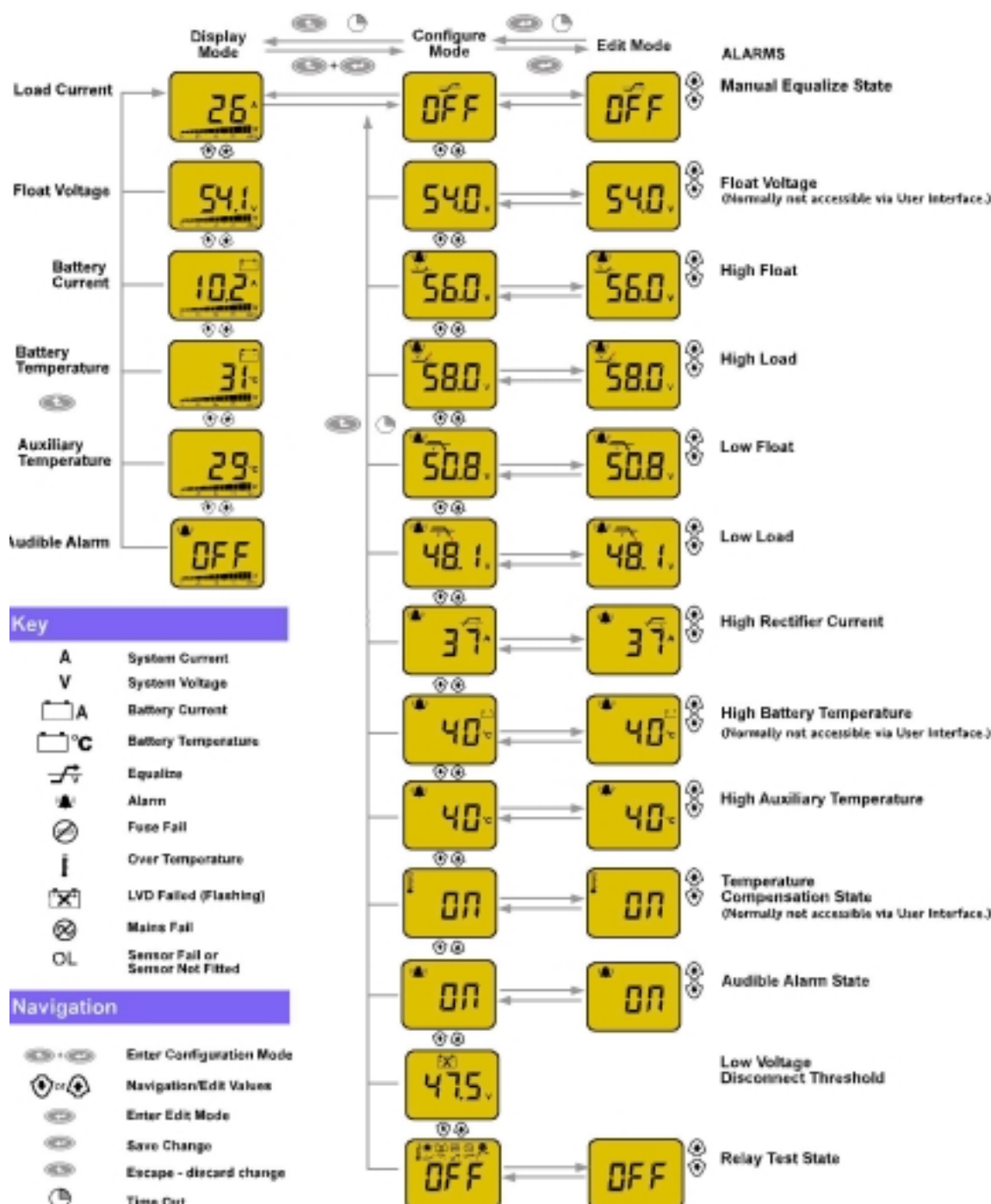


# User Interface Menu Structure



**NOTE: Battery Tray LED Indicators are printed on the inside back cover.**



# ***Intelligent Network Energy Source Installation Guide***

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## Purpose

This guide provides instructions to help you install and commission Intergy Intelligent Network Energy Source (INES) secure 48 V DC standby power systems.

## Audience

This guide is intended for use by IT professionals who have a sound working knowledge of the following.

- Safe working practices
- Local safety and electrical wiring standards and regulations

## Scope

This guide covers installation and commissioning of the intelligent NES power system and extension battery trays.

It does not cover how to:

- Change the pre-configured NES configuration values
- Operate the various NES system control functions
- Connect auxiliary alarms

For full details on changing the pre-configured NES configuration values, refer to the *User Interface Menu Structure* (on the inside front cover) or *DCTools* online help.

For full details on how to operate the various NES system control functions, contact your NES distributor.

NSM35 alarm relay specifications can be found in Appendix A. For further details on how to connect auxiliary alarms, contact your NES distributor.

## ***Related Information***

Instructions for using the *DC Tools* software are given in its online help.

## ***Reporting Problems with This Guide***

Please use the fax or email addresses below to report any problems you find in this guide.

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**Overview**

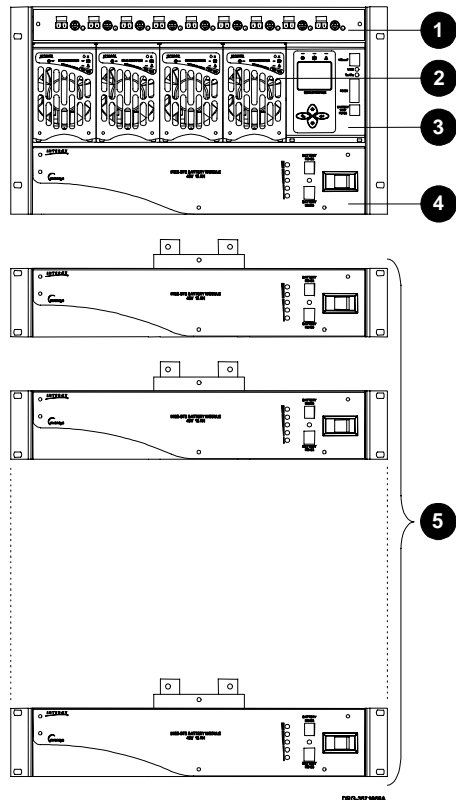
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## INES115E and INES125E (48 V) Power Systems

INES115E power systems are powered via two AC supply cables. The AC input rating is 99 to 275 VAC, (2 x 20 A).

INES125E power systems are powered via one AC supply cable. The AC input rating is 99 to 275 VAC, 32 A.

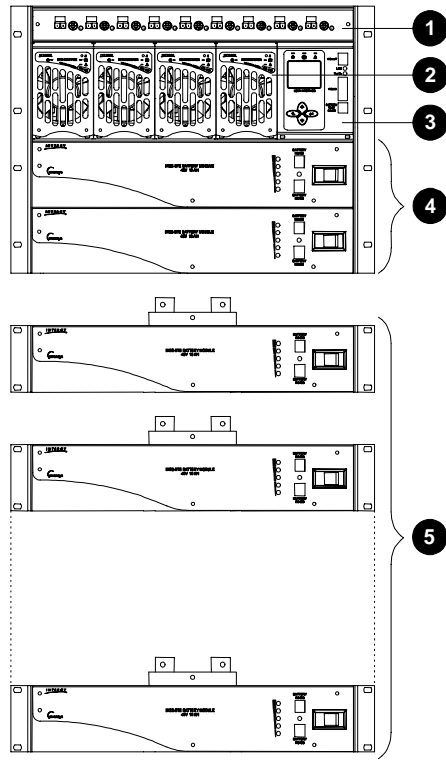


- ❶ DC Distribution (*see page 1-7*)
- ❷ Up to four R748 or R1248 Rectifiers (*see page 1-8*)
- ❸ NSM35 Supervisory Module (*see page 1-4*)
- ❹ One integrated Battery Tray (*see page 1-9*)
- ❺ Up to 15 optional Battery Extension Modules for applications that require more backup time

## INES215E and INES225E (48 V) Power Systems

INES215E power systems are powered via two AC supply cables. The AC input rating is 99 to 275 VAC, (2 x 20 A).

INES225E power systems are powered via one AC supply cable. The AC input rating is 99 to 275 VAC, 32 A.



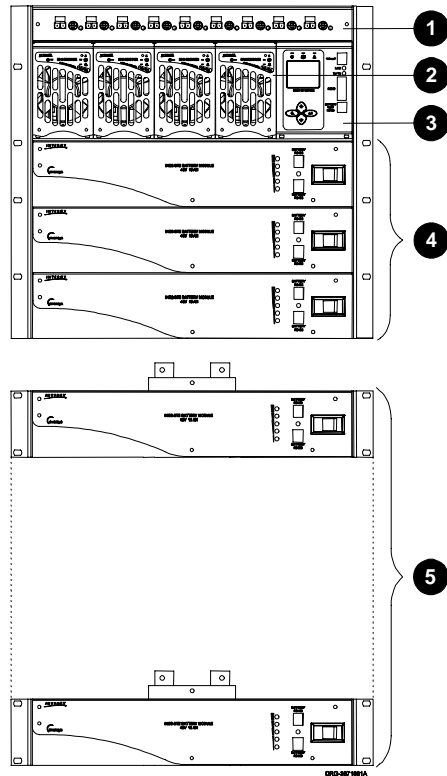
- ❶ DC Distribution (*see page 1-7*)
- ❷ Up to four R748 or R1248 Rectifiers (*see page 1-8*)
- ❸ NSM35 Supervisory Module (*see page 1-4*)
- ❹ Two integrated Battery Trays (*see page 1-9*)
- ❺ Up to 14 optional Battery Tray Extension Modules for applications that require more backup time

## INES315E and INES325E (48 V) Power Systems

INES315E power systems are powered via two AC supply cables. The AC input rating is 99 to 275 VAC, (2 x 20 A).

INES325E power systems are powered via one AC supply cable. The AC input rating is 99 to 275 VAC, 32 A.

- ❶ DC Distribution (*see page 1-7*)
- ❷ Up to four R748 or R1248 Rectifiers (*see page 1-8*)
- ❸ NSM35 Supervisory Module (*see page 1-4*)
- ❹ Three integrated Battery Trays (*see page 1-9*)
- ❺ Up to 13 optional Battery Tray Extension Modules for applications that require more backup time



## NSM35 Supervisory Module

The NSM35 supervisory module provides the control and monitoring functions for the NES. The NSM35 is fully configurable for complete operational flexibility with all system operating parameters stored in a default software configuration file. Only minimal on-site configuration changes are required, before the NES is ready for operation.

The NSM35 has an onboard audible alarm and two alarm LEDs. Alarms may be mapped to a relay, which when energized or de-energized, activates an external device. For more details, refer to the NSM35 alarm relay specification in Appendix A.

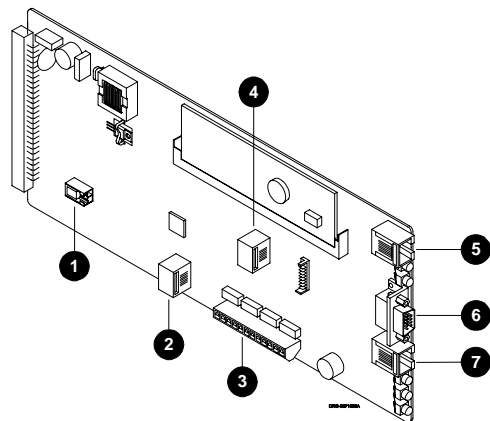
The NSM35 communicates via a standard RS-232 serial or Ethernet 10BaseT interface. You can use the 10BaseT interface to:

- Remotely monitor the NES over a LAN (*using the supplied DCTools software*)
- Send automatic alarm notification messages via email

You can also use the RS-232 serial interface /Console port to connect directly to a PC running:

- *DCTools* software
- A Terminal software application

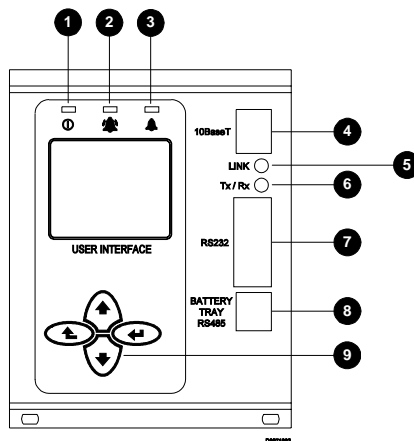
- ➊ Auxiliary Temperature Sensor Termination (optional)
- ➋ LVD2 Termination (not used)
- ➌ Alarm Relay Terminations (*see Appendix A for details*)
- ➍ LVD & Fuse Fail Termination
- ➎ Ethernet 10BaseT Interface
- ➏ RS-232 Serial Interface (Console Port)
- ➐ Battery Tray Communications Interface Port



The NSM35 is available with or without a display and keypad, as shown on the next page.

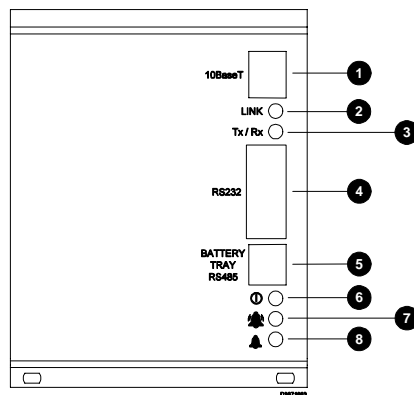
## Display Version Front Panel (Optional)

- ❶ Monitor OK LED
- ❷ Urgent Alarm LED
- ❸ Non-Urgent Alarm LED
- ❹ Ethernet 10BaseT Interface
- ❺ Ethernet Link Established LED
- ❻ Ethernet Traffic Activity LED
- ❼ RS-232 Serial Interface (Console Port)
- ❽ Battery Tray Communications Interface Port
- ❾ Keypad



## Non-Display Version Front Panel

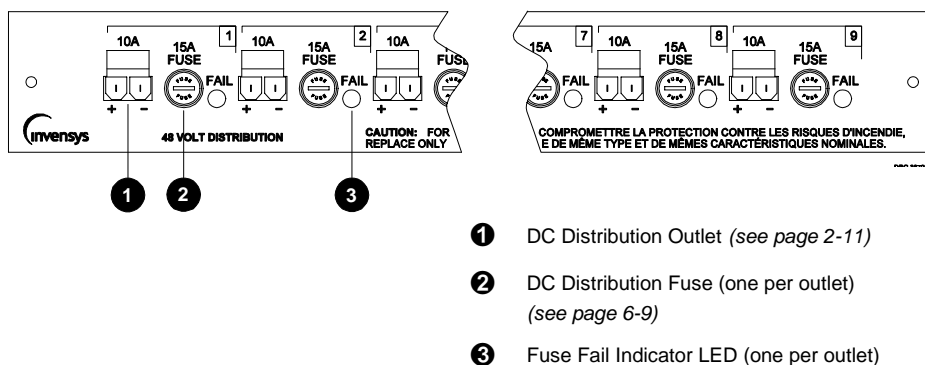
- ❶ Ethernet Interface
- ❷ Ethernet Link Established LED
- ❸ Ethernet Link Activity LED
- ❹ RS-232 Serial Interface (Console Port)
- ❺ Battery Tray Communications Interface Port
- ❻ Monitor OK LED
- ❼ Urgent Alarm LED
- ❽ Non-Urgent Alarm LED



## DC Distribution

Nine fused DC distribution outlets are available for connecting your equipment to the NES. The DC distribution outlets are floating with 1500 V AC isolation to ground or can be referenced to positive ground if required. Details about checking and changing the system voltage reference of your NES power system can be found in Chapter 3.

The maximum rated current of each outlet is 10 A. Red Fuse Fail Indicator LEDs (one per outlet) illuminate to indicate blown DC distribution fuses (however only if your equipment is plugged in).



## Low Voltage Disconnect (LVD) - Optional

An NES power system can be equipped with a Low Voltage Disconnect (LVD) module.


The LVD disconnects the batteries at the LVD disconnect voltage to prevent damage to the batteries due to excessive deep discharge. After the batteries are disconnected, they recover to their open-circuit voltage. The LVD reconnects the batteries automatically after the AC supply is restored. After the batteries are reconnected, the NES recharges the batteries and powers the loads.

Both the LVD disconnect and reconnect voltages are configurable. The default LVD disconnect voltage is set to 44 V and the reconnect voltage to 48 V. This hysteresis band ensures that the open-circuit recovery of the discharged batteries does not rise above the LVD reconnect voltage.

## Rectifiers

There are three status indicator LEDs on the front panel of a rectifier (Power On, Urgent Alarm and Non-Urgent Alarm), as shown below.

① **Power On LED (Green)** – illuminates to indicate that the rectifier is powered.

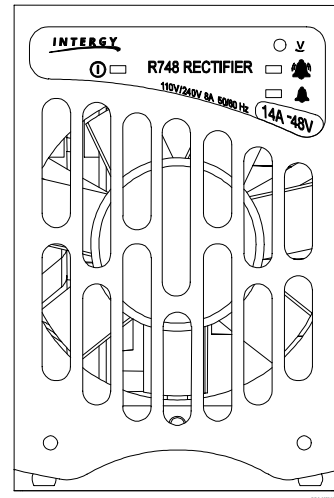
 **Urgent Alarm LED (Red)** – illuminates to indicate critical fault conditions, that require urgent attention such as:

- Rectifier failed
- Rectifier shutdown
- AC supply failed
- Very low or very high AC supply voltage

 **Non-Urgent Alarm LED (Yellow)** – illuminates to indicate non-critical conditions, such as:

- Rectifier in power/current limit mode  
*(This normally happens after an AC power outage when the batteries are recharging. The LED turns off once the batteries are sufficiently recharged.)*
- Rectifier operating in temperature turndown mode, because of high ambient temperature or low AC supply voltage

Details about replacing a faulty rectifier can be found in Chapter 6.



## Battery Trays

A battery tray contains a 16 Ah, 48 V battery string. A battery MCB (located at the back left corner as shown below) protects the battery string against overcurrent.

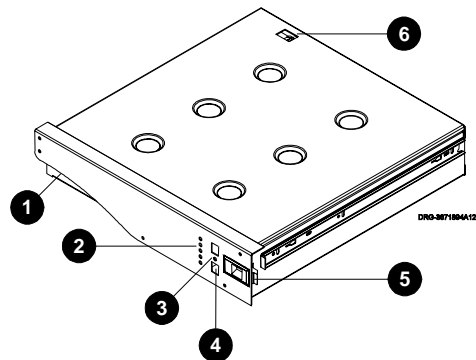
A sliding latch releases or locks the battery tray. Details about replacing a battery tray can be found in Chapter 6.

Battery monitoring electronics (located inside the battery tray) monitors the monobloc voltages, battery current and temperature. The NSM35 automatically adjusts the battery float voltage according to the battery temperature – a control process called temperature compensation.

If a battery string's state of health falls below a pre-defined threshold of 0.8, a non-urgent alarm is generated. This alarm indicates that the condition of the battery string is poor and requires either an equalizing charge or replacing.

Two battery tray communications interface ports are used to daisy chain up to 16 battery trays to the NSM35 supervisory module.

- ❶ Serial Number Label
- ❷ Battery Status LED Array
- ❸ Battery Tray Communications Activity LED
- ❹ Battery Tray Communications Interface Port
- ❺ Sliding Latch
- ❻ Battery Miniature Circuit Breaker (MCB)





The battery status LED array indicates the following:

- **Batteries are float charging** - All battery status LEDs illuminating in green
- **Batteries are recharging** - All battery status LEDs illuminating in green and in a sweeping fashion from the bottom up
- **Batteries are discharging** - % Charge Remaining is indicated by some battery status LEDs turning off and the remaining ones changing color. *(See details on inside back cover)*
- **Fault codes** *(See details on inside back cover)*
- **Battery tray identification** - Used in conjunction with *DCTools* to identify a specific battery tray within a multiple battery tray system. *(See details on inside back cover)*

A battery tray must be connected to an operational NSM35 supervisory module, for the battery status LED array to turn on.

After the battery tray communications link has been disconnected from a battery tray or the NES has been switched off, the battery tray status LED array remains on for approximately 30 minutes, before reverting to power-save mode.

## Blanking Tray

Each NES power system includes one blanking tray as shown below. A sliding latch releases or locks the blanking tray. Use the blanking tray to cover an empty battery slot. Details about removing and inserting a blanking tray can be found in Chapter 6.



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## Warnings (English)

This section contains important warnings relating to:

- Electrical Safety
- Location and Environment
- Battery Trays
- Blanking Trays
- Rectifiers
- DC Distribution
- Servicing



### Electrical Safety

- The plugs of the AC supply cables are used to disconnect the NES from the AC supply. Install the AC power outlets in an easily accessible location near the NES power system.
- Connect the NES to a three-wire AC power outlet (two-pole plus ground). This outlet must be connected to suitable upstream branch circuit/AC supply protection devices such as miniature circuit breakers (MCBs) or fuses. Connection to any other type of power outlet may result in an electrical shock hazard.
- To withstand the high internal operating temperatures, use only cables with a temperature rating of V90 or higher for alarm and auxiliary power connections.
- The maximum earth leakage current of the NES is 5.4 mA (or 2.7 mA per AC supply cable). Ensure that any upstream residual current devices are appropriately rated.
- DC common of the NES can be connected to earth (ground).
- System testing must be performed in the sequence documented in this guide.



### Location and Environment

- Always mount your NES power system in a 19-inch open or enclosed rack securely bolted to the floor. Failing to do so may affect the stability of the rack.
- To maintain optimum system cooling, keep the air vents at the back of the NES clear from walls or other equipment. (Obstructing the air vents at the top of the NES does not affect system cooling.)
- Do not install the NES in locations where the ambient temperature can exceed 40°C (104°F), or where there is excess humidity.
- Do not allow water or any foreign object to enter the NES. Do not place objects containing liquid on top of or near the unit.



### Battery Trays

- Withdraw and remove only one battery tray at a time.
- Do not lift battery trays without assistance. They are very heavy (32 kg / 70 lb) and require two persons to lift.
- To reduce the risk of an energy hazard and to maintain optimum system cooling, do not leave a battery slot empty. Insert a blanking tray (or a new battery tray, if one is immediately available).
- Do not attempt to disassemble battery trays. Return them, in their original packaging, to your local Intergy representative for replacement.



### Blanking Trays

- Do not store objects in a blanking tray.



### **Rectifiers**

- To reduce the risk of electric shock and maintain optimum system cooling, always cover empty rectifier slots with blanking panels.
- Do not attempt to disassemble rectifiers. Return them, in their original packaging, to your local Intergy representative for replacement or repair.



### **DC Distribution**

- Hazardous energy levels are present at the DC distribution outlets (although classified as SELV).
- Use cables rated for at least 60 VDC at 90°C (194°F). Type SJT two-core 14 AWG jacketed cord is recommended.
- With battery trays inserted and the AC plugs removed from the AC power outlets, power is still supplied to the DC distribution outlets (if the battery MCBs are switched on).
- Ensure that the load is switched off or disconnected from the DC distribution outlet before replacing the fuse.
- Replace DC distribution fuses with 15 A fuses of the same type (Bussman ABC-15 or Littelfuse 314-015 Type 3AB are recommended).



## **Servicing**

- The NES contains hazardous voltages. Do not attempt to disassemble the unit if you are not qualified.
- If the NES requires servicing other than battery or rectifier replacement, isolate the unit first, as follows:
  - 1** Unplug the AC supply cable(s) from the AC power outlet(s).
  - 2** Disconnect all battery trays one at a time, by switching off the battery MCBs (located at the back left corner of an opened battery tray).

## Avertissements (Français)

Cette section comprend des avertissements importants concernant:

- Sécurité Électrique
- Emplacement et Environnement
- Bacs D'accumulateur
- Bacs D'obturation
- Redresseurs
- Distribution En Continu
- Révision



### Sécurité Électrique

- Les prises des câbles d'alimentation en alternatif sont utilisées pour déconnecter l'NES de l'alimentation en alternatif. Installez les sorties de puissance en alternatif dans un emplacement d'accès aisé près du système générateur NES.
- Connectez l'NES à une sortie de puissance en alternatif à trois fils (bipolaire plus terre). Cette sortie doit être connectée à répartiteur de lignes/dispositifs de protection d'alimentation en alternatif appropriés en amont tels que des disjoncteurs en miniature (MCBs) des fusibles. La connexion à tout autre type de sortie de puissance peut entraîner un risque de choc électrique.
- Afin de résister aux températures d'opération interne élevées, n'utilisez que des câbles avec une caractérisation en température de V90 ou plus élevée pour le connexions d'alimentation auxiliaire ou d'alarme.
- Le courant maximum de perte à la terre de l'NES est 5.4 mA (ou 2.7 mA par câble d'alimentation en alternatif). Assurez-vous que tout dispositif de courant résiduel en amont ait une classification appropriée.
- L'alimentation commune en courant continu du NES peut être connectée à la prise de terre.
- Les tests du système doivent être réalisés selon la séquence documentée dans ce guide.



### **Emplacement et Environnement**

- Toujours montez votre système générateur NES dans un coffret fermé ou ouvert de 19 pouces, boulonné solidement au plancher. Le manquement de ce faire peut avoir un effet sur la stabilité du coffret.
- Pour maintenir un refroidissement optimal du système, tenez les prises d'air à l'arrière de l'NES dégagées des murs ou d'autre équipement. (L'obstruction des prises d'air en haut de l'NES 'a pas un effet sur le refroidissement du système.)
- N'installez pas le NES dans des emplacements où la température ambiante peut dépasser 40°C (104°F), ou dans lesquels il y a un excès d'humidité.
- Ne permettez pas de l'eau ou tout corps étranger d'entrer dans l'NES. Ne mettez pas les objets contenant de liquide sur ou près de l'unité.



### **Bacs D'accumulateur**

- Retirez et enlevez seulement un bac d'accumulateur à la fois.
- Ne levez pas les bacs d'accumulateur sans assistance. Ils sont très lourds (32 kg / 70 lb) et il faut deux personnes pour les lever.
- Afin de réduire le risque de danger d'énergie et maintenir un refroidissement optimal du système, ne laissez pas un espace de pile vide. Insérez un bac d'obturation (ou un nouveau bac d'accumulateur, lorsqu'il y en a disponible immédiatement).
- N'essayez pas de démonter les bacs d'accumulateur. Retournez-les, dans leur emballage original, à votre représentant Intergy le plus proche.



### **Bacs D'obturation**

- Ne stockez pas des objets dans un bac d'obturation.





### Redresseurs

- Afin de réduire le risque de choc électrique et maintenir un refroidissement optimal du système, toujours couvrez les espaces de redresseur vides avec des panneaux d'obturation.
- N'essayez pas de démonter les redresseurs. Retournez-les, dans leur emballage original, à votre représentant Intergy le plus proche pour remplacement ou réparation.



### Distribution En Continu

- Des niveaux de puissance dangereux sont présents aux sorties d'alimentation en continu (bien que classifiées comme SELV).
- Utilisez des câbles classifiés pour au moins 60 VCC à 90°C (194°F). Le type de corde à double enveloppe 14 AWG bifilaire SJT est recommandé.
- Avec les bacs insérés et les prises CA enlevées des sorties de puissance en alternatif, l'énergie est toujours alimentée aux sorties de distribution en continu (si les MCB des piles sont activés).
- Assurez-vous que le charge est coupé ou déconnecté de la sortie de distribution en continu avant de remplacer le fusible.
- Remplacez les fusibles de distribution en continu avec des fusibles 15 A du même type (Bussman ABC-15 ou Littelfuse 314-015 Type 3AB sont recommandés).



## Révision

- L'NES contient des tensions dangereuses. N'essayez pas de démonter l'unité si vous n'êtes pas qualifié.
- Si l'NES a besoin de révision autre que le remplacement de la pile ou le redresseur, d'abord isolez l'unité comme suit:
  - 1** Déconnectez le(s) câble(s) d'alimentation en alternatif de(s) sortie(s) de puissance en alternatif.
  - 2** Déconnectez tous les bacs d'accumulateur un par un, en désactivant les MCB de pile (qui se trouvent dans le coin arrière à gauche d'un bac d'accumulateur ouvert).

## Inspecting the Equipment and Reporting Damage

Unpack the NES power system and inspect it carefully for possible damage that may have occurred while in transit.

Report any damage immediately, using a copy of the Equipment Incident Report (at the back of this guide) to supply all relevant details. Fax the completed form to your local Intergy representative.

Also check the date of last charge of the batteries (indicated on a label on the outside of the battery tray packaging). If the battery was last charged more than six months ago, return the battery tray(s) to your local Intergy representative.



*Keep the original packaging. You will need it if any equipment needs to be returned to your local Intergy representative for replacement or repair.*

## Location and Environment

The NES power system may be installed in any of the following:

- A 19-inch open rack securely bolted to the floor
- A 19-inch 600 mm deep enclosed rack securely bolted to the floor

The location must provide adequate airflow around the unit, in an atmosphere free from excessive dust, corrosive fumes, or conductive contaminants.

Always operate the NES power system within its rated ambient temperature range of 0°C to 40°C (32°F to 104°F). Failing to do so greatly reduces the life and capacity of the batteries.

## **AC Supply Requirements**

Connect the NES to a three-wire AC power outlet (two-pole plus ground). This outlet must be connected to suitable upstream branch circuit/AC supply protection devices such as miniature circuit breakers (MCBs) or fuses. Connection to any other type of power outlet may result in an electrical shock hazard.

The plugs of the AC supply cables are used to disconnect the NES from the AC supply. Install the AC power outlets in an easily accessible location near the NES power system.

Ensure that any upstream residual current devices are appropriately rated. Full details about the AC supply requirements can be found in Appendix A.

## **Equipment Power Cable and Connector Requirements**

Use cables rated for at least 60 VDC at 90°C (194°F). Type SJT two-core 14 AWG jacketed cable is recommended. The maximum recommended cable length is 2 metres or (6½ feet). Pre-made cable assemblies are available from your local Intergy representative.

Use Molex Single Row Sabre receptacles (part number M44441-2002) in conjunction with Molex Wire-to-Board Sabre Female terminals (part number M43375-0001) to terminate the DC load cables at the NES DC Distribution outlets.



**Task Summary**

<b>Task</b>	<b>Description</b>	<b>Page</b>
1	Checking the System Voltage Reference	3-2
2	Mounting the NES	3-4
3	Mounting an Extended Battery Chassis	3-6
4	Inserting a Rectifier	3-11
5	Inserting a Battery Tray	3-14
6	Inserting a Blanking Tray	3-17

## Task 1 – Checking the System Voltage Reference

### INES115E, INES215E and INES315E Power Systems

To check the system voltage reference of INES115E, INES215E and INES315E power systems, follow the steps below.

#### Step 1 – Remove the appropriate rectifier or blanking panel

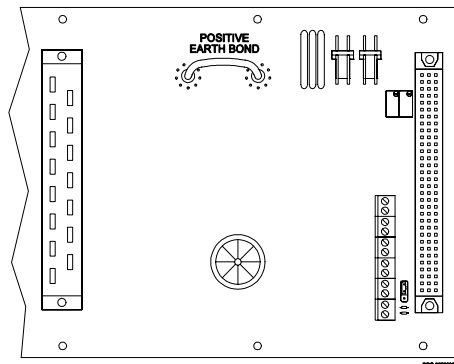


Remove the rectifier or blanking panel immediately to the left of the NSM35 supervisory module.

#### Step 2 – Check if the positive earth bond is fitted



Visually check if the positive earth bond on the backplane is fitted, as shown below.



Positive Earth Bond fitted?		Indicates DC Distribution Outlets are
No	(Standard)	Floating
Yes	(Optional)	Referenced to positive ground

#### Procedure complete

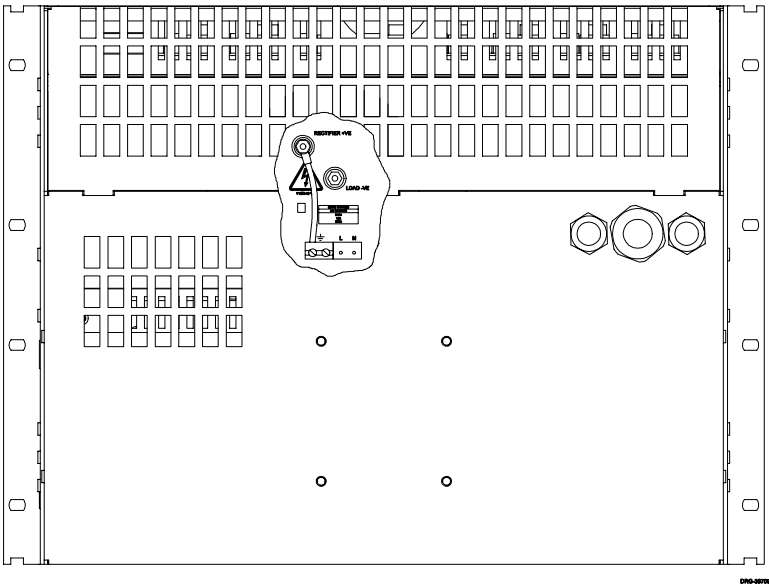
## INES125E, INES225E and INES325E Power Systems

To check the system voltage reference of INES125E, INES225E and INES325E power systems, follow the steps below.

### Step 1 – Check if the positive earth bond is fitted



Visually check if the positive earth bond on the backplane is fitted, as shown below.



Positive Earth Bond fitted?		Indicates DC Distribution Outlets are
No	(Standard)	Floating
Yes	(Optional)	Referenced to positive ground

**Procedure complete**



## **Task 2 – Mounting the NES**



**Before mounting the NES in a rack ensure that the rack is securely bolted to the floor. Failure to do this may dangerously affect the stability of the whole rack.**

### **Step 1 – Determine the mounting position of the NES in the rack**



- If no battery tray extension modules are required, always mount the NES at the bottom of the rack.
- If any battery tray extension modules are required, always mount the NES first, allowing sufficient space below it, (2U for each battery tray extension module).

### **Step 2 – Remove any rectifiers, battery trays, and blanking trays**



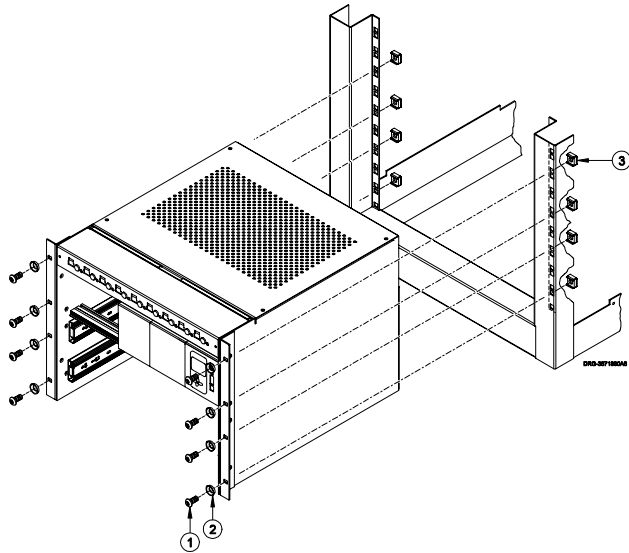
### Step 3 – Mount the NES in the rack



Mount the NES in the rack, as shown in the example below, inserting the cage nuts first.



*The diagram below shows an example of how to mount an INES2X5 with no extended battery chassis, using the fasteners supplied. Fasteners different from the ones supplied, may be used to mount the NES. However, under no circumstances use plastic fasteners, as they cannot support the weight of the NES.*



#### Key:

- ① M6 x 12 mm screw
- ② M6 finishing washer
- ③ M6 cage nut

### Procedure complete

If you have any extended battery chassis to mount, see Task 3 – Mounting an Extended Battery Chassis on page 3-6.



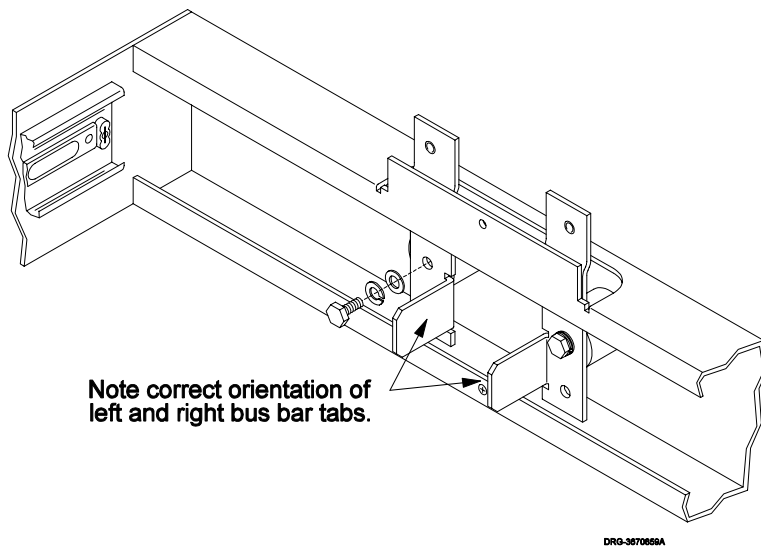
*Do **NOT** connect the NES to the AC supply at this stage.*

## **Task 3 – Mounting an Extended Battery Chassis**

### **Mounting Rule**

If any battery tray extension modules are required, mount them below the NES. Mount the NES first (see Task 2 – Mounting the NES), allowing sufficient space below it (2U for each battery tray extension module).

### **Step 1 – Mount left and right bus bars**



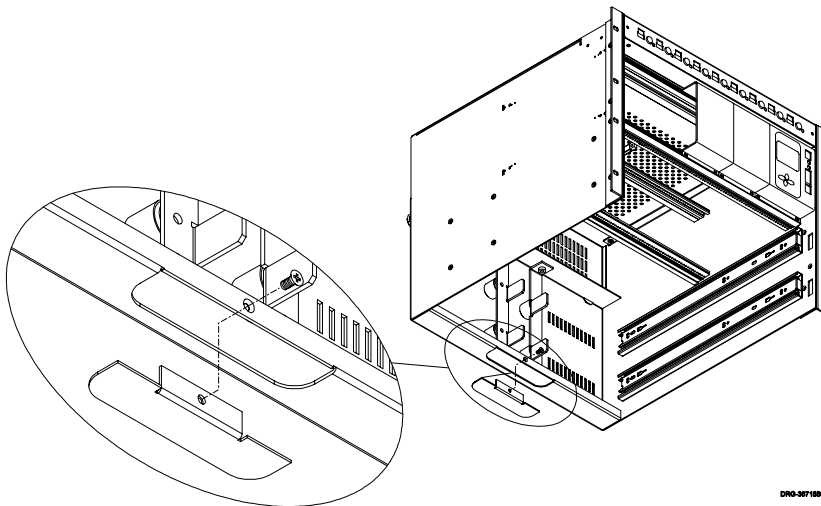
### **Step 2 – Insert cage nuts into appropriate rack mounting holes**



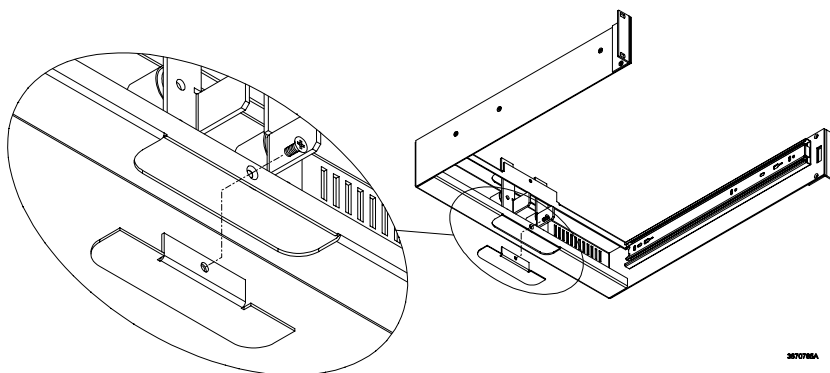
### Step 3 – Move cover plate



- 1 Unscrew and remove the cover plate from the NES, as shown below.



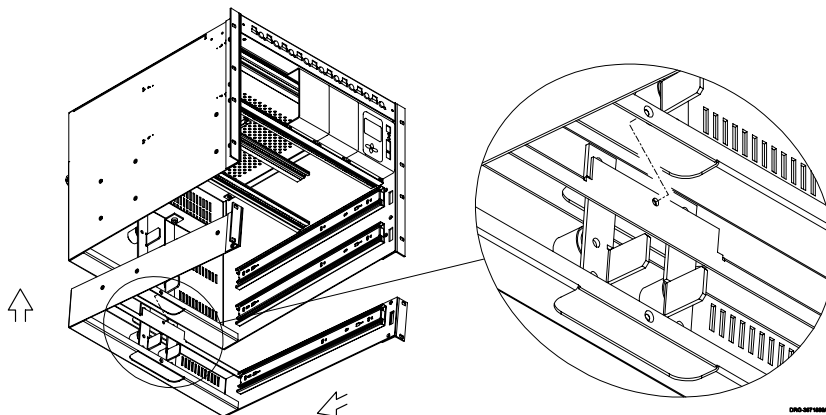
- 2 Screw the cover plate to the extended battery chassis that you will be mounting last (the bottom-most), as shown below.



#### Step 4 – Lift and align the extended battery chassis



- 1 Lift the extended battery chassis into the rack and align it with the chassis mounting hole at the back, as shown below.

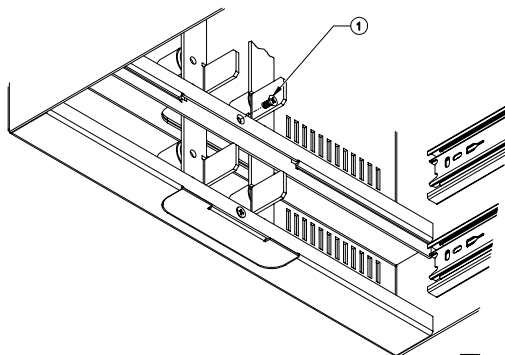


- 2 Ensure that the bus bars of the extended battery chassis are positioned behind the bus bars of the NES.

#### Step 5 – Attach the extended battery chassis to the NES chassis



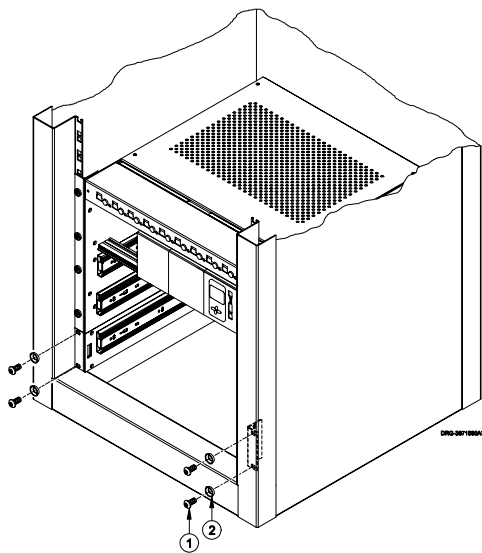
Insert an M4x8 mm countersunk pozidrive steel screw (item 1) into the chassis mounting hole, and tighten. Refer to the diagram below.



### Step 6 – Attach the extended battery chassis to the rack



The diagram below shows an example of how to mount an extended battery chassis below an INES2X5E, using the fasteners supplied.



#### Key:

- ① M6 x 12 mm screw
- ② M6 finishing washer

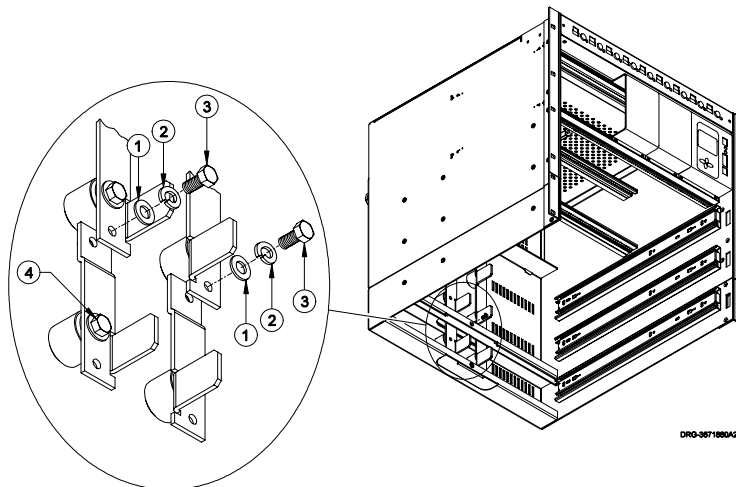


*Fasteners different from the ones supplied, may be used to mount the extended battery chassis. However, under no circumstances use plastic fasteners as they cannot support the weight of the battery tray extension modules.*

### Step 7 –Align and bolt the bus bars together



- 1 If the bus bar mounting holes are not aligned, loosen the bus bar fasteners (item 4) on the extended battery chassis (enough to allow manual alignment of the bus bar extensions), as indicated below.



- 2 Insert two M6 x 12 mm steel bolts (item 3) with washers (items 1 and 2) through the bus bar holes and tighten firmly, as shown.
- 3 Firmly tighten the bus bar fasteners (item 4) on the extended battery chassis.

### Procedure complete

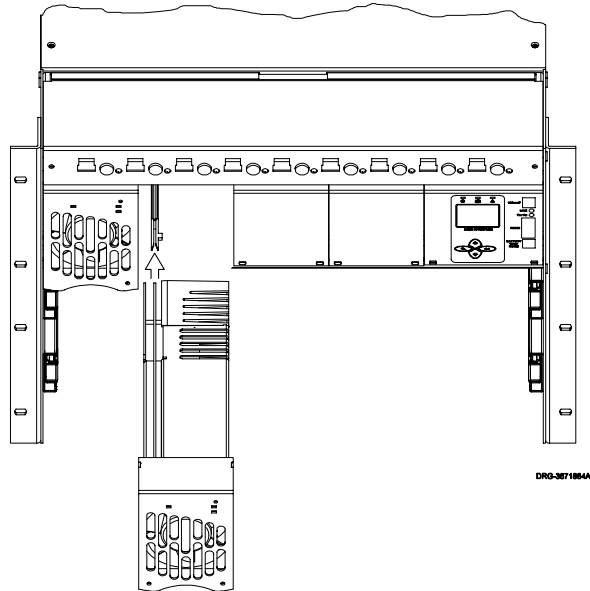
If you have any more extended battery chassis to mount, repeat the procedure for the next one down.

## Task 4 – Inserting a Rectifier

### Step 1 – Align the rectifier with the guide rail



Align the rectifier's bottom guide with the guide rail, as shown below.



*Do **NOT** switch on the AC supply at this stage.*

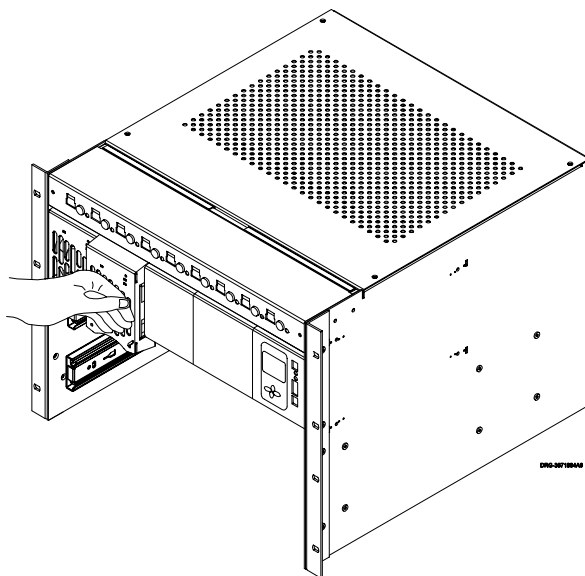


## Step 2 – Push in the rectifier



**To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.**

- 1 Slowly push the rectifier in, sliding it along the guide rail, as shown below, until it plugs firmly into the backplane connector.

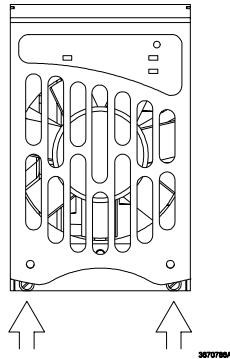


- 2 Confirm that the rectifier is properly inserted. The rectifier should not slide out easily.

### Step 3 – Tighten the rectifier retaining screws



Tighten the two rectifier retaining screws located at the bottom of the rectifier, as indicated below.



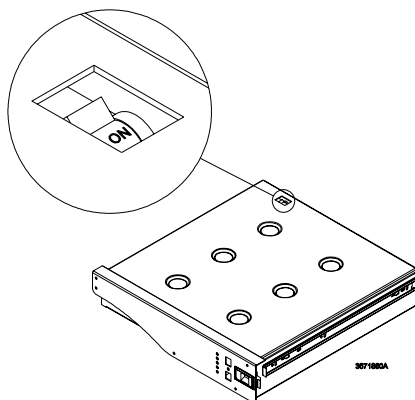
**Procedure complete**

## Task 5 – Inserting a Battery Tray



Do not lift battery trays without assistance. They are very heavy (32 kg / 70 lb) and require two persons to lift.

### Step 1 – Switch ON the battery MCB

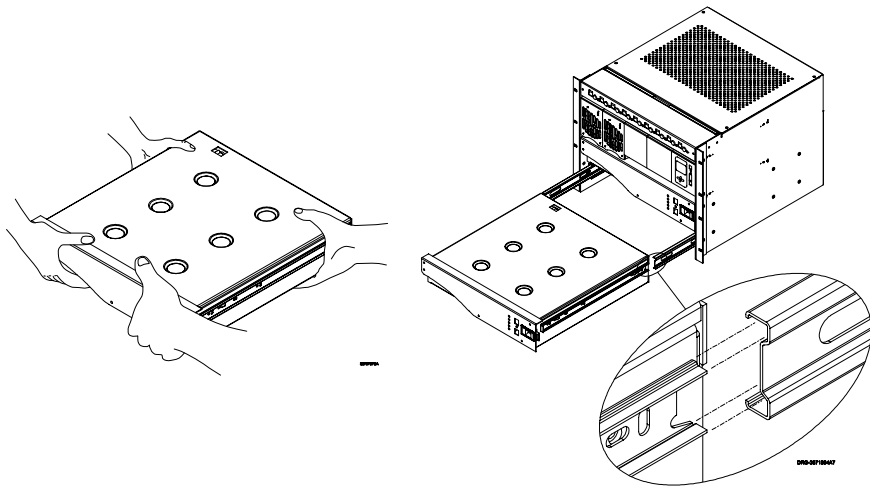


**Step 2 – Lift and align the battery tray with the rails**



**Two persons are needed to lift a battery tray.**

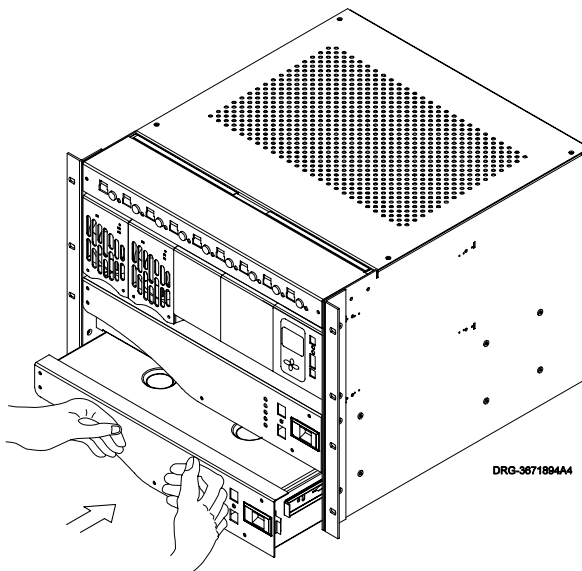
With both persons supporting the full weight of the battery tray, align it with the rails, as shown below.



### Step 3 – Push in the battery tray, until it latches closed



To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.



*Expect some resistance on the rails when inserting the battery tray initially.*

To confirm the battery tray is properly latched, pull gently on the recessed handle. The battery tray should not slide out.

### Procedure complete



**The battery bus bars (located at the rear, inside the NES) now present a potential electrical shock and energy hazard. Do not touch or short-circuit the battery bus bars.**

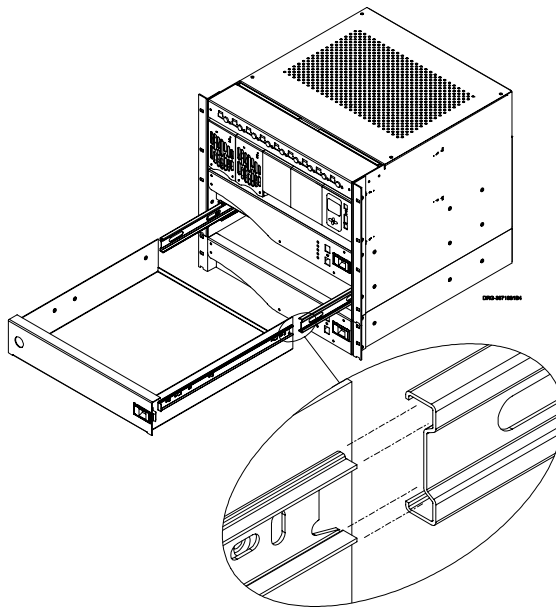
## Task 6 – Inserting a Blanking Tray

Use a blanking tray to cover an empty battery slot.



**Do not store objects in a blanking tray.**

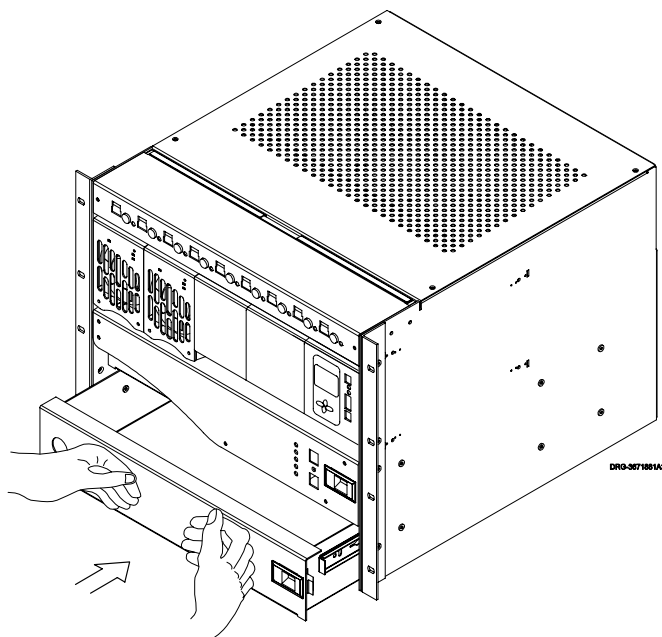
### Step 1 – Align the blanking tray with the rails



**Step 2 – Push in the blanking tray, until it latches closed**



To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.



To confirm the blanking tray is properly latched, pull gently. The blanking tray should not slide out.

**Procedure complete**

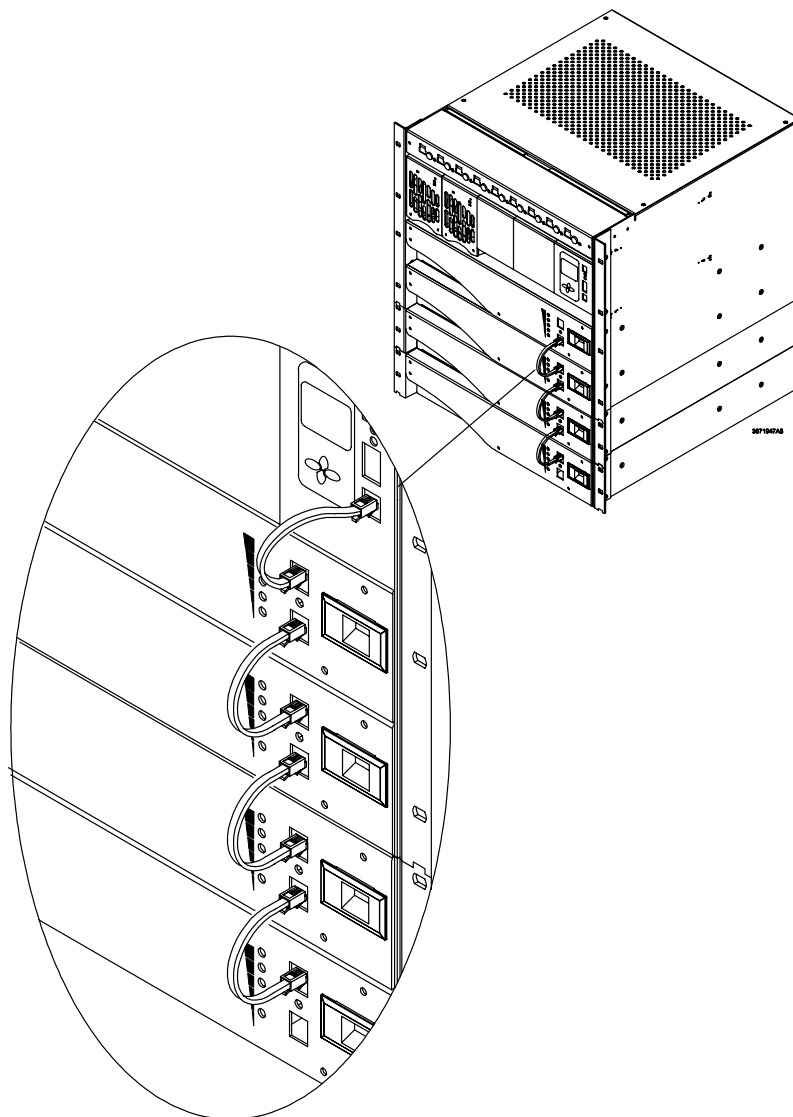
**Task Summary**

<b>Task</b>	<b>Description</b>	<b>Page</b>
1	Connecting the Battery Communications Cabling	4-2
2	Connecting the NES to the AC Supply	4-3
3	Checking that all the Rectifiers are operating OK	4-3
4	Checking that the NSM35 is operating OK	4-4
5	Configuring the NES for Operation	4-5
6	Connecting your Equipment to the NES	4-15
7	Equalizing the Batteries	4-21



## **Task 1- Connecting the Battery Communications Cabling**

Connect the battery communications cabling as shown below.



## Task 2 – Connecting the NES to the AC Supply



**Do not use extension cords or adapter plugs.**

Plug your NES power system into the three-wire AC power outlet(s) (two poles plus ground).






*INES115, INES215 and INES315 power systems require two AC power outlets.  
INES125, INES225 and INES325 power systems require one AC power outlet.*

## Task 3 – Checking that all the Rectifiers are operating OK

Check the three status indicator LEDs on each rectifier.

The following LED conditions indicate that a rectifier is operating OK:

- The green  Power On LED is on
- The red  Urgent Alarm LED is off
- The yellow  Non-Urgent Alarm LED is off

Consult the troubleshooting section in Chapter 6 if you observe any other rectifier LED conditions.

## ***Task 4 – Checking that the NSM35 is operating OK***

- 1** Check that the green ① Monitor OK LED is on. (If not, consult the troubleshooting section in Chapter 6.)
- 2** Check for error codes on the NES display (if fitted).

Error codes to check for, are:

- F100
- F101
- F102
- F103

Consult the troubleshooting section in Chapter 6, if you observe one of these error codes.

## Task 5 – Configuring the NES for Operation

To configure the NES for operation, use either:

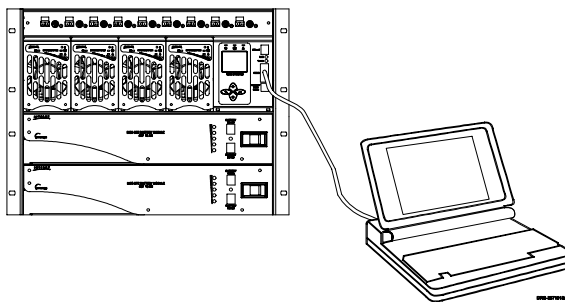
- The supplied *DCTools* software – a Windows™-based graphical application
- OR-
- A Terminal program and the command-line interface

### Using DCTools

#### Step 1 – Connect a PC to the RS-232 port of the NES



- 1 Connect a null modem cable between the RS-232 port of the NES and the serial port of your laptop or PC, as shown below.



- 2 Install the *DCTools* software as per installation instructions printed on the back of the CD-ROM cover.




The *DCTools* icon  is automatically placed on the desktop.


- 3 Start *DCTools* by double clicking on the *DCTools* icon on the desktop.


## Step 2 – Check that your PC port is specified correctly



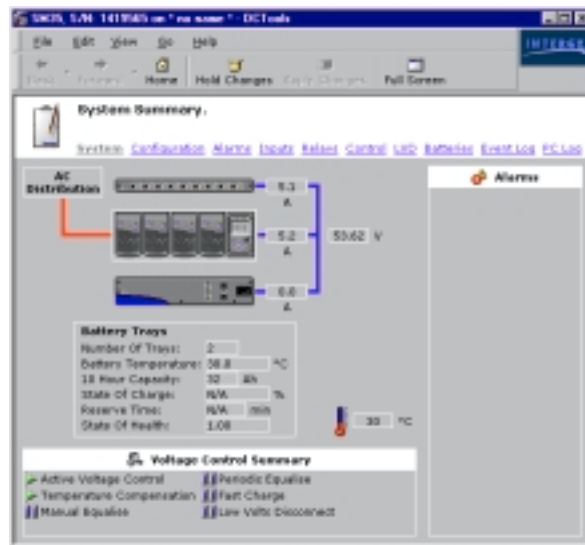
- 1 Double-click on the *DCTools* icon  in the Windows™ task bar to display the DCTools Connection List. The default connection is **COM1**.
- 2 If the port properties are correct, enable the connection by selecting the Active check box ☒ of that connection.

The correct port properties are, (**Protocol**: cpS3P and **S3P Address**: 0).

If the port properties are incorrect, select the relevant connection from the Connection List and click the  toolbar button. In the Comms Properties dialog, edit the properties as necessary and click **OK**.

To create a new connection, click the  toolbar button. A new connection is then listed and the Comms Properties dialog displayed. In that dialog, edit the properties as necessary and click **OK**.

If the connection is successful, the *DCTools* System Summary (Home) screen is displayed as shown below.



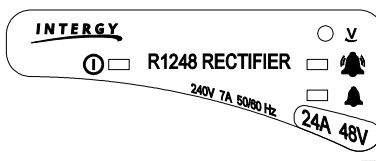
### Step 3 - Set the rectifier type in *DCTools* (essential)



- 1 From the *DCTools* System Summary (Home) screen, click the **Configuration** hotlink at the top of the view. The Configuration Screens view is then displayed.
- 2 Select **Rectifiers**. The Rectifier Table view is then displayed.
- 3 Set the rectifier type, to match the model number of the installed rectifiers, by selecting the radio button next the appropriate model number. Valid rectifier types for the NES systems are R748 and R1248 only.



*The required model number (for example R1248) can be found on the front panel label of an installed rectifier, as shown below.*



### Step 4 – Enter the system location in *DCTools* (optional)



*DCTools* provides a descriptive text field to record the location of your NES power system(s). Text entered into this field will be displayed when receiving email alarm notification messages.

Entering the system location (20 characters maximum) is particular useful when managing multiple NES power systems.



*The system location name is displayed when receiving email notifications.*

To enter the system location, follow the steps below.

- 1 From the *DCTools* System Summary (Home) screen, click the **Configuration** hotlink at the top of the view. The Configuration Screens view is then displayed.
- 2 Select **Identity**. The System Identification view is then displayed.
- 3 Enter a name into the System Location descriptive text field.

## Step 5 – Configure the settings for remote communications (optional)



For email alarm notifications or monitoring the NES over a LAN, email and IP addresses must be set, following the steps below.

- 1 From the *DCTools* System Summary (Home) screen, click the **Configuration** hotlink at the top of the view. The Configuration Screens view is then displayed.
- 2 Select **Communications**. The Monitor Communications view is then displayed, as shown below.

- 3 Enter the listed parameters using the configuration guidelines below.

Parameter	Configuration Guidelines
Email Server	Enter the IP address of your network email server.
Email Address	Enter the email address of the alarm notification recipient. A maximum of six different email addresses can be entered.

*continued*

Parameter	Configuration Guidelines
Email On Alarm	<p>You can control email notification of alarms for each recipient as follows:</p> <ul style="list-style-type: none"> <li>• Select <b>None</b> to temporarily disable email notifications to the recipient.</li> <li>• Select <b>All</b> to receive both urgent and non-urgent alarm notifications.</li> <li>• Select <b>Urgent only</b> to receive only urgent alarm notifications.</li> </ul>
Host Name	The default host name is NSM35. This name will be displayed in the email alarm notification messages. Set as appropriate.
IP Address	Enter the IP address that has been assigned to the NES system.
Network Mask	Set as appropriate.
Default GateWay	Set as appropriate.

- 4 Shut down *DCTools*, remove the null modem cable and connect the network cable to the 10BaseT port of the NES. See page 1-6 for location.

### Step 6 – Test email notifications



- 1 Ensure that the network cable is connected to the 10BaseT port of the NES and the Ethernet Link Established LED (located below the 10BaseT) connector is on.
- 2 Manually trigger an alarm by switching off the AC supply to the NES and switching it back on after 5 seconds. The NES then sends an email notification to those set-up recipients, stating that an AC power failure has occurred.
- 3 Confirm that all set-up recipients have received the email notification.

### Procedure complete

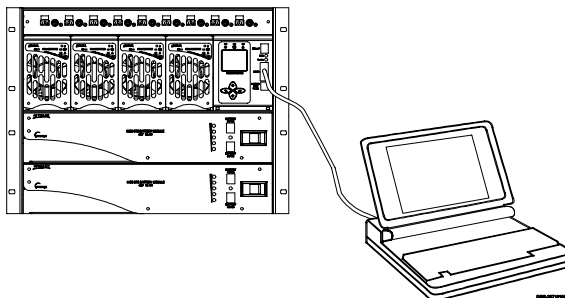


## Using the Console Command-Line Interface

### Step 1 – Connect a PC to the RS-232 port of the NES



- 1 Connect a null modem cable between the RS-232 port of the NES and the serial port of your laptop or PC, as shown below.



- 2 Start your Terminal application software and create a new connection with the following settings.

Bits per second	:	19,200
Data Bits	:	8
Parity	:	None
Stop Bits	:	1
Flow Control	:	None

**Onboard Help**

The command-line interface has comprehensive onboard help.

For example, press Enter after the NSM35 prompt to enter the administration mode and then type **help** to view the list of available commands.

To view further help about each of the commands, type the following after the NSM35 prompt and press Enter.

```
NSM35>help show
```

**Important Notes:**

- 3 After approximately 1 minute of inactivity on the console port, the NES automatically times out of the administration mode. Hit the Enter key to return to the administration mode.
- 4 Abbreviations can be used when entering commands. For example, to view the list of available commands, type the following after the NSM35 prompt and hit Enter.

```
NSM35>help show
```

-OR-

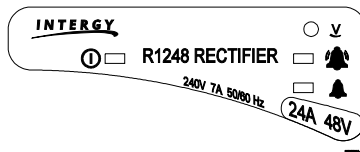
```
NSM35>h sh
```

**Step 2 – Set the rectifier type (essential)**

Set the rectifier type, to match the model number of the installed rectifiers. Valid rectifier types for the NES systems are R748 and R1248 only.



*The required model number (for example R1248) can be found on the front panel label of an installed rectifier, as shown below.*

**Example**

To set the rectifier type as R1248, using the **set system rectifier** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set system rectifiers=R1248
```

**Step 3 – Configure the settings for remote communications (optional)**

For email alarm notifications or monitoring the NES over a LAN, email and IP addresses must be set, following the steps below.

- 1 Use the **set** command or **ipconfig** command to enter the listed parameters, according to the configuration guidelines below.

Parameter	Configuration Guidelines
IP Address	Enter the IP address that has been assigned to the NES system.
Subnet Mask	Set as appropriate.
Default GateWay	Set as appropriate.

**Example 1**

To enter the IP address as (10.1.2.1), Subnet Mask as (255.255.0.0) and Default Gateway as (1.1.1.1), using the **set** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set interface ethernet ip address=10.1.2.1 255.25.0.0
```



*The IP address and subnet mask must be entered on the same command line.*

```
NSM35>set interface ethernet ip gateway=1.1.1.1
```

**Example 2**

To enter the IP address as (10.1.2.1), Subnet Mask as (255.255.0.0) and Default Gateway as (1.1.1.1), using the **ipconfig** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>ipconfig -a 10.1.2.1 -m 255.255.0.0 -g 1.1.1.1
```

- 2 Use the set command to enter the listed parameters, according to the configuration guidelines below.

Parameter	Configuration Guidelines
Email Server	Enter the IP address of your network email server.
Email Recipients	Enter the email address of the alarm notification recipient. A maximum of six different email addresses can be entered.
Alarm Types	<p>You can control email notification of alarms for each recipient as follows:</p> <ul style="list-style-type: none"><li>• Select <b>None</b> to temporarily disable email notifications to the recipient.</li><li>• Select <b>All</b> to receive both urgent and non-urgent alarm notifications.</li><li>• Select <b>Urgent</b> to receive only urgent alarm notifications.</li></ul>

**Example 1** To enter the IP address of the email server as (10.1.2.2), using the **set** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set mailhost=10.1.2.2
```

**Example 2** To enter the following three email recipients,

- yourname@yourcompany.com to receive **All** alarm notifications,
- yourname2@yourcompany.com to receive **Urgent** alarm notifications,
- yourname3@yourcompany.com to receive **All** alarm notifications,

using the **set** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set notification 1=all yourname@yourcompany.com
```

```
NSM35>set notification 2=urgent yourname2@yourcompany.com
```

```
NSM35>set notification 3=all yourname3@yourcompany.com
```

#### Step 4 – Enter the System Location and Host Name (optional)



The location of your NES power system(s) can be recorded in the System Location field and the default Host Name (NSM35) can be replaced by a more meaningful name.

Entering the system location of your NES power system(s) and replacing the default host name, is particular useful when managing multiple NES power systems.

**Example 1** To enter the system location as Data Center1, using the **set** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set system location=Data Center1
```

**Example 2** To change the host name from NSM35 to DCPower1, using the **set** command, type the following after the NSM35 prompt and hit Enter.

```
NSM35>set name=DCPower1
```



*The command prompt has now changed to DCPower1 and the sender's name now appears as DCPower1 in the From field of the email alarm notification messages.*

### Step 5 – Test email notifications (optional)



Once all the required communication parameters have been entered, you can then use the **test notification** command to prompt the NES to send a test email notification to those set-up recipients.

To send a test email notification, follow the steps below.

- 1** Ensure that the null modem cable is still connected between the RS-232 port of the NES and the serial port of your PC.
- 2** Connect a network cable between the 10BaseT port of the NES and your Ethernet network.
- 3** Check that the green Ethernet Link Established LED (located below the 10BaseT connector of the NES) is on.  
Also check that the amber Ethernet Traffic Activity LED (below the Ethernet Link Established LED) is either on or flashing.

#### Example

To send a test email notification to the recipient who has been set up to receive urgent alarm notifications, using the **test notification** command, type the following after the NSM35 prompt and hit Enter.

```
DCPower1>test notification=urgent
```

#### Important Notes:

- 1** The command prompt has been changed previously (see page 4-14) and is therefore now DCPower1.
- 2** The status of the **test notification** command can be viewed on the Terminal program as it is performed.
- 3** The email notifications are sent to all those recipients that have been set-up to receive **Urgent** and **All** (All means urgent and non-urgent) alarm notifications.

### Step 6 – Change the password (optional)



No password is required to enter the administration mode of the NES, provided you connect to the NES via the console port. However, a password is required if you wish to log on remotely via a Telnet session.

#### Example

To change the password from "Intergy" to "DCPower", using the **set password** command, type the following after the NSM35 prompt and hit Enter.

```
DCPower1>set password=DCPower
```



*The password is case sensitive and must be at least five characters long.*

### Procedure complete

The NES is now configured for operation. The basic operating parameters can be viewed by using the **show** command.

#### Example

To view the basic operating parameters, using the **show** command, type the following after the DCPower1 prompt and hit Enter.

```
DCPower1>show
```

Compare your configuration against the checklist on the next page, to ensure that all parameters have indeed been configured.

**Checklist**

- ☐ Rectifier Type
- ☐ IP Address
- ☐ Subnet Mask
- ☐ Default Gateway
- ☐ Email Server IP Address
- ☐ Email Address of Recipients
- ☐ Alarm Type (None, All, Urgent)
- ☐ System Location
- ☐ Host Name

Shut down the Terminal application and remove the null modem cable.

All remote communication features of the NES can now be accessed via the 10BaseT Ethernet connection using either *DCTools* or Telnet.



## Task 6 – Connecting your Equipment to the NES

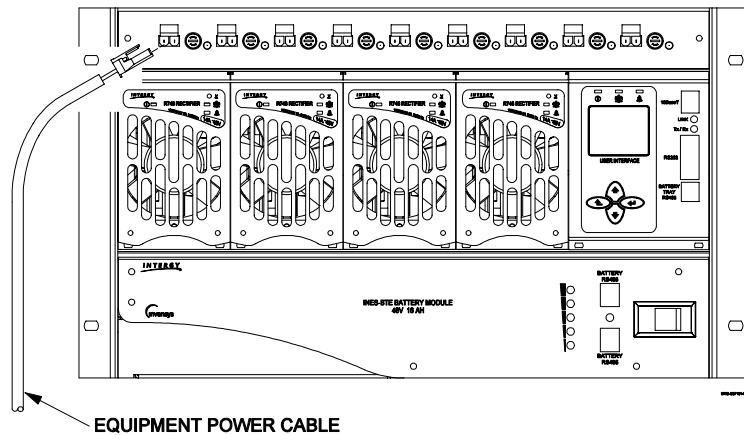
**Step 1 – Ensure that your equipment is switched OFF**



**Step 2 – Plug your equipment into the DC Distribution outlet(s)**



Plug your equipment into the DC Distribution outlet(s), one at a time, as shown below.

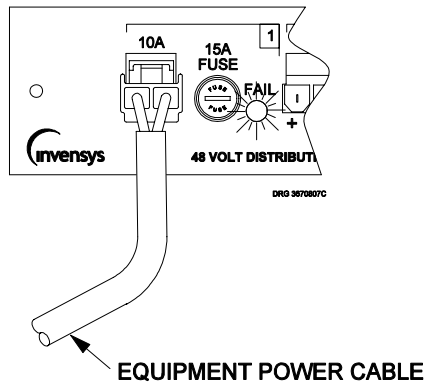


### Step 3 – Switch ON your equipment and ensure it powers up OK



If your equipment does not power up, check the Fuse Fail Indicator LEDs.

- 1 If a Fuse Fail Indicator LED is lit, as shown below, then the respective fuse is either blown or missing.



Details about replacing a DC distribution fuse can be found in Chapter 6.

- 2 If a fuse has failed:
  - Check the power cord of your equipment
  - Ensure that the input current of your equipment does not exceed 10 A.

### Step 4 – Repeat steps 1 to step 3 for your other equipment



**Step 5 – Check that the capacity of the NES is not exceeded**



When your NES power system was initially sized, certain percentages of the total capacity were pre-allocated for:

- Powering your equipment
- Recharging the batteries
- Redundancy if required

With all your equipment connected to the NES, check that the output power (load current x float voltage) does not exceed the pre-allocated percentage of the total capacity for powering your equipment.

If the actual output power is more than the figure used for the original design, then additional battery trays and/or rectifiers may be required. Otherwise there may be:

- Insufficient rectifier capacity to recharge the batteries and provide redundancy
- Insufficient battery capacity, which reduces the backup time

**Procedure complete**

## Task 7 – Equalizing the Batteries

Manual Equalize can be started from *DCTools* or the NES User Interface.



*Manual Equalize increases the system voltage to approximately 56 V for 24 hours. After the pre-configured manual-equalize time has expired, the NES system voltage reverts back to normal battery float voltage automatically.*

### Starting Manual Equalize from *DCTools*

- 1 From the *DCTools* System Summary (Home) screen, click the **Control** hotlink at the top of the view. The Voltage Control Summary view is then displayed.
- 2 Click the **Manual Equalize** button.
- 3 Ensure that the Manual Equalize field is set to Enabled (default setting).



*The Manual Equalize Voltage and Duration settings can not be changed.*

- 4 Click the **Start** button to start the process.









*The Manual Equalize process stops after 1440 minutes (24 hours).*

To stop the Manual Equalize process earlier, click the **Stop** button.

To return to the System Summary screen, click the **Home** button on the *DCTools* menu bar.


### Starting Manual Equalize from the User Interface

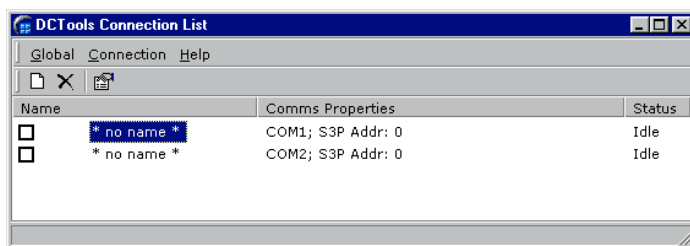
- 1 Enter the Configure Mode by pressing down the  and  buttons simultaneously for approximately three seconds.
- 2 Press the  button to enter Edit Mode. (The display starts flashing).
- 3 Press the  button to select ON.
- 4 Press the  button to confirm the selection.
- 5 Press the  button to exit the Configure Mode.




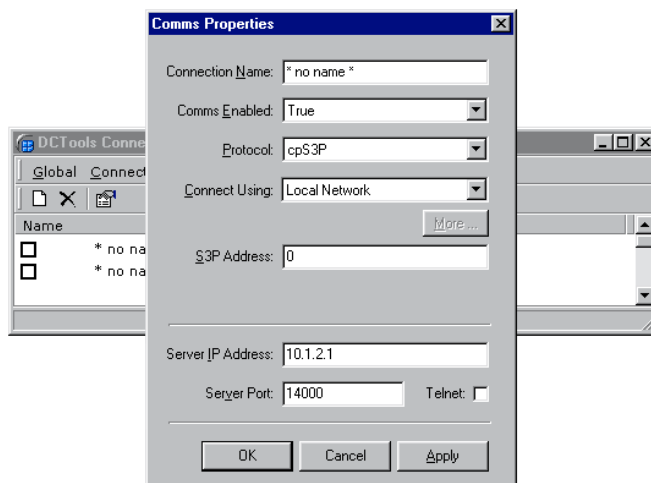
Once the your NES power system is fully commissioned and the settings for remote communications have been entered via the RS-232 serial port (see Chapter 4 for details), the NES system can be remotely monitored over a LAN via the 10BaseT Ethernet port using *DCTools*.

To configure the communications settings for *DCTools*, follow the steps below.

- 1 Double-click on the *DCTools* icon  in the Windows™ task bar. The *DCTools* Connection List is then displayed as shown below.



- 2 Create a new connection by clicking the  toolbar button. A new connection is then listed and the Comms Properties dialog displayed, as shown in the example below.



- 3 In that dialog, configure the properties according to the table below and click **Apply** and then **OK**.

Properties	Setting
Connection Name	Assign a name to the new connection. We recommend using the Host Name of the NES you wish to connect to.
Comms Enabled	True
Protocol	cpS3P
Connect Using	Local Network
S3P Address	0
Server IP Address	This is the IP address of the NES system you wish to connect to, for example 10.1.2.1
Server Port	14000
Telnet	Disabled



*When connecting to the NES system next time, simply start the DCTools Connection Manager and select the Active checkbox to enable that connection.*

**Overview**

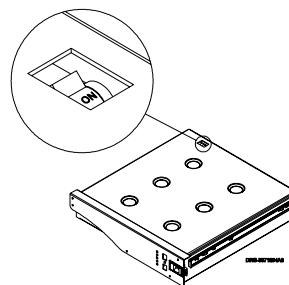
<b>Topic</b>	<b>Page</b>
Troubleshooting	6-2
Replacing a DC Distribution Fuse	6-7
Replacing a Battery Tray	6-11
Replacing a Rectifier	6-26
Battery Disposal and Recycling	6-31



## Troubleshooting

Use the table below to troubleshoot minor NES installation or operational problems. If you still cannot solve a problem, contact your local Intergy representative for assistance.


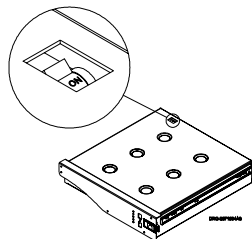

Problem	Possible Cause	Required Action
NES does not provide expected backup time	NES batteries are partly discharged because of a recent power outage or are near the end of their service life.	<p>None. The NES charges the batteries automatically after the AC supply is restored.</p> <p>Use <i>DCTools</i> to check the <i>State Of Health</i> of the batteries. If the batteries are near the end of their service life, replace the battery trays. See page 6-11.</p>
NES does not power the equipment during a power outage	Batteries are not connected, because of tripped battery MCB(s) or battery tray(s) not fully inserted.	Check that the battery MCB on each battery tray is switched on, as shown below.



Refer to page 6-12 for details on how to open a battery tray.

Check that all battery trays are fully inserted. See page 6-18.


*continued*

Problem	Possible Cause	Required Action
Fuse Fail Indicator LED(s) on	Blown or missing DC Distribution fuse(s). Blown fuses are caused by overloaded DC Distribution outlets or faulty equipment power cables.	<p>Replace DC Distribution fuse(s). See page 6-7.</p> <p> <i>The Fuse Fail Indicator LED will turn off as soon as the equipment is disconnected from the DC Distribution outlet. However, the fuse still needs to be replaced.</i></p> <p>Check the power cable of your equipment.</p> <p>Ensure that the input current of your equipment does not exceed 10 A.</p>
NSM35 ① Monitor OK LED off	NSM35 faulty.	<p>Contact your local Intergy representative for a replacement NSM35.</p>
	The AC supply is off and the batteries are not connected because of tripped battery MCB(s).	<p>Check that the battery MCB on each battery tray is switched on, as shown below.</p> <p></p> <p> <i>Switching on the battery MCB(s) will not restore power to the system if the integral Low Voltage Disconnect (LVD) unit has tripped.</i></p>


continued

Problem	Possible Cause	Required Action
NSM35 ⓘ Monitor OK LED off <i>(continued)</i>	No DC power available.	Reconnect the AC supply.
	The AC supply is off and the batteries are not connected because of battery tray(s) not fully inserted.	Check that the battery tray(s) are fully inserted. See page 6-18.
	The AC supply is off and the batteries are not connected because of the integral Low Voltage Disconnect (LVD) unit tripped.	None. The NES including the NSM35 monitor will return to normal operation when the AC supply has returned to within its specified AC input voltage range.
NSM35 🔴 (red) alarm LED on	“Urgent Alarm” active	Check the type of “Urgent Alarm” using <i>DCTools</i> or the User Interface (if fitted).
NSM35 🟡 (yellow) alarm LED on	“Non-Urgent Alarm” active	Check the type of “Non-Urgent Alarm” using <i>DCTools</i> or the User Interface (if fitted).
NSM35 Ethernet link and Ethernet traffic activity LEDs off	No network connection	Re-establish network connection.
NSM35 displays <b>F100</b> <i>(Display version only)</i>	Calibration corrupt	Contact your local Intergy representative.
NSM35 displays <b>F101</b> <i>(Display version only)</i>	Configuration corrupt	Contact your local Intergy representative.
NSM35 displays <b>F102</b> <i>(Display version only)</i>	Configuration invalid	Contact your local Intergy representative.
NSM35 displays <b>F103</b> <i>(Display version only)</i>	Incorrect configuration file	Contact your local Intergy representative.

*continued*


Problem	Possible Cause	Required Action
NSM35 displays <b>OL</b> instead of battery/auxiliary temperature ( <i>Display version only</i> )	No battery trays fitted	Insert battery tray(s) and connect the battery communications cables. See pages 6-16 to 6-19 for details.
	Auxiliary temperature sensor disconnected or not fitted	Reconnect or fit auxiliary temperature sensor.   <i>The auxiliary temperature sensor is optional.</i>
NSM35 or <i>DCTools</i> displays Phase Fail (INESX15 systems only)	One of the AC supply cables is unplugged or one of the AC power outlets is not powered.	Plug the second AC supply cable into its dedicated AC power outlet. Check that the AC power outlet is powered.
No communications between NES and PC	Incorrect cable	Check that a null modem cable has been used.
	Null modem cable not plugged into PC or plugged into the wrong port.	Check that the null modem cable is plugged into the PC and into the correct port.
	Communications port settings of PC do not match that of the console port.	Reconfigure the PC port properties (19K2 8 N 1).
	Incorrect S3P address	Check that the S3P address in <i>DCTools</i> is set to 0.
	The Telnet Active check box in the <i>DCTools</i> Comms Properties dialog is enabled.	Disable the Telnet Active check box in the <i>DCTools</i> Comms Properties dialog. See page 5-2.

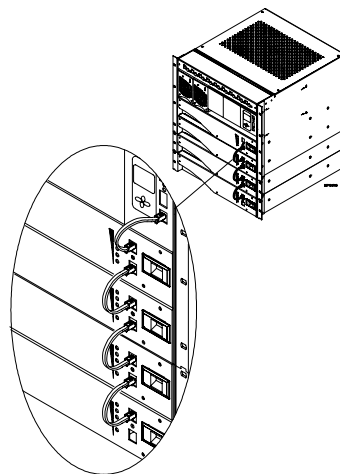
*continued*

Problem	Possible Cause	Required Action
Rectifier(s)  (red) alarm LED on	Very low AC voltage or AC supply failed	Check the AC supply. The NES will return to normal operation when the AC supply has returned to within its specified AC input voltage range. See Appendix A.
	AC overvoltage	None. The NES will return to normal operation when the AC supply has returned to within its specified AC input voltage range, as specified in Appendix A.
	Rectifier shut down	Check if a rectifier has in fact been shut down, using <i>DCTools</i> . If yes, turn on the rectifier using <i>DCTools</i> .
	Rectifier(s) failed	Use <i>DCTools</i> to determine if a rectifier has failed or has been shut down.  If a rectifier has failed, replace it. See page 6-26.  If a rectifier has been shut down, refer to required action for rectifier shut down.
		Remove and re-insert the rectifier(s). See pages 6-26 and 6-28.
All rectifier and battery tray <sup>†</sup> LEDs are off and the NSM35 is not operating.	There has been an extended power outage. The batteries are discharged to the point of low voltage disconnect.	Check that the NES is still plugged in at the AC power outlet(s) and that no MCB(s) in the switchboard are tripped.  If the NES is plugged in at the AC power outlet(s) and no MCB(s) in the switchboard are tripped; no further action is required. The NES will return to normal operation when the AC supply is restored.



<sup>†</sup> *There is a delay of approximately 30 minutes between total loss of DC power and the battery tray LEDs turning off.*

*continued*

Problem	Possible Cause	Required Action
Rectifier(s)  (yellow) alarm LED on	Rectifier power limit active	Check if the NES is recovering from a recent AC power outage. The NES may still be charging the batteries after the power outage. No further action required.  Check that the capacity of the NES is not exceeded. See page 4-12. Additional rectifiers may be required.
	Rectifier temperature turn down active, due to low AC supply voltage or excessive ambient temperature.	None. The NES will return to normal operation when the AC supply has returned to within its rated AC input voltage or operating temperature range, as specified in Appendix A.
All LEDs of a battery tray are off	Battery communications cables to that battery tray are not connected. Therefore, the battery tray monitoring electronics has reverted to power-save mode automatically.	Connect battery communications cables, as shown below.



*continued*

Problem	Possible Cause	Required Action
 Battery tray(s) top and bottom LEDs flashing (orange)	Battery MCB(s) in OFF position	Withdraw battery tray(s) and switch on the battery MCB(s).  See pages 6-12 to 6-13, 6-16 and 6-18 to 6-19 for details.   <i>A comprehensive list of battery tray LED indicators is printed on the inside back cover.</i>
“Battery tray comms lost” Alarm displayed by <i>DCTools</i> or received by email notification	Incorrect battery tray count - one or more battery trays disconnected from the system.	Remove all battery communications cables to reset the battery tray count to zero.  Reconnect battery communications cables to re-register the number of battery trays.

## Replacing a DC Distribution Fuse



Ensure that the load is switched off or disconnected from the DC distribution receptacle before replacing the fuse.



Use 15 A fuses of the same type (Bussman ABC-15 or Littelfuse 314-015 Type 3AB).

To replace a DC distribution fuse (for example, when the Fuse Fail Indicator LED is on), follow this procedure.

### Step 1 – Disconnect the equipment



Switch off the equipment or disconnect the equipment power cable from the DC distribution outlet.

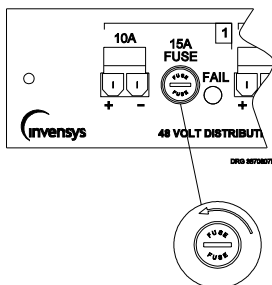


*The Fuse Fail Indicator LED will turn off when the equipment is disconnected from the DC distribution outlet.*

### Step 2 – Release bayonet cap from fuseholder base



Use a suitable flat-blade screwdriver to turn the bayonet cap 45 degrees (one-eighth of a turn) anticlockwise, to release it, and remove the bayonet cap with the fuse.

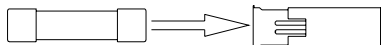




### Step 3 – Replace blown fuse



Remove the blown fuse from the bayonet cap and load a new fuse that has the ratings shown below.



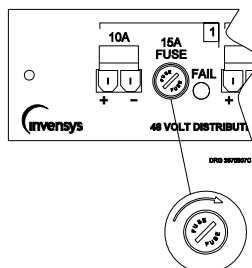
#### Fuse Ratings

Current	15 A
Voltage	250 V AC
Time Lag	Fast Blow
Dimensions	6.3 mm (diameter) x 32 mm (length) (¼ x 1¼ inches)
Type	Bussman ABC-15 or Littelfuse 314-015 Type 3AB

### Step 4 – Lock bayonet cap into fuseholder base



Slide the bayonet cap with loaded fuse back into the fuseholder base. Use a suitable flat-blade screwdriver to turn the bayonet cap 45 degrees (one-eighth of a turn) clockwise, to lock it in place.



### Step 5 – Reconnect the equipment



Switch on the equipment on or reconnect the equipment power cable to the DC distribution outlet.

Check that the Fuse Fail Indicator LED is off.

### Procedure complete

## Replacing a Battery Tray

NES battery trays are easy to replace and are 'hot-swappable' — that is, you can replace them while the power system is on and equipment is connected. This section covers the following procedures.

- Removing a Battery Tray
- Inserting a Battery Tray
- Removing a Blanking Tray
- Inserting a Blanking Tray

### Removing a Battery Tray



**Withdraw and remove only one battery tray at a time.**



**Do not lift battery trays without assistance. They are very heavy (32 kg / 70 lb) and require two persons to lift.**



**To reduce the risk of an energy hazard, do not leave a battery slot empty. Insert a blanking tray (or a new battery tray, if one is immediately available).**



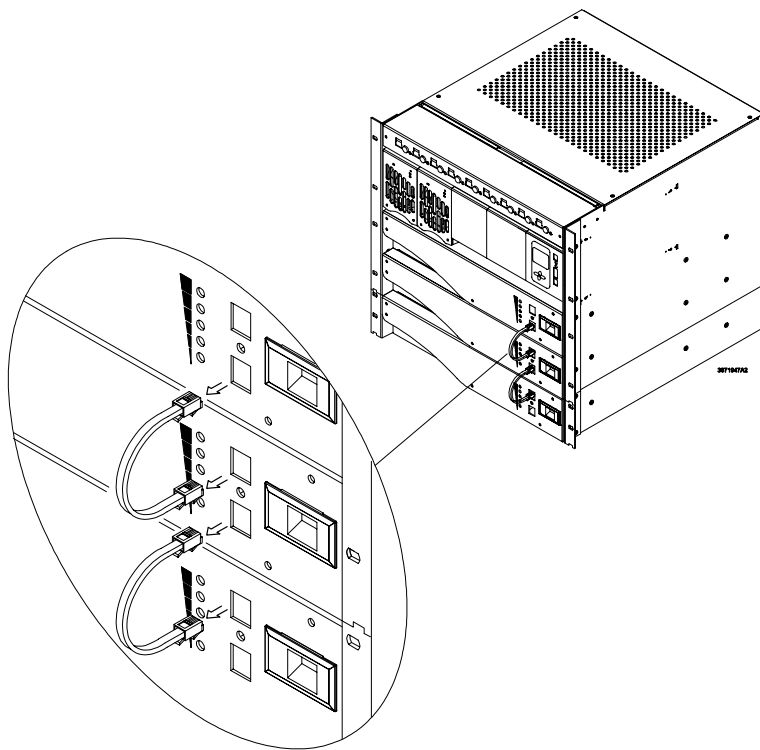
**Do not attempt to disassemble battery trays. Return them, in their original packaging, to your local Intergy representative for replacement.**

This is an example of removing the second battery tray from an NES power system.

**Step 1 – Disconnect the battery communications cable**



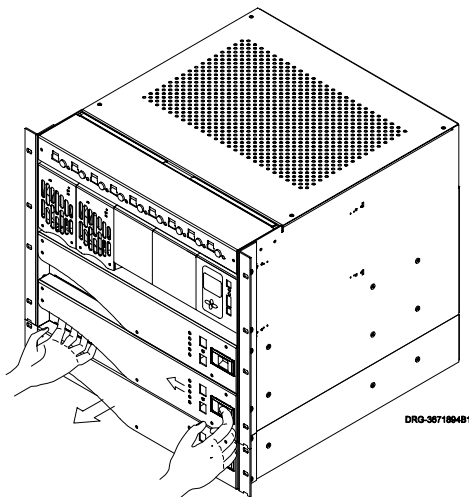
Disconnect the battery communications cables from the tray above and below the tray you want to remove, as shown below.



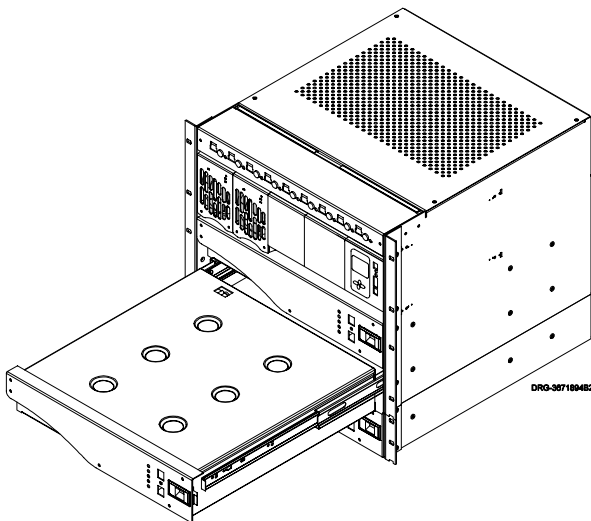
**Step 2 – Withdraw the battery tray**



- 1 Push the sliding latch to the left, as shown below.



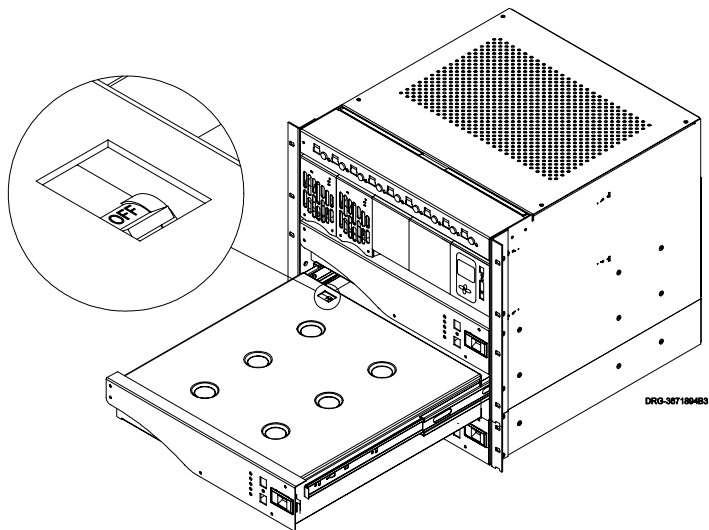
- 2 Pull the battery tray out until it reaches the end stops, as shown below.



**Step 3 – Switch OFF the battery MCB**



Switch off the battery MCB (located at the back left corner) as shown below.



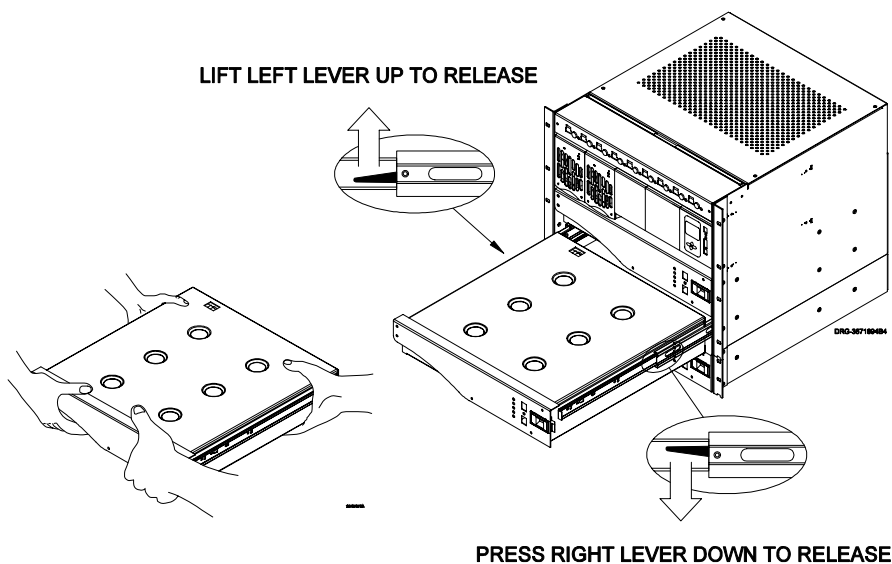
#### Step 4 – Release and lift the battery tray from the rails



Two persons are needed to remove a battery tray, as follows.

With both persons ready to support the full weight of the battery tray:

- 1 lift up the left lever,
- 2 press down the right lever,
- 3 slowly pull the tray out from the rails, lift, and remove it.



#### Procedure complete

You must now insert either a new battery tray or blanking tray into the empty slot. See the relevant procedure on page 6-16 or page 6-23, respectively.

Return the battery tray, in its original packaging, to your local Intergrity representative for replacement.

## Inserting a Battery Tray

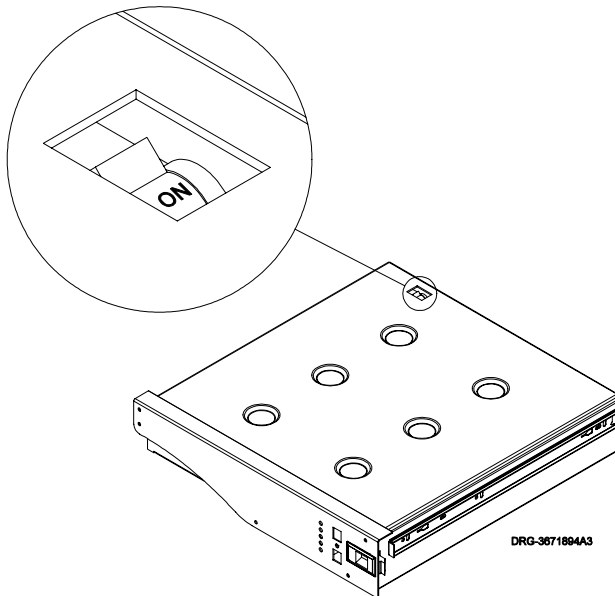


**Do not lift battery trays without assistance. They are very heavy (32 kg / 70 lb) and require two persons to lift.**

### Step 1 – Check that the battery MCB is in the ON position



Switch on the battery MCB (located at the back left corner) as shown below.

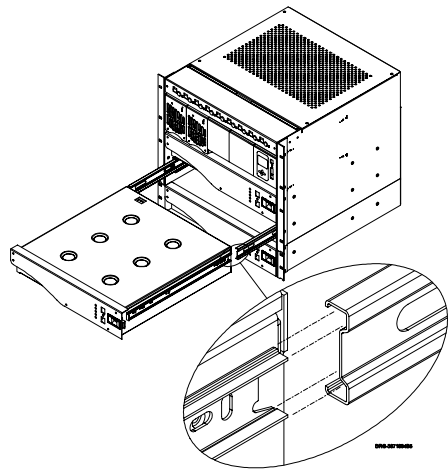
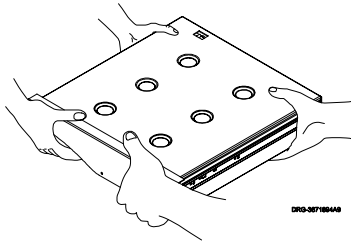


**Step 2 – Lift and align the battery tray with the rails**



**Two persons are needed to lift a battery tray.**

With both persons supporting the full weight of the battery tray, align it with the rails, as shown below.

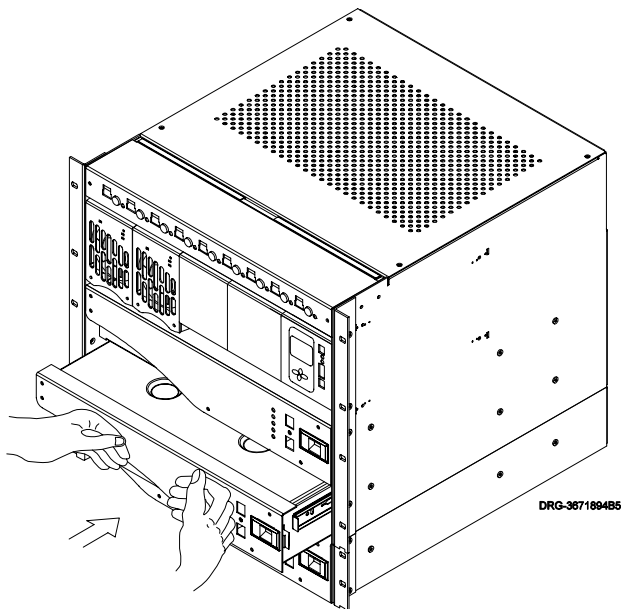




**Step 3 – Push in the battery tray, until it latches closed**

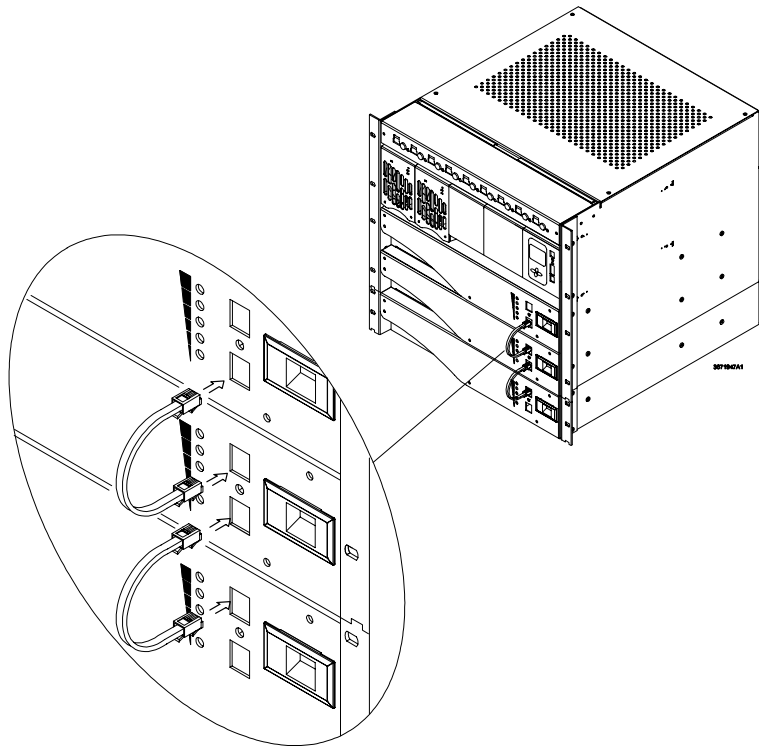


To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.



To confirm the battery tray is properly latched, pull gently on the recessed handle. The battery tray should not slide out.

**Step 4 – Reconnect the battery communications cables**



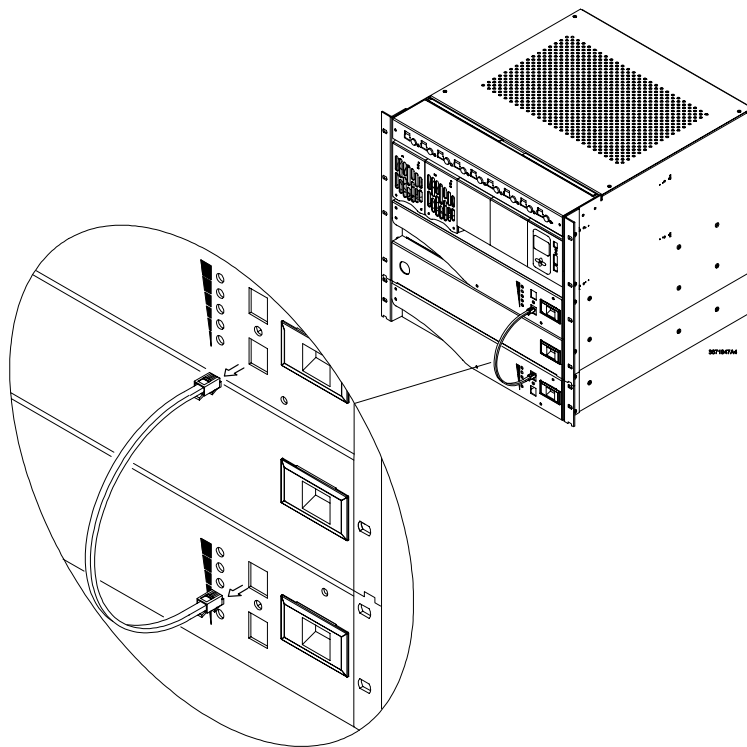
**Procedure complete**

## Removing a Blanking Tray

### Step 1 – Disconnect the battery communications cable



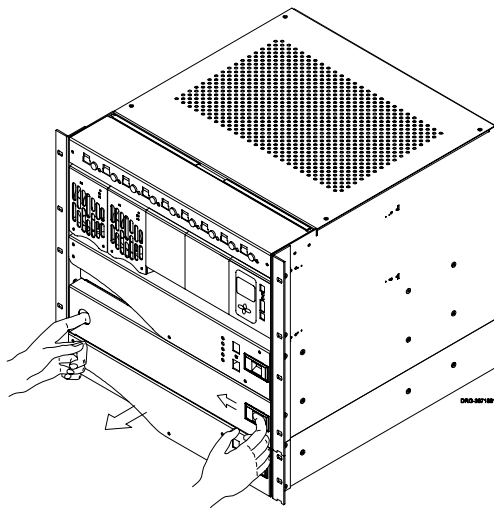
Disconnect the battery communications cable from the battery tray above and below the blanking tray, as shown below.



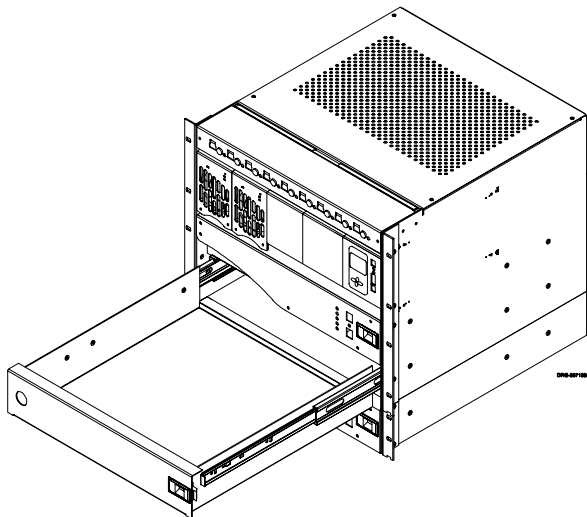
## Step 2 – Withdraw the blanking tray



- 1 Push the sliding latch to the left, as shown below.



- 2 Pull the blanking tray out, until it reaches the end-stops.



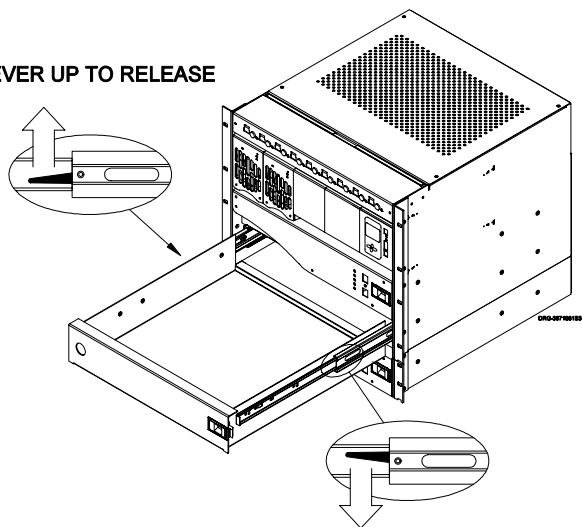
### Step 3 – Release and lift the blanking tray from the rails



While holding the blanking tray with both hands:

- lift up the left lever,
- press down the right lever,
- slowly pull the battery tray out from the rails, lift, and remove it.

LIFT LEFT LEVER UP TO RELEASE



PRESS RIGHT LEVER DOWN TO RELEASE

### Procedure complete

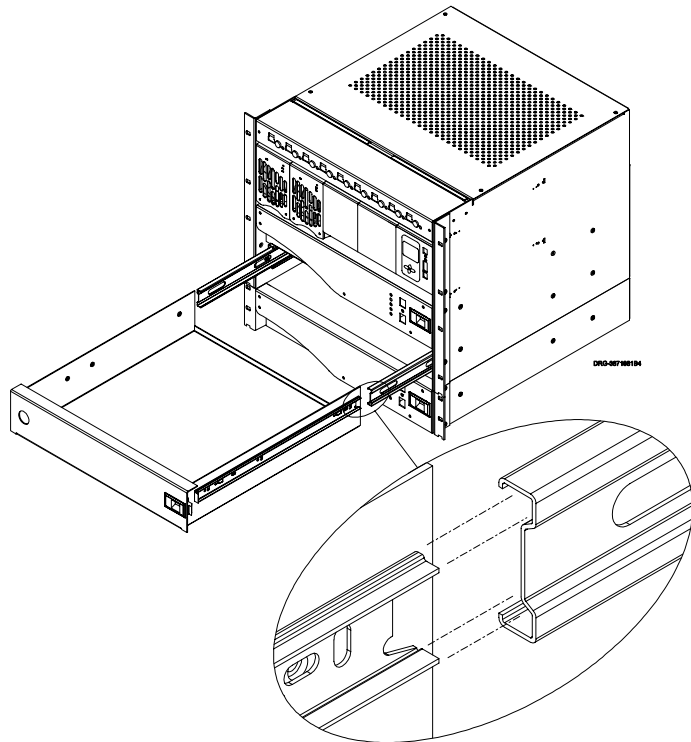
You must now insert a new battery tray into the empty slot. See the relevant procedure on page 6-16.

## Inserting a Blanking Tray



Do not store objects in a blanking tray.

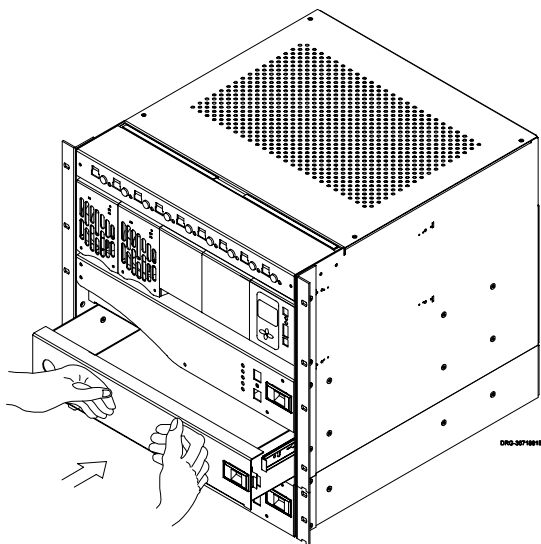
### Step 1 - Align the blanking tray with the rails



**Step 2 – Push in the blanking tray, until it latches closed**

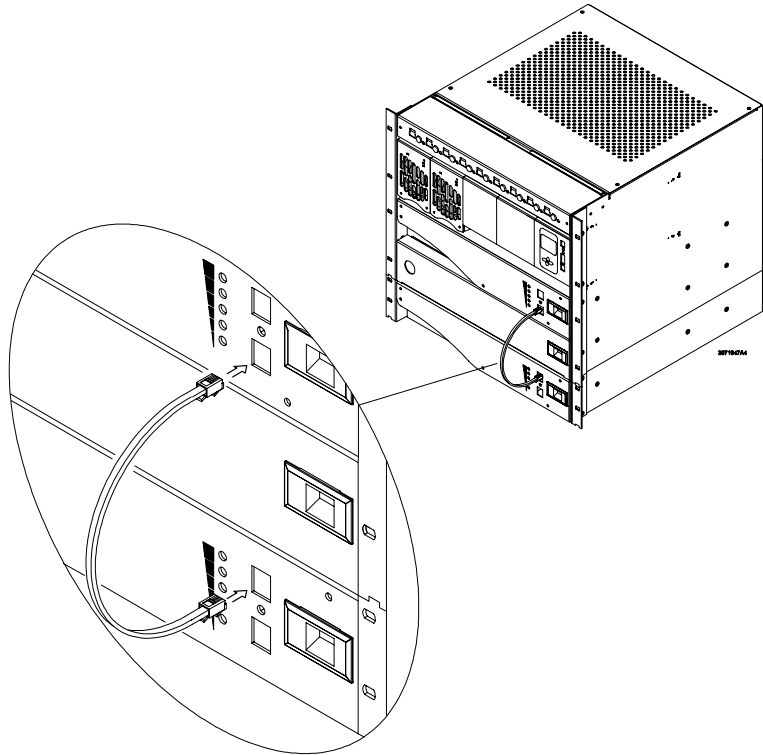


To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.



To confirm the blanking tray is properly latched, pull gently. The blanking tray should not slide out.

**Step 3 – Connect the battery communications cable**



**Procedure complete**



## Replacing a Rectifier

NES rectifiers are easy to replace, and are 'hot-swappable' — that is, you can replace them while the power system is on and equipment is connected.

This section covers the following procedures.

- Removing a Rectifier
- Inserting a Rectifier

### Removing a Rectifier



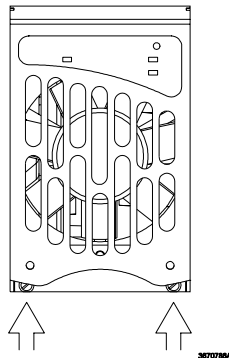
**To reduce the risk of electric shock and maintain optimum system cooling, always cover empty rectifier slots with blanking panels.**



**Do not attempt to disassemble rectifiers. Return them, in their original packaging, to your local Intergy representative for replacement or repair.**

To remove a rectifier (for example, when the Rectifier Fail LED is on), follow this procedure.

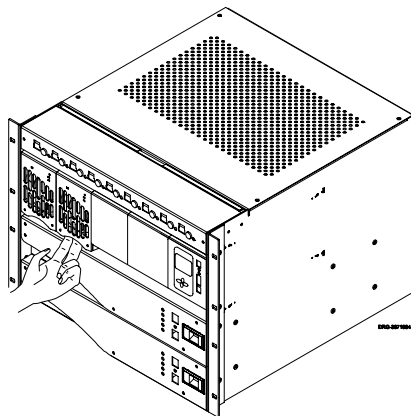
#### Step 1 – Loosen the rectifier retaining screws



## Step 2 – Pull out the rectifier

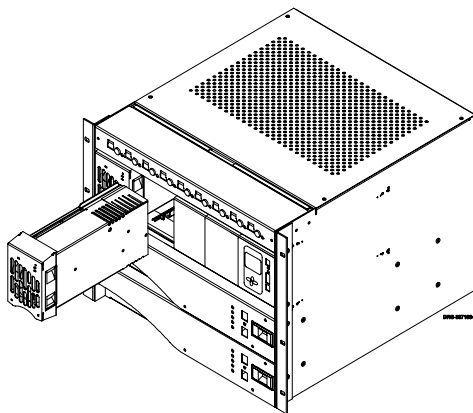


①



The rectifier may be hot. Allow the rectifier to cool down or use suitable gloves.

②



## Procedure complete

You must now insert a replacement rectifier into the empty slot (see page 6-28), or fit a blanking panel.

Return the rectifier, in its original packaging, to your local Intergy representative for replacement or repair.

## Inserting a Rectifier

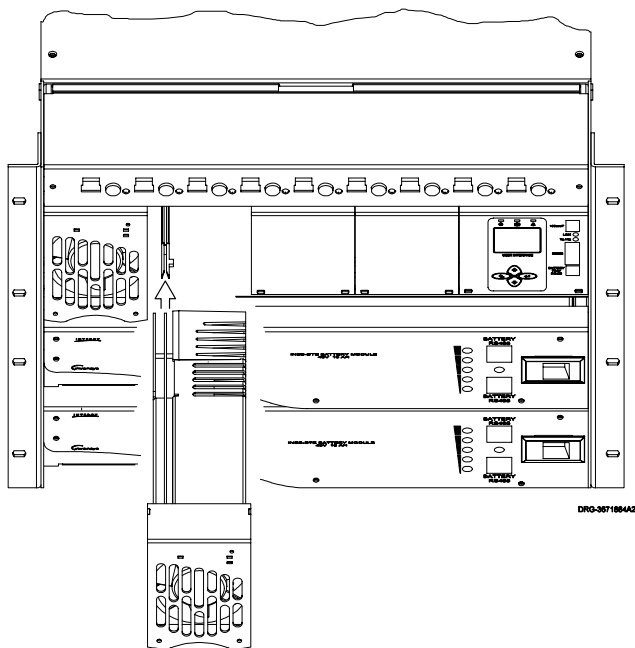
### Step 1 – Align the rectifier with the guide rail



Align the rectifier's bottom guide with the guide rail, as shown below.



*Ensure the replacement rectifier is of the same type (for example R1248 or R748). Never ever insert R1248 and R748 rectifiers into the same NES power system.*

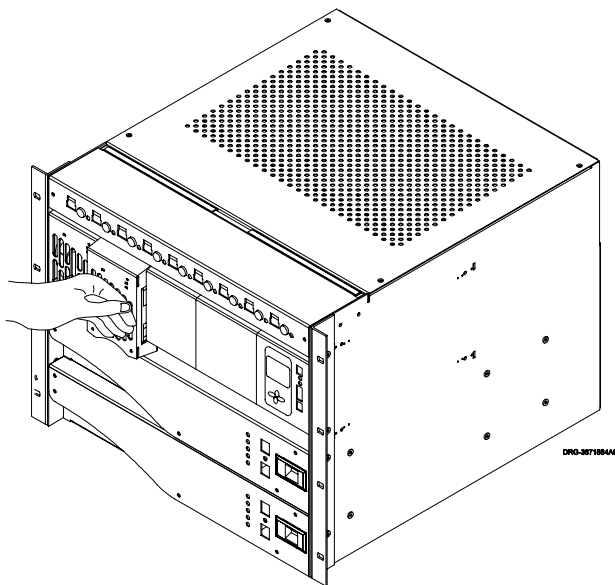


## Step 2 – Push in the rectifier



To avoid injury to your hands, keep your fingers clear, as shown in the diagram below.

- 1 Slowly push the rectifier in, until it plugs firmly into the backplane connector.



- 2 To confirm that the rectifier is properly inserted, check that it will not slide out when you gently pull on it.
- 3 Check that the rectifier's ① Power On LED turns on and the 🔔 and 🔔 alarm LEDs are off.

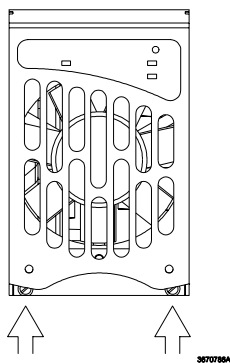


*The 🔔 alarm LED turns on for about 1 second when the rectifier powers up.*

### Step 3 – Tighten the rectifier retaining screws



Tighten the two rectifier retaining screws located at the bottom of the rectifier, as indicated below.



**Procedure complete**

## ***Battery Disposal and Recycling***

Invensys Energy Systems recommends using properly trained and experienced service technicians. It is important that your service technicians follow Environmental Protection Agency (EPA) guidelines or equivalent local regulations to dispose of all batteries. Please remember that the owner is responsible and liable to ensure those EPA guidelines or equivalent local regulations are followed.

In the United States, many states and cities have enacted legislation requiring the recycling of lead batteries. More and more states and municipalities are restricting or have completely banned the disposal of lead batteries with municipal solid waste. In addition, recent federal legislation requires that used lead-acid batteries be managed as hazardous waste, and comply with 40 CFR parts 260-272, unless the batteries are sent for reclamation and managed in compliance with 40 CFR part 266, subpart G. In other countries, equivalent local regulations apply.

Sound complicated? It can be because laws and regulations keep changing. Adding to this problem is the fact that few collection, reclamation and secondary lead smelting facilities are set up for, or have any desire to deal with small sealed-lead batteries.

### **Battery Recycling – United States**

Invensys Energy Systems recognizes these potential problems and, as a service to our customers, offers to accept the return of sealed-lead batteries produced and sold by our company. We will dispose of the batteries in an environmentally sound manner. When properly returned, Hawker Energy Products Inc. accepts ownership of the batteries for reclamation at a secondary smelting facility, in full compliance with 40 CFR part 266, subpart G.

While we think it's important that our customers know that all components (metals, plastics and acid) of their disposed batteries can be recycled, it's comforting to know that they actually are.

## ***Return Procedure for our Battery Recycling Program***

Simply follow the steps below to return your used sealed-lead batteries to us.

- 1 Contact a Hawker Customer Service Specialist at 800-964-2837 and identify yourself as a customer wishing to return a *Hawker* or *Gates* sealed-lead battery for reclamation.



*A Return Authorization letter and Tracking Document will be sent to you, providing the necessary records for the transaction. Additionally, the Customer Service Specialist will assist you in determining an acceptable method of packaging and shipping the batteries.*

- 2 Fill out the Tracking Document according to the instructions and include it with the prepaid (by customer) shipment of your used sealed-lead batteries to Hawker Energy Products Inc.



*After receiving your shipment and verifying that the batteries were properly returned, we will send you a copy of the Tracking Document as proof that the batteries have been sent to Hawker Energy Products Inc. for reclamation and managed in compliance with 40 CFR part 266, subpart G.*

Thank you for supporting our Battery Recycling Program.



*Battery recycling is also available via the Internet. To locate a recycling center in your area, visit the following website:*

**[http://www.recycle.net/recycle/battery/class\\_b1/index.html](http://www.recycle.net/recycle/battery/class_b1/index.html)**

## **Battery Recycling – Other Countries**

In other countries, contact your local Intergy representative for advise on local battery recycling procedures or call +1-660-429-2165 for the Hawker Battery Recycling Program.

**System AC Input**

AC Input Voltage Range	99 to 275 VAC (1Ø; L-N) or (2Ø; L-L)
Maximum AC Input Current	32 A or 16 A per cable
Frequency Range	45 to 66 Hz
Maximum Earth Leakage Current	5.4 mA or 2.7 mA per AC supply cable

**System DC Output**

DC Output Voltage	54 V ( <i>nominal float</i> )
System Voltage Reference	1.5 kV AC Isolation to Ground ( <i>standard</i> ) Positive Ground ( <i>optional</i> )
DC Output Power	2720 W ( <i>with four R748 rectifiers</i> ) 4640 W ( <i>with four R1248 rectifiers</i> )
DC Output Voltage Range	40 to 60 V
Setpoint Accuracy	± 0.1 V
Regulation ( <i>Active Voltage Control enabled</i> )	± 0.1 V
Current Limit	Preset to maximum rectifier current
Over Temperature Turndown	Automatic current turndown
Over Voltage Shutdown Trip Point Range	58 V



### Environment

Ambient Temperature Range <i>(operating)</i>	0°C to 40°C (32°F to 104°F)
Relative Humidity <i>(operating and storage)</i>	0 to 95%, non-condensing

### Dimensions H, W, D

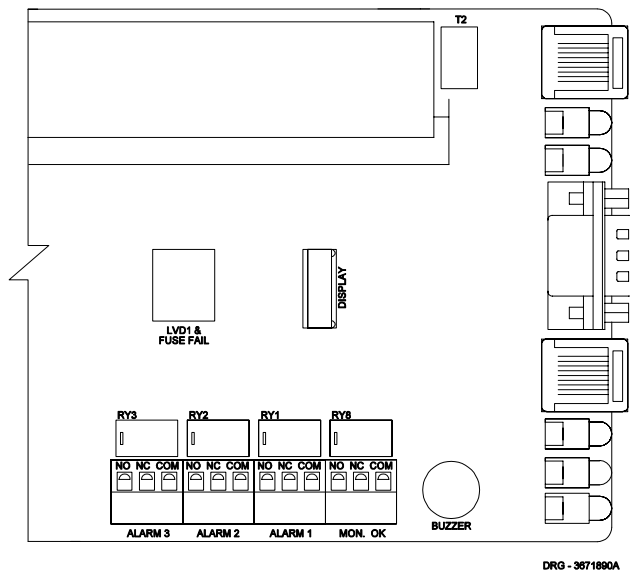
INES115/125	6U, 19 inches, 480 mm
INES215/225	8U, 19 inches, 480 mm
INES315/325	10U, 19 inches, 480 mm
Extension Battery Module	2U, 19 inches, 480 mm

### Weight

INES115/125 <i>(includes battery trays and rectifiers)</i>	53 kg (117 lb)
INES215/225 <i>(includes battery trays and rectifiers)</i>	92 kg (202 lb)
INES315/325 <i>(includes battery trays and rectifiers)</i>	131 kg (288 lb)
Battery Tray	32 kg (70 lb)
Rectifiers	1.9 kg (4.2 lb)

**NSM35 Alarm Relays**

Number of Relays	3 (configurable) 1 (non-configurable)
Contact Arrangement	One changeover contact per relay
Maximum Switching Voltage	150 VDC
Maximum Switching Current	1 A
Maximum Continuous Current	1 A
Maximum Power Rating	30 W (DC Voltage)
Isolation (Relay Connections to Ground, System COMMON and all other circuitry)	500 VDC
Maximum Cable Size	1.5 mm <sup>2</sup>
Active State	Energized or de-energized
Connector Pin Assignment	See illustration below.



**Rectifier Types**

R748 Series	48 V, 680 W, fan cooled
R1248 Series	48 V, 1160 W, fan cooled

**R748 Series Rectifiers**

Rated AC Input Voltage Range	99 to 275 VAC
Maximum AC Input Current	8 A <i>(at 99 VAC)</i> 4.2 A <i>(at 185 VAC)</i>
Rated Output Power	680 W
Rated Output Current	14.2 A <i>(at 48 V)</i> or 11.7 A <i>(at 58 V)</i>
Preset Voltage	54.5 V $\pm$ 0.1 V
Current Limit	Preset to maximum rectifier current
Wide Band Noise (0 to 1 MHz)	< 10 mV (unweighted)
Audio Frequency Noise (100 Hz to 5 kHz)	< 2 mV (psophometric)

**R1248 Series Rectifiers**

Rated AC Input Voltage Range	185 to 275 V AC
Maximum AC Input Current	8 A <i>(at 185 VAC)</i>
Rated Output Power	1160 W
Rated Output Current	24 A <i>(at 48 V)</i> or 20 A <i>(at 58 V)</i>
Preset Voltage	54.5 V $\pm$ 0.1 V
Current Limit	Preset to maximum rectifier current
Wide Band Noise (0 to 1 MHz)	< 10 mV unweighted
Audio Frequency Noise (100 Hz to 5 kHz)	< 2 mV psophometric



*Comprehensive NES and rectifier product data sheets are available. Please contact your local Intergy representative or email [info.intergy@energy.invensys.com](mailto:info.intergy@energy.invensys.com)*

If the NES is not used for an extended period, de-commission the NES using one of the following options.

### **Option 1 (Preferred)**

The preferred option is to keep the AC supply connected. This ensures that the batteries are float charged to preserve their optimum capacity. The DC loads may be disconnected if required.

### **Option 2**

If no AC supply is available at the dedicated AC power outlet(s):

- 1** Float charge the batteries for at least 72 hours before disconnecting the NES from the AC supply outlet(s).
- 2** Switch OFF the battery MCB of each battery tray, to preserve the battery capacity. See Removing a Battery Tray, Steps 1 and 2 in Chapter 6.
- 3** Label each battery tray with the date of last charge.
- 4** Disconnect the NES from the AC supply.
- 5** Ensure that battery trays are float charged for 72 hours once every six months and stored at 25°C (77°F).



*Once the battery MCBs and the AC supply are switched off, secure standby DC is no longer available.*



*The monitoring electronics inside the battery trays switch to power-save mode after approximately 30 minutes.*





## EQUIPMENT INCIDENT REPORT

Please enter as much information as you can. Send the completed form together with the item for repair to your nearest authorized service agent. NOTE: Only one fault to be recorded per form.

For further information contact: The Customer Service Department, Invensys Energy Systems  
Telephone: (+64) 3 343 3314 or Fax: (+64) 3 343 5660.

Date: .....

### Customer Information

Company: .....

Postal Address: .....

.....

Return Address (Not PO Box): .....

Telephone: ..... Facsimile: ..... Email: .....

Contact Name: .....

### Location of Failure

Product Code ..... Serial Number ..... Document No.....

System type installed in..... Serial number .....

Site name or location.....

### Fault Discovered

☐

Delivery

☐

Unpacking

☐

Installation

☐

Initial test

☐

Operation after .....years

☐

.....

### Failure Source

☐

Design

☐

Manufacturing

☐

Documentation

☐

Transportation

☐

Installation

☐

Handling

☐

.....

### Effect on system operation

☐

None

☐

Minor

☐

Major

☐

.....

### INFORMATION

(fault,details, circumstances, consequences, actions)

.....  
.....  
.....  
.....  
.....

### Internal use only.

Reference No: ..... RMA: ..... NCR: ..... Signature: ..... Date:.....

SG/03 ISS03

---

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*For a complete listing of worldwide sales offices, consult our website at:*  
<http://www.energy.invensys.com>

# Battery Tray LED Indicators

## % Charge Remaining



80 – 100%



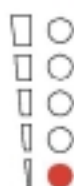
60 – 80%



40 – 60%



20 – 40%



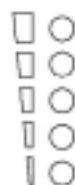
10 – 20%



0 – 10%

(LED Flashing)

## General



Battery Tray in  
Power-Save Mode



Battery Tray Identification

(LEDs Flashing)

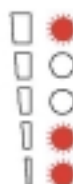
## Faults



ROM Error



RAM Error



Overtemperature

(LEDs Flashing)



Calibration  
Database  
Corrupt



Configuration  
Database  
Corrupt



Sensor Fail



Battery MCB in OFF Position  
(Battery Fuse Fail)

(LEDs Flashing)