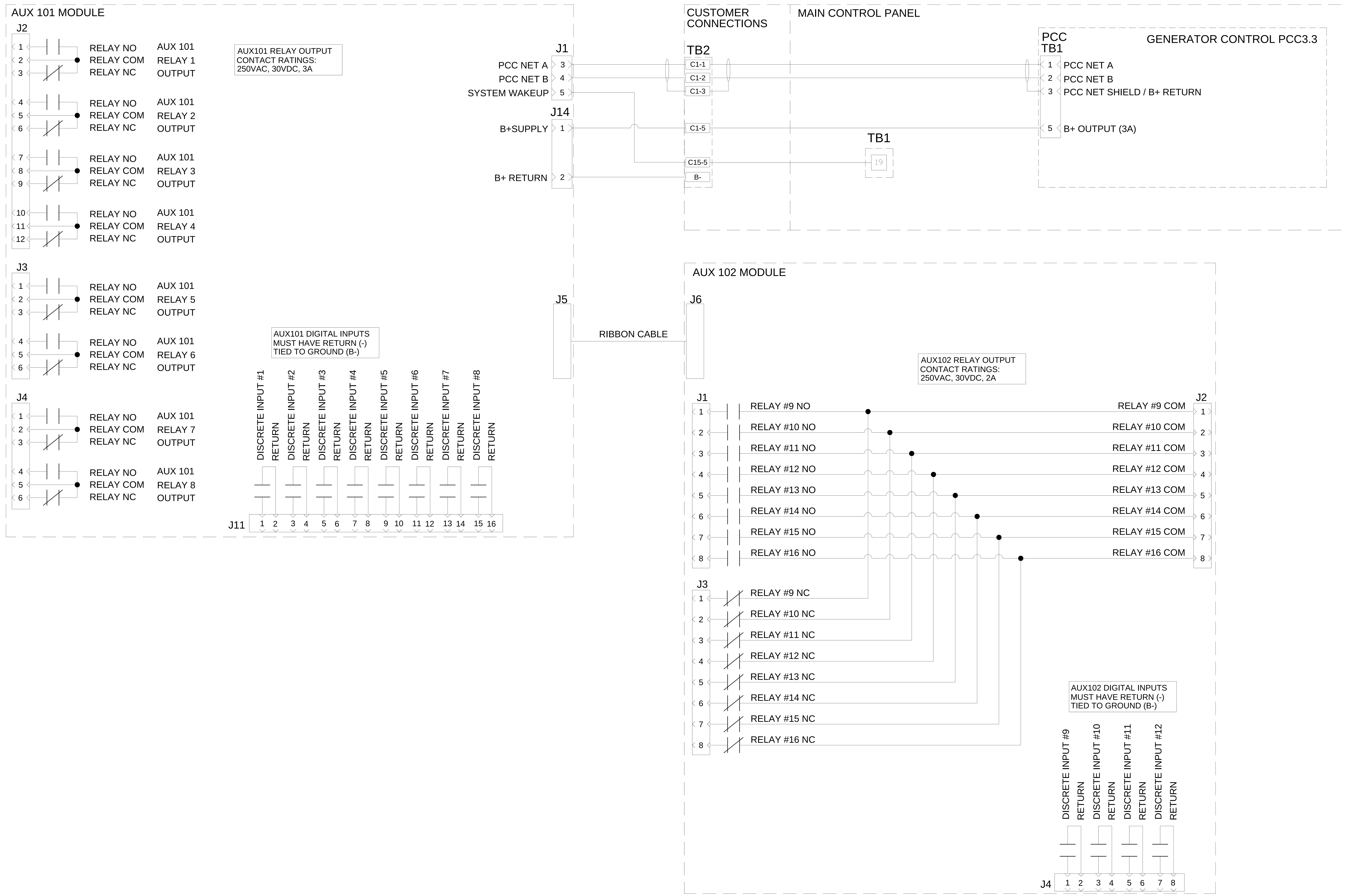
SCHEMATIC, OPTIONAL ACCESSORIES
GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 8OF11	DRAWING NO: A042H086
EST WEIGHT:		



NOTES:

1) The Aux 101 and Aux 102 modules are located in the Customer Connection side of the main control panel.
2) All connections to the I/O on the Aux 101 and Aux 102 modules are the customers responsibility.

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THIRD ANGLE PROJECTION

SCHEMATIC, AUX101 & AUX102 GTA38/50 w/ PCC3.3

DWG UNITS: INCH/LB/S	DRAWN BY: KAK	DATE: 23 JUNE 2016
	AUTO CAD	INIT ECO: 2016-022
SCALE:	SHEET 9OF11	DRAWING NO: A042H086
EST WEIGHT:		

MAIN CONTROL PANEL

ALTERNATOR

RECONNECT TERMINAL BLOCK

N W V U

P4

P3

PMG

P2

(F1) X+

(F2) XX-

FIELD WINDING

ALTERNATOR HARNESS

C1 C6

FIELD - F F

FIELD + E E

PMG 1 N N

PMG 2 O O

PMG 3 P P

F8 (10A)

F7 (10A)

AUX 103 (AVR)

J17

2 FIELD -

1 FIELD +

J18

1 PMG 1

2 PMG 2

3 PMG 3

J19

AVR FUSED B+ 1

B+ RETURN (B-) 8

AVR PWM + 2

AVR PWM - 9

FIELD CURRENT + 4

FIELD CURRENT - 10

BACKUP START DISCONNECT 3

GND CHASSIS 14

GENERATOR CONTROL PCC3.3

J26

9 AVR FUSED B+

5 B+ RETURN (B-)

16 AVR PWM +

3 AVR PWM -

14 FIELD CURRENT +

7 FIELD CURRENT -

2 BACKUP START DISCONNECT

MAIN BREAKER MCB_1

U U

V V

W W

TO CUSTOMER LOAD

C1 C2

CB SHUNT TRIPS (OPTIONAL)

2 2

1 1

Q Q

V V

U U

TB1

PE

B-

TB1

7 CB'S SHUNT TRIP B+ (OPTIONAL)

ALT. GROUND BOLT

S S

N

R R

TB2

PE

N

GFI CONNECTIONS (OPTIONAL)

CT1

X1

CT2

X1

CT3

X1

CT1 G G

CT1 COM K K

CT2 H H

CT2 COM L L

CT3 J J

CT3 COM M M

J12

1 CT1

4 CT1 COM

2 CT2

5 CT2 COM

3 CT3

6 CT3 COM

L1 D D

L2 C C

L3 B B

N A A

J22

1 L1

2 L2

3 L3

4 N

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SCHEMATIC, ALTERNATOR, MCB, CT'S
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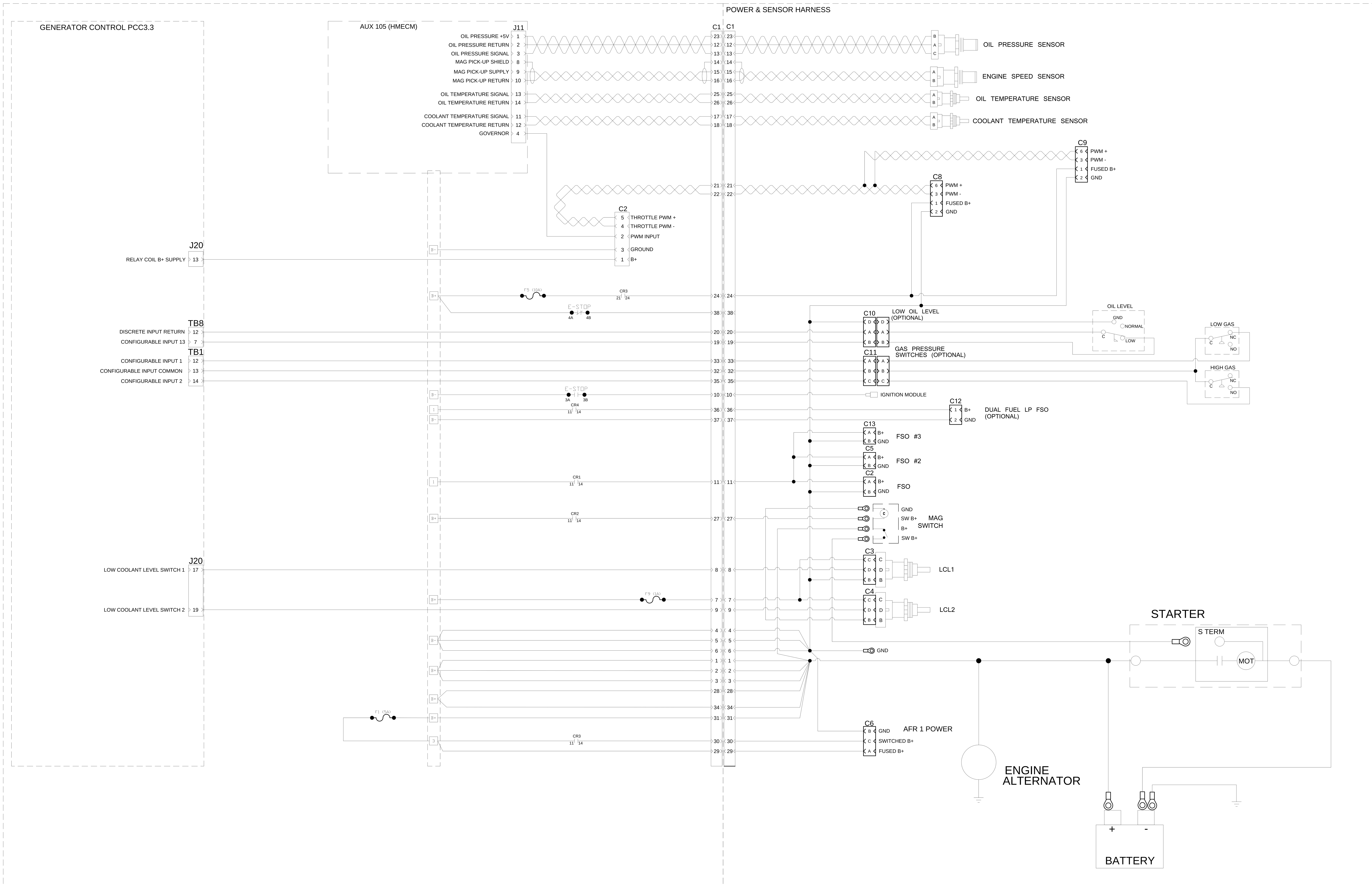
SHEET 10OF11 | DRAWING NO: A042H086


POWER & SENSOR HARNESS
GENERATOR CONTROL PCC3.3
AUX 105 (HMECM)
J11
OIL PRESSURE +5V
OIL PRESSURE RETURN
OIL PRESSURE SIGNAL
MAG PICK-UP SHIELD
MAG PICK-UP SUPPLY
MAG PICK-UP RETURN
OIL TEMPERATURE SIGNAL
OIL TEMPERATURE RETURN
COOLANT TEMPERATURE SIGNAL
COOLANT TEMPERATURE RETURN
GOVERNOR
C1
OIL PRESSURE SENSOR
ENGINE SPEED SENSOR
OIL TEMPERATURE SENSOR
COOLANT TEMPERATURE SENSOR
C9
PWM +
PWM -
FUSED B+
GND
C8
C2
THROTTLE PWM +
THROTTLE PWM -
PWM INPUT
GROUND
B+
J20
RELAY COIL B+ SUPPLY
TB8
DISCRETE INPUT RETURN
CONFIGURABLE INPUT 13
TB1
CONFIGURABLE INPUT 1
CONFIGURABLE INPUT COMMON
CONFIGURABLE INPUT 2
E-STOP
C10
LOW OIL LEVEL
(OPTIONAL)
OIL LEVEL
NORMAL
LOW
LOW GAS
HIGH GAS
NC
NO
C11
GAS PRESSURE
SWITCHES (OPTIONAL)
IGNITION MODULE
C12
DUAL FUEL LP FSO
(OPTIONAL)
C13
FSO #3
C5
FSO #2
FSO
MAG
SWITCH
SW B+
C3
LCL1
C4
LCL2
LOW COOLANT LEVEL SWITCH 1
LOW COOLANT LEVEL SWITCH 2
STARTER
S TERM
MOT
C6
AFR 1 POWER
SWITCHED B+
FUSED B+
ENGINE
ALTERNATOR
BATTERY

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SCHEMATIC, POWER & SENSOR HARNESS GTA38/50 w/ PCC3.3

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SHEET 11OF11

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