

# **BDS-256**

## **Battery Diagnostic System with BDS Controller**

### **Installation Instructions**

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Columbus, OH 43085  
Tel: (954) 377-7101 Fax: (954) 377-7042  
[www.vertivco.com](http://www.vertivco.com)

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# Table of Contents

1.	SAFETY INFORMATION .....	1
1.1.	If You Have Questions .....	1
2.	SYSTEM NOTES .....	2
2.1.	Equipment Notes .....	2
2.2.	Wiring.....	2
2.3.	Disconnect Device.....	2
2.4.	Ventilation .....	2
3.	PANEL CONTROLS AND INDICATORS .....	3
3.1.	Symbols .....	3
4.	GENERAL INFORMATION .....	4
4.1.	Maximum Wire and Cable Lengths.....	4
4.2.	Fiber Optic Cable.....	4
5.	COMMUNICATION CONNECTIONS .....	5
5.1.	Modem Connection .....	5
5.2.	Local Port Connection .....	5
5.3.	Ethernet Port Connection.....	5
5.4.	Telco Serial Port Multiplexer .....	5
5.5.	RS-232 Serial Port Multiplexer .....	6
5.6.	DIP Switch Configuration .....	6
6.	SYSTEM WITH LOCAL COMPUTER .....	7
7.	SYSTEM WITH NO LOCAL COMPUTER .....	9
8.	CONNECTING TO A BUILDING MANAGEMENT SYSTEM.....	9
9.	INSTALLING THE DCMs .....	10
9.1.	Power and Communications Connections to the DCMs.....	10
9.2.	Sense Lead Harness Routing from DCMs to the Battery .....	11
9.3.	Cell Voltage Sense Lead Connections .....	11
9.4.	Intertier Connections .....	12
9.5.	Internal Resistance Test Current Cable Connections.....	12
9.6.	Overall Voltage Sense Leads .....	12
9.7.	External Load Module Control Cable Connections .....	13
10.	OPTIONAL SENSORS .....	13
10.1.	Discharge Current Sensor.....	13
10.2.	Temperature Sensor .....	13
10.3.	Float Current Sensor .....	14
11.	ALARM CONTACTS AND REMOTE ALARM RESET.....	14
12.	BDS SYSTEM SPECIFICATIONS .....	14
13.	PREVENTIVE MAINTENANCE .....	15

## Required Drawings

**IMPORTANT NOTE:** The following drawings are required for BDS-256 installation. The drawings in this manual may not be of the latest revision and are included for reference only. Refer to the Engineering Drawing Package included with your system for drawings with the latest revisions.

General Assembly BDS Controller .....	BDS-183-B597
General Assembly, DCM-480R .....	BDS-173-B589
General Assembly, BDS-256 External Load Module.....	BDS-165-B583
Fabrication Detail, Resistor Lead Assembly, BDS.....	BDS-1202-A598
600V Fused Load Lead, BDS.....	BDS-193-A453
Quick Connect Post Clip Leads, BDS .....	BDS-163-A424
Quick Connect Sense / Load Leads, BDS .....	BDS-123-A380
Quick Connect 'C' Clamp Leads, BDS .....	BDS-127-A381
Current Transducer Connection, DCM-480 .....	BDS-1132-A501
Current Transducer / Float Connections, DCM-480 .....	BDS-1124-A493
Overall Voltage Cable, DCM-480.....	BDS-1116-A479
Sub Assembly, Temperature Connections, BDS .....	BDS-136-A397

# **1. Safety Information**

- Except as explained in this manual, do not attempt to service Vertiv equipment yourself. Opening the equipment may expose you to dangerous voltages. Refer servicing beyond that described in this manual to authorized personnel.
- Do not allow liquids or moisture to get into the equipment. If liquid does get into the equipment, unplug it immediately and contact your nearest authorized service center or Vertiv directly.
- Ensure equipment is provided adequate ventilation. Do not block equipment ventilation openings.
- Do not exceed equipment voltage or power ratings and capabilities.
- Make sure that equipment is properly grounded.
- Do not let unauthorized persons operate the equipment.
- Do not energize the cabinet or any component with 115VAC or battery voltage until after the installation is complete.
- Use of this product in a manner not specified could compromise the designed-in safety of this product.
- High voltage or current may be present inside the equipment and on the equipment terminals. Only qualified personnel should perform the operations described in this manual. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing equipment covers, and when connecting leads and making adjustments.
- Proper installation is essential to the correct functioning of your system. If you have any questions about installation, please contact Vertiv for assistance.
- This manual describes the general installation and use of the BDS-256 system. If your system has features or accessories not addressed in this manual, please contact Vertiv.
- Drawings in this manual may be for reference only or superseded by later drawings. For the latest information, refer to the drawings supplied with your system.

## **1.1. If You Have Questions**

Proper installation and testing are essential to the correct functioning of your system. If you have questions, contact Vertiv at (954) 377-7101 or fax (954) 377-7042. Request BDS assistance.

## 2. System Notes

The following are notes for a typical BDS system.

### 2.1. Equipment Notes

Only equipment that is part of the BDS system should be installed in the BDS cabinet.

The four corners of the cabinet must be securely mounted to the floor.

In this manual, the term *cell* refers to either cell or module, where appropriate.

### 2.2. Wiring

**WARNING:** The BDS system is designed to connect to UPS systems that are 600VDC or less and a maximum of 300V with respect to earth ground. The voltage with respect to earth ground must be verified before connecting the system. This can be done by measuring the voltage from each battery post referenced to earth ground. The voltage cannot exceed 300V.

A BDS-256 system, which includes a BDS Controller, DCMs, and External Load Modules, may be mounted in a 19" or 23" wide rack in a cabinet enclosure. If using such a cabinet, you must ground the cabinet and installed equipment. The cabinet has several ground lugs, of which at least one must be tied to earth ground.

The DCM and Load Module have protective earth grounding connections that must be connected to earth ground using 10AWG copper wire.

The receptacle for the AC cord from the cabinet must have protective earth connection (three prong). Do not defeat the use of the earth connection prong.

When connecting equipment via modem to a telephone line, use a minimum 26AWG Telco line cord.

Drawings in this manual may be for reference only or superseded by later drawings. For the latest information, refer to the drawings supplied with your system.

### 2.3. Disconnect Device

The three prong AC cord from the cabinet, which connects to the 115VAC receptacle, is considered the primary disconnect device.

### 2.4. Ventilation

You must provide adequate ventilation to prevent equipment overheating. The cabinet has two ventilation fans that run when power is applied. The external load module has a fan that runs when required to cool internal circuitry. Allow at least 8" clearance on all sides of the cabinet for ventilation. Do not block ventilation ports, and ensure the equipment is operated within the temperature and humidity ranges in the *MPM-100, BDS-256 and BDS-40 Monitors Product Description Guide, 4200-039*.



### **3. Panel Controls and Indicators**

Items on the front and rear panels of the BDS Controller, the DCM, and the External Load Module, which are the discrete components in a typical BDS system, are described in the *MPM-100, BDS-256 and BDS-40 Monitors Product Description Guide*. Additional descriptions may appear elsewhere in this manual or related manuals.

#### **3.1. Symbols**



This symbol, which may appear on equipment panels and cabinets, indicates: *CAUTION. Refer to accompanying documents.* Be sure to read and understand the documents that relate to the particular unit. If you do not understand the documentation, stop and contact Vertiv or an authorized Vertiv representative.

## 4. General Information

The BDS-256 system consists of Data Collection Modules (DCMs), External Load Modules, and a BDS Controller. Additional hardware may include a personal computer (PC), a cabinet to house the computer and BDS Controller, a LAN adaptor, DCM tower enclosures, a DCM external power supply and, if using more than one BDS Controller, a Serial Port Multiplexer.

Upon receipt of a site survey, Vertiv creates a customer drawing package that contains a system drawing with site specific information. Refer to this package and verify all components are available before starting installation. The following steps are required for system installation.

- Prepare the computer cabinet, if included, or the BDS Controller if no PC is included. This includes unpacking, mounting, and connecting the modules.
- Mount the DCMs close to the battery, making sure they are accessible for servicing.
- Install an insulated wire tray along the length of each battery tier, making sure it does not interfere with cell replacement.
- Install the leads. Install the sense leads, test current leads, 24VAC cable, and fiber optic cable connections according to site drawings. This manual describes how to terminate the wires at the DCM and cell ends.

### 4.1. Maximum Wire and Cable Lengths

Runs of wire, cable, and fiber optic cable have length limitations as follows:

- The maximum length for each sense lead, resistance test cable, and external load control cable is 100 feet ( $\approx 30.5$  meters).
- The maximum length for any one length of plastic fiber optic cable is 50 meters (164 feet).
- The maximum length for any one length of HCS fiber optic cable is 500 meters (1640 feet).

### 4.2. Fiber Optic Cable

When installing the fiber optic cable in the system, do not bend the cable in a radius tighter than 35mm. Refer to the figure below.

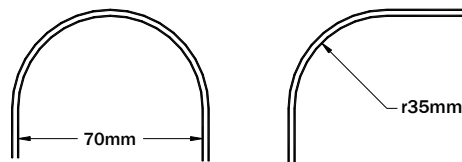


Diagram Not To Scale

**Figure 1. Minimum Bend Radius of Fiber Optic Cable.**

## 5. Communication Connections

Connection to a BDS can be via a modem or WAN (wide area network) from a remote location or on-site using the RS-232 Local port or LAN (local area network) port. Both methods let you check all battery parameters. This section explains how to set the rear panel configuration DIP switch and connect the BDS, modem, computer, and multiplexer. When connecting via modem, use a minimum 26AWG Telco line cord.

### 5.1. Modem Connection

To communicate with a BDS from a remote location, connect the BDS rear panel modem connector to a telephone line. Connect the Central computer modem to the phone line according to the computer manufacturer's instructions.

### 5.2. Local Port Connection

There are two 9-pin RS-232 local ports (BDS controller front and rear panels). You may use only one port at a time. The front panel Local Port Select switch selects the front or rear port. When the switch is lit, the front port is selected. Use the rear port for connecting to a permanent Local computer; use the front port when using a portable computer.

### 5.3. Ethernet Port Connection

There are two BDS Controller options for Ethernet connection: The Controller can have a network interface and a rear panel RJ-45 connector installed. If the RJ-45 is not installed, you may purchase a Vertiv conversion unit that connects to the DB-9.

### 5.4. Telco Serial Port Multiplexer

**Multiple monitors on one telephone line** - When only one telephone line is available for multiple BDSs at the same location, use the Vertiv Telco Serial Port Multiplexer. This optional accessory is available in two configurations that can connect up to eight or sixteen BDS monitors with different power requirements.

When using the Telco Serial Port Multiplexer, you must set a DIP switch on the BDS controller. This activates a fiber optic interface that replaces the modem and connects to the multiplexer. With this option, the RJ-11 modem port is disabled but still present.

Each unit connected to the multiplexer requires a unique MUX ID. This setting is under Setup|System|Link on the BMDM program. Refer to the BMDM manual and the *Serial Port Multiplexer User's Guide*.

Part Number	Description
1000-292	8 channel Telco multiplexer 12V
1000-293	16 channel Telco multiplexer 12V

## 5.5. RS-232 Serial Port Multiplexer

**Multiple monitors on one Local computer** - When only one Local computer is available for multiple BDSs at the same location, use the RS-232 Serial Port Multiplexer. This optional accessory is available in two configurations that can connect up to eight or sixteen BDS monitors with different power requirements.

When using the RS-232 Serial Port Multiplexer, you must set a DIP switch on the BDS controller rear panel. This activates a fiber optic interface that replaces the rear RS-232 Local port and connects to the multiplexer. With this option, the BDS front panel Local port is still available; however, if you connect a Service computer to this port for servicing or setup, set the BDS Local Port Select switch to select the front port. NOTE: The rear RS-232 connector is still present but should not be used.

Each unit connected to the multiplexer requires a unique MUX ID. This setting is under Setup\System|Link. Refer to the BMDM manual and *Serial Port Multiplexer User's Guide*.

Part Number	Description
1000-290	8 channel RS-232 multiplexer 12V
1000-291	16 channel RS-232 multiplexer 12V

## 5.6. DIP Switch Configuration

For the BDS to function with a Telco or RS-232 multiplexer, you must set the configuration DIP switch on the BDS controller rear panel. The switch is factory set for BDS-256 operation with the Telco RJ-11 and RS-232 local port enabled. To change the switch, do the following.

**WARNING:** Do not use a pencil to change the DIP switch settings. Graphite residue may harm the internal BDS components.

1. Power off the BDS.
2. Change the DIP switch, positions 1 through 4, to select Modem or Telco multiplexer (Telco fiber optic).
3. Change positions 5 through 8 to select RS-232 local port or RS-232 multiplexer (Local fiber optic).
4. The new switch setting takes effect when power is applied.

Configuration DIP Switch Position	Modem		Rear Panel RS-232	
	Modem	Telco Fiber Optic	RS-232 Local Port	Local Fiber Optic
1	ON	OFF	X	X
2	ON	OFF	X	X
3	OFF	ON	X	X
4	OFF	ON	X	X
5	X	X	ON	OFF
6	X	X	ON	OFF
7	X	X	OFF	ON
8	X	X	OFF	ON

Figure 2. DIP Switch Settings

## 6. System with Local Computer

If using a computer and cabinet, install the system as follows.

Place the cabinet where it will be permanently mounted. If using a BDS Controller and standard fiber optic cable, locate the cabinet so the fiber optic cable run does not exceed 164 feet (50 meters) from the BDS Controller to the DCM. Make sure the back of the cabinet is accessible.

You must completely fill the container at the bottom of the cabinet with ballast. This provides stability to help prevent the cabinet from tipping over. The recommended ballast is all purpose sand (Sure-Mix® All Purpose Sand or equivalent) available at most home improvement stores.

**WARNING:** Do not energize the cabinet or any component with 115VAC or battery voltage until after the installation is complete.

Look at the system drawing and the physical facility and determine how the fiber optic and power cables to the DCMs should exit the cabinet. Two 1½" holes, through which wires may be passed, are on the left side of the cabinet. Normally, pass the AC power cord for the power strip mounted inside the cabinet through the lower left hole and plug it into a UPS-protected 115VAC outlet after installation is complete. The service required is less than 15 amps. If using an internally mounted UPS (uninterruptible power supply), plug the power strip AC cord into the UPS, pass the UPS power cord through the hole, and plug it into a 115VAC outlet after installation is complete.

Optionally, pass conduit through the lower left hole and mount an outlet box inside the cabinet. This must be done by a qualified electrician and meet NEC requirements.

Install the remaining components as follows. (Refer to your copy of BDS-183-B597.)

1. If using an optional UPS, install it towards the bottom of the rack.
2. Install the computer video display (monitor) on the cabinet top shelf. Connect the power cord to the power strip.
3. Install the computer (PC) on the shelf below the display. Connect the power cord to the power strip.
4. Connect the display to the computer.
5. Install the keyboard in the keyboard drawer and connect it to the computer.
6. Unpack the BDS Controller. If mounting it in the 19" rack, install it below the computer. Connect an RS-232C cable from the BDS Controller to a COM port on the computer. Plug the power cord into the power strip.
7. If using a modem to dial out, connect the phone line to the RJ-11 jack on the Controller rear panel. Use a minimum 26AWG Telco line cord.

If using two or more BDS Controllers with one telephone line, connect the Serial Port Multiplexer to the phone line, then connect the BDS Controllers to the Serial Port Multiplexer using fiber optic cable. Refer to the *System Block Diagram* and the Serial Port Multiplexer manual.

The BDS Controller has a rear panel DIP switch that allows the Controller to be used with up to two Serial Port Multiplexers. The DIP switch settings are as follows.

<b>DIP Switch Number:</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
Telco Port - Line	ON	ON	OFF	OFF	X	X	X	X
Telco Port - Fiber Optic to Serial Port Multiplexer	OFF	OFF	ON	ON	X	X	X	X
Rear Local Port - RS-232	X	X	X	X	ON	ON	OFF	OFF
Rear Local Port - Fiber Optic to Serial Port Multiplexer	X	X	X	X	OFF	OFF	ON	ON

**Figure 3. Configuration DIP Switch Settings**

If using two or more BDS Controllers with one local computer, connect the Serial Port Multiplexer to the local computer, then connect the BDS Controllers to the Serial Port Multiplexer using fiber optic cable. Refer to the *System Block Diagram* and to the Serial Port Multiplexer manual.

If connecting through a LAN, connect the TCP/IP adaptor to the BDS Controller RS-232 connector labeled *LAN*. Refer to the *System Block Diagram* and the network interface adaptor manual.

NOTE: Make certain the DIP switch is set for the configuration being used.

- Installing the fiber optic and 24 volt power cables from the BDS Controller to the DCMs is the last step, but do not do this until the DCMs have been physically mounted in place.

## 7. System with No Local Computer

If a local computer and cabinet are not being used, install the BDS Controller as follows.

1. Provide UPS-protected 115VAC power to the location where each BDS Controller will be installed.
2. Unpack the BDS Controller and, if mounting it in the 19" rack or tower enclosure, install it below the computer. Connect the AC power cord to the UPS protected outlet.
3. If using a modem to dial out, connect the phone line to the RJ-11 jack on the Controller rear panel. Use a minimum 26AWG Telco line cord.

If using two or more BDS Controllers with one telephone line, connect the Serial Port Multiplexer to the phone line, then connect the BDS Controller to the Serial Port Multiplexer using fiber optic cable. Refer to the *System Block Diagram* and the Serial Port Multiplexer manual.

The BDS Controller has a rear panel DIP switch that allows the Controller to be used with up to two Serial Port Multiplexers. The DIP switch settings are as follows.

DIP Switch Number:	1	2	3	4	5	6	7	8
Telco Port - Line	ON	ON	OFF	OFF	X	X	X	X
Telco Port - Fiber Optic to Serial Port Multiplexer	OFF	OFF	ON	ON	X	X	X	X
Rear Local Port - RS-232	X	X	X	X	ON	ON	OFF	OFF
Rear Local Port - Fiber Optic to Serial Port Multiplexer	X	X	X	X	OFF	OFF	ON	ON

**Figure 4. Configuration DIP Switch Settings**

If connecting through a LAN, connect the TCP/IP adaptor to the BDS Controller RS-232 connector labeled *LAN*. Refer to the *System Block Diagram* and the network interface adaptor manual.

NOTE: Make certain the DIP switch is set for the configuration being used.

4. Installing the fiber optic and 24 volt power cables from the BDS Controller to the DCMs is the last step, but do not do this until the DCMs have been physically mounted in place.

## 8. Connecting to a Building Management System

The BDS-256 system can be connected to building management systems. This integration requires writing software that can communicate with the BDS. The communication protocol is MODBUS ASCII. You may obtain a register map from Vertiv or download it from the Vertiv Web site technical library at [www.vertivco.com](http://www.vertivco.com). The connections are made via the RS-232 DB-9 connectors on the Controller rear panel. Either the Local port or LAN connection can be used. The only connections made are Tx-Pin 2, Rx-Pin 3, and GND-Pin 5.

## 9. Installing the DCMs

You will need the following tools (or equivalents) to install the DCMs:

- Panduit CT-260 crimper for fuse holders and terminals.
- Amp crimper 58074-1 handle with 58063-2 head for DB-37 sense lead harness connectors.
- 1/8" flat blade screwdriver for DCM power connectors.
- Anderson Power Products 1351G1 crimper for Anderson (current lead) connectors.

Consider the maximum wire lengths of 100 feet for sense leads, resistance test cables, and external load control cables when mounting the DCMs and the External Load Module. Locate the DCMs and External Load Module as close to the batteries as possible, and mount them to allow access for servicing.

**WARNING:** Install DCMs so that each DCM connects to the cells or modules to which it is assigned. Each DCM nameplate indicates the battery string number (for multiple string installations) and the position of the DCM within that string.

### 9.1. Power and Communications Connections to the DCMs

The DCMs communicate with the BDS Controller via fiber optic cable and form a communication ring network. The Controller has seven amplified fiber optic repeater input/output connectors, which may be used to amplify signals before a long fiber optic cable run. The maximum length of standard plastic fiber optic cable that may be used is 164 feet (50 meters). The maximum length using HCS fiber optic cable is 1640 feet (500 meters).

The transmit (TX/FO) of the BDS Controller connects to the receive (RX/FO) of a DCM. The transmit of this DCM connects to the receive of the next DCM, and so on until the transmit of the last DCM returns to the receive of the BDS Controller.

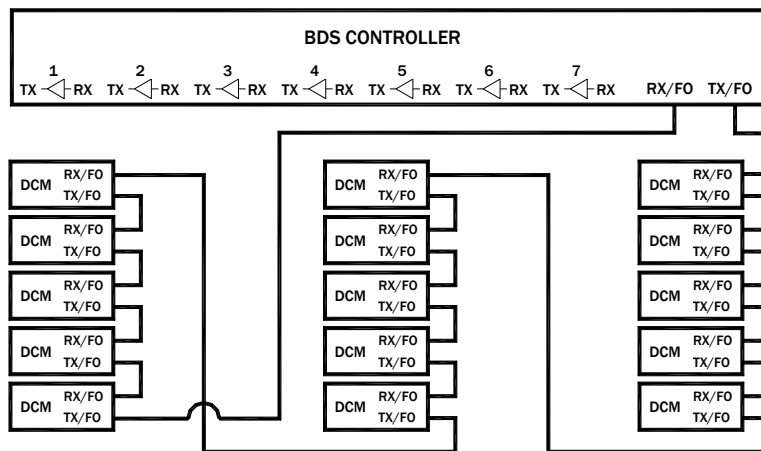
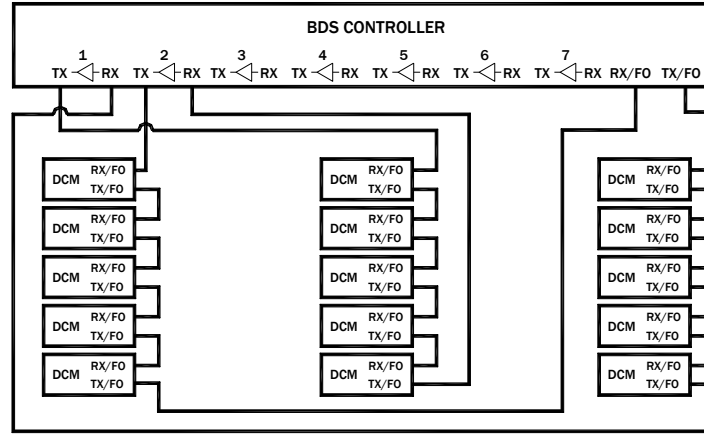


Figure 5. DCM Connection Without Repeater Amplifiers.

**IMPORTANT NOTE:** Unlike the requirement for connecting DCMs to battery strings, the string and address assignments on the DCM nameplates do not determine the order in which DCMs are connected within the fiber optic ring of the system.



Another way to connect the fiber optic cables is to make an individual connection (home run) between each string to the repeaters on the BDS Controller. This is recommended, when possible, to simplify the troubleshooting of communication problems.



**Figure 6. DCM Connection Using Repeater Amplifiers.**

A pair of #16 AWG wires, supplying 24VAC power, connects from the BDS Controller to the External Load Module and to the DCMs of each string. There are four 24-volt output connectors on the BDS Controller. The first two connectors can supply a combined total of 12 amps, and the last two can supply a combined total of 12 amps. Each DCM consumes 400mA. Do not exceed the total current for either group of connections.

### **9.2. Sense Lead Harness Routing from DCMs to the Battery**

The installer normally determines the wire routing. Do not route the wires in the same conduit as other wires in the facility. A Panduit (or equivalent) slotted cable tray with cover is normally used to distribute wires to the cells. Suggested slotted cable trays and covers are Panduit E1X1L66 with C1L66, or E5X5L66 with C5L66.

### **9.3. Cell Voltage Sense Lead Connections**

Voltage sense leads connect from each DCM to the individual cells. Cut each sense lead to the appropriate length and assemble it using BDS-120-A373. The sense lead resistor assemblies include a 10K 2W 1% flameproof resistor that reduces the risk of a short circuit during installation and maintenance. Drawing *DCM to Battery Connections* has a schematic of these connections. Properly identify each sense lead to simplify the connection process. When connecting a sense lead to the same battery terminal as the load cable, the load cable must be closest to the cell post. Refer to your copy of BDS-123-A380.

NOTE: The last sense lead on a DCM connects to the same point as the first sense lead of the next DCM within a battery string. Refer to the *DCM to Battery Connections* drawing in your drawing package.

#### **9.4. Intertier Connections**

**Combined Readings** defined - Internal cell resistance and intercell resistance readings are combined in one measurement.

Most battery installations have cables connecting groups of cells on different levels (tiers) within a battery string. Because these intertier cables normally have higher resistance than intercell connections, additional sense leads are used to monitor the resistance of these cables. Up to ten intertier channels per DCM are provided. The software accommodates up to 15 intertier connections per battery.

**CAUTION:** The sense leads monitoring an intertier connection must be from the DCM measuring the cell that has its negative post connected to the beginning of the intertier cable.

**Dual Readings** defined - Internal cell resistance and intercell resistance readings are separate.

There are no additional sense leads required. Select the intertiers under Battery Setup in the BMDM program.

#### **9.5. Internal Resistance Test Current Cable Connections**

Resistance test current cables connect from the External Load Modules to certain cells in the battery string. Cable is supplied based on an average of 35 feet per lead, unless a special length is ordered. Cut these cables to the proper length before termination.

**WARNING:** Before making any connections, ensure that the fuses are removed from the fuse holders. Do not install the fuses until the time that the entire system is commissioned.

Connect the first resistance test current cable to the positive post of the first cell. The last lead connects to the negative post of the last cell. Other connections depend on the battery configuration.

Refer to the drawing *DCM to Battery Connections* for a connection diagram. Again, verify fuses are removed from fuse holders before making any battery connections. Refer to your drawings for resistance test current cable construction details.

Identify each cable at the External Load Module to facilitate servicing.

#### **9.6. Overall Voltage Sense Leads**

Connect the Overall Voltage sense leads to DCM#1. The OV wires run from the Overall Voltage connector to the most positive and the most negative posts of the battery string. Be sure to install 10K 1% 2W flameproof resistors at the battery connection points.

## **9.7. External Load Module Control Cable Connections**

The DCM External Load Module for each string is controlled by the DCMs assigned to monitor that string. Connect the DCMs and the Module using the 15-conductor cable supplied with the installation kit. Connect the cable from the DCM Load Control connectors to the External Load Module rear panel connectors, starting with connector DCM-1.

**WARNING:** Before making any connections to the battery, verify the fuses have been removed from the fuse holders. Do not install the fuses until the time that the entire system is commissioned.

**WARNING:** In hazardous voltage applications (where battery voltage is greater than 60VDC), remove the load cable fuse before disconnecting the load cable connector from the BDS load module.

## **10. Optional Sensors**

Optional current and temperature sensors are available for the BDS-256 system.

### **10.1. Discharge Current Sensor**

The BDS-256 can be used with either a shunt or a magnetic current transducer to measure discharge current. These items are specified at time of order.

When using a magnetic current transducer, connect to the Current Transducer connector on the first DCM in the battery string. (Refer to BDS-173-589.)

When using a shunt to measure discharge current, connect the shunt to the Overall Current connector on DCM 1.

Shunts require 2-conductor shielded cable, and current transducers require 4-conductor shielded cable. Use 10K $\Omega$ , 2 watt, flameproof resistors to protect the sense wires connected to the shunt.

### **10.2. Temperature Sensor**

Two types of temperature probes are available for the BDS. One probe hangs free for ambient temperature measurement or mounts on a cell post surface. The other, a Teflon coated probe, may be immersed in a flooded cell.

Using 4-conductor shielded cable, wire these sensors to the DCM connector marked Sense Leads 16-24 for the first temperature sensing on the DCM, and to 40-48 for the second temperature sensing on the DCM. Up to ten temperature probes may be used per battery string, and up to two temperature probes may be connected to any DCM associated with that string.

### **10.3. Float Current Sensor**

There is one float current sensor channel available. Connect to the DCM rear panel Current Transducer connector on the first DCM in the battery string. This connector is shared with the discharge current sensor. Refer to your copy of BDS-1124-A493 and the Float Charging Current Probe User's Manual for termination details.

## **11. Alarm Contacts and Remote Alarm Reset**

There are two sets of Form C alarm contacts, labeled Critical and Maintenance, on the BDS Controller rear panel. Each set of connections has a COM (Common), NC (Normally Closed), and NO (Normally Open) terminal. These alarms are software configurable under the Setup selection on the Main Menu.

Connection can be made directly to a facility's alarm reporting system. If there is more than one BDS at the same location and only one set of contacts can be monitored, the alarm contacts can be wired in parallel.

The remote reset contact is on the BDS Controller rear panel. A connection can be made directly to a local alarm reporting system that provides active voltage from 12VDC to 32VDC for reset. If there is more than one BDS at the same location, and only one set of contacts is available for reset, these inputs can be wired in parallel.

## **12. BDS System Specifications**

Specification sheets for the discrete components in a typical BDS system are in the *MPM-100*, *BDS-256* and *BDS-40 Monitors Product Description Guide*.

## **13. Preventive Maintenance**

**Visual Inspection** - Visually inspect all BDS system components for damaged or frayed power cords and cables, and damaged BDS system component panels, controls, and connectors. If you detect any damage, remove the equipment from service until the damage is repaired.

**WARNING:** Before cleaning equipment, ensure the system is disconnected and power to the units has been shut off. You must disconnect the BDS system cabinet and system components (controller, DCM, load module, UPS, etc.) from any DC voltage sources and from any AC power sources.

**Cleaning System Components** - The BDS system will provide years of service if properly maintained. Clean system components using a soft cloth, slightly moistened with water. Do not use commercial or industrial cleaners that may attack the computer display and housing. Never expose the computer or any system component to water, high humidity, or dampness.

**Fans and Vents** - Remove dust from fans and vents using a small brush or hand held vacuum.

**Sense Leads** - Clean the sense leads as required. The acid to which the sense lead clips are exposed during testing should be neutralized often, using a water and baking soda mixture. Brush this mixture onto the sense lead clip, then rinse well with clean, cool tap water. Before cleaning the sense lead clips, ensure the system is disconnected and power to the system has been shut off. Dry with a clean, soft cloth.

**Internal Components** - The BDS system has no user-replaceable components. Because high voltage exists in several areas in each unit, only knowledgeable users should remove the covers or cowl from system components (controller, DCM, load module, UPS, etc.) when required. Failure to comply with this restriction could pose a safety hazard and/or void the system warranty.

**WARNING:** High voltages exist inside the BDS system components and on the terminals. Calibration must be performed only by technically qualified persons. Observe electrical safety precautions when removing and installing equipment covers and when connecting leads and making adjustments.

**UPS (Uninterruptible Power Supply)** - If you are using an optional UPS with the BDS system, be certain the UPS internal battery is functional. Follow instructions in the UPS manufacturer manual.

**Shipping** - Protect the BDS system from bumps and bangs during normal use or storage, and provide protection during shipment between test sites.

# Index

24VAC power.....	11	MODBUS .....	9
AC power receptacle .....	2	modem.....	7, 9
alarm contacts.....	14	BDS .....	5
building mgt system .....	9	port disabled .....	5
cabinet wiring .....	7	telco cord AWG.....	5
cable		monitor	
cable tray .....	11	multiple.....	5, 6
fiber optic length.....	10	multiple monitors	
fiber optic radius.....	4	RS-232 .....	6
maximum length.....	4, 10	Telco.....	5
sense leads .....	11	MUX ID.....	5, 6
test current .....	12	OV sense leads .....	12
combined readings.....	12	preventive maintenance .....	15
configuration settings .....	8, 9	remote reset contact .....	14
connectors on panels.....	3	repeater input/output.....	10
control cables.....	13	resistor .....	11, 12
current transducer .....	13	Rx .....	10
DIP switch .....	6	safety information.....	1
DIP switch settings .....	8, 9	sense leads .....	11, 12
discharge current sensor .....	13	sense leads cleaning.....	15
disconnect device .....	2	sensors .....	13
dual readings.....	12	serial port multiplexer.....	6, 7, 8, 9
earth ground.....	2	BDS .....	5
ethernet port on BDS .....	5	DIP switch .....	6
fiber optic .....	See also cable	serial port on BDS .....	5
fiber optic interface.....	5, 6	servicing equipment.....	15
fiber optic amplifiers .....	10	shunt .....	13
flame proof resistor.....	11, 12	specifications .....	14
float current sensor .....	14	switches on panels .....	3
form C alarm contacts .....	14	symbols.....	3
grounding the equipment .....	2	system diagram .....	4
indicators on panels .....	3	telco	
installation of system		serial port multiplexer BDS .....	5
with local computer .....	7	telco cord AWG.....	5
with no local computer .....	9	telco cord AWG.....	2
intertier connections .....	12	temperature sensor .....	13
LAN connection .....	8, 9	test current cable.....	12
LAN port on BDS.....	5	transducer .....	13
LEDs on panels .....	3	Tx.....	10
local computer .....	7	UPS	
multiple BDS .....	6	internal battery.....	15
local port		wiring.....	7
local port select switch on BDS.....	5	ventilation .....	2
on BDS .....	5	wire tray.....	See cable tray
magnetic transducer.....	13		
maintenance.....	15		