MYERS
EMERGENCY POWER SYSTEMS

Installation and Operation Manual

ICBM-S - **I**ndividual **C**harge **B**attery **M**anager (**S**ecurity)

AP9930-36S
AP9930-48S

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Introduction

ICBM-S – Individual Charge Battery Manager (Security)

Safety Information

When installing the Individual Charge Battery Manager (ICBM-S):

- Do not work alone under hazardous conditions.
- Do not handle any metallic connector before the power has been disconnected.
- Servicing this equipment may require working with protective covers removed and utility power connected. Use extreme caution during these procedures.
- Check that the power cord(s), plug(s), and sockets are in good condition.
- Replacement of fuses or other parts must be with identical types and ratings. Substitution of non-identical parts may cause safety and fire hazards.
- Use tools with insulated handles.
- Avoid short-circuiting the battery terminals; it could cause the terminal or the shorting object to melt. Severe burns can result.
- Do not lay tools or metal parts on top of the batteries.
- Remove watches, rings, and other metal objects.
- When used outdoors, the ICBM-S and all cables must be contained within a weather-protected enclosure.

CAUTION! All work must be performed by qualified personnel.

Overview

The ICBM-S is a battery manager/conditioner that will extend the life of batteries by maintaining an equal state of charge across each battery in a string. This will maximize the charge in each battery resulting in longer run-times.

As the ICBM minimizes battery differences in a string, individual batteries can be replaced as they fail, stopping the wasteful practice of replacing entire strings.

As batteries fail, the ICBM will locate the failed battery and notify the operator that the power station requires servicing.

In the event of battery theft, the ICBM-S can tie into the tamper switch input to the power supply to provide a discrete alarm.

The ICBM-S is available in two base models:

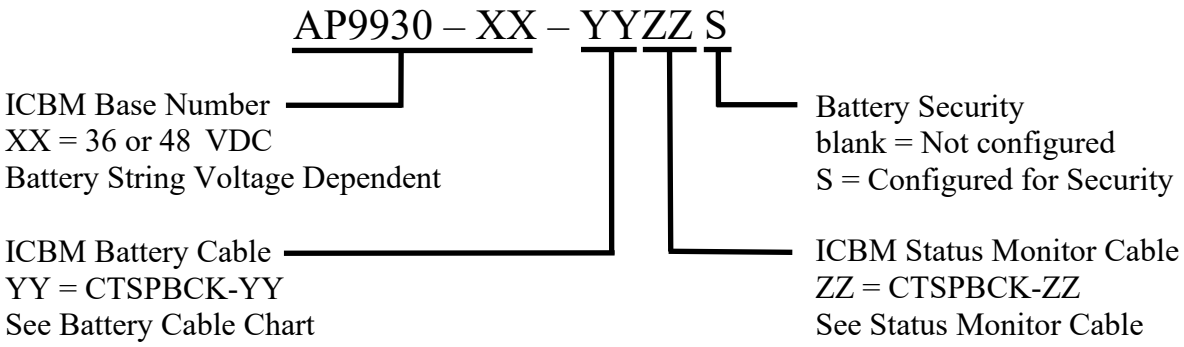
- AP9930-36S For 36VDC battery strings (3 batteries per string), or
- AP9930-48S For 48VDC battery strings (4 batteries per string)

Each string connected to the same ICBM-S must have the same number of batteries.

The ICBM-S is designed to function with most manufacturers 36 or 48VDC charging circuits.

Model Number Construction

The ICBM-S can be ordered either with or without cables. If an ICBM-S is ordered without cables, the model numbers used are AP9930-36S (36V Battery String) or AP9930-48S (48V Battery String). If an ICBM-S is to be ordered as a kit with cables, the ordered part number of the ICBM-S will have the following construction;



CAUTION! **Do not plug in any cable harnesses to the ICBM-S until the wire harnesses are fully connected to the batteries and status monitoring device.**

Inventory

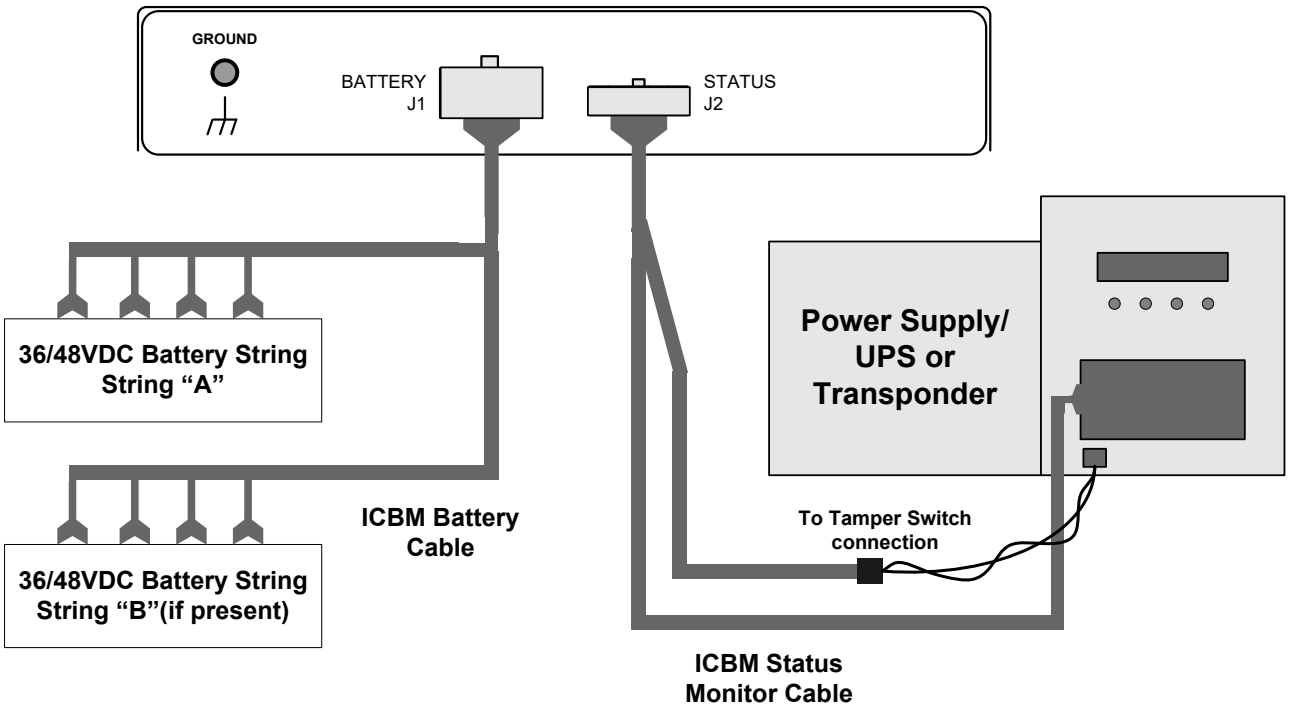
Examine the packaging and contents upon receipt. The following should exist in the carton:

Quantity	Description
1	One ICBM-S module, model # AP9930-36S or AP9930-48S. The AP9930-36S is for 36VDC battery strings. The AP9930-48S is for 48VDC battery strings.
1	One battery string cable with push-on ring-lug terminals (optional). Cable connects the ICBM-S to the batteries. The ring-lugs get fastened to the battery terminals to provide connection points for the battery string cable. See the chart of available cables on page 6.
1	One “status monitor” interface cable (optional). Connects the ICBM-S to the device that actually measures the batteries such as a transponder or the interface card on a power supply. See the chart of cables on page 6.

ICBM-S Wiring Diagram

This diagram shows a typical ICBM application. The ICBM J1-Battery connection can be made to 1 or 2 strings of batteries.

The ICBM Status Monitor Cable is optional. The ICBM will balance charge the batteries regardless if it is connected to a power supply/UPS, transponder, or other device to measure battery voltages or to monitor the contact closures.



J1 to J2 "Loop Thru" Connection

It is important to note that the J1 to J2 connection in the ICBM is a "loop-thru" connection. This simplifies the wiring inside an enclosure. The ICBM is connected to the battery strings, the battery measuring device connects to the ICBM to obtain the battery voltages through the "loop-thru" J1-J2 connection. This eliminates the need of having two cables going to the batteries.

Available Cables

ICBM Battery String Cables

These cables connect the ICBM to the battery string(s). This list may not be comprehensive. Please contact your Myers EPS Sales Representative for more information.

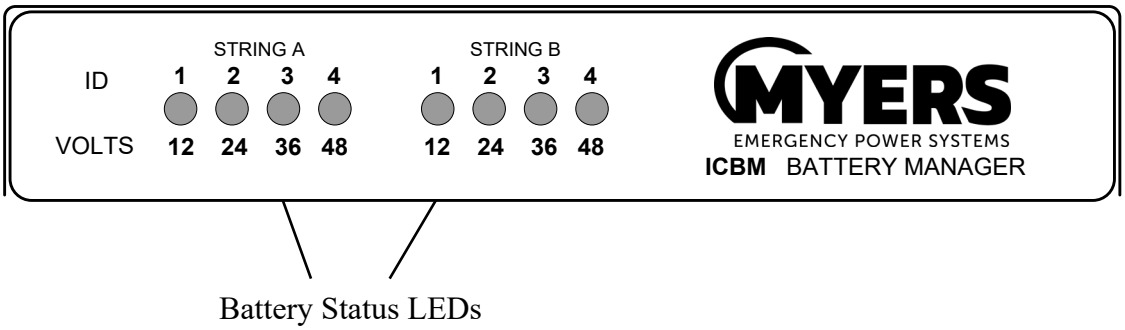
Battery Cables – Connects ICBM to batteries					
Battery String Voltage	**Number of Strings**	**Length String A**	**Length String B**	**Myers EPS Part #**	**Description**
36	1	36”	- -	CTSPBCK-33	Battery Cable 36V 1 String 36”
36	1	72”	- -	CTSPBCK-34	Battery Cable 36V 1 String 72”
36	2	36”	72”	CTSPBCK-35	Battery Cable 36V 2 String 36/72”
36	2	72”	72”	CTSPBCK-36	Battery Cable 36V 2 String 72/72”
36	2	36”	90”	CTSPBCK-73	Battery Cable 36V 21 String 36/90”
48	1	36”	- -	CTSPBCK-37	Battery Cable 48V 1 String 36”
48	1	72”	- -	CTSPBCK-38	Battery Cable 48V 1 String 72”
48	2	36”	72”	CTSPBCK-39	Battery Cable 48V 2 String 36/72”
48	2	72”	72”	CTSPBCK-40	Battery Cable 48V 2 String 72/72”

ICBM Status Monitor Cables

These cables connect the ICBM to the actual device monitoring the battery voltages or contact closure. This can be a transponder, power supply interface card, or other device. This list may not be comprehensive. Please contact your Myers EPS Sales Representative for more information.

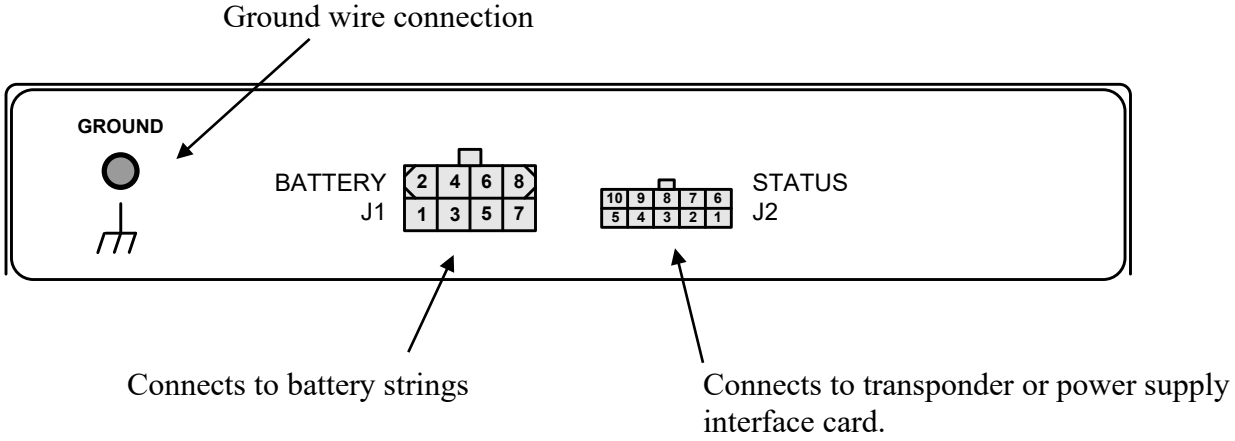
Status Monitor Cables – Connects ICBM to power supply/UPS, transponder or alarm				
Connects to:	**Number of Strings**	**Cable Length**	**Cable – No Battery Security**	**Cable - with Battery Security**
Myers ESP CTSP-SM5/8	1	36”	CTSPBCK-41	CTSPBCK-41S
Myers EPS CTSP-SM5/8	2	36”	CTSPBCK-45	CTSPBCK-45S
Alpha EDSM or DSM	1 or 2	36”	CTSPBCK-47	CTSPBCK-47S
Cheetah CMD-P	1 or 2	36”	CTSPBCK-47	CTSPBCK-47S
AM Networks – 9362	1 or 2	36”	CTSPBCK-51	CTSPBCK-51S
Contact Closure Alarm	1 or 2	72”	CTSPBCK-54	CTSPBCK-54S
Electroline DOCSIS DHT-PS also Electro/Alpha Embedded	1 or 2	36”	CTSPBCK-55	CTSPBCK-55S
Cheetah proprietary CMX-36V	1 or 2	36”	CTSPBCK-69	CTSPBCK-69S

ICBM Front View



ICBM Rear View

The two connectors on the rear of the ICBM are intentionally different to avoid misconnection.



Connector Pin Assignments

Note: The following pin assignments are for the 48VDC ICBM. The 36VDC ICBM uses the same pin assignments except that the 48VDC pins are not electrically connected and 36VDC pins are shorted together.

J1 – Battery

Pin	Description
1	+48V – String A/B
2	+36V – String A
3	+36V – String B
4	+24V – String A
5	+24V – String B
6	+12V – String A
7	+12V – String B
8	Common

J2 – Status

Pin	Description
1	Common
2	+12V – String A
3	+24V – String A
4	+36V – String A
5	Alarm (Bad Battery, Open collector)
6	+12V – String B
7	+24V – String B
8	+36V – String B
9	+48V – String A/B
10	Alarm (Battery Theft, Open collector)

Installation

ICBM – Individual Charge Battery Manager

CAUTION! Do not connect any cables to the ICBM until instructed to do so.

Locating the ICBM

If the ICBM will be installed in the field, it must be housed in a weather-resistant enclosure where the ICBM can be protected from environmental hazards such as moisture. It is recommended that the ICBM be installed in one of two locations within the outdoor enclosure; the power supply shelf or a battery shelf. This determination is important as it will affect the selection of the battery and status monitoring cables.

Power Supply Shelf

If the ICBM is to be located on the same shelf as the power supply, the ICBM will usually be located to the left or right of the power supply, standing "on-end", LEDs facing the front of the enclosure. Never place the ICBM on the power supply as the heat from the power supply may overheat the ICBM.

With the ICBM on the power supply shelf, it is likely that the ICBM status monitor cable will be short (36 inches) as the connection is normally made near the power supply. In a normal single string configuration, use the 36" ICBM battery cable to reach the battery shelf. For normal two string configurations, use the mixed length (36 and 72 inches) cable to connect the ICBM to both battery shelves.. There are a variety of cable lengths available to fit a wide range of applications/configurations.

Battery Shelf

If the ICBM is to be located on a battery shelf, the ICBM will usually be located to the left or right of batteries, standing "on-end", LEDs facing the front of the enclosure. Never place the ICBM on top of the batteries as the metal case of the ICBM may short out a battery.

With the ICBM on a battery shelf, it is likely that the ICBM status monitor cable will be long (72 inches) to connect the power supply shelf. The connection to the batteries on the same shelf as the ICBM will be short (36 inches) as they are nearby. If there is a second shelf of batteries, the battery cable will need to be of mixed length (36 and 72 inches) to connect the ICBM to both battery shelves.

CAUTION! Do not connect any cables to the ICBM until instructed to do so.

Select the Cables

As explained in "Locating the ICBM" section above, cable length selection will be determined by the installation location of the ICBM. Please refer to that section for more information. Additional information to complete the cable selection shall be explained here.

Battery String Cable

Other than the cable length, two other factors must be considered to select the correct ICBM Battery String Cable; battery string voltage and number of strings.

If the battery string(s) are comprised of three batteries each, the combined voltage is 36VDC. If there are four batteries in a string, the voltage is 48VDC. Both the voltage and the number of battery strings are noted in the list of available ICBM Battery String Cables on page 3.

Status Monitor Cable

Other than the cable length, the device that actually measures the battery voltages or monitors the contact closure will be a primary factor to determine the correct ICBM Status Monitor Cable. Additionally, it must also be determined if the battery theft alarm capability of the ICBM-S is to be used as those cables have a terminal block to connect to the power supply "tamper" alarm or other contact closure.

The ICBM connects to the batteries via one of the ICBM Battery Cables and the ICBM "passes thru" those battery voltages to the "J2-Status" connector on the rear of the ICBM. A transponder, power supply interface card, or other device might normally connect directly to the battery string(s) to measure battery voltages in the absence of an ICBM.

With the ICBM in circuit, that same transponder or interface card will still monitor the battery voltages or contact closure. Instead of connecting these devices to the batteries directly, the transponder or interface card will now connect to the batteries through the J2 – Status connection on the ICBM. This provides addition function as well as minimizing cable complexity.

There are a variety of battery measuring or contact closure devices that the ICBM can connect to. Using the chart on page 6, select the appropriate ICBM Status Monitor Cable.

Identify Battery #1

To avoid confusion, the following battery numbering convention shall be used in this manual. The battery numbering convention follows the "Society of Cable Telecommunication Engineers" (SCTE) standards.

The battery with the main output lead connected to the negative terminal of the power supply/UPS charging circuit is **always** Battery 1, regardless of battery string voltage. When using multiple strings, the first string is String A, the next String B, etc. It may be helpful to mark the enclosure shelf in front of each battery to identify the battery location in the string.

CAUTION! **Disconnect the battery string(s) from the power supply/UPS charger prior to modifying any battery connections.**

Ring Terminal Installation

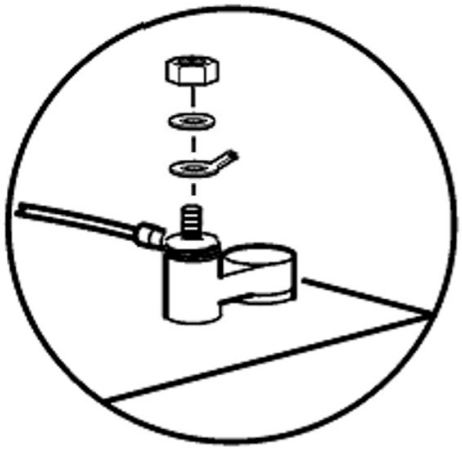
Completely install one Ring Terminal at a time.

Remove the existing battery nut/fastener and remove all wire and connections from the battery terminal. Use a wire brush completely clean the battery terminal, hardware and battery cable.

Start the process with Common, the negative terminal on Battery 1, String A. Starting from a clean, bare battery post, reattach the heavy battery cable to the battery terminal **first**, followed by the provided Ring "Push-on" Terminal. Ensure that the Ring Terminal tab is pointed "up". Rotate the Ring Terminal so that the tab is clear of any obstructions. Reattach the battery nut/fastener to the battery terminal and tighten securely. Repeat this for each positive terminal on every battery.

Ring Terminal Installation Steps:

1. **Install heavy battery cable**
2. **Install the Ring Terminal**
3. **Add Flat/lockwashers**
4. **Secure with nut or bolt**



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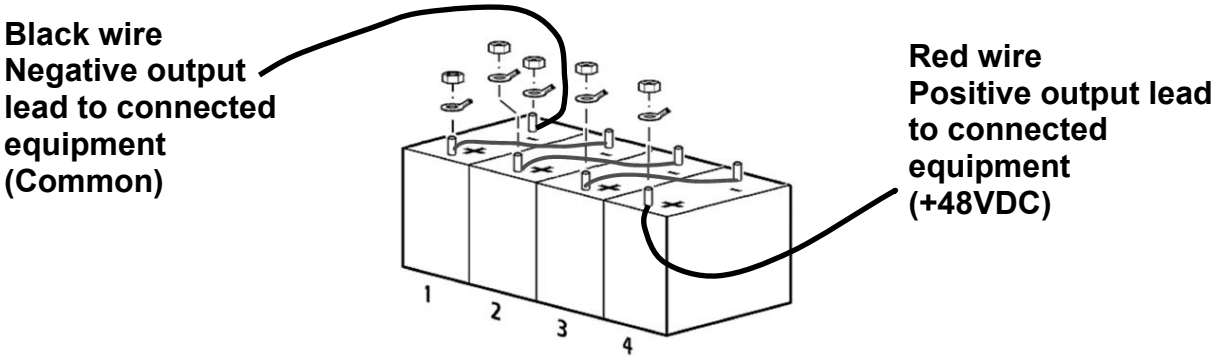
CAUTION! Disconnect the battery string(s) from the power supply/UPS charger prior to modifying any battery connections.

*48VDC Battery String Example**

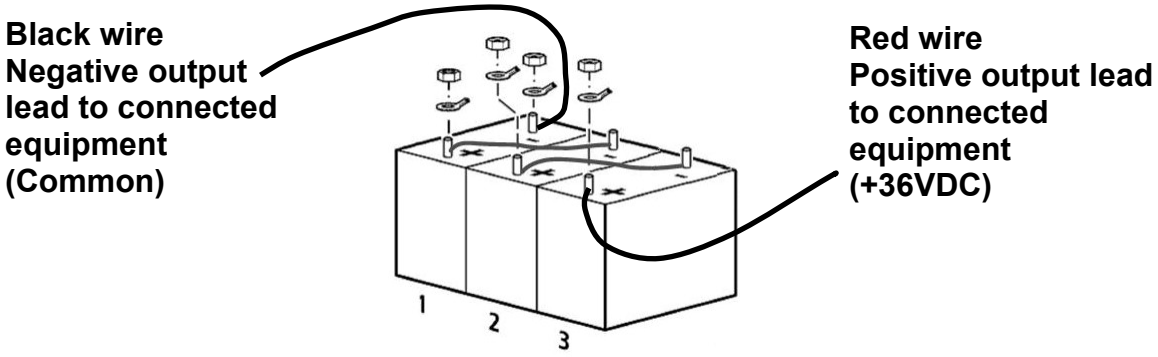
In this example, using the positive terminal on each battery as a reference point, Battery #1 is 12VDC, Battery #2 is 24VDC, Battery #3 is 36VDC, Battery #4 is 48VDC. The negative of Battery #1 is Common. Ring terminals go on the string Common and the positive terminal of each battery.



**Note: Battery arrangement in the enclosure may differ.*

*36VDC Battery String Example**

In this example, using the positive terminal on each battery as a reference point, Battery #1 is 12VDC, Battery #2 is 24VDC, Battery #3 is 36VDC. The negative of Battery #1 is Common. Ring terminals go on the string Common and the positive terminal of each battery.



**Note: Battery arrangement in the enclosure may differ.*

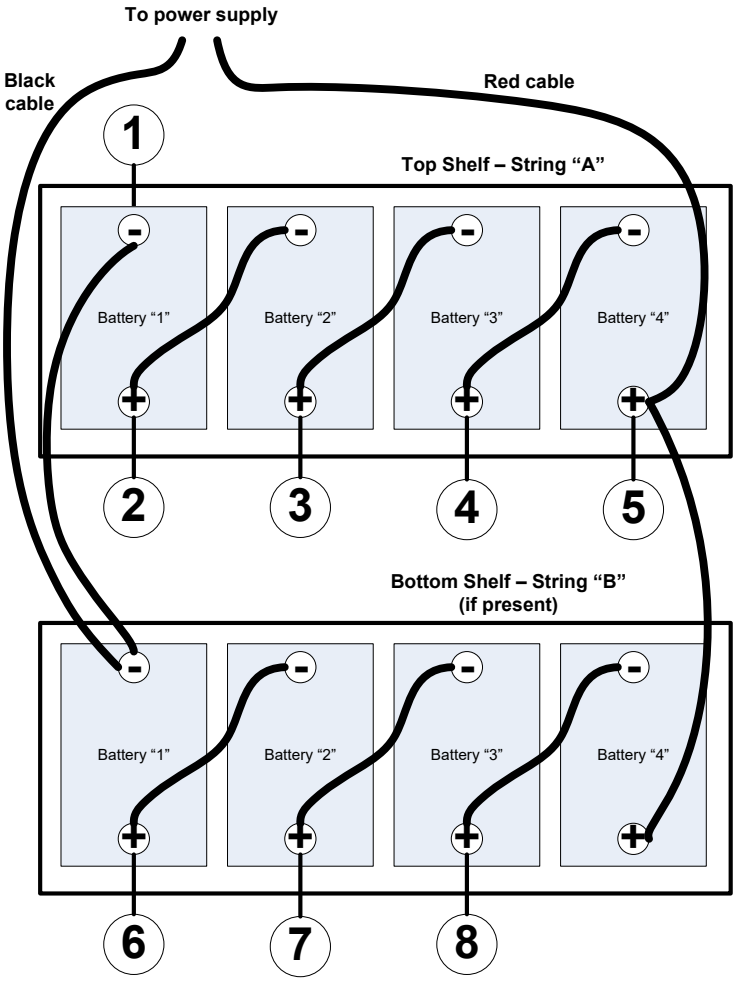
Battery Cable Installation – 48VDC Strings

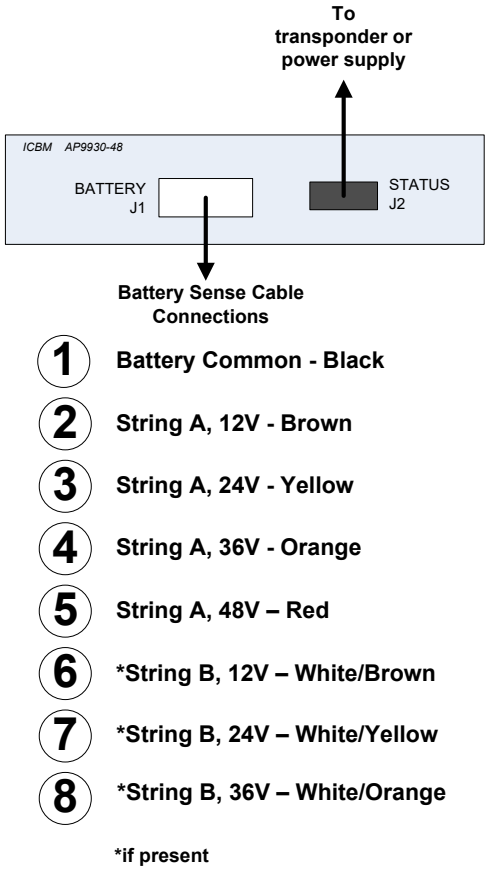
Prior to making a connection to any battery, route the ICBM Battery Cable from ICBM location through the shelf access holes to the battery locations. Leave enough slack in the cable to accommodate the battery drawer being pulled out.

Start the connection process with Common, the negative terminal on Battery 1, String A. Connect in numerical order the connections to Batteries 1, 2, 3 and 4 following the wiring diagrams below. Once the connections are made to String A, repeat the process for String B, if it exists.

CAUTION! Do not connect any cables to the ICBM until instructed to do so.

48VDC Battery String – Battery Cable Installation





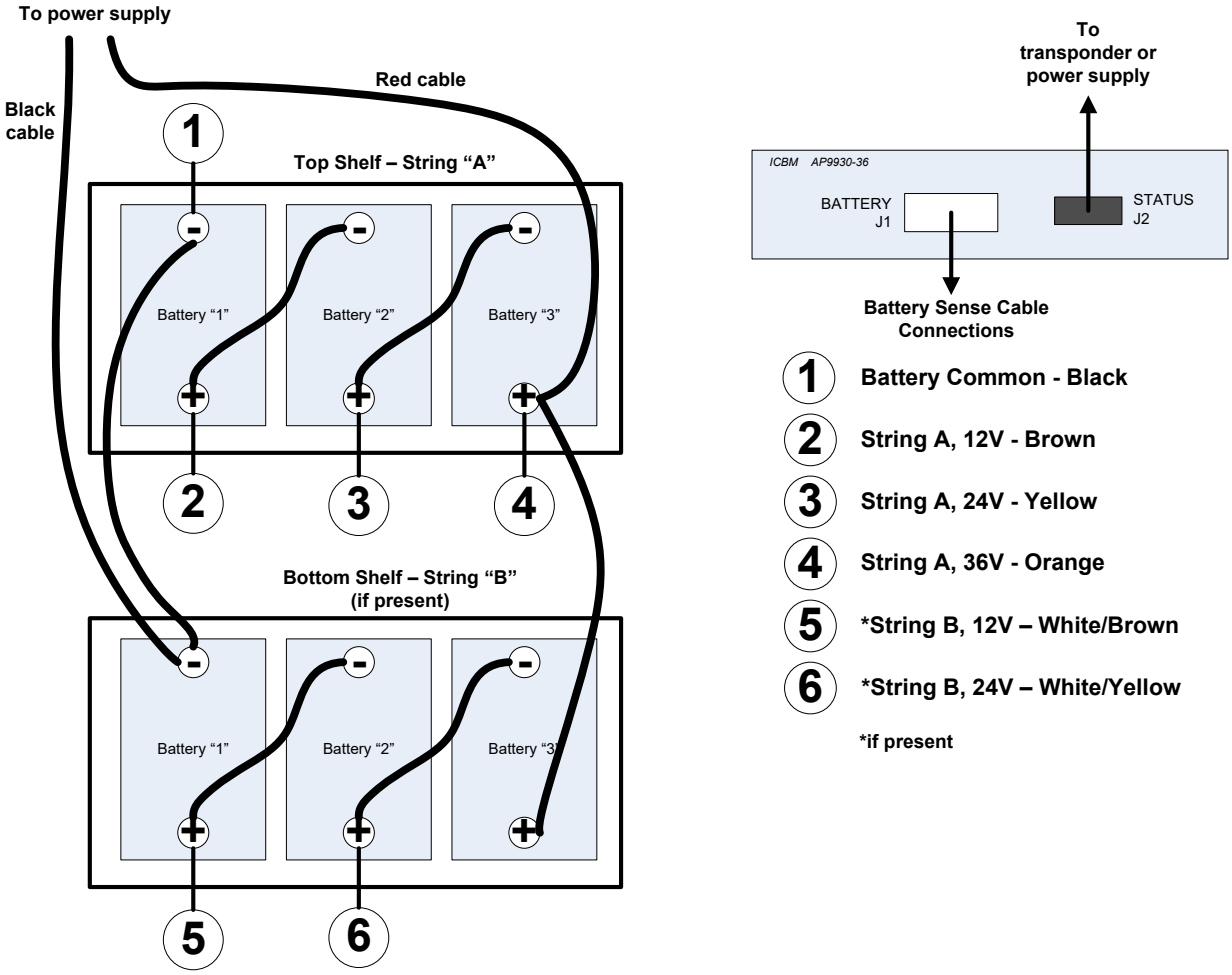
Battery Cable Installation – 36VDC Strings

Prior to making a connection to any battery, route the selected ICBM Battery Cable from the ICBM location through the shelf access holes to the battery locations. Leave enough slack in the cable to accommodate the battery drawer being pulled out.

Start the connection process with Common, the negative terminal on Battery 1, String A. Connect in numerical order the connections to Batteries 1, 2 and 3 following the wiring diagrams below. Once the connections are made to String A, repeat the process for String B, if it exists.

CAUTION! Do not connect any cables to the ICBM until instructed to do so.

36VDC Battery String – Battery Cable Installation



Status Monitor Cable Installation

Cable Routing

Prior to making a connection to the ICBM or other device, route the selected ICBM Status Monitor Cable from the ICBM location through the shelf access holes to the transponder, status monitor card or other device that will perform the actual measurement of the individual battery voltages or monitor the contact closure.

If the ICBM is to be mounted onto the battery drawer, ensure that the ICBM Status Monitor Cable has enough slack to accommodate normal battery drawer movement.

CAUTION! Do not connect any cables to the ICBM until instructed to do so!

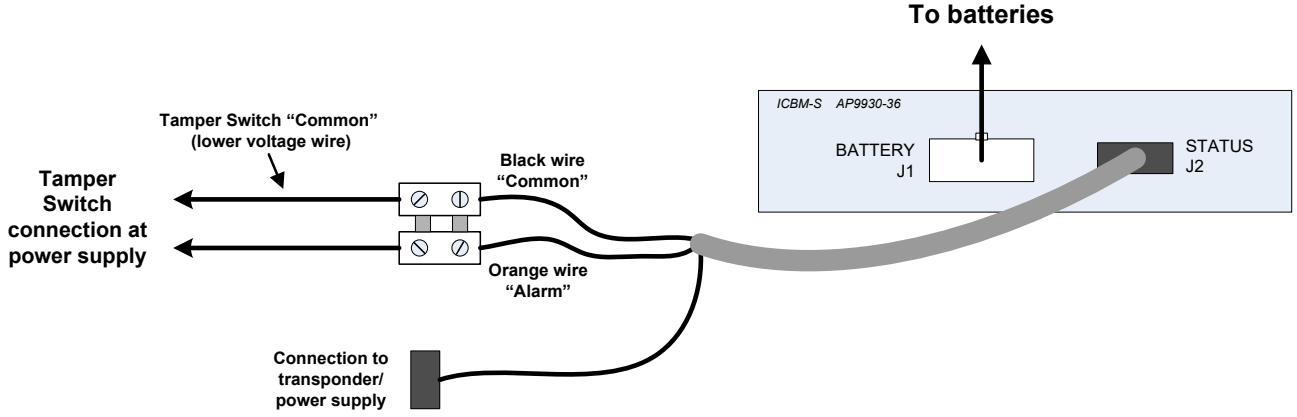
Connecting the Battery Security Theft Alarm

The ICBM-S can be connected to the power supply "tamper" alarm or other contact closure to provide an alarm that can be remotely monitored to detect the removal and theft of batteries. The Status Monitor Cables that support this feature have a two position small terminal block.

The power supply tamper switch or other contact closure is always a two wire connection consisting of one "alarm" wire and one "common" wire. To connect these wires to the ICBM-S, the identity of the wires coming from the power supply or other connection must be determined.

With the power supply or other device connected to it's tamper alarm cable (but not connected to the ICBM-S cable) using a DC voltmeter, carefully measure the DC voltage across the power supply tamper switch wires. One wire will be at a **lower** voltage than the other (about 5 to 15Volts difference). The lower voltage wire is the "common". Mark the lower voltage wire by putting a knot in it, using a piece of tape or other means to permanently indentify it.

To connect the power supply tamper alarm to the ICBM-S Status Monitor Cable, connect the power supply tamper switch "common" to the black wire at the terminal block connection. Connect the other wire of the power supply tamper switch to the orange wire at the terminal block connection.



Connecting the Battery Cable

Before attempting to connect the ICBM Battery Cable, electrically reconnect the battery string(s) to the Power supply/UPS charging circuit. Ensure that the power supply/UPS charging circuit is operating normally.

With the ICBM properly grounded and in its intended operating location, attach only the ICBM Battery Cable to the J1 – Battery connector on the rear of the ICBM, then watch the operation of the ICBM LEDs. If the ICBM is properly connected, all LEDs for a connected string should be lit. There might be a short "off" period for any LED, but the LEDs should be "on" 90% of the time.

If the ICBM has a wiring or a connection problem, the LEDs that show a good connection will blink at the rate of 1 second on, 1 second off. Bad connections will show a LED that is completely dark.

If there is only one string connected to the ICBM, only String A LEDs should be on. If there are two strings connected to the ICBM, both String A and String B LEDs should be on. If there is a wiring or connection fault on String A, then String B will be ignored and all String B LED's will be off. String B will be recognized only when the wiring or connection faults on String A have been resolved.

The ICBM is internally protected against all wiring error combinations including reverse polarity on any wire and battery overvoltage on any wire.

48VDC Battery String – Connection Error Chart

For String A, use colors as shown.
For String B, preface colors Brown, Yellow and Orange with "White/".

For any connected string, where ● indicates a LED that is on at least 50% of the time, ○ indicates a LED that is dark 100% of the time. Corrections to the wiring can be made with the ICBM powered. Connection changes will be immediately reflected by the LEDs.

LEDs for ID	**1**	**2**	**3**	**4**	
Volts	**12**	**24**	**36**	**48**	**Possible error**
	●	●	●	●	All connections OK, LEDs on 90%
	○	○	○	○	Check Red and Black, or ICBM is bad
	○	○	○	●	Only the Red and Black wires are OK
	○	○	●	●	Brown, Yellow in error, Orange, Red, Black OK
	○	●	○	●	Brown, Orange in error, Yellow, Red, Black OK
	○	●	●	●	Brown in error, Yellow, Orange, Red, Black OK
	●	○	○	●	Yellow, Orange in error, Brown, Red, Black OK
	●	○	●	●	Yellow in error, Brown, Orange, Red, Black OK
	●	●	○	●	Orange in error, Brown, Yellow, Red, Black OK

Note: The ICBM goes through an initial self-check prior to powering any LEDs. If this self-check fails, and the wiring is correct, the LEDs will remain dark. The ICBM may have failed and needs replacement.

Connecting the Battery Cable – 36VDC Strings

Before attempting to connect the ICBM Battery Cable, electrically reconnect the battery string(s) to the Power supply/UPS charging circuit. Ensure that the power supply/UPS charging circuit is operating normally.

With the ICBM properly grounded and in its intended operating location, attach only the ICBM Battery Cable to the J1 – Battery connector on the rear of the ICBM, then watch the operation of the ICBM LEDs. If the ICBM is properly connected, all LEDs for a connected string should be lit. There might be a short "off" period for any LED, but the LEDs should be "on" 90% of the time.

If the ICBM has a wiring or a connection problem, the LEDs that show a good connection will blink at the rate of 1 second on, 1 second off. Bad connections will show a LED that is completely dark.

If there is only one string connected to the ICBM, only String A LEDs should be on. If there are two strings connected to the ICBM, both String A and String B LEDs should be on. If there is a wiring or connection fault on String A, then String B will be ignored and all String B LED's will be off. String B will be recognized only when the wiring or connection faults on String A have been resolved.

The ICBM is internally protected against all wiring error combinations including reverse polarity on any wire and battery overvoltage on any wire.

36VDC Battery String – Connection Error Chart

For String A, use colors as shown.
For String B, preface colors Brown and Yellow with "White/".

For any connected string, where ● indicates a LED that is on at least 50% of the time, ○ indicates a LED that is dark 100% of the time. Corrections to the wiring can be made with the ICBM powered. Connection changes will be immediately reflected by the LEDs.

LEDs for ID	**1**	**2**	**3**	
Volts	**12**	**24**	**36**	**Possible error**
	●	●	●	All connections OK, LEDs on 90%
	○	○	○	Check Orange and Black wires, or ICBM is bad
	○	○	●	Only the Orange and Black wires are OK
	○	●	●	Brown in error, Yellow, Orange, Black OK
	●	○	●	Yellow in error, Brown, Orange, Black OK

Note: The ICBM goes through an initial self-check prior to powering any LEDs. If this self-check fails, and the wiring is correct, the LEDs will remain dark. The ICBM may have failed and needs replacement.

Connecting the Status Monitor Cable

Do not proceed with this step until the ICBM LEDs indicate that the ICBM is operating normally. To determine if the ICBM is operating normally, go to the "Connecting the Battery Cable" sections on the preceding pages.

Before attempting to connect the ICBM Status Monitor Cable to the ICBM, ensure that the Status Monitor Cable is securely connected to the transponder, power supply status monitoring card, or other device that will be measuring the individual battery voltages or monitoring a contact closure. Also, ensure that those devices are operating normally.

At this point, attach the unconnected end of the ICBM Status Monitor Cable into the J2 – Status connector at the rear of the ICBM. Verify that the LED's are operating normally.

If the ICBM is connected to a single string, connect the unconnected end of the ICBM Status Monitor Cable into the port monitoring String A.

If the ICBM is connected to two strings (or a two string ICBM Status Monitor Cable is being used) connect the unconnected side of the ICBM Status Monitor Cable into the ports monitoring Strings A and B.

When using a Myers EPS CTSP-SM* series product in a two string configuration, the status monitor cable is a "Y" cable. Insert the connector with the brown wire to the String A port, the other connector to the String B port.

Observe the operation of the transponder, power supply status monitoring card, or other measuring device and the ICBM to ensure that these devices are operating normally. If they are not, remove the Status Monitor Cable and troubleshoot the issue until it has been resolved.

Once that normal operation of all devices has been verified, it is advisable that the data regarding battery voltages be accessed to ensure that the Status Monitor Cable is properly forwarding the individual battery voltages to the transponder, power supply interface card, or other measuring device.

If the Battery Security feature is being used, disconnect one of the Battery Sense Cables while monitoring the power supply tamper alarm. The LED's on the front of the ICBM will flash on/off and the tamper alarm should be active. Replace the disconnected wire to return the installation to normal operation.

Operation

ICBM – Individual Charge Battery Manager

ICBM-S and LED Operation

The ICBM has several LED display patterns representing different operating modes of the ICBM. These different modes are:

- Wiring / Connection Fault or Missing Battery
- Normal Operating Mode
- Runway Mode
- Bad Battery Detected Mode
- Low Voltage Disconnect Mode

Wiring / Connection Fault

The ICBM LEDs will indicate a wiring or connection fault upon power up or after normal operation. Those connections that are good will be represented by a LED with a 50% flash rate, one second on, one second off. Those connections that are bad will remain dark.

Upon power up, wiring or connection faults will be displayed immediately. If a wire is inadvertently disconnected during normal operation, or one or more batteries are removed, it may take up to 20 seconds for the ICBM to register and display the wiring / connection fault.

Any wiring or connection fault on String A will cause the ICBM to ignore and turn off the LED's for String B (if connected). String B will not get recognized until such time that the wiring or connection fault on String A has been resolved.

For additional detail, refer to the "Connecting the Battery Cable" in the preceding sections.

The ICBM LED status should be checked during every power supply service visit, with special attention given after the battery drawer has been moved and/or a battery has been replaced.

Missing Battery

If a battery is removed from the power supply station, the ICBM-S will alarm as if there were a wiring / connection fault. It may take up to 20 seconds for the missing battery to register and display the missing battery connection.

During normal operation, the Common and Battery Theft connection is closed. When a wiring / connection fault is detected or one or more batteries become missing, the Common and Battery Theft connection opens. The Battery Theft alarm can be considered a "Normally Open" or N.O. connection.

The ICBM-S will remember that it is connected to one or two strings and alarm if any battery is removed, even if a technician is performing service on the power supply batteries.

Please be aware that if the J2 cable of the ICBM is removed, the Common and Battery Theft connection is opened thereby generating a Tamper or Battery Theft Alarm.

Downgrading from Dual to Single String Operation

Regardless if the Battery Security feature is used or not, the ICBM-S "remembers" the maximum string battery/string count that it had. If any battery is removed, the ICBM-S will alarm as if it were a bad connection.

If a power supply was configured as a dual string setup and then later configured as a single string setup, then the LED's would flash in alarm until the ICBM-S has its power cycled. This can be accomplished by removing the Battery Sense Cable from the J1 connector on the ICBM, waiting a few seconds, and then plugging it back into the ICBM. The ICBM will now reboot to its new string configuration.

Normal Operating Mode

When the ICBM is in "Normal Operating" mode, the ICBM is individually charging the batteries in its attached strings. The ICBM will only operate in the Normal Operating mode when the batteries that are attached to the power supply/UPS charger are in the region which is considered to be a "float" voltage.

The ICBM can individually charge batteries in up to two strings. Operation of the ICBM is slightly different when using a single string versus dual strings.

Single String: With only a single string attached, the ICBM will test each battery of the string. This can be observed by the LEDs each sequentially going into a 90% on cycle, where an LED would be mostly on, and just turn off very briefly. This is the way the ICBM shows that it is testing or charging a particular battery. Batteries that are not being tested or charged are represented by a solid on LED.

The ICBM will test each battery in the string in sequence. Once a string has been examined, the ICBM will select the "worst" battery in the string and individually charge that battery for 15 minutes. This approximately 16 minute cycle of: string test, select battery, and then individually charge, will continuously repeat unless interrupted. An interruption could occur because the batteries are no longer near the float voltage because a deep discharge event occurred.

Dual String: With two strings attached, the ICBM upon power up will test each battery in both strings, first in String A, then String B. Once testing is complete, the ICBM will switch to the string with the "worst" battery and will then individually charge that battery for 15 minutes. The ICBM will start the string test, select battery, and then individually charge 16 minute cycle, **remaining on that same string** for the next 5 hours.

At the conclusion of the 4 hour period, the ICBM will re-examine both strings and start servicing the worst battery in both strings, staying on that string for the next 4 hours. The ICBM will only select the same string sequentially twice. If after two 4 hour cycles the same string has the worst battery, the ICBM will force itself to service the other string. This stops the ICBM from focusing too much on any one string.

This larger 4 hour cycle of examining both strings will continue indefinitely as long as the batteries are near the float voltage or until such time that a bad battery has been detected in a string. Once a bad battery has been detected in a particular string, the ICBM will continue to service the identified bad battery to minimize its impact on the other batteries in that string.

Runway Mode

The ICBM will only operate normally when the batteries that are attached to the power supply/UPS charger voltage approach "float" voltages. It may be after an extended outage or after a new battery string has been installed that those batteries have a low state of charge.

During this low state of charge period, the LEDs will reflect this state by turning on, then off, one after another, in a repeating, rapid sequence. This is similar to the one-after-another "flash" of runway lights at an airport as an airplane is guided in for landing.

While the ICBM is in this "runway" mode, no individual charging of batteries will occur. The ICBM is waiting for the charge voltage to approach float voltage, at which time it will automatically revert to normal operation.

Bad Battery Detected Mode

During the period that the ICBM is in the Normal Operating mode, the ICBM is keeping track of the performance of each of the batteries in a string. Selection and detection of a bad battery commences when the same battery in a string has been reselected as the worst battery continuously for over three weeks. If this occurs, the ICBM will perform additional tests and may determine that battery is "bad".

The ICBM will continue to individually charge the batteries in the string, including the bad battery. This will minimize the impact of the bad battery on the other batteries in the string.

Once a battery in a string has been determined as bad, the ICBM will then "flag" the bad battery by flashing that battery's LED at a fast 50% on/off rate, keeping the LEDs of the other batteries solid on.

If only the contact closure is monitored, the contact closure will change state to indicate that a bad battery has been identified.

When the battery voltages are measured, the ICBM will signal the existence of a bad battery to a management system by artificially lowering the voltage of Battery 1, String A as reported through the J2 – Status connection to 6 Volts. A typical status monitoring system that remotely monitors the individual battery voltages would then show that the 12V battery, Battery 1 String A had dropped to 6 Volts. The status monitor system would "alarm" on this unusual event, drawing attention to the fact that a bad battery has been detected by the ICBM. This should initiate effort to have a servicing technician visit the power supply site and service the batteries.

The 6 Volt point was selected because such a voltage would not be normally be seen in a system. A normal fault might be a disconnected wire which would show as 0 Volts, or a shorted cell in a battery which would show something around 10 to 11 volts. A 6 Volt reading should only been seen by an operator using an ICBM.

The ICBMs bad battery flag can be reset if the battery connector is removed from the ICBM, essentially power cycling and resetting the ICBM. If a bad battery is simply replaced by a new battery without resetting the ICBM, it may take a few days for the bad battery flag to clear.

Note: The ICBM will use its LEDs to "flag" the worst bad battery detected. There may be other batteries in that string that also may be bad. It is important that the servicing technician measure and examine the other batteries in that string.

Low Voltage Disconnect Mode

The ICBM will go into a "sleep" mode and draw minimal current if the average voltage of the string goes below 10.5Volts DC per battery. All LEDs will be dark, except that the LED of Battery 1 String 1 will very briefly flash on every minute to show that it is in this low voltage sleep mode.

The ICBM will "wake up" when the power supply/UPS charger comes back on after AC line power has been restored. The ICBM will likely go into the Runway mode until the batteries approach float voltage.

Quick Lookup LED Chart

This is a simple look-up chart to help understand what the LEDs mean. Once a condition has been identified, look up the details of that mode in the "ICBM and LED Operation" section of this manual.

LED Status	Flash Rate	Mode
Some LEDs off, others flashing	1 sec on, 1 sec off	Wire / Connection Fault or Battery Missing
All LEDs mostly on, One blinking briefly off	2 seconds on, 250mec off	Normal Operation - Battery Charge
LEDs mostly off, Flashing on one at a time	250msec	Runway - Low Voltage
All LEDs on except one LED Flashing	250msec on, 250msec off	Bad Battery Detected
All LEDs off except Batt1 String A Flashing	15 sec off, 250msec on	Low Voltage Disconnect - Sleep

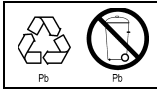
Service and Warranty Information

ICBM – Individual Charge Battery Manager

Service and Contact Information

Myers Emergency Power Systems makes every effort to ensure parts and equipment arrive in working condition. Occasionally, it may be necessary to return parts or equipment that are not in working condition.
If the unit requires service do not return it to the dealer. Follow these steps:

1. Contact Myers EPS Technical Customer Service by telephone at (610) 868-5400 Monday - Friday 8AM to 5PM U.S. Eastern time. Sales and Accounting issues use (610) 868-3500.
   - Note the product model number, the serial number, and the date purchased. If you call Myers EPS Customer Service, a technician may ask you to describe the problem and try to solve it over the phone. If this is not possible the technician will issue a Returned Material Authorization Number (RMA#).
   - If the product is under warranty, repairs are free. If not, there is a repair charge.
   - Procedures for servicing or returning products may vary internationally. Contact Myers EPS for country specific instructions.
2. If possible, pack the product in its original packaging. If the original packaging does not exist, pack the product carefully in a study carton with sufficient padding.
   - Pack the unit properly to avoid damage in transit. Never use Styrofoam beads for packaging as the static electricity that is generated may damage electronics. Damage sustained in transit is not covered under warranty.
3. Mark the RMA# on the outside of the package.
4. Return the unit by insured, prepaid carrier to the address given to you by Customer Service.



Be sure to deliver spent batteries to a recycling facility or ship to the manufacturer in the replacement battery packing material.

Myers Emergency Power Systems contact information:

For Customer Service…	Mailing/Shipping Address…
Technical (610) 868-5400	Myers Emergency Power Systems
Sales/Accounts (610) 868-3500	44 S Commerce Way
Monday – Friday	Bethlehem, PA 18017
8AM to 5PM US Eastern	

Limited Warranty

Myers Emergency Power Systems, LLC (Myers EPS) warrants this product to be free from defects in materials and workmanship for a period of five (5) years from the date of purchase. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. To obtain service under warranty you must obtain a Returned Material Authorization (RMA) number from customer support. Products must be returned with; transportation charges prepaid, accompanied by a brief description of the problem encountered. This warranty does not apply to equipment that has been damaged by accident, negligence, misapplication, or has been altered or modified in any way. This warranty applies only to the original purchaser.

EXCEPT AS PROVIDED HEREIN, MYERS EPS MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

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