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JUPITER GPIO-4848

GENERAL PURPOSE INTERFACE UNIT

Operation Manual

www.grassvalley.com

071891300
SEPTEMBER 2013

CERTIFICATE

Certificate Number: 510040.001

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Grass Valley USA, LLC and its Grass Valley Affiliates

Headquarters:

400 Providence Mine Road
Nevada City, CA 95945
United States

15655 SW Greystone Ct.
Beaverton, OR 97006
United States

Kapittelweg 10
4827 HG Breda
The Nederlands

2300 So. Decker Lake Blvd.
Salt Lake City, UT 84119
United States

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ISO 9001:2008

Scope:
The design, manufacture and support of video and audio hardware and software products and related systems.

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4377 County Line Road
Chalfont, PA 18914
Ph: (215)997-4519
Fax: (215)997-3809
CRT 001 042108

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Contacting Grass Valley

International Support Centers	**France 24 x 7**	+800 8080 2020 or +33 1 48 25 20 20	**United States/Canada 24 x 7**	+1 800 547 8949 or +1 530 478 4148
Local Support Centers (available during normal business hours)	**Asia**	**Hong Kong, Taiwan, Korea, Macau:** +852 2531 3058 **Indian Subcontinent:** +91 22 24933476 **Southeast Asia/Malaysia:** +603 7492 3033 **Southeast Asia/Singapore:** +65 6379 1313 **China:** +861 0660 159 450 **Japan:** +81 3 5484 6868		
	Australia and New Zealand: +61 1300 721 495			**Central/South America:** +55 11 5509 3443
	Middle East: +971 4 299 64 40 **Near East and Africa:** +800 8080 2020 or +33 1 48 25 20 20			
	Europe	**Belarus, Russia, Tadzikistan, Ukraine, Uzbekistan:** +7 095 2580924 225 **Switzerland:** +41 1 487 80 02 **S. Europe/Italy-Roma:** +39 06 87 20 35 28 **-Milan:** +39 02 48 41 46 58 **S. Europe/Spain:** +34 91 512 03 50 **Benelux/Belgium:** +32 (0) 2 334 90 30 **Benelux/Netherlands:** +31 (0) 35 62 38 42 1 **N. Europe:** +45 45 96 88 70 **Germany, Austria, Eastern Europe:** +49 6150 104 444 **UK, Ireland, Israel:** +44 118 923 0499		

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Grass Valley Web Site

The http://www.grassvalley.com/support web site offers the following:

Online User Documentation — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

FAQ Database — Solutions to problems and troubleshooting efforts can be found by searching our Frequently Asked Questions (FAQ) database.

Software Downloads — Download software updates, drivers, and patches.

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END-OF-LIFE PRODUCT RECYCLING NOTICE

Grass Valley's innovation and excellence in product design also extends to the programs we've established to manage the recycling of our products. Grass Valley has developed a comprehensive end-of-life product take back program for recycle or disposal of end-of-life products. Our program meets the requirements of the European Union's WEEE Directive, the United States Environmental Protection Agency, and U.S. state and local agencies.

Grass Valley's end-of-life product take back program assures proper disposal by use of Best Available Technology. This program accepts any Grass Valley branded equipment. Upon request, a Certificate of Recycling or a Certificate of Destruction, depending on the ultimate disposition of the product, can be sent to the requester.

Grass Valley will be responsible for all costs associated with recycling and disposal, including freight. However, you are responsible for the removal of the equipment from your facility and packing the equipment to make it ready for pickup.

For further information on the Grass Valley product take back system please contact Grass Valley at + 800 80 80 20 20 or +33 1 48 25 20 20 from most other countries. In the U.S. and Canada please call 800-547-8949, and ask to be connected to the EH&S Department. Additional information concerning the program can be found at: www.grassvalley.com/about/environmental-policy

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Preface

About This Manual

This manual is a part of the Jupiter CM-4400 documentation set and provides the hardware installation, software configuration, and operating instructions for the Jupiter CM-4400 Control Module, which only supports the Jupiter AccuSwitch control software. This manual can be accessed through the Jupiter Configuration Editor's Help menu. An electronic version of this manual, as well as the complete documentation set, are also available on the:

- Software and Documentation flash drive provided with this system
- Grass Valley web site

Standard Documentation

The standard documentation set comprises:

- Jupiter CM-4400 AccuSwitch Control System Release Notes
- Jupiter CM-4400 AccuSwitch Control System Installation and Operation Manual
- JEP Series Jupiter/Encore Control Panels Installation Manual
- Jupiter AccuSwitch Soft Panels and Visual Status Display Instruction Manual.
- Jupiter Control System L-S and LCD Series Control Panels Release Notes.
- Jupiter Control System L-S and LCD Series Control Panels Installation and Operating Manual.

Note The documentation set is also available on the Grass Valley web site.

Other Documentation

For any peripheral component information, refer to the that manufacturer's respective support documentation.

Safety Summary

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

WARNING Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. 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.

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING Warning statements identify conditions or practices that may result in personal injury or loss of life.

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

The following symbols may appear on the product:

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 user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.

This is a prompt to note fuse rating when replacing fuse(s). 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.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life:

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

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.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property:

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

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

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they ar not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICS). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Sicherheit – Überblick

Lesen und befolgen Sie die wichtigen Sicherheitsinformationen dieses Abschnitts. Beachten Sie insbesondere die Anweisungen bezüglich Brand-, Stromschlag- und Verletzungsgefahren. Weitere spezifische, hier nicht aufgeführte Warnungen finden Sie im gesamten Handbuch.

WARNUNG **Alle Anweisungen in diesem Handbuch, die das Abnehmen der Geräteabdeckung oder des Gerätegehäuses erfordern, dürfen nur von qualifiziertem Servicepersonal ausgeführt werden. Um die Stromschlaggefahr zu verringern, führen Sie keine Wartungsarbeiten außer den in den Bedienungsanleitungen genannten Arbeiten aus, es sei denn, Sie besitzen die entsprechende Qualifikationen für diese Arbeiten.**

Sicherheit – Begriffe und Symbole

In diesem Handbuch verwendete Begriffe

Sicherheitsrelevante Hinweise können in diesem Handbuch in der folgenden Form auftauchen:

WARNUNG **Warnungen weisen auf Situationen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen.**

VORSICHT Vorsichtshinweise weisen auf Situationen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen oder zum zeitweisen Ausfall wichtiger Komponenten in der Arbeitsumgebung führen können.

Hinweise am Produkt

Die folgenden Hinweise können sich am Produkt befinden:

GEFAHR — Wenn Sie diesen Begriff lesen, besteht ein unmittelbares Verletzungsrisiko.

WARNUNG — Wenn Sie diesen Begriff lesen, besteht ein mittelbares Verletzungsrisiko.

VORSICHT — Es besteht ein Risiko für Objekte in der Umgebung, den Mixer selbst oder andere Ausrüstungskomponenten.

Symbole am Produkt

Die folgenden Symbole können sich am Produkt befinden:

Weist auf eine gefährliche Hochspannung im Gerätegehäuse hin, die stark genug sein kann, um eine Stromschlaggefahr darzustellen.

Weist darauf hin, dass der Benutzer, Bediener oder Servicetechniker wichtige Bedienungs-, Wartungs- oder Serviceanweisungen in den Produkthandbüchern lesen sollte.

Dies ist eine Aufforderung, beim Wechsel von Sicherungen auf deren Nennwert zu achten. Die im Text angegebene Sicherung muss durch eine Sicherung ersetzt werden, die die angegebenen Nennwerte besitzt.

Weist auf eine Schutzerdungsklemme hin, die mit dem Erdungskontakt verbunden werden muss, bevor weitere Ausrüstungskomponenten angeschlossen werden.

Weist auf eine externe Schutzerdungsklemme hin, die als Ergänzung zu einem internen Erdungskontakt an die Erde angeschlossen werden kann.

Weist darauf hin, dass es statisch empfindliche Komponenten gibt, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

Warnungen

Die folgenden Warnungen weisen auf Bedingungen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen:

Gefährliche Spannungen oder Ströme — Schalten Sie den Strom ab, und entfernen Sie ggf. die Batterie, bevor sie Schutzabdeckungen abnehmen, löten oder Komponenten austauschen.

Servicearbeiten nicht alleine ausführen — Führen Sie interne Servicearbeiten nur aus, wenn eine weitere Person anwesend ist, die erste Hilfe leisten und Wiederbelebungsmaßnahmen einleiten kann.

Schmuck abnehmen — Legen Sie vor Servicearbeiten Schmuck wie Ringe, Uhren und andere metallische Objekte ab.

Keine offen liegenden Leiter berühren — Berühren Sie bei eingeschalteter Stromzufuhr keine offen liegenden Leitungen, Komponenten oder Schaltungen.

Richtiges Netzkabel verwenden — Verwenden Sie nur das mitgelieferte Netzkabel oder ein Netzkabel, das den Spezifikationen für dieses Produkt entspricht.

Gerät erden — Schließen Sie den Erdleiter des Netzkabels an den Erdungskontakt an.

Gerät nur mit angebrachten Abdeckungen und Gehäuseseiten betreiben — Schalten Sie dieses Gerät nicht ein, wenn die Abdeckungen oder Gehäuseseiten entfernt wurden.

Richtige Sicherung verwenden — Verwenden Sie nur Sicherungen, deren Typ und Nennwert den Spezifikationen für dieses Produkt entsprechen.

Gerät nur in trockener Umgebung verwenden — Betreiben Sie das Gerät nicht in nassen oder feuchten Umgebungen.

Gerät nur verwenden, wenn keine Explosionsgefahr besteht — Verwenden Sie dieses Produkt nur in Umgebungen, in denen keinerlei Explosionsgefahr besteht.

Hohe Kriechströme — Das Gerät muss vor dem Einschalten unbedingt geerdet werden.

Doppelte Spannungsversorgung kann vorhanden sein — Schließen Sie die beiden Anschlußkabel an getrennte Stromkreise an. Vor Servicearbeiten sind beide Anschlußkabel vom Netz zu trennen.

Zweipolige, neutrale Sicherung — Schalten Sie den Netzstrom ab, bevor Sie mit den Servicearbeiten beginnen.

Fassen Sie das Gerät beim Transport richtig an — Halten Sie das Gerät beim Transport nicht an Türen oder anderen beweglichen Teilen fest.

Gefahr durch mechanische Teile — Warten Sie, bis der Lüfter vollständig zum Halt gekommen ist, bevor Sie mit den Servicearbeiten beginnen.

Vorsicht

Die folgenden Vorsichtshinweise weisen auf Bedingungen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen führen können:

Gerät nicht öffnen — Durch das unbefugte Öffnen wird die Garantie ungültig.

Richtige Spannungsquelle verwenden — Betreiben Sie das Gerät nicht an einer Spannungsquelle, die eine höhere Spannung liefert als in den Spezifikationen für dieses Produkt angegeben.

Gerät ausreichend belüften — Um eine Überhitzung des Geräts zu vermeiden, müssen die Ausrüstungskomponenten entsprechend den Installationsan-

weisungen belüftet werden. Legen Sie kein Papier unter das Gerät. Es könnte die Belüftung behindern. Platzieren Sie das Gerät auf einer ebenen Oberfläche.

Antistatische Vorkehrungen treffen — Es gibt statisch empfindliche Komponenten, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

CF-Karte nicht mit einem PC verwenden — Die CF-Karte ist speziell formatiert. Die auf der CF-Karte gespeicherte Software könnte gelöscht werden.

Gerät nicht bei eventuellem Ausrüstungsfehler betreiben — Wenn Sie einen Produktschaden oder Ausrüstungsfehler vermuten, lassen Sie die Komponente von einem qualifizierten Servicetechniker untersuchen.

Kabel richtig verlegen — Verlegen Sie Netzkabel und andere Kabel so, dass Sie nicht beschädigt werden. Stützen Sie schwere Kabelbündel ordnungsgemäß ab, damit die Anschlüsse nicht beschädigt werden.

Richtige Netzkabel verwenden — Wenn Netzkabel mitgeliefert wurden, erfüllen diese alle nationalen elektrischen Normen. Der Betrieb dieses Geräts mit Spannungen über 130 V AC erfordert Netzkabel, die NEMA-Konfigurationen entsprechen. Wenn internationale Netzkabel mitgeliefert wurden, sind diese für das Verwendungsland zugelassen.

Richtige Ersatzbatterie verwenden — Dieses Gerät enthält eine Batterie. Um die Explosionsgefahr zu verringern, prüfen Sie die Polarität und tauschen die Batterie nur gegen eine Batterie desselben Typs oder eines gleichwertigen, vom Hersteller empfohlenen Typs aus. Entsorgen Sie gebrauchte Batterien entsprechend den Anweisungen des Batterieherstellers.

Das Gerät enthält keine Teile, die vom Benutzer gewartet werden können. Wenden Sie sich bei Problemen bitte an den nächsten Händler.

Consignes de sécurité

Il est recommandé de lire, de bien comprendre et surtout de respecter les informations relatives à la sécurité qui sont exposées ci-après, notamment les consignes destinées à prévenir les risques d'incendie, les décharges électriques et les blessures aux personnes. Les avertissements complémentaires, qui ne sont pas nécessairement repris ci-dessous, mais présents dans toutes les sections du manuel, sont également à prendre en considération.

AVERTISSEMENT **Toutes les instructions présentes dans ce manuel qui concernent l'ouverture des capots ou des logements de cet équipement sont destinées exclusivement à des membres qualifiés du personnel de maintenance. Afin de diminuer les risques de décharges électriques, ne procédez à aucune intervention d'entretien autre que celles contenues dans le manuel de l'utilisateur, à moins que vous ne soyez habilité pour le faire.**

Consignes et symboles de sécurité

Termes utilisés dans ce manuel

Les consignes de sécurité présentées dans ce manuel peuvent apparaître sous les formes suivantes:

AVERTISSEMENT **Les avertissements signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales.**

ATTENTION Les mises en garde signalent des conditions ou des pratiques susceptibles d'occasionner un endommagement à l'équipement ou aux installations, ou de rendre l'équipement temporairement non opérationnel, ce qui peut porter préjudice à vos activités.

Signalétique apposée sur le produit

La signalétique suivante peut être apposée sur le produit:

DANGER — risque de danger imminent pour l'utilisateur.

AVERTISSEMENT — Risque de danger non imminent pour l'utilisateur.

MISE EN GARDE — Risque d'endommagement du produit, des installations ou des autres équipements.

Symboles apposés sur le produit

Les symboles suivants peut être apposés sur le produit:

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.

Signale que l'utilisateur, l'opérateur ou le technicien de maintenance doit faire référence au(x) manuel(s) pour prendre connaissance des instructions d'utilisation, de maintenance ou d'entretien.

Il s'agit d'une invite 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 protection de mise à la masse qui doit être raccordée correctement avant de procéder au raccordement des autres équipements.

Identifie une borne de protection de mise à la masse qui peut être connectée en tant que borne de mise à la masse 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.

Avertissements

Les avertissements suivants signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales:

Présence possible de tensions ou de courants dangereux — Mettez hors tension, débranchez et retirez la pile (le cas échéant) avant de déposer les couvercles de protection, de défaire une soudure ou de remplacer des composants.

Ne procédez pas seul à une intervention d'entretien — Ne réalisez pas une intervention d'entretien interne sur ce produit si une personne n'est pas présente pour fournir les premiers soins en cas d'accident.

Retirez tous vos bijoux — Avant de procéder à une intervention d'entretien, retirez tous vos bijoux, notamment les bagues, la montre ou tout autre objet métallique.

Évitez tout contact avec les circuits exposés — Évitez tout contact avec les connexions, les composants ou les circuits exposés s'ils sont sous tension.

Utilisez le cordon d'alimentation approprié — Utilisez exclusivement le cordon d'alimentation fourni avec ce produit ou spécifié pour ce produit.

Raccordez le produit à la masse — Raccordez le conducteur de masse du cordon d'alimentation à la borne de masse de la prise secteur.

Utilisez le produit lorsque les couvercles et les capots sont en place — N'utilisez pas ce produit si les couvercles et les capots sont déposés.

Utilisez le bon fusible — Utilisez exclusivement un fusible du type et du calibre spécifiés pour ce produit.

Utilisez ce produit exclusivement dans un environnement sec — N'utilisez pas ce produit dans un environnement humide.

Utilisez ce produit exclusivement dans un environnement non explosible — N'utilisez pas ce produit dans un environnement dont l'atmosphère est explosible.

Présence possible de courants de fuite — Un raccordement à la masse est indispensable avant la mise sous tension.

Deux alimentations peuvent être présentes dans l'équipement — Assurez vous que chaque cordon d'alimentation est raccordé à des circuits de terre séparés. Débranchez les deux cordons d'alimentation avant toute intervention.

Fusion neutre bipolaire — Débranchez l'alimentation principale avant de procéder à une intervention d'entretien.

Utilisez les points de levage appropriés — Ne pas utiliser les verrous de la porte pour lever ou déplacer l'équipement.

Évitez les dangers mécaniques — Laissez le ventilateur s'arrêter avant de procéder à une intervention d'entretien.

Mises en garde

Les mises en garde suivantes signalent les conditions et les pratiques susceptibles d'occasionner des endommagements à l'équipement et aux installations:

N'ouvrez pas l'appareil — Toute ouverture prohibée de l'appareil aura pour effet d'annuler la garantie.

Utilisez la source d'alimentation adéquate — Ne branchez pas ce produit à une source d'alimentation qui utilise une tension supérieure à la tension nominale spécifiée pour ce produit.

Assurez une ventilation adéquate — Pour éviter toute surchauffe du produit, assurez une ventilation de l'équipement conformément aux instructions d'installation. Ne déposez aucun document sous l'appareil — ils peuvent gêner la ventilation. Placez l'appareil sur une surface plane.

Utilisez des procédures antistatiques - Les composants sensibles à l'électricité statique présents dans l'équipement sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.

N'utilisez pas la carte CF avec un PC — La carte CF a été spécialement formatée. Le logiciel enregistré sur la carte CF risque d'être effacé.

N'utilisez pas l'équipement si un dysfonctionnement est suspecté — Si vous suspectez un dysfonctionnement du produit, faites inspecter celui-ci par un membre qualifié du personnel d'entretien.

Acheminez les câbles correctement — Acheminez les câbles d'alimentation et les autres câbles de manière à ce qu'ils ne risquent pas d'être endommagés. Supportez correctement les enroulements de câbles afin de ne pas endommager les connecteurs.

Utilisez les cordons d'alimentation adéquats — Les cordons d'alimentation de cet équipement, s'ils sont fournis, satisfont aux exigences de toutes les réglementations régionales. L'utilisation de cet équipement à des tensions dépassant les 130 V en c.a. requiert des cordons d'alimentation qui satisfont aux exigences des configurations NEMA. Les cordons internationaux, s'ils sont fournis, ont reçu l'approbation du pays dans lequel l'équipement est utilisé.

Utilisez une pile de remplacement adéquate — Ce produit 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 instructions du fabricant des piles.

Cette unité ne contient aucune partie qui peut faire l'objet d'un entretien par l'utilisateur. Si un problème survient, veuillez contacter votre distributeur local.

Regulatory Notices

Certifications and Compliances

FCC Emission Control

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. Changes or modifications not expressly approved by Grass Valley can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'emet pas de bruits radioélectriques dépassant les limites applicables aux appareils numeriques de la classe A préscrites dans le Règlement sur le brouillage radioélectrique édicte par le ministère des Communications du Canada.

EN55022 Class A Warning

In a domestic environment, products that comply with Class A may cause radio interference in which case the user may be required to take adequate measures.

Canadian Certified Power Cords

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Canadian Certified AC Adapter

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

Laser Compliance

Laser Safety Requirements

The device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering from its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21CFR Chapter 1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to recertify and reidentify this product in accordance with provisions of 21CFR subchapter J for distribution within the U.S.A., and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the “Laser Product Performance Standard,” Code of Federal Regulation (CFR), Title 21, Subchapter J.

The International Electrotechnical Commission (IEC) Standard 825, “Radiation of Laser Products, Equipment Classification, Requirements and User’s Guide,” governs laser products outside the United States. Europe and member nations of the European Free Trade Association fall under the jurisdiction of the Comite European de Normalization Electrotechnique (CENELEC).

For the CDRH: The radiant power is detected through a 7 mm aperture at a distance of 200 mm from the source focused through a lens with a focal length of 100 mm.

For IEC compliance: The radiant power is detected through a 7 mm aperture at a distance of 100 mm from the source focused through a lens with a focal length of 100 mm.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation. This device has been tested and found to comply with FCC Part 15 Class B limits for a digital device when tested with a representative laser-based fiber optical system that complies with ANSI X3T11 Fiber Channel Standard.

Certifications:

Category	Standard	Designed/tested for compliance with:
Safety	ANSI / UL60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (ANSI/UL 60950-1, First Edition, Dated April 1, 2003, with revision through and including November 26, 2003.)
	IEC 60950	"Standard for Safety for Information Technology Equipment - Safety - Part 1: General Requirements", (IEC 60950-1, First Edition, 2001, Corrigendum 1:10-2002)
	CAN/CSA C22.2, No. 60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (CAN/CSA-C22.2 No. 60950-1-03. First Edition Dated April 1, 2003, with revisions through and including November 26, 2003)
	EN60950	Safety of Information Technology Equipment, including Electrical Business Equipment.
	2006/95/EC	Low Voltage Directive
EMI	EMC Directive 2004/108/EC via EN 55103-1 and 2	Audio, Video and Entertainment Lighting Control for the European Community.
	EN 55103-1 standards	Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1 Emissions, Environment E1/E2 EN 55022: Class A Radiated and Conducted Emissions EN 61000-3-2: Power Line Harmonic Emissions, Radiated Magnetic Field Emissions, Peak Inrush Current
	EN55103-2 standards	Electromagnetic compatibility--Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 2 Immunity, Environment E1/E2 EN 50082-1: Immunity EN 61000-4-2: Electrostatic Discharge "ESD" Immunity EN 61000-4-3: Radiated RF Electromagnetic Field Immunity EN 61000-4-4: Electrical Fast Transient/Burst "EFT" Immunity EN 61000-4-5: Surge Immunity EN 61000-4-6: Conducted RF Immunity EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Annex A - Radiated Magnetic Field Immunity Note: This only applies to assemblies sensitive to magnetic fields
	US FCC Class A Canada FCC Industry Canada	CISPR Pub. 22 (1985)
	Australia & New Zealand:	AS/NZS CISPR 22

IMPORTANT NOTE TO WRITERS - SEE THE FOLLOWING PARAGRAPHS AND DELETE THIS TEXT BEFORE PUBLICATION.

THE INFORMATION IN THE CERTIFICATION TABLES ABOVE MUST BE REVIEWED TO CONFIRM THE PROPER COMPLIANCE NOTICES ARE INCLUDED. STANDARDS MAY HAVE CHANGED SINCE THIS BOILERPLATE INFORMATION WAS DRAFTED. REGULATORY COMPLIANCE IS ESTABLISHED WHEN THE PRODUCT IS RELEASED THE FIRST TIME. THAT COMPLIANCE LEVEL IS RETAINED UNLESS THE PRODUCT OR MARKET CHANGES IN SOME WAY THAT REQUIRES NEW COMPLIANCE TESTING. DO NOT BLINDLY REPLACE INFORMATION IN OLDER MANUALS WITH THIS BOILERPLATE INFORMATION. CHECK WITH THE PRODUCT MANAGER TO CONFIRM WHAT NOTICES ARE REQUIRED.

SOME OLDER PRODUCTS (KAYAK DD FOR EXAMPLE) MAY REQUIRE OLDER “UL1419” SAFETY INFORMATION. THE INFORMATION BELOW REPLACES THE “ANSI/UL60950” SAFETY INFORMATION LISTED AS THE FIRST ITEM IN THE TABLE ABOVE FOR THESE OLD PRODUCTS.

Category	Standard	Designed/tested for compliance with:
Safety	UL1419	Professional Video and Audio Equipment

ESD Protection

Electronics today are more susceptible to electrostatic discharge (ESD) damage than older equipment. Damage to equipment can occur by ESD fields that are smaller than you can feel. Implementing the information in this section will help you protect the investment that you have made in purchasing Grass Valley equipment. This section contains Grass Valley's recommended ESD guidelines that should be followed when handling electrostatic discharge sensitive (ESDS) items. These minimal recommendations are based on the information in the *Sources of ESD and Risks* area. The information in *Grounding Requirements for Personnel* on page 25 is provided to assist you in selecting an appropriate grounding method.

Recommended ESD Guidelines

Follow these guidelines when handling Grass Valley equipment:

- Only trained personnel that are connected to a grounding system should handle ESDS items.
- Do not open any protective bag, box, or special shipping packaging until you have been grounded.

Note When a Personal Grounding strap is unavailable, as an absolute minimum, touch a metal object that is touching the floor (for example, a table, frame, or rack) to discharge any static energy before touching an ESDS item.

- Open the anti-static packaging by slitting any existing adhesive tapes. Do not tear the tapes off.
- Remove the ESDS item by holding it by its edges or by a metal panel.
- Do not touch the components of an ESDS item unless it is absolutely necessary to configure or repair the item.
- Keep the ESDS work area clear of all nonessential items such as coffee cups, pens, wrappers and personal items as these items can discharge static. If you need to set an ESDS item down, place it on an anti-static mat or on the anti-static packaging.

Sources of ESD and Risks

The following information identifies possible sources of electrostatic discharge and can be used to help establish an ESD policy.

Personnel

One of the largest sources of static is personnel. The static can be released from a person's clothing and shoes.

Environment

The environment includes the humidity and floors in a work area. The humidity level must be controlled and should not be allowed to fluctuate over a broad range. Relative humidity (RH) is a major part in determining the level of static that is being generated. For example, at 10% - 20% RH a person walking across a carpeted floor can develop 35kV; yet when the relative humidity is increased to 70% - 80%, the person can only generate 1.5kV.

Static is generated as personnel move (or as equipment is moved) across a floor's surface. Carpeted and waxed vinyl floors contribute to static build up.

Work Surfaces

Painted or vinyl-covered tables, chairs, conveyor belts, racks, carts, anodized surfaces, plexiglass covers, and shelving are all static generators.

Equipment

Any equipment commonly found in an ESD work area, such as solder guns, heat guns, blowers, etc., should be grounded.

Materials

Plastic work holders, foam, plastic tote boxes, pens, packaging containers and other items commonly found at workstations can generate static electricity.

Grounding Requirements for Personnel

The information in this section is provided to assist you in selecting a grounding method. This information is taken from ANSI/ESD S20.20-2007 (Revision of ANSI/ESD S20.20-1999).

Table 1. Product Qualification

Personnel Grounding Technical Requirement	Test Method	Required Limits
Wrist Strap System*	ANSI/ESD S1.1 (Section 5.11)	< 3.5 x 10^7 ohm
Flooring / Footwear System – Method 1	ANSI/ESD STM97.1	< 3.5 x 10^7 ohm
Flooring / Footwear System – Method 2 (both required)	ANSI/ESD STM97.1 ANSI/ESD STM97.2	< 10^9 ohm < 100 V

Product qualification is normally conducted during the initial selection of ESD control products and materials. Any of the following methods can be used: product specification review, independent laboratory evaluation, or internal laboratory evaluation.

Table 2. Compliance Verification

Personnel Grounding Technical Requirement	Test Method	Required Limits
Wrist Strap System*	ESD TR53 Wrist Strap Section	< 3.5 x 10^7 ohm
Flooring / Footwear System – Method 1	ESD TR53 Flooring Section and ESD TR53 Footwear Section	< 3.5 x 10^7 ohm
Flooring / Footwear System – Method 2 (both required)	ESD TR53 Flooring Section and ESD TR53 Footwear Section	< 1.0 x 10^9 ohm

* For situations where an ESD garment is used as part of the wrist strap grounding path, the total system resistance, including the person, garment, and grounding cord, must be less than 3.5 x 10^7 ohm.

Section 1

Introduction

In modern broadcasting, the multi-platform delivery and multi-purpose repackaging of materials demand that you master various workflows. Command Center software application makes the implementation of multiple video and audio signal paths easier, more efficient and cost-effective. Command Center provides comprehensive tools to configure, monitor and maintain Grass Valley products and other devices.

You can now take total control over multiple and complex routines. Make your own workflows the way you want it to flow!

For more information on the latest updates and new products, visit the Grass Valley website at www.GrassValley.com.

Key Features

Command Center is a Windows-based application that allows you to:

- Configure a complex workflow in a short space of time.
- Manage and report events using hierarchical system status.
- Control devices via an intuitive and user-friendly graphical interface.
- Maintain a workflow over its lifetime.

Command Center uses Ethernet communication to each devices in your chosen workflow, thus, enable configuring and monitoring devices at local and remote sites. It uses SQL database to record, view and archive historical workflow events and store the user-definable aspects of each device's configuration. This database can also be redeployed for your own requirements via ODBC or similar interface.

Command Center allows you to define up to 64 user-groups. For each groups, you can restrict the access to program functionality and individual settings on specific devices. You can add as many users and assign them to one of these groups, each with their own unique password. This is to ensure Command Center can be used in operations where conditional access is required as well as an administrative tool.

Configuration

Command Center provides you with the tools to configure your worklow with speed and ease. Each device is represented by one or more, graphical dialogue interfaces, which are shown automatically in the Control view when the device is selected. These provides a clear idea of the function and signal flow within the module and the effect the setting has on the signal path.

You can save the configuration of a device as a template file, or to the clipboard, and copy it to other selected devices in the workflow. Use Command Center's Compare function to compare the settings and status of a device of the same type with any differences highlighted. To ease some aspects of configuration and to make monitoring of the system more applicable to each user's particular application, additional data can be added about the location, channel and/or service the device is providing. There is also a free-form notes field for all other critical information.

Monitoring workflow and events

Command Center provides a multitude of ways to let you accurately track events within your workflows. Each device in your workflow is shown in the System view, and displays its current and historical status using an icon. Command Center actively monitors each device to check for its current status. The status of each device is passed to a parent node within the System view and hierarchical status of your complete workflow is shown using a single icon. This is also reflected in the application's optional Status Bar, and in the System Icon Tray, when the application is either obscured or minimized. The System view can be alphanumerically sorted by the network address, user name, card type or one of the user defined data items such as Channel, Service, Room or Bay.

Each event occurring for a device being monitored is logged to the database and shown in the Event Log. A status priority can be assigned to each event to determine whether an alarm or warning action should be triggered. Each state of a device's status can be configured by the system administrator to reflect the severity of the event, plus the method by which the warning or error should be cleared (either manually or automatically on a good event state) allowing the status to really reflect the condition of a users system.

The Event Log window can be filtered using different criteria. Additional user data can be stored with each event, such as the cause/reason for the related warning or error. Command Center allows limits to be set for the size of the Alarm Log table in the SQL database allowing the user to keep historical records for the activity of the system.

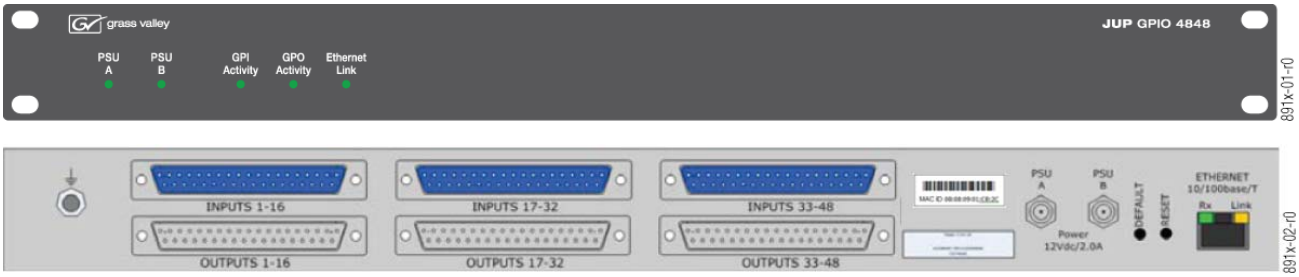
Section 2

Control Panel

Introduction

The Jupiter GPIO-4848 General Purpose Interface Unit is a 1U rack mount panel with 48 GPI inputs and 48 GPI outputs.

Figure 1. Control Panel



Features

All GPIs are optically isolated providing a high degree of isolation from the connected equipment. A local protected low voltage source is available on the input connectors for any GPIs fed from a floating relay contact pair.

All GPO's are provided in the form of a floating/isolated relay contact pair using the common and normally open contacts. 15 of the relay outputs also make the normally closed contact available.

The unit provides a basic hardware interface to a Command Center control system. The general purpose inputs and outputs can be used for a variety of tasks including physical GPI/Os for the Command Center Tally and Mnemonic option or just for very simple interface to third party devices for tasks such as alarm/status monitoring or control.

The unit uses its built-in 100Base-T Ethernet connector to connect to the Command Center server over either a local or wide area network. The unit can be configured to use either DHCP or manually assigned IP addresses. As with other Grass Valley devices when used in manual IP assignment

mode the address, sub-net mask and gateway can be assigned using the configuration mode of the panel.

The unit shows the status for the power supplies, GPI, and GPO activity as well as Ethernet connectivity on the front panel of the device.

The unit is powered with an external AC-DC wall-mount power supply. The rear of the unit has 2 lockable DC power inlets allowing for an optional redundant PSU in critical applications. The unit has an earth or grounding stud by the side of the DC inlets.

Section 3

Installation

IConnecting the D-sub connectors

The connection details of the 37 way D type connectors are shown in the tables on the next page. Ensure that the cables are properly soldered by the trained personnel.

General Purpose Inputs

To activate a GPI input on the unit a voltage drop (4.5V-13Vdc) has to be present across the input (A & B) pins. Internally these pins feed a bidirectional optical isolator which provides an electrical isolation between the input signals applied and the unit. Internal resistors on each pin (330 Ohms, total of 660 Ohms) will limit the current flow through the optical isolator.

If the input to the unit cannot generate a voltage then the local supply voltage (+5Vdc) on pin 19 of each of the input connectors can be used to provide this. This output pin is current limited and will provide no more than 400mA. However even if all 16 inputs use this pin then only 120mA will be drawn.

For instance to connect a normally open mechanical switch to trigger input GPI 1 when it is closed, wire pin 19 of the input connector to one side of the switch, then wire the other side of the switch to pin 1 (Input 1A) of the same connector, then wire pin 20 (Input 1B) to pin 17,18,36 or 37(0V).

General Purpose Outputs

The GPI outputs are connected internally to relay contacts. On the first five GPI outputs of each connector the common, normally open and normally closed contacts are available. On the remaining eleven GPI outputs just the common and normally open contact pairs are available.

The contact pairs can pass a current of up to 2A with a resistive load. For more details see the following specification section.

GPI Input Connectors

This is the 37 pin 'D'-type female (socket) connector pin assignment.

Table 3. GPI Input Connector Pinouts

Inputs 1-16		Inputs 17 - 32		Inputs 33 - 48	
PIN	**SIGNAL**	**PIN**	**SIGNAL**	**PIN**	**SIGNAL**
1	Input 1A	1	Input 17A	1	Input 33A
2	Input 2A	2	Input 18A	2	Input 34A
3	Input 3A	3	Input 19A	3	Input 35A
4	Input 4A	4	Input 20A	4	Input 36A
5	Input 5A	5	Input 21A	5	Input 37A
6	Input 6A	6	Input 22A	6	Input 38A
7	Input 7A	7	Input 23A	7	Input 39A
8	Input 8A	8	Input 24A	8	Input 40A
9	Input 9A	9	Input 25A	9	Input 41A
10	Input 10A	10	Input 26A	10	Input 42A
11	Input 11A	11	Input 27A	11	Input 43A
12	Input 12A	12	Input 28A	12	Input 44A
13	Input 13A	13	Input 29A	13	Input 45A
14	Input 14A	14	Input 30A	14	Input 46A
15	Input 15A	15	Input 31A	15	Input 47A
16	Input 16A	16	Input 32A	16	Input 48A
17	0V (1-16)	17	0V (17-32)	17	0V (33-48)
18	0V (1-16)	18	0V (17-32)	18	0V (33-48)
19	+5V (1-16)	19	+5V (17-32)	19	+5V (33-48)
20	Input 1B	20	Input 17B	20	Input 33B
21	Input 2B	21	Input 18B	21	Input 34B
22	Input 3B	22	Input 19B	22	Input 35B
23	Input 4B	23	Input 20B	23	Input 36B
24	Input 5B	24	Input 21B	24	Input 37B
25	Input 6B	25	Input 22B	25	Input 38B
26	Input 7B	26	Input 23B	26	Input 39B
27	Input 8B	27	Input 24B	27	Input 40B
28	Input 9B	28	Input 25B	28	Input 41B
29	Input 10B	29	Input 26B	29	Input 42B

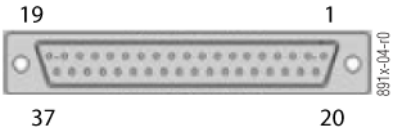
Table 3. GPI Input Connector Pinouts

Inputs 1-16		Inputs 17 - 32		Inputs 33 - 48	
30	Input 11B	30	Input 27B	30	Input 43B
31	Input 12B	31	Input 28B	31	Input 44B
32	Input 13B	32	Input 29B	32	Input 45B
33	Input 14B	33	Input 30B	33	Input 46B
34	Input 15B	34	Input 31B	34	Input 47B
35	Input 16B	35	Input 32B	35	Input 48B
36	0V (1-16)	36	0V (17-32)	36	0V (33-48)
37	0V (1-16)	37	0V (17-32)	37	0V (33-48)

GPI Output Connectors

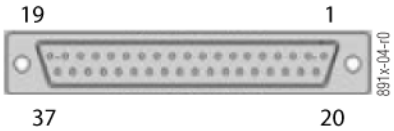
This is the 37 pin 'D'-type male (plug) connector pin assignments.

Table 4. GPI Output Connector Pinouts



Outputs 1-16		Outputs 17 - 32		Outputs 33 - 48	
PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	Output 1 NO	1	Output 17 NO	1	Output 33 NO
2	Output 1 NC	2	Output 17 NC	2	Output 33 NC
3	Output 2 COM	3	Output 18 COM	3	Output 34 COM
4	Output 3 NO	4	Output 19 NO	4	Output 35 NO
5	Output 3 NC	5	Output 19 NC	5	Output 35 NC
6	Output 4 COM	6	Output 20 COM	6	Output 36 COM
7	Output 5 NO	7	Output 21 NO	7	Output 37 NO
8	Output 5 NC	8	Output 21 NC	8	Output 37 NC
9	Output 6 COM	9	Output 22 COM	9	Output 38 COM
10	Output 7 COM	10	Output 23 COM	10	Output 39 COM
11	Output 8 COM	11	Output 24 COM	11	Output 40 COM
12	Output 9 COM	12	Output 25 COM	12	Output 41 COM
13	Output 10 COM	13	Output 26 COM	13	Output 42 COM
14	Output 11 COM	14	Output 27 COM	14	Output 43 COM
15	Output 12 COM	15	Output 28 COM	15	Output 44 COM
16	Output 13 COM	16	Output 29 COM	16	Output 45 COM
17	Output 14 COM	17	Output 30 COM	17	Output 46 COM

Table 4. GPI Output Connector Pinouts



Outputs 1-16		Outputs 17 - 32		Outputs 33 - 48	
18	Output 15 COM	18	Output 31 COM	18	Output 47 COM
19	Output 16 COM	19	Output 32 COM	19	Output 48 COM
20	Output 1 COM	20	Output 17 COM	20	Output 33 COM
21	Output 2 NO	21	Output 18 NO	21	Output 34 NO
22	Output 2 NC	22	Output 18 NC	22	Output 34 NC
23	Output 3 COM	23	Output 19 COM	23	Output 35 COM
24	Output 4 NO	24	Output 20 NO	24	Output 36 NO
25	Output 4 NC	25	Output 20 NC	25	Output 36 NC
26	Output 5 COM	26	Output 21 COM	26	Output 37 COM
27	Output 6 NO	27	Output 22 NO	27	Output 38 NO
28	Output 7 NO	28	Output 23 NO	28	Output 39 NO
29	Output 8 NO	29	Output 24 NO	29	Output 40 NO
30	Output 9 NO	30	Output 25 NO	30	Output 41 NO
31	Output 10 NO	31	Output 26 NO	31	Output 42 NO
32	Output 11 NO	32	Output 27 NO	32	Output 43 NO
33	Output 12 NO	33	Output 28 NO	33	Output 44 NO
34	Output 13 NO	34	Output 29 NO	34	Output 45 NO
35	Output 14 NO	35	Output 30 NO	35	Output 46 NO
36	Output 15 NO	36	Output 31 NO	36	Output 47 NO
37	Output 16 NO	37	Output 32 NO	37	Output 48 NO

Section 4

Configuration

IP Settings

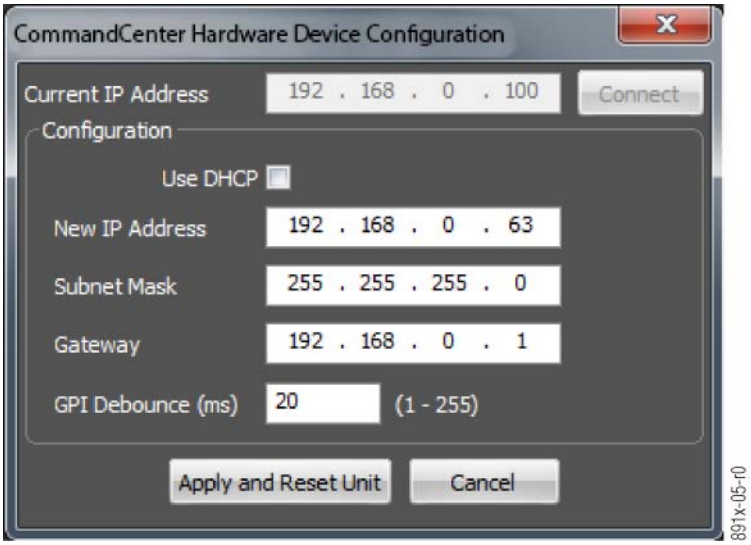
When powering on the Jupiter GPIO 4848 unit for the first time the unit will default its IP address to 192.168.0.100.

In order to change IP settings of the Jupiter GPIO 4848 unit you will need to use Command Center V1.07 (or higher).

The Command Center application will need to be able to communicate with the unit at the default (192.168.0.100) or currently assigned IP address. This may require you to directly connect to the unit using a CAT5 crossover cable and manually assigning an IP address for the PC, or assigning another IP address within the same sub-net (192.168.0.X) to your local IP adapter.

In order to change the IP address of the unit select the Engineering->Configure Command Center Hardware option under the View menu. This will present a dialog as shown in Table 2.

Figure 2. Device Configuration



When the Current IP Address field is correct, press the 'Connect' button to read back the current settings from the unit. If the application communicated with the unit then the fields for the New IP Address, Use DHCP, Subnet mask, Gateway IP address and GPI de-bounce time will reflect the settings of the unit and will be enabled for editing.

When the desired settings have been given, press the Apply and Reset Unit button to write these settings to the unit. The unit will then re-boot and will appear on the network at the desired IP address.

In order to default the unit back to its initial settings there is a recessed default switch on the rear of the unit. If this is pressed for 5 seconds while either the unit is powered on, or the recessed reset button is pressed then the unit will clear down the statically stored settings to the values listed in Table 5.

Table 5. Default Values

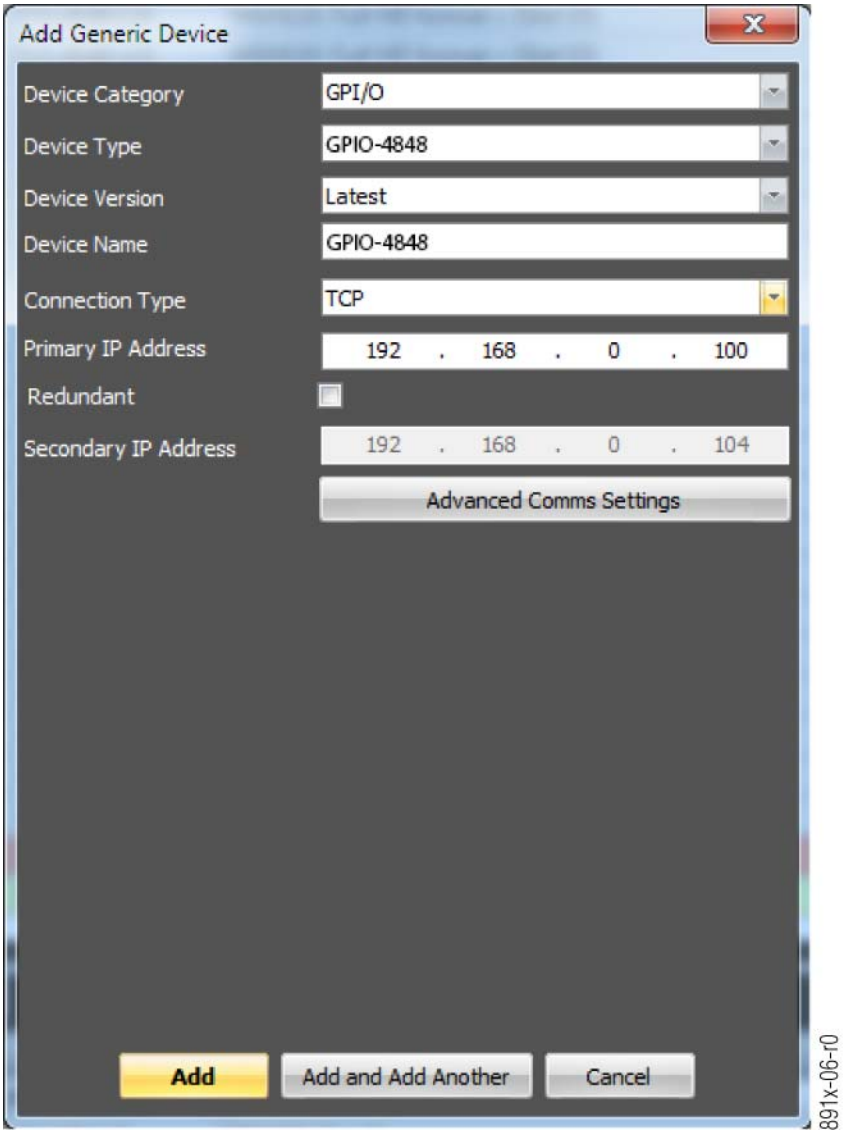
DHCP Mode:	off (manually assigned IP
IP Address:	192.168.0.100
Sub-net mask:	255.255.255.0
Gateway IP Address:	192.168.0.1
GPI de-bounce time:	5 msec

Adding the Jupiter GPIO 4848

On the correct IP address has been given, the device will need to be added to the Command Center system in order for it to be used within the application.

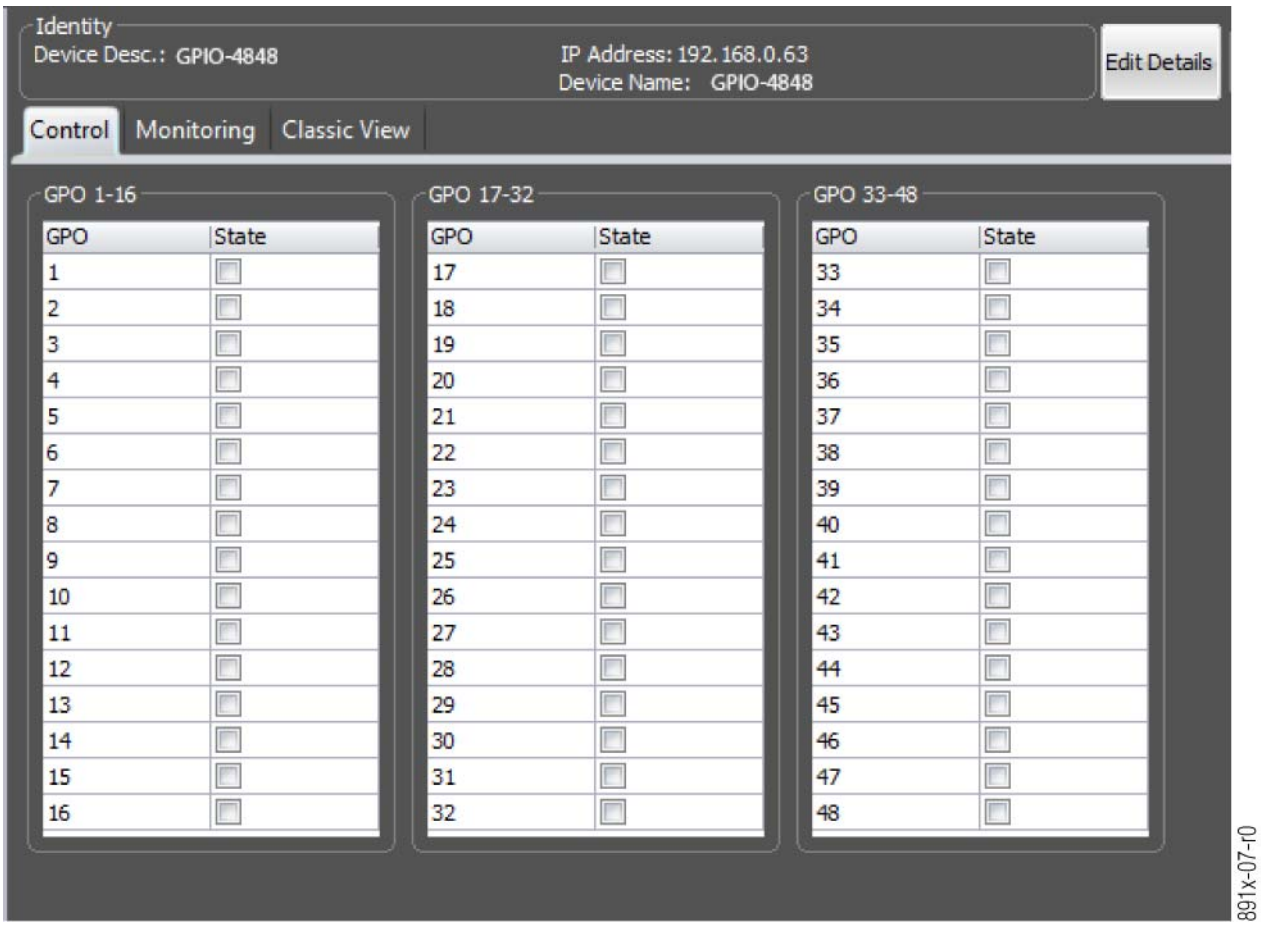
In order to use a Jupiter GPIO 4848 you will need to be running V1.07 or later. To add the unit go to the Network menu and choose the Add Generic Device option, from the Device Category selection choose the 'GPI/O' setting and Jupiter GPIO 4848 from the Device type selection. Then select the configured IP address and suitable Device name for the unit and finally press the Add button (Figure 3).

Figure 3. Generic Device



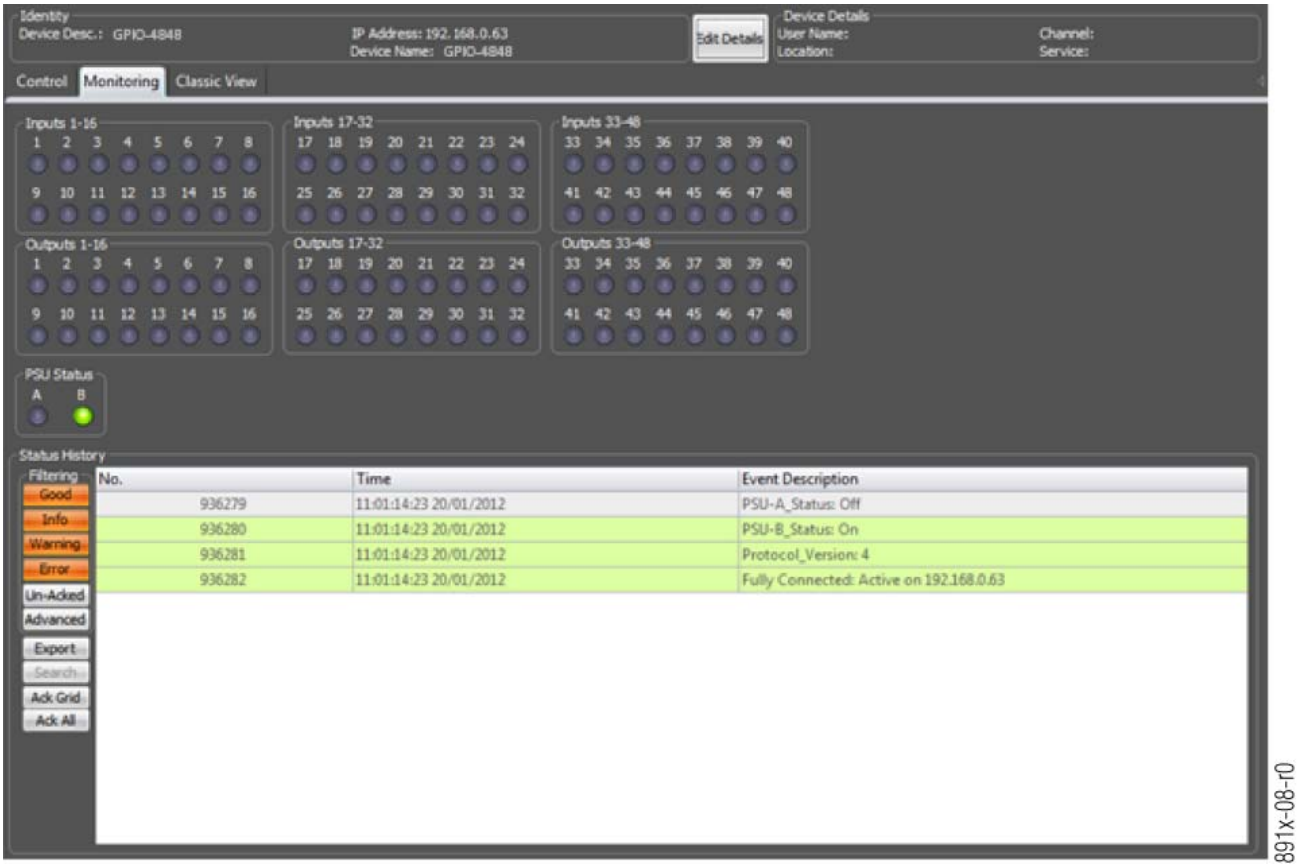
When the unit is on-line and selected in the System View the Device View will allow control of the GP outputs of the unit as shown in Figure 4.

Figure 4. GP Outputs



The Monitoring tab, in the same way as all other devices within Command Center, shows a historical log of the status events for this unit along with the status of the GP inputs and PSUs. Figure 5 displays the Monitoring tab.

Figure 5. Monitoring Tab



Configuring Functionality

The Jupiter GPIO 4848 is a 'generic' device in the system and can be used by the Command Center cost options (Panel Viewer, Tally Manager) to trigger GP outputs and any event within the Command Center system.

The Jupiter GPIO 4848 device can be used as a basic status detection for third party devices, for this to be used the Status severities of the unit will need to be configured using the Generic Device Status Severities dialog which can be found in the Configuration->Status Severities menu within Command Center.

For more information on either of these topics please consult the Command Center on-line help file.

Section 5

Specifications

Dimensions	Details
Height	45mm (1.73”) (1RU)
Width (including front panel)	484mm (19”)
Depth (including front panel and DC connector)	195mm (7.67”)
Width (excluding front panel)	450mm (17.71”)
Depth (excluding front panel, including DC connector)	175mm (6.88”)

Weight	Details
Weight (excluding power adapter)	~ 2.5 kg

Power	Details
AC PSU	100-240V AC - 1.2A, Frequency: 50/60 Hz
Panel input	12V DC - 2.0A

General Purpose Inputs	Details
Input Voltage range	5-12Vdc +/- 10% (4.5V - 13.2V)
Typical input current	5mA (5Vdc input)

General Purpose Outputs	Details
Maximum Voltage	220Vdc, 250Vac
Maximum Current	2 A
Max. Switching capacity	60W
Contact resistance	<70mOhms
Expected life	> 5 x 10? operations

Local Output Voltage (Input connectors pin 19)	Details
Voltage	5Vdc +/- 10%
Maximum current	400mA

Miscellaneous	Details
Operating temperature	0° to 40° C environmental temperature (32° to 104° F)
Storage temperature	-20° to 70° C environmental temperature (-4° to 158° F)