



Cordex 48-1kW 19" Shelf For Systems Up To 6000W

Installation & Operation Manual

Part # 030-706-J0
Effective: 02/2014



Important Safety Instructions

SAVE THESE INSTRUCTIONS: This manual contains important safety instructions that must be followed during the installation, servicing, and maintenance of the product. Keep it in a safe place. Review the drawings and illustrations contained in this manual before proceeding. If there are any questions regarding the safe installation or operation of this product, contact Alpha Technologies or the nearest Alpha representative. Save this document for future reference.

Safety Symbols

To reduce the risk of injury or death, and to ensure the continued safe operation of this product, the following symbols have been placed throughout this manual. Where these symbols appear, use extra care and attention.

The use of ATTENTION indicates specific regulatory/code requirements that may affect the placement of equipment and /or installation procedures.

NOTE:

A NOTE provides additional information to help complete a specific task or procedure.



CAUTION!

CAUTION indicates safety information intended to PREVENT DAMAGE to material or equipment. Cautions are designated with a shock hazard icon, the word CAUTION, and a rule beneath which the information appears.



WARNING!

WARNING presents safety information to PREVENT INJURY OR DEATH to personnel. Warnings are indicated by a shock hazard icon, the word WARNING, and a rule beneath which the information appears.



HOT!

The use of HOT presents safety information to PREVENT BURNS to the technician or user.

General Safety



WARNING!

This system is designed to be installed in a restricted access location that is inaccessible to the general public.

Mechanical Safety

- Keep hands and tools clear of fans. Fans are thermostatically controlled and switch on automatically.
- Power supplies can reach extreme temperatures under load.
- Use caution around sheet metal components and sharp edges.

Electrical Safety



WARNING!

Hazardous voltages are present at the input of power systems. The DC output from rectifiers and batteries, though not dangerous in voltage, has a high short-circuit current capacity that may cause severe burns and electrical arcing.

Before working with any live battery or power system, follow these precautions:

- Remove all metallic jewelry, such as watches, rings, metal rimmed glasses, or necklaces
- Wear safety glasses with side shields at all times during the installation.
- Use OSHA approved insulated hand tools.



WARNING!

Lethal voltages are present within the power system. Always assume that an electrical connection or conductor is energized. Check the circuit with a voltmeter with respect to the grounded portion of the enclosure (both AC and DC) before performing any installation or removal procedure.

- Do not work alone under hazardous conditions.
- A licensed electrician is required to install permanently wired equipment. Input voltages can range up to
- 240 Vac. Ensure that the utility power is disconnected and locked out before performing any installation or removal procedure.
- Ensure that no liquids or wet clothes come into contact with internal components.
- Hazardous electrically live parts inside this unit are energized from the batteries even when the AC input power is disconnected.

Battery Safety

- Servicing and connection of batteries must be performed by, or under the direct supervision of, personnel knowledgeable of batteries and the required safety precautions.
- Always wear eye protection, rubber gloves, and a protective vest when working near batteries. Remove all metallic objects from your hands and neck.
- Use OSHA approved insulated hand tools. Do not rest tools on top of batteries.
- Batteries contain or emit chemicals known to cause cancer and birth defects or other reproductive harm.
- Battery post terminals and related accessories contain lead and lead compounds. Wash your hands after handling batteries.



WARNING!

Follow battery manufacturer's safety recommendations when working around battery systems. Do not smoke or introduce an open flame when batteries (especially vented batteries) are charging. When charging, batteries vent hydrogen gas, which can explode.

- Batteries are hazardous to the environment and should be disposed at a recycling facility. Consult the battery manufacturer for recommended local authorized recyclers.

Seguridad

GUARDE ESTAS INSTRUCCIONES: Este manual contiene instrucciones de seguridad importantes que deben seguirse durante la instalación, reparación y mantenimiento del producto. Manténgalas en un lugar seguro. Inspeccione los dibujos y las ilustraciones contenidas en este manual antes de continuar. Si existe cualquier pregunta relacionada con la instalación u operación segura de este producto, póngase en contacto con Alpha Technologies o con su representante de Alpha más cercano. Guarde este documento para referencia futura.

Símbolos de Seguridad

Para reducir el riesgo de lesión o muerte y para asegurar la operación continua segura de este producto, se han colocado los siguientes símbolos a lo largo de este manual. En las partes donde aparecen estos símbolos, preste atención y cuidado adicional.

Atención:

El uso de ATENCIÓN indica requisitos de código o regulatorios específicos que pueden afectar la ubicación del equipo y/o los procedimientos de instalación.

NOTA:

Una NOTA (NOTE) provee información adicional para ayudar a completar una tarea o un procedimiento específico.



¡CUIDADO!

CUIDADO (CAUTION) indica información de seguridad con el propósito de **PREVENIR DAÑOS** al material o al equipo. Los avisos de cuidado están designados con un icono de peligro de choque, la palabra **CUIDADO** y una línea debajo de la cual aparece la información.



¡ADVERTENCIA!

Una **ADVERTENCIA (WARNING)** presenta información de seguridad para **PREVENIR LESIÓN O MUERTE** al personal. Las advertencias se indican con un icono de peligro de choque, la palabra **ADVERTENCIA** y una línea debajo de la cual aparece la información.



¡CALIENTE!

El uso de **CALIENTE (HOT)** presenta información de seguridad para **PREVENIR QUEMADURAS** al técnico o al usuario.

Seguridad General



¡ADVERTENCIA!

Este sistema está diseñado para instalarse en una ubicación con acceso restringido que no sea accesible para el público general.

Seguridad Mecánica

- Mantenga las manos y las herramientas alejadas de los ventiladores. Los ventiladores están controlados de forma termostática y se encienden automáticamente.
- Las fuentes de alimentación pueden alcanzar temperaturas extremas bajo carga.
- Tenga cuidado cerca de bordes filosos y componentes de chapa.

Seguridad Eléctrica



¡ADVERTENCIA!

Hay voltajes peligrosos en la entrada de los sistemas de alimentación. La salida de CC de rectificadores y baterías, si bien no es peligrosa en cuanto al voltaje, cuenta con una alta capacidad de conducción de cortocircuito que puede causar quemaduras graves y arcos eléctricos.

Antes de trabajar con una batería activa o un sistema de alimentación, siga estas precauciones:

- Quítese toda joyería metálica, como relojes, anillos, anteojos con montura de metal o collares.
- Use antiparras de seguridad con protecciones laterales en todo momento durante la instalación.
- Use herramientas manuales aisladas aprobadas por OSHA.



¡ADVERTENCIA!

El sistema de alimentación presenta voltajes mortales en su interior. Suponga siempre que las conexiones o los conductores eléctricos están energizados. Revise el circuito con un voltímetro con respecto de la porción a tierra del cerramiento (tanto CA como CC) antes de realizar cualquier procedimiento de instalación o remoción.

- No trabaje solo en condiciones peligrosas.
- Se requiere que un electricista matriculado se ocupe de instalar equipos con conexión permanente. Los voltajes de entrada pueden llegar a los 240 VCA. Asegúrese de que la fuente de alimentación eléctrica del servicio esté desconectada y bloqueada antes de realizar un procedimiento de instalación o remoción.
- Asegúrese de que ningún líquido ni ropa húmeda en contacto con los componentes internos.
- Las partes eléctricamente activas peligrosas dentro de esta unidad están energizadas por las baterías incluso cuando se desconecta la alimentación de entrada de CA.

Seguridad de la Batería Externa

- El mantenimiento y la conexión de las baterías debe ser realizado por, o bajo la supervisión directa de, personal experto en baterías y tomando las precauciones de seguridad requeridas.
- Siempre que trabaje con baterías utilice protección para los ojos, guantes de goma y un chaleco protector. Quítese todos los objetos metálicos de las manos y el cuello.
- Use herramientas manuales aisladas aprobadas por OSHA. No apoye las herramientas sobre las baterías.
- Las baterías contienen o emiten elementos químicos que causan cáncer y defectos de nacimiento u otros problemas reproductivos.
- Los terminales de batería y accesorios similares contienen plomo y compuestos del plomo. Lávese las manos después de manipular baterías.



¡ADVERTENCIA!

Siga las recomendaciones del fabricante de las baterías cuando trabaje cerca de sistemas de baterías. No fume ni introduzca una llama abierta cuando las baterías (en especial las baterías ventiladas) se están cargando. Mientras se cargan, las baterías ventilan gas hidrógeno que puede explotar.

- Las baterías son peligrosas para el medioambiente y deben desecharse en un centro de reciclado. Consulte al fabricante de las baterías acerca de centros de reciclado autorizados locales recomendados.

Sécurité

CONSERVEZ CES INSTRUCTIONS: Le présent manuel contient des consignes de sécurité importantes à suivre pendant l'installation, l'entretien et la maintenance du produit. Rangez-le dans un endroit sûr. Examinez les schémas et illustrations contenus dans ce manuel avant de poursuivre. En cas de questions sur l'installation ou le fonctionnement en toute sécurité de ce produit, contactez Alpha Technologies ou le représentant d'Alpha le plus près. Conservez ce document pour référence future.

Symboles de Sécurité

Pour réduire le risque de blessures ou d'accident mortel et assurer le maintien de conditions d'exploitation sécuritaires de ce produit, les symboles ci-après ont été utilisés systématiquement dans ce manuel. Lorsque ces symboles sont utilisés, prenez des précautions supplémentaires.

L'utilisation du symbole « ATTENTION » indique l'existence d'exigences réglementaires ou normatives qui peuvent affecter l'emplacement de l'équipement ou les procédures d'installation.

REMARQUE:

Une **REMARQUE (NOTE)** fournit des informations supplémentaires destinées à aider à la réalisation d'une tâche ou d'une procédure spécifique.



PRUDENCE !

Le symbole **PRUDENCE (CAUTION)** indique une information de sécurité destinée à **ÉVITER DES DOMMAGES** au matériel ou à l'équipement. Ce symbole est représenté par une icône de danger de décharge électrique, le terme **PRUDENCE** et une ligne en dessous de laquelle l'information est affichée.



AVERTISSEMENT!

Le symbole **AVERTISSEMENT (WARNING)** donne des informations sur la sécurité permettant au personnel d'**ÉVITER DES BLESSURES OU DES ACCIDENTS MORTELS**. Les avertissements sont identifiés par une icône de danger de décharge électrique, le terme **AVERTISSEMENT** et une ligne en dessous de laquelle l'information est affichée.



CHAUD!

Le symbole **CHAUD (HOT)** est associé à des informations de sécurité destinées à **ÉVITER DES BRÛLURES** au technicien ou à l'utilisateur.

Avertissements et Mises en Garde D'ordre Général



AVERTISSEMENT !

Ce système est conçu pour être installé dans un endroit restreint inaccessible au public.

Sécurité Mécanique

- Gardez les mains et les outils à l'écart des ventilateurs. Les ventilateurs sont thermostatés et s'allument automatiquement.
- Les blocs d'alimentation peuvent atteindre des températures extrêmes lorsqu'ils sont sous tension.
- Procédez avec prudence autour des composants en tôle et des bords tranchants.

Sécurité Electrique



AVERTISSEMENT !

Des tensions dangereuses sont présentes à l'entrée des systèmes électriques. La sortie CC des redresseurs et des batteries, bien que non dangereuse en termes de tension, a une capacité de courant de court-circuit élevée qui peut causer de graves brûlures et des arcs électriques.

Avant de travailler sur une batterie ou un système électrique alimenté(e), suivez ces précautions :

- Retirez tout bijou métallique, tel qu'une montre, une alliance, des montures métalliques ou un collier.
- Portez des lunettes de sécurité avec des écrans latéraux de protection à tout moment durant l'installation.
- Utilisez des outils à mains isolés et approuvés par OSHA.



AVERTISSEMENT !

Des tensions mortelles sont présentes dans le système électrique. Considérez toujours une connexion électrique ou un conducteur comme étant sous tension. Vérifiez le circuit avec un voltmètre au niveau de la partie mise à la terre du boîtier (CA et CC) avant de lancer une procédure d'installation ou de retrait.

- Ne travaillez pas seul lorsque les conditions sont dangereuses.
- Un électricien agréé est requis pour installer un équipement câblé de façon permanente. Les tensions d'entrée peuvent atteindre
- 240 V CA. Assurez-vous que l'électricité de service est débranchée et verrouillée avant de lancer une procédure d'installation ou de retrait.
- Assurez-vous qu'aucun liquide ou vêtement mouillé n'entre en contact avec les composants internes.
- Les pièces électriques dangereuses à l'intérieur de cette unité sont alimentées par les batteries même lorsque l'alimentation CA en entrée est débranchée.

Sécurité de la Batterie

- L'entretien et la connexion des batteries doivent être effectués par un spécialiste des batteries ou sous la supervision directe d'un tel spécialiste, en prenant les précautions de sécurité requises.
- Portez toujours une protection pour les yeux, des gants en caoutchouc et un gilet de protection lorsque vous travaillez à proximité de batteries. Retirez tous les objets métalliques de vos mains et de votre coup.
- Utilisez des outils à main isolés et approuvés par OSHA. Ne déposez pas les outils sur les batteries.
- Les batteries contiennent ou émettent des produits chimiques identifiés comme cause de cancer et de malformations congénitales ou d'autres troubles de l'appareil reproducteur. Les bornes des batteries et leurs accessoires contiennent du plomb et des composés de plomb. Lavez-vous les mains après avoir manipulé des batteries.



AVERTISSEMENT !

Observez les recommandations de sécurité du fabricant quand vous travaillez avec des systèmes de batteries. Ne fumez pas, ou n'introduisez pas de flamme nue quand les batteries (surtout les batteries ouvertes) sont en cours de charge. En cours de charge, les batteries dégagent de l'hydrogène gazeux susceptible d'exploser.

- Les batteries sont néfastes pour l'environnement et doivent être mises au rebut dans un centre de recyclage. Consultez le fabricant de la batterie pour connaître les centres de recyclages agréés locaux.

Wichtige Sicherheitshinweise

BEWAHREN SIE DIESE ANWEISUNGEN AUF: Dieses Handbuch enthält wichtige Sicherheitshinweise, die bei der Installation, Wartung und Instandhaltung des Produkts beachtet werden müssen. Bewahren Sie es an einem sicheren Ort auf. Sehen Sie sich die Zeichnungen und Illustrationen in diesem Handbuch genau an, bevor Sie fortfahren. Sollten Sie Fragen zur sicheren Installation oder zum Betrieb dieses Produkts haben, wenden Sie sich bitte an Alpha Technologies oder den nächstgelegenen Alpha-Vertreter. Bewahren Sie dieses Dokument für den zukünftigen Gebrauch auf.

Sicherheitssymbole

Um das Risiko von Verletzungen oder Todesfällen zu reduzieren und den weiteren sicheren Betrieb dieses Produkts zu gewährleisten, wurden in diesem Handbuch die folgenden Symbole verwendet. Seien Sie besonders vorsichtig und aufmerksam, wenn diese Symbole abgebildet sind.

Das Symbol **VORSICHT (ATTENTION)** deutet auf spezifische Anforderungen von aufsichtsrechtlichen Vorschriften oder Normen hin, welche Einfluss auf die Platzierung von Geräten und/oder Installationsverfahren haben können.

HINWEIS:

Ein **HINWEIS (NOTE)** liefert zusätzliche Informationen, die Ihnen helfen, eine bestimmte Aufgabe zu lösen bzw. ein bestimmtes Verfahren durchzuführen. Hinweise sind mit einem Häkchen, dem Wort **HINWEIS** und einem Strich, unter dem die Informationen aufgeführt sind, gekennzeichnet.



ACHTUNG!

ACHTUNG (CAUTION) kennzeichnet Sicherheitsinformationen, die darauf abzielen, **SCHÄDEN** an Materialien oder Geräten **ZU VERHINDERN**. Diese Warnhinweise sind mit einem gelben Warndreieck, dem Wort **ACHTUNG** und einem Strich, unter dem die Informationen aufgeführt sind, gekennzeichnet.



WARNUNG!

Eine **WARNUNG (WARNING)** enthält Sicherheitsinformationen zur **VERHINDERUNG VON VERLETZUNGEN ODER TODESFÄLLEN** bei Mitarbeitern. Diese Warnhinweise sind mit einem Stromschlagsymbol, dem Wort **WARNUNG** und einem Strich, unter dem die Informationen aufgeführt sind, gekennzeichnet.



HEISS!

Die Warnung **HEISS! (HOT)** liefert Sicherheitsinformationen, die dazu dienen, **VERBRENNUNGEN** des Technikers oder Benutzers zu **VERHINDERN**.

Allgemeine Sicherheit



WARNUNG!

Dieses System wurde für eine Aufstellung an einem Standort mit Zugangsbeschränkung entworfen, der für die allgemeine Öffentlichkeit nicht zugänglich ist.

Mechanische Sicherheit

- Achten Sie darauf, dass Hände und Werkzeuge nicht mit den Lüftern in Berührung kommen. Die Lüfter werden thermostatisch kontrolliert und schalten sich automatisch ein.
- Die Netzteile können unter Last Extremtemperaturen erreichen.
- Gehen Sie in der Nähe von Blechteilen und scharfen Kanten vorsichtig vor.

Elektrische Sicherheit



WARNUNG!

Am Punkt der Stromeinspeisung liegen gefährliche Spannungen vor. Der Gleichstromausgang von Gleichrichtern und Batterien weist zwar keine gefährliche Spannung auf, die Kurzschlussstrom-Kapazität ist jedoch sehr hoch, was zu ernsthaften Verbrennungen und Lichtbögen führen kann.

Befolgen Sie die folgenden Vorsichtsmaßnahmen, bevor Sie mit einer spannungsführenden Batterie oder einem Stromversorgungssystem arbeiten:

- Legen Sie sämtlichen Schmuck aus Metall wie z.B. Armbanduhren, Ringe, Brillen mit Metallrahmen oder Halsketten ab.
- Tragen Sie während der Installationsarbeiten jederzeit Schutzbrillen mit Seitenschutz.
- Verwenden Sie nur geprüftes isoliertes Werkzeug.



WARNUNG!

Innerhalb des Stromversorgungssystems herrschen lebensgefährliche Spannungen vor. Gehen Sie jederzeit davon aus, dass eine elektrische Verbindung oder ein Leiter Strom führt. Überprüfen Sie den Stromkreis mit einem Spannungsmesser bezüglich des geerdeten Teils des Gehäuses (sowohl Wechsel- als auch Gleichstrom), bevor Sie eine Installation oder Demontage durchführen.

- Arbeiten Sie unter gefährlichen Bedingungen niemals alleine.
- Die Installation festverdrahteter Geräte muss durch einen zugelassenen Elektriker vorgenommen werden. Die Eingangsspannungen können bis zu 240 VAC betragen. Stellen Sie sicher, dass die Verbindung zum Netzstrom getrennt und gegen Wiedereinschalten gesichert ist, bevor Sie eine Installation oder Demontage durchführen.
- Stellen Sie sicher, dass keine Flüssigkeiten oder nasse Kleidungsstücke mit innenliegenden Komponenten in Berührung kommen.
- Gefährliche stromführende Teile innerhalb dieses Geräts werden auch bei Trennung der Netzverbindung noch über die Batterien versorgt.

Batteriesicherheit

- Die Wartung und der Anschluss von Batterien muss von Mitarbeitern durchgeführt bzw. direkt beaufsichtigt werden, die über Kenntnisse über Batterien und die erforderlichen Sicherheitsmaßnahmen verfügen.
- Tragen Sie jederzeit Augenschutz, Gummihandschuhe und eine Schutzweste, wenn Sie in der Nähe von Batterien arbeiten. Entfernen Sie sämtliche Metallgegenstände von Ihren Händen und Ihrem Hals.
- Verwenden Sie von der OSHA genehmigte isolierte Handwerkzeuge. Legen Sie Werkzeuge nicht auf Batterien ab.
- Verwenden Sie nur geprüftes isoliertes Werkzeug. Legen Sie Werkzeug niemals auf Batterien ab.
- Batterien enthalten Chemikalien bzw. setzen Chemikalien frei, von denen bekannt ist, dass sie Krebs oder Geburtsfehler verursachen oder die Fortpflanzungsfähigkeit anderweitig schädigen.
- Batterieanschlüsse und entsprechendes Zubehör enthalten Blei und Bleiverbindungen. Waschen Sie nach dem Umgang mit Batterien Ihre Hände.
- verursachen oder die Fortpflanzungsfähigkeit anderweitig schädigen.



WARNUNG!

Befolgen Sie die Sicherheitsempfehlungen von Batterieherstellern, wenn Sie mit Batteriesystemen arbeiten. Während Batterien (insbesondere geschlossene Batterien) aufgeladen werden, darf weder geraucht noch offenes Feuer verwendet werden. Beim Aufladen setzen Batterien Wasserstoffgas frei, das explodieren kann.

- Batterien sind schädlich für die Umwelt und sollten im Sondermüll entsorgt werden. Wenden Sie sich an den Batteriehersteller, um sich über empfohlene zugelassene örtliche Recyclingstellen zu informieren.

Cordex 48-1kW 19" Shelf For Systems Up To 6000W

Models:

030-706-20

030-707-20

The following documents and drawings are included in this manual to provide the necessary information required for installation, operation and fault diagnosis of the unit:

- **Specifications, 19" Shelf:** **030-706-B1**
- **Specifications, Rectifier:** **010-606-B1 (010-566-20 non-RoHS)**
- **Schematic:** **030-706-05**
- **Outline Drawing, 19" Shelf:** **030-706-06**
- **Customer Connections:** **030-706-08**
- **Schematic:** **030-707-05**
- **Outline Drawing, 19" Shelf, Flush Mounting:** **030-707-06**
- **Customer Connections:** **030-707-08**

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1 Introduction

1.1 Scope of the Manual

This instruction manual explains the installation and interconnection of Apha Technologies' Cordex 48-1kW 19" Shelf for Systems up to 6000W.

NOTE: *To aid the user with installation, frequent reference is made to drawings located at the rear of this manual.*

For systems ordered with the Cordex CXC System Controller option, separate documentation will be provided detailing the software features, setup and operation.

1.2 Product Overview

A complete Cordex rectifier system consists of a CXC and one or more power modules in a common shelf enclosure. The shelf has connections for AC inputs, DC output, and system communications.

Cordex rectifier modules use a high frequency, switched mode conversion technique to provide a fully regulated and isolated DC output from the AC mains. The rectifier input is wide range to allow use on 208/220/240 50/60 Hz electrical service. Rectifier power modules are "hot swappable" meaning they can be inserted or removed from the shelf without cutting power to or from the system or the load. Additional power modules can be included with the system at the time of ordering or added after the shelf has been installed.

The shelf (and rectifier system) is designed to operate with the Apha Cordex System Controller (CXC); in particular, the optional CXCM (modular version of the CXC controller) plugs directly into the rectifier system shelf. See Figure 1 below.

Details for installation and wiring are provided in the respective chapters of this documentation package.

There are also rack (CXCR) and panel (CXCP) mount versions of the system controller that communicate with the shelf via offset RJ-12 shelf connectors.

See manual #018-587-B2 (non-RoHS #018-557-B2).

The CXC allows the user to set up, control and monitor the entire power system and ancillary components from one central, easy-to-use source.

Details of controller operation are provided in the current version software manual.



Figure 1—Cordex 5000W system with CXCM

1.3 Part Numbers and List Options

This product is available to order under the following part numbers and list options:

| Description | Part Number/List Option |
|--|-------------------------|
| Cordex 48-1kW 19" Shelf for Systems up to 6000W | 030-706-20 |
| [equipped to receive one CXCM controller and up to five CXRC 48-1kW rectifiers (Figure 1)] | *List 0 |
| 208/220/240Vac input | List 6 |
| 19" rack, mid-mounting | List 19 |
| 23" rack, mid-mounting | List 23 |
| 23" rack, flush mounting | List 25 |
| Temperature sensor, 1/4" lug, 12 ft..... | List 72 |
| Temperature sensor, 3/8" lug, 12 ft..... | List 75 |
| Six 1kW rectifier module positions, dual feed ac input, no CXCM (Figure 2) | *List 81 |
| DC output adapters, dual 2-position, 5/8" centers | List 85 |
| Power module blank plate..... | List 50,90 |
| | |
| Cordex 48-1kW 19" Shelf for Systems up to 6000W, flush mounting only..... | 030-707-20 |
| [equipped to receive one CXCM controller and up to five CXRC 48-1kW rectifiers (Figure 1)] | *List 0 |
| 208/220/240Vac input | List 6 |
| Temperature sensor, 1/4" lug, 12 ft..... | List 72 |
| Temperature sensor, 3/8" lug, 12 ft..... | List 75 |
| Six 1kW rectifier module positions, dual feed ac input, no CXCM (Figure 2) | *List 81 |
| Six 1kW rectifier module positions, three feed ac input, no CXCM (Figure 2)..... | List 82 |
| DC output adapters, dual 2-position, 5/8" centers | List 85 |
| Power module blank plate..... | List 50,90 |
| | |
| Cordex 48-1kW rectifier power module..... | 010-566-20 |
| Basic module..... | *List 0 |
| Gray finish with blue silkscreen..... | *List 50 |

* Default option

The above information is valid at the time of publication. Consult factory for up-to-date ordering information.



Figure 2—Cordex 6000W system (no CXCM)

2 Rectifier Features

2.1 Front Panel



Figure 3–Cordex 48-1kW rectifier

2.1.1 LEDs

The front panel LEDs provide:

- Rectifier status summary,
- Rectifier software upgrade in progress indication,
- Locate module pattern.

Rectifier status summary will show the rectifier alarm status, communication fail status and rectifier on/off status.

2.1.1.1 AC ON

The top LED (green) is on when AC is within valid range. The LED will flash (~2Hz) when AC is outside the nominal range – **AC voltage is invalid if the AC Mains Low or AC Mains High alarm is active**. The LED turns off when AC has failed.

2.1.1.2 DC ON

The middle LED (green) is on when the rectifier is delivering power to the load. The LED will flash when communication is lost. The LED turns off when the rectifier is off; e.g., when commanded via the CXC.

2.1.1.3 ALARM

The bottom LED (red) is on continuously in the event of an active Module Fail alarm. The LED will flash (~2Hz) when a minor alarm is detected. The LED remains off in the absence of an alarm.

2.1.1.4 LED Activity During Software Upload

When a rectifier software upload is in progress, the LEDs will behave in a distinctly different way to indicate new rectifier software is being transferred from the CXC.

When a rectifier data transfer is in progress, all three LEDs will flash in a sequence lasting 1.5 seconds. When the last LED is lit, the sequence is repeated beginning at the first LED.

2.1.1.5 LED Activity During 'Locate Module' Command from CXC

When the 'locate module' command has been received from the CXC, the LEDs will behave in another distinct fashion so that the rectifier is easier to visually identify among adjacent rectifiers.

This state is entered when commanded via the CXC. The LEDs will flash in a ping-pong pattern repeating every 2 seconds.

The ping-pong pattern lights each LED sequentially. After the last LED is lit, each LED is lit in reverse sequence. When the first LED is lit, the pattern repeats. The effect makes it appear as if the light is bouncing between the first and last LED.

2.1.2 Mechanical

A thumbscrew is provided to secure the rectifier into the shelf. During normal operation the rectifier shall be locked into position. A handle (or grip) is incorporated into the front panel to facilitate the removal of the rectifier from the shelf. No special tools are required.

2.2 Rear Panel

Located on the rear panel of the rectifier are connectors for shelf power and communications.

2.3 True Module Fail Alarm

The power modules have a "true" fail alarm. This provides a true indication of the power module's ability to source current. When the module's output current drops below 2.5% of the rated output a low output current condition is detected and the Module Fail detection circuit is activated. This circuit momentarily ramps up the output voltage to determine if the module will source current. If no increase in current is detected, the Module Fail alarm is activated. The module will test once every 60 seconds for the condition until current is detected. Output voltage ramping will cease upon detection of current¹. A minimum 2.5% load is required to avoid the Ramp Test Fail alarm; this can typically be provided with the parallel system battery. Activation of this alarm could indicate a failed module or a failed load.

NOTE: *For Cordex rectifier systems without batteries (or with a very light load; below 2.5% of rated output) it is recommended that the ramp test be disabled to avoid nuisance alarms. The Ramp Test feature is enabled/disabled via the CXC menu item: Rectifiers, Configure Settings.*

2.4 Heat Dissipation

Heat dissipation is achieved through natural (bottom to top) convection cooling.

NOTE: *Some rectifier shelves incorporate fan aided cooling to increase the temperature rating of the module. See shelf manual supplied with your system.*

2.5 Over Temperature Protection

Each module is protected in the event of an excessive increase in temperature due to component failure or cooling airflow blockage. During over temperature conditions, the rectifier limits the output power as well as the output current. **At 65°C output power and current limit are reduced to 70%.** If temperature continues to increase, a shutdown of the rectifier is initiated. The rectifier shall restart automatically if the temperature has returned to a safe level.

¹ A battery connected to the output of the rectifier will draw current when the voltage ramp occurs. Therefore the rectifier fail alarm will not be generated with a battery connected.

2.6 Wide AC Range

A minor alarm is generated when the AC input voltage drops below 180Vac. Output power is reduced linearly below 150Vac to 40% of the rated output power. At a lower voltage the module will shut down and will not restart until the AC is greater than or equal to 150Vac.

For voltages above 276Vac, power factor and total harmonic distortion may be derated. For voltages between 277Vac and 320Vac, the rectifier may not be operational but shall not suffer any damage.

2.7 AC Inrush/Transient Suppression

The modules' inrush current is limited to less than one times the nominal peak line current to prevent surge on the AC line. Modules are also protected from input lightning and transient surges in accordance with IEEE/ANSI C62.41 Category B3.

2.8 Soft Start

To eliminate an instantaneous demand on the AC source, a soft start feature is employed. Soft Start, sometimes referred to as "current walk-in", works by gradually (up to five seconds) ramping the current limit up from zero to the actual or defined customer setting. The output voltage is ramped up from the minimum voltage to the float voltage.

2.9 Start Delay

The modules are equipped with a delay timer in order to stagger start a series of modules to prevent excessive loading of generators upon start up. The built-in timer delays the turn on of the module depending on the value selected (up to 120 seconds) via the CXC. A minimum one-second delay is preset to allow charging of the input capacitors.

2.10 Current Limit/Short Circuit Protection

The current limit function determines the maximum output current limit of the module, regardless of output voltage or power. Maximum output current is limited to a constant value down to short circuit condition. Current limiting can be used to mate the rectifier output current ampacity to the needs of the load and parallel battery to minimize excessive battery recharge current.

The rectifier will sustain a short circuit at the output terminals indefinitely. The maximum short circuit current shall not exceed 105% of the rated full load current.

2.11 Power Limiting

Each module is designed to limit power output to the module specification. This enables more current to be supplied at lower output voltages, and allows matching of output to the demand of constant power loads, normally seen with telecom equipment.

This feature may also be used for a faster recharge of flooded batteries paralleled with the load.

NOTE: *Current limiting overrides the power-limiting feature.*

2.12 High Voltage Shutdown (HVSD)

This feature provides protection to the load from over voltage conditions originating from the rectifiers. It operates by shutting down the offending rectifier module when a high output voltage condition occurs. Indication is through the red Alarm (Module Fail) LED. Modules will restart automatically; however, if more than three over voltage conditions occur in one minute, the module will latch off and remain shut down until it is reset via the CXC.

2.13 Battery Eliminator Operation

Modules maintain all specifications (except where indicated) with or without a battery attached in parallel to the output; however, if a battery or another module supplying DC voltage in parallel is not present, there will be no monitoring or control activity if there is an AC power failure or input fuse failure.

3 CXCM Features

The optional CXCM (Cordex Controller, Modular) can be mounted in the rectifier system shelf and brings advanced monitoring technology to the Cordex series of rectifiers. This compact 4RU system controller is designed for seamless operation and set up of Apha power systems and is equipped with the complete range of Cordex software features, including the following:

- Designed to communicate directly with Cordex rectifiers
- Includes battery temperature compensation charging
- Battery performance diagnostics
- Provides local and remote communications
- User definable alarms
- Daily logging of power system events and system statistics.

The CXCM includes a web server providing easy set up and monitoring using an Internet connection with the standard Windows® Internet Explorer browser.

The data logging feature allows the user to capture data from multiple inputs, for AC/DC voltages, load/battery current, cell voltages & temperatures (automatically for up to 16 user defined logs). Typical applications of the CXCM logging include power system details, thermal performance of outdoor enclosures, battery cell specifics, or mains variations captured by an AC voltage watchdog.

A built-in audio speaker sounds an intermittent tone during active alarms.

The input/output (I/O) board houses a series of terminal connections; located at the back of the system shelf.

3.1 Front Panel

3.1.1 Display

Located on the front panel is a 160 x 160-pixel graphical LCD with touch screen similar to those used in PDAs. This graphical user interface (GUI) allows the operator to interact with screen selectable items using a fingertip.



Figure 4–Cordex CXCM model system controller front panel

3.1.2 LEDs

The CXCM has three LEDs located on the front panel. These are used to display the alarm status of the power system, CXCM progress and status during startup, and file transfers.

3.1.2.1 Alarm Conditions

The CXCM illuminates the LED that corresponds to the system alarm status. The following show the corresponding alarm status for each LED color:

Green – OK, no alarms present

Yellow – Minor alarm is present (no major alarms)

Red – Major alarm is present.

Only one LED is illuminated at a time during alarm conditions.

3.1.2.2 Progress and Status Indication

The LEDs are also used in the following situations:

Base unit validation – all three LEDs are on at the same time.

File transfer – when recovering from invalid firmware application – the red LED is illuminated.

3.1.3 Reset

A reset button is located on the front panel for restarting the CXCM's microprocessor. It takes approximately 15 seconds before the display reappears after pressing the reset button.

NOTE: *Refer also to the software manual – always select the shutdown menu item before pressing the reset button.*

3.1.4 Ethernet Port

The Ethernet port is designed for CXCM connection to a user supplied network (TCP/IP secured by user) via a rear panel RJ-45 jack and a standard network cable.

Local access (e.g. laptop computer) is also possible from the Ethernet port connection using a standard network crossover cable.

3.1.5 RS-232 Serial (Craft) Port

Local access to the CXCM is possible through a front panel RS-232 serial port; using a null modem cable. The communication protocol supports a web interface (via Microsoft® Internet Explorer 6 or greater). The remote screen display is an enhanced version of the CXC's front panel display.

3.2 Analog Input Channels

The CXCM has analog input channels for voltage, current, and temperature.

3.2.1 Voltage Inputs

Two voltage input channels, V1 and V2, provide monitoring of discharge and charge voltage. The CXCM software is pre-configured to monitor V2 for both load and battery voltage. V2 is used as the system reference for rectifier float voltage, low voltage disconnect (LVD), system high voltage alarm, and system low voltage alarm. V1 is available for additional voltage measurements.

3.2.2 Current Inputs

The CXCM software is pre-configured to monitor I1 for load current using an external 50mV current shunt.

3.2.3 General-Purpose

A set of terminals are provided to monitor a bi-voltage signal that may vary in either polarity from zero; e.g., +/-60Vdc.

3.2.4 Temperature Inputs

Two temperature input channels, T1 and T2, provide monitoring of battery temperature and temperature compensation (temp comp) or room/ambient temperature. A voltage is supplied to these terminals to power the temperature sensors.

3.3 Digital Input Channels

The CXCM can accommodate up to three channels and can monitor digital alarm/control signals from rectifiers, converters and many other types of equipment.

3.4 Alarm and Control Output Relays

The CXCM contains eight Form C digital alarm output relays to extend alarms and control external apparatus. Each internally generated alarm or control signal may be mapped to any one of the relays, or, several signals may be mapped to just one relay or none at all.

3.4.1 LVD Control (External Option)

The LVD Control functions can be hardwired directly from the assigned relay output to an optional LVD override control and distribution alarm card. This provides a safety measure to protect against load disconnect during CXCM reset or replacement; e.g. when the controller is off-line. Operators may also perform test and maintenance procedures on the CXCM without disturbing the load.

3.5 System Fail Alarm/Relay

The CXCM system fail alarm (K0) activates because of a major internal failure. During such a condition, the unit will attempt to reset, but if this fails, an alarm condition will be extended to a relay and the red LED on the front panel will illuminate. This is a fail-safe signal to the remote monitoring equipment; i.e. alarm will be extended even if power to the unit is interrupted.

3.6 Network Connection and Remote Communications

The Cordex system can be set up, monitored and tested via Ethernet 10/100 Base-T serial data connection. The communication protocol supports a web interface. All alarming and control of Cordex rectifiers is accomplished with a CXC via a CAN bus.

A step-by-step connection wizard – provided to establish remote communications with your CXC – is available via the Apha website (www.alph.ca).

4 Inspection

4.1 Packing Materials

All Apha products are shipped in rugged, double walled boxes and suspended via solid inserts to minimize shock that may occur during transportation. Packaging assemblies and methods are tested to International Safe Transit Association standards.

Products are also packaged with Cortex. This plastic wrap contains a corrosive-inhibitor that protects the product from corrosion for up to two years.

4.1.1 Returns for Service

Save the original shipping container. If the product needs to be returned for service, it should be packaged in its original shipping container. If the original container is unavailable, make sure the product is packed with at least three inches of shock-absorbing material to prevent shipping damage.

NOTE: *Apha Technologies is not responsible for damage caused by the improper packaging of returned products.*

4.2 Check for Damage

Prior to unpacking the product, note any damage to the shipping container. Unpack the product and inspect the exterior for damage. If any damage is observed contact the carrier immediately.

Continue the inspection for any internal damage. In the unlikely event of internal damage, please inform the carrier and contact Apha Technologies for advice on the impact of any damage.



Verify that you have all the necessary parts per your order for proper assembly.

5 Installation

This chapter is provided for qualified personnel to install the product, which shall be mounted in a clean and dry environment.

NOTE: *To aid the user with installation, frequent reference is made to drawings located at the rear of this manual.*

5.1 Safety Precautions



WARNING

Hazardous voltages are present at the input of power systems. The DC output from the rectifiers and battery system has a high short circuit current capacity that may cause severe burns and electrical arcing.

Before working with any live battery or power system/distribution center, follow these precautions:

- Remove all metallic jewelry; e.g., watches, rings, metal rimmed eyeglasses, necklaces.
- Wear safety glasses with side shields (and prescription lenses if necessary) at all times during installation.

The installer should follow all applicable local rules and regulations for electrical and battery installations; e.g., CSA, UL, CEC, NEC, OSHA, and local fire codes.

Use OSHA approved insulated hand tools.

5.2 Shelf Preparation/Mounting

For 030-706-20, the shelf has been designed for mounting in a standard EIA 19" rack (19" shelf option only) or 23" relay rack. See drawing 030-706-06.

For 030-707-20, the shelf has been designed for flush mounting only (in a standard EIA 19" rack). See drawing 030-707-06.

NOTE: *The shelf shall be mounted in a clean and dry environment. Allow at least 1.75" of free space above and below the unit for unrestricted convection cooling airflow.*

Mounting brackets accommodate either 1" or 1-3/4" rack spacing. The shelf should be mounted to the rack using at least two #12 – 24 x 1/2" screws in each bracket. Philips-type screws and screwdriver should be used to eliminate the possibility of slippage and scratching of the unit's exterior. Washers (such as internal tooth) or special screws that are designed to cut through the painted surface should be used to ensure a good chassis ground.

5.3 Module Insertion/Removal

Insert by placing the module on the shelf bottom and sliding the module into the rear connectors (inside of the shelf). Apply pressure on the handles to engage the rear connector in the shelf receptacle. Tighten the screw on the bottom of the faceplate to secure the module to the shelf.

NOTE: *Do not force a module into position if it does not seat properly. All modules are keyed to ensure that the correct module type is used.*

To remove modules, loosen the screw on the bottom of the faceplate. Grasp handle and pull out, sliding the module away from the rear connectors and out of the shelf.

6 Wiring and Connections

This chapter provides cabling details and notes on cable sizing for DC applications with respect to the shelf.

NOTE: Refer also to drawings located at the rear of this manual.

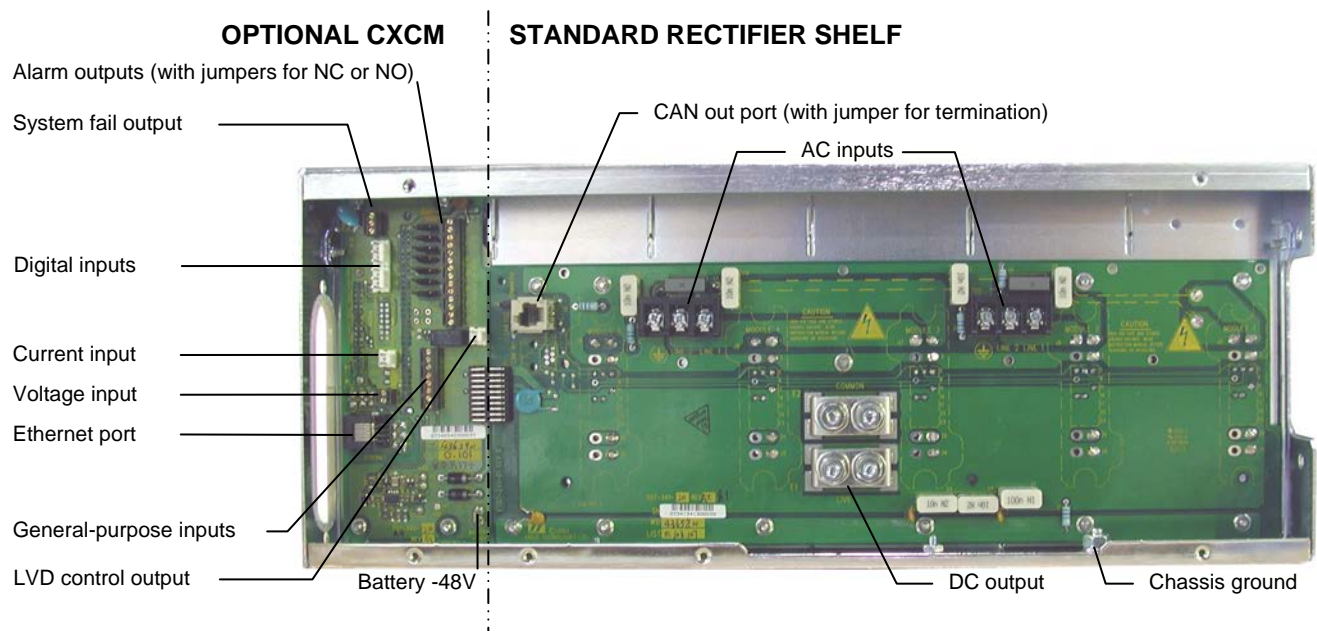


Figure 5–Rear view of shelf showing all system connections

6.1 Safety Precautions



WARNING

Hazardous AC voltages may be present. Ensure power at the AC service panel is off before attempting work on the AC connections. Use a voltmeter to verify the absence of voltage. Clearly mark the correct polarity of the battery leads before commencing work on DC connections.

Refer to the previous (Installation) chapter for additional safety precautions.

6.2 Tools Required

Various tools are essential for product installation. Use this list as a guide:

- Slot head screwdrivers (blade sizes: 1/4", 1/8", 1/16")
- Philips head screwdriver, #2 (tip size 3/16")
- Digital voltmeter equipped with test leads
- Adjustable 48Vdc load (optional)
- Cutters and wire strippers
- Crimping tool (optional for large gauge wire)
- Socket and ratchet set (Imperial measure)
- Anti-static wrist strap
- Computer (laptop) with Microsoft® Internet Explorer 6 or greater
- Crossover cable RJ-45 (for access using the Ethernet port).

6.3 Power System Chassis Ground

WARNING

For safety reasons, ensure the system is properly bonded to the building's ground grid.

Both the shelf chassis ground (via power system chassis ground) and common return shall be connected to the site ground to ensure correct operation of the system and to prevent drifting floating analog (especially current) readings.

6.4 AC Feeder Protection/Sizing

To maximize system reliability, a dual AC feed divides the rectifiers into two groups to be supplied by two separate feeds. A three feed option divides the rectifiers into three groups to be supplied by three separate feeds.

It is recommended for each feed to use a dedicated protection feeder breaker located at the AC distribution panel. The feeder breaker can also act as the disconnect device for the connected modules.

| Number of Rectifiers on AC Feed | Circuit Breaker Exact Value to Use (A) | 90 deg. C Wire Gauge to use at 30 deg. C ambient (AWG) |
|---------------------------------|--|--|
| 1 | 15 | 12 |
| 2 | 20 | 12 |
| 3 | 30 | 10 |

Table A—Recommended AC supply configuration

6.5 AC Input Connections

CAUTION: AC input wires should be routed in flexible or rigid conduit as far away as possible from the DC power wires to minimize EMI disturbances.

Remove the metal cover from the rear of the shelf to expose the wireway for input terminal blocks.

The wireway is designed for two customer-supplied 1" conduit fittings for AC supply located on the left side of the shelf and two 3/4" conduit fittings on the rear.

Attach the conduit retainers to the wireway hole(s) and route the AC cables through. Secure the wires to the AC input and chassis ground terminals as required. Tighten the cable connector to the AC cable (conduit similar).

Replace rear cover once all connections have been completed.

6.6 Calculating Output Wire Size Requirements

Wire size is calculated by first determining the appropriate maximum voltage drop requirement. Using the formula below calculate the CMA wire size requirement. Determine the size and number of conductors required to satisfy the CMA requirement.

$CMA = (A \times LF \times K) / AVD$, where:

CMA = Cross section of wire in circular MIL area

A = Ultimate drain in amps

LF = Conductor loop feet

K = 11.1 constant factor for commercial (TW type) copper wire

AVD = Allowable voltage drop

Check again that the ampacity rating of the cable meets the requirement for the installation application. Consult local electrical codes (NEC, CEC, etc.) for guidelines. If required, increase the size of the cable to meet the code.

6.7 DC Output Connections



WARNING

Leave cables or bus bars disconnected at battery and verify output polarity using a voltmeter. Make battery connections only after all other wiring is completed.

DC output wire shall be UL approved XHHW or RHH/RHW (for Canadian users, RW90 Type). Control and sense wires shall be UL approved Style 1015 (for Canadian users, TEW type).

Connect DC output cables at the side of the shelf. Without the distribution option, the side DC access is made toward the rear of the shelf.

Terminate cable leads with appropriate crimp lugs. Secure the positive and negative to the shelf output post of the correct polarity; i.e., +V_{cable} to +V_{post}. Ensure the washers are on the bolts in the same order in which they were shipped from the factory. Tighten the bolts as per Customer Connections drawing at the rear of this manual.

The common output leg of the rectifier system should be connected to ground. This is typically done at the load common termination point.

Replace rear cover once all connections have been completed.

6.8 CAN Serial Ports

Connect Cordex equipment and set jumpers as shown:



Serial ports, for communications with Apha's Cordex rectifiers and other CAN-enabled equipment, are located on the backplane.

Daisy-chain from shelf to shelf as necessary and ensure that the last shelf is terminated with the jumper (below).



List 0 (system equipped for CXCM) has one CAN OUT port.



List 81 (equipped for six rectifiers and no CXCM) has one CAN IN port and one CAN OUT port.

The jumper (P1) allows setting of the CAN OUT to be open to next shelf or TERMINATED if last shelf on CAN bus, as shown here:

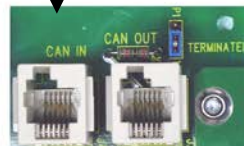


Figure 6–CAN ports for multiple shelf connections with CXCM



Serial ports, for communications with Alpha's Cordex rectifiers and other CAN-enabled equipment, are located on the backplane.

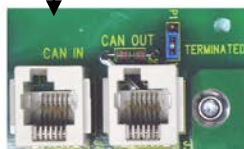
Daisy-chain from shelf to shelf as necessary and ensure that the last shelf is terminated with the jumper (below).



System equipped with CXCP or CXCR has one CAN OUT port.



List 81 (shelf equipped for six rectifiers and no CXCM) has one CAN IN port and one CAN OUT port.



The jumper (P1) allows setting of the CAN OUT to be open to next shelf or TERMINATED if last shelf on CAN bus, as shown here:



Figure 7–CAN ports for multiple shelf connections with CXCP (CXCR typical)

6.9 Network Connection and Remote Communications via CXC

The Cordex 48-1kW system can be set up, monitored and tested via Ethernet 10/100 Base-T or with RS-232 serial data connection. The communication protocol supports a web interface.

NOTE: Pinouts are shown in drawings 030-706-08 and 030-707-08.

Some standard scenarios are described below:

6.9.1 Ethernet Port for Network Connection (Standard Network Cable)

The Ethernet port is designed for CXC connection to a user supplied network (TCP/IP secured by user) via a rear panel RJ-45 jack. Connect to the Cordex shelf using a standard network cable.

6.9.2 Ethernet Port for Local Connection (Crossover Cable)

Local access (e.g. laptop computer) is also possible from the Ethernet port connection using a standard network crossover cable.

6.9.3 RS-232 Serial (Craft) Port for Local Connection

Local access to the CXC is possible through the front panel RS-232 serial port using a null modem cable. See Figure 8.

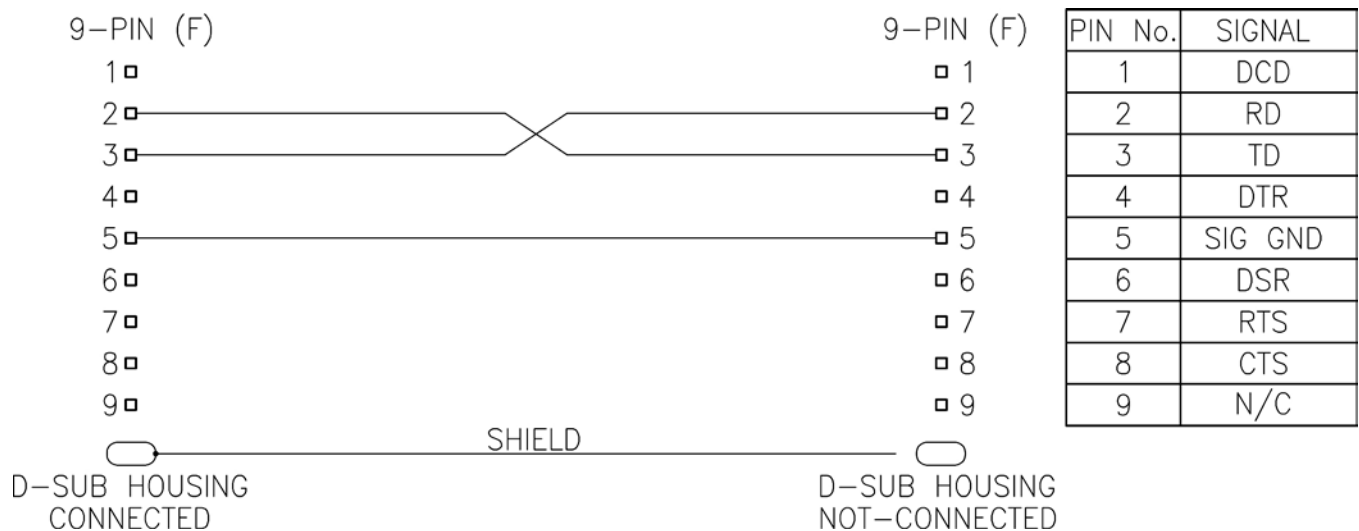


Figure 8—NULL modem pinouts

6.10 Alarm and Signal Wiring Connections for CXCM

For terminal block connections, the recommended wire sizes are 0.75 to 0.14mm² (#18 to #26 AWG) for the temperature range of 0 to 50 deg. C (as per UL/CSA).

For insulation displacement receptacles, the recommended wire size is 0.75mm² (#18 AWG).



CAUTION: to reduce risk of fire, use only 0.129mm² (#26 AWG) or larger wire.

| Terminal | Description | Signal Type | Range |
|---|-------------------------------|--------------------|----------------------------|
| Alarm Outputs – Can be configured to de-energize on alarm (DOA) or energize on alarm (EOA). | | | |
| #2-21,22(common) | K2, LVD2 | NC/COM/NO (JP2) | 60Vdc / 1A |
| #3-19,20(common) | K3, LVD3 | NC/COM/NO (JP3) | 60Vdc / 1A |
| #4-17,18(common) | K4, System Minor | NC/COM/NO (JP4) | 60Vdc / 1A |
| #5-15,16(common) | K5, System Major | NC/COM/NO (JP5) | 60Vdc / 1A |
| #6-13,14(common) | K6, AC Mains Hi-Low | NC/COM/NO (JP6) | 60Vdc / 1A |
| #7-11,12(common) | K7, Not assigned | NC/COM/NO (JP7) | 60Vdc / 1A |
| #8-9,10(common) | K8, Not assigned | NC/COM/NO (JP8) | 60Vdc / 1A |
| #0-25,24,23 | K0, System Fail Output* | NC/COM/NO | 60Vdc / 1A |
| Digital Inputs – See Table B for definitions of logic and system | | | |
| P5-1,2 | D1, Distribution Fuse (Alarm) | Pos (+) or Neg (-) | 0–60Vdc |
| P5-3, P6-1 | D2, Distribution CB (Alarm) | Pos (+) or Neg (-) | 0–60Vdc |
| P6-2,3 | D3, Battery CB (Alarm) | Pos (+) or Neg (-) | 0–60Vdc |
| Analog Inputs and System Signals | | | |
| E1 | Battery -48V** | Neg (-) | 20–60Vdc |
| J3 | Ethernet port | N/A | N/A |
| P1-2,1 | K1, LVD1 | Pos (+) / Neg (-) | 0–60Vdc / 1A |
| P7-2,1 | V1, Load Voltage | Pos (+) / Neg (-) | 0–100Vdc |
| P8-2,1 | I1, Load Current | Pos (+) / Neg (-) | ±50mV |
| – for List 120, add the following: | | | |
| 1-2 | T1 (GP1), Temp Probe 1 | Pos (+) / Neg (-) | 0–20Vdc, with power source |
| 3-4 | T2 (GP2), Temp Probe 2 | Pos (+) / Neg (-) | 0–20Vdc, with power source |
| 5-6 | GP3, General Input 3 | Pos (+) / Neg (-) | Not used |
| 7-8 | GP4, General Input 4 | Pos (+) / Neg (-) | ±60V, bi-polar voltage |
| – for List 124, consult the factory to add the following: | | | |
| 1-2 | V3 (GP1), Voltage Input 3 | Pos (+) / Neg (-) | 0–60Vdc |
| 3-4 | V4 (GP2), Voltage Input 4 | Pos (+) / Neg (-) | 0–60Vdc |
| 5-6 | V5 (GP3), Voltage Input 5 | Pos (+) / Neg (-) | 0–60Vdc |
| 7-8 | T1 (GP4), General Input 4 | Pos (+) / Neg (-) | 0–20Vdc, with power source |

Table B–Signal wiring connections for CXCM

* System Fail output relay is fail-safe and will de-energize during an alarm condition.

** Battery –48V: connect to battery only when using a battery disconnect device

NOTE: To aid the user with installation, frequent reference is made to drawings located at the rear of this manual. Custom configurations may be detailed within the Apha power system documentation package.

6.10.1 Alarm (Relay) Outputs

Terminals provide contacts for extending various alarm or control signals. Each relay output can be wired (jumper selectable) for NO or NC operation during an alarm or control condition. See Figure 9.

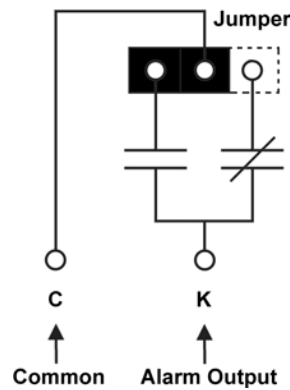


Figure 9—Showing relay connections

Relays can be programmed to energize or de-energize during an alarm condition (see CXC Software manual). When the CXCM reset button is pressed or power is lost, all relays de-energize.

These relays could be used for additional external LVD contactor control; however, this would not provide the redundant LVD control as with the assigned output pins described below.

6.10.1.1 LVD Control

The LVD Control functions can be hardwired directly from the assigned output pins (+ and -) to an external LVD contactor (or panel). See Controls Menu Defaults in the CXC Software manual.

Redundant LVD Control Circuit

The shelf backplane² provides circuitry to override the LVD Control function. This is a safety measure to protect against accidental load disconnect should the CXCM be removed from the shelf. This protection is also necessary during CXCM reset.

The OUT voltage is 46V and the IN voltage is 51V. Ensure the CXCM LVD voltages are set outside of this range. **NOTE: Controller Relay 1 must be set to ENERGIZED for the LVD to operate properly.**

6.10.1.2 System Fail Output

Terminals (#0) provide connections for a system controller fail relay (K0). This is a fail-safe relay and will de-energize during an alarm condition. Both NO and NC contacts are available for this particular relay.

² Apha #707-340-20 for the CXCM. See Customer Connections drawing at the rear of this manual.
030-706-J0 Rev B

6.10.2 Digital Inputs

The digital input channels are used to monitor various alarm and control signals. All input channels are voltage activated and accept a bipolar (i.e. negative or positive) DC signal directly.

6.10.2.1 Connection Method

Typical Apha systems use the “reset with Hot and trigger with Ground” connection. The digital input is wired in such a way that the Hot is wired directly into one of the input terminals; e.g., negative input for –48V systems. The other input terminal is wired to the Ground (common) of the system through a relay (dry contact – usually located on the equipment requiring monitoring). This method (see Figure 10) allows the digital input to receive (or not receive) a Ground signal on an alarm.

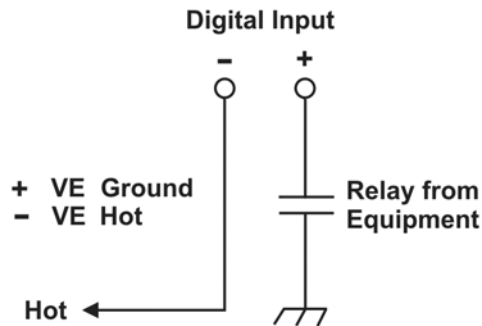


Figure 10–Showing connection method

6.10.2.2 Programming the Digital Input

The digital input channels can be programmed for “active high” or “active low.” Active high indicates “alarm on the presence of a ground signal” and active low indicates “alarm on the removal of a ground signal.” See CXC Software manual for detailed instruction on programming.

| Voltage Range (VDC) | Voltage Level (VDC) Considered As “0” (Off) | Voltage Level (VDC) Considered As “1” (On) |
|----------------------------------|---|--|
| 0—60 (system voltage setting) | 0—3 | 18—60 |

Table C–Voltage level definitions for digital inputs

6.10.3 Battery –48V

The Battery -48V should be connected at the battery system voltage terminal for CXCM reference when a battery disconnect device is used. It is critical to CXCM operation as it ensures a source of power to the CXCM should the disconnect device open the circuit. A 1/4" spade (quick connect) connector is provided on the CXCM portion of the shelf backplane. #18AWG wire is recommended.

6.10.4 Analog Inputs

CAUTION: Ensure the correct polarity is used for all input cable terminations.

The analog input channels are used to monitor various types of electrical signals. Some of the analog channels are reserved for specific signals, while others are designated as general-purpose inputs, which accommodate various types of analog signals. The input cables should be bundled together and routed through the entry holes of the shelf, if applicable.

6.10.4.1 Voltage

Voltage Input #1 (discharge voltage per CXC software) terminals on the shelf provide connections to an optional secondary voltage input. For example, this can be terminated to the load side of an LVD contactor to monitor load voltage.

Voltage Input #2 (charge voltage per CXC software) is wired internally to the rectifier output voltage of the shelf. This is used as the reference for system alarming (such as high voltage) and control (such as low voltage disconnect).

6.10.4.2 Current

Current Input #1 terminals provide connections (factory-installed) to the system current shunt used to monitor discharge (load) current.

6.10.4.3 General-Purpose

Terminals provide connection pairs for various analog inputs such as temperature sensors. These are configured at the time of ordering. The configuration determines whether the signals allowed are to be bipolar (may vary in either polarity from zero; e.g., +/-60VDC) or unipolar (may vary positive from zero; e.g., 0 to +60VDC).

NOTE: *The CXC software is pre-configured to monitor converter voltage through input channel GP1.*

Temperature Sensor

Terminals, of the general purpose grouping, may be configured as temperature input channels and provide connections for up to two temperature sensors. A voltage is supplied to these terminals for sensor measurements.

7 Operation

7.1 Main Rectifier States

Rectifier operation can be broken up into five main states:

1. Off,
2. Start delay,
3. Soft start,
4. Normal operation,
5. Turning off.

Each state is characterized as being distinct and necessary for the operation of the rectifier. These states are briefly described below.

7.1.1 Off State

The rectifier will be in the Off state immediately after power is applied to the rectifier or after a rectifier shutdown. The shutdown source may be remote or local shutdown, AC shutdown, OVP or thermal shutdown.

When the rectifier is in this state the DC-DC converter is turned off and the CXC will be monitoring its inputs for the proper conditions to begin the start up sequence.

When the conditions have been met for the rectifier to start up, it will transition to the Start Delay state.

7.1.2 Start Delay State

When the rectifier is in the Start Delay state, the DC-DC converter is held off and still not sourcing power and is waiting for a given amount of time before transitioning to the next state.

When in this state, the CXC continues to monitor its inputs.

After the Start Delay state the rectifier will transition to the Soft Start state.

NOTE: *Soft start, or current walk-in, gradually increases the voltage and current output of the rectifier upon startup. This is done to reduce the instantaneous load on the AC source.*

7.1.3 Soft Start State

When the Soft Start state is entered, the rectifier will be turned on and the output voltage and output current will be gradually increased. If a load is present, the rectifier will begin to source power.

When the voltage and current limit ramps have finished, the rectifier will transition to the Normal Operation state.

7.1.4 Normal Operation State

The Normal Operation state is the state that the rectifier will be in performing all of the rectifier functions and features specified herein.

From this state, the only valid transition is to the Turning Off state. This transition will happen if the rectifier is required to shut down.

7.1.5 Turning Off State

The Turning Off state is entered because a short delay is required before the rectifier actually turns off to take care of any initialization requirements.

When this short delay has elapsed, a transition to the Off state is made.

7.2 Main Rectifier Modes

In addition to Main Rectifier States, there is a set of Main Rectifier Modes. These modes can be divided into two categories as follows:

7.2.1 Output Voltage Modes

Voltage modes can be thought of as modes that, under software control, can directly adjust the output voltage. The qualification of 'under software control' is made because there are processes that occur in the rectifier that can change the output voltage that do not adjust the output voltage directly (such as the rectifier being in current limit).

The following table lists the five Output Voltage Modes and a description of when they are active:

| Output Voltage Modes | Active when... |
|----------------------|--|
| Float | Output voltage is set to the float voltage setting. |
| Equalize | Output voltage is set to the equalize voltage setting. |
| Battery Test | Output voltage is set to the battery test voltage setting. |
| Safe | Output voltage is set to the safe mode voltage setting. |
| Manual Test | Output voltage can be manually adjusted outside of the standard adjustment ranges. |

Table D—Output voltage modes

7.2.2 Output Current/Power Modes

These modes directly affect the output current and power.

The following table lists the four Output Current/Power Modes and a description of when they are active:

| Output Current/Power Mode | Active when... |
|------------------------------|--|
| Temperature foldback mode | Output current and power limit have been reduced due to high temperature of the heatsink or internal ambient temperature sensor. |
| AC foldback mode | Output current and power limit have been reduced due to low AC input voltage. <i>Note: this will reduce the risk of tripping an AC breaker due to increased AC current draw as the AC voltage decreases.</i> |
| Short circuit foldback mode | Output current limit has been reduced due to a short circuit at the output. |
| Internal fault foldback mode | Output current limit has been reduced due to an internal fault. |

Table E—Output current/power modes

7.3 Thermal Management

Heat dissipation of rectifiers is achieved through natural (bottom to top) convection cooling. Performance of the rectifiers may vary depending on the ambient temperature and whether the convection path of the exhaust air through the enclosure is hindered. A rectifier's specified performance may also be affected by adjacent rectifiers in the shelf.

Even with one or more Over-temperature and Current Limit alarms active, the shelf is typically able to supply the demanded power steadily. For example, the shelf can deliver 85% load at 40°C, with some alarms active. However, in higher ambient temperatures, load reduction may be necessary.



7.4 Factory Ranges and Defaults

The following table lists the rectifier settings/ranges/defaults; changes are made via the CXC:

| Setting | Range (minimum to maximum) | Default |
|---------------------------|----------------------------|---------|
| Float (FL) Voltage | 47.5 – 58.2V | 54V |
| Equalize (EQ) Voltage | 49.8 – 60.2V | 55V |
| Battery Test (BT) Voltage | 44 – 52V | 46V |
| OVP | See note below – 63V | 57V |
| Current Limit (CL) | 23 – 100% | 100% |
| Power Limit (PL) | 0 – 100% | 100% |
| Module Start Delay | 0 – 250s | 1s |
| System Start Delay | 0 – 600s | 0s |
| Low Voltage Alarm (LVA) | 42 – 52V | 44V |
| High Voltage Alarm (HVA) | 52 – 63V | 55.5V |
| EQ Timeout | 1 – 2399h | 30h |
| BT Timeout | 1 – 250h | 8h |
| Softstart Ramp-rate | Normal/Fast | Normal |
| CL/PL Alarm | Enable/Disable | Enable |
| Remote Shutdown | Enable/Disable | Enable |
| Ramp Test | Enable/Disable | Enable |

Table F–Cordex 48-1kW rectifier factory ranges and defaults

NOTE: OVP cannot be set below the present system/FL/EQ/BT voltage setting or the safe mode voltage of 51.4V.

8 System Startup

After completing the shelf wiring and installation, perform the following startup and test procedure to ensure proper operation:

8.1 Check System Connections

- Ensure AC is off, battery is disconnected
- Ensure CXCM (if equipped) and all power modules are removed from the shelf.
- Triple check the polarity of all connections.

8.2 Verify AC and Power the Shelf

- Install one power module.
- Verify AC input voltage is correct and turn on the corresponding AC input feeder breaker.
- The power module OK LED should illuminate after a preset start delay.
- Using the CXC (CXCM if equipped), test functionality of various module alarms and controls.

8.3 Check Battery Polarity and Connect

- Verify correct battery polarity using a voltmeter (ensuring no cells or batteries are reversed).
- Connect battery as required to the output of the system or turn on battery breaker.
- Install remaining power modules.
- In the adjustments menu of the CXC, set Float and Equalize voltage to the levels specified by the battery manufacturer.
- Using the CXC, test functionality of various module alarms and controls. In addition, perform a load test with the system using a resistive load box as needed.

8.4 CXC Reset

A reset button is located on the front panel of the CXC for restarting the microprocessor. It takes approximately 15 seconds before the display reappears after pressing the reset button. To protect against accidental load disconnect, see 6.10.1.1.

9 Maintenance

Although very little maintenance is required with Apha systems, routine checks and adjustments are recommended to ensure optimum system performance. Qualified service personnel should do repairs.

The following table lists a few maintenance procedures for this system. These procedures should be performed at least once a year.



WARNING: HIGH VOLTAGE AND SHOCK HAZARD.

Use extreme care when working inside the shelf while the system is energized. Do not make contact with live components or parts.

Circuit cards, including RAM chips, can be damaged by static electricity. Always wear a grounded wrist strap when handling or installing circuit cards.

| Procedure | Date Completed |
|---|----------------|
| Clean ventilation openings | |
| Inspect all system connections (re-torque as necessary) | |
| Verify alarm/control settings | |
| Verify alarm relay operation | |

Table G—Sample maintenance log

NOTE: *There are no field replaceable parts.*

10 Warranty

Alpha Technologies Ltd. warrants all equipment manufactured by it to be free from defects in parts and labor, for a period of two years from the date of shipment from the factory. The warranty provides for repairing, replacing or issuing credit (at Alpha's discretion) for any equipment manufactured by it and returned by the customer to the factory or other authorized location during the warranty period. There are limitations to this warranty coverage. The warranty does not provide to the customer or other parties any remedies other than the above. It does not provide coverage for any loss of profits, loss of use, costs for removal or installation of defective equipment, damages or consequential damages based upon equipment failure during or after the warranty period. No other obligations are expressed or implied. Warranty also does not cover damage or equipment failure due to cause(s) external to the unit including, but not limited to, environmental conditions, water damage, power surges or any other external influence.

The customer is responsible for all shipping and handling charges. Where products are covered under warranty Alpha will pay the cost of shipping the repaired or replacement unit back to the customer.

Visit www.alpha.ca for full warranty information.

11 Acronyms and Definitions

| | |
|------|--|
| AC | Alternating current |
| AWG | American wire gauge |
| CAN | Controller Area Network |
| CEC | Canadian Electrical Code |
| CSA | Canadian Standards Association |
| CX | Cordex series; e.g., CXC for Cordex™ System Controller |
| DC | Direct current |
| EIA | Electronic Industries Alliance |
| HVSD | High voltage shutdown |
| LED | Light emitting diode |
| LVD | Low voltage disconnect |
| NC | Normally closed |
| NEC | National Electrical Code (for the USA) |
| NO | Normally open |
| OSHA | Occupational Safety & Health Administration |
| OVP | Over voltage protection |
| RAM | Random access memory |
| UL | Underwriters Laboratories |

Specifications for Apha Cordex 48-1kW 19" Shelf System

Basic Unit, Shelf

| | |
|----------------------------|--|
| Output: | 111A @ 54Vdc nominal (124.8A maximum @48V) |
| Recommended Feeder Breaker | |
| Single Phase: | 15A, #12AWG, 90 deg.C wire at 30 deg. C ambient (per rectifier) [refer also to AC Feeder Protection/Sizing section of the manual] |

Mechanical

| | |
|--------------|---|
| Dimensions*: | 177.3mm H x 444.5mm W x 303.4mm D (rectifier front panel 18.8mm D) [6.98" H x 17.50" W x 11.95" D (rectifier front panel 0.74" D)] |
| Mounting*: | 19" or 23" mid-mount, 23" flush |
| Weight: | 7.5 kg (16.5 lb.) |

Connections*

| | |
|-----------------|---|
| AC Input: | #6-32 screw terminal blocks |
| Chassis ground: | 1/4-20 stud |
| Communications: | CAN (bus), in and out, RJ-12 offset; Ethernet RJ-45 |
| DC Output: | 1/4-20 x 5/8" studs |
| Signal wiring: | Terminal blocks 0.75 to 0.14mm ² (#18 to #26 AWG) |

Safety

| | |
|----------|---|
| CSA | C22.2 No. 60950-1 |
| UL | 60950-1 |
| CE | EN 60950, CB Scheme 73/23/EEC Low Voltage Directive with amendment 93/68/EEC |
| EN 60950 | Rectifier output shall be rated SELV suitable for connection to TNV-1 circuits |

* See drawings at the rear of this manual.

Basic Unit, CXCM

| | |
|----------------|--|
| Input Voltage: | 17 to 65Vdc within rated limits |
| Current: | <100mA @ 48Vdc <200mA @ 24Vdc |
| MTBF: | >430,000 hours @ 30°C (86°F) |
| EMC: | The unit meets requirements of: ICES-003 Class B EN 55022 Class B (CISPR 22) EN 61000-4-2 ESD EN 61000-4-3 Radiated Immunity EN 61000-4-4 EFT /Burst EN 61000-4-6 Conducted Immunity FCC Part 15 Class B, FCC Part 68 |

In accordance with FCC requirements, we provide the following statement as specified in the FCC guidelines for conformance to Part 15, Class B:

NOTE: *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications to this equipment not expressly described in this manual could void the FCC compliance.

Environmental

| | |
|--------------|--|
| Temperature: | -40 to 50°C standard @ 3000m (-40 to 122°F) |
| Humidity: | 0 to 95% non-condensing |
| Elevation: | -500 to +4000m (-1640 to 13124 ft) |

Specifications for Apha Cordex 48-1kW 19" Shelf System Continued

Hardware Specifications, CXCM

| | |
|---|--|
| CPU: | Coldfire |
| RAM: | 8MB |
| Flash: | 4MB standard, 8MB optional |
| Display: | 160 x 160 pixel grayscale LCD |
| Front Panel Controls: | Reset button and touch panel (display and input device) |
| LED's: | System OK (Green) Power System Minor Alarm (Yellow) Power System Major Alarm / Controller Fail (Red) |
| Audio: | Built-in speaker for alarm and popup message tones |
| Dimensions: | 177mm H x 74mm W x 255mm D (6.9" H x 2.9" W x 10" D) |
| Weight: | 2.2 kg (5 lb.) |
| Mounting*: | Modular on Cordex 4RU series 1kW shelves |
| Relay Outputs*: | Eight (8) Form C, 60Vdc 1A maximum |
| Digital Inputs*: | Three (3), 0 to 60Vdc |
| Analog Inputs and System Signals*: [standard for List 120] | Two (2) DC voltage -LVD1 (K1), Form C relay, 60Vdc 1A maximum -Load Voltage (V1), 0 to 100Vdc One (1) current, $\pm 50\text{mV}$ Two (2) temperature, 0 to 20Vdc with power source One (1) bi-voltage |

* See drawings at the rear of this manual.

*The above information is valid at the time of publication. Consult factory for up-to-date ordering information.
Specifications are subject to change without notice.*

Specifications for Apha's Switched Mode Rectifier Cordex 48-1kW

Power Module Output

| | |
|--------------------------|--|
| Voltage: | 40.5 to 58Vdc within rated limits |
| Current: | 18.5A @ 54Vdc nominal (20.8A maximum @ 48V) |
| Maximum Power: | 1000W continuous/module |
| Static Load Regulation: | Better than $\pm 0.5\%$ for any load change within rated limits |
| Dynamic Load Regulation: | Better than $\pm 2\%$ for 10% - 90% load step (output shall recover to static limits within 2ms) |
| Static Line Regulation: | Better than $\pm 0.1\%$ for any change in input voltage within rated limits |
| Dynamic Line Regulation: | Better than $\pm 1\%$ for any change in input voltage within rated limits (output voltage shall recover to static limits within 2ms) |
| Hold-up Time: | 10ms |
| Time Stability: | $\leq 0.2\%$ per year |
| Temperature Stability: | $\leq 100\text{ppm}/^\circ\text{C}$ over the operating range |
| Heat Dissipation: | $< 340\text{BTU}$ per hour (per rectifier module) |
| Electrical Noise: | $< 26\text{dBnC}$ (voice band) without battery $\leq 22\text{dBnC}$ (voice band) with battery $< 5\text{mVrms}$ to 100MHz (wideband) $< 100\text{mVp-p}$ to 100MHz $< 2\text{mV}$ (psophometric) |
| Acoustic Noise: | $< 55\text{dBa}$ @ 1m (3ft.) @ 30°C (86°F) [individual module] $< 55\text{dBa}$ @ 1m (3ft.) @ 30°C (86°F) [four modules] |
| EMI: | The unit meets requirements of EN55022 (see Standards for more EMC) |

In accordance with FCC requirements, we provide the following statement as specified in the FCC guidelines for conformance to Part 15, Class B:

NOTE: *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications to this equipment not expressly described in this manual could void the FCC compliance.

Specifications for Apha's Switched Mode Rectifier Cordex 48-1kW Continued

Power Module Input

| | |
|------------------------------|---|
| Voltage: | 208 to 240Vac nominal |
| Extended Operation: | Low: 150 to 90Vac (power de-rated linearly to 40% output) High: 176 to 320Vac (de-rated power factor above 265Vac) |
| Frequency: | 50/60Hz nominal (45 to 66Hz) |
| Current: | 5.3 to 4.6A (nominal Vac) 7.4A maximum @ 150Vac |
| Power Factor: | >0.99 at nominal conditions and 50-100% load; >0.98 at nominal conditions and 30-100% load |
| Protection: | 10kA-interrupting capacity fuses in active and neutral lines |
| Efficiency: | >91% at nominal conditions and 50-100% load |
| Inrush Current: | ≤ full load steady state current of the rectifier within rated limits |
| Start-up Ready Time: | <5 seconds (excluding soft start) to complete inrush limit routine and ac measurement (for OK signal) |
| Start-up Delay: | Programmable up to 120 seconds to enable stagger-start of multiple rectifiers and to minimize the effect on a supply source |
| Soft Start: | User adjustable to at least 5 seconds (not including start-up delay time) and is determined by output current limit ramp-up |
| T.H.D. (Current): | <5% at 100% load |
| Input Transient Suppression: | Meets ANSI/IEEE C62.41 Category B3 |
| Input Leakage Current: | <3.5mA @ 265Vac 60Hz |

Miscellaneous

| | |
|-------------|--|
| MTBF: | >400,000 hours |
| Dimensions: | 177mm H x 71mm W x 250mm D (excluding connector) [6.9" H x 2.8" W x 9.8" D] |
| Weight: | 2.9 kg (6.4 lb.) |

Environmental

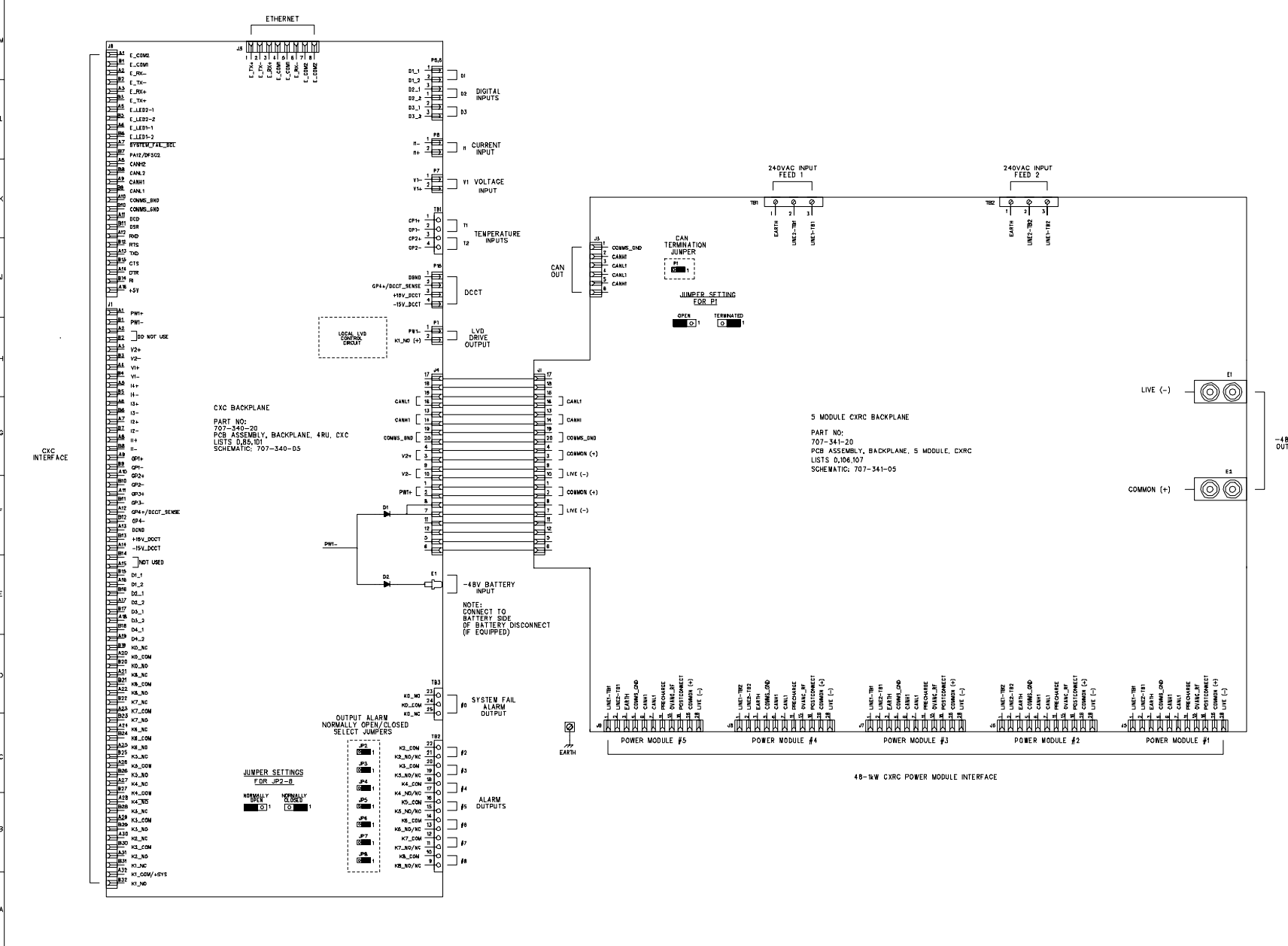
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|------------------------|--|
| Temperature Operating: | -40 to +50°C (-40 to 122°F) |
| Extended: | 400W @ +65°C (149°F) |
| Storage: | -50 to +85°C (-58 to 185°F) |
| Humidity: | 0 to 95% non-condensing |
| Elevation: | -500 to +4000m; derate @ -4°C/1000m above sea level (-1640 feet to 13124 feet; derate @ -7.2°F/3281 feet above sea level) |

Referenced Standards

| | |
|---------------------------|--|
| EN 300 386-2 | EMC and ERM; Telecommunication Network Equipment |
| EN 55022 (CISPR 22): 1998 | Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement |
| EN 61000-3-2:2000 | Harmonic Current Emissions |
| EN 61000-3-3:1995 | Voltage Fluctuations and Flicker |
| EN 61000-4-2 | ESD Immunity |
| EN 61000-4-3 | Radiated Electromagnetic Immunity |
| EN 61000-4-4 | Electrical Fast Transient/Burst Immunity |
| EN 61000-4-5 | Power Line Surge Immunity |
| EN 61000-4-6 | Conducted Electromagnetic Immunity |
| EN 61000-4-11 | Voltage Dips, Short Interruptions and Variations |
| ETS 300 019-1-1 | Environmental Conditions; Storage |
| ETS 300 019-1-2 | Environmental Conditions; Transportation |
| ETS 300 132-2 | Power Supply Interface at the Input to Telecommunications Equipment; Operated by Direct Current (DC) |
| ETS 300 753 | Acoustic Noise Emissions |
| IEC 60950 | Safety of Information Technology Equipment, Including Electrical Business Equipment (UL/CSA 60950) |

The above information is valid at the time of publication. Consult factory for up-to-date ordering information. Specifications are subject to change without notice.

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| LTR | DESCRIPTION | | |
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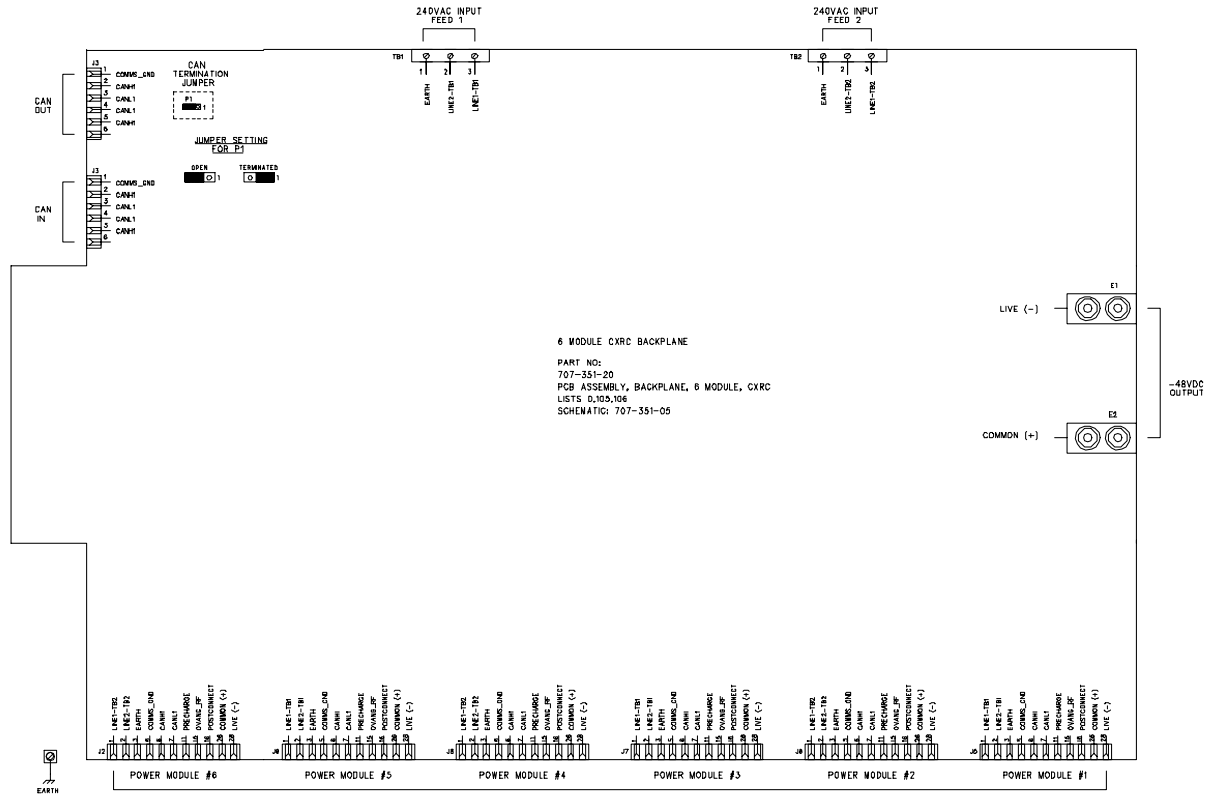
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ISSUE DATE SHEET 1 of 2

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48-1kW CXRC POWER MODULE INTERFACE

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| CHECKED | JJK | 2003/11 | |
| APPROVED | WES | 2003/11 | FINISH |

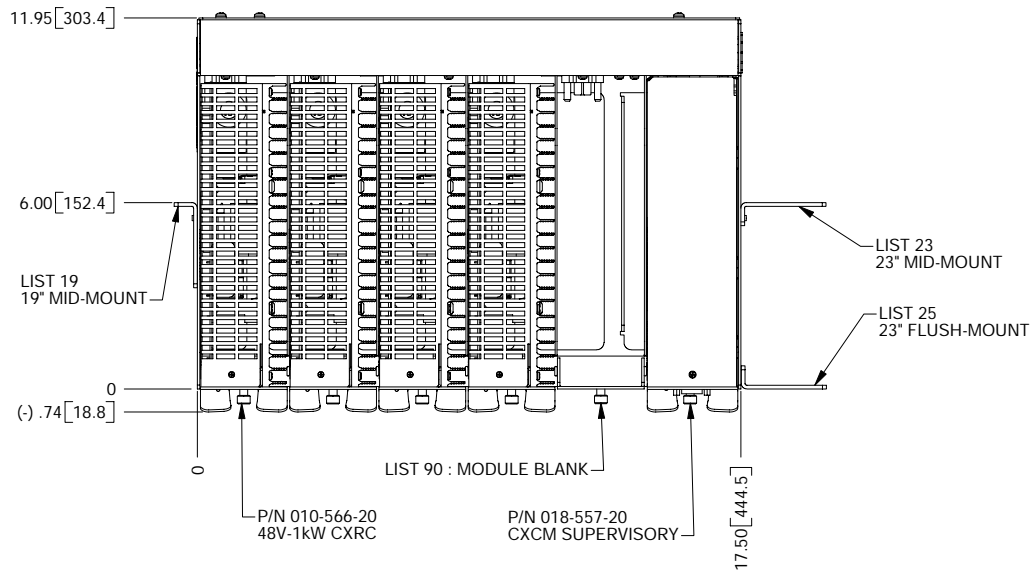
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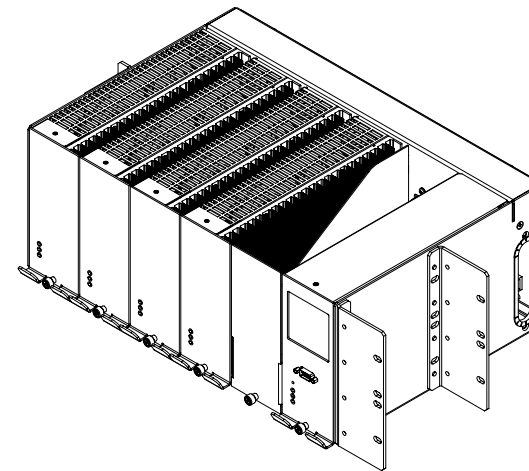
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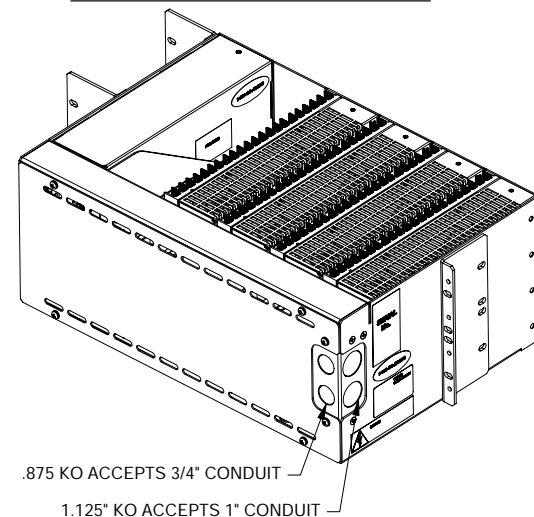
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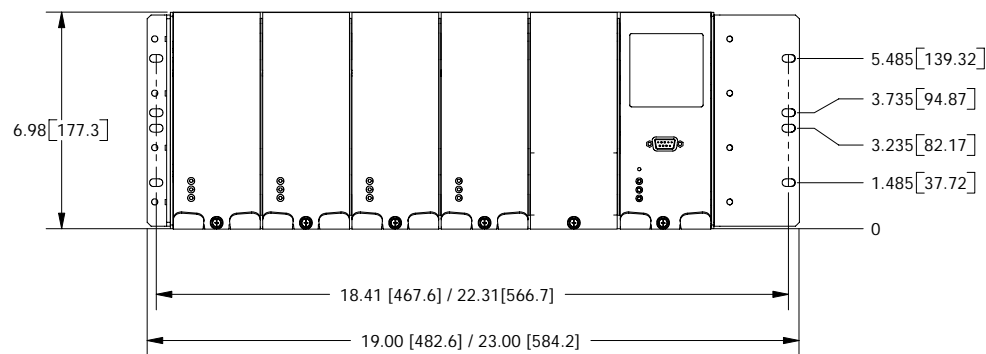
TOP VIEW



FRONT RIGHT ISOMETRIC VIEW



LEFT REAR ISOMETRIC VIEW



PLAN VIEW

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1.125" KO ACCEPTS 1" CONDUIT

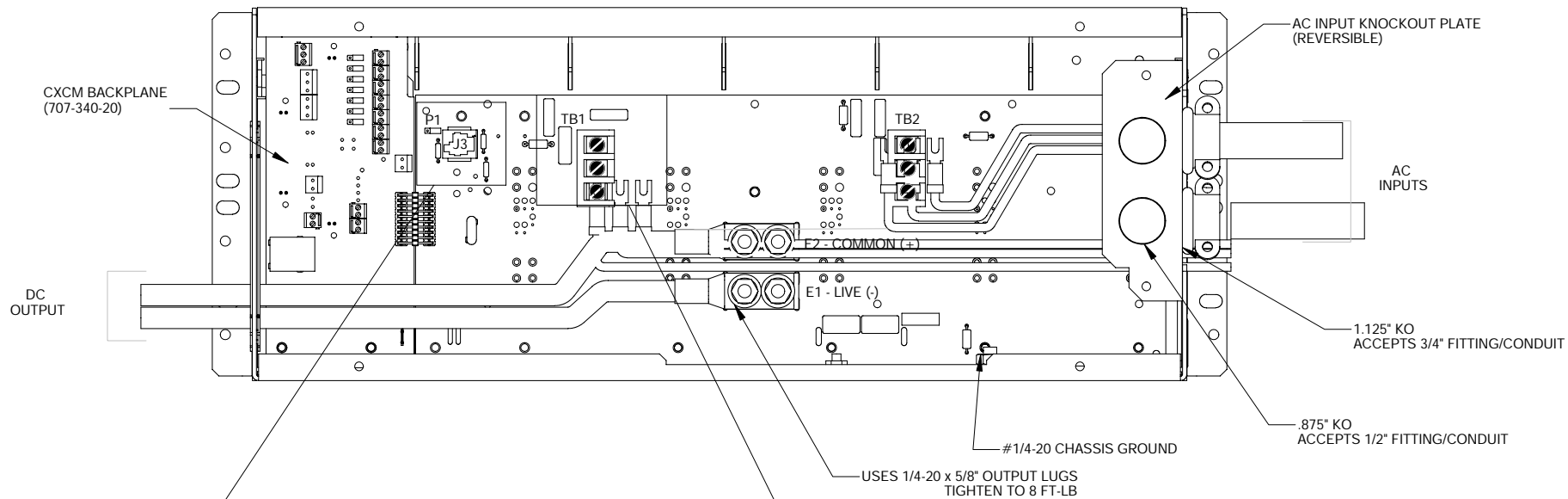
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| TOLERANCES | | | PER P.O. and Doc. 070-024-83 |
| X.X | ±0.04" | [X] ±1mm | |
| X.XX | ±0.02" | [X.X] ±0.5mm | |
| X.XXX | ±0.01" | [X.XXX] ±0.25mm | SCALE NTS |
| TITLE | | | |
| OUTLINE, 19/23" CNTR MNT CABINET 5 MDL w CXCM SUP. OR 6 MDL 48-1KW CXRC | | | |
| ISSUE | DATE | SHEET | 1 OF 1 |
| SIZE | TYPE | DWG NO. | REV |
| B | D2 | 030-706-06 | A |

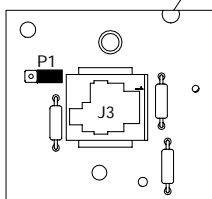
LIST 0,6 : 5 MODULE WITH CXC CONTROLLER

| REVISIONS | | | | |
|-----------|---|--------|---------|------|
| LTR | DESCRIPTION | REV BY | DATE | APPD |
| B | SPECIFIED RECTIFIERS FED BY TB1 & TB2 | M.P. | 2005/11 | WES |
| C | UPDATED AC I/P TERMINAL BLOCK FROM LINE 2 TO L2/N | M.P. | 2007/09 | |



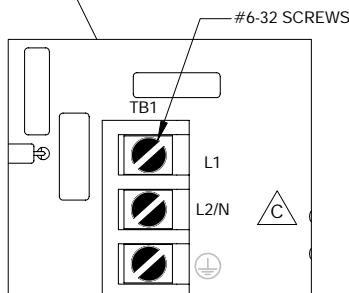
CAN OUT RJ12 OFFSET PIN OUT (J3)

1. GND
2. CAN H
3. NOT CONNECTED
4. CAN L
5. NOT CONNECTED
6. NOT CONNECTED



JUMPER SETTING FOR P1

- CAN TERMINATED
- CAN UNTERMINATED



TYPICAL AC INPUT TERMINAL BLOCK (TB1 SHOWN)

TB1 FEEDS RECTIFIERS 1, 3, 5
TB2 FEEDS RECTIFIERS 2, 4

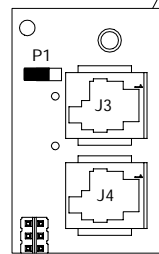
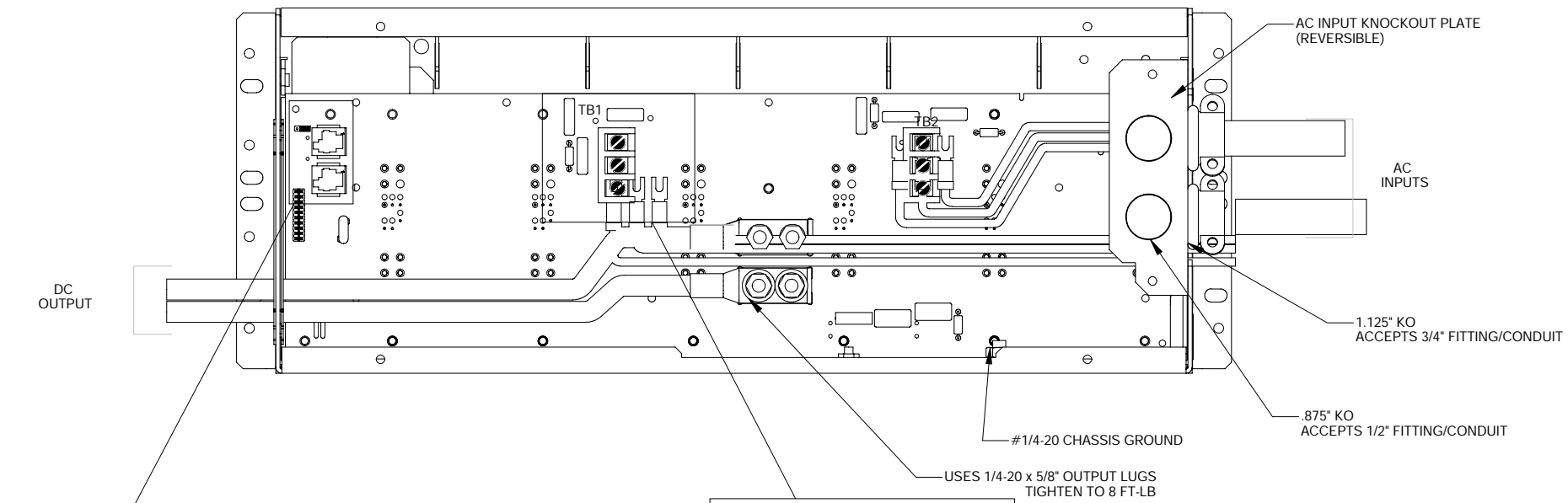
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DIMENSIONS ARE IN INCHES WITH METRIC [mm] IN BRACKETS: INCHES [mm]

| | | | |
|--|--------|------------|------------------------------|
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| DESIGN | DGW | 2004/05 | MATERIAL |
| DRAWN | DGW | 2004/05 | |
| CHECKED | J.K. | 2004/05 | |
| APPROVED | W.E.S. | 2004/05 | FINISH |
| TOLERANCES | | | PER P.O. and Doc. 070-024-83 |
| X.X | ±0.04" | [X] | ±1mm |
| X.XX | ±0.02" | [X.X] | ±0.5mm |
| X.XXX | ±0.01" | [X.XX] | ±0.25mm |
| TITLE | | | SCALE |
| CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXC SUP. 48-1KW CXRC 19/23" MNT SHELF | | | NTS |
| ISSUE | DATE | SHEET | 1 OF 3 |
| SIZE | TYPE | DWG NO. | REV |
| B | D2 | 030-706-08 | C |

LIST 0,6,81 - 6 MODULE

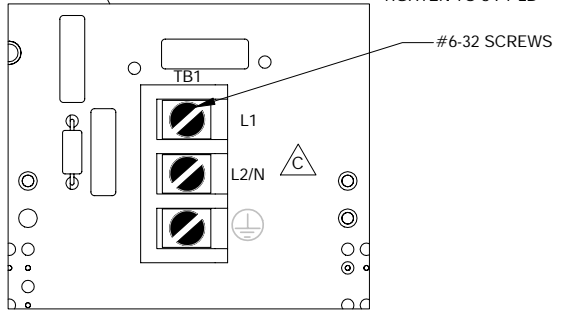
| REVISIONS | | | | |
|-----------|-------------|--------|------|------|
| LTR | DESCRIPTION | REV BY | DATE | APPD |
| | | | | |



JUMPER SETTING FOR P1

- CAN TERMINATED
- CAN UNTERMINATED

| CAN OUT RJ12 OFFSET PIN OUT (J3) | CAN IN RJ12 OFFSET PIN OUT (J4) |
|-------------------------------------|------------------------------------|
| 1. GND | 1. GND |
| 2. CAN H | 2. CAN H |
| 3. NOT CONNECTED | 3. CAN L |
| 4. CAN L | 4. CAN L |
| 5. NOT CONNECTED | 5. CAN H |
| 6. NOT CONNECTED | 6. NOT CONNECTED |



TYPICAL AC INPUT TERMINAL BLOCK
(TB1 SHOWN)
TB1 FEEDS RECTIFIERS 1, 3, 5
TB2 FEEDS RECTIFIERS 2, 4, 6

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DIMENSIONS ARE IN INCHES WITH METRIC [mm] IN BRACKETS: INCHES [mm]

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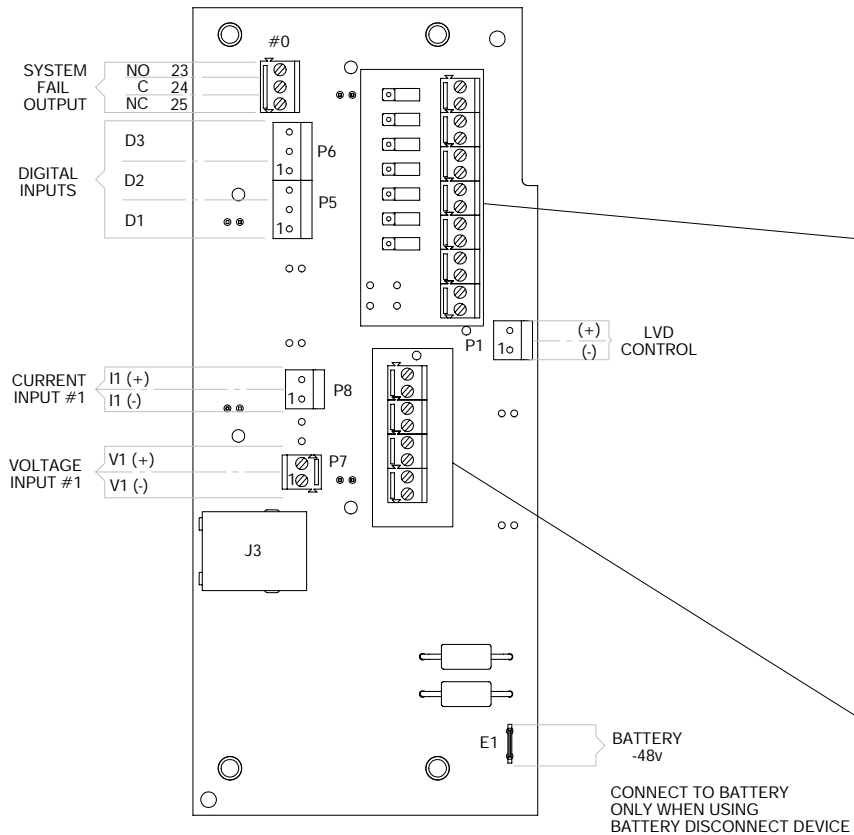
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| | | | |
|---|--------|------------|------------------------------|
| DESIGN | DGW | 2004/05 | MATERIAL |
| DRAWN | DGW | 2004/05 | |
| CHECKED | J.K. | 2004/05 | |
| APPROVED | W.E.S. | 2004/05 | FINISH |
| TOLERANCES | | | PER P.O. and Doc. 070-024-83 |
| XX | ±0.04" | [X] | ±1mm |
| X.XX | ±0.02" | [X.X] | ±0.5mm |
| X.XXX | ±0.01" | [X.XXX] | ±0.25mm |
| TITLE | | | SCALE NTS |
| CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXC SUP. 48-1KW CXRC 19/23" MNT SHELF | | | |
| ISSUE | DATE | SHEET | 2 OF 3 |
| SIZE | TYPE | DWG NO. | REV |
| B | D2 | 030-706-08 | C |

LIST 0 : 5 MDL W CXC

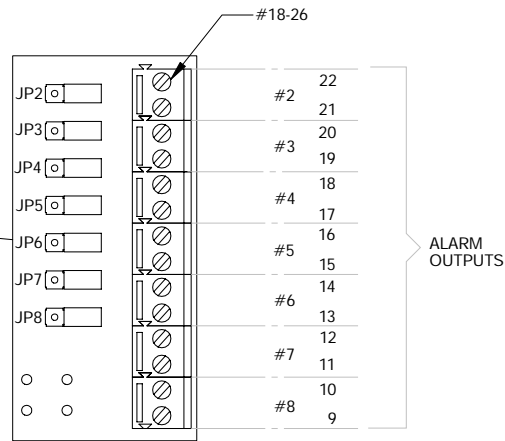
JUMPER SETTINGS FOR JP2-8

| REVISIONS | | | | |
|-----------|-------------|--------|------|------|
| LTR | DESCRIPTION | REV BY | DATE | APPD |
| | | | | |

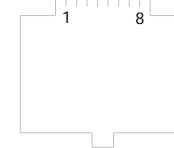


TOP VIEW - CXC BACKPLANE
(707-340-20)

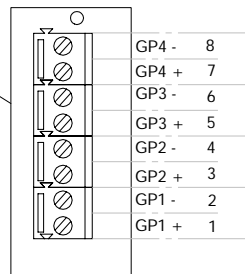
SOME DETAILS OMITTED



ETHERNET RJ45
PINOUT (J3)



1. TX+
2. TX-
3. RX+
4. COM1
5. COM1
6. RX-
7. COM2
8. COM2



GENERAL PURPOSE ANALOG INPUTS

GENERAL PURPOSE CONFIGURATION TABLE

| INPUT | CXCM LIST OPTION | |
|-------|------------------|----------|
| | LIST 120 | LIST 124 |
| GP4 | ±60V | TEMP |
| GP3 | N/A | 0-60V |
| GP2 | TEMP | 0-60V |
| GP1 | TEMP | 0-60V |

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DIMENSIONS ARE IN INCHES WITH METRIC [mm] IN BRACKETS: INCHES [mm]

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| | | | |
|----------|--------|---------|----------|
| DESIGN | DGW | 2004/05 | MATERIAL |
| DRAWN | DGW | 2004/05 | |
| CHECKED | J.K. | 2004/05 | |
| APPROVED | W.E.S. | 2004/05 | FINISH |

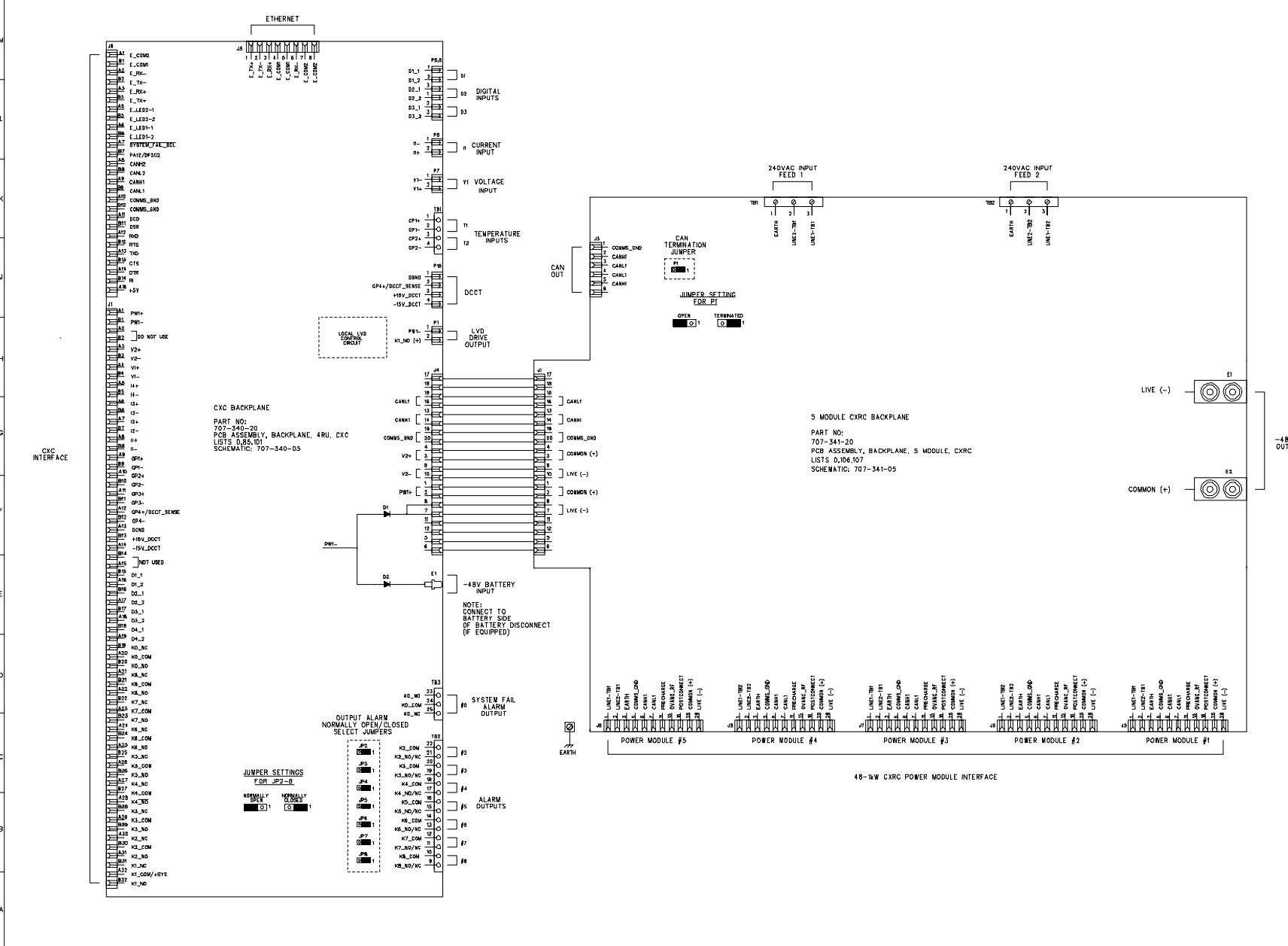
TOLERANCES
 XX ±0.04" [X] ±1mm
 XXX ±0.02" [XXX] ±0.5mm
 XXXX ±0.01" [XXXX] ±0.25mm

PER P.O. and Doc. 070-024-83
SCALE NTS

TITLE CUSTOMER CONNECTION,
6 MOD OR 5 MOD w CXC SUP.
48-1kW CXRC 19/23" MNT SHELF

| | | |
|-------------------|--------------|--------------|
| ISSUE DATE | SHEET 3 OF 3 | REV |
| SIZE TYPE DWG NO. | B D2 | 030-706-08 C |

| REVISION | | DATE | APPD |
|----------|-----------------------|-------|------|
| LTR | DESCRIPTION | | |
| A | REVISED PER EGS AS.10 | 05/02 | |



LISTS SHOWN: 0,6

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| | | | |
|----------|------|---------|----------|
| DESIGN | WES | 2003/09 | MATERIAL |
| DRAWN | J.K. | 2003/10 | |
| CHECKED | J.K. | 2003/10 | |
| APPROVED | WES | 2003/10 | FINISH |

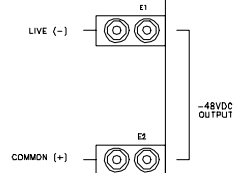
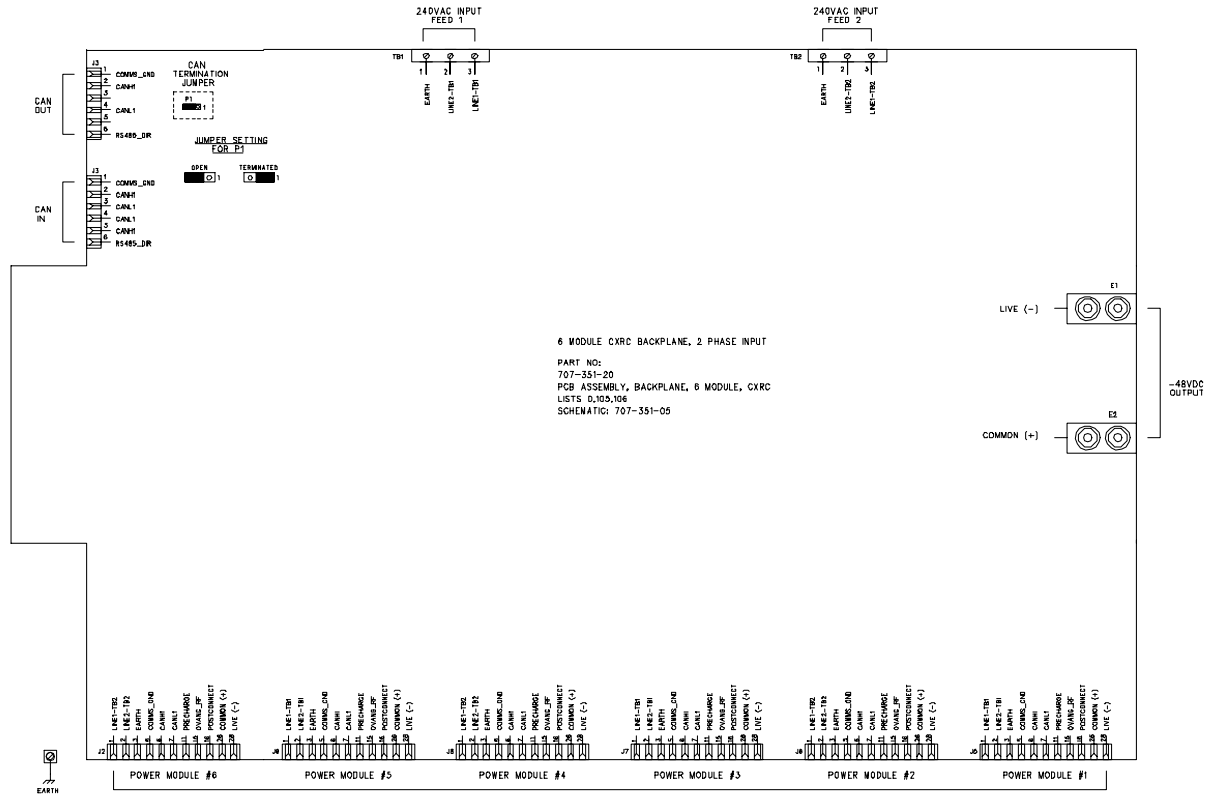
TOLERANCES SCALE N/A

TITLE SCHEMATIC, CAB, 19" FLUSH MNT, 5 MDL W/ CXRC OR 6 MDL, 48-1kW CXRC

ISSUE DATE SHEET 1 of 3

| | | |
|------|---------------|-----|
| SIZE | DWG NO. | REV |
| B | S3 030-707-05 | B |

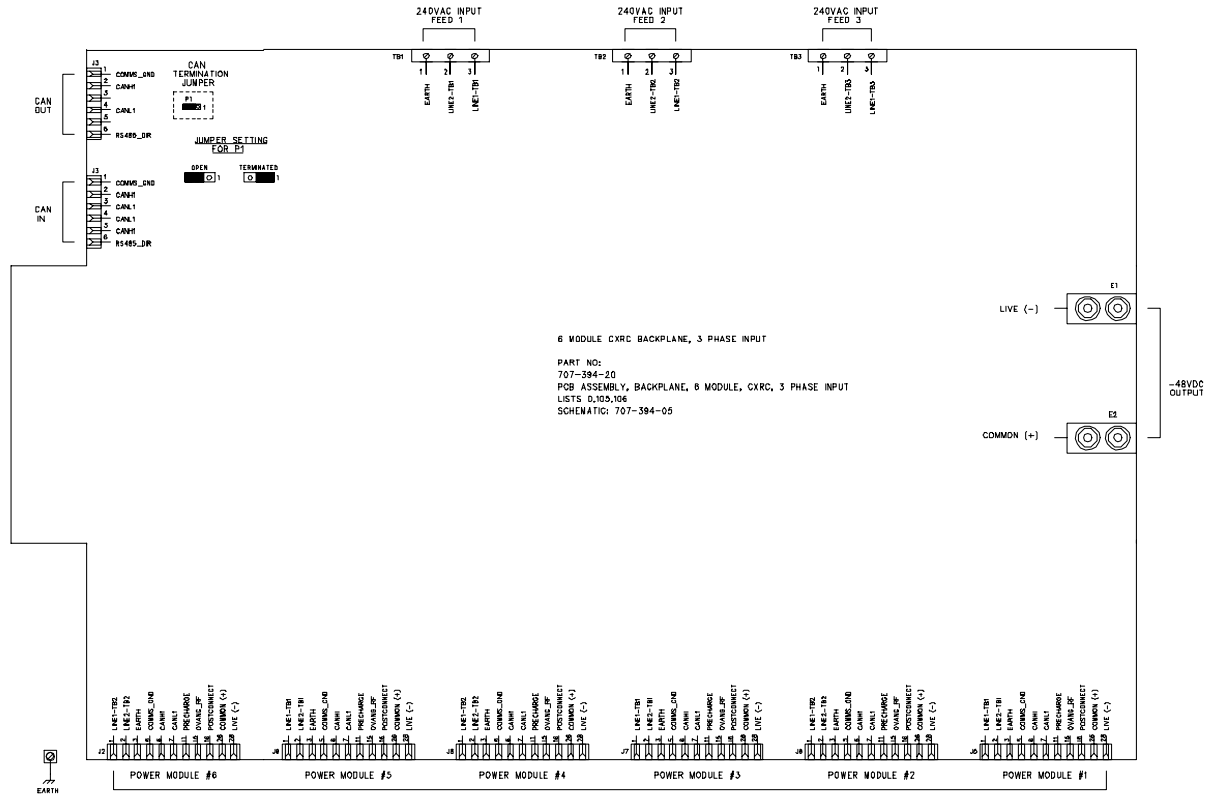
| REVISION | | | |
|----------|-------------|------|------|
| LTR | DESCRIPTION | DATE | APPD |
| | | | |



LISTS SHOWN: 0,6,8,1

| | | | |
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| DESIGN | WES | 2003/09 | MATERIAL |
| DRAWN | J.K. | 2003/10 | |
| CHECKED | J.K. | 2003/10 | |
| APPROVED | WES | 2003/10 | FINISH |
| TOLERANCES | | SCALE | N/A |
| TITLE SCHEMATIC, CAB, 19" FLUSH MNT, 5 MDL W/ CXRC OR 6 MDL, 48-1kW CXRC | | | |
| ISSUE DATE | | | SHEET 2 of 3 |
| SIZE | DWG NO. | | REV |
| B | S3 | 030-707-05 | B |

| REVISION | | | |
|----------|-------------|------|------|
| LTR | DESCRIPTION | DATE | APPD |
| | | | |



LISTS SHOWN: 0,6,82

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| | | | |
|----------|------|---------|----------|
| DESIGN | WES | 2003/09 | MATERIAL |
| DRAWN | J.K. | 2003/10 | |
| CHECKED | J.K. | 2003/10 | |
| APPROVED | WES | 2003/10 | FINISH |

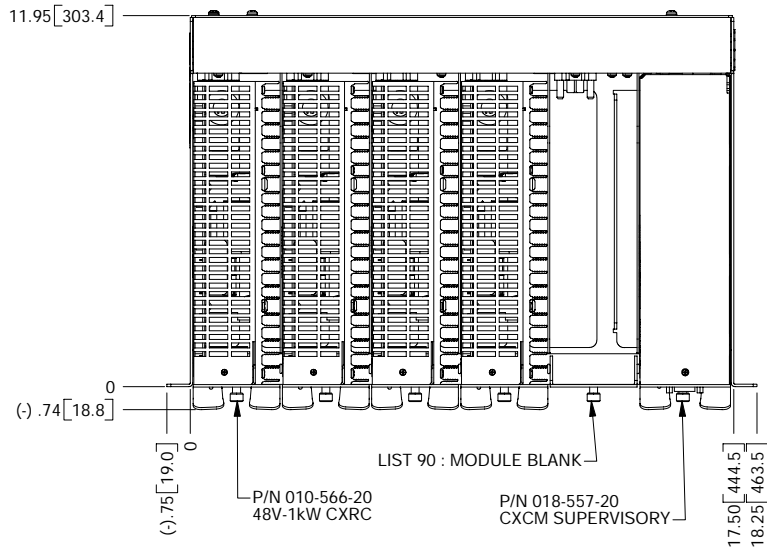
TOLERANCES SCALE N/A

TITLE SCHEMATIC, CAB, 19" FLUSH MNT, 5 MDL W/ CXRC OR 6 MDL, 48-1kW CXRC

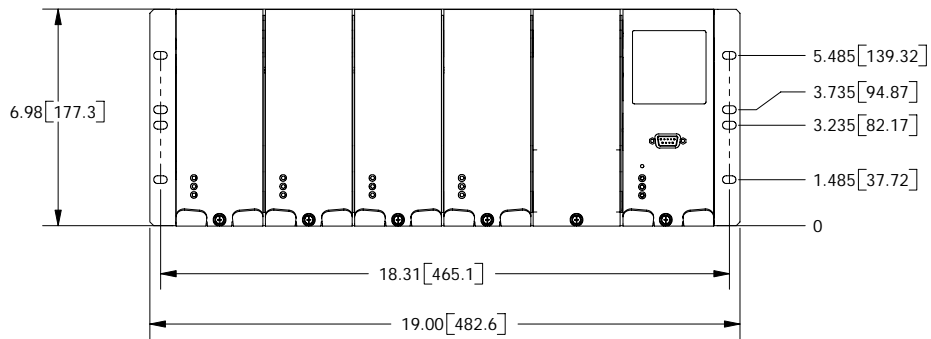
ISSUE DATE SHEET 3 of 3

| | | |
|------|---------------|-----|
| SIZE | DWG NO. | REV |
| B | S3 030-707-05 | B |

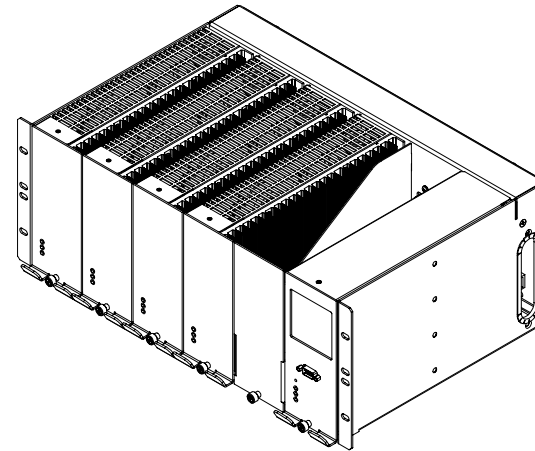
| REVISIONS | | | | |
|-----------|-------------|--------|------|------|
| LTR | DESCRIPTION | REV BY | DATE | APPD |
| | | | | |



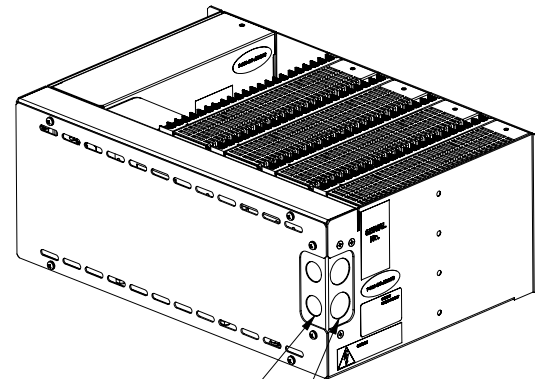
TOP VIEW



PLAN VIEW



FRONT ISOMETRIC VIEW



875 K.O ACCEPTS 3/4" CONDUIT

1.125 K.O. ACCEPTS 1" CONDUIT

REAR ISOMETRIC VIEW

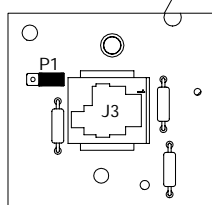
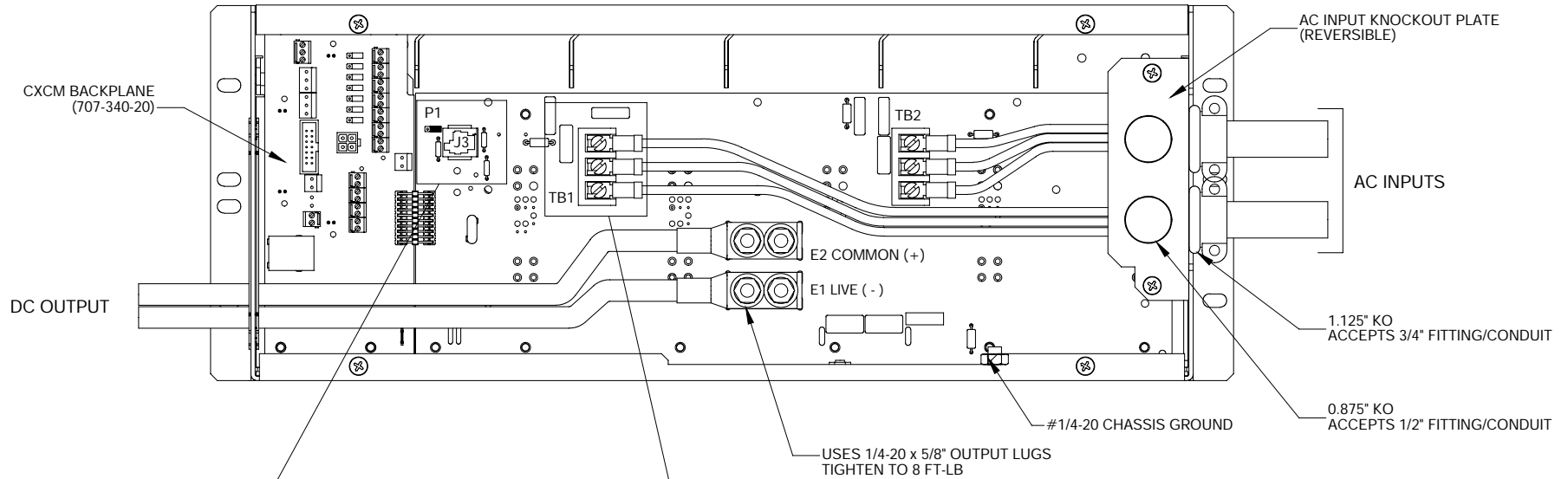
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DIMENSIONS ARE IN INCHES WITH METRIC [mm] IN BRACKETS: INCHES [mm]

| | | | |
|--|--------|----------------|------------------------------|
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| DESIGN | DGW | 2003/11 | MATERIAL |
| DRAWN | DGW | 2003/11 | |
| CHECKED | | | |
| APPROVED | | | FINISH |
| TOLERANCES | | | PER P.O. and Doc. 070-024-83 |
| X.X | ±0.04" | [X] ±1mm | |
| X.XX | ±0.02" | [X.X] ±0.5mm | |
| X.XXX | ±0.01" | [X.XX] ±0.25mm | SCALE NTS |
| TITLE | | | |
| OUTLINE, 19 FLUSH MOUNT CABINET 5 MDL w CXCM SUP. OR 6 MDL 48-1kW CXRC | | | |
| ISSUE | DATE | SHEET | 1 of 1 |
| SIZE | TYPE | DWG NO. | REV |
| B | D2 | 030-707-06 | A |

| REVISIONS | | | | |
|-----------|----------------------------------|--------|---------|------|
| LTR | DESCRIPTION | REV BY | DATE | APPD |
| B | ADDED PG3, LIST0, 9, 82, 3 FEEDS | DGW | 2004/12 | GS |
| C | UPDATED AC I/P TERM BLOCK | SDW | | |

LIST 0,6 : 5 MODULE WITH CXC CONTROLLER

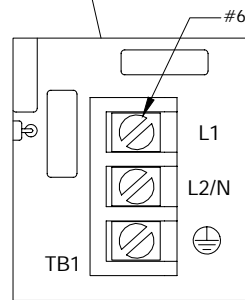


CAN OUT RJ12 OFFSET PIN OUT (J3)

1. GND
2. CAN H
3. NOT CONNECTED
4. CAN L
5. NOT CONNECTED
6. NOT CONNECTED

JUMPER SETTING FOR P1

- CAN TERMINATED
- CAN UNTERMINATED



TYPICAL AC INPUT TERMINAL BLOCK (TB1 SHOWN)

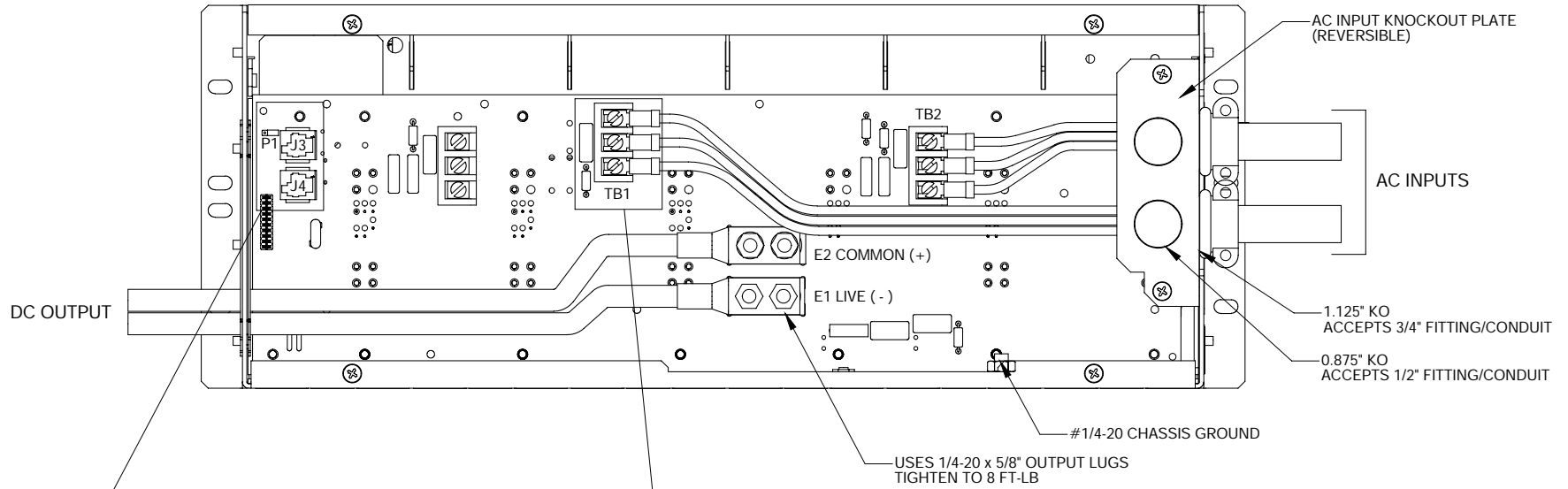
TB1 FEEDS RECTIFIERS 1,3,5
TB2 FEEDS RECTIFIERS 2,4

| | | | |
|--|--------------|---------|------------------------------|
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| DESIGN | DGW | 2004/05 | MATERIAL |
| DRAWN | DGW | 2004/05 | |
| CHECKED | JK | 2004/05 | |
| APPROVED | WES | 2004/05 | FINISH |
| TOLERANCES | | | PER P.O. and Doc. 070-024-83 |
| X.X | ±0.04" | [X] | ±1mm |
| X.XX | ±0.02" | [X.X] | ±0.5mm |
| X.XXX | ±0.01" | [X.XXX] | ±0.25mm |
| TITLE | | | SCALE NTS |
| CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXC SUP. 48-1kW CXRC 19" FLUSH MNT | | | |
| ISSUE DATE | SHEET 1 of 4 | | REV |
| SIZE TYPE DWG NO. | 030-707-08 | | REV C |

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DIMENSIONS ARE IN INCHES WITH METRIC (mm) IN BRACKETS: INCHES [mm]

LIST 0,6,81 - 6 MODULE , DUAL FEEDS



JUMPER SETTING FOR P1

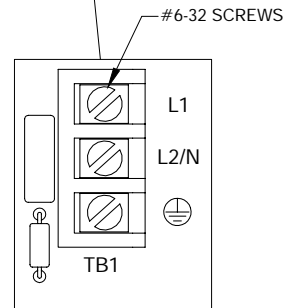
- CAN TERMINATED
- CAN UNTERMINATED

CAN OUT RJ12 OFFSET
PIN OUT (J3)

1. GND
2. CAN H
3. NOT CONNECTED
4. CAN L
5. NOT CONNECTED
6. NOT CONNECTED

CAN IN RJ12 OFFSET
PIN OUT (J4)

1. GND
2. CAN H
3. NOT CONNECTED
4. CAN L
5. NOT CONNECTED
6. NOT CONNECTED



TYPICAL AC INPUT TERMINAL BLOCK
(TB1 SHOWN)

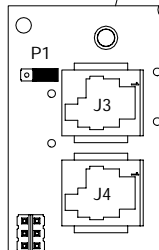
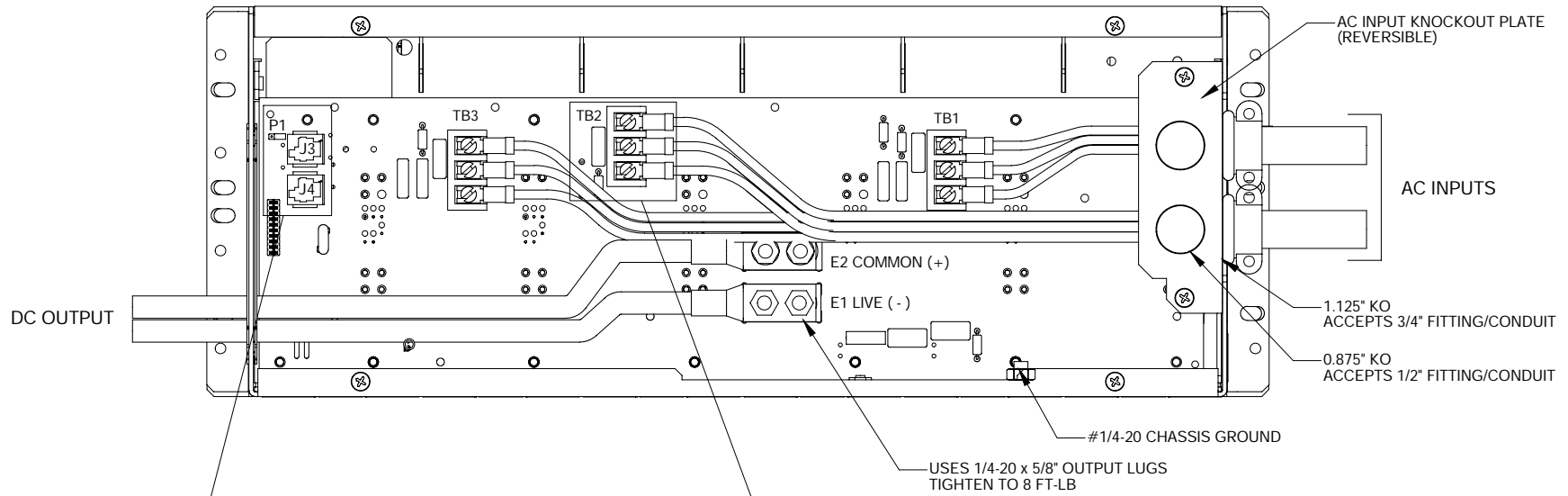
TB1 FEEDS RECTIFIERS 1, 3, 5
TB2 FEEDS RECTIFIERS 2, 4, 6

| | |
|--|--------------|
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| SCALE | NTS |
| TITLE CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXG SUP. 48-1kW CXRC 19" FLUSH MNT | |
| ISSUE | SHEET 2 OF 4 |
| DATE | |
| SIZE | REV C |
| B | D2 |
| DWG NO. | 030-707-08 |

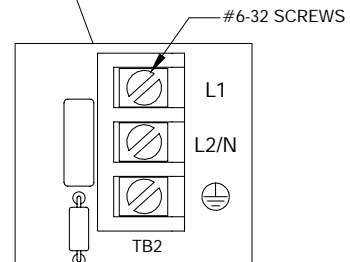
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DIMENSIONS ARE IN INCHES WITH METRIC (mm) IN BRACKETS: INCHES [mm]

LIST 0,9,82 - 6 MODULE ,THREE FEEDS



- JUMPER SETTING FOR P1**
- CAN TERMINATED
 - CAN UNTERMINATED
- | | |
|---|--|
| <p>CAN OUT RJ12 OFFSET PIN OUT (J3)</p> <ol style="list-style-type: none"> 1. GND 2. CAN H 3. NOT CONNECTED 4. CAN L 5. NOT CONNECTED 6. NOT CONNECTED | <p>CAN IN RJ12 OFFSET PIN OUT (J4)</p> <ol style="list-style-type: none"> 1. GND 2. CAN H 3. NOT CONNECTED 4. CAN L 5. NOT CONNECTED 6. NOT CONNECTED |
|---|--|



TYPICAL AC INPUT TERMINAL BLOCK (TB2 SHOWN)

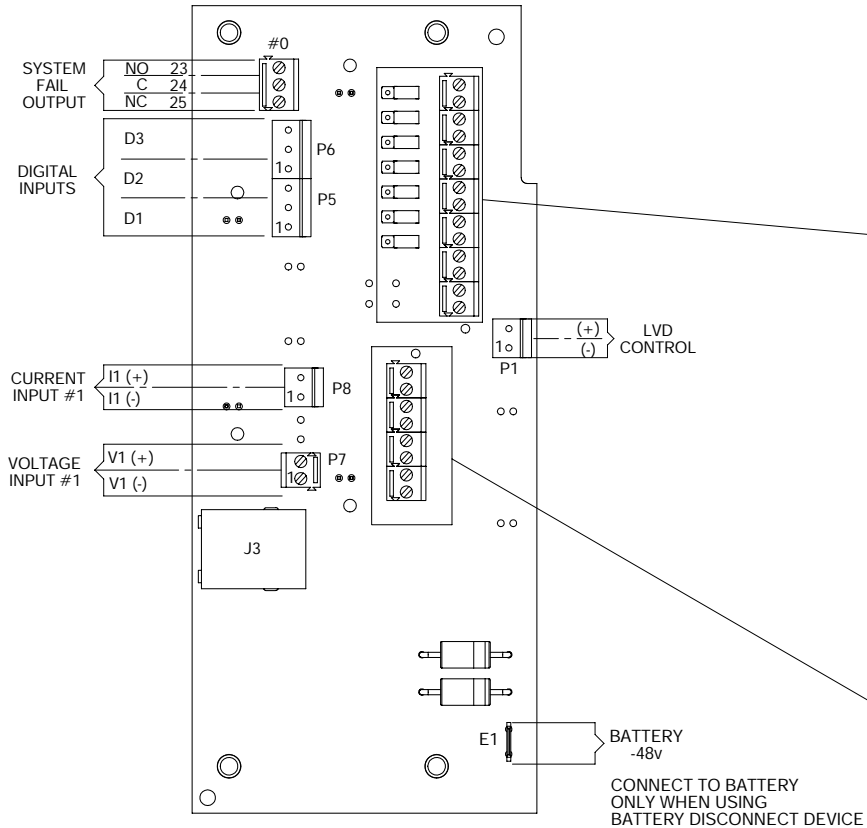
TB1 FEEDS RECTIFIERS 1, 2
 TB2 FEEDS RECTIFIERS 3, 4
 TB3 FEEDS RECTIFIERS 5, 6

| | |
|---|--------------|
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| SCALE | NTS |
| TITLE CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXC SUP. 48-1KW CXRC 19" FLUSH MNT | |
| ISSUE DATE | SHEET 3 of 4 |
| SIZE TYPE DWG NO. | REV C |
| B D2 | 030-707-08 |

JUMPER SETTINGS FOR JP2-8

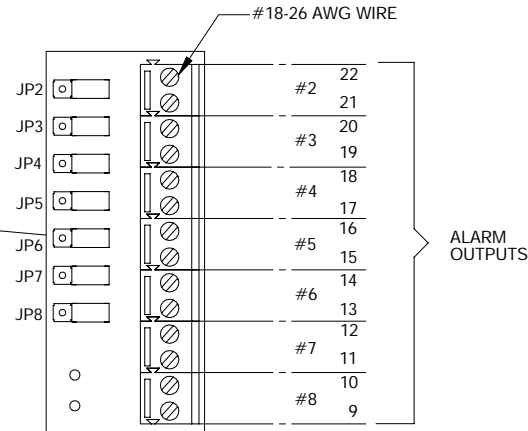


LIST 0 : 5 MDL e/w CXC

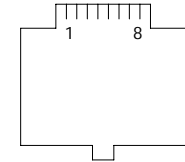


TOP VIEW - CXC BACKPLANE
(707-340-20)

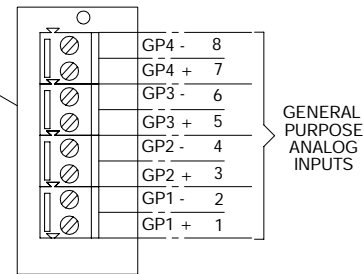
SOME DETAILS OMITTED



ETHERNET RJ45
PINOUT (J3)



- 1. TX+
- 2. TX-
- 3. RX+
- 4. COM1
- 5. COM2
- 6. RX-
- 7. COM1
- 8. COM2



GENERAL PURPOSE CONFIGURATION TABLE

| INPUT | CXC LIST OPTION | |
|-------|-----------------|----------|
| | LIST 120 | LIST 124 |
| GP4 | ±60V | TEMP |
| GP3 | N/A | 0 - 60V |
| GP2 | TEMP | 0 - 60V |
| GP1 | TEMP | 0 - 60V |

DIMENSIONS ARE IN INCHES WITH METRIC (mm) IN BRACKETS: INCHES [mm]

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| | |
|--|--------------|
| TITLE | SCALE |
| CUSTOMER CONNECTION, 6 MOD OR 5 MOD w CXC SUP. 48-1kW CXRC 19" FLUSH MNT | NTS |
| ISSUE DATE | SHEET 4 OF 4 |
| SIZE TYPE DWG NO. | REV |
| B D2 030-707-08 | C |

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Hertfordshire, CM22 7PA
United Kingdom
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Fax: +44 1279 659870

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Fax: +852 2199 7988

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Alpha Technologies GmbH

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