



Cordex 24-400W 19" Integrated Shelf System

Up to 1600W with CXCI/CXCI+ and Distribution Installation & Operation Manual

Part # 030-763-J0

Effective: 11/2013



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.

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.

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.

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, VERBENNUNGEN 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.

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1 Introduction

1.1 Scope of the Manual

This instruction manual explains the installation, interconnection, and operation of Alpha Technologies' Cordex 24-400W integrated 19" 2RU shelf system with up to 1600W output power and distribution.

- Specifications, Shelf: 030-819-B1
- Specifications, Rectifier: 010-612-B1
- Specifications, CXCI/CXCI+: 7400233-S0
- Schematic drawing: 030-763-05
- Outline drawing: 030-763-06
- Customer connection drawing: 030-763-08

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

1.2 Product Overview

A complete Cordex rectifier system consists of a controller with 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 120/208/220/240Vac 50/60Hz 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 rectifier system is designed to operate with the Alpha Cordex CXCI/CXCI+ (integrated version of the CXC controller) that is built into the rectifier system shelf.

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

- All models of the CXC allow the user to set up, control and monitor the entire power system and ancillary components from one central, easy-to-use source: your web browser. The CXCI/CXCI+ model does not have a touch screen display; therefore, system setup and management is performed exclusively with the web interface.

Details of controller operation are provided in the current version software manual (part # 0350046-J0):

- CXCI is running software version 2.06 or later
- CXCI+ is running software version 2.14 or later

The distribution component utilizes up to four bullet-type breakers.



Figure 1—Cordex 24-400W integrated 19" 2 R.U. shelf system with CXCI

1.3 Part Numbers and List Options (030-819-20 RoHS)

The product and accessories are available to order under the following part numbers and list options:

Description	Part Number/List Option
Cordex 24-400W 19" (flush mounting) 2RU shelf for systems up to 1600W.....	030-819-20
[equipped to receive one CXCI/CXCI+ controller and up to four CXRC 24-400W rectifiers]	*List 0
24Vdc output	*List 1
120Vac input	List 5
240Vac input	List 6
19" rack, 6" offset mounting	List 19
19" rack, flush mounting	List 21
19" rack, 5" offset mounting	List 22
23" rack, 6" offset mounting	List 23
23" rack, flush mounting	List 25
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Charcoal finish with white (contrasting) silkscreen	*List 56
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Breaker, mid-trip, 50A	List 105
Breaker, mid-trip, 60A	List 106
Breaker, series-trip, 65A	List 157
Replacement CXCI+ controller	7400232-001
Rectifier blank plate.....	613-465-W3
Breaker, AM-type mid-trip plug-in, 5A.....	470-302-19
Breaker, AM-type mid-trip plug-in, 10A.....	470-303-19
Breaker, AM-type mid-trip plug-in, 20A.....	470-305-19
Breaker, AM-type mid-trip plug-in, 30A.....	470-307-19
Breaker, AM-type mid-trip plug-in, 40A.....	470-309-19
Breaker, AM-type mid-trip plug-in, 50A.....	470-311-19
Breaker, AM-type mid-trip, 60A.....	470-312-19
Breaker, AM-type series-trip, 65A.....	470-370-19
Cordex 24-400W rectifier power module, 120Vac-208-240Vac universal input	(010-582-20 pre-RoHS) 010-612-20
Basic module, 24Vdc output	*List 0
Charcoal finish with white (contrasting) silkscreen	*List 56
Paralleling diode (Oring MOSFET) for operation without battery	List 82
Replacement MOV pack, 120V	707-382-20-040
Replacement MOV pack, 240V	707-382-20-041
Cordex DC Modem (complete with Alpha cable)	018-585-20

* Default option

** Distribution option requires one of List 80, 83 or 84. NOTE: For effective alarm operation, battery circuit breakers should be series-trip.

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

1.4 Part Numbers and List Options (030-763-20 RoHS)

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

Description	Part Number/List Option
Cordex 24-400W 19" (flush mounting) 2RU shelf for systems up to 1600W.....	030-763-20
[equipped to receive one CXCI/CXCI+ controller and up to four CXRC 24-400W rectifiers]	*List 0
24Vdc output	*List 1
120Vac input	List 5
240Vac input	List 6
19" rack, 6" offset mounting	List 19
19" rack, flush mounting	List 21
19" rack, 5" offset mounting	List 22
23" rack, 6" offset mounting	List 23
23" rack, flush mounting	List 25
23" rack, 5" offset mounting	List 26
Charcoal finish with white (contrasting) silkscreen	*List 56
Temperature sensor, 1/4" lug, 12 ft.....	List 72
Temperature sensor, 3/8" lug, 12 ft.....	List 75
Circuit breaker distribution, bullet-type, four load circuit breakers, two battery connections	**List 80
Circuit breaker distribution, bullet-type, three load circuit breakers, one battery circuit breaker	**List 83
Circuit breaker distribution, bullet-type, two load circuit breakers, two battery circuit breakers	**List 84
Load disconnect	List 86
Battery disconnect.....	List 87
Two line cords without plugs, 3m each	List 89
Rectifier blank plate.....	List 90
CXCI+ controller.....	*List 98
Breaker, mid-trip, 5A	List 100
Breaker, mid-trip, 10A	List 101
Breaker, mid-trip, 20A	List 102
Breaker, mid-trip, 30A	List 103
Breaker, mid-trip, 40A	List 104
Breaker, mid-trip, 50A	List 105
Breaker, mid-trip, 60A	List 106
Breaker, series-trip, 65A	List 157
 Cordex 24-400W rectifier power module, 120Vac-208-240Vac universal input	 010-582-20
Basic module, 24Vdc output	*List 0
Charcoal finish with white (contrasting) silkscreen	*List 56
Paralleling diode (Oring MOSFET) for operation without battery	List 82

* Default option

** Distribution option requires one of List 80, 83 or 84. NOTE: For effective alarm operation, battery circuit breakers should be series-trip.

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

2 Features

2.1 Cordex Integrated System Controller (CXCI/CXCI+)

The Cordex CXCI/CXCI+ integrated system controller is mounted in the rectifier system shelf and brings advanced monitoring technology to the Cordex series of rectifiers. This compact system controller is designed for seamless operation and set up of Alpha 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.

Behind the CXCI/CXCI+ front panel lies the main controller motherboard, which contains a microprocessor, memory, as well as numerous other electronic components.

The CXCI/CXCI+ 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 and temperatures (automatically for up to 16 user defined logs). Typical applications of the CXCI/CXCI+ 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; accessed via the front of the shelf.

NOTE: *Customer settings for the CXCI/CXCI+ are provided in manual part number 0350046-J0.*

2.2 System Controller Front Panel

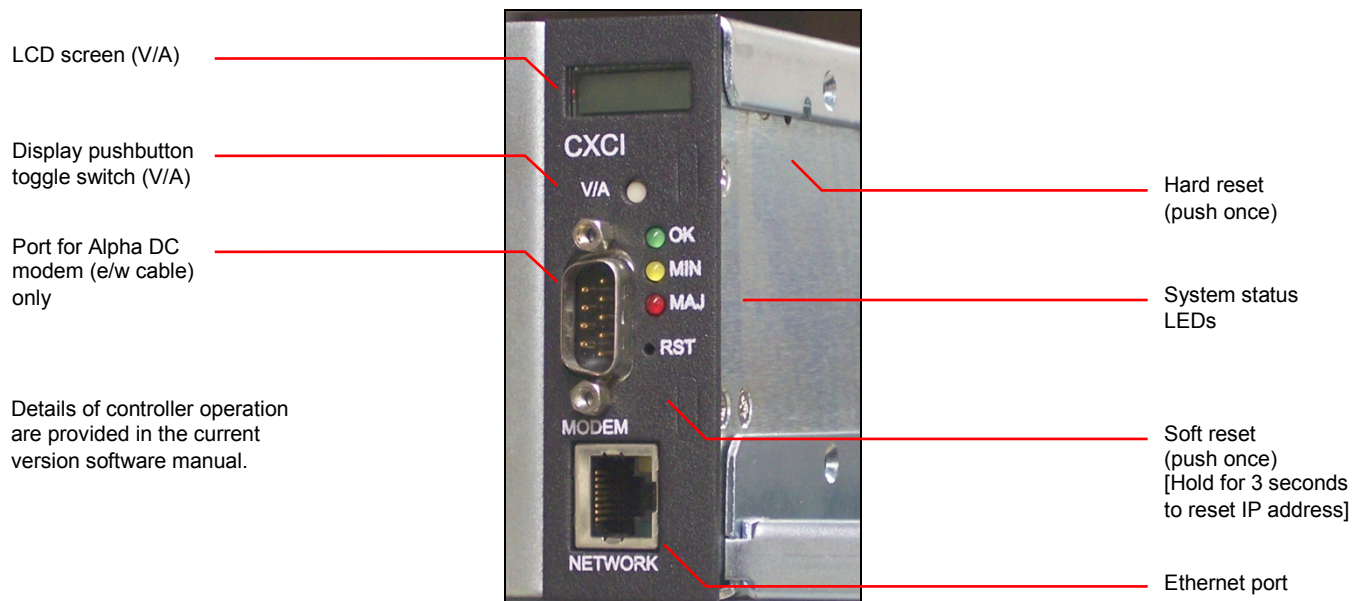


Figure 2—Cordex CXCI controller front panel

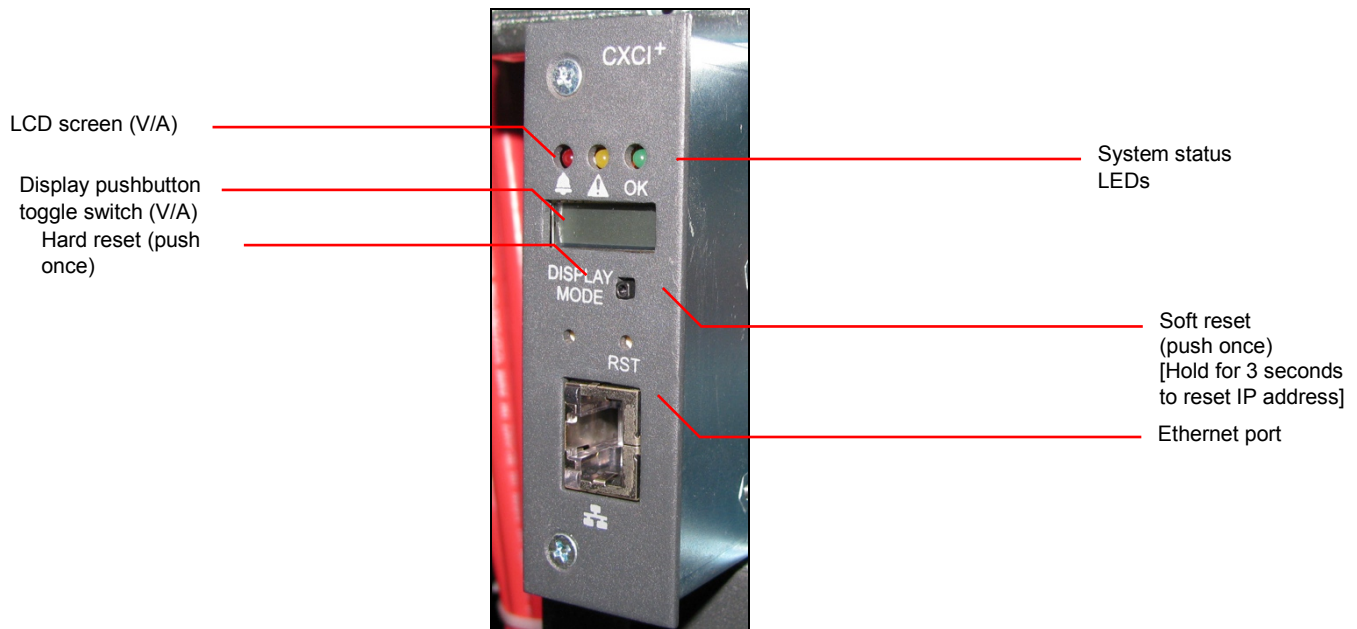


Figure 3—Cordex CXCI+ controller front panel

2.2.1 Display

The CXCI/CXCI+ has a 4-digit display for monitoring system voltage (V) and current (A). A pushbutton toggle switch allows the user to alternate the display reading.

2.2.2 LEDs

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

2.2.2.1 Alarm Conditions

The CXC 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.

2.2.2.2 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.

2.2.3 Reset

A reset button is located on the front panel for restarting the CXC microprocessor. See Section 7.4.

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

2.2.4 Modem Port (not available on the CXCI+, list 98)

The Modem port (front panel DB-9 connector, Figure 2) is designed for CXCI connection to the Alpha Cordex DC Modem #018-585-20 (complete with Alpha cable).

CAUTION

Connect only Alpha-supplied modem and cable; otherwise, equipment damage can result.

2.2.5 Ethernet Port

The Ethernet port is designed for CXCI/CXCI+ connection to a user supplied network (TCP/IP secured by user) via a front panel RJ-45 jack (Figure 2) 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.

2.3 Analog Input Channels

2.3.1 Voltage Inputs

Two voltage input channels, V1 and V2, provide monitoring of discharge and charge voltage. The CXCI/CXCI+ software is pre-configured to monitor V2 for load and for 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.

2.3.2 Current Inputs

The CXCI/CXCI+ software is pre-configured to monitor I1 for load current wired internally to the system current shunt.

2.3.3 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.

2.4 Digital Input Channels

The CXCI/CXCI+ can accommodate up to two (2) channels and can monitor digital alarm/control signals from rectifiers, converters and many other types of equipment.

2.5 Alarm and Control Output Relays

The CXCI/CXCI+ contains four (4) 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.

2.6 Network Connection and Remote Communications via CXCI/CXCI+

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.

2.7 Rectifier Front Panel

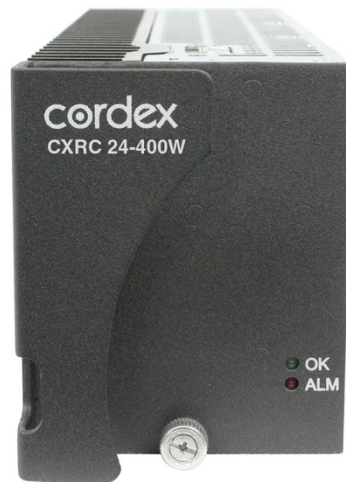


Figure 4—Cordex 24-400W rectifier front panel

2.7.1 LEDs

The front panel LEDs provide rectifier status summary and help to locate a specific module under CXC control.

2.7.1.1 OK

The top LED (green) is on when AC is within a valid range and the rectifier is delivering power to the load.

The LED turns off when AC has failed or when the rectifier is off; for example, when commanded by the CXC controller. AC voltage is invalid if the AC Mains Low or AC Mains High alarm is active.

2.7.1.2 ALM (Alarm)

The bottom LED (red) is on continuously in the event of an active Module Fail alarm.

The LED flashes (~2Hz) when a minor alarm is detected.

The LED remains off in the absence of an alarm.

2.7.1.3 LED Activity during 'Locate Module' Command from CXC

When the "locate module" command is received from the CXC, the rectifier LEDs flash in a distinct pattern that makes it easy to identify the rectifier visually among adjacent rectifiers.

2.7.1.4 LED Activity during Firmware Upload

When a rectifier firmware upload is in progress, the LEDs flash in the same pattern as the "locate module" command described above.

2.7.2 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.

2.8 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.*

2.9 Heat Dissipation

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

2.10 Over Temperature Protection

Each rectifier 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. 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.

2.11 Wide AC Range

A minor alarm is generated when the AC input voltage drops below specification. The unit will deliver derated output power down to 80Vac.

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

2.12 AC Inrush/Transient Suppression

The inrush current of the rectifier module is limited to the full load steady state 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.

2.13 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 rectifier output voltage is ramped up from the minimum voltage to the float voltage.

2.14 Start Delay

The rectifier 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.

¹ Under normal conditions, 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.

2.15 Current Limit/Short Circuit Protection

The current limit function determines the maximum output current limit of the rectifier 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.

2.16 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.

2.17 Battery Eliminator Operation

Rectifier 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.

2.17.1 Paralleling Diode (optional)

An optional Oring MOSFET on the output prevents disruption of DC system output power in the event of a rectifier internal fault in systems without batteries.

3 Inspection

3.1 Packing Materials

All Alpha products are shipped in rugged cardboard 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.

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

3.2 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 Alpha Technologies for advice on the impact of any damage.



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

4 Installation

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

NOTE: *During this installation, reference is made to drawings located at the rear of this manual.*

4.1 Safety Precautions



WARNING

Hazardous voltages are present at the input of power systems. The DC output from the rectifiers and battery system, 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/distribution center, follow these precautions:

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

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.

4.2 Shelf Preparation/Mounting



WARNING

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

The shelf has been designed for flush mounting in a 19" or 23" rack. Universal mounting brackets allow for 5" or 6" offset mounting. The configuration depends on the options chosen. See drawing 030-763-06.

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 cooling airflow. 3.5" (2RU) is recommended.*

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.

4.3 Rectifier Module Insertion/Removal

Insert by placing the rectifier module on the shelf bottom and sliding the module into the rear connector (inside of the shelf). Apply pressure on the module handle to engage the rear connector in the shelf receptacle.

NOTE: *It is recommended that the first module be inserted into the front leftmost position using the side of the shelf-mounted controller as a guide. The next module may be inserted using the previous module as a guide.*

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 (polarity/voltage) type is used.*

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

5 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.*

5.1 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.

5.2 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 24/48Vdc 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
- Crossover cable RJ-45 (for access using the Ethernet port).

5.3 Power System Chassis Ground and DC Ground Reference

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.

5.4 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. See customer connections drawing (modules are numbered left to right). TB3 feeds modules 1 and 2. TB4 feeds modules 3 and 4.

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	90 deg. C Wire Gauge to use at 30 deg. C ambient
1	15A	2.50mm ² (#14 AWG)
2	20A	4mm ² (#12 AWG)

Table 1 Recommended AC supply configuration

5.5 AC Input

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.

1. If the shelf is factory-equipped with the optional line cord, proceed to the next section.
2. Refer to customer connections drawing 030-763-08 (rear view – back cover removed).
3. Remove the metal cover from the rear of the shelf to expose the wire way for the input terminal blocks.
4. Attach the conduit retainers to the wire way 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).
5. Replace rear cover once all connections have been completed.

5.6 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.

5.7 DC Output



WARNING

Leave cables disconnected at battery and verify output polarity using a voltmeter. Make final connections at the battery 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).

5.7.1 Circuit Breaker Distribution

The shelf is factory-equipped with four AM-style bullet-type breakers.

NOTE: *Battery breakers should be series-trip to ensure effective alarm operation; service personnel must reset the breaker to clear the alarm.*

NOTE: *When there is no power on the rectifiers and there is only one battery circuit breaker, there will be no alarm if the circuit breaker trips.*

Secure the positive and negative cable leads to the shelf output terminal blocks of the correct polarity; i.e., +V_{cable} to +V_{post}.

The common output leg of the rectifier system should be connected to ground. This is typically done at the load common termination point (negative bus bar for +24V systems).

Refer to schematic drawing 030-763-05 with respect to the output terminal block configurations as follows:

- For List 80, battery outputs 5 and 6 and load outputs 1 – 4 are connected.
- For List 83, battery output 5 and load outputs 1 – 3 are connected, 4 and 6 are not.
- For List 84, battery outputs 5 and 6 and load outputs 1 – 2 are connected, 3 and 4 are not.

Replace rear cover once all connections have been completed.

5.8 CAN Out Port

The communication between the rectifier and CXC consists of commands and data transfer that are used during the operation of the power system to configure the rectifier with system settings and to monitor rectifier status.

A single CAN Out port, is located on the shelf backplane. Daisy-chain from node to node (CAN OUT of one node to CAN IN of another) as necessary and ensure that only the last node is terminated. CAN Termination Jumper Setting shown in drawing 030-763-08.

NOTE: The CXCI/CXCI+ can accommodate up to a maximum of twelve Cordex 400W rectifiers; they do not have self-powered CAN Bus nodes.

5.9 Network Connection and Remote Communications via CXCI/CXCI+

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. Some standard scenarios are described below:

5.9.1 Modem Port (not available on the CXCI+, list 98)

The Modem port is designed for CXCI connection to the Alpha Technologies' Cordex DC Modem (#018-585-20) via a front panel DB-9 connector.

CAUTION

Connect only Alpha-supplied modem and cable; otherwise, equipment damage can result.

5.9.2 Ethernet Port for Network Connection (Standard Network Cable)

The Ethernet port is designed for CXCI/CXCI+ connection to a user supplied network (TCP/IP secured by user) via a front panel RJ-45 jack.

Connect to the CXCI/CXCI+ using a standard network cable. Pinouts are shown in drawing 030-763-08.

5.9.3 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.

5.10 Signal Wiring Connections

For terminal block connections, the recommended wire sizes are 1.5 to 0.14mm² (#16 to #26 AWG) for the temperature range of 0 to 50 deg. C (as per UL/CSA). Control and sense wires shall be UL approved Style 1015 (for Canadian users, TEW type).



CAUTION: to reduce risk of fire, use only 0.14mm² (#26 AWG) or larger wire.

Terminal	Description	Default Name	Signal Type	Range
1, 2, 3*	LVD Control (internal)	K1, Relay 1	NO/COM/NC	60Vdc / 1A
4, 5, 6*	Alarm Output 2	K2, Relay 2	NO/COM/NC	60Vdc / 1A
7, 8, 9*	Alarm Output 3	K3, Relay 3	NO/COM/NC	60Vdc / 1A
10, 11, 12*	Alarm Output 4	K4, Relay 4	NO/COM/NC	60Vdc / 1A
13, 14**	Digital Input 1 (internal)	D1, Digital 1	Pos (+) or Neg (-)	0—60Vdc
15, 16**	Digital Input 2	D2, Digital 2	Pos (+) or Neg (-)	0—60Vdc
17, 18***	Voltage Input 1	V1, Load Voltage	Pos (+) / Neg (-)	0—60Vdc
19, 20***	Temp Probe 1	T1, Analog Input T1	Pos (+) / Neg (-)	0—20Vdc
21, 22***	Temp Probe 2	T2, Analog Input T2	Pos (+) / Neg (-)	0—20Vdc
23	Battery +24V	Batt Hot	Pos (+)	20—60Vdc
24, 25	Current Input 1 (internal)	I1, Load Current	Pos (+) / Neg (-)	±50mV

Table 2 Wiring connections for CXCI/CXCI+

* NO and NC Form C contacts available. Can be configured to de-energize on alarm (DOA) or energize on alarm (EOA).

** See Table C for definitions of logic and system.

*** Voltage (Input) is 0—60VDC, Temp Probe is 0—20VDC with power source.

NOTE: During this installation, reference is made to drawings located at the rear of this manual. Custom configurations may be detailed within the Alpha power system documentation package.

The signal cables should be bundled together and routed through the entry holes of the shelf.

5.10.1 Analog Inputs for CXCI/CXCI+

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.

5.10.1.1 Voltage

Voltage Input #1 (load 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 (battery 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 LVD).

The Battery +24V should be connected at the battery system voltage terminal for CXCI/CXCI+ reference when a battery disconnect device is used. It is critical to CXCI/CXCI+ operation as it ensures a source of power to the CXCI/CXCI+ should the disconnect device open the circuit.

For List 87, the Battery +24V is factory wired for internal battery disconnect.

5.10.1.2 Temperature Sensor

Temperature Probe input channels provide connections for up to two temperature sensors. A voltage is supplied to these terminals for sensor measurements. Connect the red lead to “+” and the black lead to “-”.

5.10.1.3 Current

Current Input #1 (load current per CXC software) is wired internally to the system current shunt (75A/50mV) in the negative lead.

5.10.2 Digital Inputs for CXCI/CXCI+

The digital input channels (factory-installed) 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.

D1 and D2 on TB12 are available for customer connections as required.

5.10.2.1 Connection Method

Typical Alpha 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., positive input for +24V 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 5) allows the digital input to receive (or not receive) a Ground signal on an alarm.

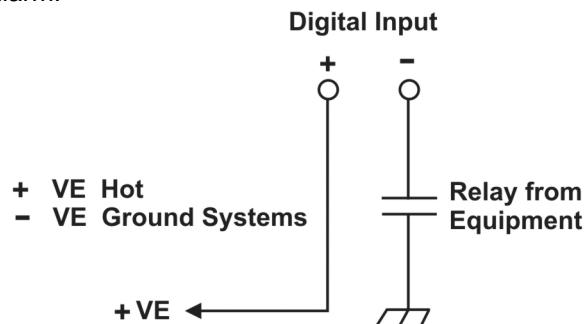


Figure 5—Showing digital input connection method

5.10.2.2 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	9—60

Table 3 Voltage level definitions for digital inputs

5.10.3 Alarm (Relay) Outputs



CAUTION: Relay contacts are not power limited. Connect relay outputs to SELV circuits only.

Terminals provide contacts for extending various alarm or control signals. Each relay output can be wired for NO or NC operation during an alarm or control condition. See Figure 6.



CAUTION: Connect the common contact of the relay (2, 5, 8 or 11) to the powered line. Use the NO or NC contact as the output.

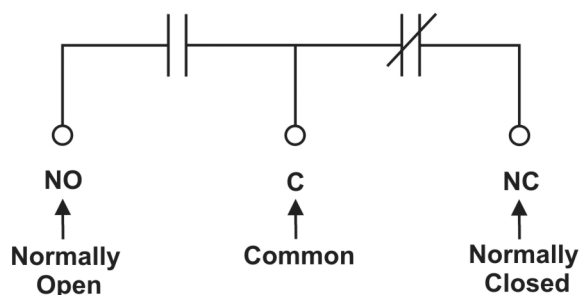


Figure 6—Showing relay connections

Relays can be programmed to energize or de-energize during an alarm condition (see CXC Software manual).

NOTE: When the CXCI/CXCI+ 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 in section 5.10.4.

5.10.4 LVD Control (Load Disconnect or Battery Disconnect) Option

The disconnect option is controlled by and connected internally to relay K1.

5.10.4.1 LVD Inhibit

Should it be necessary to remove the customer connection board or CXCI/CXCI+, the customer connection board (on the back of the shelf) provides shorting pins (JP2) to inhibit (or override) the LVD Control function. See drawing 030-763-08 next to TB11, pin 1, of the customer connections.

If the LVD is controlled on NC contacts (factory default for LVD option), then JP2 pins 1 and 2 must be shorted together to maintain LVD operation. If the LVD is controlled on NO contacts, then pins 2 and 3 must be shorted together. For normal operation, the factory-supplied shorting jumper should be left on pins 3 and 4.

5.10.5 LVD Control Alternative

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

6 Operation

6.1 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.

6.1.1 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.

6.1.2 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.*

6.1.3 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.

6.1.4 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.

6.1.5 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.

6.2 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:

6.2.1 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 four 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. NOTE: <i>After five minutes without communications with the system controller, the rectifier will revert to Safe Mode voltage and clear any current limit adjustments made by the controller.</i>

Table 4 Output voltage modes

6.2.2 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. NOTE: <i>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 5 Output current/power modes

6.3 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	23.75 – 29.30V	27.00V
Equalize (EQ) Voltage	24.90 – 29.30V	27.50V
Battery Test (BT) Voltage	22.00 – 26.00V	23.00V
Safe Mode Voltage	23.00 – 28.00V	25.70V
OVP	See note below – 30.30V	28.50V
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)	21.00 – 26.00V	22.00V
High Voltage Alarm (HVA)	26.00 – 30.30V	27.75V
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 6 Cordex 24-400W factory ranges and defaults

NOTE: OVP cannot be set below the present system/FL/EQ/BT voltage setting or the safe mode voltage (default) of 25.7V.

7 System Startup

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

7.1 Check System Connections

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

7.2 Verify AC and Power the Shelf

1. Install one power module.
2. Verify AC input voltage is correct and turn on the corresponding AC input feeder breaker.
3. The power module OK LED should illuminate after a preset start delay.
4. Login to the controller as follows:
 - a. Set the laptop IP Network settings (**Start > Control Panel**)
 - IP address: 10.10.10.202
 - Subnet mask: 255.255.255.0
 - b. Turn off Pop-up Blocker.
 - c. Enter 10.10.10.201 in the web address bar of the laptop.
 - d. Login to the CXC controller:
 - Username: your company name and your initials
 - Password: 1234
 - Language selection: English
5. Use the CXC controller to test the functionality of various module alarms and controls.

7.3 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 CXCI/CXCI+ (web browser), set Float and Equalize voltage to the levels specified by the battery manufacturer.
- Using the CXCI/CXCI+, test functionality of various module alarms and controls. In addition, perform a load test with the system using a resistive load box as needed.

7.4 CXC Reset

7.4.1 Soft Reset

The reset button located on the front panel of the CXCI/CXCI+ is for restarting the microprocessor. When pressed momentarily, the unit beeps twice then resets. The front-panel LEDs illuminate temporarily, but will extinguish after the system has finished its 15-second self-test.

CAUTION: During rest, the controller may need to run a defragmentation cycle. Cycling of the LEDs in the front panel indicate that defragmentation is in progress. All full defragmentation can take up to 20 minutes to perform. DO NOT POWER DOWN the CXC during this time.

7.4.2 IP Address Reset

To reset the IP address, press and hold the front panel reset button for three seconds. The CXCI/CXCI+ unit beeps three times, IP is reset (to 10.10.10.201) and DHCP is disabled. The settings are saved and the unit is then reset.

This reset allows local access; for example, with a laptop and a standard network crossover cable. See the current version software manual for details.

7.4.3 Hard Reset

Refer to Figure 2 and Figure 3 for the location of the hard reset button on the CXCI/ CXCI+. This can be used to restart the microprocessor in the event that the front panel (soft) reset button fails to operate as described above.

A second reset button is located on the side of the CXCI to the right of the front panel (see Figure 2). On the CXCI+, the hard reset button is the unmarked button on the front panel (see Figure 3). This reset button can be used to restart the microprocessor if the soft reset button fails to operate as described in section 7.4.1.

CAUTION: Use of hard reset may cause loss of data.

NOTE: *To access the hard reset button on the CXCI model, remove the converter module adjacent to the CXCI.*

7.4.4 Time Settings

The CXCI/CXCI+, upon startup*, will set the time based on the following:

- Attempt to synchronize with the NTP server (see www.NTP.org).
- Retrieve the last time stamp from the Event Log.
- Retrieve the last time stamp from the Statistics Log.
- Set the time to 2005-01-01 midnight.

* Whenever the unit is reset or power is completely removed from the CXCI/CXCI+.

8 Maintenance

Although very little maintenance is required with Alpha 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 7 Sample maintenance log

8.1 MOV Replacement

The MOVs (Metal Oxide Varistor) are used to protect the power modules from power line surges and the surges caused by lightning strikes. High capacity surges may permanently damage MOVs, which are easily replaced in the field using the following procedure:

1. Shut off the unit and wait five minutes for the output capacitors to discharge.
2. Loosen the thumbscrew that secures the power module to the shelf and remove the module from the shelf.
3. Turn the module around to face the back of the unit and remove the three (3) screws securing the rear grill/cover. Remove the rear cover. See Figure 7:

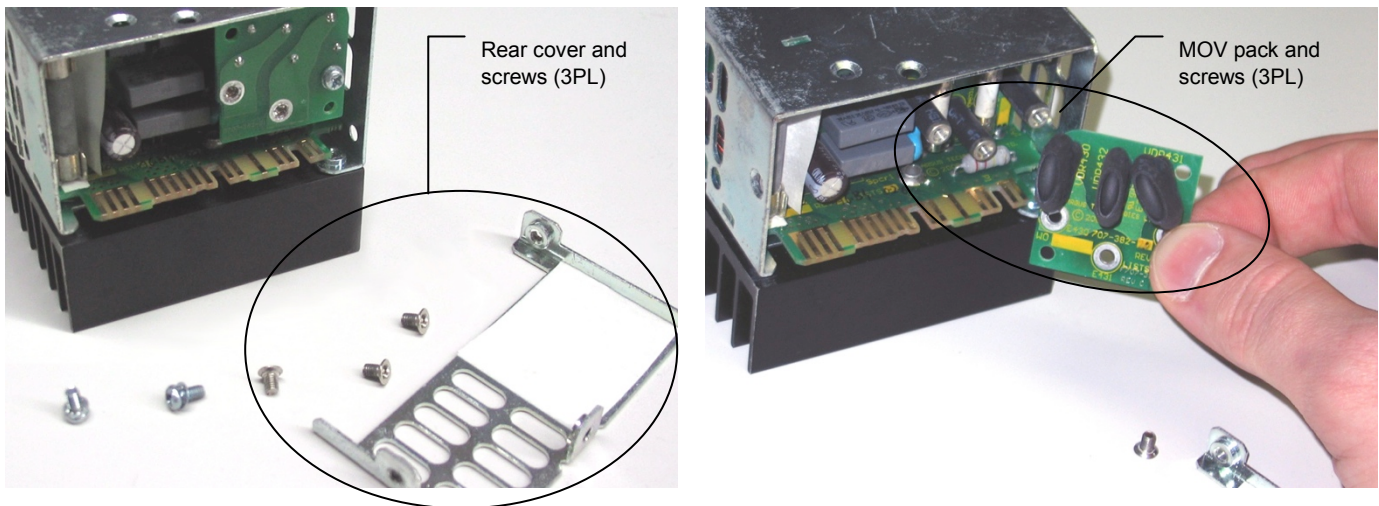


Figure 7–Showing MOV removal and replacement

4. Locate the “MOV pack.” Remove the three (3) screws securing the MOVs and remove.
5. Decontaminate the affected area with flux remover or a similar cleaning compound. This is to remove any metallic particles or carbon, which may have been deposited when the MOV failed.
6. Install the replacement MOV pack and reassemble the unit following the preceding steps in reverse order.

8.2 CXCI/CXCI+ Replacement

8.2.1 Replacing a CXCI Controller

1. Write down the CXC communication information: dynamic or static IP, IP address, and gateway.
2. Connect a laptop to CXC per software manual; standard network crossover cable to Ethernet port.
3. Save the CXC configuration file (see software manual **Logs and Files > Manage Configuration File > Save Full Site Configuration**).
4. Save the CXC text file if necessary: **Logs and Files > Manage Editable Text Files > Save Dynamic Text File**.
5. If applicable, bypass the system LVD:
 - Locate JP2 on the back of CXCI/CXCI+ system shelf (Figure 8)
 - If the LVD is controlled on NC contacts (factory default for LVD option), then JP2 pins 1 and 2 must be shorted together to maintain LVD operation.
 - If the LVD is controlled on NO contacts, then JP2 pins 2 and 3 must be shorted together.

NOTE: bypassing the LVD generates an alarm.

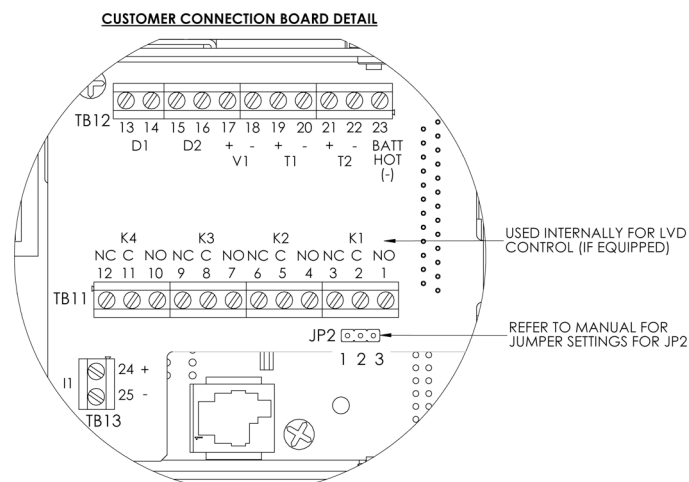


Figure 8—Location of LVD bypass jumper

6. Disconnect the DB signal connector from the CXCI/CXCI+ at the rear of the shelf.
7. Ensure a rectifier is in the right-most position. Remove the rectifier in the left-most position in order to access the side of the CXCI where the mounting screws are located.
8. Remove three mounting screws from the CXCI as shown in Figure 9.

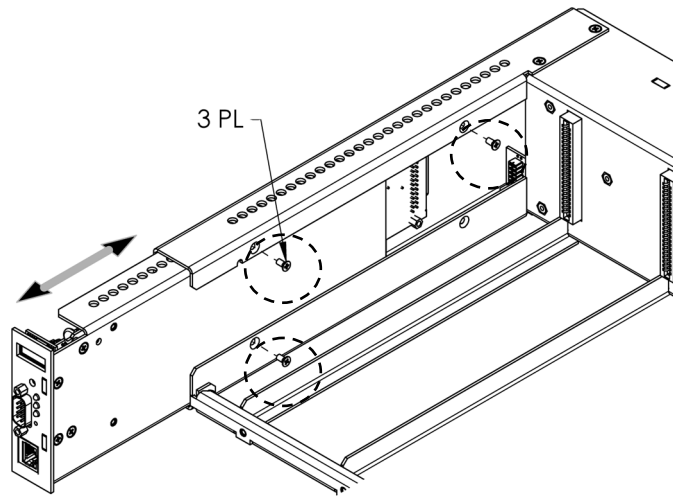


Figure 9—Showing CXCI removal and replacement

9. For CXCI removal/installation, two persons will be required for early revision CXCI I/O PCB (rev B or older). One person, at the back of the system shelf, should grip the terminal blocks on the PCB to prevent it from flexing as the other person, at the front of the CXCI, carefully pulls the controller module clear of the backplane/DB-25 connectors.
10. Install the new CXCI: one person must apply minimal pressure to the I/O PCB terminal blocks while the other person pushes the CXCI into the connectors. The front panel should not be removed and is used to grip (with thumb and index finger) along bottom and top edge for removal/insertion. CAUTION - Do not push on the LCD.
11. Reinstall the three mounting screws.
12. Review steps 1 through 3 with respect to new installation and upload the saved CXCI configuration file to the new controller.
13. Use a meter to verify the buss voltage and current shunt. Recalibrate as required due to differences in the new CXCI.
14. Replace rectifiers and remove LVD bypass.

8.2.2 Replacing a CXCI+ Controller

1. Write down the CXC communication information: dynamic or static IP, IP address, and gateway.
2. Connect a laptop to CXC per software manual; standard network crossover cable to Ethernet port.
3. Save the CXC configuration file (see software manual **Logs and Files > Manage Configuration File > Save Full Site Configuration**).
4. Save the CXC text file if necessary: **Logs and Files > Manage Editable Text Files > Save Dynamic Text File**.

If applicable, bypass the system LVD:

- Locate JP2 on the back of CXCI+ system shelf (Figure 8)
- If the LVD is controlled on NC contacts (factory default for LVD option), then JP2 pins 1 and 2 must be shorted together to maintain LVD operation.
- If the LVD is controlled on NO contacts, then JP2 pins 2 and 3 must be shorted together.

NOTE: bypassing the LVD generates an alarm.

5. Disconnect the DB signal connector from the CXCI+ at the rear of the shelf.
6. Gently pull the controller from the slot.
7. Place the new CXCI+ controller module on the shelf bottom and slide into the rear connector at the back of the slot.



Figure 10–Showing CXCI+ controller module replacement

8. Replace the DB connector on the back of the CXCI+ at the rear of the shelf
9. Log on to the CXC and go to **Logs and Files > Manage Configuration File > Upload Site Configuration** and select the saved *.cfg file. After the upload do a **Submit Changes**. Make sure the site information is checked to save it, and click **Accept**.
10. Go to **Logs and Files > Manage Editable Text Files > Upload Dynamic Text File** and select the saved *.tfg file. You do not need to submit changes; it is already saved.
11. Use a meter to verify the bus voltage and current shunt. Recalibrate as required due to differences in the new CXCI+.
12. Replace rectifiers and remove LVD bypass.

8.2.3 Replacing a CXCI Controller with a CXCI+ Controller

1. Write down the CXC communication information: dynamic or static IP, IP address, and gateway.
2. Connect a laptop to CXC per software manual; standard network crossover cable to Ethernet port.
3. Save the CXC configuration file (see software manual **Logs and Files > Manage Configuration File > Save Full Site Configuration**).
4. Save the CXC text file if necessary: **Logs and Files > Manage Editable Text Files > Save Dynamic Text File**.
5. If applicable, bypass the system LVD:
 - Locate JP2 on the back of CXCI/CXCI+ system shelf (Figure 9)
 - If the LVD is controlled on NC contacts (factory default for LVD option), then JP2 pins 1 and 2 must be shorted together to maintain LVD operation.
 - If the LVD is controlled on NO contacts, then JP2 pins 2 and 3 must be shorted together.

NOTE: bypassing the LVD generates an alarm.

6. Disconnect the DB signal connector from the CXCI at the rear of the shelf.
7. Follow steps 8 and 9 for replacing a CXCI (Figure 9).
8. Place the CXCI+ controller module on the shelf bottom and slide into the rear connector at the back of the slot.
9. Replace the DB connector on the back of the CXCI+.
10. Log on to the CXC and go to **Logs and Files > Manage Configuration File > Upload Site Configuration** and select the saved *.cfg file. After the upload do a **Submit Changes**. Make sure the site information is checked to save it, and click **Accept**.
11. Go to **Logs and Files > Manage Editable Text Files > Upload Dynamic Text File** and select the saved *.tfg file. You do not need to submit changes; it is already saved.
12. Use a meter to verify the bus voltage and current shunt. Recalibrate as required due to differences in the new CXCI+.
13. Replace rectifiers and remove LVD bypass.

9 Warranty and Service Information

9.1 Technical Support

Free Technical Support 24/7/365 is part of the Alpha customer satisfaction commitment. The phone numbers below can also be used to access a wide range of service solutions both at your premise and at the Alpha facility nearest you.

In Canada and the USA, call toll free 1-888-462-7487.

Customers outside Canada and the USA, call +1-604-436-5547.

9.2 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.

9.3 Battery Warranty

Note that battery warranty terms and conditions vary by battery and by intended use. The most common battery warranty provided by Alpha is a two year full replacement warranty with a pro-rated warranty for the following three years. Pro rated warranty provides a credit applicable toward the purchase of new batteries from Alpha. The credit is calculated as the purchase price multiplied by the percentage of the battery life that was not available (in months). Battery warranty coverage is lost where the battery charge is not maintained for 6 months. Contact your Alpha sales representative or the Technical Support team at the above number to understand your entitlements under Battery Warranty.

9.4 Return of Material

Please contact Technical Support at the number above to obtain a Service Repair Order (or Return Material Authorization) number BEFORE sending material back. This will ensure that your service needs are handled promptly and efficiently.

For more service and warranty information, visit the Alpha website: <http://www.alpha.ca/>

10 Acronyms and Definitions

AC	Alternating current
ANSI	American National Standards Institute
AWG	American wire gauge
BTU	British thermal unit
CAN	Controller area network
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
CX	Cordex™ series; e.g., CXC for <u>C</u> ordex <u>S</u> ystem <u>C</u> ontroller
DC	Direct current
DHCP	Dynamic host configuration protocol
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ERM	<u>E</u> lectromagnetic compatibility and <u>r</u> adio spectrum <u>m</u> atters
ESD	<u>E</u> lectrostatic <u>d</u> ischarge
FCC	Federal Communications Commission (for the USA)
HVSD	<u>H</u> igh <u>v</u> oltage <u>s</u> hut <u>d</u> own
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet protocol
LED	Light emitting diode
LVD	Low voltage disconnect
MOV	Metal oxide varistor
MTBF	Mean time between failures
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
RU	Rack unit (1.75")
TCP	Transmission control protocol
THD	Total harmonic distortion
UL	Underwriters Laboratories

Specifications for Alpha CXCI/CXCI+ Cordex Controller Integrated Model

Basic Unit, CXCI/CXCI+

CXCI Input Voltage:	17 to 65Vdc within rated limits [9 to 65Vdc for shelf systems with 12V rectifiers (List 3)]
CXCI+ Input Voltage:	10 to 65Vdc within rated limits
Current:	<100mA @ 48Vdc <200mA @ 24Vdc
MTBF:	CXCI: 472,000 hours @ 25°C (77°F) CXCI+: 1,500,000 hrs @30°C ambient; test model Telcordia SR-332, Issue 2
EMC:	

Radiated and Conducted Emissions

CXCI:

North America Regions:
CFR 47, Part 15 Subpart J, Class A

CXCI+:

North America Regions:

- CFR 47, Part 15 Subpart B, Class B
- ICES-003 Issue 2, Rev 1, Class

European Regions

- EN 55022 Class B
- EN 300 386-2
- EN61000-3-2; Harmonics
- EN61000-3-3; Flicker

Immunity

CXCI+:

- EN 300 386-2
- EN61000-4-2:2005, ESD ± 8 kV Air, ± 6 kV Contact
- EN61000-4-3:2005, RF Immunity 10 V/m
- EN61000-4-4:2005, EFT, 1kV/0.5kV
- EN61000-4-5:2005, Surge; 2 kV line to line, 1 kV line to earth
- EN61000-4-6:2005, Conducted Susceptibility, 10 Vrms
- EN61000-4-11: Voltage Dips and Interruptions

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

Warning: *The CXCI+ 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.

Specifications for Alpha CXCI/CXCI+ Cordex Controller Integrated Model Continued

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

NOTE: *The CXCI has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

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

Environmental

Temperature:	-40 to 65°C standard @ 3000m derate to 55°C @ 4000m (-40 to 149°F derate to 131°F @ 13124ft)
Humidity:	0 to 95% non-condensing
Elevation:	-500 to +4000m (-1640 to 13124 ft)

Hardware Specifications, CXCI/CXCI+

CPU:	Coldfire
Display:	4 digit LCD
Front Panel Controls:	Display pushbutton toggle switch for voltage (V) or current (A) CXCI/CXCI+ reset switch (soft reset button; hold for 3 seconds to reset IP)
LEDs:	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:	88mm H x 26mm W x 280mm D (3.5" H x 1" W x 11" D)
Weight:	0.34 kg (0.75 lb.)
Mounting:	Integrated on Cordex 2RU series 19" and 23" shelves
Relay Outputs:	Four (4) Form C, 60Vdc 1A maximum
Digital Inputs:	Two (2), 0 to 60Vdc
Analog Inputs:	One (1) DC voltage, 0 to 60Vdc One (1) DC current, $\pm 50\text{mV}$ Two (2) temperature, self-powered Alpha sensor (max 12Vdc)
CXCI Communication Ports:	Ethernet RJ-45, Alpha Modem DB-9, CAN [see shelf specifications]
CXCI+ Communication Ports:	Ethernet RJ-45, CAN [see shelf specifications]

Software Specifications, CXCI/CXCI+

CXCI	Software version: All
CXCI+	Software version: 2.10 minimum

Recommended Signal Wire Sizes (as per UL/CSA)

Wire Size Range:	0.14 to 1.50mm ² (#26 to #16 AWG)
Temperature Range:	0 to 50°C (32 to 122°F)

CAUTION – TO REDUCE RISK OF FIRE, USE ONLY 0.14mm² (#26 AWG) OR LARGER WIRE.

*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 Alpha Cordex 24-400W 19" Integrated Shelf System

Basic Unit, Shelf

Maximum Output Current:	56A @ 27Vdc (four rectifiers)
Maximum Output Voltage:	29Vdc
Recommended Feeder Breaker	
Single Phase:	20A, 4mm ² (#12 AWG) for up to two rectifiers 15A, 2.50mm ² (#14 AWG) for one rectifier

Mechanical

Dimensions:	88mm H x 442mm W x 307mm D (rectifier front panel 18mm D) [3.5" H x 17.4" W x 12.1" D (rectifier front panel 0.7" D)]
Mounting*:	19" or 23" rack (flush or 5" offset or 6" offset)
Weight:	6.9 kg (15.2 lb.)

Connections

AC Input:	Dual feed terminal blocks 4 to 0.34mm ² (#12 to #22 AWG)
Chassis ground:	M4 studs
Communications:	CAN (bus) out RJ-12 offset, see also specifications for CXCI/CXCI+ options
DC Output:	Terminal blocks 16mm ² (#6 AWG) maximum
Signal wiring:	Terminal blocks 1.5 to 0.14mm ² (#16 to #26 AWG)

Safety

EN 60950	Rectifier output shall be rated SELV suitable for connection to TNV-1 circuits
UL	60950-1-2002
CSA	C22.2 No. 60950
CE	EN 60950, CB Scheme 73/23/EEC Low Voltage Directive with amendment 93/68/EEC
Telcordia (Bellcore)	GR-1089-CORE (requirements applicable to rectifier)

* 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 Alpha Switched Mode Rectifier Cordex 24-400W

Power Module Output

Voltage:	21 to 30Vdc within rated limits
Current:	14A @ 27Vdc nominal (14A maximum)
Maximum Power:	400W $\pm$ 25W/module @ 120Vac nominal
Static Load Regulation:	Better than $\pm$ 0.5% for any load change within rated limits
Dynamic Load Regulation:	Better than $\pm$ 5% for 40% – 90% – 40% (50% load step) [output shall recover to static limits within 30ms]
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:	25ms
Time Stability:	$\leq$ 0.2% per year
Temperature Stability:	$\leq$ 100ppm/ $^{\circ}$ C over the operating range
Heat Dissipation:	<151 BTU per hour (per rectifier module)
Electrical Noise:	<32dBnC (voice band) <10mVrms to 10MHz <100mVp-p to 100MHz <1mV (psophometric)
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.

Power Module Input

Voltage:	120/208/220/240/277Vac (continuous operation 90-320Vac) Low: 90 to 70Vac (de-rated linearly to 60% output power) High: 276 to 320Vac (de-rated power factor)
Frequency:	50/60Hz nominal (45 to 70Hz)
Current:	3.8 @120Vac 5.0A maximum @90Vac
Power Factor:	>0.99 at nominal conditions and 50-100% load; >0.98 at nominal conditions and 40-50% load
Protection:	10kA-interrupting capacity fuses in active and neutral lines
Efficiency:	>87% @ 240Vac and 50-100% load >86% @ 120Vac 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% @ 120Vac and 100% load
Input Transient Suppression:	Meets ANSI/IEEE C62.41 Category B3
Input Leakage Current:	<3.5mA @ 265Vac 60Hz

Environmental

Operating Temperature:	-40 to +50°C (power de-rated up to 70°C) (-40 to 122°F) [power de-rated up to 158°F]
Storage Temperature:	-40 to +85°C (-40 to 185°F)
Humidity:	0 to 95% non-condensing
Elevation:	-500 to +3000m (-1640 feet to 9843 feet)

Miscellaneous

MTBF:	>405,000 hours ground benign, natural convection cooled
Dimensions:	88.1mm H x 71.6mm W x 242mm D (excluding connector) [3.47" H x 2.82" W x 9.5" D]
Weight:	1.4 kg (3 lb.)

Referenced Standards

EN 300 386-2	EMC and ERM; Telecommunication Network Equipment
EN 55022 (CISPR 22)	Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement
EN 61000-3-2	Harmonic Current Emissions
EN 61000-3-3	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.*

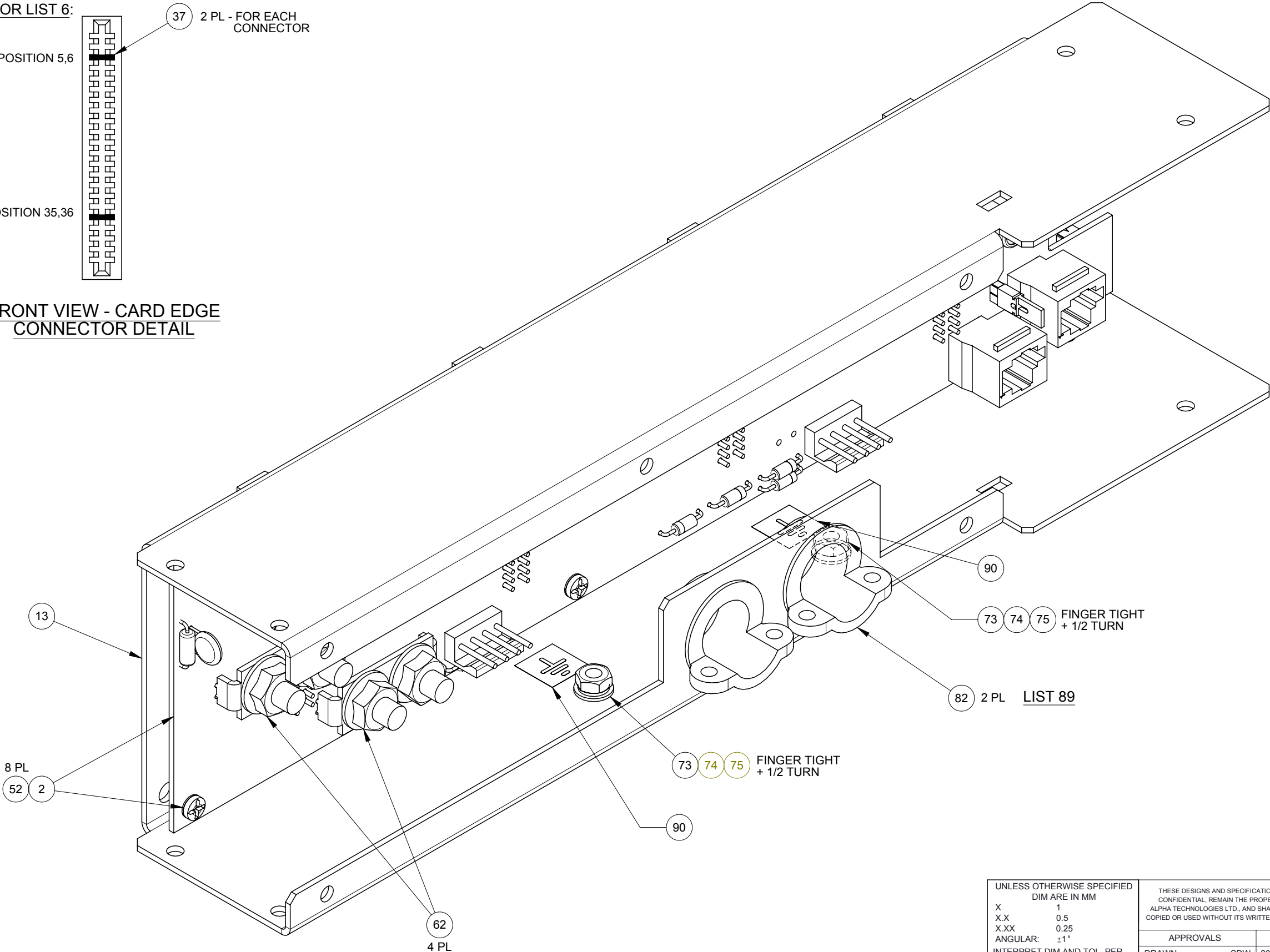
REVISIONS						
LTR	DESCRIPTION	DWN	DATE	CHKD	APPD	
B	REV A NEVER RELEASED	RP	2005/11		GS	
C	RE-DESIGNED	RP	2006/02		GS	
D	UPDATED FRONT PANEL	SDW	2006/09		GS	
E	REV'D PER EOs C1-8	MP	2008/01		GS	
F	EO D2 & ECO-10406.	MP	2010/10		JK	
K	ADD LIST 98, BP00337	CF	2011/07	LS		

LIST 5 OR LIST 6:

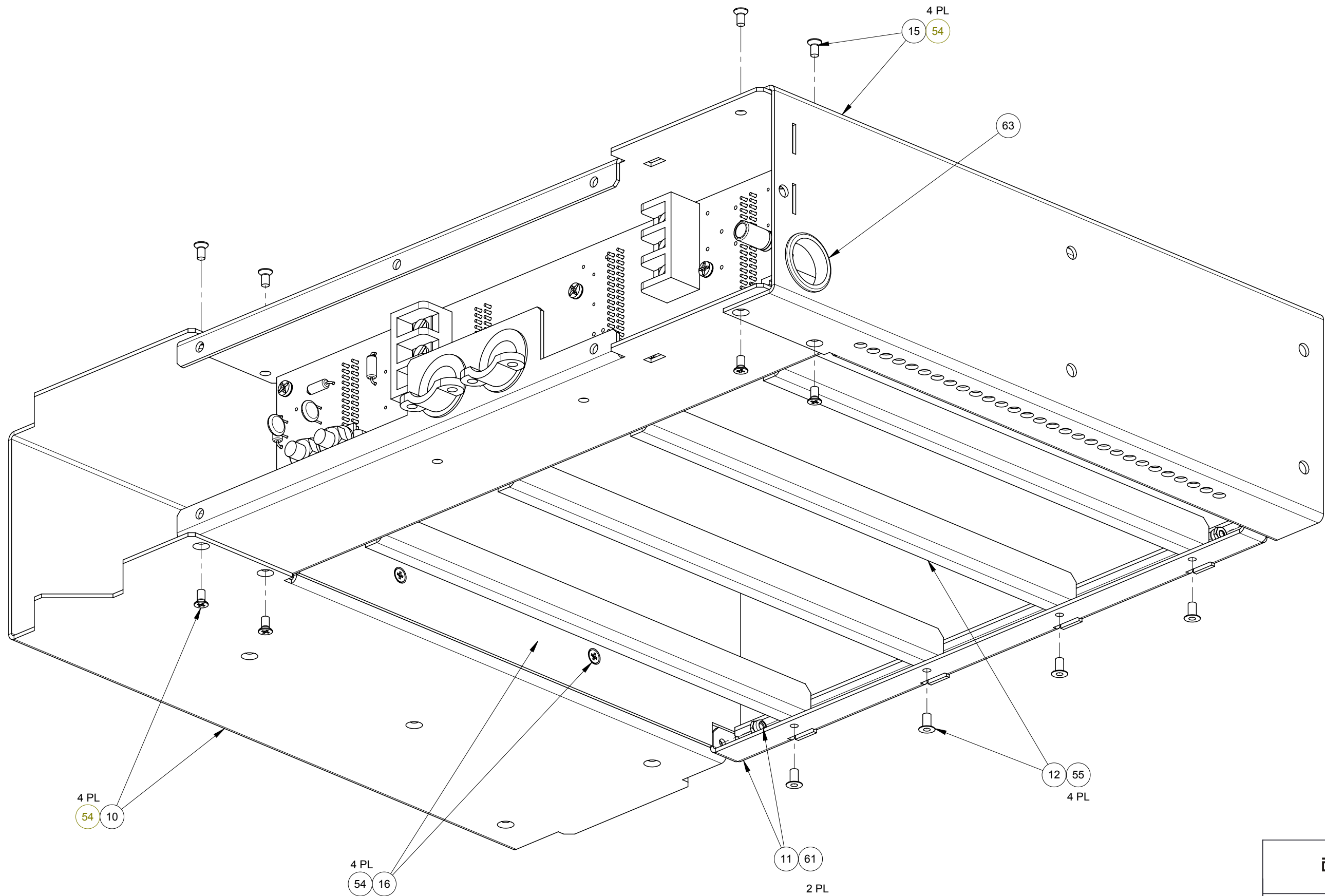
POSITION 5,6

POSITION 35,36

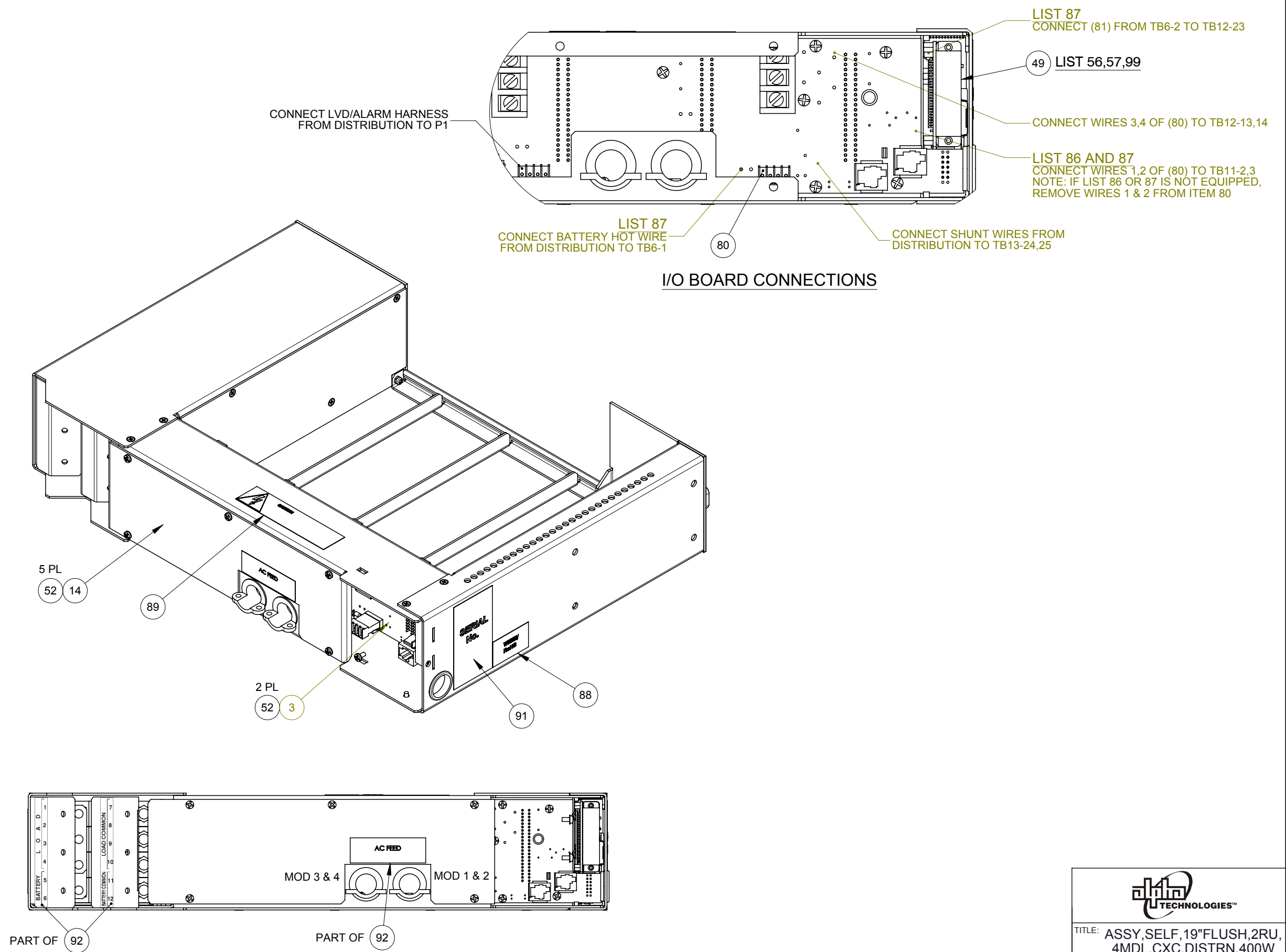
FRONT VIEW - CARD EDGE
CONNECTOR DETAIL



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X	1	APPROVALS				DATE	
X.X	0.5	DRAWN	SDW	2009/09	TITLE: ASSY,SELF,19"FLUSH,2RU, 4MDL,CXC,DISTRN,400W		
X.XX	0.25						
ANGULAR:	±1°	CHECKED	GS	2005/11			
INTERPRET DIM AND TOL PER ASME Y14.5M-1994							
THIRD ANGLE PROJECTION					SIZE B	DWG NO.	REV G
		© ALPHA TECHNOLOGIES LTD			SCALE: NTS		SHEET 1 OF 5

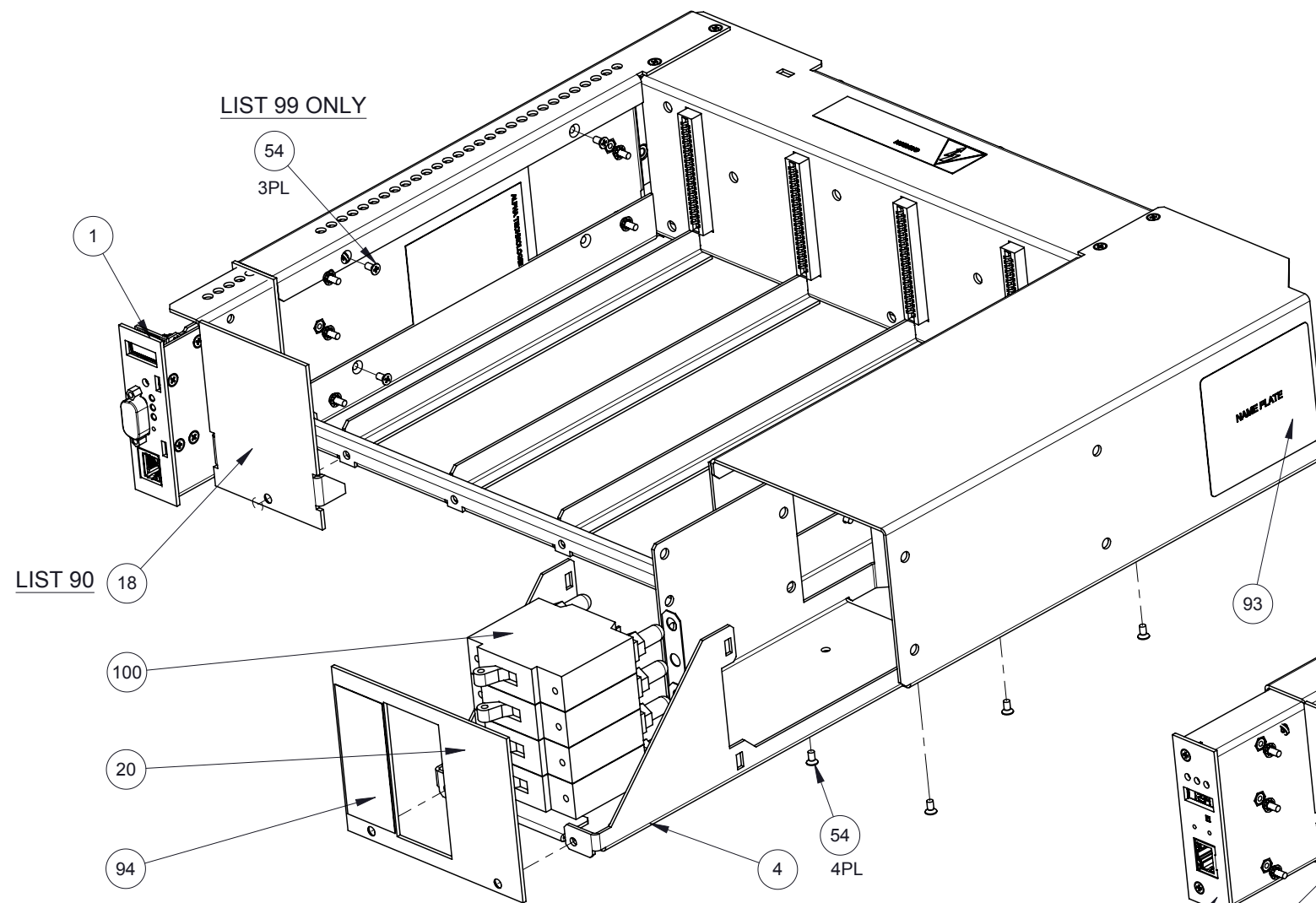


TITLE: ASSY,SELF,19"FLUSH,2RU, 4MDL,CXC,DISTRN,400W			
SIZE B	DWG NO. 030-763-04	REV G	
SCALE: NTS	SHEET	2 OF 5	

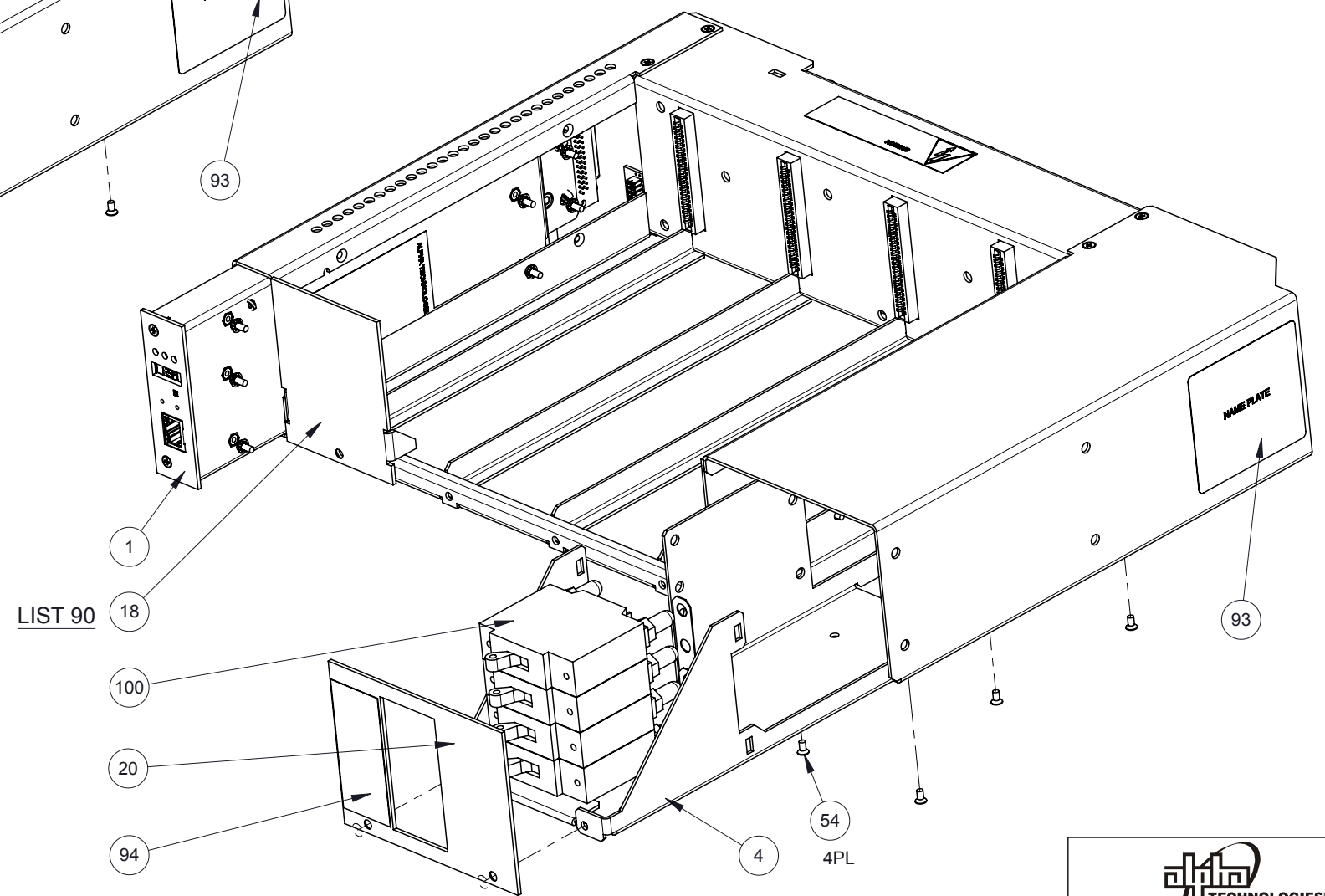


TITLE: ASSY,SELF,19"FLUSH,2RU,
4MDL,CXC,DISTRN,400W

SIZE B	DWG NO. 030-763-04	REV G
SCALE: NTS	SHEET 3 OF 5	



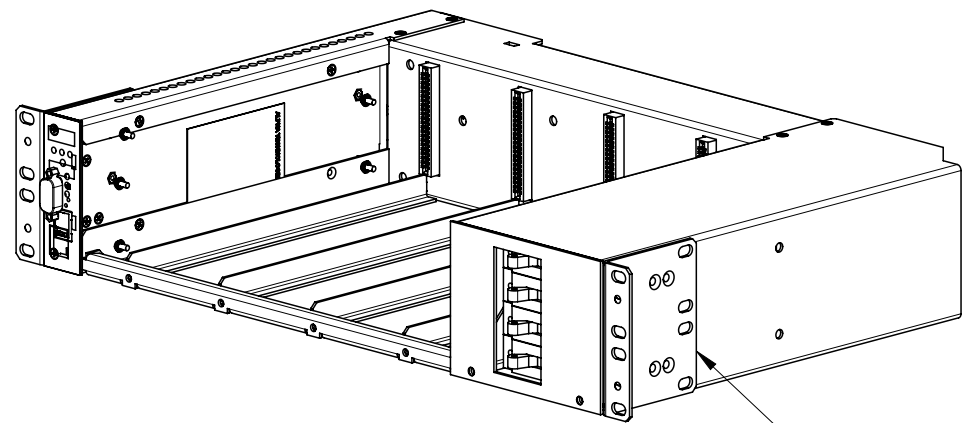
LIST 99



LIST 98

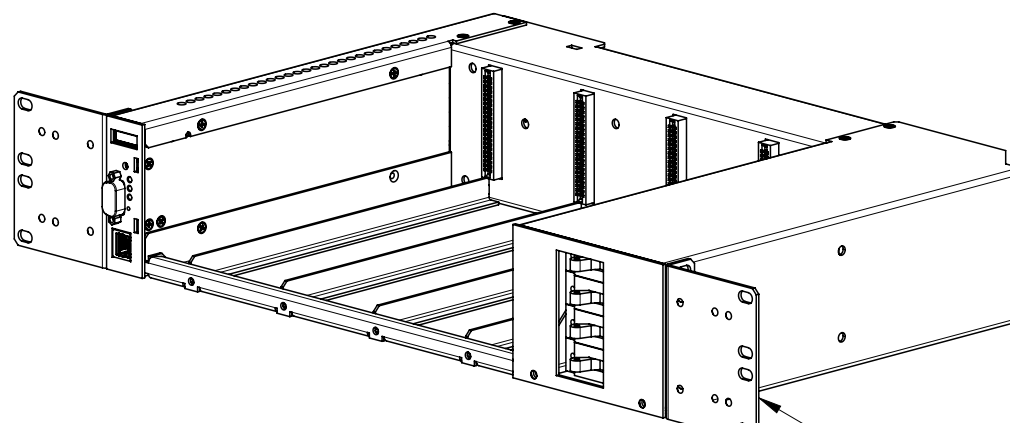


			
TITLE: ASSY,SELF,19"FLUSH,2RU,4MDL,CXC,DISTRN,400W			
SIZE B	DWG NO. 030-763-04	REV G	
SCALE: NTS	SHEET	4 OF 5	



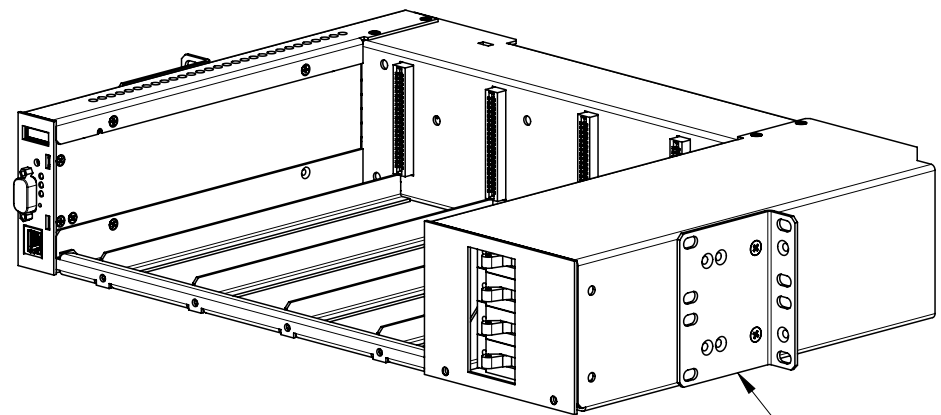
LIST 21 - FLUSH MOUNT FOR 19" RACK

2 PL
17 53
BOTH SIDES



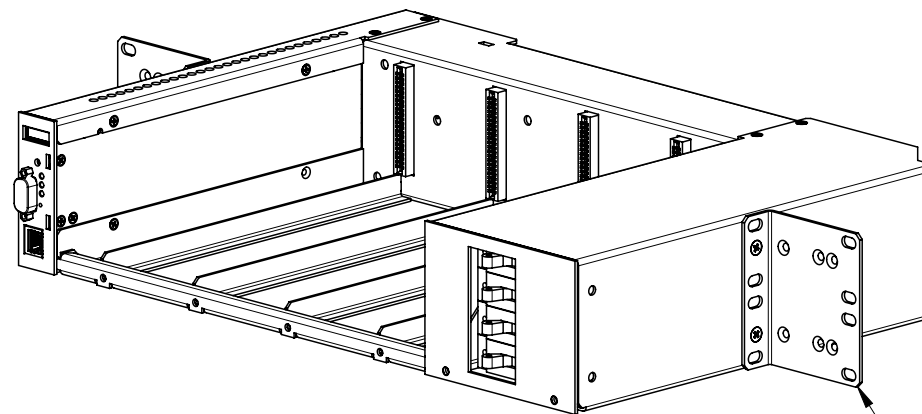
LIST 25 - FLUSH MOUNT FOR 23" RACK

2 PL
17 53
BOTH SIDES



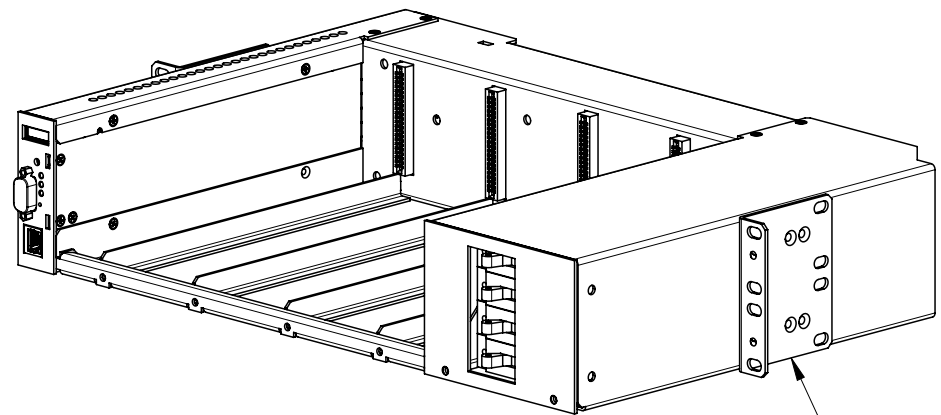
LIST 19 - 6" OFFSET FOR 19" RACK

2 PL
17 53
BOTH SIDES



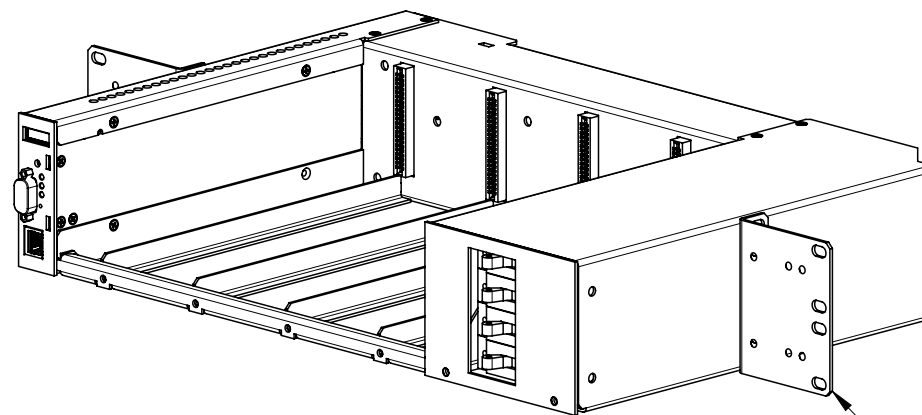
LIST 23 - 6" OFFSET FOR 23" RACK

2 PL
17 53
BOTH SIDES



LIST 22 - 5" OFFSET FOR 19" RACK

2 PL
17 53
BOTH SIDES



LIST 26 - 5" OFFSET FOR 23" RACK

2 PL
17 53
BOTH SIDES

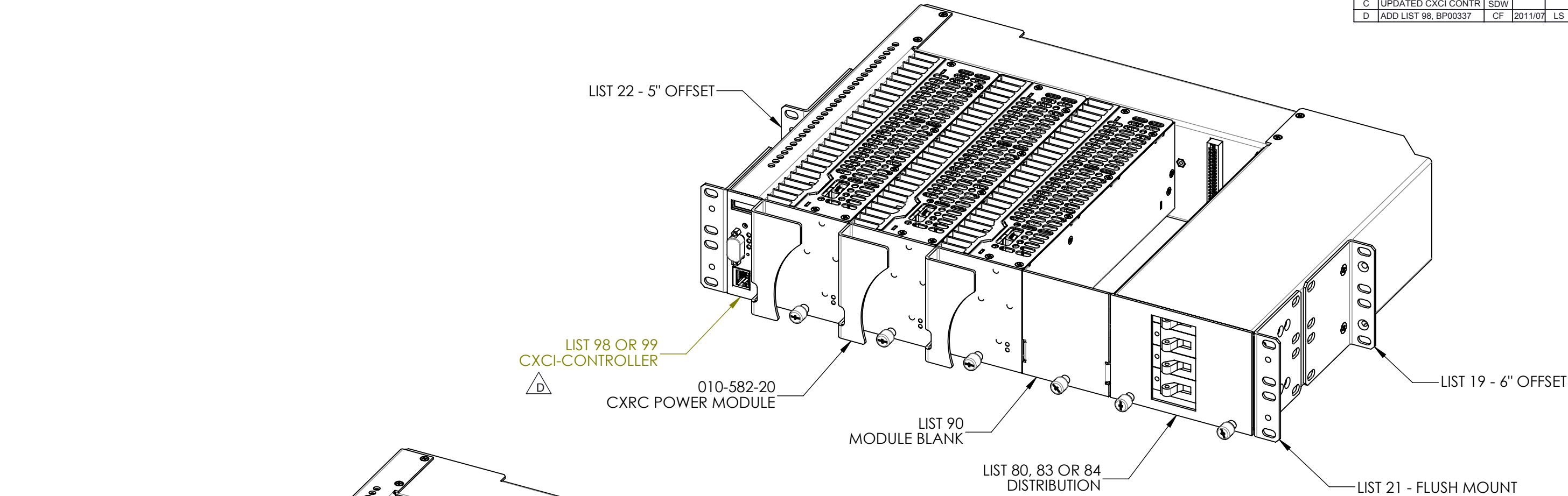


TITLE: ASSY,SELF,19"FLUSH,2RU,
4MDL,CXC,DISTRN,400W

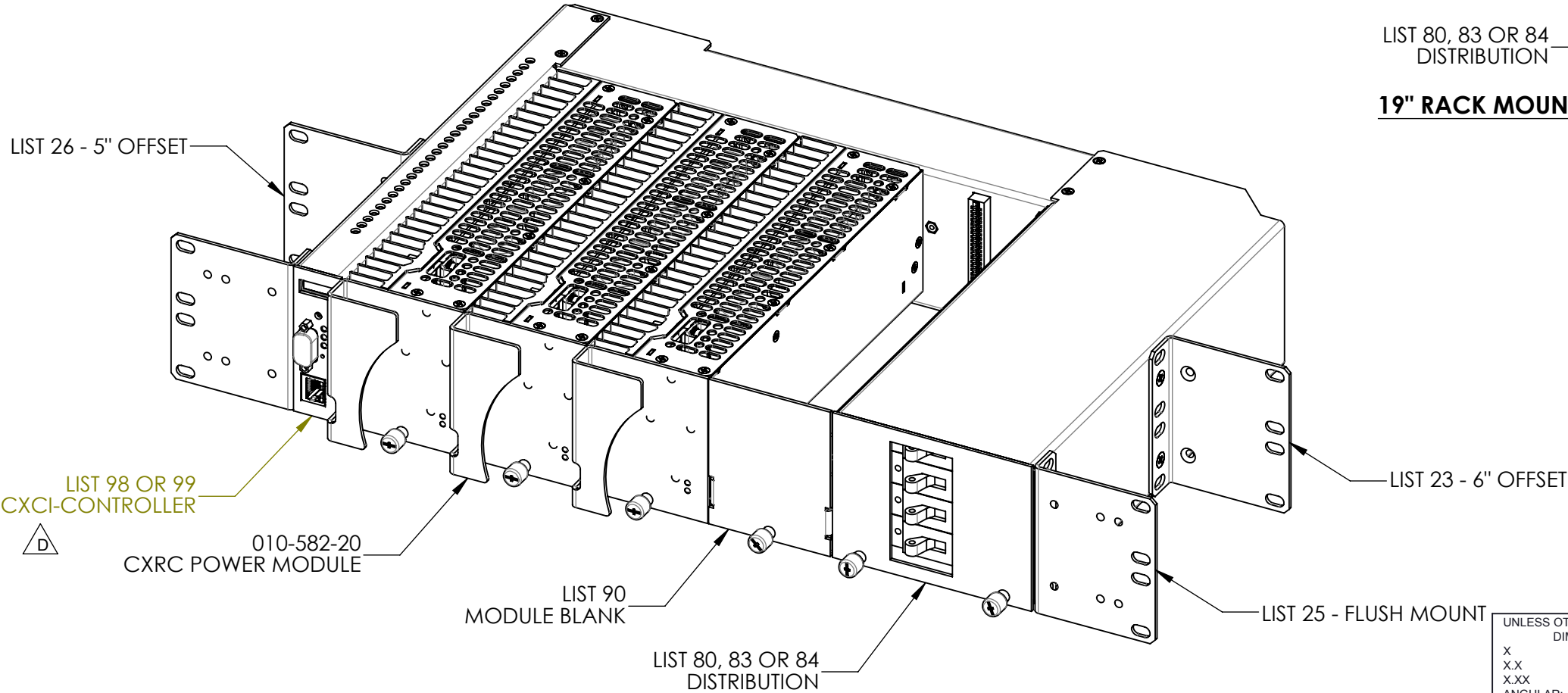
SIZE DWG NO. REV
B 030-763-04 G

SCALE: NTS SHEET 5 OF 5

REVISIONS						
LTR	DESCRIPTION	DWN	DATE	CHKD	APPD	
B	UPDATED TO REV C ASSY	RP	2006/02		GS	
C	UPDATED CXCI CONTR	SDW				
D	ADD LIST 98, BP00337	CF	2011/07	LS		

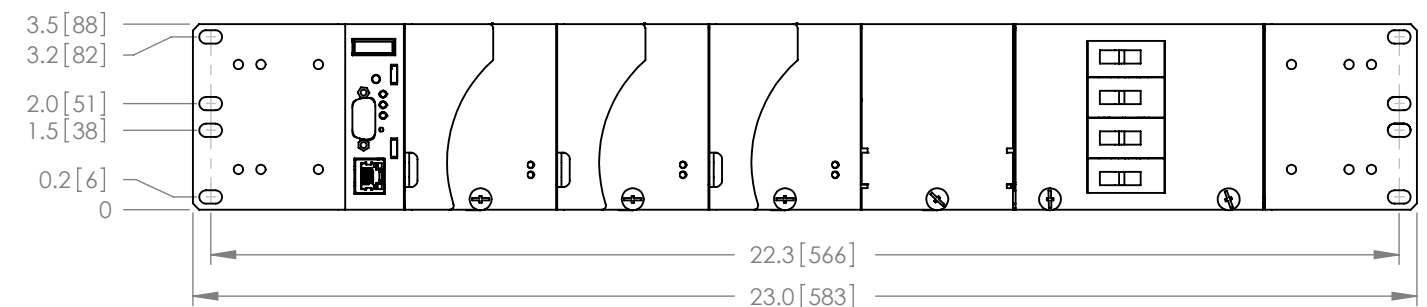
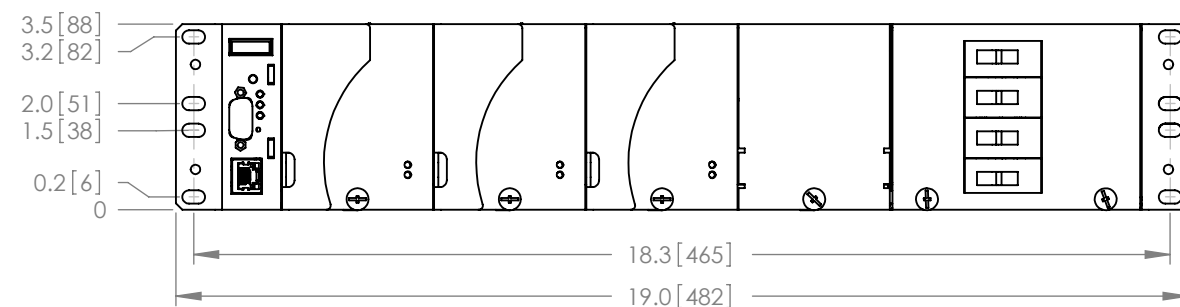
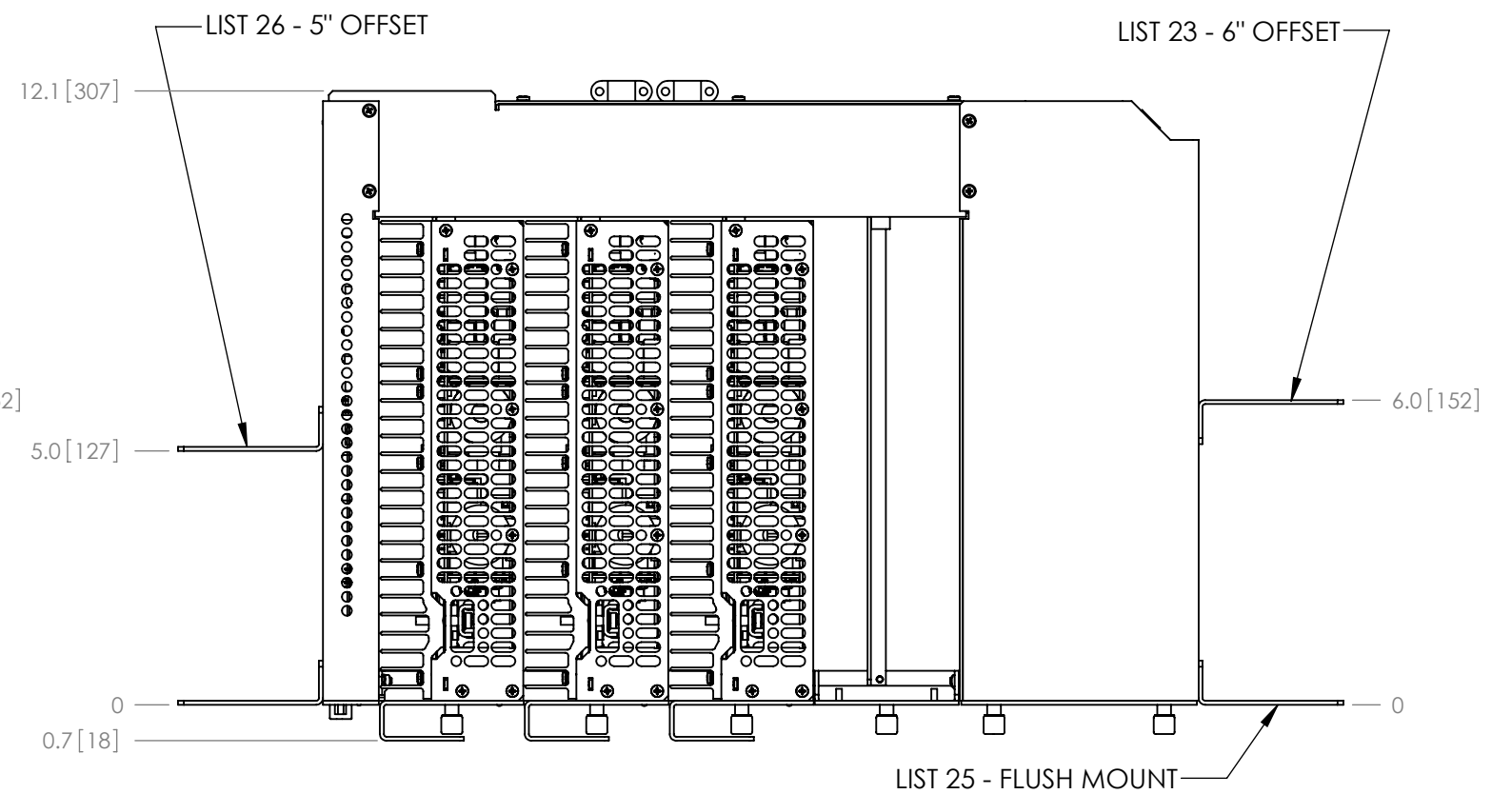
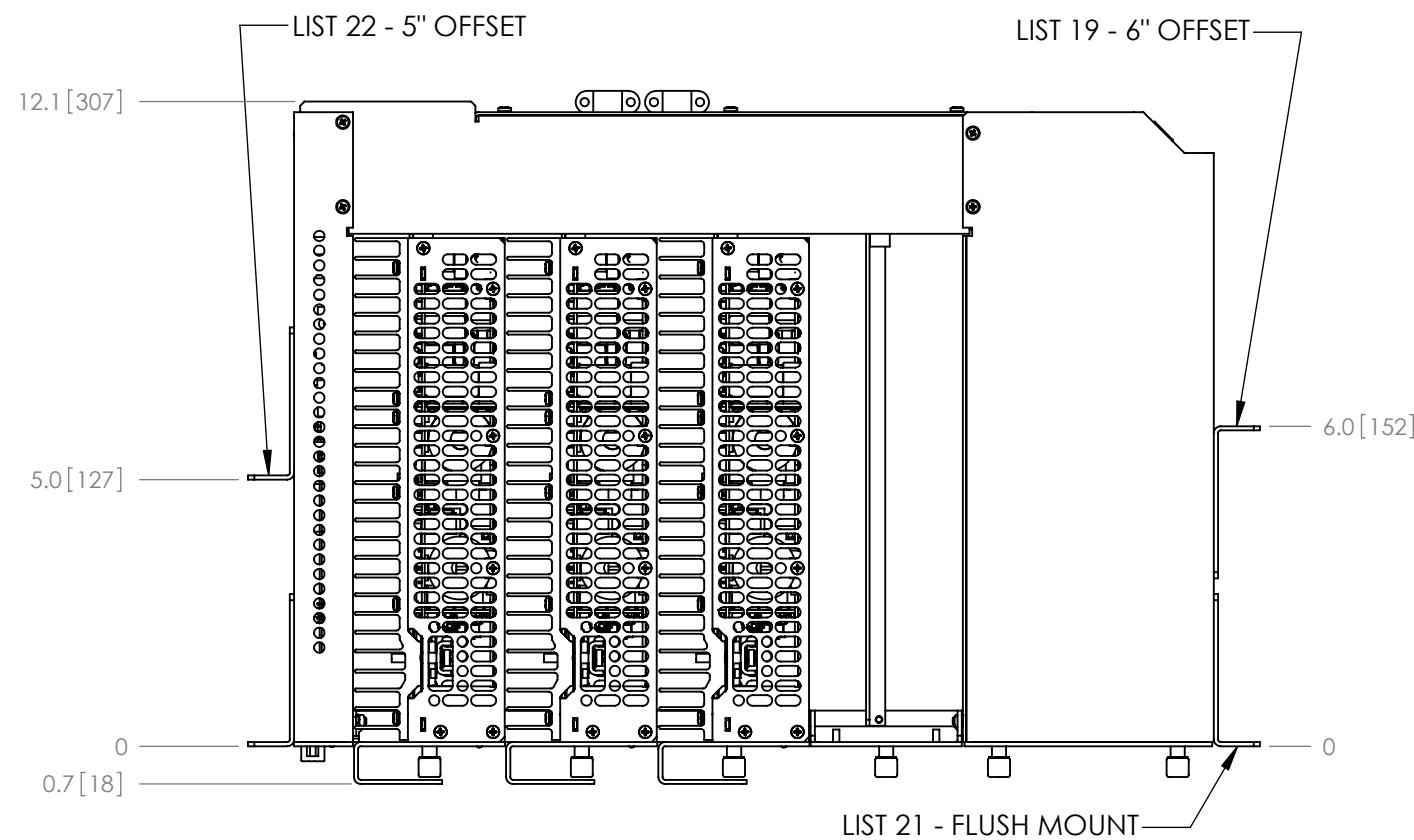


19" RACK MOUNT OPTIONS



23" RACK MOUNT OPTIONS

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X	1	APPROVALS				DATE	
X.X	0.5	DRAWN	EOF	2005/05	TITLE: OUTLINE, SELF, 19" FLUSH, 2RU, 4MDL, CXC, DISTRN, 400W		
X.XX	0.25	CHECKED		RP		2005/05	
ANGULAR:	±1°						
INTERPRET DIM AND TOL PER ASME Y14.5M-1994							
THIRD ANGLE PROJECTION					SIZE B	DWG NO. 030-763-06	REV D
		© ALPHA TECHNOLOGIES LTD			SCALE: NTS		SHEET 1 OF 2

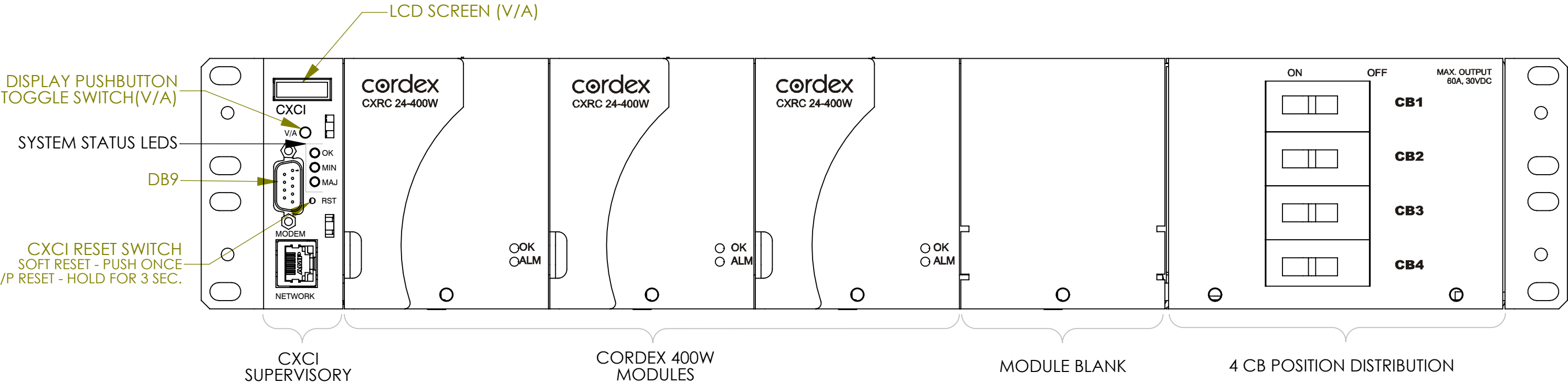


19" RACK OPTION

23" RACK OPTION

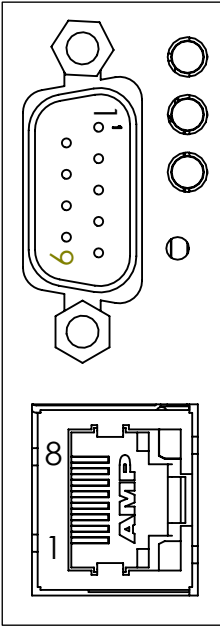
REVISIONS					
LTR	DESCRIPTION	DWN	DATE	CHKD	APPD
B	UPDATED TO REV C ASSY	RP	2006/02		GS
C	CORRECTED CUST INT PCB LABELING	RP	2006/03		GS
D	CORRECTED DETAIL ON SHEET4	JU	2006/06		GS
E	CORRECTED RJ45 DETAIL	SDW	2006/08		GS
F	UPDATED CXCI SUPERVISORY	SDW	2006/09		JK
G	CHANGED AC IP FROM L2 TO L2/N	MP	2007/04		GS
H	CORRECTED JP2 PINOUT (SHT.4)	JK	2007/10		GS
J	UPDATED NOTES	SDW	2008/01		JK
K	ADD LIST 98 (SHT.2), BP00337	CF	2011/07	LS	

LIST 99 ONLY



DB9
FOR ARGUS DC
MODEM USE ONLY

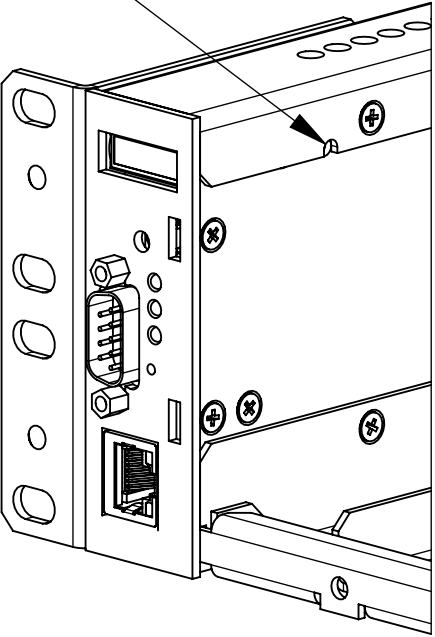
1. DCD
2. RX
3. TX
4. DTR
5. COM
6. DSR
7. RTS
8. CTS
9. RI

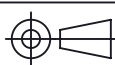


ETHERNET RJ45

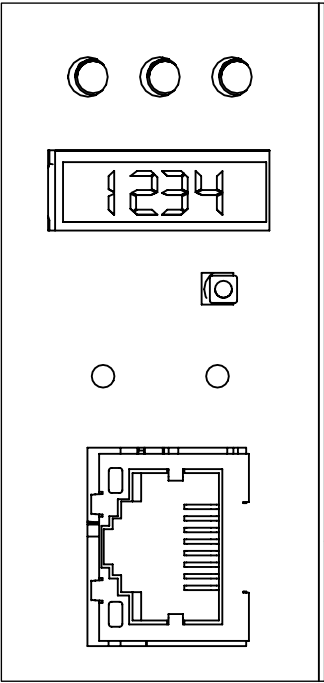
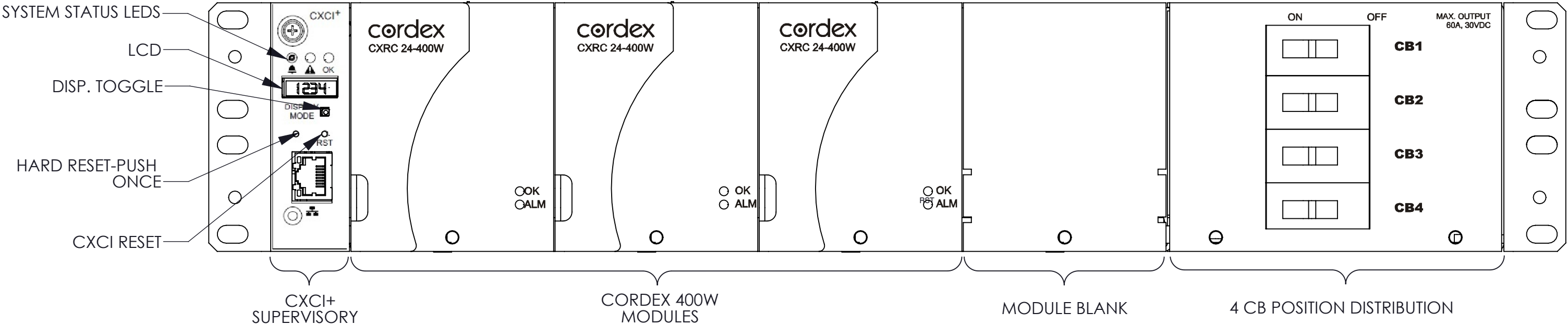
1. TX+
2. TX-
3. RX+
4. NOT CONNECTED
5. NOT CONNECTED
6. RX-
7. NOT CONNECTED
8. NOT CONNECTED

HARD RESET-PUSH ONCE



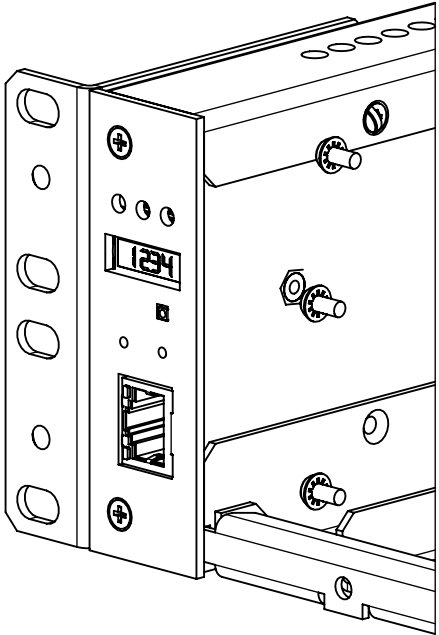
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X	1	APPROVALS			
X.X	0.5	DATE			
X.XX	0.25	DRAWN		TITLE: CUSTOMER CONNECTION, 2RU,4MDL,CXC,DISTRN,400W	
ANGULAR:	±1°	CHECKED		2RU,4MDL,CXC,DISTRN,400W	
INTERPRET DIM AND TOL PER ASME Y14.5M-1994		RP		2RU,4MDL,CXC,DISTRN,400W	
THIRD ANGLE PROJECTION				2RU,4MDL,CXC,DISTRN,400W	
		© ALPHA TECHNOLOGIES LTD		2RU,4MDL,CXC,DISTRN,400W	
				2RU,4MDL,CXC,DISTRN,400W	

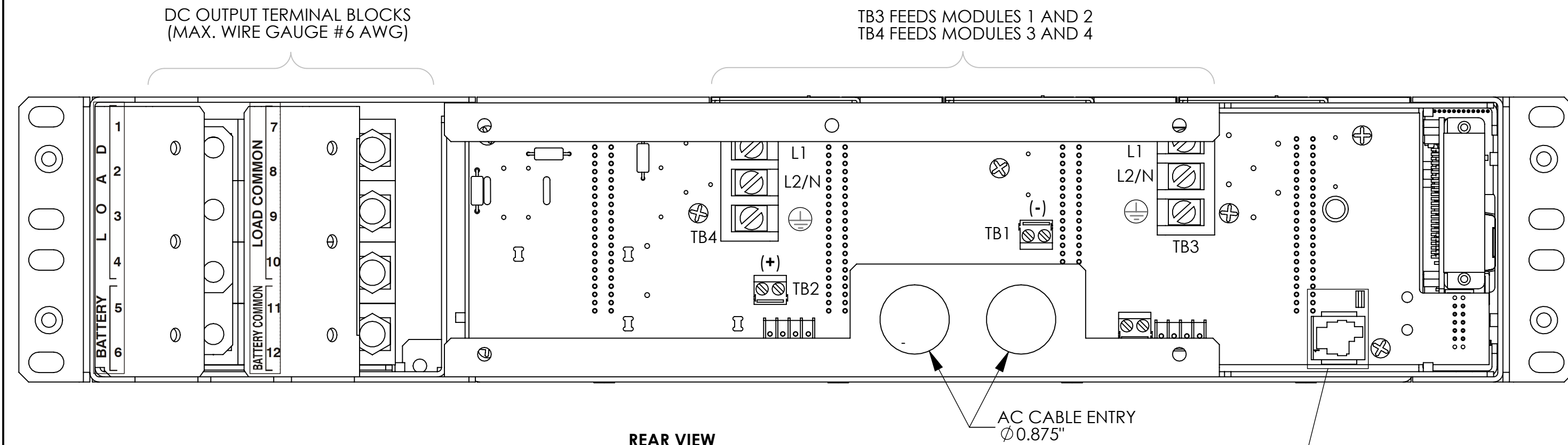
LIST 98 ONLY



ETHERNET RJ45

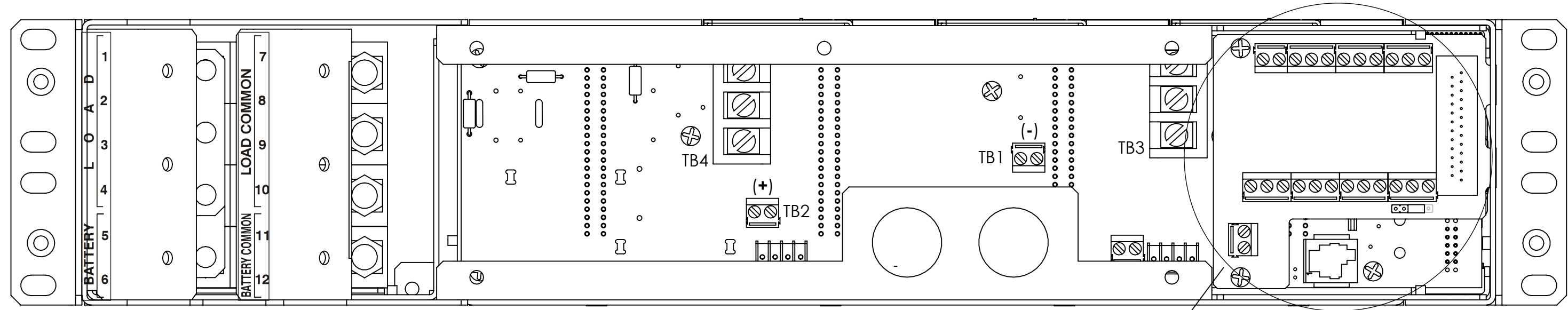
1. TX+
2. TX-
3. RX+
4. NOT CONNECTED
5. NOT CONNECTED
6. RX-
7. NOT CONNECTED
8. NOT CONNECTED



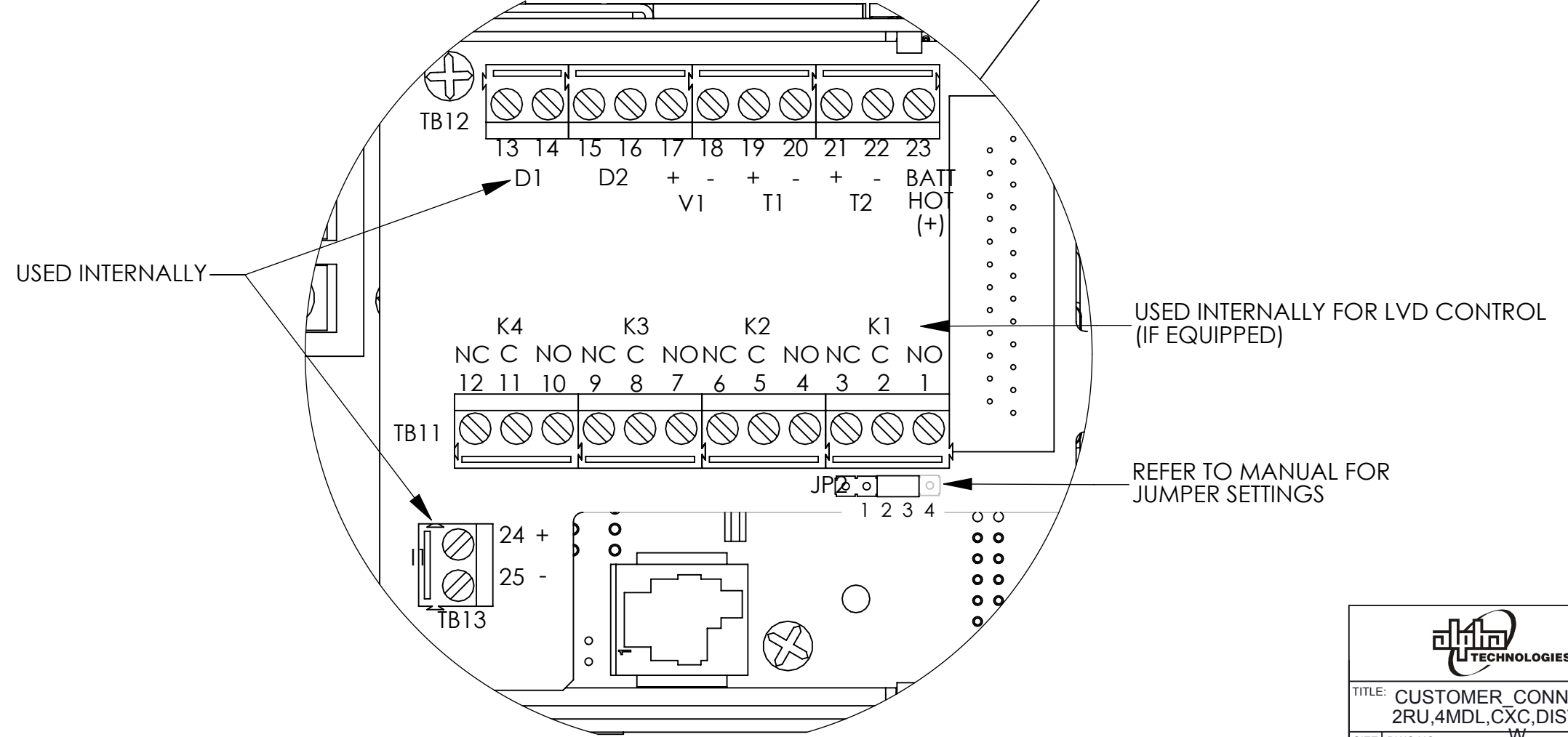


TITLE: CUSTOMER CONNECTION 2RU,4MDL,CXC,DISTRN,400W			
SIZE B	DWG NO. 030-763-08	REV K	
SCALE: NTS	SHEET	3 OF 4	

REAR VIEW
 (BACK COVER REMOVED)
 (CUSTOMER CONNECTION BOARD SHOWN)



CUSTOMER CONNECTION BOARD DETAIL



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Power