



grass valley

A **BELDEN** BRAND

LUMO

HIGH DENSITY FIBER CONVERTERS

User Manual

M974-9900-104

2016-02-18

www.grassvalley.com

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Title: LUMO User Manual

Part Number: M974-9900-104

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Important Safeguards and Notices

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions appear throughout the manual where they apply. Please read and follow this important information, especially those instructions related to the risk of electric shock or injury to persons.

Symbols and Their Meanings



Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



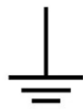
Indicates that the user, operator or service technician should refer to the product manuals for important operating, maintenance, or service instructions.



This is a prompt to note the fuse rating when replacing fuses. The fuse referenced in the text must be replaced with one having the ratings indicated.



Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.



Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.



Indicates that static sensitive components are present, which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.



Indicates that the equipment has more than one power supply cord, and that all power supply cords must be disconnected before servicing to avoid electric shock.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Canadian Standard Association (CSA) regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Underwriters Laboratory (UL) regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley equipment means that it has been tested and certified as complying with applicable Intertek Testing Services regulations and recommendations for USA/Canada.



The presence of this symbol in or on Grass Valley product means that it complies with all applicable European Union (CE) directives.



The presence of this symbol in or on Grass Valley product means that it complies with safety of laser product applicable standards.

Warnings



A warning indicates a possible hazard to personnel, which may cause injury or death. Observe the following general warnings when using or working on this equipment:

- Appropriately listed/certified mains supply power cords must be used for the connection of the equipment to the mains voltage at either 120 V AC or 240 V AC.
- This product relies on the building's installation for short-circuit (over-current) protection. Ensure that a fuse or circuit breaker for 120 V AC or 240 V AC is used on the phase conductors.
- Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only.
- Do not operate the equipment in wet or damp conditions.
- This equipment is grounded through the grounding conductor of the power cords. To avoid electrical shock, plug the power cords into a properly wired receptacle before connecting the equipment inputs or outputs.
- Route power cords and other cables so they are not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.
- High leakage current may be present. Earth connection of product is essential before connecting power.
- Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.
- To avoid fire hazard, use only the fuse type and rating specified in the service instructions for this product, or on the equipment.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Use proper lift points. Do not use door latches to lift or move equipment.
- Avoid mechanical hazards. Allow all rotating devices to come to a stop before servicing.
- Have qualified service personnel perform safety checks after any service.

Cautions



A caution indicates a possible hazard to equipment that could result in equipment damage. Observe the following cautions when operating or working on this equipment:

- This equipment is meant to be installed in a restricted access location.

- When installing this equipment, do not attach the power cord to building surfaces.
- Products that have no on/off switch, and use an external power supply must be installed in proximity to a main power outlet that is easily accessible.
- Use the correct voltage setting. If this product lacks auto-ranging power supplies, before applying power ensure that each power supply is set to match the power source.
- Provide proper ventilation. To prevent product overheating, provide equipment ventilation in accordance with the installation instructions.
- Do not operate with suspected equipment failure. If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.
- To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel. Servicing should be done in a static-free environment.
- This unit may have more than one power supply cord. Disconnect all power supply cords before servicing to avoid electric shock.
- Follow static precautions at all times when handling this equipment.

Electrostatic Discharge (ESD) Protection



Electrostatic discharge occurs when electronic components are improperly handled and can result in intermittent failure or complete damage adversely affecting an electrical circuit. When you remove and replace any card from a frame always follow ESD-prevention procedures:

- Ensure that the frame is electrically connected to earth ground through the power cord or any other means if available.
- Wear an ESD wrist strap ensuring that it makes good skin contact. Connect the grounding clip to an *unpainted surface* of the chassis frame to safely ground unwanted ESD voltages. If no wrist strap is available, ground yourself by touching the *unpainted* metal part of the chassis.
- For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms.
- When temporarily storing a card make sure it is placed in an ESD bag.
- Cards in an earth grounded metal frame or casing do not require any special ESD protection.

Battery Handling



This product includes a backup battery. There is a danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Before disposing of your Grass Valley equipment, please review the *Disposal and Recycling Information* appendix.

Mesures de sécurité et avis importants

La présente section fournit des consignes de sécurité importantes pour les opérateurs et le personnel de service. Des avertissements ou mises en garde spécifiques figurent dans le manuel, dans les sections où ils s'appliquent. Prenez le temps de bien lire les consignes et assurez-vous de les respecter, en particulier celles qui sont destinées à prévenir les décharges électriques ou les blessures.

Signification des symboles utilisés



Signale la présence d'une tension élevée et dangereuse dans le boîtier de l'équipement ; cette tension peut être suffisante pour constituer un risque de décharge électrique.



Avertit l'utilisateur, l'opérateur ou le technicien de maintenance que des instructions importantes relatives à l'utilisation et à l'entretien se trouvent dans la documentation accompagnant l'équipement.



Invite l'utilisateur, l'opérateur ou le technicien de maintenance à prendre note du calibre du fusible lors du remplacement de ce dernier. Le fusible auquel il est fait référence dans le texte doit être remplacé par un fusible du même calibre.



Identifie une borne de mise à la terre de protection. Il faut relier cette borne à la terre avant d'effectuer toute autre connexion à l'équipement.



Identifie une borne de mise à la terre externe qui peut être connectée en tant que borne de mise à la terre supplémentaire.



Signale la présence de composants sensibles à l'électricité statique et qui sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.



Le symbole ci-contre signifie que l'appareil comporte plus d'un cordon d'alimentation et qu'il faut débrancher tous les cordons d'alimentation avant toute opération d'entretien, afin de prévenir les chocs électriques.



La marque C-CSA-US certifie que l'appareil visé a été testé par l'Association canadienne de normalisation (CSA) et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



La marque C-UL-US certifie que l'appareil visé a été testé par Underwriters Laboratory (UL) et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



La marque ETL Listed d'Intertek pour le marché Nord-Américain certifie que l'appareil visé a été testé par Intertek et reconnu conforme aux exigences applicables en matière de sécurité électrique en vigueur au Canada et aux États-Unis.



Le marquage CE indique que l'appareil visé est conforme aux exigences essentielles des directives applicables de l'Union européenne en matière de sécurité électrique, de compatibilité électromagnétique et de conformité environnementale.



Le symbole ci-contre sur un appareil Grass Valley ou à l'intérieur de l'appareil indique qu'il est conforme aux normes applicables en matière de sécurité laser.

Avertissements



Les avertissements signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire fatales. Veuillez vous familiariser avec les avertissements d'ordre général ci-dessous :

- Un cordon d'alimentation dûment homologué doit être utilisé pour connecter l'appareil à une tension de secteur de 120 V CA ou 240 V CA.
- La protection de ce produit contre les courts-circuits (surintensités) dépend de l'installation électrique du bâtiment. Assurez-vous qu'un fusible ou un disjoncteur pour 120 V CA ou 240 V CA est utilisé sur les conducteurs de phase.
- Dans le présent manuel, toutes les instructions qui nécessitent d'ouvrir le couvercle de l'équipement sont destinées exclusivement au personnel technique qualifié.
- N'utilisez pas cet appareil dans un environnement humide.
- Cet équipement est mis à la terre par le conducteur de mise à la terre des cordons d'alimentation. Pour éviter les chocs électriques, branchez les cordons d'alimentation sur une prise correctement câblée avant de brancher les entrées et sorties de l'équipement.
- Acheminez les cordons d'alimentation et autres câbles de façon à ce qu'ils ne risquent pas d'être endommagés. Supportez correctement les enroulements de câbles afin de ne pas endommager les connecteurs.
- Coupez l'alimentation avant de nettoyer l'équipement. Ne pas utiliser de nettoyeurs liquides ou en aérosol. Utilisez uniquement un chiffon humide.
- Des tensions dangereuses peuvent exister en plusieurs points dans cet équipement. Pour éviter toute blessure, ne touchez pas aux connexions ou aux composants exposés lorsque l'appareil est sous tension.
- Avant de procéder à toute opération d'entretien ou de dépannage, enlevez tous vos bijoux (notamment vos bagues, votre montre et autres objets métalliques).
- Pour éviter tout risque d'incendie, utilisez uniquement les fusibles du type et du calibre indiqués sur l'équipement ou dans la documentation qui l'accompagne.
- Ne pas utiliser cet appareil dans une atmosphère explosive.
- Présence possible de courants de fuite. Un raccordement à la masse est indispensable avant la mise sous tension.

- Après tout travail d'entretien ou de réparation, faites effectuer des contrôles de sécurité par le personnel technique qualifié.

Mises en garde



Les mises en garde signalent des conditions ou des pratiques susceptibles d'endommager l'équipement. Veuillez vous familiariser avec les mises en garde ci-dessous :

- L'appareil est conçu pour être installé dans un endroit à accès restreint.
- Au moment d'installer l'équipement, ne fixez pas les cordons d'alimentation aux surfaces intérieures de l'édifice.
- Les produits qui n'ont pas d'interrupteur marche-arrêt et qui disposent d'une source d'alimentation externe doivent être installés à proximité d'une prise de courant facile d'accès.
- Si l'équipement n'est pas pourvu d'un module d'alimentation auto-adaptable, vérifiez la configuration de chacun des modules d'alimentation avant de les mettre sous tension.
- Assurez une ventilation adéquate. Pour éviter toute surchauffe du produit, assurez une ventilation de l'équipement conformément aux instructions d'installation.
- N'utilisez pas l'équipement si vous suspectez un dysfonctionnement du produit. Faites-le inspecter par un technicien qualifié.
- Pour réduire le risque de choc électrique, n'effectuez pas de réparations autres que celles qui sont décrites dans le présent manuel, sauf si vous êtes qualifié pour le faire. Confiez les réparations à un technicien qualifié. La maintenance doit se réaliser dans un milieu libre d'électricité statique.
- L'appareil peut comporter plus d'un cordon d'alimentation. Afin de prévenir les chocs électriques, débranchez tous les cordons d'alimentation avant toute opération d'entretien.
- Veillez à toujours prendre les mesures de protection antistatique appropriées quand vous manipulez l'équipement.

Protection contre les décharges électrostatiques (DES)



Une décharge électrostatique peut se produire lorsque des composants électroniques ne sont pas manipulés de manière adéquate, ce qui peut entraîner des défaillances intermittentes ou endommager irrémédiablement un circuit électrique. Au moment de remplacer une carte dans un châssis, prenez toujours les mesures de protection antistatique appropriées :

- Assurez-vous que le châssis est relié électriquement à la terre par le cordon d'alimentation ou tout autre moyen disponible.
- Portez un bracelet antistatique et assurez-vous qu'il est bien en contact avec la peau. Connectez la pince de masse à une *surface non peinte* du châssis pour détourner à la terre toute tension électrostatique indésirable. En l'absence de bracelet antistatique, déchargez l'électricité statique de votre corps en touchant une surface métallique *non peinte* du châssis.

- Pour plus de sécurité, vérifiez périodiquement la valeur de résistance du bracelet antistatique. Elle doit se situer entre 1 et 10 mégohms.
- Si vous devez mettre une carte de côté, assurez-vous de la ranger dans un sac protecteur antistatique.
- Les cartes qui sont reliées à un châssis ou boîtier métallique mis à la terre ne nécessitent pas de protection antistatique spéciale.

Remplacement et élimination des piles



L'appareil renferme une pile. Pour réduire le risque d'explosion, vérifiez la polarité et ne remplacez la pile que par une pile du même type, recommandée par le fabricant. Mettez les piles usagées au rebut conformément aux directives du fabricant. Avant de vous défaire de l'équipement, assurez-vous d'avoir lu l'appendice *Disposal and Recycling Information*.

Recycling

Visit www.grassvalley.com for recycling information.

Certification and Compliance

Safety Compliance



c us

This equipment complies with the requirements of CSA/UL/IEC/EN 60950-1, 2nd Ed. + AM1, Safety of information technology equipment.

The power cord supplied with this equipment meets the appropriate national standards for the country of destination.

Safety of Laser Modules



This equipment incorporates modules containing Class 1 lasers. These modules are certified by the manufacturer to comply with:

- IEC/EN 60825-1 Safety of laser products
- IEC 60950-1 Safety of information technology equipment

Electromagnetic Compatibility



This equipment has been tested for verification of compliance with FCC Part 15, Subpart B requirements for class A digital devices.

Note: This equipment 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 environment. 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.



This equipment has been tested and found to comply with the requirements of the EMC directive 2004/108/EC:

- EN 55022 Class A Radiated and conducted emissions
- EN 61000-3-2 Limits for harmonic current emissions
- EN 61000-3-3 Limitation of voltage fluctuations and flicker
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity
- EN 61000-4-4 Electrical fast transient immunity
- EN 61000-4-5 Surge transient immunity
- EN 61000-4-6 Conducted disturbances immunity
- EN 61000-4-8 Power frequency magnetic field immunity
- EN 61000-4-11 Voltage dips, short interruptions and voltage variations immunity

Environmental Compliance

Restriction on Hazardous Substances (RoHS)

FIO-911-4R-LC	有毒有害物质或元素 (Toxic or hazardous Substances and Elements)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6)	多溴联苯 (PBB)	多溴二苯 (PBDE)
部件名称 Part name						
电路模块 Circuit Modules	X	O	O	O	O	O
FIO-911-4T-S13, LC, FIO-911-4TH-CwwCxxCyyCzz-LC	有毒有害物质或元素 (Toxic or hazardous Substances and Elements)					
部件名称 Part name						
电路模块 Circuit Modules	X	O	O	O	O	O
金属零件 Metal Parts	X	O	O	O	O	O
LUMO-BNC, LUMO-CPU-ETH, LUMO-DIN	有毒有害物质或元素 (Toxic or hazardous Substances and Elements)					
部件名称 Part name						
电缆及电缆组件 Cables and Cable Assemblies	O	O	O	O	O	O
电路模块 Circuit Modules	X	O	O	O	O	O
组装风扇 Fan Assemblies	O	O	O	O	O	O
金属零件 Metal Parts	X	O	O	O	O	O
LUMO-PSU-AC	有毒有害物质或元素 (Toxic or hazardous Substances and Elements)					
部件名称 Part name						
电缆及电缆组件 Cables and Cable Assemblies	O	O	O	O	O	O
电路模块 Circuit Modules	X	O	O	O	O	O
金属零件 Metal Parts	X	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006 规定的限量要求以下。
O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T 11363-2006.

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 规定的限量要求。
X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement in SJ/T 11363-2006.

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此声明所依据之数据由 Grass Valley 环境管理部门向我们的部件供应商获取。Grass Valley 公司相信此信息的正确性, 但由于数据来源于公司外部, 我们无法保证它的完整和准确。所有这些特性可能在未获通知的情况下更改。
Technical explanations:
This statement is based on the information provided by our component suppliers and collected through Grass Valley's environmental management system. Grass Valley believes this environmental information to be correct but cannot guarantee its completeness or accuracy as it is based on data received from sources outside our company. All specifications are subject to change without notice.

Registration, Evaluation, Authorization of Chemicals (REACH)

The table below indicates which substance(s) of very high concern (SVHC) may be present above the threshold level of 0.1% by weight of the listed articles.

Products	Substance of Very High Concern	CAS Number	Articles (part name)
LUMO-BNC and LUMO-DIN	1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazinane-2,4,6-trione (TGIC)	2451-62-9	Metal frame parts

Technical explanations:
This statement is based on information provided by our component suppliers and collected through Grass Valley's environmental management system. Grass Valley believes this environmental information to be correct but cannot guarantee its completeness or accuracy as it is based on data received from sources outside our company. All specifications are subject to change without notice.

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1 Introduction

Chapter 1 is an introduction to the LUMO series of products.

Topics

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Introduction to LUMO

The LUMO is a high-density 1RU frame with 36 SFP-based fiber converters, ideal for large distribution of high bandwidth 3Gbps signals. LUMO's 1RU size minimizes rack space, and often-complex cabling concerns have been greatly reduced by including fiber connectivity on one side of the unit and coax electrical on the other.

Reliability and serviceability is further secured through the use of hot-swappable cards and a redundant PSU, as well as remote system health monitoring and alarming for all key components, including optical signal strength.

Key Features and Benefits

- High-density 1RU frame with 36 SFP-based fiber converters
- Supports 2 x 18 CWDM wavelengths
- Modular, hot-swappable SFPs and cards for efficient serviceability
- Mechanical design with fiber connectivity on one side and coax on the other for ease of cabling
- Redundant, hot swappable built-in power supplies
- Remote system health monitoring and alarming for all key components
- Fiber support for convenient and secure optical fiber installation

Available Options

- LUMO-CPU-ETH controller for ethernet access and control
- Second power supply for redundant power security

Cards (maximum 9 per frame)

The following cards are available to be used with the LUMO frame:

- FIO-911-4T-S13-LC Quad 3Gbps/HD/SD optical transmitter 1310 nm LC/PC connectors
- FIO-911-4R-LC Quad 3Gbps/HD/SD optical receiver LC/PC connectors
- FIO-911-4TH-CwwCxxCyyCzz-LC High power Quad 3Gbps/HD/SD optical CWDM Tx, LC/PC connector.

CwwCxx and CyyCzz show the wavelengths of the CWDM transmitters used in this card.

These cards can be used in any combination to occupy the nine available slots in the LUMO frame.

LUMO Housing Frame



Chapter 2 describes the LUMO housing frame and details of its installation.

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Overview

The 1-RU LUMO housing frame and its associated LUMO-series cards are designed to provide maximum configuration flexibility in a high density and low cost 1-RU chassis. The basic configuration includes one power supply unit and a chassis status card for basic system monitoring. Up to 9 FIO-911-series cards can be installed within a single frame. The LUMO frame offers full flexibility and integration of a variety of functions and signal types on BNC/DIN or fiber SFP. All components are hot-swappable and can be quickly configured. The frame is air-cooled, the PSUs and fan are monitored and status reporting is available. Each card has some multicolored LEDs for status reporting as well. Remote control and status monitoring via Ethernet is available as an option. The frame is available in two versions, identified by the rear connector type:

- LUMO-BNC
- LUMO-DIN



Features

- 1 RU with 19" rack mount
- Up to 9 cards (72 Watts)
- Ease of serviceability
- Hot-swappable PSU with optional 2nd redundant PSU
- Hot-swappable cards, SFPs, controller and fan
- Status and alarm over IP with optional LUMO Ethernet Controller
- Cards can operate without controller
- Small granularity
- Fiber on the front, coax on the rear
- Multiple video and audio formats can be fitted in a single chassis

Physical Layout

Front Panel Appearance



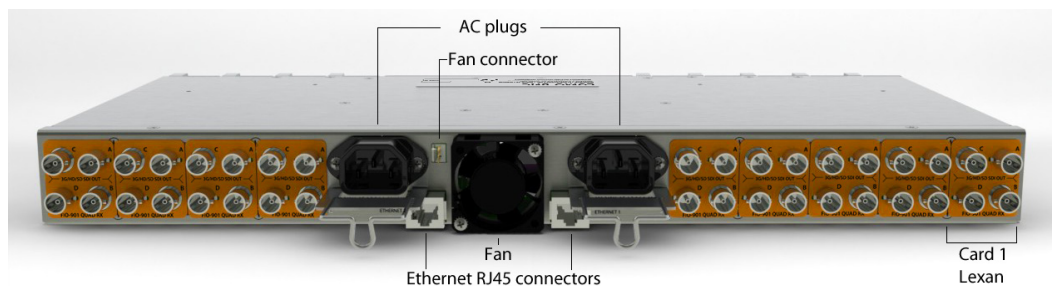
Each card (numbered 1 to 9 from left to right as seen from the front of the unit) has its own face plate which allows the status LEDs on the installed cards to be seen and also allows the card to be secured in the chassis by a screw. The opening near the center of the panel is for the status or controller card status LED.

The frame is provided with a fiber support that extends beyond the front of the frame to physically support the fiber cables and protect the fiber connectors from stress-related damage. Two versions are available:

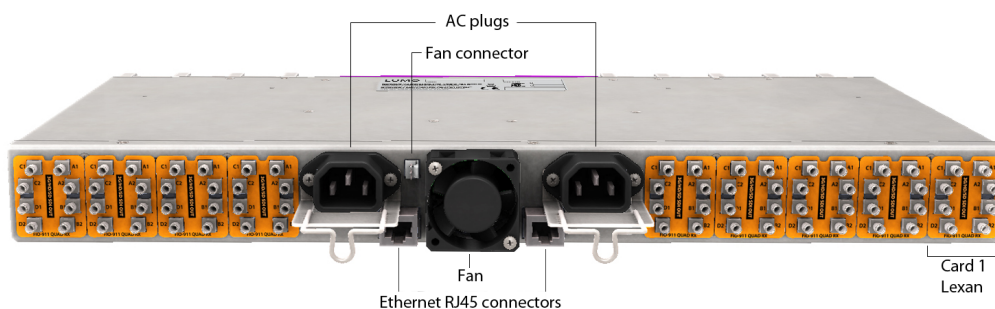
- Standard version, for single-fiber cables.
- MPO version, for multi-fiber cables connected with MPO connectors.

Rear Panel Appearance

The rear panel incorporates the electrical signal connectors, and so has a different appearance for the LUMO-BNC and the LUMO-DIN. The central portion of the panel is the same for both models.



LUMO-BNC Rear Panel



LUMO-DIN Rear Panel

The functionality of Ethernet connectors is described in the Controller card chapter.

The details of the rear panel card lexans vary depending on the card type, and are described in Chapter 5.

Installation

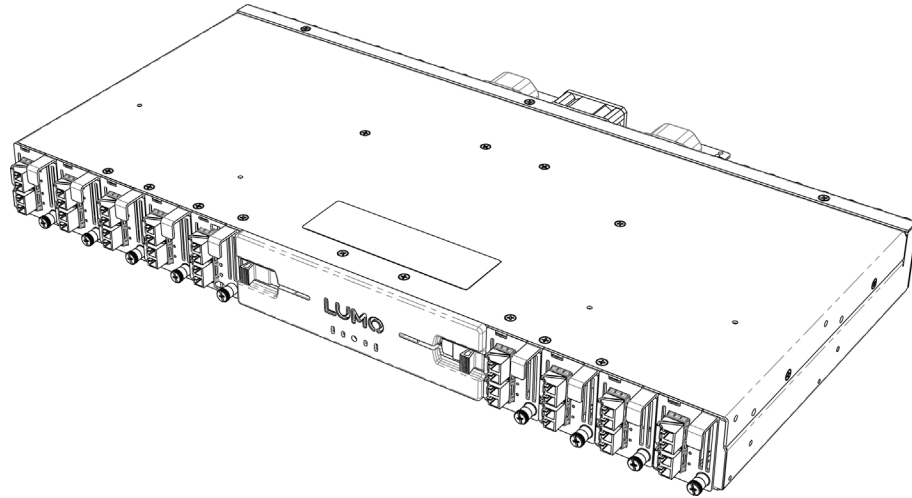
Unpacking

Make sure the following items have been shipped with your LUMO frame:

- LUMO-BNC or LUMO-DIN frame, including 1 Power Supply unit (AC in) and 1 Status card
 - If the optional LUMO CPU-ETH controller has been ordered, the Status card is not included
- Rack-mounting brackets (1 pair, with 8 mounting screws)
- An AC power cord
- Power cord retaining clips (2)
- LUMO-series cards (per order) with associated lexans
- Fiber Support with 8 mounting screws (standard or MPO version)
- LUMO controller card (optional)
- A second power supply and AC cord (optional)

Assembling the LUMO Frame

The LUMO frame is shipped with neither the frame mounting brackets nor the fiber support installed.



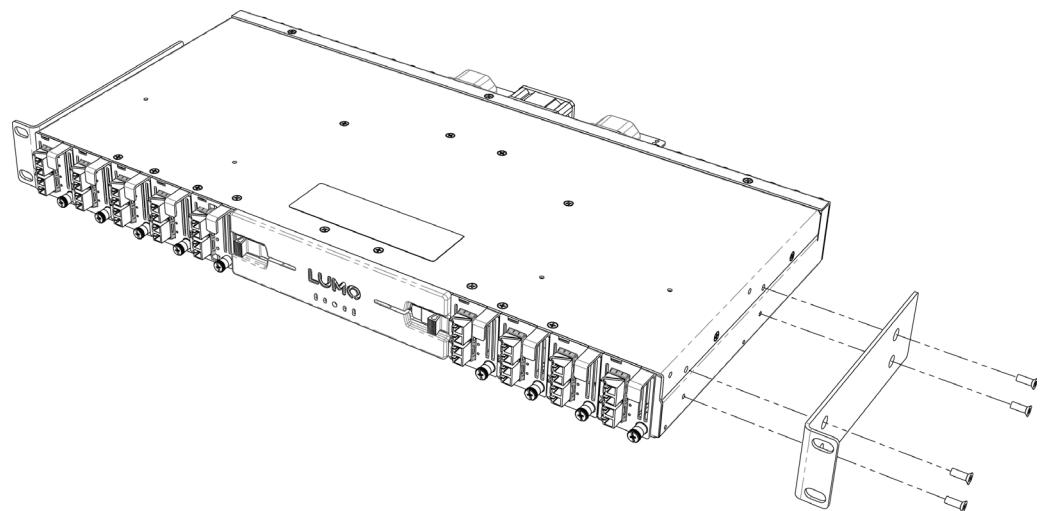
These instructions describe the installation of the rack mounting brackets and the fiber support onto the LUMO frame.

The rack mounting brackets may be installed alone (See section A), or in combination with the fiber support.

If the rack mounting brackets are installed with the fiber support, the fiber support must be installed first. See section B.

A Installing the rack mounting brackets alone

Position a bracket at each side of the LUMO frame, and install them using the four provided screws, as shown in the Figure.



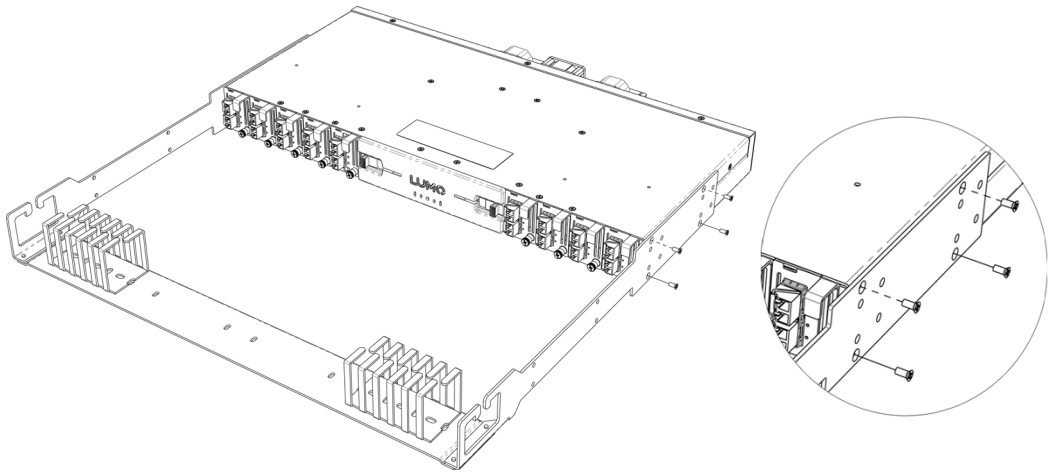
B Installing the Fiber Support

If you are installing this support onto a LUMO frame which has rack mounting brackets installed, you must remove those brackets first, and then re-install them after the fiber support has been installed, as described in Section C.

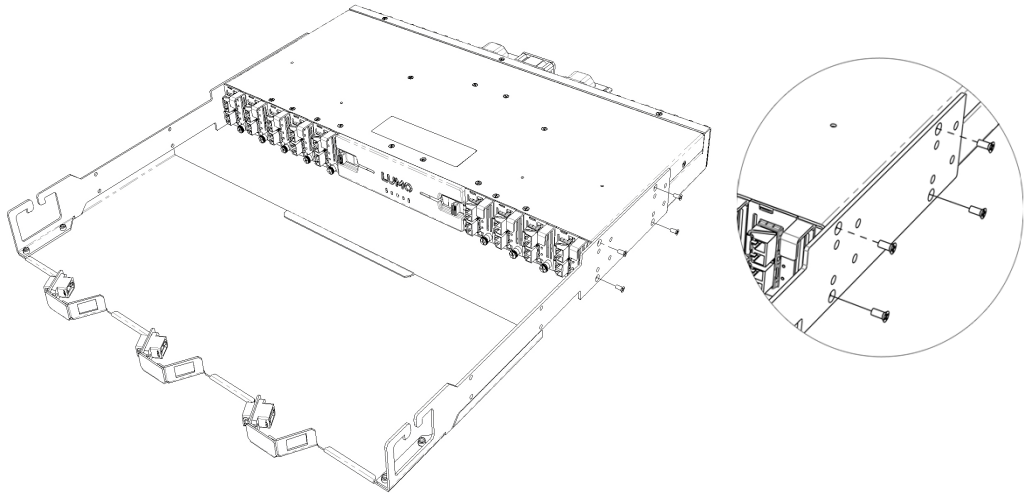
Position the fiber support against the LUMO frame as shown in the figure, and attach it to the frame with the eight provided screws.

Note that the fiber support configuration varies depending on the LUMO model.

For the standard LUMO-xxx model:

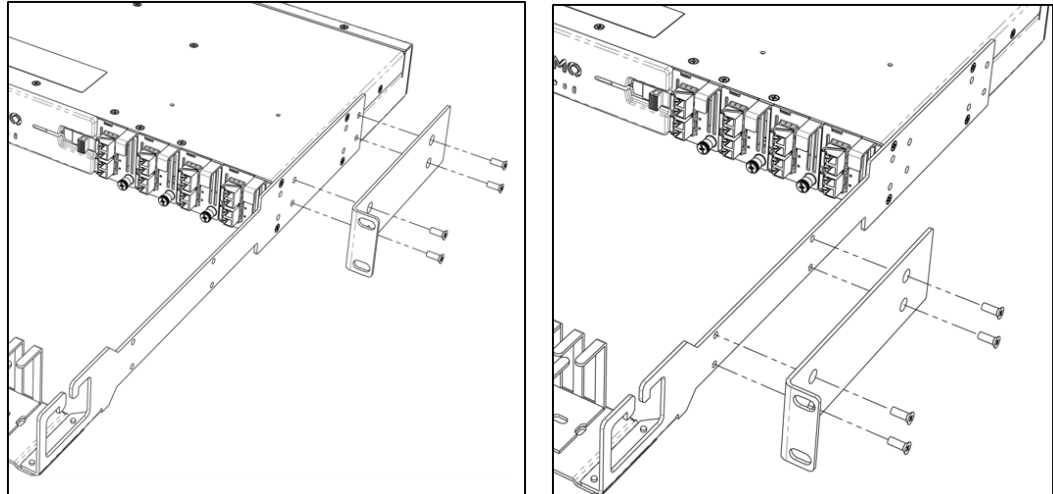


For the LUMO-xxx-MPO model:



C Installing the Rack Mounting Brackets with the Fiber Support

After the fiber support is installed, you may install the rack mounting brackets in either of two positions, using four provided screws for each bracket. The figure illustrates the two possible mounting positions.

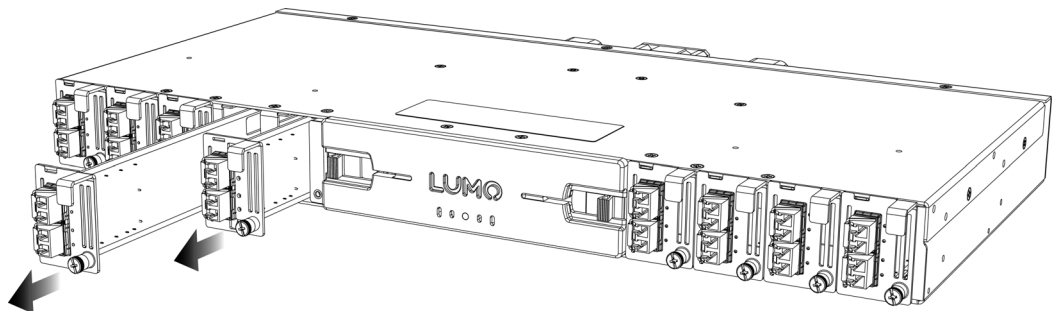


Once installation of the rack mount brackets is complete, the LUMO frame should be installed directly into a standard 19" rack using 4 standard rack-mounting screws through the four holes in the corners of the rack mount brackets.

Installing Cards in the LUMO Frame

Each card includes an integrated front panel incorporating the fiber optic connectors.

All cards can be installed with the frame power on. The card has a connector which plugs into a backplane for distribution of power, connection to the controller card, and connections to the input and output connectors.



To install the card:

- 1 To remove an existing card from the slot, unscrew the existing card front panel and gently pull the handle on the front of the card to pull the card straight out of the slot. To add a card

in an empty position, first remove the blank card front by unscrewing it and pulling the handle straight out of the slot.

- 2 Slide the new card into the slot and push gently on the handle to seat the connectors. Secure the card in place with the provided front panel captive screw.

Slip the lexan that was shipped with the card over the connectors (four BNC or eight DIN) on the rear panel that are associated with the slot into which the card was installed. The lexan identifies the function of the connectors for that card.

Note: Detailed information about the rear panel connections is included in the chapters describing each card type.

Installing the Power Cord Retaining Clips

Each power supply is provided with a power cord retaining clip that holds the power cord in place to prevent inadvertent disconnections.

With the power cord removed, install the clip into the plate that extends out beneath the power cord socket on the rear of the frame, by slipping the two ends of the clip into a pair of holes in the plate, and rotating the clip down into a horizontal position. Several pairs of holes are provided to accommodate different sizes of plugs. Use the holes that position the clip closest to the body of the plug.

Once the clip is in place, insert the power cord into the socket, and press the cord into the gripping loop of the clip.

Ventilation

Ventilation for the frame is provided by a fan mounted in the center of the rear panel. The fan draws air through the frame and exhausts it to the rear. Ventilation slots are provided in the chassis and cards front panels to allow air to flow into the frame.

Important Note: to ensure proper cooling, the front panel of the LUMO frame must be closed at all times when cards are installed and operating. As well, blank card front panels must be installed if no card is present in a slot.

Ensure that the front panel ventilation slots of the chassis and the cards are not obstructed.

Field-Serviceable Items

Field-serviceable items on the LUMO frame itself include the power supplies, the status or controller card, and the ventilation fan.

The power supplies and status or controller card are located behind the door on the front panel. The door must be opened to change the power supplies, and it must be removed to change the status or controller card.

Opening and removing the front panel

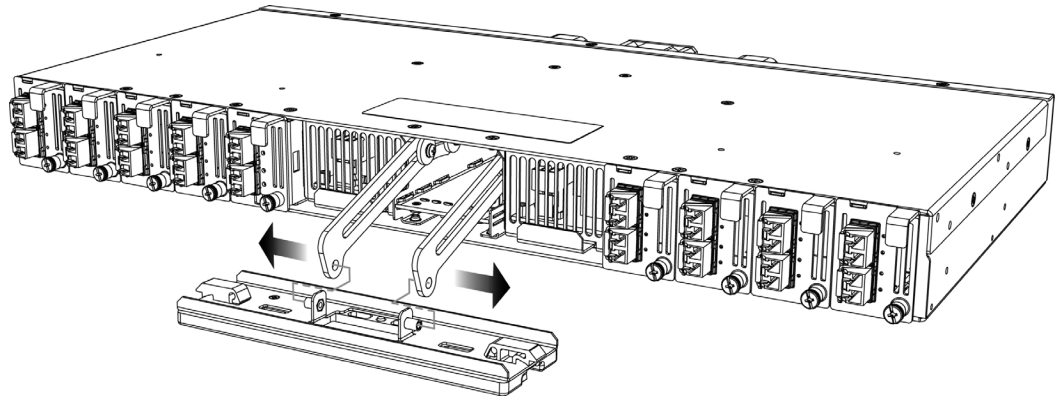
The front panel of the LUMO frame is attached by swivel brackets. Two spring-loaded sliders secure the panel in the closed position. To open the panel, pull the sliders toward the center of the panel, and then pull the panel out until the support brackets allow it to move down below the level of the power supplies. The supplies can then be removed.

To remove the status card, the door must be detached from the frame. Once the door is open, push the flexible brackets apart until the door posts slip out of the holes in the brackets.

There are no electrical connections to the panel.

Reinstall the panel by slipping the door posts into the holes in the brackets, and then move the door into position and snap it in place. The spring-loaded sliders will hold it in position.

Note that the door must be kept closed while the frame is in use, to ensure proper ventilation.



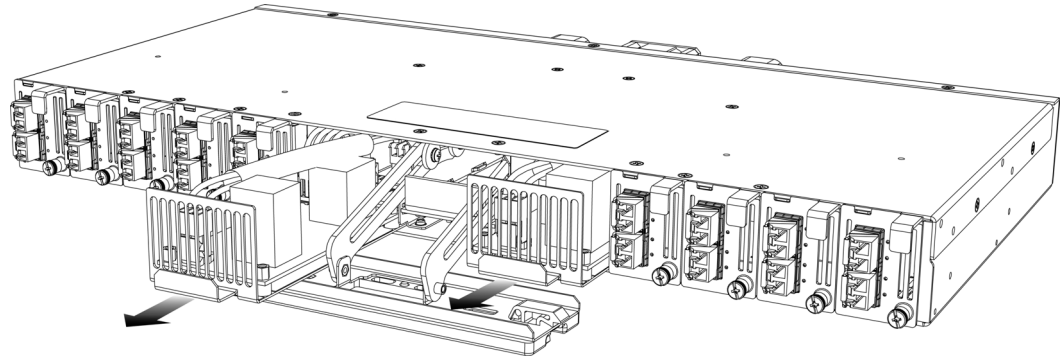
Changing the Power Supply

The LUMO frame supports dual redundant hot-swappable power supplies. The basic configuration includes a single supply, plus an empty slot for the optional redundant power supply. Installing a second power supply module and applying power to it automatically engages the redundant supply mode. Each power supply has its own power socket on the rear panel, and should be connected to the AC supply using the supplied power cord or other approved cord.

- A single supply can be installed in either of the two slots

To install or change a power supply module:

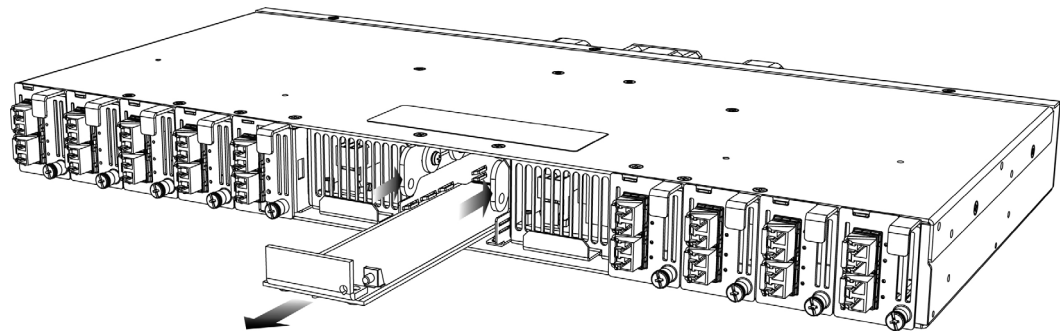
- 1 Open the front panel of the frame
- 2 Remove the power supply module by pulling on the handle on its front panel and sliding it out of the frame
- 3 Slide the new power supply module into the slot, and push it gently into position to seat the connectors. There is no guiding slot - the supply base sits on the floor of the frame.
- 4 Close the front panel of the LUMO frame. The panel secures the power supplies in place.



Replacing or Upgrading the Controller Card or Status Card

The Controller or Status card is located between the power supply slots at the center of the frame. To replace the card, proceed as follows:

- 1 Open the center front door, remove the door and push the door mounting brackets back into the frame
- 2 Hook your finger over the plastic diffuser mounted at the front of the card, and pull out gently until the card is released from the rear connector; then slide the card out of the frame.
- 3 Slide the new card into the controller slot, and push gently on the card edge to engage the rear connectors.



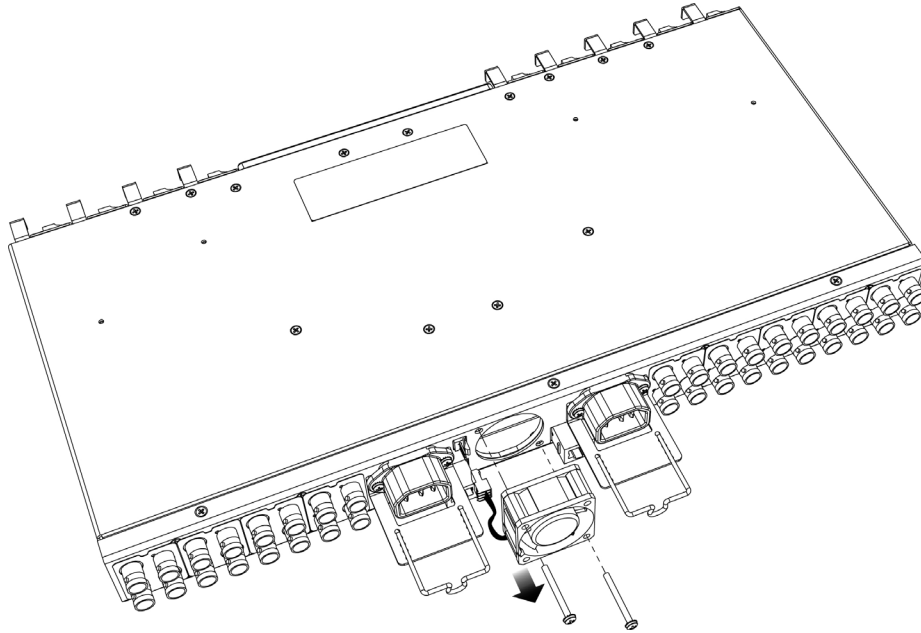
- 4 Pull the door mounting brackets back out of the frame, and re-install the door onto the brackets.
- 5 Be sure to close the door before operating the LUMO system, to ensure proper ventilation.

Replacing the Frame Ventilation Fan

In case of failure of the main cooling fan on the rear of the frame, replace it according to the following steps.

- 1 Procure a replacement fan. It is available from Miranda as part #1974-1500-100
- 2 Remove the defective fan from the frame:

- Disconnect the fan power by grasping the connector and pulling straight out.
- Remove the two screws that secure the fan unit to the frame and pull the fan unit away from the frame.
- Retain the screws, as they will be used with the replacement fan.



- 3 Install the replacement fan:
- Use the two screws that were retained when the old fan was removed to install the new fan onto the rear panel. See the note above.
 - Grasp the power connector attached to the fan assembly, and push it onto the power outlet located to the left of the fan on the rear panel

Specifications

MECHANICAL

Dimensions	1RU x 17.60" W (447 mm) x 10" D (254 mm) without fiber support 1RU x 17.60" W (447 mm) x 20.25" D (515 mm) with fiber support with connectors
Weight:	8.9 lbs (4.45 kg) with 1 PSU and controller card installed

POWER

Rating:	100-240V~ 0.83 - 0.42 A
---------	----------------------------

Ambient Temperature: 50/60 Hz
150 W max
40° C max

COOLING

Fans: 1 on frame, removable

COMMUNICATION

Connectors: RJ45 (2)
Compliant to: 10BaseT/100BaseTx

3 Status Card

Chapter 3 describes the installation and functionality of the LUMO chassis status card.

Topics

<i>Overview</i>	page 15
<i>Features</i>	page 15
<i>Block Diagram</i>	page 16
<i>Installation</i>	page 16
<i>Card-Front Status LED</i>	page 17
<i>Operation</i>	page 17
<i>Specifications</i>	page 18

Overview

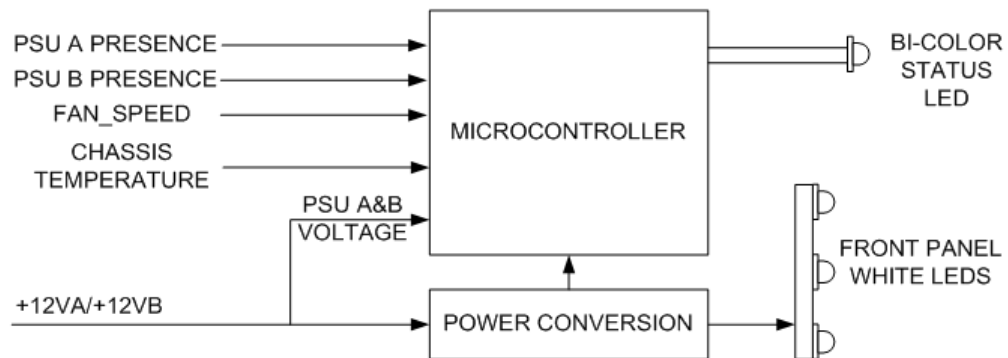
The Status card for the LUMO series is a simple status report card that monitors the presence and voltage of the power supplies, the temperature of the air flow leaving the chassis, and the speed status of the fan and reports it on a single bi-color front panel LED. It also carries white LEDs to illuminate the LUMO chassis front panel.

Features

- Simple LUMO chassis health monitoring card
- Monitors the presence and voltage levels of the power supplies.
- Monitors the chassis fan speed
- Monitors the temperature of the air flow leaving the chassis
- Convenient front loading design
- The LUMO Status card can be easily replaced for maintenance
- The LUMO Status card can be replaced by the LUMO Controller card with remote control/status monitoring through iControl and iControl Web Software

Block Diagram

The following block diagram shows the functionality of the LUMO status card.

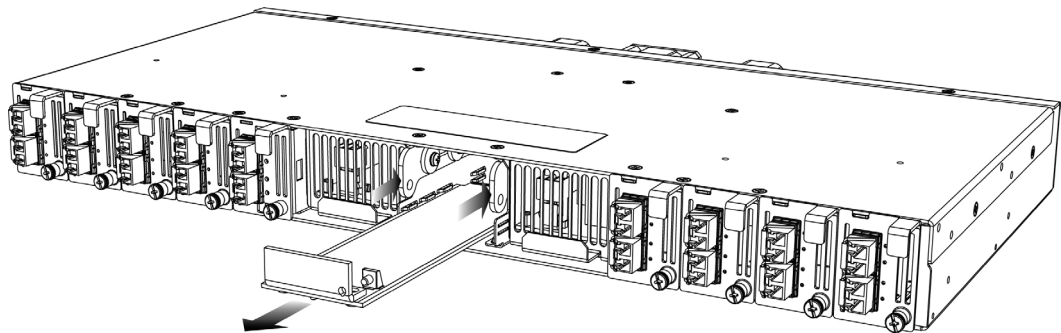


Installation

The Miranda LUMO-series Status card is installed in the center of the LUMO chassis, between the two power supply slots.

To remove or install a LUMO status card, follow these steps:

- 1 Open the center front door, remove the door and push the door mounting brackets back into the frame
- 2 Hook your finger over the plastic diffuser mounted at the front of the card, and pull out gently until the card is released from the rear connector; then slide the card out of the frame.
- 3 Slide the new card into the controller slot, and push gently on the card edge to engage the rear connectors.



- 4 Pull the door mounting brackets back out of the frame, and re-install the door onto the brackets.
- 5 Be sure to close the door before operating the LUMO system, to ensure proper ventilation.

Operation

Card-Front Status LED

The Status card monitor LED is located on the front card-edge of the LUMO Status card, and is visible through the LUMO frame front panel. This multi-color LED indicates the health status of the LUMO frame by color, and by flashing/steady illumination.



The table shows how the various error conditions are flagged on the LUMO status card LED.

Alarm/Status	Priority	Class	LED
Chassis temperature over limit	1	Critical	Flashing RED
Frame fan stopped	2	Critical	Flashing YELLOW
12VA or 12VB missing with PSUA or PSUB present	3	Redundancy problem	RED
Frame fan low speed	4	Maintenance problem	YELLOW
All good		All good	Green

The front LED can display only one alarm/status, so it displays only the highest priority. For example if the fan is at low speed, it should display Yellow. But if at the same time the chassis temperature is too high, then the LED will display Flashing RED instead.

Be aware that a high priority alarm can mask a lower priority one.

Specifications

PROCESSING PERFORMANCE

Microcontroller ARM Cortex-M3

Latency: <1 second

Power: <1W

LUMO-CPU-ETH Controller Card

Chapter 4 describes the installation and functionality of the LUMO-CPU-ETH Controller card in the LUMO housing frame.

Topics

Overview	page 19
Features	page 19
Control Interfaces	page 20
Using the LUMO-CPU-ETH web page	page 20
IP Configuration	page 20
Resetting the Controller	page 23
Using the iControl interface	page 24
Card-Front Status LED	page 25
Configuring the LUMO-CPU-ETH Controller	page 25
Specifications	page 36

Overview

The LUMO-CPU-ETH Controller installed in the LUMO frame supports all on-frame communication between cards, and incorporates a web page for local control and adjustment of the frame. The LUMO-CPU-ETH Controller serves as the communications port for control and alarm information entering and leaving the frame. The LUMO-CPU-ETH controller features two Ethernet ports for system-wide monitoring and control of the frame, using Miranda's control solutions or a third party monitoring system. This controller card is compatible with the TCP/IP protocol and can support polling or report on error modes (unsolicited messaging).

Features

- Dual Ethernet RJ-45 ports (10/100Base-T) with static IP address configuration - same address for both ports, which are configured for active backup redundancy.
- Provides ultra-robust Ethernet connectivity for LAN/WAN
- Controls up to 9 LUMO cards of any type
- Linux-based operating system for robust, mission-critical operations
- Features web page for local configuration of the controller and frame
- Can be remotely configured via iControl
- Provides card and frame health monitoring and status reporting
- Provides extensive frame monitoring:

- Ethernet port monitoring, with communication settings and overall bit rate
- detailed bitrate and communication throughput from individual cards
- self-monitoring with CPU load, memory usage
- Power Supply and fan status reporting
- Individual Card parameter storage for easy card swapping
- Communication speeds of up to 100 Mbps via Ethernet ports

Control Interfaces

The LUMO-CPU-ETH controller is the control point for the LUMO frame and the LUMO-series cards installed in the frame. There are no separate operating controls on the frame or cards.

The LUMO-CPU-ETH has two available control interfaces:

- The LUMO-CPU-ETH serves its own web page with access to some operating controls
- Control panels for the LUMO-CPU-ETH can be accessed through Miranda's iControl system.

Using the LUMO-CPU-ETH web page

The web page served by the LUMO-CPU-ETH controller provides the *only* means of configuring the IP address for the controller card.

IP Configuration

Use of this page is essential for the initial configuration of the device, or re-configuration after a reset, in order to set it up so it can be accessed via iControl on the local area network.

LUMO-CPU-ETH controllers are shipped from the factory with the following IP configuration:

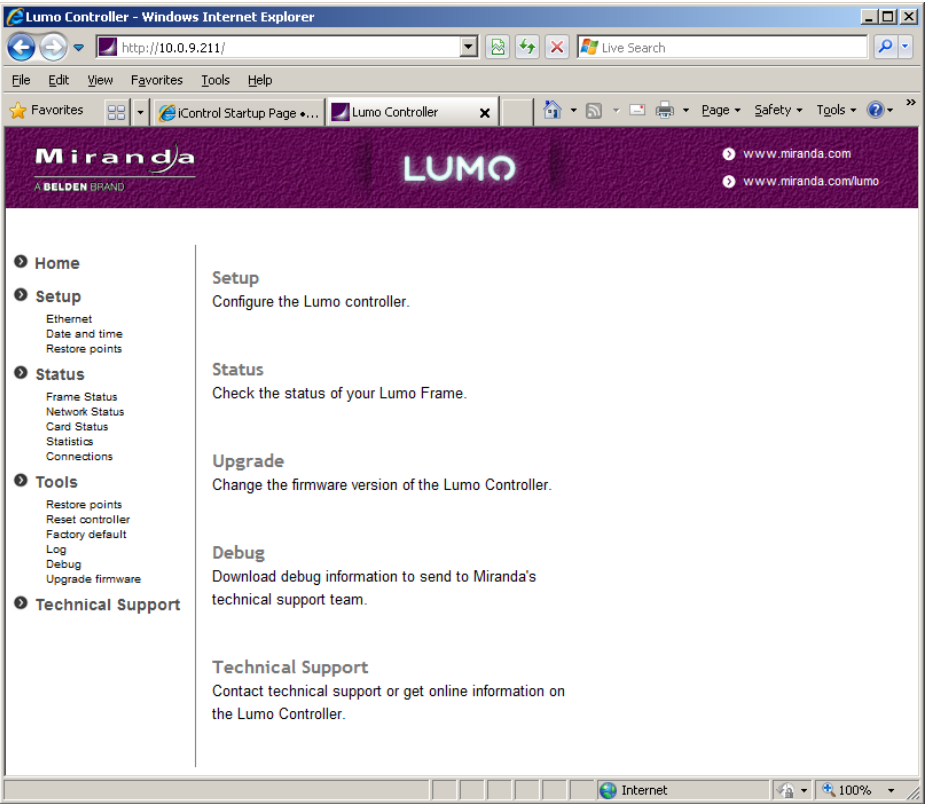
- IP address: 192.168.3.31
- Subnet mask: 255.255.0.0

In addition, the LUMO-CPU-ETH IP address will be reset to this value if the front-panel RESET button is pushed. See the detailed instructions for the reset process on page 23.

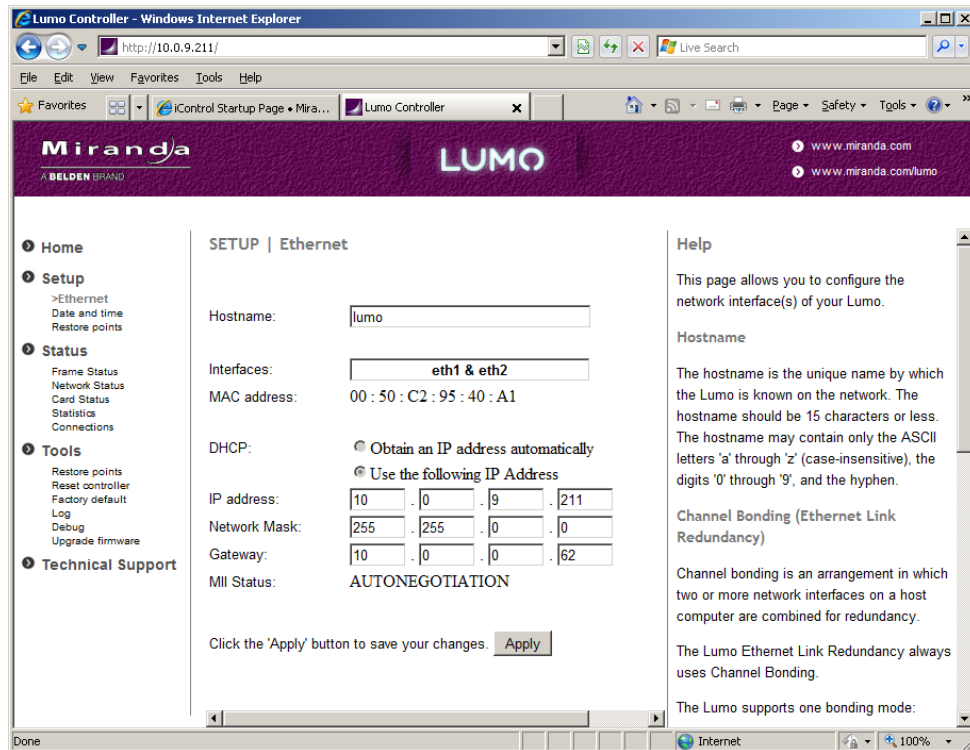
It is necessary to change these settings to integrate the LUMO frame into the local network setup before it can be accessed using iControl. Proceed as follows:

- 1 Configure a stand-alone computer with the following IP address:
 - IP address: 192.168.x.x
 - Subnet mask: 255.255.0.0
- 2 Connect the stand-alone computer to the ETH1 port on the LUMO frame (with the LUMO-CPU-ETH controller installed, and powered up), using a crossover ethernet cable.

- 3 Start a browser on the stand-alone computer, and browse to the LUMO's factory IP address as given above. The LUMO's web page will open in the browser.



- 4 Select Setup > Ethernet in the menu on the left to open the ethernet setup page.



- 5 On the SETUP | Ethernet page, enter the required information. Consult your IT department if necessary.

Hostname: The hostname is the unique name by which this LUMO is known on the network. The hostname should be 15 characters or less. The hostname may contain only the ASCII letters 'a' through 'z' (case-insensitive), the digits '0' through '9', and the hyphen

DHCP: (Disabled for this controller)

IP address: Enter an address appropriate for the local network

Network Mask: Enter a mask value appropriate for the local network

Gateway: Enter a gateway address appropriate for the local network

- 6 Click the Apply button to save your changes
- 7 Disconnect the stand-alone computer from the LUMO.

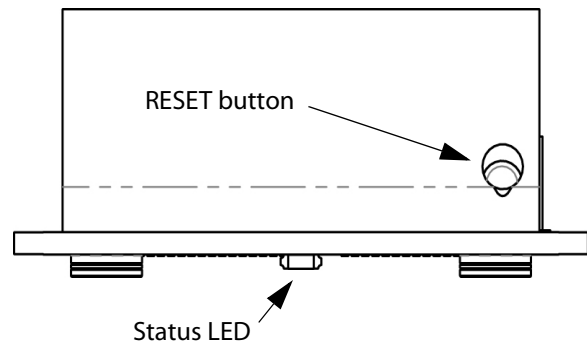
The LUMO frame is now ready to be installed in its operating location and connected to the local network.

Once it is installed, the LUMO web page can be accessed via the network at any time using a browser and the IP address set in the controller using the above procedure.

Resetting the Controller

IMPORTANT: If for any reason you cannot connect to the LUMO frame through the network using the address you have entered:

- 1 Press the **RESET** button on the front panel (access it through the cutout on the panel - it is recessed to protect against accidental activation)
- 2 You must keep pressing the button for approximately 10 seconds in order to reset the controller. During that time, the front panel status LED will flash yellow. You can abort the reset at any time while the LED is flashing by releasing the button.
- 3 Once the LED has stopped flashing, the LUMO-CPU-ETH will reboot, and the IP address (along with other on-board parameters) will be reset to its factory values.
- 4 Follow the steps in [IP Configuration](#) on page 20 to set the IP address to the required value.



If you can connect to the LUMO-CPU-ETH controller through the network, you can reset the IP address by browsing to the controller's IP address, and following steps 4-6 in the [IP Configuration](#) on page 20.

Once you have applied the changes, your browser will lose contact with the controller, but you may re-establish contact at the new IP address.

Using the iControl interface

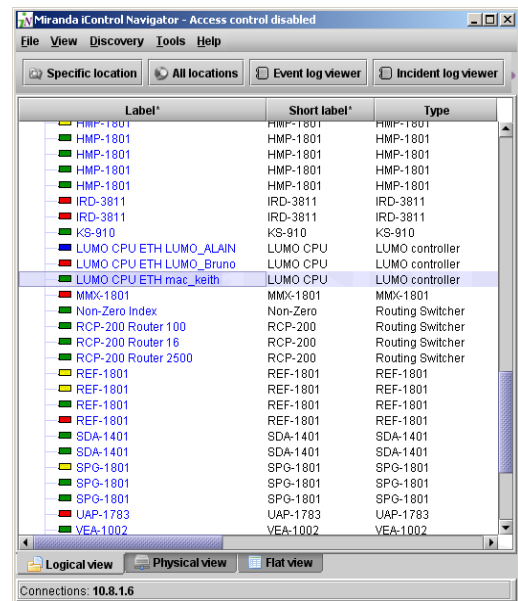
The LUMO-CPU-ETH controller supports remote operation through its two rear-panel 10/100 Base-T ethernet ports, using Miranda's iControl or a third-party solution. This manual describes the control panels associated with the LUMO-CPU-ETH and their use.

Note - you must configure the LUMO-CPU-ETH controller with an appropriate IP address before it can be accessed on your network by iControl. See [IP Configuration](#) on page 20 for details.

Please consult the iControl User's Guide for information about setting up and operating iControl.

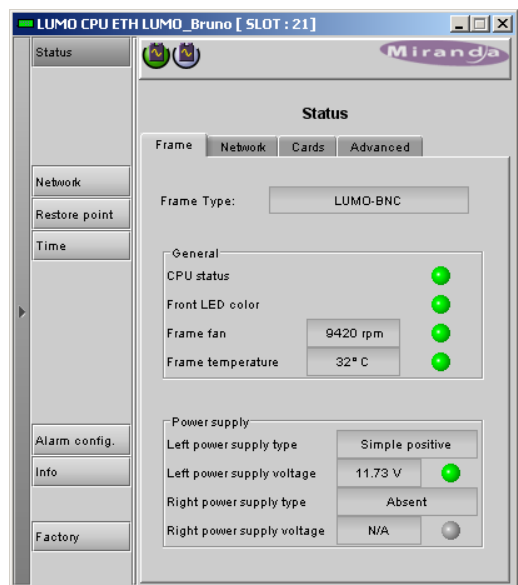
In iControl Navigator or iControl Websites, double-click on the icon of the controller to open its control panel.

- LUMO-CPU-ETH controllers are identified as *LUMO Controller* in the Type column of the iControl Navigator window.
- For convenience, enter a descriptive Label in the Info panel of the card, to make it easy to locate this specific frame controller amongst those in the list. See [Identification](#) on page 26 for instructions.



The iControl panel for the LUMO-CPU-ETH controller displays a series of buttons down the left-hand side. Clicking a button changes the contents of the main window to display status reports and controls related to the topic named on the button.

A full description of the use of the iControl interface to configure the LUMO-CPU-ETH card is given below, beginning on page 25.



Card-Front Status LED

The status LED is located on the lower-front card-edge of the controller module, and is visible through the front access door of the LUMO frame. This multi-color LED indicates the status of the controller card by color, and by flashing/steady illumination.



The table shows how the various error conditions are flagged on the LUMO-CPU-ETH status LED.

Alarm/Status	Priority	LED
Power supply failure	1	FLASHING RED
Fan failure	1	FLASHING RED
Internal error	2	RED
Normal (no errors)		GREEN

The status LED can display only one alarm/status, so it displays only the highest priority. For example if there is an internal error, it should display RED. But if at the same time the chassis fan has failed, then the LED will display FLASHING RED.

Be aware that a high priority alarm can mask a lower priority one.

Configuring the LUMO-CPU-ETH Controller

This section introduces the operating features of the LUMO-CPU-ETH controller, and describes how to access and control them using the iControl interface.

See [Using the iControl interface](#) on page 24 for instructions on accessing the iControl interface.

The following topics are covered:

- [Identification](#) page 26
- [Status Monitoring](#) page 27
- [Network Status](#) page 30
- [Data Restoration](#) page 30
- [Factory Alignment](#) page 32
- [Time Management](#) page 33
- [Alarms](#) page 33
- [Specifications](#) page 36

Identification

Click the *Info* button

The LUMO-CPU-ETHcontroller is accessible on a network, and must be identifiable in order to function in the iControl environment. The identification data is entered in the iControl INFO control panel. This panel also shows other data that is not user-adjustable.

You can enter the following information by clicking and typing in the data box:

Label: allows the user to define the label that identifies this device when it appears in iControl applications

Short Label: allows the user to define the short-form label for iControl (8 characters)

Source ID: type a descriptive name for this LUMO-CPU-ETH controller

Comments: type any desired text

The remaining data boxes show manufacturing information about this card.

Three buttons in the panel give access to other information:

Details: Reports the Firmware version, service version, and panel version for this card

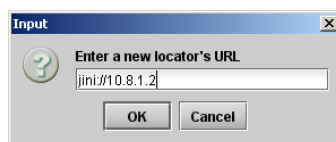
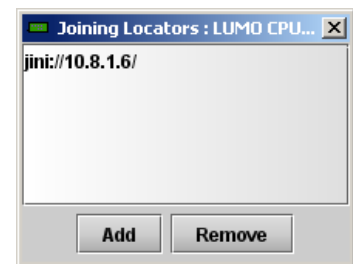
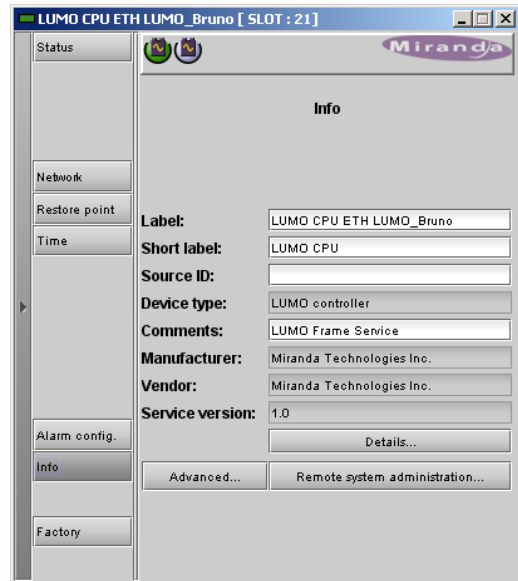
Advanced: Shows the Miranda LongID for this card. The Miranda LongID is the address of this LUMO-CPU-ETH controller in the iControl network.

Remote System Administration: Opens the Joining Locators data box, which lists remote lookup services to which this LUMO-CPU-ETH is registered.

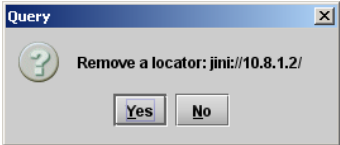
Add: Force the iControl service for this LUMO-CPU-ETH to register itself on a user-specified Jini lookup service, using the following syntax in the data box:

jini://<ip_address>

where <ip_address> is the ip address of the server running the lookup service, e.g.:



Remove: select one of the services listed in the window by clicking on it, and click *Remove* to open a query box allowing you to delete it from the window.



Status Monitoring

The LUMO-CPU-ETH controller continuously monitors the operating condition and status of the housing frame’s power supplies and ventilating fans. It also monitors the status and usage of its two ethernet ports, and the status of its on-board memory, as well as the data throughput of all cards installed in the frame.

In addition to the information displayed on the [Card-Front Status LED](#) (see page 25), status information acquired by the controller can be viewed in the iControl interface, and on the local controller display through the menu.

The iControl interface always displays two icons in the upper left of the window. These report the status of the frame’s two power supplies.

The graphic shows the possible icon displays and the associated messages that appear below them. Error messages are always displayed; other status messages appear only upon mouse-over of the icon.

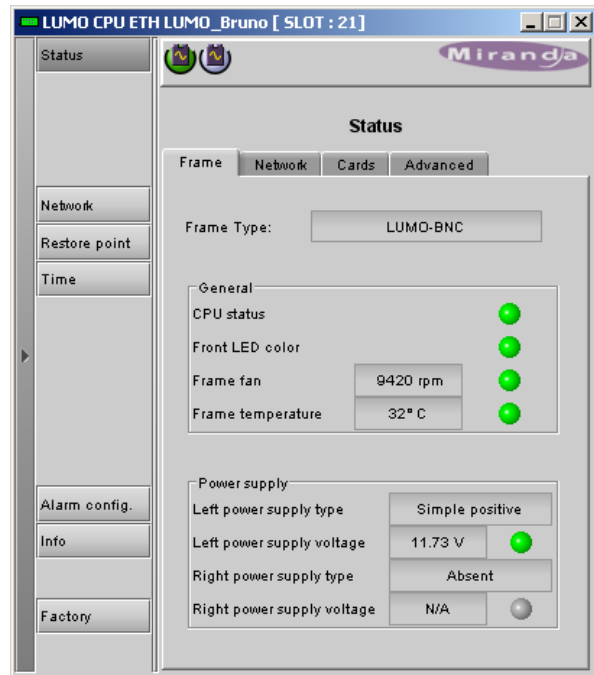


Click the *Status* button

The Status panel shows status information in four categories, each accessed by clicking the appropriate tab.

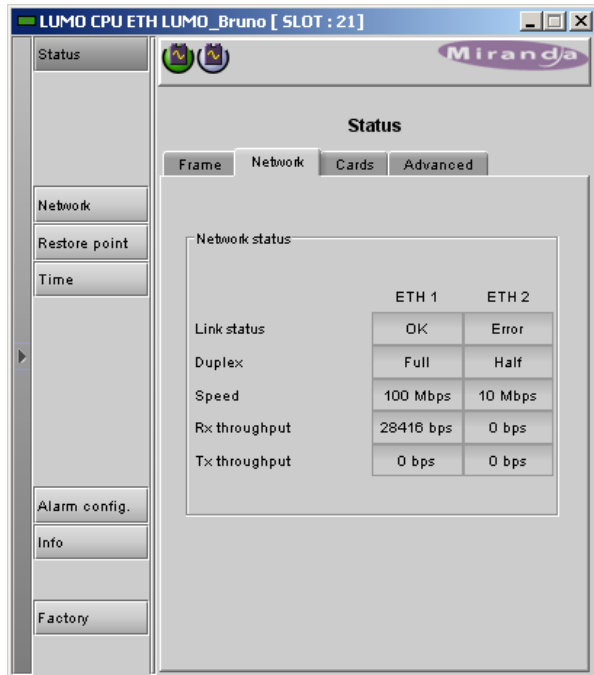
Status - Frame

Select the *Frame* tab to see a report on the status of the frame's CPU, fans and power supplies.



Status - Network

Select the *Network* tab to see a report on the status of the two Ethernet ports on the LUMO-CPU-ETH card.

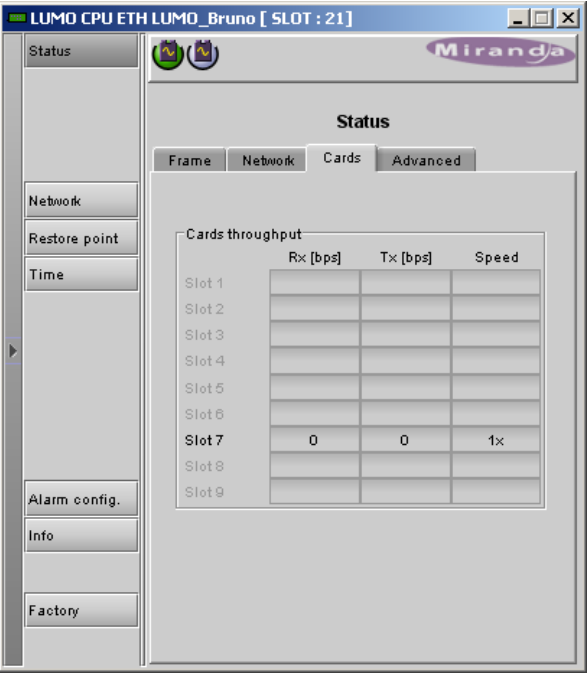


Status - Cards

Select the *Cards* tab to see a chart of the current send (Tx) and receive (Rx) data rates, and speed, for all cards installed in the LUMO frame.

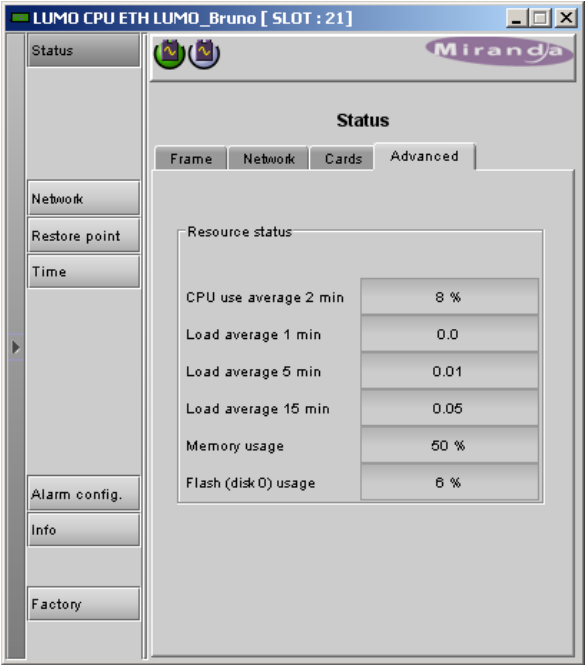
- Note that in the LUMO frame, only slots 1 to 9 are available

For a more detailed report on the status of a specific card, open that card's control panel in iControl.



Status - LUMO-CPU-ETH Resource Usage

Select the *Advanced* tab to view a report on the usage of the controller card's resources:



Network Status

Click the **Network** button and select the **ETH** tab

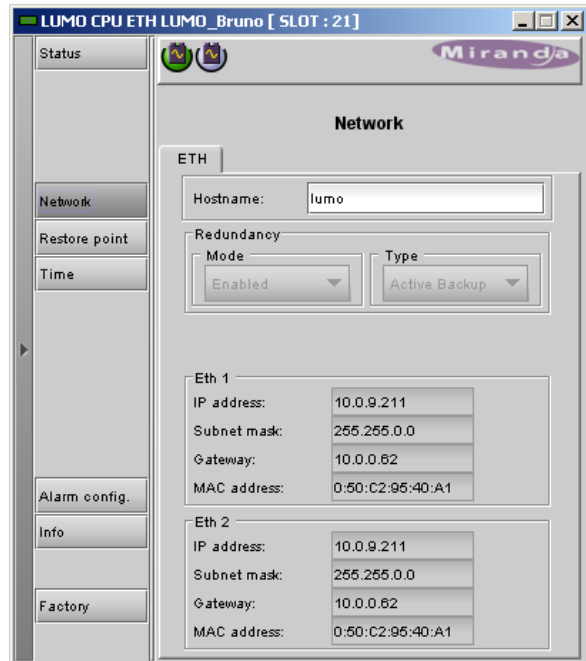
The status of the LUMO-CPU-ETH controller's two Ethernet ports is displayed in this panel.

NOTE: The IP address for the LUMO-CPU-ETH controller must be set using the on-board web page. See [Using the LUMO-CPU-ETH web page](#) on page 20 for detailed instructions.

The **Ethernet Link Redundancy** status is reported in this panel.

In LUMO, this feature is always set to Active Backup.

- The two ethernet interfaces are bonded together and configured with the same IP address.
- In the event that the primary interface fails, network traffic is automatically switched over to the backup interface



The MAC (Media Access Control) address is reported in the data box

- The MAC address is not user-configurable.

Data Restoration

Many of the LUMO-series cards that can be installed in the LUMO frame are complex and have a lot of data stored on-board related to their configuration and parameter values. The LUMO-CPU-ETH controller provides a backup of this data, which can be restored to the card when needed. This is valuable if the card is inadvertently reconfigured, or is replaced after failure with a new card of the same type. The saving of the current data into the controller's memory, and restoring the data onto the LUMO-series card, can be done manually or automatically.

For manual operation:

Click the **Restore Point** button and view the **Cards** tab.

The tab show a list of the slots available in the frame, with a check box, name, and status box for each.

- The LUMO frame uses slots 1 to 9.

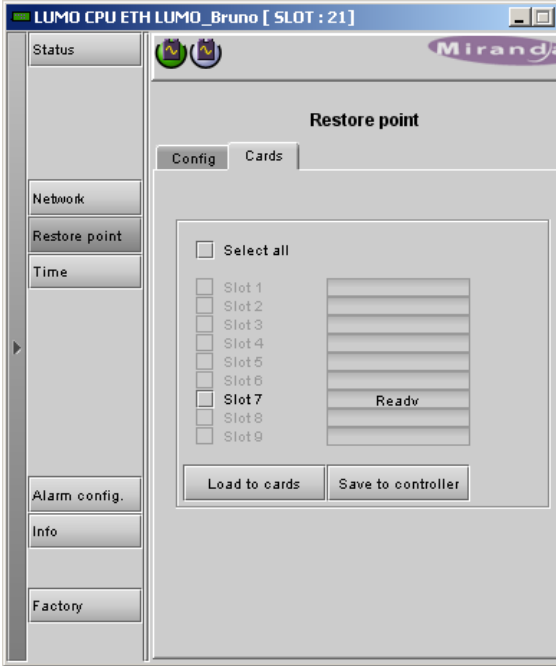
Click the check box to activate the Data Restore feature for the card in that slot,

-or-

Click the Select All box at the top to activate the feature for all slots in the frame.

Click **Save to controller** at the bottom to copy all restorable data from the cards in the selected slots into the memory on board the LUMO-CPU-ETH controller.

Click **Load to cards** to load the cards in the selected slots with data from the controller's memory. Note that a data restore will only work if the card in the slot is the same type as the card that was there when the data was saved.



For automatic restore and save:

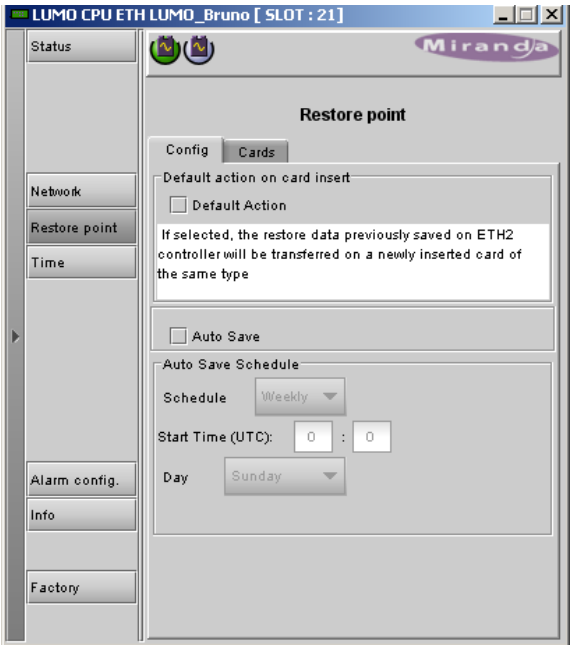
Click the *Restore Point* button and view the *Config* tab.

Restore: The LUMO-CPU-ETH card can be set up to automatically update a card when it is inserted in a slot previously occupied by a card of the same type whose data was saved. Thus, a new card can be configured automatically to replace the card that was removed, saving a lot of time when cards are swapped.

Click the *Default Action* box to enable the auto restore function for all the cards in the frame.

Save: The LUMO-CPU-ETH card can be configured to automatically back up the data on the cards in its slots according to a set schedule.

Click the *Auto Save* box to enable the automatic save function.



Set up the schedule for data backup using the controls provided.

- Schedule: Daily, Weekly, Monthly
- Start Time (UTC): Time in hours (24-hour clock) and minutes

The label and function of the pulldown at the bottom changes to follow the Schedule selection:

Schedule	Label	Pulldown Options
Daily	Freq	Every day, Weekdays
Weekly	Day	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
Monthly	Week	Week1, Week2, Week3, Week4, Last Week
	Day	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Factory Alignment

There may be times when the LUMO-CPU-ETH settings have been adjusted and it is useful to restore them to a normalized condition. The LUMO-CPU-ETH controller maintains a “Factory Default” alignment in its memory, to which it can be restored at any time.

Note: Ethernet settings are not included in the Factory data set, and are not changed when the Factory Default alignment is installed.

Click the **Factory Control** button

Click the *Load Factory* button to restore the card to the Factory default alignment.



Time Management.

The LUMO-CPU-ETH controller is time-aware, and its internal clock can be updated manually or via NTP.

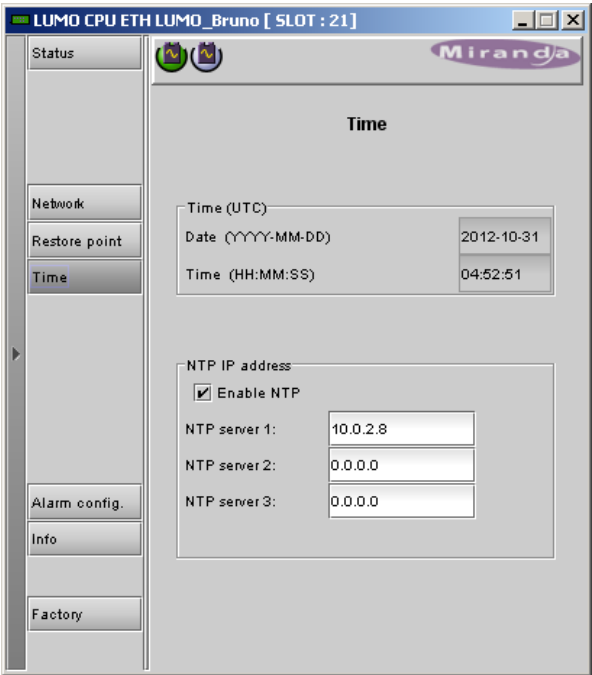
Click the *Time* button

Time (UTC)

The data boxes in this section display the time and date currently held in the card.

Enter new values in these boxes to change the current setting. If an automatic update via NTP is not enabled, the clock will continue to run using an on-board reference, but precision is not guaranteed.

Note - there is no backup battery for the time circuit, so the time must be reset any time the card is powered down.



NTP IP address

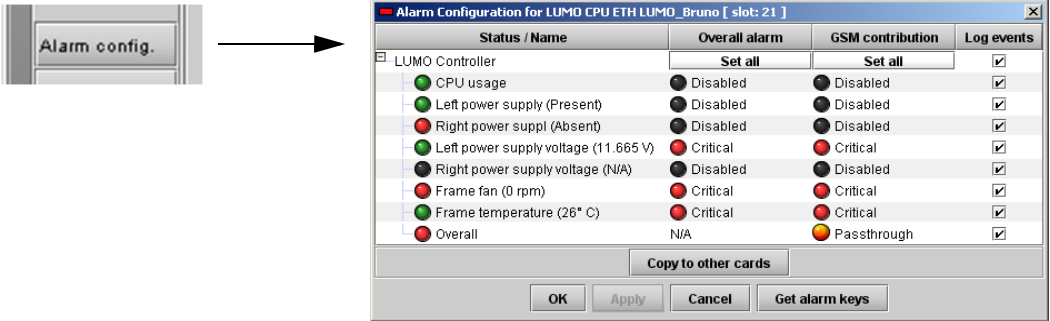
Click the *Enable NTP* box to use an NTP (Network Time Protocol) source. Enter up to three IP addresses of NTP servers. The LUMO-CPU-ETH card will use the first source of valid time it finds in this list.

Alarms

The LUMO-CPU-ETH controller generates alarms for the frame in which it is installed when error conditions are detected. These alarms are used to set the card-front Status LED and the status icon in the top left of the iControl window.

The alarms are reported to the iControl network.

Click the *Alarm Config* button



The iControl Alarm Configuration panel opens in a new window when the *Alarm Config* button is clicked, and can be resized if needed. It allows the alarm reporting of the LUMO-CPU-ETH to be configured. The panel is organized in columns.

Status/Name

This contains an expandable tree listing all the alarms reported by this LUMO-CPU-ETH controller.

Each alarm name includes an icon that shows its current status.

The **Overall alarm** and **GSM contribution** columns contain pulldown lists that allow the level of contribution of each individual alarm to the alarm named in the column heading to be set. Click on the alarm status in either of these columns to show the status options that are available, then click on one to select it. If no options appear, the alarm is not user-configurable

Overall Alarm

This column allows configuration of the contribution of each individual alarm to the Overall Alarm associated with this card. The Overall Alarm is shown in the upper left corner of the iControl panel, and also appears at the bottom of the Status/Name column.






GSM Contribution

This column allows configuration of the contribution of each individual alarm to the GSM Alarm Status associated with this card. GSM is a dynamic register of all iControl system alarms, and is also an alarm provider for external applications. The possible values for this contribution are related to the Overall alarm contribution:

- If the Overall alarm contribution is selected as Disabled, the GSM alarm contribution can be set to any available value
- If the Overall alarm contribution is selected as any level other than disabled, the GSM contribution is forced to follow the Overall Alarm.

Levels associated with these alarms:

The alarm status list may contain some or all of the following options:

Alarm status	Significance
 Disabled	The alarm makes no contribution (black icon)
 Minor	The alarm is of minor importance (yellow icon)
 Major	The alarm is of major importance (orange icon)
 Critical	The alarm is of critical importance (red icon)
 Passthrough	The alarm exists but has no effect (used for text and composite alarms)

Shortcut: if you click on “Set All” at the top of one of these columns, you will open a pulldown list that lets you assign a level to all alarms in that column simultaneously.

Once the alarms are configured, you may accept the changes or discard them:

Log Events

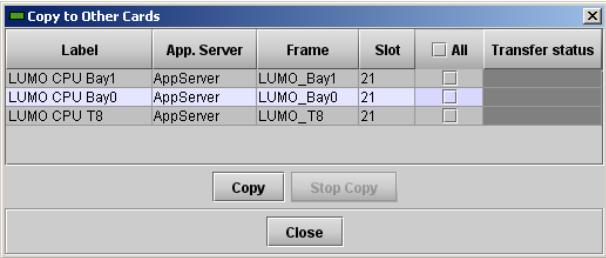
iControl maintains a log of alarm events associated with the card. The log is useful for troubleshooting and identifying event sequences. Click in the checkbox to enable logging of alarm events for each individual alarm.

At the bottom of the window are several other controls:

Copy to other cards

Click this button to open a panel that allows the alarm configuration set for this card to be copied into other LUMO-CPU-ETH controllers in other frames.

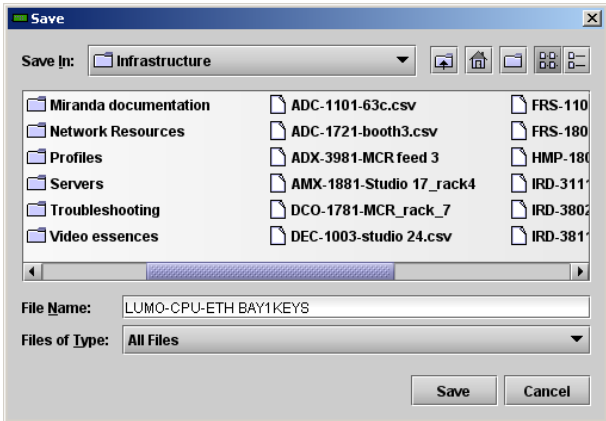
Select one or more destination controllers from the list in the window by clicking in the checkboxes, or all of them by clicking in the *All* checkbox



Get alarm keys

Click this button to open a save dialog where you can save a file containing a list of all alarms on this controller and their current values, along with an Alarm Key for each. The alarm keys are useful for system integration and troubleshooting.

The file is saved in .csv format



OK, Apply, Cancel

- **OK** accepts the settings and closes the window once the controller confirms that there are no errors.
- **Apply** accepts the settings, but leaves the window open
- **Cancel** closes the window without applying any changes, and leaves the previous settings intact.

Specifications

System Interfaces

Status LED

Ethernet Ports (2)

Power ON and System Status

IEEE802.3 10/100 Base-T on RJ45

Power:

<3W

5

FIO-911 O/E and E/O Converters

Chapter 5 describes the FIO-911-series optical/ electrical and electrical/opticalconverters that are available for the LUMO housing frame.

Topics

<i>FIO-911 3G/HD/SD Optical to/from Electrical Converters</i>	<i>page 37</i>
<i>Features</i>	<i>page 37</i>
<i>Description</i>	<i>page 38</i>
<i>Installing cards and SFP modules</i>	<i>page 38</i>
<i>FIO-911-4R-LC</i>	<i>page 38</i>
<i>FIO-911-4T-S13-LC</i>	<i>page 40</i>
<i>FIO-911-4TH-CwwCxxCyyCzz-LC</i>	<i>page 41</i>
<i>iControl Interface</i>	<i>page 43</i>
<i>Specifications</i>	<i>page 50</i>

FIO-911 3G/HD/SD Optical to/from Electrical Converters

The FIO-911 series are flexible serial digital video To/From Fiber Optic converters for the LUMO housing frame (both -BNC and -DIN versions). The FIO-911 series are designed for SD, HD and 3G serial video as well as compressed bit-streams (DVB-ASI). The series supports any data rate within the range of 19.4 Mbps to 2.97 Gbps and provides a reclocked serial digital video from 270Mbps to 2.97 Gbps.

The FIO-911 series offers three different configurations:

- Quad fiber Tx, with two dual optical transmitters
- Quad fiber Tx CWDM, with two dual high-power optical transmitters
- Quad fiber Rx, with two dual optical receivers

The series is based on SFP modules that provide easy product maintenance and flexibility when multiple wavelengths are needed (as for CWDM). The SFP Modules are also hot-swappable.

Features

- Supports any serial data rate from 19.4 Mbps (ATSC) to 2.97 Gbps (3G SDI)
- Rclocked serial digital video for 270 Mbps, 1.49 Gbps, and 2.97 Gbps
- Provides unidirectional interface between fiber optic and serial digital
- Supports Multiple wavelength from the standard 1310 nm to multiple CWDM wavelengths
- Ideal for long video run with “Hum” immunity

- Presence/loss of signal alarm – iControl, on-board LED for presence
- SFP Optical power monitoring and report
- Internal SFP temperature alarms on the iControl interface
- SFP Module type detection and card configuration
- Remote monitoring and control
- Convenient front-loading design, SFP on the front of the card
- The cards and the SFP modules are fully hot swappable

Description

The FIO-911 card incorporates two SFP module slots on its front panel. Each slot has two dedicated status LEDs. The front panel also incorporates ventilation slots, a handle used to remove the card from its slot in the LUMO frame, and a captive screw to secure it in position.

Within the frame, the card connects to intra-frame data and power busses, and to the connectors (four BNC or eight DIN) dedicated to its slot on the frame's rear.

The front panel of the card is labeled to identify the FIO variant, and each status LED is labeled.

The function of the rear-panel connectors depends on the FIO-911 variant that is installed, and is identified by a lexan that slips over the connectors on the rear panel. Lexans are supplied for both -BNC and -DIN versions of the frame.

Installing cards and SFP modules

See [Installing Cards in the LUMO Frame](#) on page 8 for detailed instructions for installing the FIO-911 cards in the LUMO frame.

See [SFP Modules](#) on page 53 for instructions on removing and installing SFP modules into the FIO-911 front panel slots.

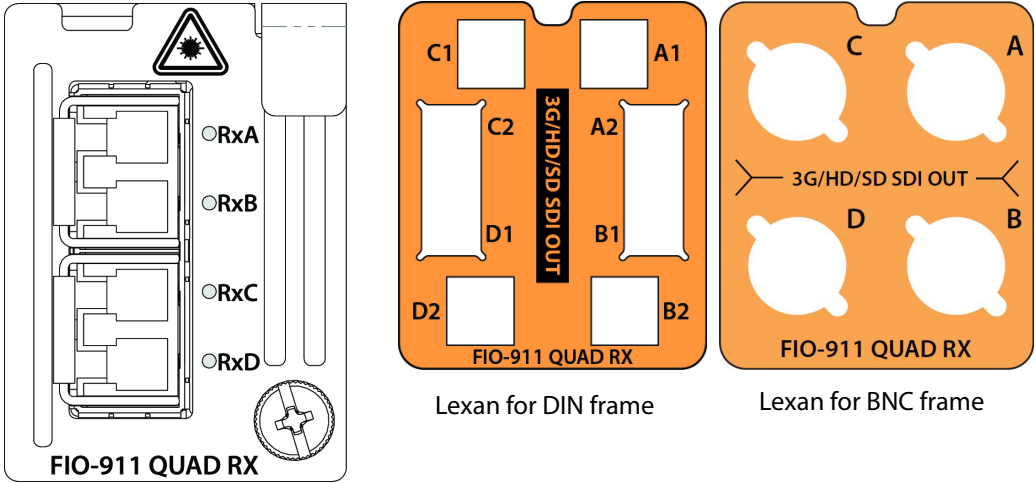
FIO-911-4R-LC

Quad 3 Gbps/HD/SD Optical Receiver with LC/PC Connector

This variant utilizes two dual optical receivers at its inputs to receive four channels, each of which is O-to-E converted, reclocked and sent to the outputs (one BNC or two DIN) on the rear panel of the housing frame.

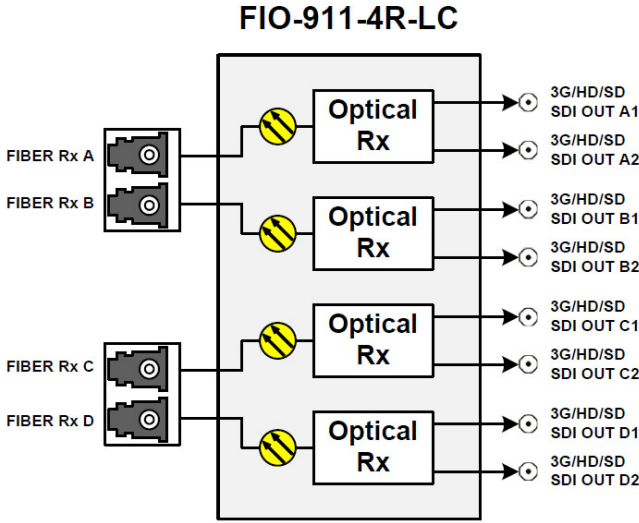
The FIO-911-4R-LC Quad Receiver includes two SFP-RR-LC modules. All receiver channels are wideband, responding to wavelengths ranging from 1260 to 1620 nm, compatible with 1310 nm and CWDM wavelengths.

The front panel and rear lexans (DIN and BNC) for this model are shown here:



The functional block diagram of the FIO-911 Quad Rx model is shown here.

Note that the second outputs (A2, B2, C2, D2) are only available on the LUMO-DIN frame.



Card-Front Status LEDs

These LEDs monitor the status of the optical inputs to the FIO-911 Quad Rx:

- Green = Optical signal OK
- Yellow = No lock
- Flashing Yellow = Input level too high or too low
- Red = No signal
- Flashing Red = SFP not present, or SFP not detected, or hardware failure

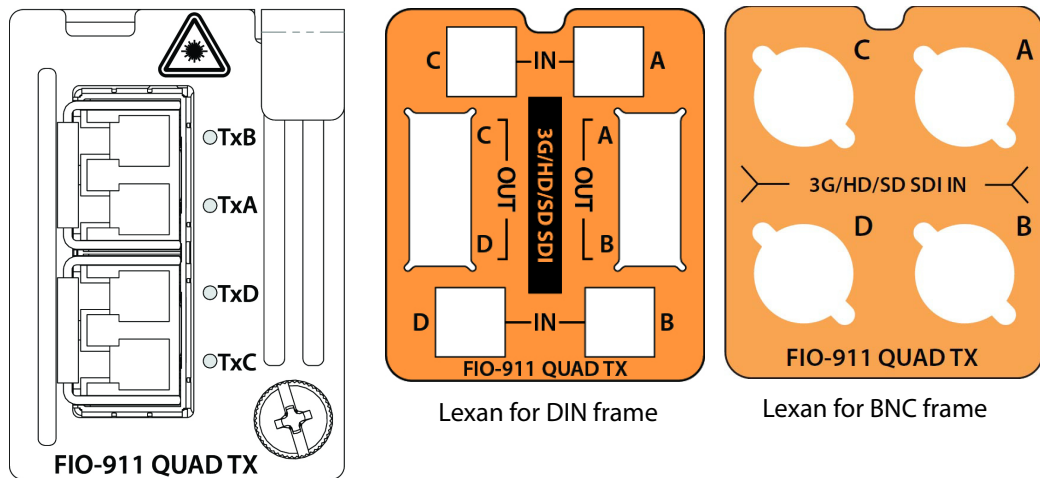
FIO-911-4T-S13-LC

Quad 3 Gbps/HD/SD Optical Transmitter 1310 nm with LC/PC connector

This variant utilizes two dual optical transmitters at its outputs to send four channels, each of which enters on a rear-panel connector, is equalized, reclocked, E-to-O converted, and sent to the SFP transmitter. For the DIN frame only, each electrical input is also reclocked and sent to the matching electrical output on the rear panel.

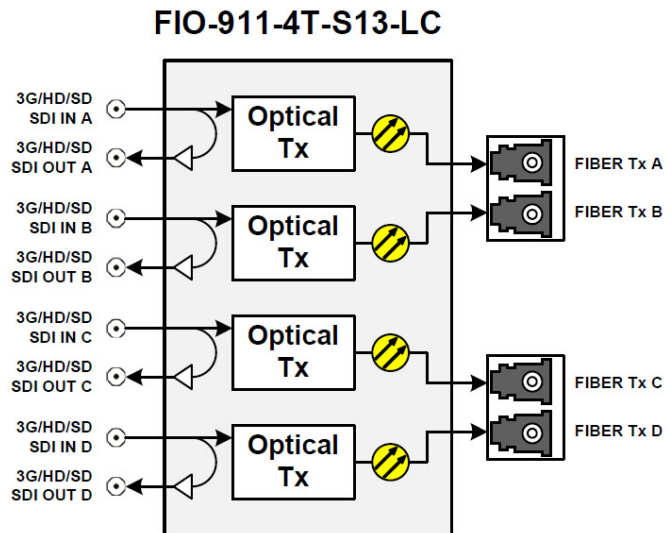
The FIO-911-4T-S13-LC Quad Transmitter includes two SFP-TT-S13S13-LC modules.

The front panel and rear lexans (DIN and BNC) for this model are shown here:



The functional block diagram of the FIO-911 Quad Tx model is shown here.

Note that the electrical loop outputs are only available on the LUMO-DIN frame.



Card-Front Status LEDs

These LEDs monitor the status of the electrical inputs to the FIO-911 Quad Tx:

- Green = SDI signal OK
- Yellow = No lock
- Red = No signal
- Flashing Red = SFP not present, or SFP not detected, or hardware failure

FIO-911-4TH-CwwCxxCyyCzz-LC

High Power Quad 3 Gbps/HD/SD Optical CWDM Transmitter with LC/PC connector

This variant utilizes two dual high-power CWDM optical transmitters at its outputs to send four channels, each of which enters a rear-panel DIN, is equalized, reclocked, E-to-O converted, and sent to the SFP transmitter. For the DIN frame only, each electrical input is also reclocked and sent to the matching electrical output on the rear panel.

The two signals entering each CWDM transmitter module are modulated at different wavelengths.

The model number for this device identifies the two included SFP high-power CWDM transmitter modules by specifying the wavelengths of their output:

Model #: FIO-911-4TH-CwwCxxCyyCzz-LC

Wavelengths of one SFP module

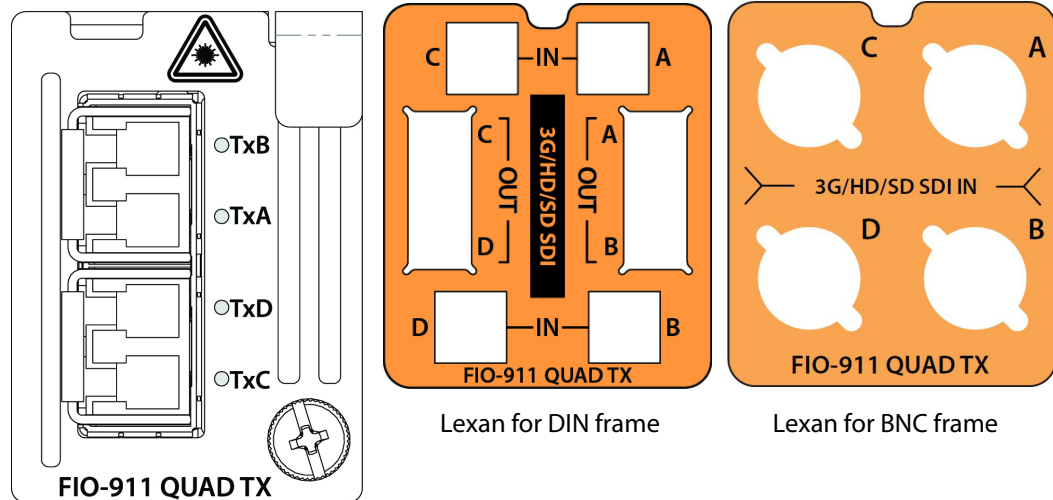
Wavelengths of the other SFP module

CwwCxx and CyyCzz	Wavelength (nm)	Color Code
C27C29	1271/1291	Light Purple
C31C33	1311/1331	Yellow Green
C35C37	1351/1371	Pink
C39C41	1391/1411	White
C43C45	1431/1451	Black
C47C49	1471/1491	Gray
C51C53	1511/1531	Blue
C55C57	1551/1571	Yellow
C59C61	1591/1611	Red

Note that both SFP modules can operate at the same wavelengths.

The front panel and rear lexans (DIN and BNC) for this model are shown below. Note that they are identical to those for the FIO-911-4T-LC model. The clasp handles on the SFP modules are color-coded to identify their wavelengths, and this will serve to distinguish the two FIO-series products.

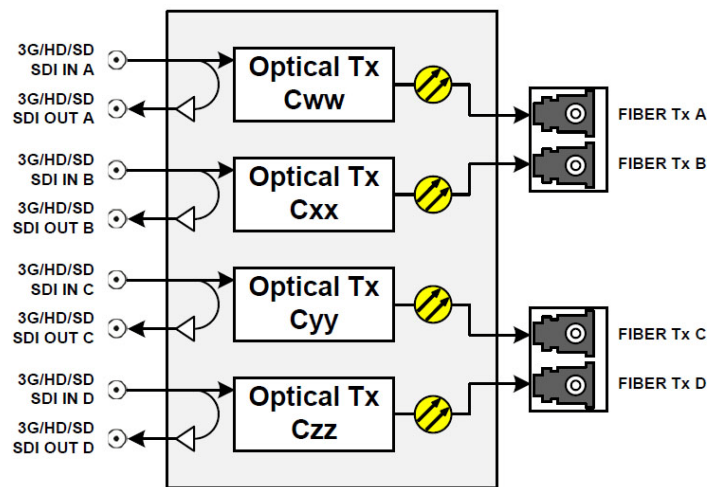
- Color coding for CWDM modules is shown in the above table.



The functional block diagram of the FIO Quad High Power CWDM module is shown here.

Note that the electrical loop outputs are only available on the LUMO-DIN frame

FIO-911-4TH-CwwCxxCyyCzz-LC



Card-Front Status LEDs

These LEDs monitor the status of the electrical inputs to the FIO-911 Quad High Power CWDM Tx:

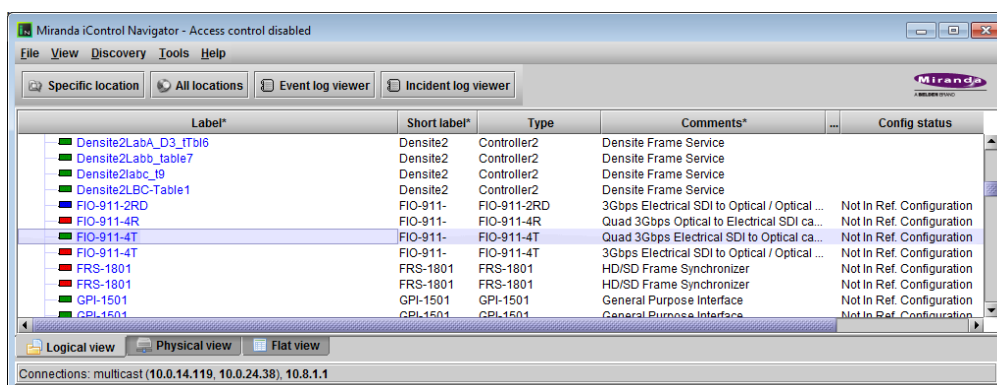
- Green = SDI signal OK
- Yellow = No lock
- Red = No signal
- Flashing Red = SFP not present, or SFP not detected, or hardware failure

iControl Interface

When installed in a LUMO frame equipped with a LUMO-CPU-ETH controller card and connected to a network (see Chapter 4), the FIO-911 cards may be remotely monitored and controlled using Miranda's iControl system.

To use iControl with the FIO-911 cards, proceed as follows:

- 1 Install and configure your LUMO-CPU-ETH controller for network access to enable the iControl interface. See [IP Configuration](#) on page 20 for details.
- 2 In iControl Navigator (shown below) or iControl Websites, double-click on the icon of an FIO-911 card to open its control panel.



- For convenience, enter a descriptive Label in the Info panel of the card, to make it easy to locate this specific card amongst those in the list. See [Identification and Information](#) on page 48 for instructions.

The iControl panel for the FIO-911 card displays a series of buttons down the left-hand side. Clicking a button changes the contents of the main window to display.

The FIO-911 series of cards share the same basic control panel layout, but the detailed information within the main display window changes with the card's functionality.

Status

The **Status** window shows the status of the four inputs to the card. One tab shows the status of inputs A and B, and the status of their associated SFP module, while a second tab provides the same information for inputs C and D.

The Inputs are identified as Electrical or Optical, and status icons show the data rate, Lock status, and Signal status.

The SFP module is identified by type, part number, serial number and date code. This is manufacturer-supplied information, read from the module.

Data about the two optical channels is monitored on the card, and reported in the SFP Info table: Temperature (C), Voltage (V), Optical Power (dBm), and Wavelength (nm)



Reclocker and Optical

The Reclocker and Optical window allows the user to choose whether the signal reclockers at the inputs are ON or BYPASSED.

- Reclocker control is provided for both electrical and optical inputs
- A separate control is provided for each of the four inputs A, B, C and D.
- The default setting is ON.

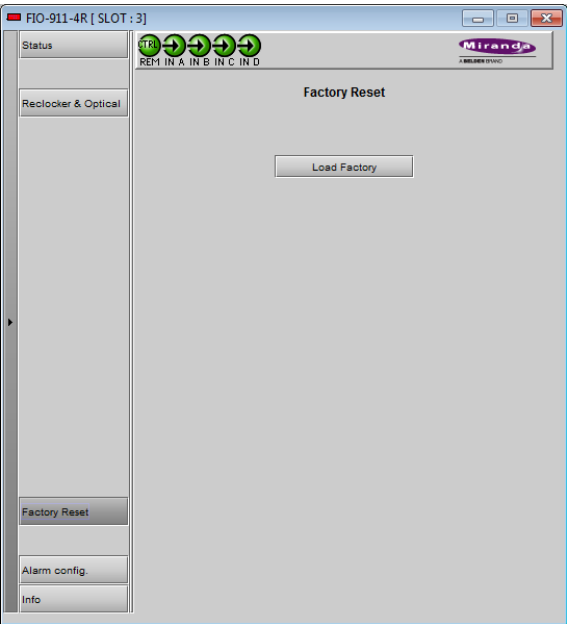
For FIO-911 cards with optical outputs, controls are provided to turn the optical transmitters in the SFP modules ON or OFF for outputs A, B, C and D individually.

- The default setting is ON.



Factory Reset

The FIO-911 card can be reset to factory-specified settings of all on-board parameters by clicking the **Load Factory** button.



Alarm Configuration

The FIO-911 card detects and signals alarm conditions.

A status LED is positioned beside each fiber connection to the SFP module on the front panel of the card. These four LEDs report the status of their associated channel. The significance of the LED's appearance for each card type is given above, in the section devoted to that card.

The iControl Alarm Configuration panel opens in a new window when the *Alarm Config* button is clicked, and can be resized if needed. It allows the alarm reporting of the LUMO-CPU-ETH to be configured. The panel is organized in columns.

Status/Name

This contains an expandable tree listing all the alarms reported by this FIO-911 card.

Each alarm name includes an icon that shows its current status:

- Green: OK
- Red: Alarm set
- Black: Alarm not applicable (in this case, e.g. there is no SFP for inputs A and B, so all alarms associated with them appear black).

The **Card LED**, **Overall alarm** and **GSM contribution** columns contain pulldown lists that allow the level of contribution of each individual alarm to the alarm named in the column heading to be set. Click on the alarm status in either of these columns to show the status options that are available, then click on one to select it. If no options appear, the alarm is not user-configurable



Alarm Configuration for FIO-911-4T [slot: 5]

Status / Name	Card LED	Overall alarm	GSM contribution	Log events
FIO-911-4T				
	Set all	Set all	Set all	
IN A SIGNAL STATUS	N/A	Critical	Critical	<input checked="" type="checkbox"/>
IN B SIGNAL STATUS	N/A	Critical	Critical	<input checked="" type="checkbox"/>
IN C SIGNAL STATUS	N/A	Critical	Critical	<input checked="" type="checkbox"/>
IN D SIGNAL STATUS	N/A	Critical	Critical	<input checked="" type="checkbox"/>
IN A NO LOCK	Minor	Critical	Critical	<input checked="" type="checkbox"/>
IN B NO LOCK	Minor	Critical	Critical	<input checked="" type="checkbox"/>
IN C NO LOCK	Minor	Critical	Critical	<input checked="" type="checkbox"/>
IN D NO LOCK	Minor	Critical	Critical	<input checked="" type="checkbox"/>
IN A NO SIGNAL	Critical	Critical	Critical	<input checked="" type="checkbox"/>
IN B NO SIGNAL	Critical	Critical	Critical	<input checked="" type="checkbox"/>
IN C NO SIGNAL	Critical	Critical	Critical	<input checked="" type="checkbox"/>
IN D NO SIGNAL	Critical	Critical	Critical	<input checked="" type="checkbox"/>
SFP1 A TEMPERATURE	Critical	Critical	Critical	<input checked="" type="checkbox"/>
SFP1 B TEMPERATURE	Critical	Critical	Critical	<input checked="" type="checkbox"/>
SFP2 C TEMPERATURE	Critical	Critical	Critical	<input checked="" type="checkbox"/>
SFP2 D TEMPERATURE	Critical	Critical	Critical	<input checked="" type="checkbox"/>
NO SFP1	Critical	Critical	Critical	<input checked="" type="checkbox"/>
NO SFP2	Critical	Critical	Critical	<input checked="" type="checkbox"/>
SFP1 Mismatch	N/A	Critical	Critical	<input checked="" type="checkbox"/>
SFP2 Mismatch	N/A	Critical	Critical	<input checked="" type="checkbox"/>
Card LED	N/A	Passthrough	Passthrough	<input checked="" type="checkbox"/>
Overall	N/A	N/A	Passthrough	<input checked="" type="checkbox"/>

Overall alarm and GSM contribution follow card LED Copy to other cards

OK Apply Cancel Get alarm keys

Overall Alarm

This column allows configuration of the contribution of each individual alarm to the Overall Alarm associated with this card. The Overall Alarm is shown in the upper left corner of the iControl panel, and also appears at the bottom of the Status/Name column.






GSM Contribution

This column allows configuration of the contribution of each individual alarm to the GSM Alarm Status associated with this card. GSM is a dynamic register of all iControl system alarms, and is also an alarm provider for external applications. The possible values for this contribution are related to the Overall alarm contribution:

- If the Overall alarm contribution is selected as Disabled, the GSM alarm contribution can be set to any available value
- If the Overall alarm contribution is selected as any level other than disabled, the GSM contribution is forced to follow the Overall Alarm.

Levels associated with these alarms:

The alarm status list may contain some or all of the following options:

Alarm status	Significance
 Disabled	The alarm makes no contribution (black icon)
 Minor	The alarm is of minor importance (yellow icon)
 Major	The alarm is of major importance (orange icon)
 Critical	The alarm is of critical importance (red icon)
 Passthrough	The alarm exists but has no effect (used for text and composite alarms)

Shortcut: if you click on “Set All” at the top of one of these columns, you will open a pulldown list that lets you assign a level to all alarms in that column simultaneously.

Once the alarms are configured, you may accept the changes or discard them:

Log Events

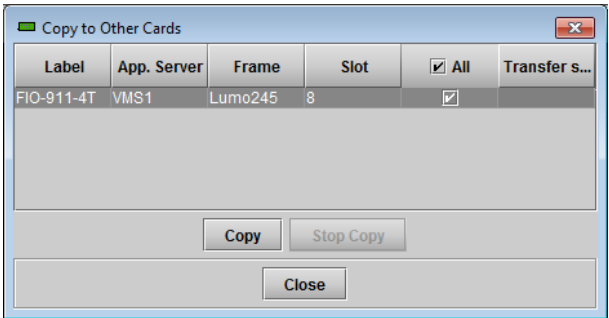
iControl maintains a log of alarm events associated with the card. The log is useful for troubleshooting and identifying event sequences. Click in the checkbox to enable logging of alarm events for each individual alarm.

At the bottom of the window are several other controls:

Copy to other cards

Click this button to open a panel that allows the alarm configuration set for this card to be copied into other FIO-911 cards in this or other frames.

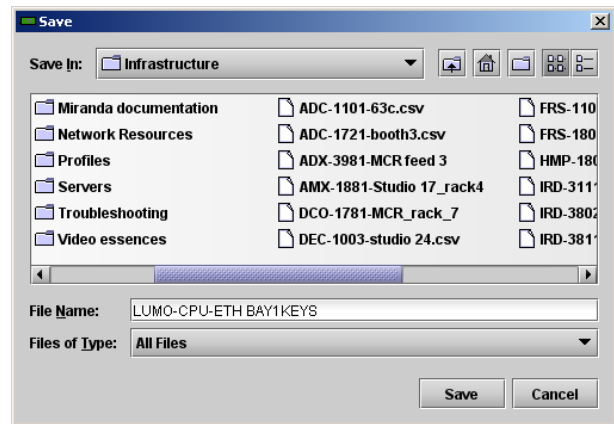
Select one or more destination cards from the list in the window by clicking in the checkboxes, or all of them by clicking in the *All* checkbox



Get alarm keys

Click this button to open a save dialog where you can save a file containing a list of all alarms on this card and their current values, along with an Alarm Key for each. The alarm keys are useful for system integration and troubleshooting.

The file is saved in .csv format



OK, Apply, Cancel

- **OK** accepts the settings and closes the window once the controller confirms that there are no errors.
- **Apply** accepts the settings, but leaves the window open
- **Cancel** closes the window without applying any changes, and leaves the previous settings intact.

Identification and Information

Click the *Info* button

The FIO-911 card is accessible on a network, and must be identifiable in order to function in the iControl environment. The identification data is entered in the iControl INFO control panel. This panel also shows other data that is not user-adjustable.

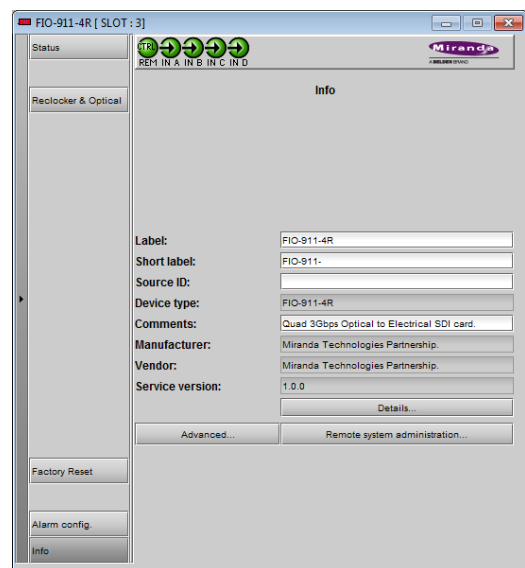
You can enter the following information by clicking and typing in the data box:

Label: allows the user to define the label that identifies this device when it appears in iControl applications

Short Label: allows the user to define the short-form label for iControl (8 characters).

Source ID: type a descriptive name for this FIO-911 card.

Comments: type any desired text



The remaining data boxes show manufacturing information about this card.

Three buttons in the panel give access to other information:

Details: Reports the Firmware version, service version, and panel version for this card

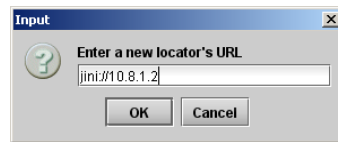
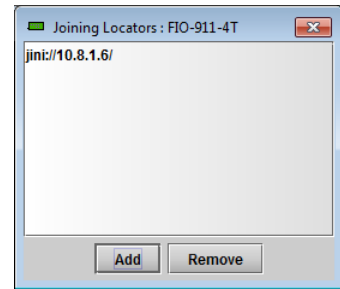
Advanced: Shows the Miranda LongID for this card. The Miranda LongID is the address of this FIO-911 card in the iControl network.

Remote System Administration: Opens the Joining Locators data box, which lists remote lookup services to which this FIO-911 is registered.

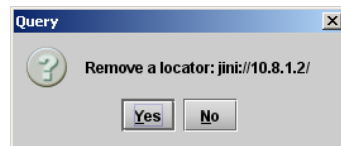
Add: Force the iControl service for this FIO-901 to register itself on a user-specified Jini lookup service, using the following syntax in the data box:

jini://<ip_address>

where <ip_address> is the ip address of the server running the lookup service, e.g.:



Remove: select one of the services listed in the window by clicking on it, and click *Remove* to open a query box allowing you to delete it from the window.



Specifications

ELECTRICAL INPUT

Signal:	3G/HD/SD SDI SMPTE 424M, 292M, and 259M-C compliant Supported data rates: Reclocker bypassed – all rates between 19.4 Mbps and 3 Gbps Reclocked data at 270, 1483.5, 1485, 2967, 2970 Mbps EN50 83-9 DVB-ASI 270 Mbps
Return loss:	15 dB for up to 1.5 GHz 10 dB from 1.5 GHz to 3 GHz
Cable length:	100m at 3G 150m at HD 350m at SD

ELECTRICAL OUTPUT

Signal:	3G/HD/SD SDI SMPTE 424M, 292M, and 259M-C compliant Supported data rates: Reclocker bypassed – all rates between 19.4 Mbps and 3 Gbps Reclocked data at 270, 1483.5, 1485, 2967, 2970 Mbps EN50 83-9 DVB-ASI 270 Mbps
Return loss:	15 dB for up to 1.5 GHz 10 dB from 1.5 GHz to 3 GHz
Jitter (wideband):	HD/SD: < 0.2 UI p-p 3G: < 0.3 UI p-p
Rise/Fall time:	HD: 135 ps max., 20% to 80% SD: 400 – 800 ps, 20% to 80%

OPTICAL I/O

Optical:	SMPTE-297M-2006 compliant
3G/HD/SD SDI:	SMPTE-424M SMPTE-292M and SMPTE-259M-C Compliant

RX CHANNEL (PATHOLOGICAL BITSTREAM)

Sensitivity between 1260 and 1610 nm:	SD, HD and 3 Gbps: -22 dBm
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Tx CHANNEL (1310 nm)

Transmit power:	-5 dBm to 0 dBm
Laser type:	Fabry-Perot

Tx CHANNEL (CWDM)

Transmit power:	0 dBm to +4 dBm
Laser type:	DFB (Distributed Feedback)

PROCESSING PERFORMANCE

Signal path:	10 bits
Latency:	< 6 ns

Power:	< 4W
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SFP Modules

Chapter 6 presents information regarding the use of SFP modules in LUMO-series cards.

Topics

<i>Introduction</i>	page 53
<i>Cautions and Warnings</i>	page 53
<i>Installing an SFP module</i>	page 54
<i>Connecting the fiber optic cables</i>	page 54
<i>Removing the fiber optic cables</i>	page 55
<i>Removing an SFP module</i>	page 55
<i>Keep the connection clean!</i>	page 56

Introduction

The LUMO series cards incorporate a fiber optic interface. The interface consists of two parts:

- Sockets on the front panel into which SFP interface modules are plugged
- SFP (Small Form-factor Pluggable) modules into which the optical fibers are plugged, and which incorporate the optical/electrical interface

Cautions and Warnings



SFP Transmitter modules contain a class 1 laser, which emits invisible radiation whenever the module is powered up. Because the SFP is hot-swappable, the module may be powered up as soon as it is installed.

DO NOT LOOK INTO AN OPERATING SFP MODULE'S CONNECTORS, AS EYE DAMAGE MAY RESULT.



The SFP module is sensitive to electrostatic discharge (ESD). It is recommended that you use an ESD-preventive wrist strap grounded to the Lumo chassis while handling the SFP module.



SFP modules are subject to wear, and their useful lifetime is reduced each time they are inserted or removed. Do not remove them more often than absolutely necessary.



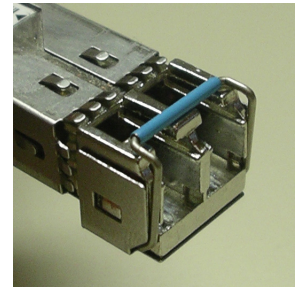
Never remove or install an SFP module with the fiber optic cables connected. Damage to the cables could result.



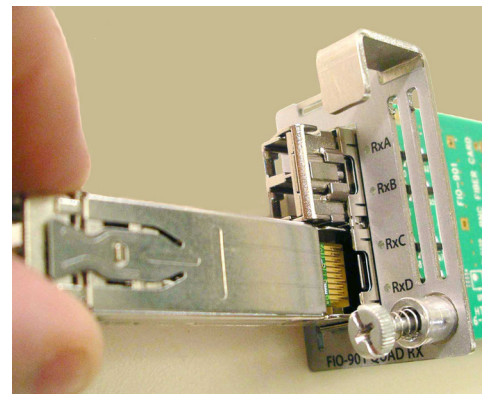
The presence of dust and debris can seriously degrade the performance of an optical interface. It is recommended that you insert a dust plug into the SFP module whenever a fiber optic cable is not connected.

Installing an SFP module

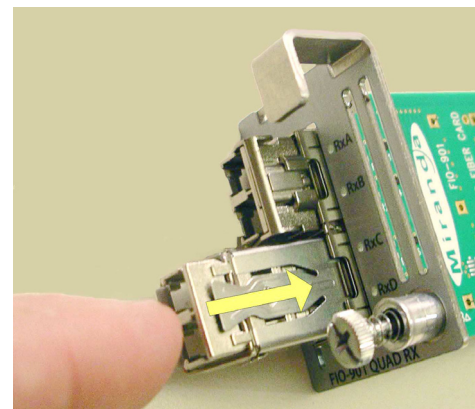
- 1 Make sure that the bale clasp lever is in the closed position



- 2 Position the SFP module so that the recessed slot is lined up with the tab side of the socket.



- 3 Slide the module straight into the socket, and push gently until it clicks into position.



Connecting the fiber optic cables

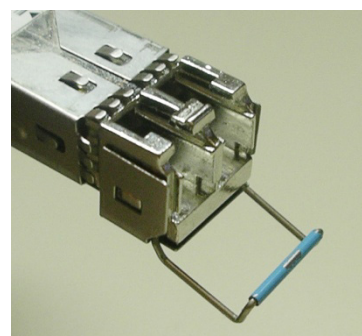
- 1 Remove the dust plug from the SFP module if present
- 2 Verify that the exposed end of the optical fiber in the LC connector is clean
- 3 Carefully remove any debris if necessary.
- 4 Plug the LC-terminated fiber optic cable into the SFP module

Removing the fiber optic cables

- 1 Grasp the LC fiber optic connector that is plugged into the SFP module, and pull it straight out to disengage the optical fiber from the SFP.
 - Never pull the fiber optic cable itself, as catastrophic damage may occur.
- 2 Insert a dust plug into the SFP module.

Removing an SFP module

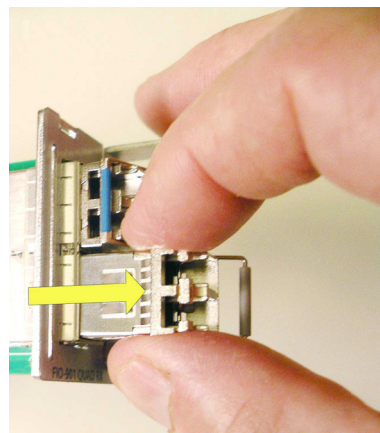
- 1 Move the bale clasp lever to the open position.



- 2 Grasp the SFP module between your thumb and forefinger, and pull it straight out of the slot.

Do NOT pull on the bale clasp lever to remove the module, as it is easily damaged.

You may find that you need to wiggle the module, or perhaps push it into the slot a bit, before it will release and slide out.



- 3 Insert a dust plug into the SFP module.

Keep the connection clean!

The physical interface between two optical fibers is the critical point in a fiber system. The two fibers must be accurately aligned – that’s the job of the connector plugs and bulkheads – and be in intimate contact with no obstructions. That’s the job of the user. The small size of the fiber, and the even smaller size of the fiber core, means that even common dust particles can seriously impair the transfer of light from one fiber to another.

There are a variety of cleaning solutions available to help the fiber user maintain good fiber network performance. For best results, it should be possible for the user to perform a visual inspection of the fiber ends to verify cleanliness.

Miranda strongly urges all users to select a cleaning method that meets their needs, and to use it rigorously and consistently.

A few tips:

- Always use a dust plug in an empty fiber receptacle, to keep airborne particles from settling on the fiber end
- Keep your dust plugs clean – a sealed container is a must.
- Always follow the instructions carefully when cleaning – abrasions on the fiber ends can degrade system performance significantly
- A visual inspection will ensure that particles and liquid residue have been removed

If it’s still dirty, clean it again!



Grass Valley Technical Support

For technical assistance, contact our international support center, at 1-800-547-8949 (US and Canada) or +1 530 478 4148.

To obtain a local phone number for the support center nearest you, please consult the Contact Us section of Grass Valley's website (www.grassvalley.com).

An online form for e-mail contact is also available from the website.

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