BVS S4

BATTERY VALIDATION SYSTEM
MODEL BVS S4-XXX

INSTALLATION MANUAL

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WARNING: BTECH Inc. strongly recommends that only persons trained in the techniques and procedures necessary to assure personal safety when working with high-energy batteries perform installation of its Battery Validation Systems.

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4/5/05

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OVERVIEW

The S4 Battery Validation System (BVS) has been designed with ease of installation in mind. The traditional determination of voltage, temperature, and current help to predict impending battery failure before it becomes a problem. However, its use of impedance measurement makes the S4 an invaluable tool.

The S4 installation is performed in eleven steps:

1. Physical inspection of the package contents
2. Preparation of the battery cabinet
3. Mounting the monitor
4. Placement and connection of Voltage, Current and Temperature leads
5. Placement and connection of Current Transducer and cable
6. Providing AC power (110 to 240 VAC, 50/60 Hz)
7. Providing for communication
8. Installation of Alarm Leads (optional)
9. Grounding
10. System checks
11. Installation of fuses

This manual will cover each step in detail. ***Please read the manual carefully before beginning the installation.*** **If you have any questions, or any point seems unclear, please call us. You can reach us by phone between the hours of 8:00AM and 5:00PM (Eastern Time), Monday through Friday at 973-983-1120. Or you can fax us any time at 973-983-1125.**

Throughout the installation process, care should be taken to conform to all applicable electrical and building codes.

WARNING:
The S4 installation kit contains both 62mA and 9A fuses. Do not install these fuses until instructed to do so. Early installation of the fuses will result in your working with LIVE WIRES, and could result in a lethal shock.

STEP 1

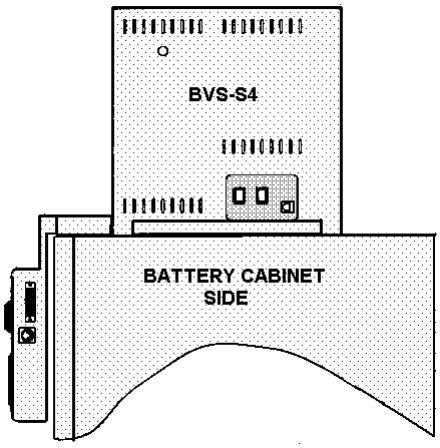
Physical Inspection of the Carton(s) Contents

The S4 packaging has been designed to protect the device's electronics during shipment, and make the job of unpacking easy and neat. The S4 system is shipped in its own carton with the wiring harness and other peripherals in a separate carton. Depending on the size of the battery installation to be monitored, there are 2-3 separate cartons. Immediately upon receipt, the S4 cartons should be opened and their contents compared to the accompanying packing list. Remove the S4 unit from the carton and inspect the unit looking for any physical signs of external damage. If there is any external damage, put the S4 back into the carton and notify BTECH as soon as possible. Inspect the contents of the remaining cartons, while unlikely, note should be made of any item(s) that appear to be damaged. If an item listed on the packing list cannot be located, or if any item is suspected of being damaged, BTECH must be notified within ten (10) calendar days from receipt of the package to prevent limiting our ability to successfully file any damage claims against the carrier.

After the carton contents have been inspected, carefully replace all items back into their respective cartons. The original S4 system carton should be kept to store the unit until it is time for installation. Close all cartons and keep them stored in a dry, and secure area until you are ready to perform the installation.

STEP 2

Preparation of the Battery Cabinet



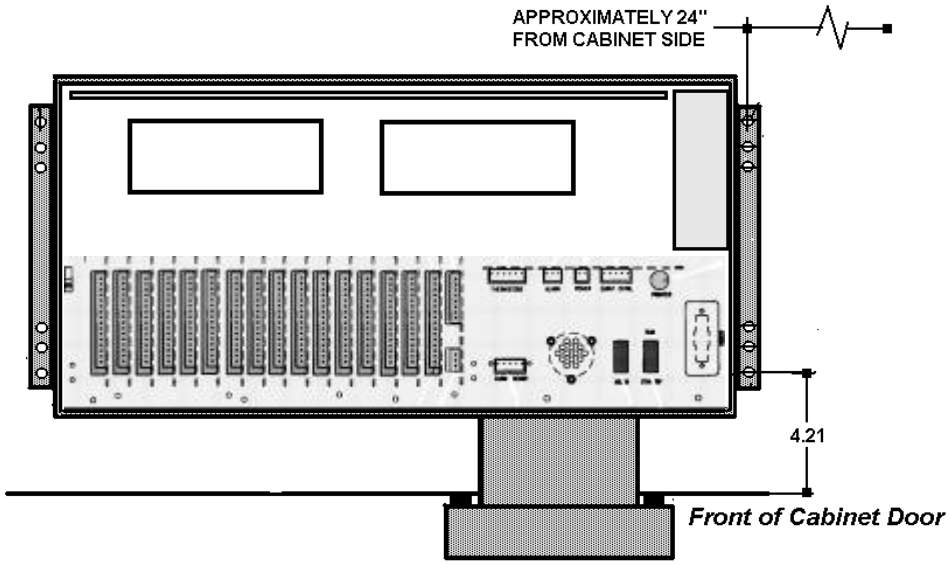
The S4 is mounted directly on the top of the second battery cabinet from the UPS. This location provides the best routing for the cables. It also isolates the S4 from the UPS, which can be a significant source of heat. The wires and the cables provided with the system have been designed with this in mind. If the S4 cannot be mounted on the second cabinet, please contact BTECH before continuing with the installation. If there is only one battery cabinet, the wires and cables have been designed for the S4 to be mounted on the first battery cabinet.

It is important that the S4 be positioned according to the dimensions on the drawing provided to allow for the correct location of the flip-down Display Panel. If mounted too far back, the panel will not fold down. If mounted too far forward, the bracket will project too far beyond the front of the battery cabinet. The monitor should be placed approximately on the center of the battery cabinet. However, the precise location must be determined by the installer to avoid obstructions to the openings provided in the bottom of the enclosure for the various wires and cables that must pass into the battery cabinet.

Holes must be provided in the top of the battery cabinet for the AC power cord, load current leads, voltage sense leads and thermistor leads. In order to align the holes properly, the cover of the S4 must be removed. There are two rectangular openings in the bottom of the enclosure. They will be used to route the voltage sense leads, thermistors, power cord and load leads. Rectangular holes have been used to provide adequate clearance when punching holes in the battery cabinet. Bushings for non-metallic cable (Romex style) are inserted in the punched holes to provide protection and strain relief for the wires, cables and S4 connectors.

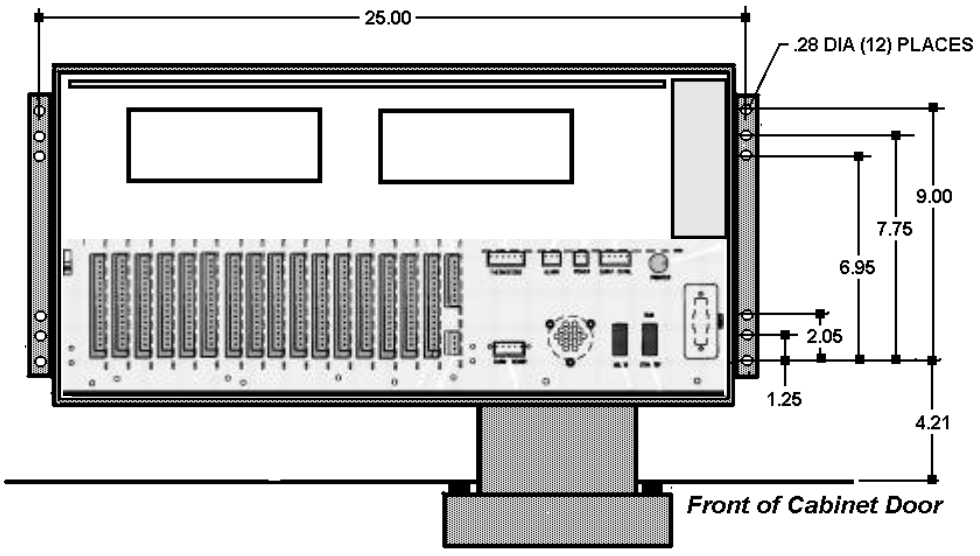
Remove the cover from the enclosure frame by removing the 12 screws securing the cover in place. Carefully lift the cover from the enclosure frame and place aside.

Temporarily place the S4 enclosure on the battery cabinet to locate the holes for passage of the cables into the battery cabinet and the holes for mounting the enclosure to the top of the cabinet. Verify the position is consistent with the dimensions shown in the drawing and that the display panel folds down and the rubber bumpers are against the front door of the battery cabinet.



- After correctly positioning the enclosure, check that there are no obstructions inside the battery cabinet that could interfere with the holes that will be cut into the top of the battery cabinet for mounting the S4 enclosure and holes for cable passage. If required, move the enclosure to the right, or left to avoid any obstructions.

- The S4 enclosure has two (2) mounting brackets with six (6) holes on each side. After positioning the enclosure, select two (2) holes on each bracket for mounting the enclosure to the top of the battery cabinet. See the drawing for location and dimensions.

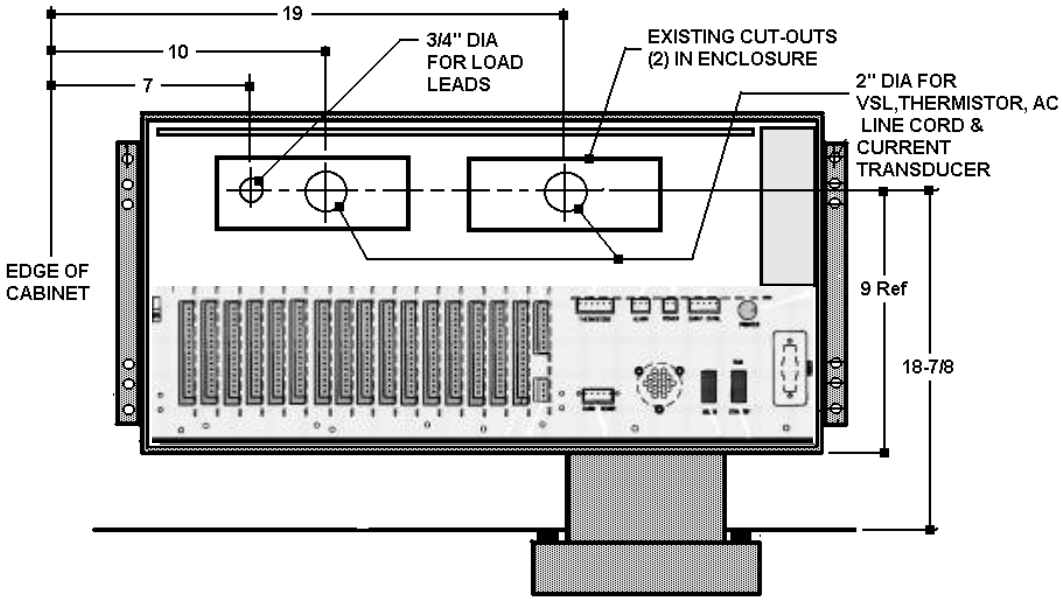


- After marking the mounting holes, use a scribe to trace around the large rectangular holes in the bottom of the enclosure. Remove the S4 enclosure and set aside in a safe place.

- Protect the batteries on the top shelf from metal chips and possible contact with tools. BTECH strongly recommends the use of rubber insulating blankets rated for 600 volts to protect the batteries and installer!

- Drill or punch holes in each of the larger rectangular holes as shown in the drawing.

ENCLOSURE SHOWN WITH COVER REMOVED



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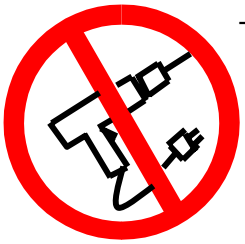
1. Install a 2" non-metallic cable bushing in each of the two larger holes.

2. Install a 3/4" non-metallic cable bushing in the smaller hole.

STEP 3

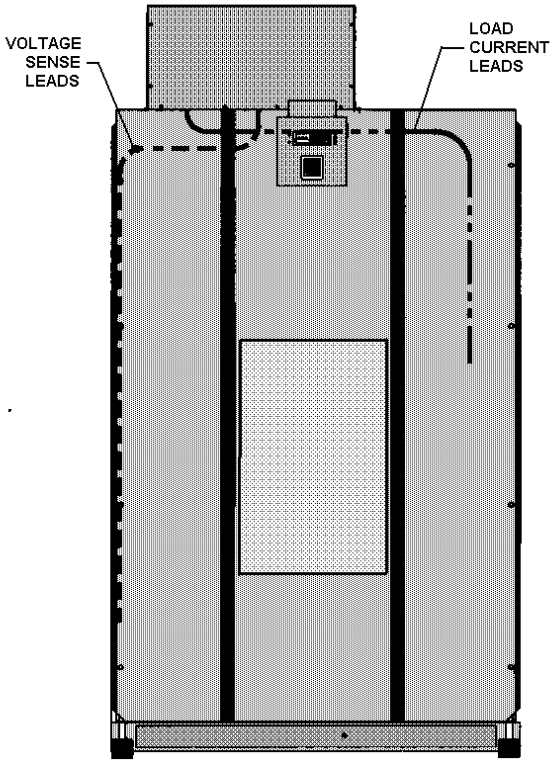
Mounting the Monitor

Mount the S4 with (4) ¼”-20 x 1” long 18-8 stainless steel screws, nuts, flat washers and split-ring lock washers.

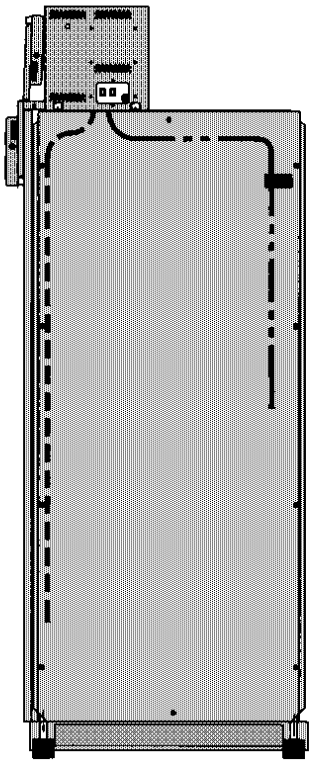


The enclosure should not need to be modified in any way, and ***BTECH does not recommend making any modifications***. Any cutting or punching of the enclosure may cause metal chips or filings to fall into the S4 electronics. If this happens, it will void the warranty. If a modification is required, please contact BTECH before making any changes to the enclosure.

Normally all the cables will be routed through the openings in the bottom of the enclosure into the battery cabinet. Be particularly careful to avoid batteries, cables, and other components in the battery cabinet when mounting the S4.



FRONT VIEW SINGLE STRING



RIGHT SIDE VIEW

STEP 4

Placement and Connection of Voltage, Current, and Temperature Leads

Types of Leads Included in the Kit:

Voltage Pigtails:

A custom set of voltage pigtails is provided. The pigtails are designed to connect to the battery terminal at one end, and to mate with the Voltage Sense Leads (mentioned below) at the other end. They are terminated with the female side of an in-line fuseholder at one end. At the other end, the type of battery and the customer's specifications dictates the form of termination.

Current Pigtails:

The current pigtails are 8 AWG wires terminated with a 30 amp, in-line fuse holder. The other end will be connected to the batteries using an insulation piercing tap or it may be directly inserted into the wire lug in the disconnect switch. The open end of the in-line fuse holder will be crimped onto the un-terminated ends of the Load Current Leads (mentioned below). Each pigtail comes with a piece of heat shrinkable tubing, and a copper sleeve. Detailed instructions for connecting the pigtails to the Load Current Leads appear later in this manual.

Voltage Sense Leads:

The Voltage Sense Leads are 23-conductor Multi-Conductor Cable. They are color-coded and terminated at one end with the male side of an in-line fuse holder. These are designed to mate with the Voltage Pigtails at one end, and to connect to the S4 at the other.

Load Current Leads:

The Load Current Leads are 16 AWG wires made into a harness, all terminating in one or more high-voltage plugs at one end. These are designed to be crimped into the 30A in-line fuse holder of the Load Current Pigtails at one end, and plug into the S4 at the other. Detailed instructions on the crimping operation appear later in this manual.

Thermistor Probes:

The S4 is normally provided with two to four thermistor probes, each with a lead of 18 AWG zip cord. The design calls for one probe to measure the ambient air temperature in the bottom of one battery cabinet, and the remaining probes to be placed against the sides of representative pilot cells on the top shelves, usually one per battery cabinet (limited to a total of 4 thermistors). The probes will connect to a six-position plug in the S4. Self-adhesive wire clips and heat insulating foam tape are included.

Current Transducer Cable:

This assembly consists of a length of jacketed, shielded, dual twisted pair cable, terminated with a circular connector. The connector is designed to plug into the Current Transducer (mentioned later in this manual). The un-terminated end will connect to a five-position plug in the S4.

Shortening and Lengthening Leads:

All of the wires and cables may be shortened as required. If you need to shorten a Voltage Sense Lead, first move the wire numbering band from its original position near the un-terminated end of the lead. Move it to a point beyond where you plan to cut the wire. If you must shorten the Thermistor Probes or the Current Clamp Cable, record the original placement of the wires in the plug. IMPORTANT, do not tin the leads prior to re-inserting them in the plug as this may cause the setscrew to loosen causing a bad connection.

If additional length is required on a wire, the wires can be extended by splicing the additional length needed. If you plan to splice into the Current Clamp Cable, use Alpha Cable No. 6416, or an equivalent, and be sure to splice the drain wires as well as the conductors.

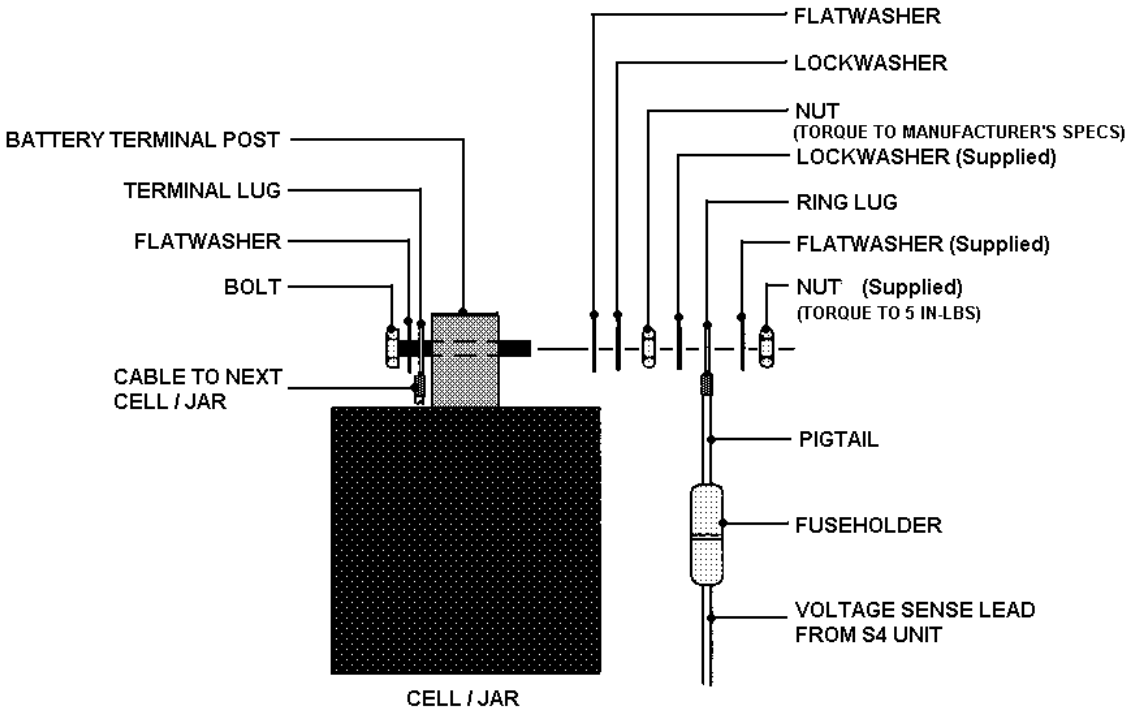
Installation of Voltage Pigtails

Sets of different length pigtail assemblies are included with the unit and are packed in separate bags. Each bag has a sufficient number of pigtails for each cabinet in the system. Each battery terminal will receive an appropriate length pigtail as shown in the diagram specific to the installation.

The type of battery termination dictates the way the pigtail is terminated. There are three (3) types of termination: Posts with bolts and associated harware, bolts threaded into the battery itself (threaded inserts) and ¼" tab connections. Battery manufacturers typically use 1/4" or 5/16" bolts.

Connecting to a Battery Post

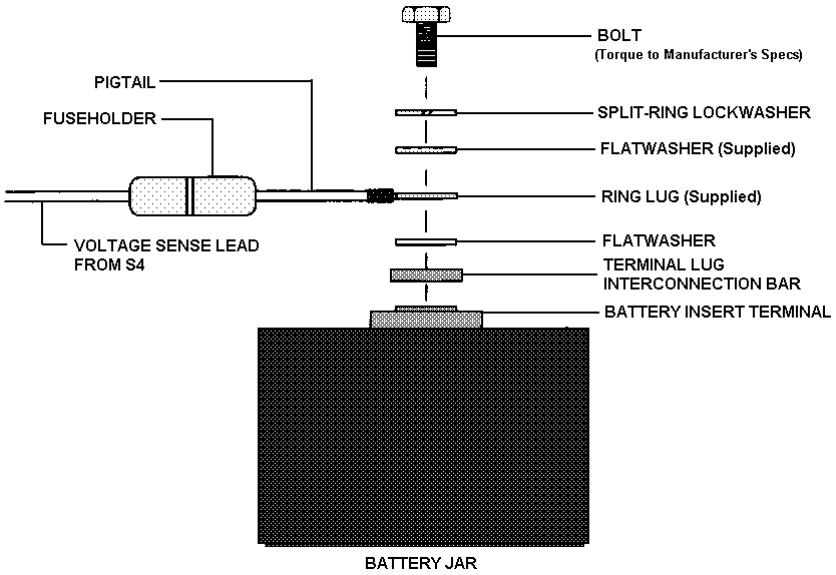
If your batteries have a post connection, connect the pigtail to the ***Most Positive Terminal*** using the double-nut method as shown on page 12.



CONNECTING TO A BATTERY POST

Threaded Insert Connection

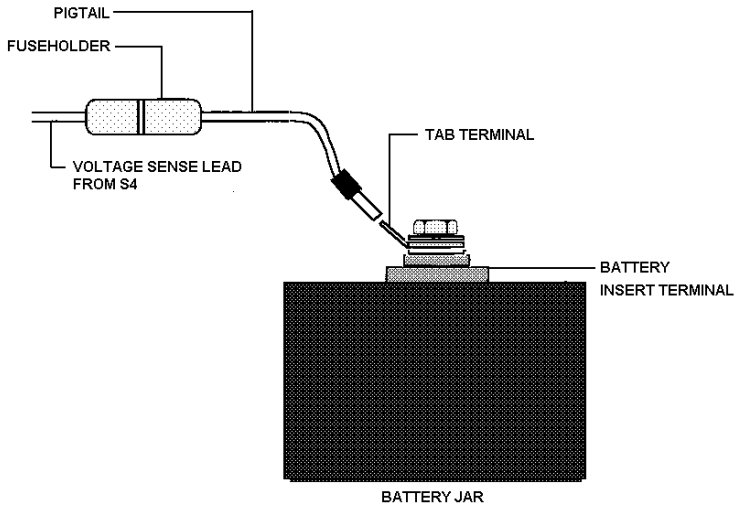
If your batteries use a threaded insert connection, connect the pigtails as shown below. In both cases, use the battery manufacturer's torque specifications.



CONNECTING TO A THREADED INSERT

Tab Terminal Connection

If your batteries use a ¼" wide tab terminal, simply connect the female quick disconnects on the pigtails to the tab terminals until they fit snugly.



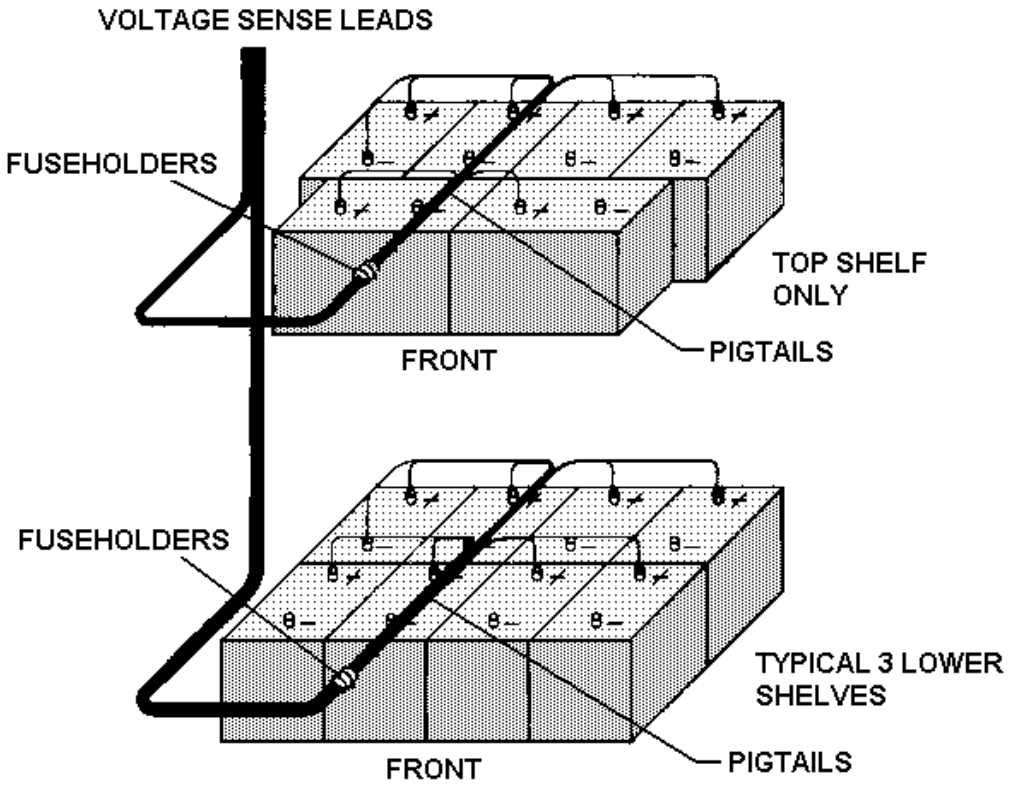
CONNECTING TO A TAB TERMINAL

The pigtails or ring terminals are installed on the batteries according to the Battery Wiring List. Be sure to install them on the post of the polarity indicated in the column headed "***+/-***". Every positive terminal in the battery cabinet will receive a pigtail or disconnect ring terminal. An ***additional*** disconnect ring terminal or pigtail will be installed on the negative terminal of the most negative jar on **each** shelf. Be sure to re-torque the bolt to the manufacturer's recommended torque after installing the disconnect ring terminal or pigtail.

The pigtails should be labeled with the lead numbers according to the Battery Wiring List for the particular installation prior to dressing them. This will eliminate errors when matching the voltage sense leads to the pigtails. When you are finished with this installation step, all the female fuse holder halves should line up neatly in front of the jar on the left side of each shelf.

IMPORTANT! *Bundle, tie and dress the pigtails as shown on page 14. Attach the pigtails to the rails above and bring towards the front of the cabinet, keeping the pigtails above the top of the battery jars.*

The diagram below illustrates a typical arrangement of batteries, and the suggested routing of Voltage Pigtails from the battery terminals to the front of the cabinet.



TYPICAL BATTERY CABINET HARNESS AND PIGTAIL ROUTING

Installation of the Current Pigtails

The installation of the Load Current pigtails will vary depending on whether or not there is a center disconnect in your string. Normally, *at a point half way through the battery string*, you would expect to find a cable connecting the negative terminal of the last battery on one shelf to the positive terminal of the first battery on the next. However, in some cases, that cable goes through a disconnect switch on its way between the two batteries. This is the **center disconnect**.

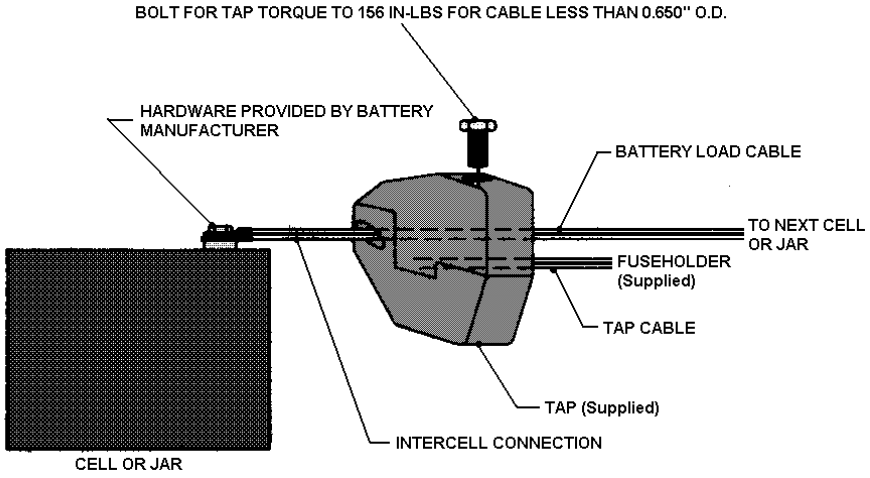
A center disconnect does not pose a problem to the S4, but it does require the use of an additional Load Current Pigtail for each string, and a slightly different configuration for the Load Current Leads. Much of the procedure is the same for both a normal installation and for one using a center disconnect.

Additionally, there are two ways of connecting the Load Current pigtails. Insulation piercing taps are the first option. These taps are installed on the battery cables to allow

for the connection of the Load Current pigtails to the batteries. Normally, only single battery cables are used for this connection. However, the system may use more than one cable in parallel. If this is the case, it is only necessary to connect to one of the parallel cables.

The second method of connecting the Load Current pigtails is by directly inserting the pigtail into the wire lug in the disconnect switch.

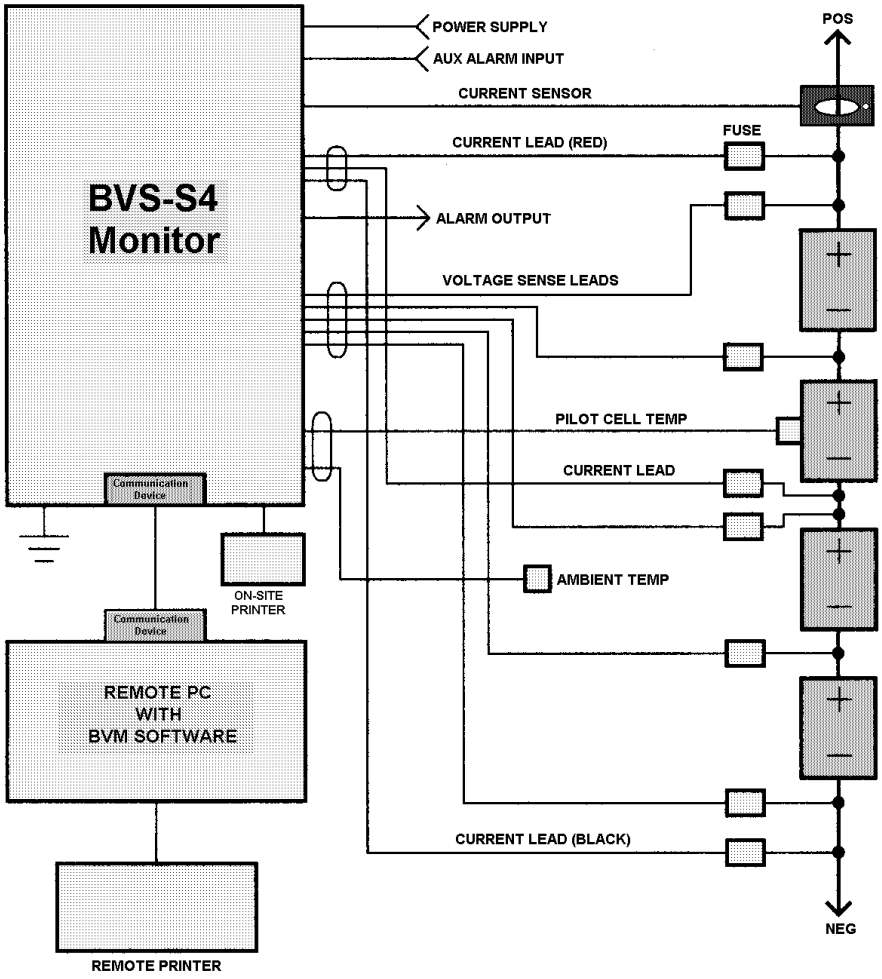
To install a tap, loosen its bolt until the larger of the two holes will accept the battery cable, and slip the tap over the cable. See the drawing below. Do not be concerned with the clear grease; it should be left where it is. Next, without stripping the wire, insert the 8 AWG wire from the Current Pigtail into the smaller hole in the tap until it stops against the tap's wall. Finally, tighten the bolt firmly to close the tap's jaws. This will pierce the insulation of both the battery cable and the current pigtail wire, connecting the two.



Install a current pigtail anywhere on the cable running from the Most Positive terminal on the battery to the positive terminal of the battery disconnect switch. This pigtail will eventually connect to the Red Load Current Lead.

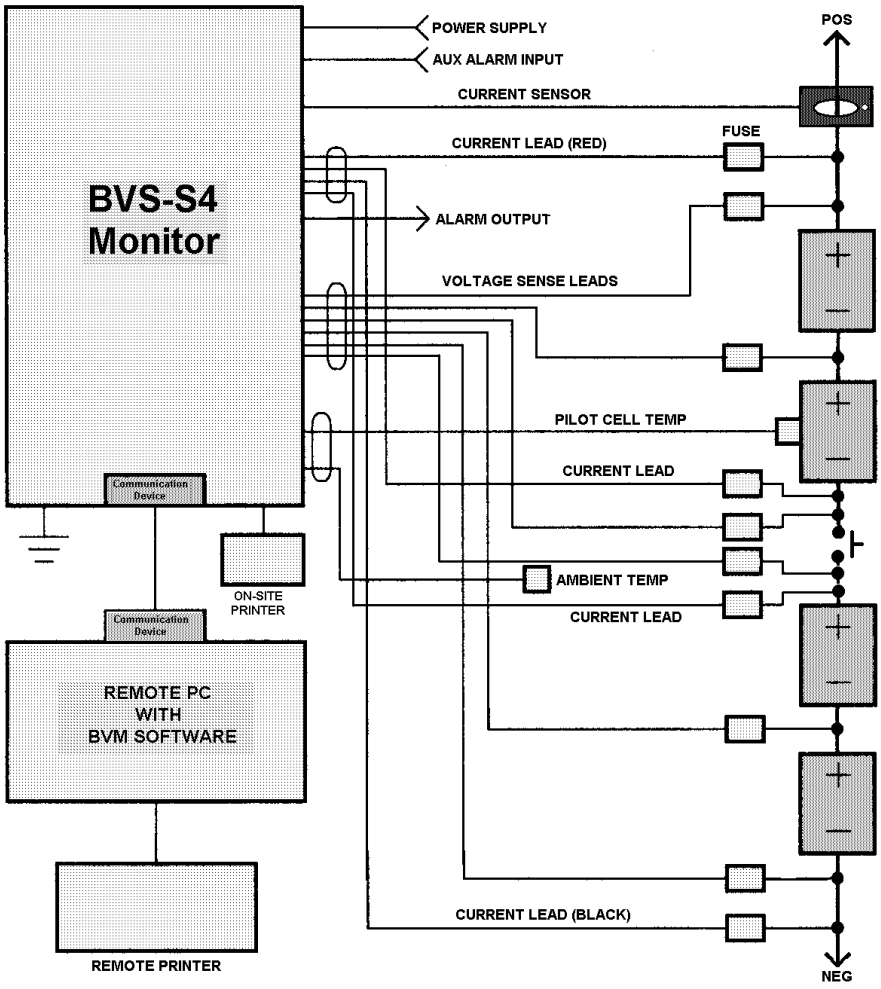
Next, install a current pigtail anywhere on the cable running from the Most Negative terminal on the battery to the negative terminal of the battery disconnect switch. This pigtail will eventually connect to the Black Load Current Lead.

If your system does NOT have a center disconnect, locate the cable, *at the midpoint of the battery string* that directly connects the negative terminal of the last battery on one shelf to the positive terminal of the first battery on the next. Each of the Load Current pigtails has hangtags indicating their connection points to locate their correct position easier. Connect each Pigtail near the center of the indicated cable. For each installation a table describing the location of the Load Current pigtails is provided.



SYSTEM WITHOUT A CENTER DISCONNECT

If your system DOES have a center disconnect, follow these procedures. First, install the positive and negative pigtails just as is described above. The other Load Current pigtails, however, should be installed one on each of the cables, that run through the disconnect switch, at the string's midpoint. Each of the Load Current pigtails has hangtags indicating their connection points to locate their correct position easier. One Load Current pigtail should be connected to the cable coming off the Negative battery terminal, and the other Load Current pigtail to the Positive terminal. For each installation a table describing the location of the Load Current pigtails is provided. See drawing below.



SYSTEM WITH A CENTER DISCONNECT

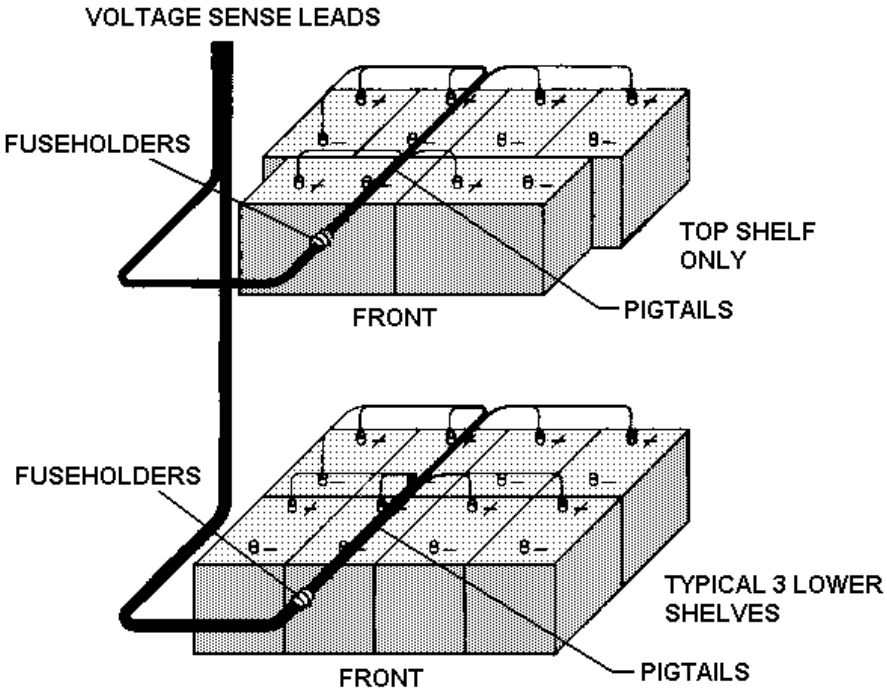
The Current Pigtails take 9 amp, fast blow fuses, of which are included in your kit. Put these aside for now. They must not be installed until the end of the installation process.

Installation of the Voltage Sense Leads

The Voltage Sense Leads must enter the S4 enclosure through the cable entrances on the bottom of the enclosure.

The Voltage Sense Leads may be run with the Thermistor Assembly and/or the Current Clamp Cable. They **cannot** be run with the Load Current Leads. *In fact, whenever possible, a distance of at least twelve (12) inches should be maintained between the Voltage Sense Leads and the Load Current Leads.* If the two absolutely must cross, they should do so at a right angle.

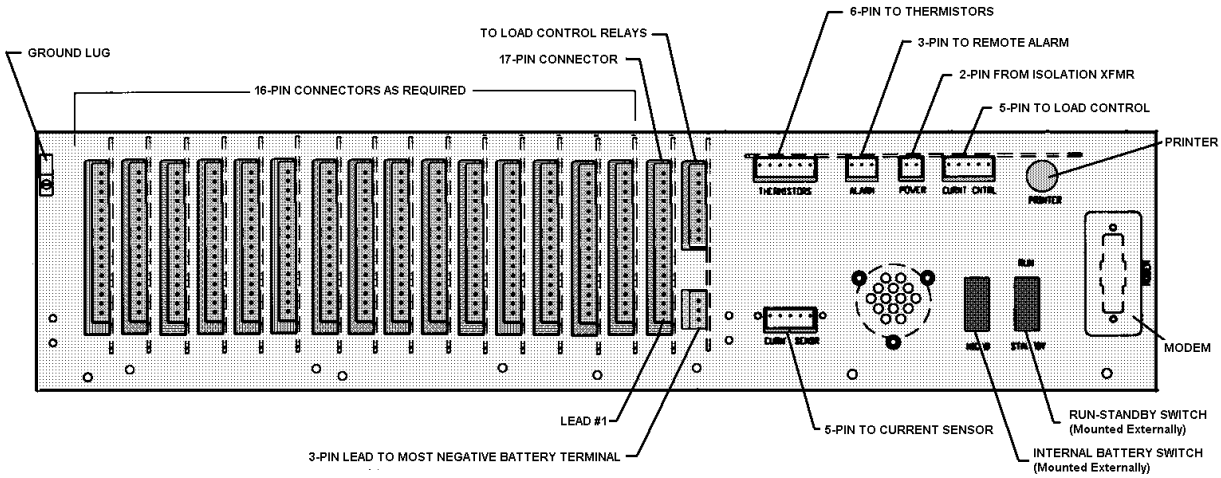
It is important that the Voltage Sense Leads be tightly bundled throughout their run. This also applies to each shelf's branch of leads when it leaves the trunk. For examples, see drawing below. This step is important to minimize the pick up of " noise" which can affect the impedance measurements of the S4.



It is easier to run the Voltage Sense leads from the batteries to the S4, rather than from the S4 to the batteries. Connect each color-coded lead to its corresponding pigtail.

The Voltage Sense Leads take 62mA/250V, 1-1/4x1/4 glass fuses, which are included in your kit. Put these aside for now. They should not be installed until the installation is complete.

Run the Voltage Sense Leads back to the S4, bring them into the enclosure, and dress them. Now, the leads must be connected to the S4. See drawing below for a view of all the plug-in connections in the S4.



Find the color lead for the number 1 position according to the Battery Wiring List. This lead is going to be connected to the number 1 terminal on the 17 position terminal strips inside the S4. It will probably need to be cut to length first. Next, strip the wire about ¼ of an inch, being careful not to nick the conductors. Then twist the conductors and insert them into the correct terminal on the strip. Tighten the screw firmly. Do not tin the wires. This may cause a gradual loosening of the terminal screw.

Note that in String 1 (Cabinet 1), the order of the voltage sense leads start from the most positive battery terminal and ends with the most negative battery terminal of the string (cabinet). In String 2 (Cabinet 2), the voltage sense leads are installed in reverse order. The leads will start from the most negative battery terminal and end with the most positive battery terminal of the string (cabinet). This pattern is used for all the strings in the system. This wiring scheme ensures that the total system voltage is never across two adjacent voltage sense leads.

Repeat this procedure for each of the remaining leads in sequence. Not every terminal on the strips are labeled with a number, but the number for any terminal can be determined by simply counting over from the nearest one that is labeled.

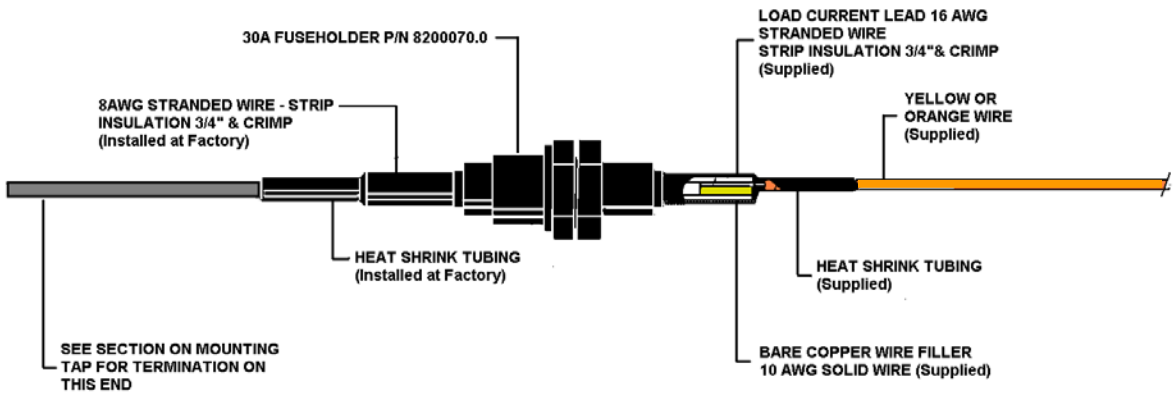
Installation of the Load Current Leads

The Load Current Leads must enter the S4 enclosure through the cable entrance at the bottom of the unit. It is important that a distance of twelve inches be maintained between the Load Current Leads and The Voltage Sense Leads whenever possible. If the two absolutely must cross, they should do so at a right angle.

It is easiest to run the Load Current Leads from the S4 to the batteries. Bring each colored wire to its corresponding colored pigtail. See the specific installation documentation for the correct wiring.

After dressing the leads, cut them to length. Slip the heat shrinkable tubing, provided with the pigtails, over the wires. Strip the wires about 3/4 of an inch. Be careful not to nick the conductors.

Insert the copper sleeves, provided with the pigtails, into the crimp barrels of the fuseholders. Twist the wire leads, and insert them as well. Crimp the connections firmly using a tool for #10-#12 insulated terminals. Slide the heat shrinkable tubing down over the connections, and heat them until they are snug. See the drawing below. If you feel uncomfortable using a heat source near the batteries, you may instead cover the connection with a generous amount of 600V electrical tape.

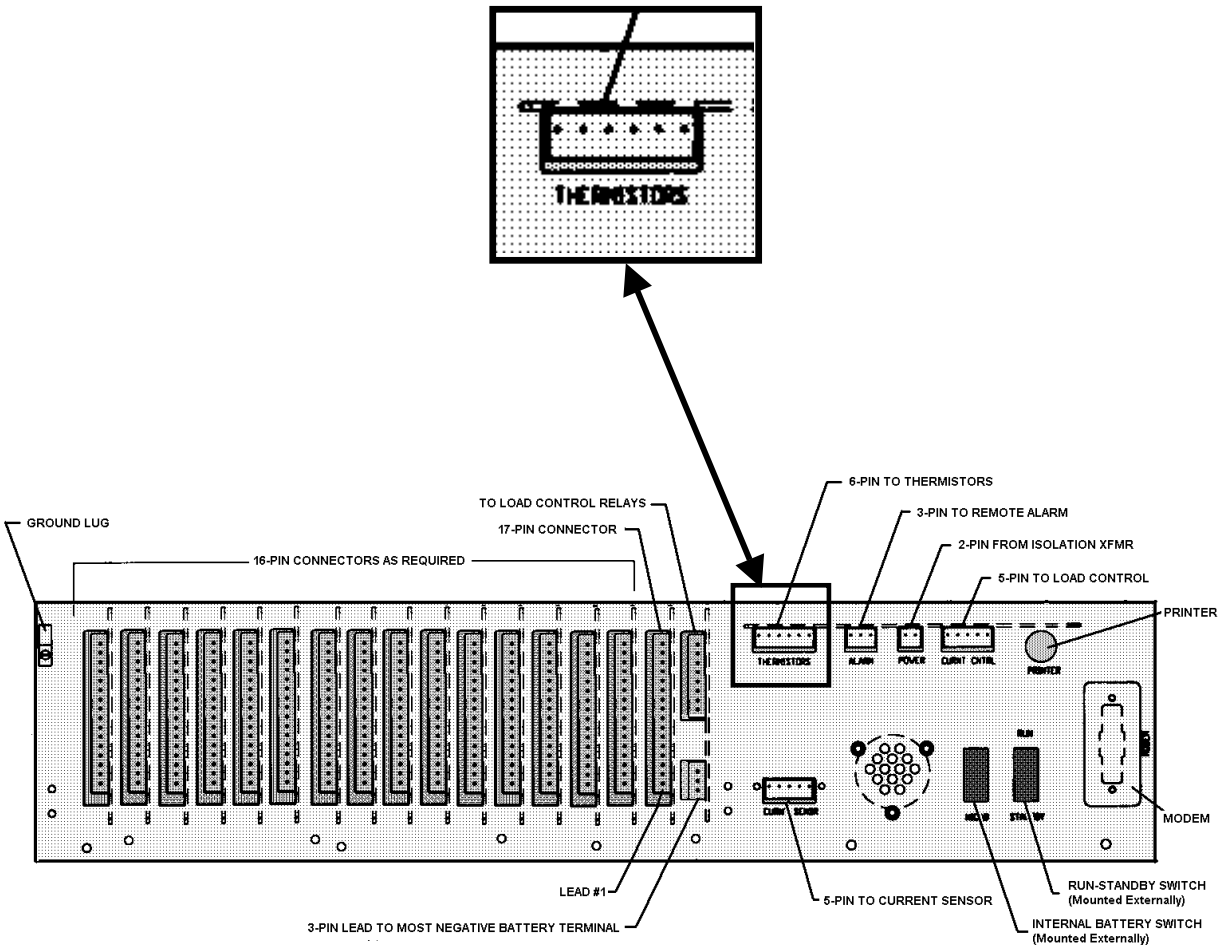


Insert the plug into the appropriate socket in the S4.

Installation of the Thermistor Probes

Using any wire marking system, label the probes, “A, 1, 2, and 3.” Attach wire markers at both ends. Run the Thermistor Probes from the batteries to the S4, and enter the enclosure through the same cable entrance as the Voltage Sense Leads. They should not be run with the Load Current Leads.

The temperature probe marked, “A” should be mounted in the bottom of the cabinet near the vents that allow air to come into the cabinet. This probe will measure the ambient air temperature coming into the cabinet. The remaining temperature probes should be mounted on the sides of various batteries on the upper shelves of the cabinets. Ideally, the thermistors should be mounted in the upper third of the battery’s side. Self-adhesive wire clips are provided. Once a probe has been clipped to the side of a battery, it should be covered with a piece of the self-stick, heat insulating tape included with your kit. This tape *should not* be used on the probe marked, “A.”
Record the number of each probe, and the number of the battery on which it is installed. The end user will need these records when the S4 refers to the measured temperature of each probe.



In the S4, you will find a six position plug labeled, “A C 1 2 C 3.” See above. Note that the plug is arranged in pairs of numbered terminals, with a Common between them. You may wish to cut the probe leads to length before connecting them to the six-position plug. Be sure to reposition the wire marker above the cut before doing so.

After cutting the leads to length, strip about ¼ inch of insulation, being careful not to nick the conductors. Twist the conductors and connect them to the six position connector terminals as indicated by the **bold print and underlined** below. Do not tin the leads. There is no need to observe polarity:

Probe A to **A C** 1 2 C 3
Probe 1 to A **C 1** 2 C 3
Probe 2 to A C 1 **2 C** 3 (if applicable)
Probe 3 to A C 1 2 **C 3** (if applicable)

Placement of the Current Transducer and Cable

In order to run the Current Transducer Cable, you must first determine the placement of the Current Transducer (or clamp). The clamp may be placed on a cable anywhere in the system. The current clamp is opened by pushing up (away from the circular connector) with either of the prawl latches. Be careful, the top portion may fall free, and it is fragile.

If your system uses more than one cable in parallel, the clamp must be placed over all the cables in order to measure 100% of the current flow. If this is not possible because the cables are too large, place the clamp over only one cable, and call BTECH Technical Support for assistance.

To close the clamp, first be sure the red dots on the top and bottom are on the same side. Next, fit the top portion's two keys into the key ways in the lower portion, and hook one of the latches over its corresponding catch. Press the latch closed firmly. Do the same for the other latch.

Orientation is very important: **Both red dots on the clamp must face the positive terminal of the UPS, regardless of the clamp's location in the system**. See **Figures 1A** or **1B** in the Appendix.

Once you have placed the clamp, connect the cable to it using the matching circular socket. The socket is polarized, so you may have to gently rotate it until it slips in. Then turn its retaining ring until it is snug.

Run the Current Clamp Cable from the batteries to the S4, along with the Voltage Sense Leads. It must not be run with the Load Current Leads.

The cable will be connected to the five position plug in the S4 marked, "R B W G S," (for the cable's wires: Red, Black, White, Green, and Shield). See **Figure 7** in the Appendix.

After cutting the leads to length, strip about ¼ inch of the insulation, being careful not to nick the conductors. Twist the conductors and connect them to the appropriate terminals in its plug. You will find two #28 drain wires, one for each shield. These should be twisted together before being connected to the "S" terminal. Do not tin the leads.

STEP 6

Providing AC Power for the S4

The S4 is designed to run on a voltage between 120VAC to 240VAC, 50/60Hz. No modifications are required prior to connection. Some UPS have convenience outlets installed. Power to the unit will be provided from the convenience outlet, if the UPS is equipped with one. The extension cord with the pass-through plug (provided by BTECH) will be inserted in this socket. BTECH recommends the use of a cable tie to prevent removal of the plug. A second extension cord terminated with an IEC plug will be used to connect the power to the socket inside the S4. If no outlet is available, BTECH recommends installing the outlet at a convenient location within the battery cabinet.

The S4 is equipped with an internal, rechargeable battery capable of providing about two hours of operation if power to the outlet is lost. Even so, it is best to draw power for the outlet from either the UPS or a generator that will operate during a power failure.

STEP 7

Providing for Communication

The S4 must be able to communicate with a computer (PC) in order to allow full functionality. The PC may be located anywhere, but its location is often dictated by the form of communication being used. The BTECH BVM software on the PC organizes the data collected by the S4 that allows an operator to quickly and easily analyze the health of the monitored batteries. In addition, the software can be used to modify the S4 settings and perform control functions. Communication can be provided via dial modem, short haul modem, or an Ethernet Intranet Adapter as desired by the customer.

A standard analog telephone line will need to be installed for dial modem communication. It must terminate in an RJ11 modular jack within three feet of the S4's right side (as viewed from the front). The wire and jack are not provided, but they can be purchased in any hardware store or home center. The phone line must be activated before the S4 can be considered fully installed. An RJ11 phone patch cord is included with the S4. Use the patch cord to connect between the modular jack you install, and the RJ11 jack on the side of the S4. It is located near the power switch. The power supply for the modem is plugged into the outlet provided in the enclosure.

A CAT 5 network connection will need to be run for Ethernet communication. It must terminate in an RJ45 modular jack to the right of the S4 (as viewed from the front). The wire and jack are not provided, but they can be purchased in any hardware store or home center. The network connection must be functional before the S4 can be considered fully installed. An RJ45 patch cord is included with the S4. Use the patch cord to connect between the modular jack you install, and the RJ45 jack on the side of the S4. It is located near the power switch. The power supply for the Ethernet Adapter is plugged into the outlet provided in the enclosure.

STEP 8

Installing Alarm Leads (optional)

The S4 is equipped with one set of outgoing alarm contacts. When an alarm is detected, the contacts can be used to signal some outside device, such as a horn, a light, or a Building Management System. The set of contacts consists of one Normally Open (NO), one Normally Closed (NC), and a Common. These are Form C, 125VA, dry- contacts with a rating of 2A at 30VDC.

Connections to the outside devices are made through the Alarm connector. See the *S4 Operation Manual* for a description of alarms.

Connect to alarm connector by running suitable wires to the Common, and either the NO or the NC terminals as required by the outside device. The connector terminals are labeled. The wires should exit the enclosure through the opening on the right side or the cable entrance on the bottom, and run to the remote device's input.

STEP 9

Grounding

Please ensure a good ground by connecting the S4 enclosure to system ground with a #10 or larger stranded conductor. The power cord to the S4 does not provide an acceptable ground.

STEP 10

System Checks

Before installing fuses or applying power to the system, please double check that there are no metal chips or filings in the connector sockets and that the connectors to the display card on the door are correctly mated.

STEP11

Installing Fuses

Voltage Sense Leads

To complete the installation, carefully insert the 62mA fuses in the Voltage Sense Lead fuse holders. Do so by placing the fuse in the long side, and then inserting the long side into the short piece on the pigtail. This will help prevent your being exposed to a live fuse end. Rotate pigtail ¼ turn clockwise to lock.

Should you suspect a fuse is blown, you can check it with an ohmmeter. A good fuse will read about 30Ω.

Load Current Leads

Unscrew the Load Current Fuse holders. Insert the fuse into the side connected to the wire, not the pigtail. If you press firmly, it should stay in place. Then screw the two halves together firmly. This procedure will help prevent your being exposed to a live fuse end.

Completion of Installation

To verify correct installation and avoid a return trip by the installer to correct an incomplete installation or errors in wiring, BTECH has provided a self-test feature in the battery monitoring system. If the above steps have been completed, the unit is now ready to be powered and the Installation Verification Tests completed. The Installation Checklist and test procedure are included in the Installer's Installation Test Booklet attached to the inside of the unit.

One printer has been included with the S4(s) sent to your site. Plug the printer into the socket located on the right-hand side of the display panel. Load the paper as shown in the drawing in the printer-operating manual included in the back of the operating manual.

Please fax a copy of the completed checklist and printer tape obtained in Phase 4 of the test to BTECH at (973) 983-1125.

This completes the S4 installation procedure.

After reviewing these instructions, if there are any questions, or if any point is unclear, please call BTECH. **BTECH can be reached by phone between the hours of 8:00AM and 5:00PM (Eastern Time), Monday through Friday at 973-983-1120 or by fax at 973-983-1125.**

Operating Instructions

Now that the installation is complete, refer to the ***S4 Operation Manual*** for instructions on start-up and operation.