PRODUCT MANUAL

Basic Installation and User's Guide for the Millennium II Controller J85501P-1

Notice:

The information, specifications, and procedures in this manual are subject to change without notice. OmniOnPower assumes no responsibility for any errors that may appear in this document.

Product Manual
Select Code 167-792-181
Ordering Code 108994645

This page intentionally left blank

PRODUCT MANUAL

Basic Installation and User's Guide for the Millennium II Controller J85501P-1

TABLE OF CONTENTS

1 Introduction 5

Millennium II 5

Customer Service Contacts 6

2 Product Description 7

Overview 7

Feature Summary 7

General Specifications 12

Hardware 13

3 Safety 15

Safety Statements 15

Warning Statements and Safety Symbols 16

Precautions 17

Special Installation Notes 18

4 New Installations 19

Controller Connections 20

Installing Circuit Packs 21

Thermal Probes 24

USB Interface. 25

Wiring Alarm Outputs 25

Wiring Alarm and Control Inputs 27

Fuses 30

Front Panel Display. 30

Controller Defaults. 33

Controller Display Menu Maps 38

5 Acceptance Testing 47
Introduction 47
Tools and Test Equipment 47
Test Precautions 47
Test Sequences 47
6 Controller Retrofits 55
Millennium Basic Controller Retrofit 55
Millennium Intelligent Controller Retrofit 68
7 Troubleshooting 83
Controller Circuit Pack 83
Option Cards 83
Controller Alarm Descriptions 83
Clear Events 87
Uninstall Devices 87
8. Spare Parts 89
9. Product Warranty 91
10 Revision 93

1 Introduction

Millennium II

The J85501P-1 Galaxy Millennium II controller is the next generation full-featured power system controller from OmniOn Power. It provides control, monitoring, and alarm monitoring functions over a multi-drop serial interface that interconnects system rectifiers, converters, Bay Interface Cards (BICs), and other serial devices. It utilizes robust RS-485 serial busses that support the Galaxy Protocol (GP) to communicate to these devices. The Millennium II has a plethora of I/O and monitoring options. It can monitor and control battery plants containing up to 64 Galaxy serial rectifiers, up to 16 serial converters, and up to 32 BICs. A maximum combination of 85 GP nodes can be directly managed on the rectifier serial bus. The Millennium II performs many functions described more thoroughly in following sections. Following is a high level view.

- Alarm Detection, Identification, and Reporting
- System and Component Status
- System and Feature Configuration
- System Alarm Thresholds
- Battery Management (Slope Thermal Compensation/Recharge Current Limit)
- Battery discharge testing
- Reserve Time Prediction
- Selective high/low voltage shutdown
- Float/Boost Mode Control
- Low Voltage Disconnect Management
- Remote Access Control And Multiple Level Password Security
- Control and Operations
- History
- Statistics

This controller replaces the existing +24V and -48V versions of the Millennium controller with a single unit. While becoming easier to use, the Millennium II adds additional functionality to the comprehensive feature set now provided by the existing Millennium. The Millennium II is OmniOn Power's new flagship controller product. The separate Independent (Basic), Intelligent, and network interface circuit packs of the existing Millennium controller have been integrated into a single standard board offering with the Millennium II. This eliminates the need to manage multiple boards for features as well as plant voltage. Intelligent functionality with remote 10/100 Base-T network access capability to display power system operating status and available information via the world wide web (internet) or your enterprise network (intranet) using standard browsers such as Microsoft Internet Explorer® or Netscape® Navigator is now the standard offering.

Not only are the software features of the Millennium all contained in the Millennium II, the new controller is physically backwards compatible for field upgrades and replacements. The Millennium II can also be used as an upgrade to the door mounted Galaxy Vector controller When performed, this installation adds newer and more available technologies to the power system. The old Millennium chassis is replaced with the new Millennium II chassis shown in the figure following. All existing and future GPS cabinet systems remain supported by the Millennium II.

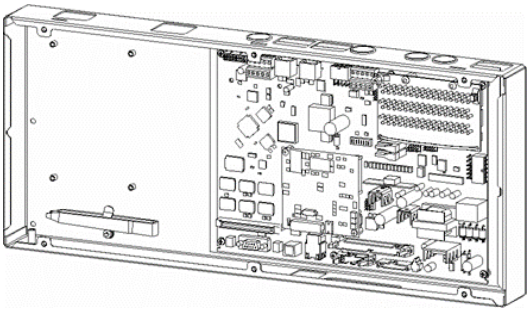


Figure 1-1:Galaxy Millennium II Controller

Customer Service Contacts

Customer Service, Technical Support, and Warranty Service

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-THE-1PWR (1-877-546-3243). This number is staffed from 7:00 am to 5:00 pm Central Time (zone 6), Monday through Friday, on normal business days. At other times this number is still available, but for emergencies only. Services provided through this contact include initiating the spare parts procurement process, ordering documents, product warranty administration, and providing other product and service information.

For other customers worldwide the 800 number may be accessed after first dialing the OmniOnDirect country code for the country where the call is originating, or you may contact your local field support center or your sales representative to discuss your specific needs.

Customer Training

OmniOn Power offers customer training on many Power Systems products. For information call 1-877-546-3243. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

On-Line Power Systems Product Manuals and Software

Power Systems on-line product manuals and software are available on-line. Software includes Easy View and SNMP MIB.

2 Product Description

Overview

The Millennium II has been designed to be a complete power system monitor and controller with a variety of alarming and remote access capabilities that complies with all relevant regulatory requirements, respectively. It is the nerve center of the battery plant that utilizes serial monitored and controlled rectifiers, converters, and system peripherals. It monitors and controls the plant rectifiers, distribution, and batteries. It can also monitor and control peripheral power equipment, including standby generators, converter plants, and inverters.

The Millennium II monitors and control battery plants containing up to 64 Galaxy serial rectifiers, up to 16 serial converters, and up to 32 Bay Interface Cards (BICs). A maximum combination of 85 GP nodes can be directly managed on the rectifier RS485 serial bus. The following table contains the OmniOn Power rectifiers that can interface with the Galaxy Millennium II:

Model	Vdc	Current
570A	-48V	100A
595A, 595B, 595C, 595LTA, 595LTB	-48V	200A/220A
596A / 596D	-48V	50A / 100A
596B	+24V	100A / 125A
596F	+24V	100A
NP	+24V / -48V	24A – 50A
CPS6000 QS86X	-48V	7.5A – 50A
AC3000	-48V	60A

Table 2-A: Rectifiers That May Be Used With Millennium II

Feature Summary

The Millennium II has combined and enhanced its Millennium predecessor's Basic, Intelligent, and Network functionality into its standard offering. This controller unit supports OmniOn Power's most extensive controller feature set. Following is a summary of the features available in the Millennium II.

Standard System Features

Monitoring and control of up to 85 RS485 serial connected devices	• Maximum of 64 serial switch mode rectifiers • Maximum of 32 Bay Interface Cards (BICs) • Maximum of 16 serial converters
Alarms	• Standard and custom User Defined system alarms • Alarm test • Alarm cut-off • Multiple-level alarm severity: Critical, Major,Minor,
Rectifiers	• Automatic rectifier restart • Reserve engine transfer • High Voltage Shutdown • Energy management • Remote rectifier (on/off) control • Automatic rectifier sequence control • N + X redundancy check • Digital voltage regulation and rectifier load share
Contactor/Disconnect Control	• Low Voltage Load • Low Voltage Battery
Interfaces	• Enhanced Front Panel Display • Local PC Port • Modem • LAN (Gateway Card) • X.25/TL1
Peripheral Monitoring and Control	• Up to 512 monitoring channels • On board generic voltage channel • On board 4-20mA transducer interface
Maintenance Tools	• User Programmable Alarms • History • Statistics • Diagnostics • Derived Channels • Inventory Management • Configuration Backup/Restore
Memory	• Non-Volatile • Battery Backed • Remote and Local Software Upgrade

Enhanced Front Panel User Interface

Cabinet door mounted	• Front access without opening the cabinet door
LCD	• 8-line by 40-character (240 x 64) backlitdisplay with digital contrast adjust
Menu Driven User Interface	• Re-designed user friendly menu driven LCDwith similar push-button membrane switch interface • Menu structure similar to other OmniOn Power controllers
Audible Alarm Buzzer	• Integrated on display assembly • May be Enabled/Disabled
LEDs	• 12 individual user configurable status LEDs: Critical, Major, Minor, Normal, AC System,Battery, Controller, Distribution, Rectifier, Remote Modules, Modem, and Battery On Discharge
Test Jacks	• Used to verify displayed system bus voltage
Local Port	• DB-9 RS232 system port for local terminal access or event log printing • ANSI T1.317 serial access • EasyView Windows-based software for configuration and reporting • Ground referenced
Compatibility	• Backwards compatible to existing Millennium

Remote Access And Features

Integrated 10/100Base-T Ethernet Network capability	• Supports TCP/IP Version 5, SNMP Version2c, SMTP, TL1, DHCP, Telnet, FTP • Standard and custom web pages for standard browsers (HTTP) • Compatible to Galaxy Manager • Standard shielded RJ-45 interface referenced to chassis
Optional Modem access	• Remote access via internal BSM5 Modem option (56k bps Modem) • Remote access capability via external Modem • Callback security
Optional BSW Data switch	• Connections to 3 standard RS232 devices for pass-through and alarm management • BSN extension to provide 3 additional RS232 serial connections
TL1	• Configurable RS-232/485 port for remote via TL1/X.25
Easy View PC User Interface	• Windows-based software, for configuration and reporting through local terminal or • Modem connections
Security	• Multiple password-protected security levels • Dip Switches • Enhanced Security Features enable or disable many controller features

Battery Management

Slope Thermal Compensation(STC)	• High temperature compensation • Low temperature compensation • Step temperature • STC Enable/Disable • Low temperature Enable/Disable • mV/°C adjustments
Recharge Current Limit	• Control recharge rate for batteries
Reserve Time Prediction	• Supports a variety of batteries • Use configurable Low Reserve Time Alarm • Integrated “At Rate Calculator” for estimation purposes
Battery Discharge Testing	• Manual • Periodic • Plant Battery Test (PBT) input driven • Battery Discharge trace data
Float/Boost Mode Control	• Manual Timed Boost- Locally T1.317 andremotely initiated • External Timed Boost • Battery Thermal Protect module Boost (BTP) • Auto Boost terminated by time or current • Manual front panel Boost
Temperature Disconnect	• Programmable high temperature
Emergency Power Off	• User programmable

Integrated Monitoring Inputs/Outputs

System	Voltage and Current monitoring
System Shunts	• Maximum of 2 (more with BICs and RPMs) • Battery or Load • Battery or Return Side
4-20 mA	• Single channel • Input
0-5 Vdc	• Single Channel • Input • Selectable resistors for: 5, 30 and 60 Vdcranges
Temperature Probe	• 4 Channels • 1 – 10/30k Thermal Probe Inputs • 3 – 10k Thermal Probe Inputs
Binary Inputs	• 22 Inputs • Engine signal inputs • Battery test inputs • External Float/Boost control • 2 User programmable
Remote Peripheral Monitoring	• Integrated serial bus • Maximum 300 M serial bus • 512 channels • Transducer interface • Battery, Shunt monitoring • Channels can be programmed for custom alarms

Integrated Outputs

Traditional Office Alarms	• 19 Form C alarm outputs • 2 User programmable relay outputs
Alarm Battery Supply	• 1.3A Fused

General Specifications

Basic Millennium II specifications are summarized in table 2-B. Consult service center for other details.

General	Specifications
Input Voltage Range	±24 Vdc, -48 Vdc (Range: 18-60V)
Maximum Input Power	36W depending upon options
Operating Temperature Range	-40 to 75 °C (-40 to 167 °F)
Storage Temperature Range	-40 to 85 °C (-40 to 185 °F)
Physical Specifications	9.24 in. H, 20.76 in. W, 2.14 in. D
Display	8-line by 40-character backlit LCD
Cabinet Mounting Requirements	Door mounted
Input/Outputs	**Specifications**
Form C Alarm Output Contact Ratings	60VDC at 0.5A
Plant Voltage Measurement Accuracy 0 to 50 °C (±.05% of full scale + 1 count) -40 to 85 °C (±0.1% of full scale + 1 count) Resolution	 48V Systems: ±40mV 24V Systems: ±25 mV 48V Systems: ±70 mV 4V Systems: ±40 mV 0.01V
Plant Current Measurement (Up to 2shunts) Accuracy Resolution	 0 to +50 °C : ±0.5% of full scale -40 to +85 °C: ±1.25% of full scale 1A
Temperature Measurement Accuracy Thermistor temperature One-Wire Serial probes Resolution	 -5 to +55 °C: ±2°C -40 to +85 °C: ±3°C -5 to +55 °C: ±1°C (next release) -40 to +85 °C: ±3°C 0.1°C
4-20mA Input Monitor Accuracy Resolution	 ±100µA ±10.0µA
General (0-5V) Input Accuracy	 0 to +50 °C: ±0.5% of full scale
Resolution	-40 to +85 °C: ±1.0% of full scale 0.01 VDC
Safety And Standards	**Specifications**
Electrostatic Discharge	IEC 801-2 level 2, 4, 5
Radiated Emissions	FCC Class B, CISPR 22 level B
Safety	UL Unlisted Component as Part of GPS Power system
NEBs	Level 3 Tested and Complaint with Galaxy Power Systems

Table 2-B: General Millennium II Controller Specifications

It should also be noted that the Millennium II is suitable for use in power plants with or without batteries. In battery less plants, the loss of ac power causes an immediate loss of dc power to the controller and the activation of all office alarm relays. When ac power is restored, plant rectifiers will return to their last specified voltage set point, and the controller will automatically return to its last configuration.

Hardware

Chassis

The Galaxy Millennium II, like its Millennium predecessor, is low-profile enclosure mounted on the inside front cabinet door of a Galaxy Power System (GPS) plant. See Figure 2-1, and 2-2. This arrangement occupies no space within the frame mounting racks, thus allowing additional room for other plant equipment. The unit is pre-installed in the factory for all applicable GPS configurations. However, it has been designed to be backwards compatible to existing Millennium to allow field replacements or upgrades. It is composed of two main components: a rust resistant metal enclosure and a clear plastic cover. The metal enclosure interfaces with the cabinet door and provides appropriate cable routing entrances to the circuit pack it secures. A maintenance friendly clear plastic cover is used to protect the enclosed circuit packs. This cover also provides clear and quick visibility to individual circuit pack alarm status indicators and all wiring connections without removing a cover allowing quick board integrity and connectivity checks without removing cover.

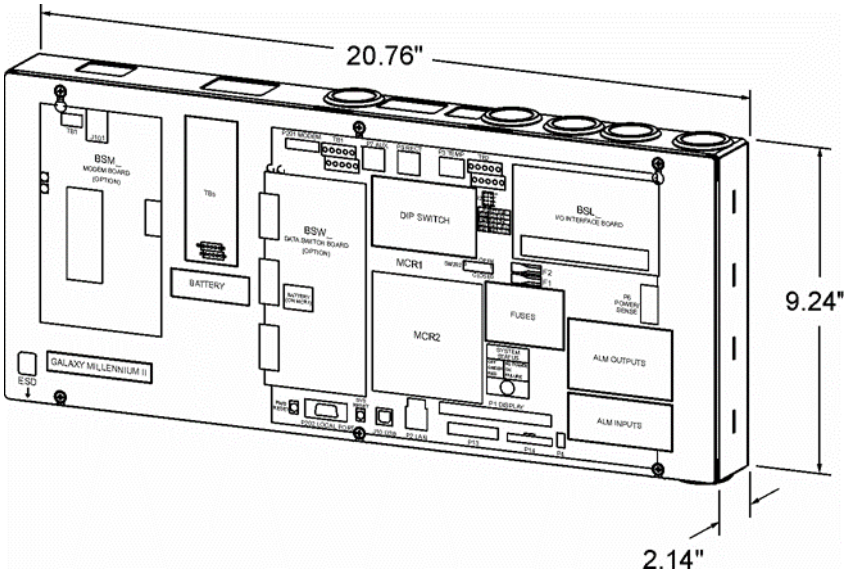


Figure 2-1: Controller Dimensions

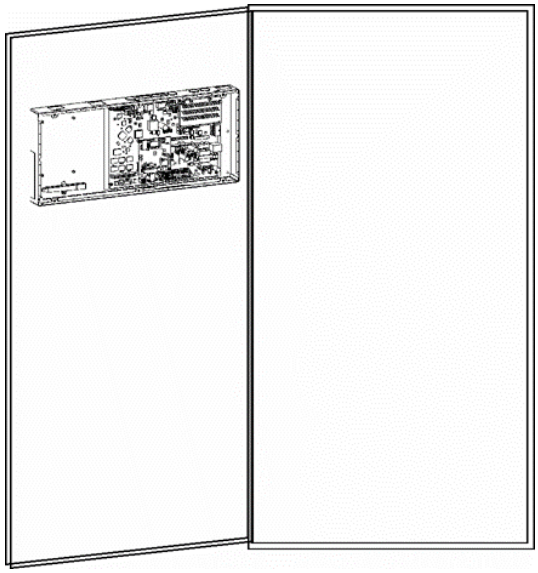


Figure 2-2: Millennium Mounted on Cabinet Door

Controller Circuit Packs

MCR1 and MCR2

The core of the Galaxy Millennium II controller consists of a matched pair of surface mount technology circuit packs, MCR1 and MCR2. These circuit cards are attached and secured together at the factory. See Figure 2-3. The MCR1 is the larger of the two boards and contains all the external input/output interfaces, local and remote user interface circuitry, measurement circuits, real time clock, wide input range power converter, and connections for the MCR2. The MCR2 contains the main 32-Bit 66MHz microprocessor with 16Mbytes of Flash memory and 8Mbytes of RAM. It also contains the hardware for the Ethernet control. Factory calibration values for the analog circuits located on the MCR1 are stored in memory on the MCR2.

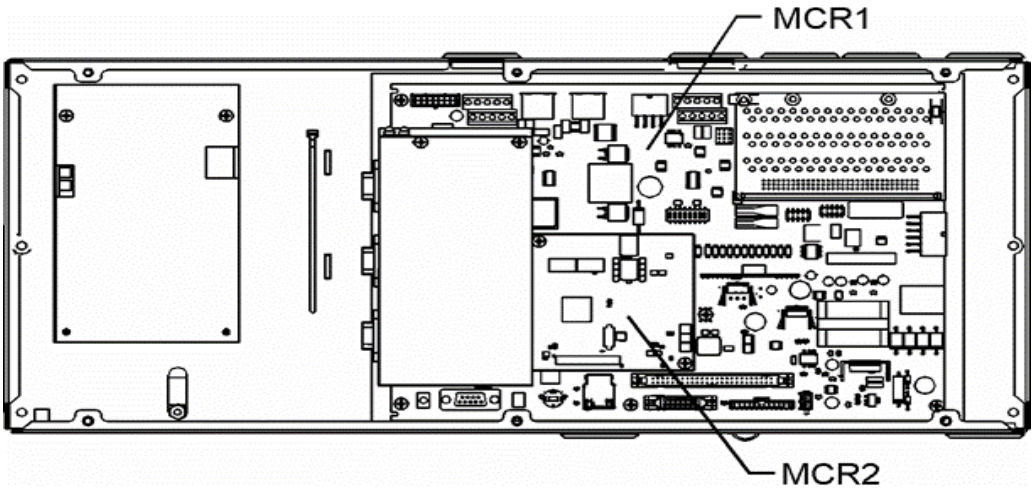


Figure 2-3: MCR1 and MCR2 Boards

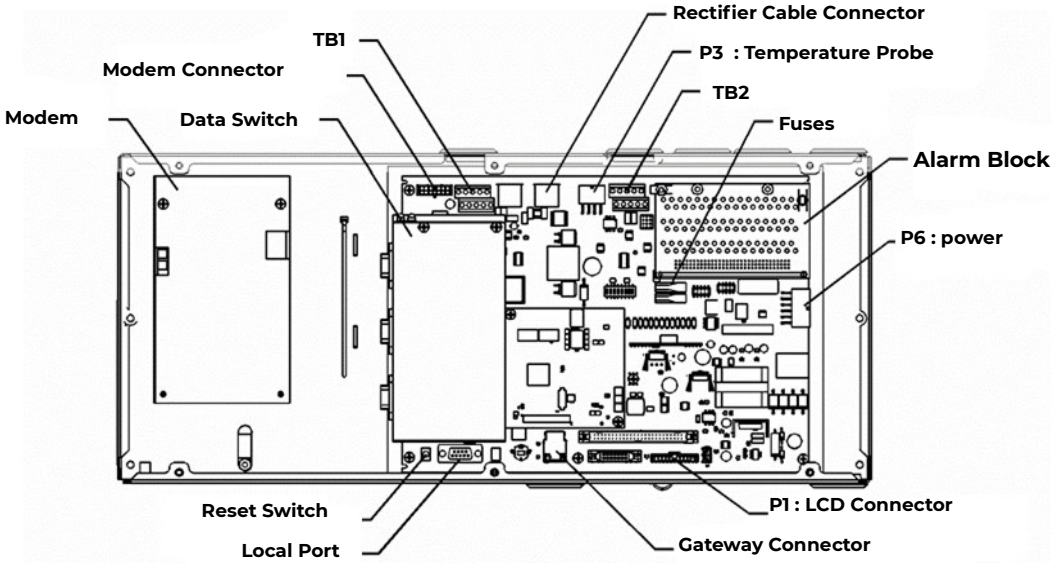


Figure 2-4: Millennium II Primary Interfaces

Figure 2-4 illustrates all of the primary interfaces located on the MCR1 for the Millennium II controller.

3 Safety

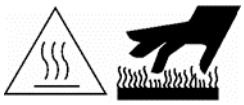
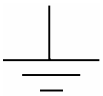
Safety Statements

Please read and follow all safety instructions and warnings before installing, maintaining, or repairing the Millennium II controller:

- The CE Mark demonstrates compliance with the European Union Council Directives for Low Voltage and EMC.
- The Millennium II platform is Underwriters Laboratories (UL) recognized per Subject Letter 1801, DC Power Distribution Centers for Telecommunications Equipment.
- Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the U.S. National Electric Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.
- This equipment is to be used in controlled environments (an area where the humidity is maintained at levels that cannot cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified).
- This equipment has been evaluated for continuous use in ambient temperature from -40°C to 75°C.
- This equipment must not be installed over combustible surfaces.
- For installations in the United States, Listed compression connectors are to be used to terminate Listed field-wired conductors where required. For all installations, the appropriate connector is to be applied only to the correct size conductor as specified by the connector manufacturer, using only the connector manufacturer's recommended tooling or tooling approved for that connector.
- If the proper connector for the country of installation is not provided, obtain appropriate connectors and follow manufacturer's and all local requirements for proper connections. All national and local rules and regulations should be followed when making field connections.
- All input and output connections comply with SELV requirements.
- Insulation on field-wired conductors should be rated no less than 90° Celsius. Wire conductor size should be sized per electrical codes for 90° Celsius wire, and based on the ampacity of the associated protection device. Wiring internal to enclosed equipment cabinets should be rated at 105° Celsius (minimum).
- Torque or secure electrical connections to the values specified on labels or in the product documentation.
- Alarm contacts on the office alarm connector are not fused within the controller; therefore, current limiting protection for these contacts must be provided by external circuits. Maximum ratings for alarm connections are 60Vdc and 0.5 amperes. Exceeding these maximum ratings could result in fire or damage to the unit.
- In enclosed equipment cabinets, the Millennium II mounting framework must be connected directly to the cabinet ac service ground bus. For applications in huts, vaults, and central offices, the Millennium II mounting framework must be connected to the system integrated ground grid.
- Installing fuses not specified for use in controller may result in equipment damage. Use only replacement parts listed in this manual and on the equipment drawings.
- The telecom-type (e.g., GMT type) fuses can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only fuses provided with safety caps for this type of circuit. Installing telecom-type fuses not equipped with safety caps may result in injury to service personnel.

Warning Statements and Safety Symbols

The symbols may sometimes be accompanied by some type of statement; e.g., “Hazardous voltage/energy inside, or Risk of injury. This unit must be accessed only by qualified personnel.” Signal words as described below may also be used to indicate the level of hazard.

DANGER	Indicates the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.
WARNING	Indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.
CAUTION	Indicates the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided.
	This symbol identifies the need to refer to the equipment instructions for important information.
	These symbols (or equivalent) are used to identify the presence of hazardous ac mains voltage.
	This symbol is used to identify the presence of hazardous ac or dc voltages. It may also be used to warn of hazardous energy levels.
	One of these two symbols (or equivalent) may be used to identify the presence of rectifier and battery voltages. The symbol may sometimes be accompanied by some type of statement, for example: “Battery voltage present. Risk of injury due to high current. Avoid contacting conductors with uninsulated metal objects. Follow safety precautions.”
	One of these two symbols may be used to identify the presence of a hot surface. It may also be accompanied by a statement explaining the hazard.A symbol like this with a lightning bolt through the hand also means that the part is or could be at hazardous voltage levels.
	This symbol is used to identify the protective safety earth ground for the equipment.
	This symbol is used to identify other bonding points within the equipment.
	This symbol is used to identify the need for safety glasses and may sometimes be accompanied by some type of statement, for example:“Fuses can cause arcing and sparks. Risk of eye injury. Always wear safety glasses.”

Precautions

When working on or using this type of equipment, the following precautions should be noted:

- This unit must be installed, serviced, and operated only by skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment.
- The equipment could be powered by multiple ac inputs. Ensure that the appropriate circuit protection device for each ac input being serviced is disconnected before servicing the equipment. Do not disconnect permanent bonding provisions unless all ac inputs are disconnected.
- Batteries may be connected in parallel with the output of the rectifiers. Turning off the rectifiers will not necessarily remove power from the bus. Make sure the battery power is also disconnected and/or follow safety procedures while working on any equipment that contains hazardous energy/voltage.
- Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment. When equipped with ringer modules, hazardous voltages will be present on the ringer output connectors.

In addition to proper job training and safety procedures, the following are some basic precautions that should always be used:

- Use only properly insulated tools.
- Remove all metallic objects (key chains, glasses, rings, watches, or other jewelry).
- Wear safety glasses. Fuses can produce sparks. High energy levels on buses and distribution components can produce severe arcing.
- Test circuits before touching.
- Lock out and tag circuit breakers/fuses when possible to prevent accidental turn on.
- Be aware of potential hazards before servicing equipment.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (note the condition of these circuits, especially wiring).
- Use care when removing or replacing covers; avoid contacting circuits.

Special Installation Notes

Deutsch

Installationsanleitung

Eingangsspannung (Voltage) : 2x AC 120/200-240V V

Eingangsstrom (Current) : QS801A, max 45A, QS800A, max 30A

Eingangsleistung (Watts) :

Nennfrequenz (Frequency) : 50 / 60 Hz

Seriennummer (Assembly No.):--

Modellnummer (Modell No.) : QS801A, QS 800A

Abmessungen sind nur zur Referenz : 150mm x 22.5mm x 77.5mm (Dimensions are for reference only)

Max. Umgebungstemperatur : max. 75 deg. C (Max. Operation temperatur)

Achtung: Für kontinuierlichen Feuerschutz sollte die Sicherung nur mit einer des gleichen Types ersetzt werden.

Sicherungswert :

(Warning : For continued protection against fire replace with same type and rating of fuse)

Das System ist ein Gerät der Schutzklasse I / Überspannungs Kategorie II (Power Supply is a Class I equipment / overvlotage category II)

Ausgangsspannungen und –stöme: DC 58 V / SELV (Output Voltage and Current)

- Das Gerät darf nur in Räumen mit beschränktem Zutritt aufgestellt werden. (Nur ausgebildetes Personal)
- Nur für Aufstellung auf Boden oder einer anderen brennbaren Oberfläche geeignet.
- Das Gerät hat keinen eigenen Ausschalter, es muß daher mit einem Ein- und Ausschalter im Versorgungskreis versehen sein.
- Das Gerät ist für den Einbau in IT- Geräte in einem Rahmen bestimmt (siehe weitere Anleitung)
- Beim Einbau des Gerätes ist daraf zu achten das alle Anforderungen gemäß EN60950 eingehalten werden.

ACHTUNG: HOHER ABLEITSTROM

VOR ANSCHLUSS AN DEN VERSORGUNGSSTROMKREIS UNBEDINGT ERDUNGSVERBINDUNG HERSTELLEN

Espanol

Notas especiales para instalaciones en países de habla hispana

- Instrucciones de instalación (Installation Instructions)
- Voltaje (Voltage): Vea tabla 2-A
- Corriente (Current): Vea tabla 2-A
- Frecuencia (Frequency): 50/60Hz
- Voltaje y corriente de salida (Output Voltage and Current): Vea tabla 2-A
- Temperatura < IRE< a de operación (Maximum Operation Temperature): 75°C (167°F)
- Sin cabina contra incendios, suelo no combustible (No < IRE enclosure, non-combustible floor)
- Evaluado en EN60950 (Evaluated to EN60950)

4 New Installations

The Millennium II is factory pre-installed and pre-configured with industry standard defaults for thresholds and feature operability in GPS cabinet applications. In addition, customer specific default controller settings may be available upon request. This section provides:

Preparation and Precautions
Procedures for the proper addition of optional packs
Input and output wiring to the controller and the installation and wiring of optional features
Controller default configuration information such as alarm severity and description, system voltage, shunt information
Controller configuration information

Preparation

The following Installation procedures should be performed AFTER:	• All the equipment frames (initial and supplemental bays, free-standing rectifiers, etc.) are anchored in place. • The battery stands have been erected and the batteries installed. • The overhead cable racks have been installed and the power cables have been run and terminated. • The plant's charge and discharge bus bar assemblies have been installed.
But BEFORE:	• Connecting the batteries to the plant charge and discharge bus bars or turning up the plant rectifiers.

Precautions

Observe ESD protection while installing circuit packs.
Wear grounded antistatic wrist straps when handling all circuit packs. The wrist strap must contact the skin and is not to be worn over clothing.
Never hand a circuit pack from a grounded to a non-grounded person or vice-versa.

Safety

Action	Verified
Always consider personal safety before beginning any procedure. Review the Safety section.	
Be aware of the presence of unfused battery potential in the vicinity of the controller.	
Use only insulated tools.	
Make sure the system is properly grounded per the National Electrical Code and local building codes.	
Remove all metal jewelry before beginning the installation.	

Installation Materials

Item	Verified
Wire cutters and strippers	
18 to 22 AWG wire	
Jewelers screwdriver (Flat and Phillips)	
Small needle nose pliers	
Digital meter, +/- 0.02%	
Screw Drivers (flat-blade and Phillips)	
ESD wrist strap	
Wire-wrap tool or Amp alarm punch-down tool	

Installation Materials (Continue)

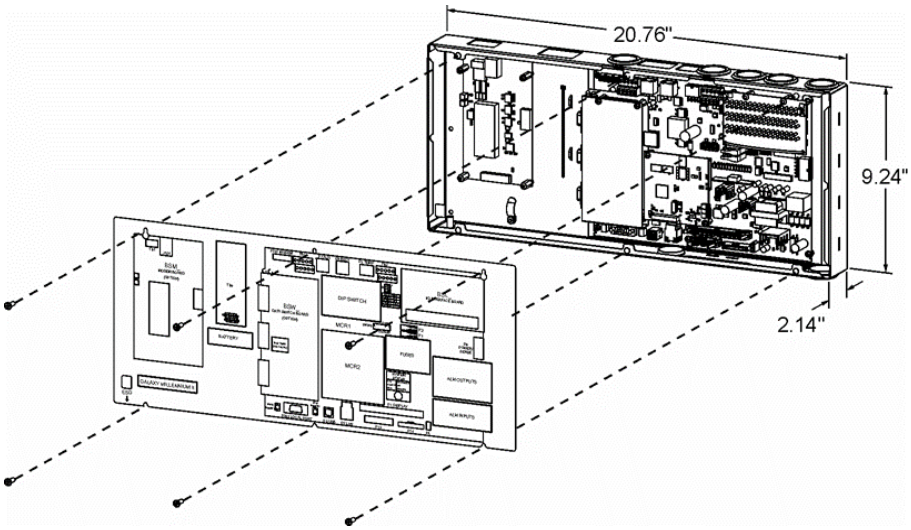


Figure 4-1: Millennium II

Controller Connections

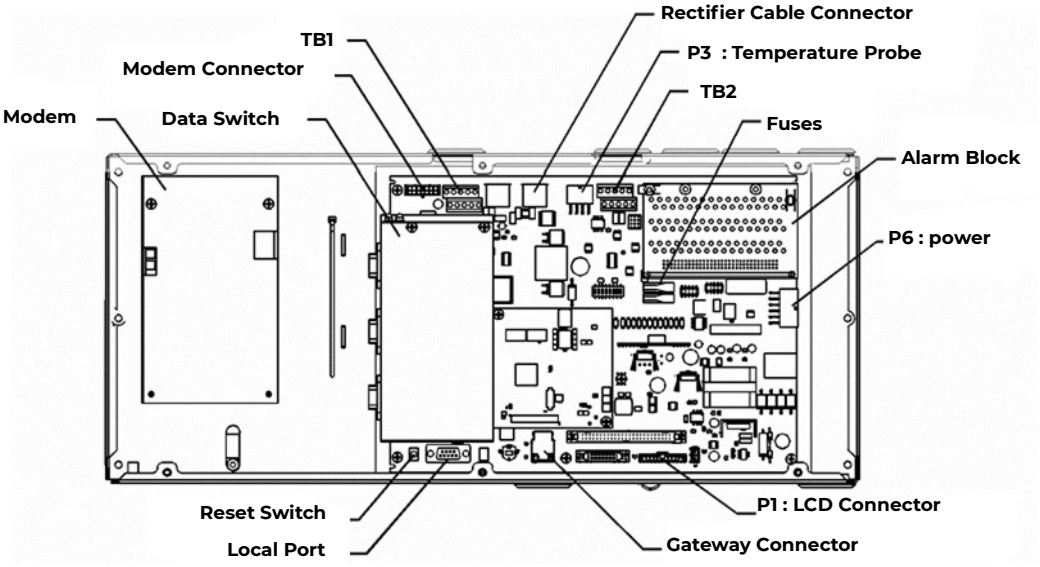


Figure 4-2: Millennium II Controller Connections

Interface Reference	Description
P1	Connectorized interface for large parallel format 8x40 LCD assembly
P2	10/100 Base-T LAN/Ethernet interface
P3	Connectorized interface for 10K/30K thermistor probe options or 210E
P6	Connectorized input for input power, monitoring of two shunts, plant sense voltage, and Major Fuse alarm (Same connection as on the Millennium)
P7	RJ45 receptacle for ground referenced Auxiliary RS485 circuit and One-Wire temperature monitoring devices
P8	BSL1-4 circuit pack Interface connector for Input/Output to controller
P9	RJ45 receptacle for isolated RS485 system component monitoring and control of rectifiers,converters, low voltage disconnect contactors, and bay level alarm inputs (Serial Rectifier bus)
P13	Factory test connector (not used in the field)
P14	Connectorized interface for future smaller serial format LCD
P15	Connectorized interface for future smaller serial format LCD
P201	Connectorized interface for optional Modem
P202	Ground referenced DB-9 for local RS232 serial port
P205	Option board connector
TB1	Terminal block interface for RS232/RS485 Auxiliary port and Remote Peripheral Module(RPM) connections
TB2	Terminal block interface for three additional 10K thermistor probe or 210E connection options
J10	USB interface (reserved for future use)

Table 4-A: Millennium II Interface Reference

Installing Circuit Packs

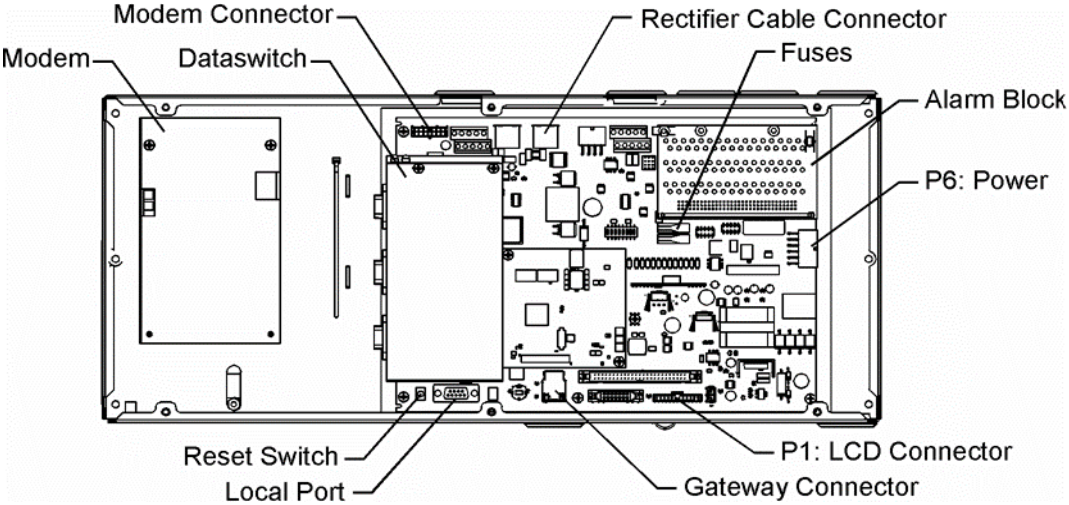


Figure 4-3: Millennium II Controller Connections

Modem Card

The optional Modem card may require field installation. To do so, perform the following steps:

Step	Action
NOTE:	Installation or replacement of this pack can be done “hot”; power removal is not necessary.
1.	Remove the controller front cover.
2.	Install the BSM on the 4 standoffs, to left of the controller MCR1 board using four 845143866 screws.
3.	Connect the 848091798 cable assembly between the BSM J100 plug and P201 on the MCR1 board.
4.	Note: This step may be performed at a later time Install phone line wiring from Connect the existing telephone cable to the RJ11 connector at the top of the board OR Connect Tip/Ring conductors to TB1 at the top of the board. NOTE: Tip is TB1 pin 1 (Pin closest to the RJ11 connector) and Ring is Pin 3. Pin 2 is not used.
5.	Operate the reset switch on the MCR1 board in the lower left corner of the MCR1 board. (see Figure 4 -3)
NOTE:	The Password Reset button is to the LEFT of the serial port connector, and the Controller Reset is to the right of the serial connector.

Data Switch Card

Step	Action
NOTE:	Installation or replacement of this pack can be done “hot”; power removal isnot necessary.
2.	Install two 407882133 standoffs on the BSJ intelligent board. Screw threads are protruding just below TB1, located at the upper left hand corner of the MCR1 board.
3.	Place BSW pack inside the 847950938 insulator.
4.	Plug BSW pack into the P205 connector on the BSJ intelligent controller board
5.	Secure the BSW board to the standoffs with two 900562208 screws.
NOTE:	To install the Data Switch Extension board, please see the User’s Guide for Millennium II Controller Advanced Features manual.

Alarm Termination Board

Alarm Termination board options provide for wire wrapped or insulation displacement (punch down) terminations. The Alarm Termination Board for a specific application may require field installation. To do so, perform the following steps:

Step	Action
1.	In the upper right hand corner of the MCR1 board, find the alarm board already installed.
2.	Remove the two screws holding the board at the top.
3.	Holding the board on both sides, slowly, but firmly, remove the alarm board from the P8 connector.
4.	Unpack the new board from its box, carefully observing proper ESD procedures.
5.	Connect the alarm board to P8 and press down firmly, until the board isseated.
6.	Secure the alarm board at the top using the two screws removed earlier.

Gateway (LAN) Connections

Step	Action
NOTE:	The Gateway card has been designed into the MCR1/MCR2 boards and requires no additional circuit packs.
NOTE:	The Gateway has an IEEE 802.3 compliant 10Base-T network interface.Since the cable length required to connect to the network is variable, this cable must be supplied by the user.
1.	At the controller, connect one end of the network interface cable to P2. Thisconnector is located at the bottom center of the MCR1 board, and immediately below the MCR2 board.
2.	Connect the other end to an IEEE 802.3 compatible network.
3.	Configure the Gateway for the network by contacting the customer’s network administrator. Detailed configuration information may be found in the User’s Guide for Millennium II Controller Advanced Features manual.

Rectifier Cabling

Step	Action
NOTE:	For new installations, the Millennium II rectifier cabling has been factory wired and installed to the cabinet BIC/BLJ board for alarm and rectifier communication.
NOTE:	For connector integrity, verify that the cable is installed and connected properly.
1.	Verify that the rectifier cable is connected to P9, and NOT P7(AUX) cable connector.
2.	Verify that the cable connector is properly seated into P9, and that it is not loose.
3.	Verify that the rectifier cable terminating on the BIC/BLJ board is connected to P9 and also not loose.

Remote Peripheral Monitoring (RPM)

RPM provides data acquisition capability far beyond that normally available in a power system controller. Monitoring modules available consist of:

- Shunt monitors (6 channels + 1 temperature channel)
- 0-100mV dc Voltage monitors (6 channels + 1 temperature channel)
- 0-3V dc Voltage monitors (6 channels + 1 temperature channel)
- 0-16V dc Voltage monitors (6 channels + 1 temperature channel)
- 0-200V dc Voltage monitors (6 channels + 1 temperature channel)
- Temperature monitor (7 Channels)
- Control Relay module (3 sets of programmable form C relay outputs)

The user may connect a maximum of 95 of any combination of these modules serially.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>NOTE:</td><td>The Remote Peripheral Monitoring feature has been designed into the MCR1 board and requires no additional circuit packs. Monitoring and control modules ARE required, based on the application.</td></tr>
<tr><td>NOTE:</td><td>This section only describes a single module connection to the controller. Modules MUST BE PROGRAMMED after they have been installed or theymay not function properly. Detailed connection and configuration information may be found in the User's Guide for Millennium II Controller Advanced Features manual.</td></tr>
<tr><td>1.</td><td>Using the RPM bus cable (Ordering Code 407377704), wrap the cable through the EMI inductor bead twice. Place the bead approximately 3 inches from the end of the cable.</td></tr>
<tr><td>2.</td><td>Connect the bus cable to:
<table>
<tr><th>TB-1 Pin Assignments</th><th>TB-1 Pin Descriptions</th><th>RPM Conductor Color</th><th>RPM Conductor Description</th></tr>
<tr><td>6</td><td>*6</td><td>Blue or White</td><td>Power/Communications</td></tr>
<tr><td>8</td><td>*8</td><td>Blue or White</td><td>Power/Communications</td></tr>
<tr><td>9 or 10</td><td>FGND</td><td>Bare wire</td><td>Shield</td></tr>
</table>
*connections of the bus wire are NOT polarity sensitive.</td></tr>
<tr><td>3.</td><td>Secure the module connection unit and route the wires through the open-faced bottom of the connection unit.</td></tr>
<tr><td>4.</td><td>Make the connections to TB2 on the connection unit:
<table>
<tr><th>TB-2 Pin Assignments</th><th>RPM Conductor Color</th><th>RPM Conductor Description</th></tr>
<tr><td>IN</td><td>Blue or White</td><td>Power/Communications</td></tr>
<tr><td>OUT</td><td>Blue or White</td><td>Power/Communications</td></tr>
<tr><td>SHIELD</td><td>Bare wire</td><td>Shield</td></tr>
</table>
*connections of the bus wire are NOT polarity sensitive.
* there are 2 IN, and 2 OUT connections. Either one may be used.</td></tr>
<tr><td>5.</td><td>Locate the control unit. This is the half with circuitry on it.</td></tr>
<tr><td>6.</td><td>In the lower right hand side of the control unit (inside), are two rotary Switches. Set SW-1 (LO) to 1. The module will be recognized as 01 by the controller. Other modules added cannot have the same address or 00 for the address.</td></tr>
<tr><td>7.</td><td>Carefully attach the control unit to the connection unit using the ribbon connector.</td></tr>
</table>

Remote Peripheral Monitoring (RPM) (Continue)

NOTE:	This connector/cable is not keyed, so be careful to line up the pins properly.
8.	After approximately 1 minute, the green LED on the front of the module will blink once approximately every 5 seconds. Detailed troubleshooting information may be found in the User's Guide for Millennium II Controller Advanced Features manual.

Thermal Probes

Without thermal probes, many of the controller's battery management features will not function, or produce erroneous results. Some features requiring thermal inputs are:

- Slope Thermal Compensation
- Reserve Time Prediction
- High Temperature Alarm
- Ambient High and Low Temperature Alarms
- High Temperature Disconnect

Step	Action
NOTE:	The controller supports a number of thermal probe inputs. The type of probe used determines where it is connected on the controller. Detailed thermal probe and battery management information may be found in the User's Guide for Millennium II Controller Advanced Features manual.
1.	The following table shows the type of probe and connector location on the Millennium:

Type of Probe	Ordering Code	Controller Connection Location
10/30K		P3
210E Thermal Probe Mux		P3
1 Wire Temperature Monitoring Devices Terminal Block		P7
Interface for 3 additional 10k probes or 210E connection		TB2

Pin	Description
1	Probe 2
2	Probe 2 RTN
3	Probe 3
4	Probe 3 RTN
5	Probe 4
6	Probe 4 RTN

USB Interface

This interface is reserved for future use

Wiring Alarm Outputs

These external alarms may be wired to customer external office alarms at their destination.

Form-C Alarm Contact Ratings	60Vdc, 0.3A
Conductor Size for terminating on Alarm board	18 – 22AWG (if less than 18AWG, use multi- conductor cable for mechanical integrity)

Refer to Table 4-B and 4-C for lead designations and their descriptions for leads terminating on the BSL alarm interface board.

Pin Number	Signal Name	Pin Number	Signal Name	Pin Number	Signal Name
1	PCRAO	33	MJFR	65	FAN
2	PCRAC	34	MNFR	66	AMN
3	PCRAR	35	MNFC	67	TFLT
4	PCRVR	36	MNFO	68	TBST
5	PCRVC	37	BDO	69	TRTN
6	PCRVO	38	BDC	70	PBTR
7	PCREO	39	BDR	71	PBT
8	PCREC	40	ACFR	72	OS
9	PCRER	41	ACFC	73	TR1
10	PMJAR	42	ACFO	74	TEQ
11	PMJAC	43	RFAO	75	ETR
12	PMJAO	44	RFAC	76	ETRR
13	PMJEO	45	RFAR	77	RO
14	PMJEC	46	HVR	78	ROR
15	PMJER	47	HVC	79	TR2
16	PMJVR	48	HVO	80	TR4
17	PMJVC	49	UR1O	81	RBRPO
18	PMJVO	50	UR1C	82	TBD now general I/O-1
19	PMNAO	51	UR1R	83	USR1PRESENT/BTP now general I/O-2
20	PMNAC	52	CTLRR	84	LVD1
21	PMNAR	53	CTLRC	85	TR3
22	PMNVR	54	CTLRO	86	-
23	PMNVC	55	UR2O	87	4-20mA in
24	PMNVO	56	UR2C	88	4-20mA Rtn
25	5V	57	UR2R	89	USR 3PRESETN/BTPFLT now general I/O-3
26	-	58	UR3R Now VLVR	90	USR3DETECT/ BTMJ
27	-	59	UR3C Now VLVC	91	0-5V in
28	PMNER	60	UR3O Now VLVO	92	0-5V Rtn
29	PMNEC	61	LVD2	93	ABS
30	PMNEO	62	LVD2R	94	ABS
31	MJFO	63	FAJ	95	DG
32	MJFC	64	AMJ	96	DG

Table 4-B: Controller Alarm Descriptions and Pin Numbers

Critical-Audio	1	PCRAO
	2	PCRAC
	3	PCRAR
Critical-Visual	4	PCRVR
	5	PCRVC
	6	PCRVO
Critical-External	7	PCREO
	8	PCREC
	9	PCRER
Power Major-Audio	10	PMJAR
	11	PMJAC
	12	PMJAO
Power Major –External	13	PMJEO
	14	PMJEC
	15	PMJER
Power Major –Visual	16	PMJVR
	17	PMJVC
	18	PMJVO
Power Minor-Audio	19	PMNAO
	20	PMNAC
	21	PMNAR
Power Minor –Visual	22	PMNVR
	23	PMNVC
	24	PMNVO
Power Minor –External	28	PMNER
	29	PMNEC
	30	PMNEO
Major Fuse	31	MJFO
	32	MJFC
	33	MJFR
Minor Fuse	34	MNFR
	35	MNFC
	36	MNFO
Battery On Discharge	37	BDO
	38	BDC
	39	BDR
AC Fail	40	ACFR
	41	ACFC
	42	ACFO
Rectifier Fail	43	RFAO
	44	RFAC
	45	RFAR
High Voltage	46	HVR
	47	HVC
	48	HVO
User Relay 1	49	UR1O
	50	UR1C
	51	UR1R

Controller Fail	52	CTLRR
	53	CTLRC
	54	CTLRO
User Relay 2	55	UR2O
	56	UR2C
	57	UR2R
Very Low Voltage	58	VLVR
	59	VLVC
	60	VLVO

Wiring Alarm and Control Inputs

In a standard Galaxy Power System configuration, plant level alarms are sent to the controller via the Bay Interface Card through serial data communication. The following alarm inputs are provided for discretionary use in non-standard applications.

Alarm	Pin Number	Signal Name
Low Voltage 2 Disconnect State Detect	61	LVD2
Fuse Alarm Major	63	FAJ
Fuse Alarm Minor	65	FAN
Auxiliary Alarm Major	64	AMJ
Auxiliary Alarm Minor	66	AMN
Timer Float Control	67	TFLT
Timer Boost Control	68	TBST
Plant Battery Test	71	PBT
Open String Detect	72	OS
Transfer Rectifier 1	73	TR1
General Purpose Input 4	74	IN-4 previously TEQ
General Purpose Input -5 (Previously Engine Transfer)	75	IN-5 Previously ETR
Reserve Operation	77	RO
Transfer Rectifier 2	79	TR2
Transfer Rectifier 4	80	TR4
Reserve Battery-Emergency Power Off	81	RBRPO
General Purpose Input 1	82	IN-1
BTP or General Purpose Input 2	83	IN-2/BTP
Low Voltage 1 Disconnect State Detect	84	LVD1
Transfer Rectifier 3	85	TR3
General Purpose 4-20mA Measuring Circuit	87	4-20mA
General Purpose 4-20mA Measuring Circuit-RTN	88	4-20mAR
BTPFLT or Generic Input 3	89	IN-3/ BTPFLT
Low Voltage 3 Disconnect State Detect Also Battery Thermal Protect Major	90	LVD3/ BTMJ
General Purpose 0-5Vdc Measuring Circuit	91	0-5V
General Purpose 0-5Vdc Measuring Circuit-RTN	92	0-5VR

Table 4-C: Controller Alarm and Control Inputs

BSL-63 FAJ: Fuse Alarm Major

An optional battery potential input, must use an external 1K ohm 2W current limiting resistor at the source. A Fuse Alarm Major is generated when battery potential is received.

BSL-65 FAN: Fuse Alarm Minor

A battery potential input is required, which must use an external 1K ohm, 2W current limiting resistor at the source. A Fuse Alarm Minor is generated when battery potential is received.

BSL-72 OS: Open String Alarm

A battery potential input is required, which must use an external 1K ohm 2W current limiting resistor at the source. This circuit is used to signal Galaxy that a battery string protective device or switch is in the open position. An Open String Alarm is generated when battery potential is received.

BSL-64 AMJ: Aux Major

A battery potential input is required, which must use an external 1K ohm, 2W current limiting resistor at the source. This circuit is used to allow Galaxy to monitor another power device and provide alarms for it. An Aux Major Alarm is generated when battery potential is received.A battery potential input is required, which must use an external 1K ohm, 2W current limiting resistor at the source. This circuit is used to allow Galaxy to monitor another power device and provide alarms for it. An Aux Major Alarm is generated when battery potential is received.

BSL-66 AMN: Aux Minor

A battery potential input is required, which must use an external 1K ohm, 2W current limiting resistor at the source. This circuit is used to allow Galaxy to monitor another power device and provide alarms for it. An Aux Minor Alarm is generated when battery potential is received.

LVD1: BSL-84 Low Voltage Disconnect Active

A battery potential input is required, which must use an external 1K ohm, 2W current limiting resistor at the source if not using standard OmniOn Power LVD circuit boards or controller. This circuit is used to inform Galaxy that the monitoring circuit of a Low Voltage Disconnect device has failed. In standard Galaxy Power Systems, the Bay Interface board monitors these alarms and informs the Controller through the serial interface connection.

LVD2/LVD2R: BSL-61/62 Low Voltage Disconnect Active

A closure between these points or a ground signal into LVD2/ BSL-61 is used to inform Galaxy that the a Low Voltage Disconnect device has opened. In standard Galaxy Power Systems, the Bay Interface board monitors these alarms and informs the Controller through the serial interface connection.

External Boost Option

A variety of external devices may be used to initiate boost in Galaxy. Wiring is required from positions 67/68/69 on the BSL board for operation of this feature. Providing a contact closure between TBST and TRTN initiates the boost feature. A contact closure between TFLT and TRTN returns the plant to float. Additional information on External Boost can be found in the User's Guide for Millennium II Controller Advanced Features manual.

Rectifier Sequence Option

The controller is capable of sequencing rectifiers on line after detecting a AC is being provided by emergency generator. Internal Rectifier Sequencing requires external wiring to ETR/ETRR on BSL pin numbers 75/76, and optionally RO/ROR on BSL pin numbers 77/78, in order to function.

The controller can also accept ground signals onto TR1 to TR4 on BSL 73/79/ 85/80 from an external device to control the sequencing of plant rectifiers in groups as follows:

TR Signal	Rectifiers Affected
TR1	G01, G02, G09, G10, G17, G18, G25, G26, G33, G34, G41, G42, G49, G50, G57, G58
TR2	G03, G04, G11, G12, G19, G20, G27, G28, G35, G36, G43, G44, G51, G52, G59, G60
TR3	G05, G06, G13, G14, G21, G22, G29, G30, G37, G38, G45, G46, G53, G54,G61, G62
TR4	G07, G08, G15, G16, G23, G24, G31, G32, G39, G40, G47, G48, G55, G56, G63, G64

Table 4-D: TR leads and Associated Rectifiers

Additional information on the Rectifier Sequence Options can be found in the User's Guide for Millennium II Controller Advanced Features manual.

Battery Temperature Option

Slope Thermal Compensation and Battery Reserve Time Prediction features of the controller, require that battery temperature be monitored. If either of these features is to be configured in Galaxy software, a battery temperature input must be connected to P3 temperature probe connector on the Controller board.

Three optional cables are used to connect to various battery arrangements:

Cable Assembly	Connects to:
848152997	KS20472 round cell thermistor
848152989	ring or paddle type thermistors
848153003	210E Thermal Probe Multiplexer

Refer to User's Guide for Millennium II Controller Advanced Features manual for additional information on these features.

Alarm Battery Supply Signals

SignalName	Pin No.
ABS	93
ABS	94
DG	95
DG	96

Table 4-E: ABS Pin Numbers

Fused Battery Supply

BSL-93, 94 ABS: Alarm Battery Supply

This is an alternate plant voltage source for user alarm systems. This power is fused with a 1-1/3 ampere ABS fuse

BSL-95,96 DG: Discharge Ground

Plant ground/return source for user alarm systems.

Fuses

Two Fuses, located on the MCR1 board, provide protection for the controller input power and Alarm Battery Supply, used to power alarm panels or other devices requiring the power system voltage at no more than 1.3A.

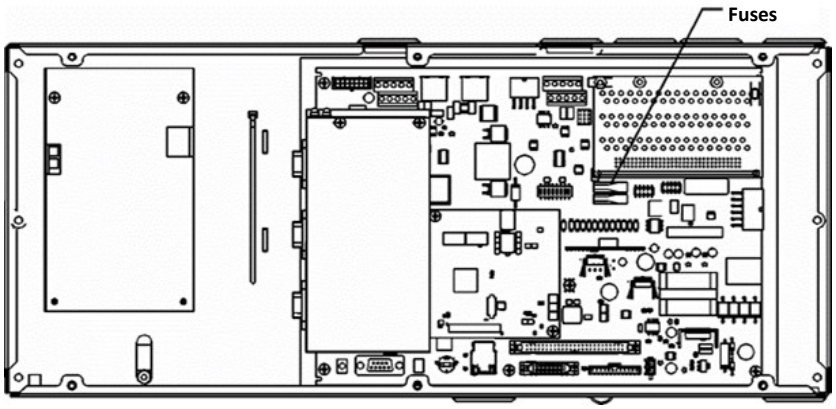


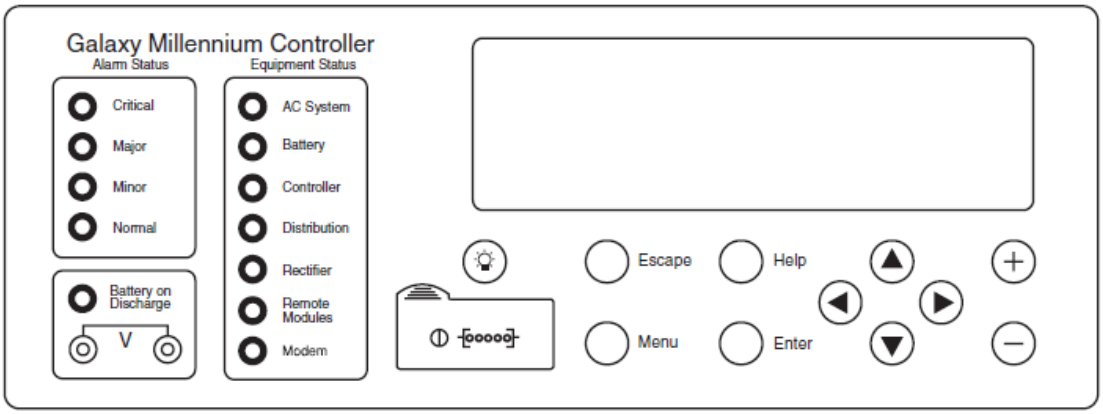
Figure 4-4: Millennium Controller Fuses

FUSE	Description	Fuse Size
F1	Controller Input Power	3A
F2	Alarm Battery Supply (ABS)	1.3A

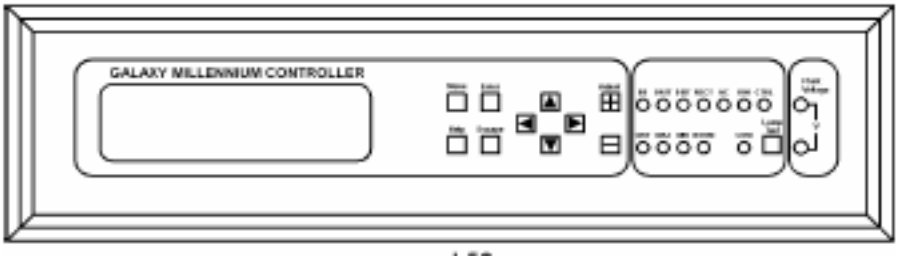
Front Panel Display

LCD

The primary local interface for the Millennium II is an eight-line LCD assembly mounted to the front of the primary GPS cabinet door. This user interface is a panel that includes a backlit LCD module, two sections of status LEDs, system voltage test jacks, and an array of simple push-button controls. This controller supports multiple LCD display assemblies. It is backwards compatible to both existing Millennium LCD assemblies L51 and L50 shown in Figure 4-5. It is also compatible with the enhanced L52 LCD display assembly (see figure 4-6) specifically developed for the Millennium II. This new display assembly is compatible to existing GPS cabinet doors and is functionally backwards compatible to the Millennium. It looks very similar to the L51 option. LCD assembly, but the L52 also provides a built-in audible alarm and digital contrast adjust that are only available when used with the Millennium II controller.



L51



L50

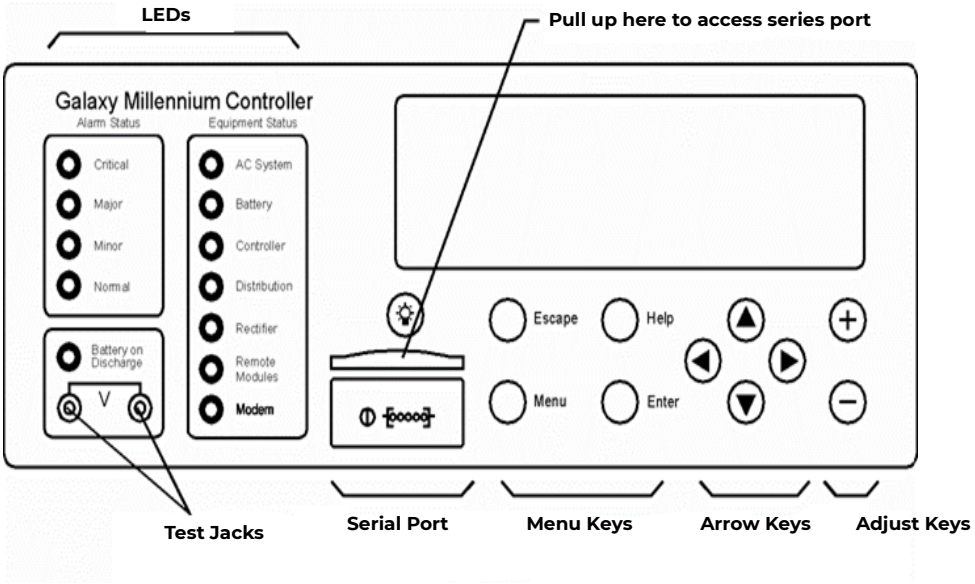


Figure 4-6: Detailed Controller Front Panel Display – L51/52

LEDs

Depending on the LCD option utilized, the LCD assemblies contain two rows of LEDs at the right side of the interface board or two columns of LEDs at the left side of the interface board as seen in figure 4-5. The segregated sections of LEDs provide an indication of the alarm source (rectifier, battery, distribution, communication, controller, remote modules) and the severity (Critical, Major, Minor, Nominal) of the various alarms. Operation of the status LEDs can be reconfigured via the local or remote controller interfaces.

Push Buttons

A group of push-button keys identified in table 4-F, provides the primary method of locally interacting with the Galaxy Millennium II controller. These keys are used singly or in combination to navigate through the menus and follow industry standard functionality. Following is the general description of all the keys.

Key	Function
Up arrow	Use to navigate the menu; press the key to move the cursor up one line.
Down arrow	Use to navigate the menu; press the key to move the cursor down one line.
Left arrow	Use to navigate the menu; press the key to move the cursor left one field.
Right arrow	Use to navigate the menu; press the key to move the cursor right one field.
ADJUST Plus(+)	Use to adjust (increase) the value of a field.
ADJUST Minus(-)	Use to adjust (decrease) the value of a field.
MENU	Press this key any time to bring the MAIN menu online.
HELP	Press this key to display limited on-line help information.
ENTER	Use this key to save a value that has been changed, orto select a menu item.
ESCAPE	Use this key to abort a change, or to go back to the immediate higher level menu.
Lamp Test (L50 only)	Use this key to test the display and LEDs

Table 4-F: Push-Button Key Functionality

Test Jacks

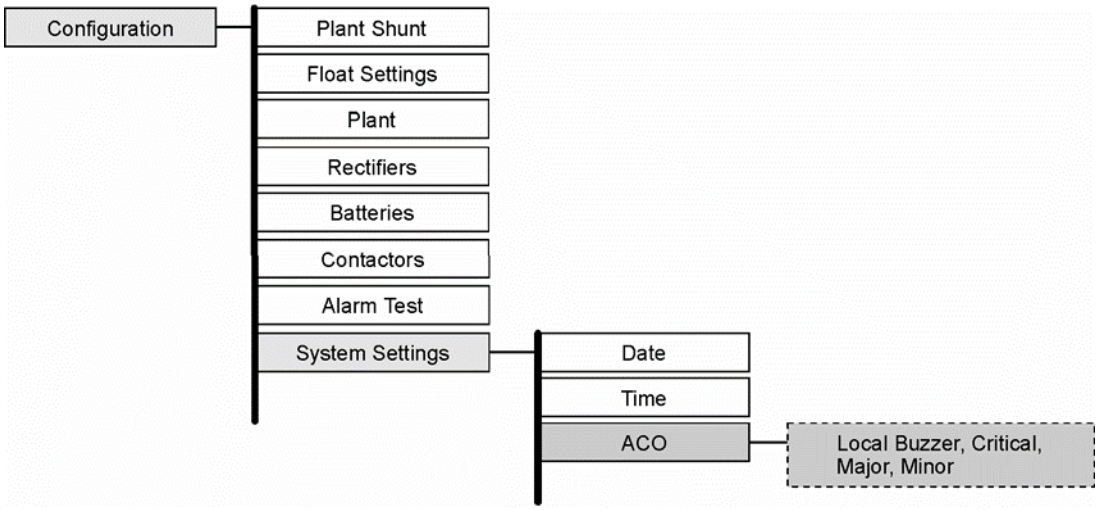
The Millennium II LCD panel assemblies also provide test jacks to provide the ability of using an external meter to monitor the Plant Voltage as seen in figure 4-7. Voltages to the front panel test jacks are current limited and ESD protected. The controller measures this voltage to regulate the system bus voltage as well as display it as the battery plant bus voltage. The value of this voltage is used for many other controller related features.

Serial (PC) Port

A ground referenced RS-232 local port is provided at the front of the display to allow easy connection to a personal computer or terminal using ANSI T1.317 object oriented command language. OmniOn Power's EasyView is also available to provide a user friendly system interface locally or remotely. See figure 4-6.

Alarm Buzzer

The audible alarm buzzer is located on the front panel display assembly. It can be programmed from the front panel display to operate as follows:



• Disabled for ALL Alarms
• Audible on PCR
• Audible on PMJ
• Audible on PMN

Contrast Adjust

- For L50, L52 Displays:

  Press the + or – keys and hold until the display changes it's contrast setting. Once the desired setting is reached, release the button.

- For L51 Displays:

  Using a small flat head jeweler's screwdriver, insert it into the small opening at the top of the display assembly (above the UP arrow). Turn clockwise or counter clockwise until the display contrast is set.

Controller Defaults

Dip Switch Settings

The Millennium has 8 dip switch positions (SW202) that may be changed. SW202 is located on the MCR1 board, above the MCR2 board. (See figure 4-7)

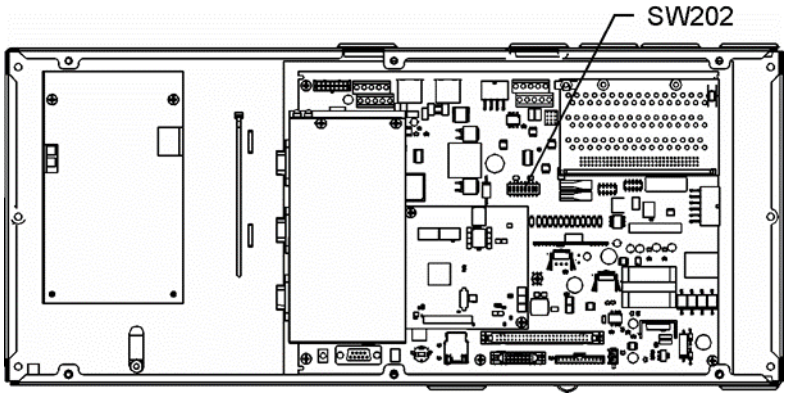


Figure 4-7: Millennium II Controller Dip Switches

Switch Position	Default	Description	Closed (1)	Open (0)
SW202-8	1	Front Panel Configuration	ENABLED	DISABLED
SW202-7	0	Modem/Aux/Local/Gateway/USB/IRDA Port Setting Configuration (Remote Access)	ENABLED	DISABLED
SW202-6	0	Enhanced Security Mode (See table 4-H, for features affected	ENABLED	DISABLED
SW202-5	1	Auxiliary Port Configuration	RS-232	RS-485
SW202-4	1	Remote Rectifier in Standby	ENABLED	DISABLED
SW202-3	0	Boost Mode	ENABLED	DISABLED
SW202-2	1	Reserved for Future Use	ENABLED	DISABLED
SW202-1	1	Reserved for Future Use	ENABLED	DISABLED

Table 4-G: Millennium II Controller Dip Switch Settings

The modem and auxiliary ports can be configured for full access and read-only using DIP switch 202-7. Restricted access is also available. This prevents changes ia the modem and auxiliary ports that will affect the state of the plant, even when logged in as a Super-User or Administrator. This enhanced remote security is enabled and disabled with DIP switch SW202-6. The functions and parameters restricted with the enhanced remote security feature are listed in this table.
Enable or disable Rectifier Restart feature
Change All Rectifier On Threshold
Change Timed Manual Boost Duration
Change Boost Current Threshold
Change Rectifier Status to “Standby”/ “Vacant” status is prohibited. The change to “On”status is allowed.
Change Rectifier Shunt Voltage configuration
Change Rectifier Float High Voltage Shutdown Threshold
Change Rectifier Boost High Voltage Shutdown Threshold
Change Rectifier Float Set Point
Change Rectifier Boost Set Point
Change Rectifier Boost Current Limit
Change Converter Voltage Set-Point
Change Converter Low Voltage Disconnect Threshold
Change Converter Low Voltage Reconnect Threshold
Enable or disable Converter Low Voltage Disconnect feature
Change Converter Status to “Standby”/ “Vacant” status is prohibited. The change to“On”status is allowed.
Change Battery High Temperature Threshold
Enable or disable Battery Current Limit
Change Battery Limit Threshold
Change Battery Contactor Status to “Open” status is prohibited. The change to “Close” status is allowed.
Change Battery Disconnect Threshold
Change Battery Reconnect Threshold
Change Very Low Voltage Alarm Threshold and Severity
Change Multiple Rectifier Fail Alarm Threshold and Severity
Change Limited Recharge Current Alarm Threshold and Severity
Change Excess Rectifier Drain Alarm Threshold and Severity
Change Engine Transfer Timeout Alarm Threshold and Severity
Change Reserve Time Low Alarm Threshold and Severity
Change Multiple Converter Fail Alarm Threshold and Severity
Change Battery On Discharge Alarm Threshold and Severity

Table 4-H: Enhanced Remote Security Features

Voltage Threshold Ranges and Default Values

	Low	High	Default
Very Low Voltage (VLV)			
24V	20.00	25.50	23.00
48V	40.00	51.00	46.00
Battery on Discharge (BD)			
24V Float	23.00	28.00	25.00
24V Boost	23.00	28.00	25.00
48V Float	46.00	55.00	51.00
48V Boost	46.00	55.00	51.00
High Float Voltage (HFV)			
24V Float	24.75	29.75	26.50
24V Boost	25.75	31.75	26.50
48V Float	50.00	60.00	53.00
48V Boost	52.00	60.00	53.00
High Voltage Shutdown Alarm (HV)			
24V Float	24.75	29.75	26.8
24V Boost	25.75	31.75	26.8
48V Float	50.00	60.00	53.6
48V Boost	52.00	60.00	53.6
Rectifier On Threshold (ROT)			
24V	20.00	25.00	22.00
48V	40.00	51.00	44.00

Table 4-I: Voltage Threshold Ranges and Default Values

Controller Alarm Severity, LED and Relay Default Values

Symbol	Default Designation	Default Severity	Default LED	Default Relay
AAC	ACO Active	RO	None	None
ABS	Alarm Battery Supply Fuse	Major	CTLR	CTLR
AMJ	Auxiliary Major	Major	None	None
AMN	Auxiliary Minor	Minor	None	None
ATA	Alarm Test Active	RO	None	None
ATB	Alarm Test Aborted	RO	None	None
ATF	Alarm Test Failed	Warning	None	None
BBL	Memory Backup Battery Low	Warning	None	None
BCA	Battery Type Conflict	Warning	None	None
BDA	Battery on Discharge	Major	BD	BD
BFA	Battery Test Failed	Minor	BAT	None
BID	Bay Interface ID Conflict	Major	CTLR	CTLR
BTA	Battery Test Active	RO	BD	BD
BTJ	Battery Thermal Major	Major	BAT	None
BTN	Battery Thermal Minor	Minor	BAT	None
CCH	Configuration Changed	RO	None	None
CDFA	Converter Distribution Fuse	Major	RECT	MJF
CDID	Converter ID Conflict	Major	RECT	None
CFA	Converter Fail	Minor	RECT	None
CLC	Clock Changed	RO	None	None
CMA	Minor Communications Failure	Minor	CTLR	None
CMFA	Multiple Converter Fail	Major	RECT	None
CNF1	Contactor 1 Failed	Major	BAT	None
CNF2	Contactor 2 Failed	Major	BAT	None
CNF3	Contactor 3 Failed	Major	BAT	None

Symbol	Default Designation	Default Severity	Default LED	Default Relay
CNO1	Contactor 1 Open	Major	BAT	None
CNO2	Contactor 2 Open	Major	BAT	None
CNO3	Contactor 3 Open	Major	BAT	None
COF	Queue Overflow	Warning	None	None
COR	Number Did Not Respond	Warning	None	None
CPA	Circuit Pack Fail	Major	CTLR	CTLR
CRA	Controller Fail	Major	CTLR	CTLR
DID	Rectifier ID Conflict	Major	RECT	None
EMD	Energy Management Disabled	Warning	None	None
EPD	Excess Plant Drain	Minor	RECT	None
EPO	Emergency Power Off	Critical	BATT	None
EPR	External Password Reset	Warning	None	None
ETO	Engine Transfer Timeout	Minor	AC	None
EXL	Excessive Login Attempts	Warning	None	None
FAJ	External Fuse Major	Major	DIST	MJF
FAN	External Fuse Minor	Minor	DIST	MNF
HCL	History Cleared	RO	None	None
HFV	High Float Voltage	Minor	RECT	None
HVA	High Voltage	Major	RECT	HV
LMR	Limited Recharge	Minor	RECT	None
LVD	Low Voltage Disconnect	Minor	BAT	None
LVDA	Low Voltage Disconnect Fail	Minor	BAT	None
MCM	Major Communication Fail	Minor	CTLR	None
MDF	Module Failure	Minor	RM	None
MOR	Measurement Out Of Range	Minor	RM	None
MTC	Module Type Conflict	Warning	None	None
NNC	Number Not Configured	Warning	None	None
OSA	Open String	Minor	BAT	None
PFD	Password At Default	Warning	None	None
PGI	Program Line Invalid	Major	None	None
PHT	Processor Halt	RO	None	None
POR	Number Did Not Respond	Warning	None	None
RLS1	Redundancy Loss	Ninor	RECT	None
RPI	Rectifier/Plant Inconsistency	Warning	None	None
RTL	Reserve Time Low	Minor	BAT	None
SNC	Shunt Not Configured	Warning	None	None
STF	Self Test Failed	Minor	CTLR	CTLR
TPA	Thermal Probe Failure	Minor	CTLR	CTLR
URC	User Relay Conflict	Warning	None	None
VLA	Very Low Voltage	Critical	BAT	UR3
VSF	Sense/Control Fuse	Major	CTLR	CTLR
ZID	ID Not Configured	Major	RECT	None

Table 4-J:Controller Alarm Severity, LED and Relay Default Values

Symbol	Default Designation	Default Severity	Default LED	DefaultRelay
ACF	AC Fail	Minor	AC	ACF
CLM	Rectifier Current Limit	RO	None	None
ERD	Excess Rectifier Drain	Minor	RECT	None
ETS	External Transfer Shutdown	Minor	RECT	None
HPA	Half Power	Minor	RECT	None
LCA	Low Current Alarm	Minor	RECT	None
LSF	Load Share Fuse	Minor	RECT	None
MACF	Multiple AC Fail	Major	AC	ACF
MAN	Manual Off	Minor	RECT	None
MFA	Multiple Rectifier Fail	Major	RECT	RFA
MMAN	Multiple MAN Alarm	Major	RECT	None
PHA	Phase Or Low Output	Minor	AC	None
RIC	Rectifier Incomplete Config	Warning	None	None
RFA	Rectifier Fail	Minor	RECT	RFA

Table 4-K: Rectifier Alarm Defaults

Default Display

The default display shown in figure 4-8 provides basic system status. The controller returns to this display after approximately three minutes after the last time a key is pressed.

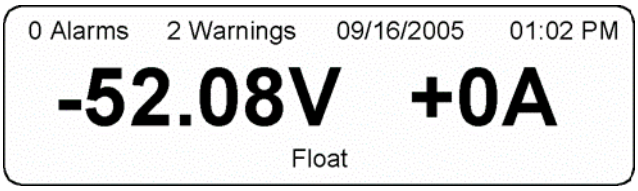


Figure 4-8: Millennium II Controller Default Display

The first line shows:

# of Alarms	# of Warnings	Date	Time

The larger text in the middle of the screen shows:

Plant Voltage	Plant Load (Current)

The bottom line(s) show:

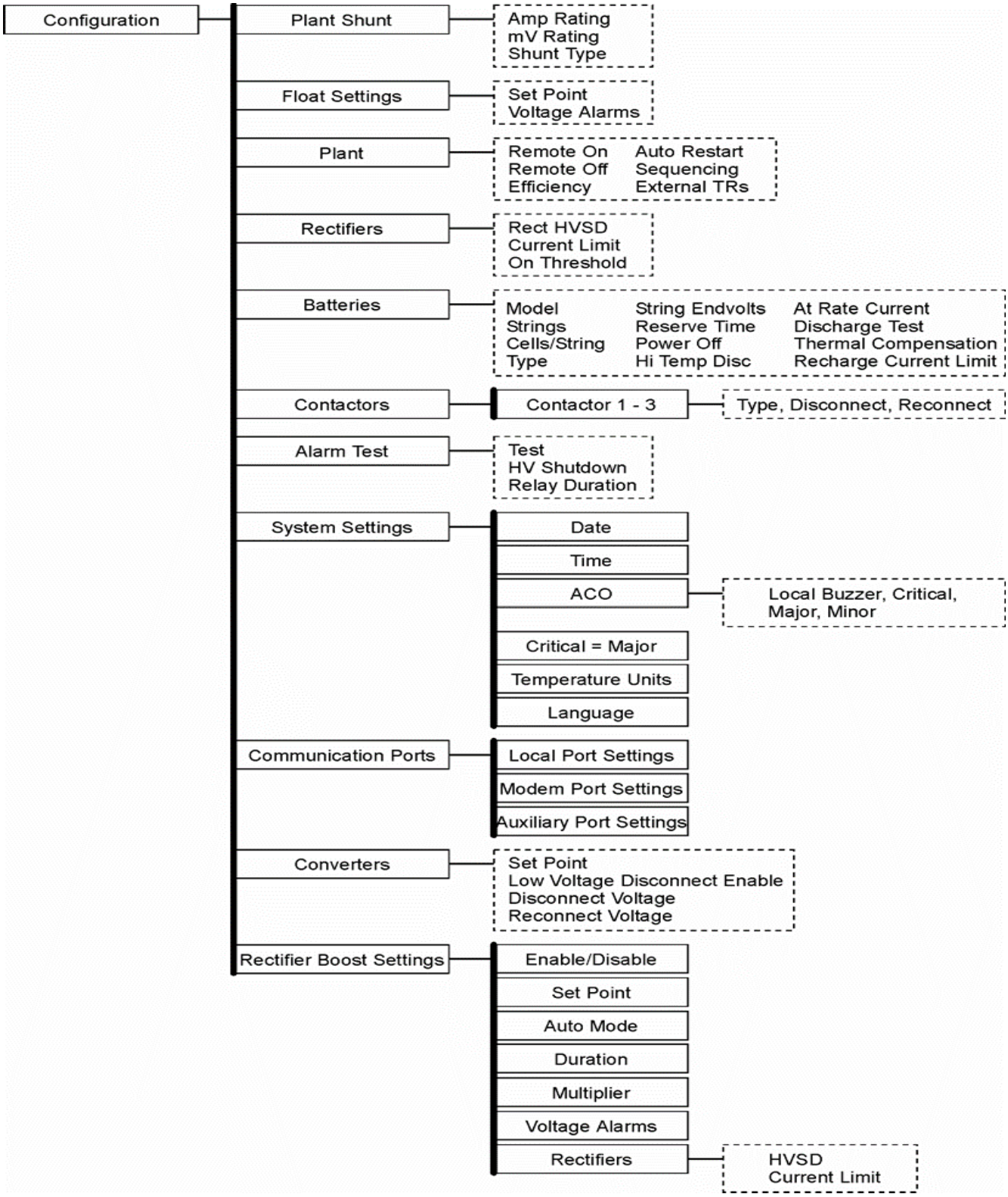
An Hourglass may appear in the lower left hand corner of the screen. This indicates that a configuration change is being saved to non-volatile memory.
Audible Alarm Cutoff State(Toggle) (Only shown if an alarm is active)
Plant Mode (Default Float)

Screen information is updated approximately every two seconds. The front panel display offers a series of menus that allow the user to:

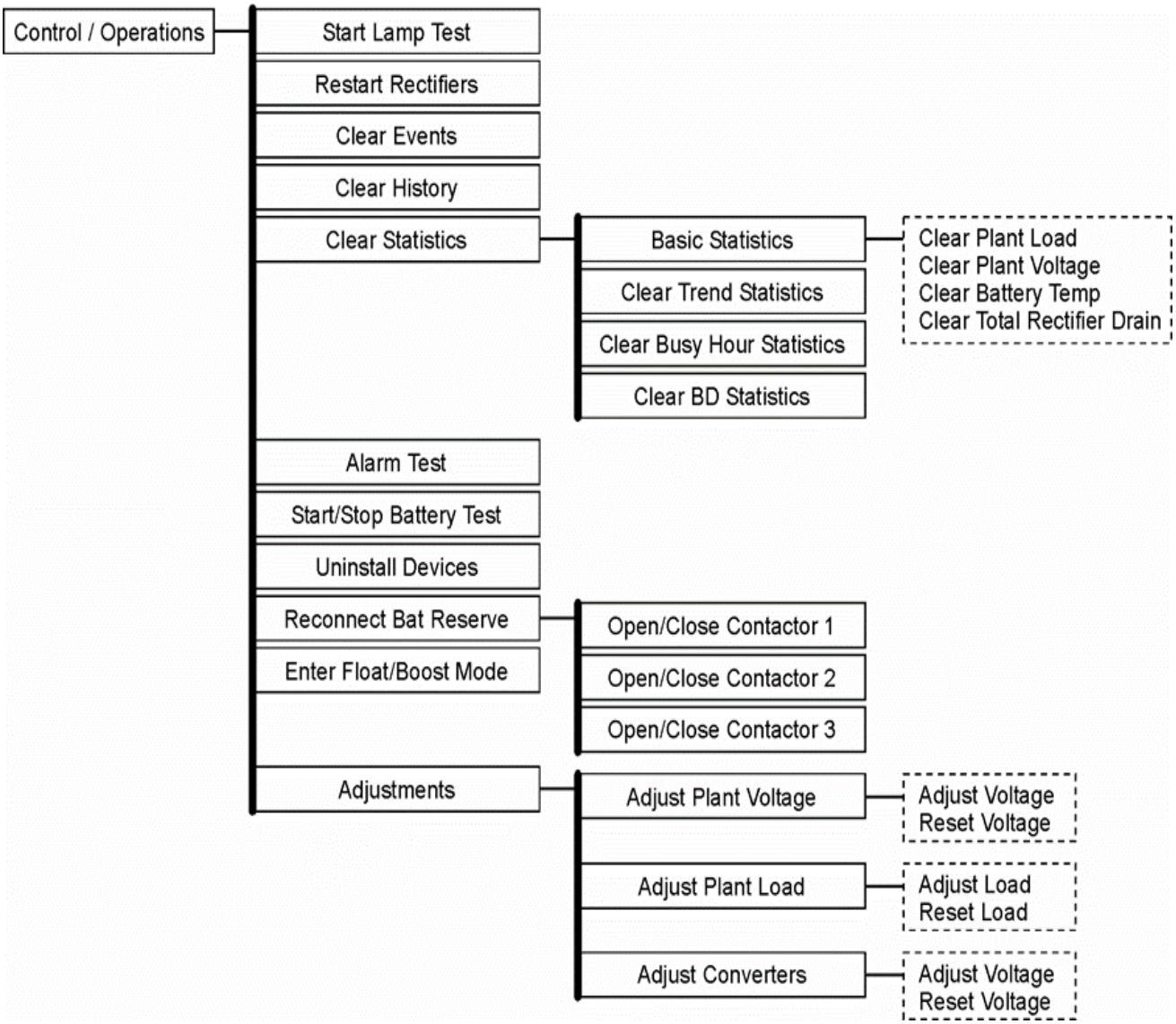
- Configure
- Control
- View Status
- View History
- View Statistics
- Perform Diagnostics

Controller Display Menu Maps

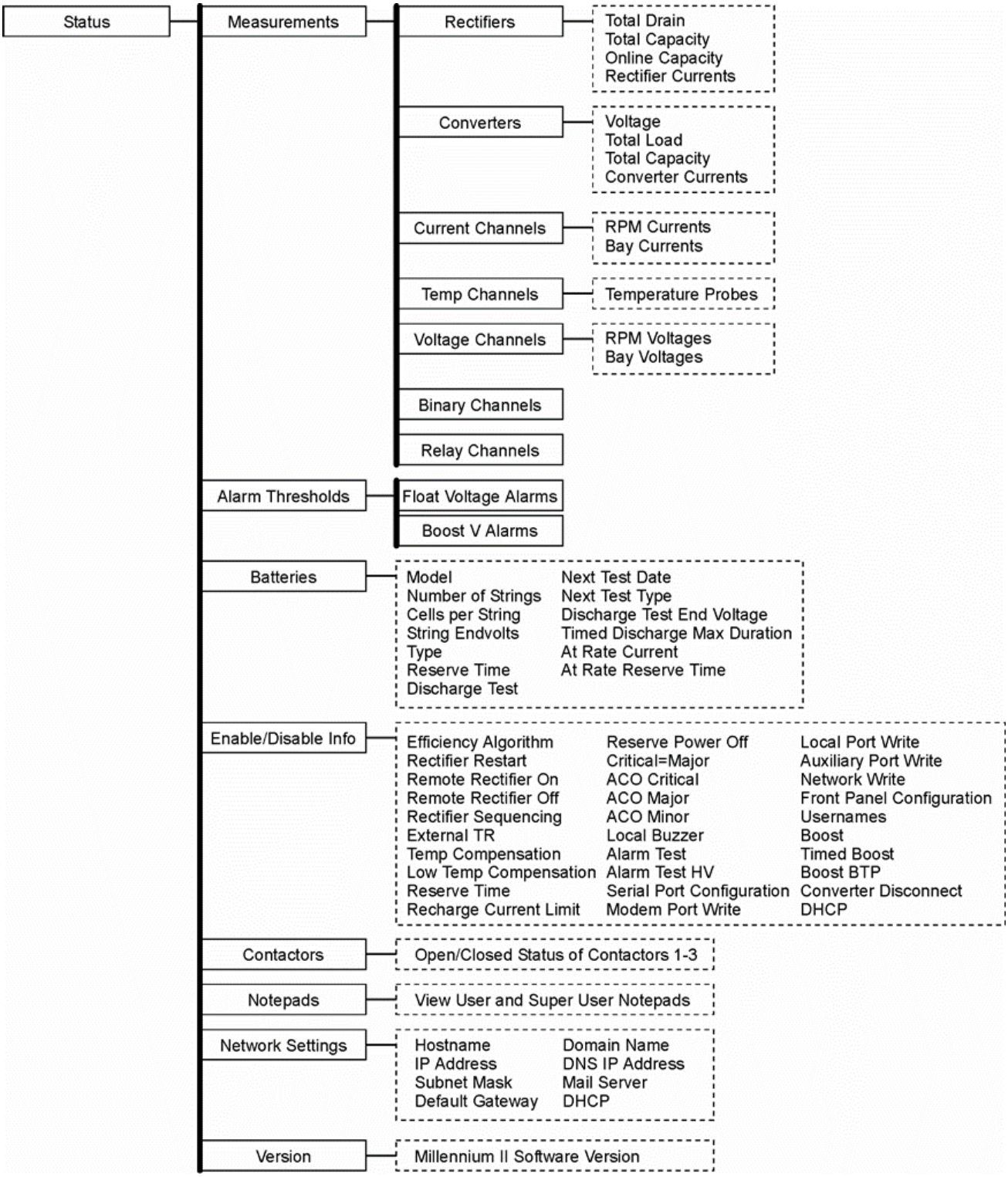
Configuration Menu Map



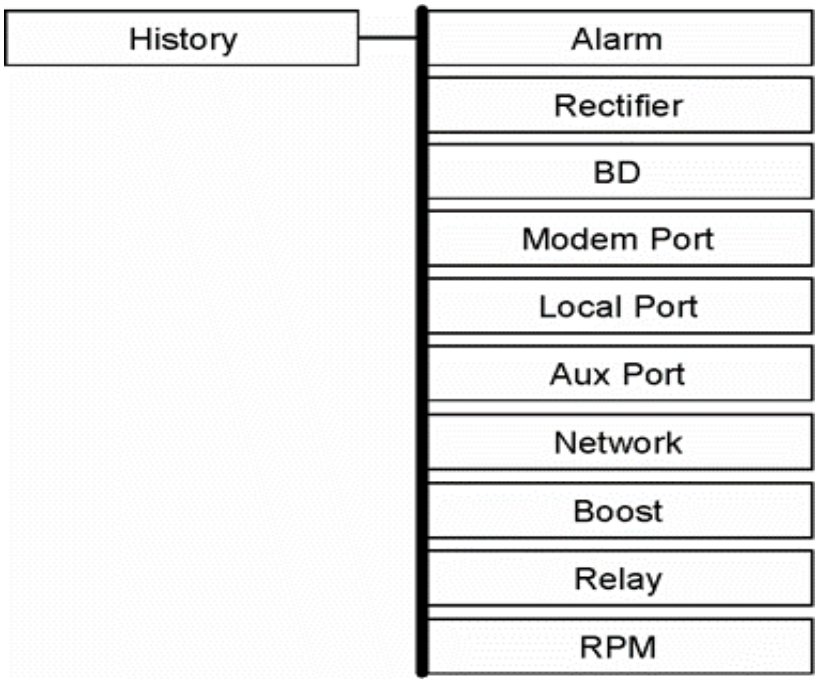
Control and Operations Menu Map



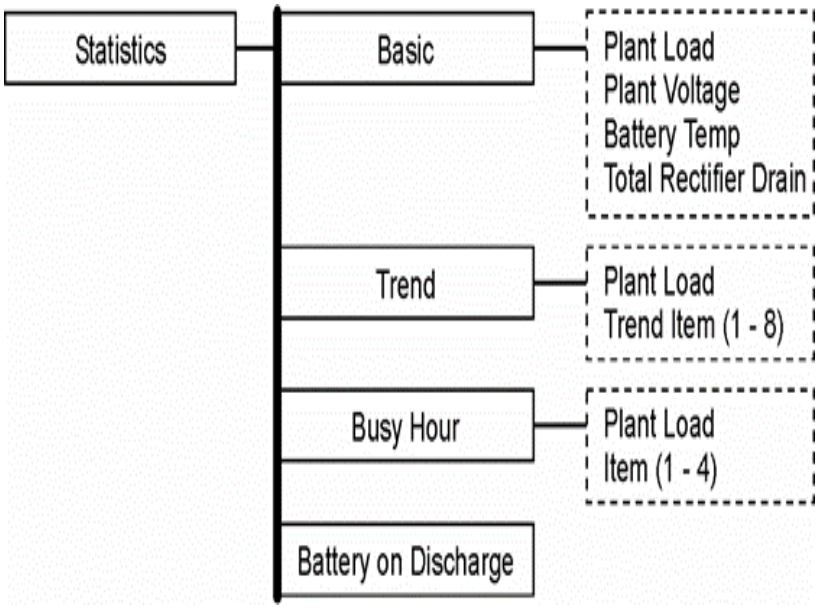
Status Menu Map



History Menu Map



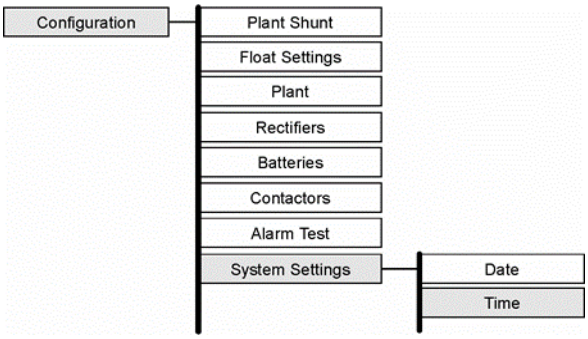
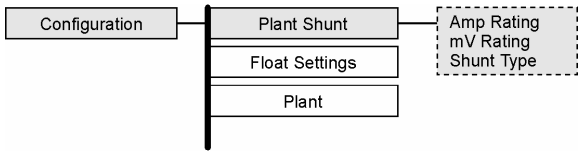
Statistics Menu Map

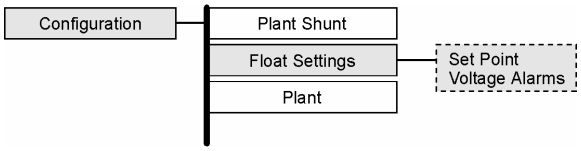


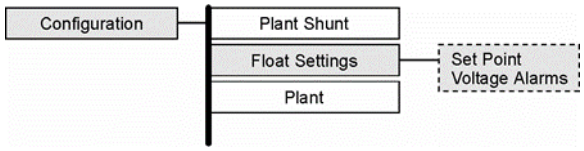
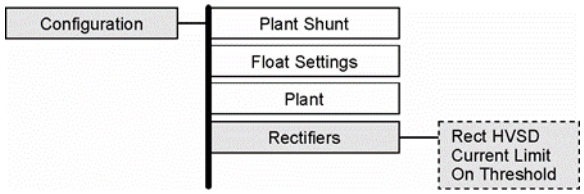
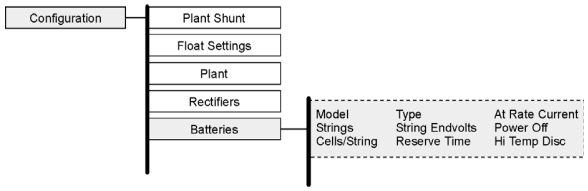
Minimum Configuration

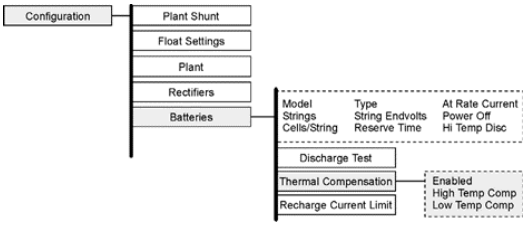
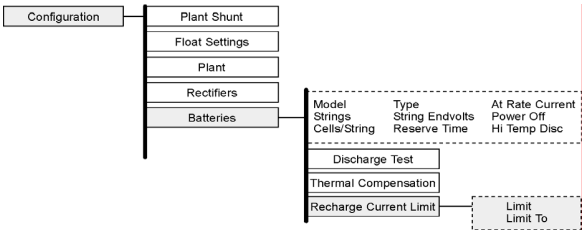
Front Panel

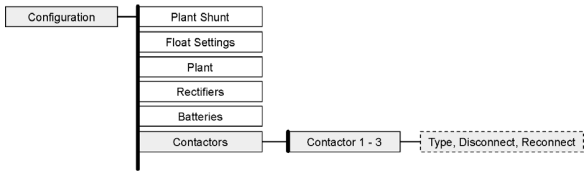
The Millennium II controller's primary user interface is the front panel, which includes a backlit LCD, and an array of pushbutton controls. SW202-8 must be set to ENABLED for changes to be made from the front panel. This section covers only the basic operations that must be performed so that the controller is minimally configured. For more advanced operations, please see the User's Guide for Millennium II Controller – Advanced Features.

Step	Configuration Attribute to Change	Menu Path/Action	Customer Value
1.	DATE/TIME		
	Format	This field allows you to select one of the following date formats: MM/DD/YY, DD/MM/YY, YY/MM/DD, MM/DD/YYYY, DD/MM/YYYY, YYYY/MM/DD. Use the <+> or <-> key to select the desired format and press <ENTER> to save the change.	
	Month	Use this field to change the month; thepossible value is from 1 to 12.	
	Day	Use this field to change the day of the month;the possible value is from 1 to 31.	
	Year	Use this field to change the year; the possible value is from 1992 and up.	
NOTE**:**		Please note that the system will validate the entries before the system date is modified.	
2.	TIME		
	Format	This field allows you to select one of the following time display formats: 12 or 24 hour.Use the <+> or <-> key to select the desired format and press <ENTER> to save the change.	
	Time	Allows you to change/set the time.	
	Daylight	Enables or Disables Daylight Savings.	
3.	SYSTEM SHUNT		

	Type	This selection allows the operator to configure the type of shunt that is connectedto the controller. Possible values are LOAD, BATTERY, or NONE. The configuration is determined by the plant architecture. Refer to the GPS Power Plant Product Manual for a description of these architectures. In a plant using distributed architecture a shunt type of NONE should be selected. In this arrangement, up to 32 shunts, located between batteries and plant bus bars, can be connected to the Bay Interface Cards in the system bays. The controller reads the shunt currents over the serial data connection. The load current displayed is derived from the total of battery currents and the total of rectifier currents. In a plant using centralized architecture, either LOAD or BATTERY should be selected. A maximum of two shunts of the same amperage can be connected through P6 on the BSH. A shunt type of LOAD means that a load shunt, located between load and plant bus bars, is connected. The load current displayed on the front panel is the sum of the two shunt currents. A shunt type of BATTERY means that a battery shunt locatedbetween the batteries and plant bus bars is connected. The load current displayed on the front panel is derived from the total batterycurrent and the total rectifier output current. Use the <+> or <-> key to change the field values. Press <ENTER> to save the changes.	
	mV	The first item to configure is the Plant Voltage shunt. Make sure the cursor is on the SHUNT mV field and use the <+> or <-> key to step through the available values (25, 50, 60, 100, 150 mV). Select the one that best suits the application; press the <ENTER> key to save the change.	
	I	Move the cursor to the SHUNT I field by using the <UP>/<DOWN>/<LEFT>/<RIGHT> ARROW keys. Use the <+> or <-> key tostep through the available values (0-99999). Select the desired value; press <ENTER> to save the change.	
4.	ALARM THRESHOLDS		
	High Voltage	When the plant voltage exceeds this threshold, the plant High Voltage Alarm(HVA) is turned ON, and the controller will send a signal to the rectifiers to shut down in an orderly and timely fashion. This will also light the Major (MJ) LED, and activate the PMJ relay (assuming there is no alarm with CRITICAL severity level active). Move the cursor to the fields and use the <+> or <->key to adjust the High Voltage shut downalarm for FLOAT mode to the desired level. Press <ENTER> to	
	High Voltage Float	When the plant voltage exceeds this threshold, the plant High Float Voltage Alarm(HFV) is turned ON, and this will also light the Minor LED, activate the PMN contact closure (assuming there is no alarm with CRITICAL or MAJOR severity level active).The purpose of this alarm is to indicate that the plant voltage is high probably due to an adjustment in the plant rather than due to a failure. This alarm allows the High Voltage (HV) shutdown threshold to be raised slightly,thus reducing the number of nuisance shutdowns without decreasing the plant reliability. Move the cursor to the fields and use the <+> or <-> key to adjust the High Voltage shut down alarm for FLOAT mode tothe desired level (normally less than the HV threshold). Press <ENTER> to save the change.	

	Battery on Discharge	If the plant voltage is less than the threshold value, the Battery Discharge alarm is turned ON, this in turn activates the PMJ and BD relay, light the MAJ and BD LEDs. Move the cursor to the fields, and use the <+> or <-> key to adjust the threshold to the desired level. Press <ENTER> to save the change.	
	Very Low Voltage	This alarm threshold is used to indicate that the system voltage is very low, and that the batteries have discharged to a dangerously low depth. When the plant voltage falls belowthis level, the Very Low Voltage (VLV) and Power Critical alarm will be generated. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
5.	Rectifiers		
	Setpoint	This value sets the system voltage for all serial rectifiers. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
			
	HVSD	The configuration of this field sets the internal high voltage shutdown value of all serial rectifiers. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
6.	Batteries		
	Model	The configuration of this field selects the installed battery type from a list of pre- defined battery types used in reserve time prediction and enhanced battery test features. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
	Strings	The configuration of this field selects the number of battery strings in the system. This parameter is used in reserve time prediction and enhanced battery test features. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
	Cells/String	The configuration of this field selects the number of installed cells in the battery strings.This parameter is used in reserve time prediction and enhanced battery test features. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	

	Type	The configuration of this field selects the batter type, Flooded or Valve Regulated(sealed). This parameter is used in reserve time prediction and enhanced battery test features. Move the cursor to the field and use the <+> or <-> key to adjust the threshold value. Press <ENTER> to save the change.	
7.	Thermal Comp	 This feature allows dynamic control of sealed cell battery voltage as function of temperature.	
	Enabled	Enables or Disables the Thermal compensation Feature. Move the cursor to the field and use the <+> or <-> key to Enable orDisable. Press <ENTER> to save the change.	
	High Temp Comp	This feature allows the system to compensatefor high temperatures.	
	Volt Step Down	Battery step temperature can be set from 113-185F. At this temperature, the system voltage is reduced by 0.17 X # of cells/ string.	
	High Comp Limit	This sets the maximum temperature for which thermal compensation is active.	
	Decrease	This sets the slope (mV/degC) for high temperature compensation.	
	Nominal Temp	This field set the temperature at which no compensation is required. The system voltageis at the setpoint float mode.	
	Low Temp Comp	This feature allows the system to compensate for low temperatures.	
	Low Temp Comp	This enables or disables the low temperaturecompensation feature.	
	Low Comp Limit	This sets the minimum temperature for which thermal compensation is active.	
	Increase	This sets the slope (mV/degC) for low temperature compensation.	
8.	Recharge Current Limit	This feature sets the total amount of current that will be allowed to recharge the batteries. 	
	Limit	The configuration of this field enables or disables the feature.	
	Limit to	This programmable value sets the maximum amount of recharge current (in Amps) that will be allowed for recharging the batteries.The range is from 10 – 1000A.	

9.	Contactors	Up to three optional LVD devices can be connected to a Millennium and configured from this screen from this screen 	
	Contactor 1-3		
	Type	This setting identifies the type of contactor, BATTERY, LOAD or NONE that has been installed in the plant. Be sure that the wiring for the contactor being configured matchesthe type chosen here. For standard GPS configurations using BIC cards, Contactor 1 is wired to and controls all BATTERY contactors in the plant. Contactors 2 and 3 are wired to and control only LOAD contactors. To toggle between the various contactortypes, move the cursor to one of the fields anduse the <+> or <-> key to select the desired type. Press <ENTER> to save the change.	
	Disconnect	This setting configures the plant voltage at which the contactor will disconnect from thebus. Use the <+> or <-> key to adjust the voltage to the desired level. Press <ENTER>to save the change.	
	Reconnect	This setting configures the plant voltage at which the contactor will reconnect to the bus. To prevent the contactor from re-operating when battery voltage increases due to load removal, a voltage several volts higher than the disconnect voltage is recommended. Use the <+> or <-> key to adjust the voltage to thedesired level. Press <ENTER> to save the change.	

5 Acceptance Testing

Introduction

The Galaxy Millennium Controller is tested before it leaves the factory, but many users wish to add some test procedures as part of installation and turn-up. The tests described here will simulate various alarm conditions and verify that the controller functions properly. Follow the steps listed below in the order they are given.

Tools and Test Equipment

Tools and Test Equipment Required for Acceptance Testing
Digital Voltmeter (DVM) with dc accuracy of at least 0.05%
Short length of wire or clip lead for jumper
Jeweler's screwdriver

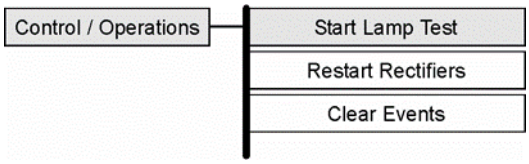
Test Precautions

Follow these steps to test plant alarms when installing the Galaxy Millennium Controller in a new plant. In a new installation, begin the sequence with the rectifiers running with adummy load on the plant bus bar.
For these tests, it is assumed that:
• All rectifiers are functioning properly.
• Plant batteries have received their original charges and are ready to support aload.
If you are testing a controller in a live plant:
• Some tests will cause a battery discharge. Insure that plant batteries are capableof supporting the load.
• Alarms will be generated. Notify the appropriate alarm monitoring personnel.

Test Sequences

Lamp Test

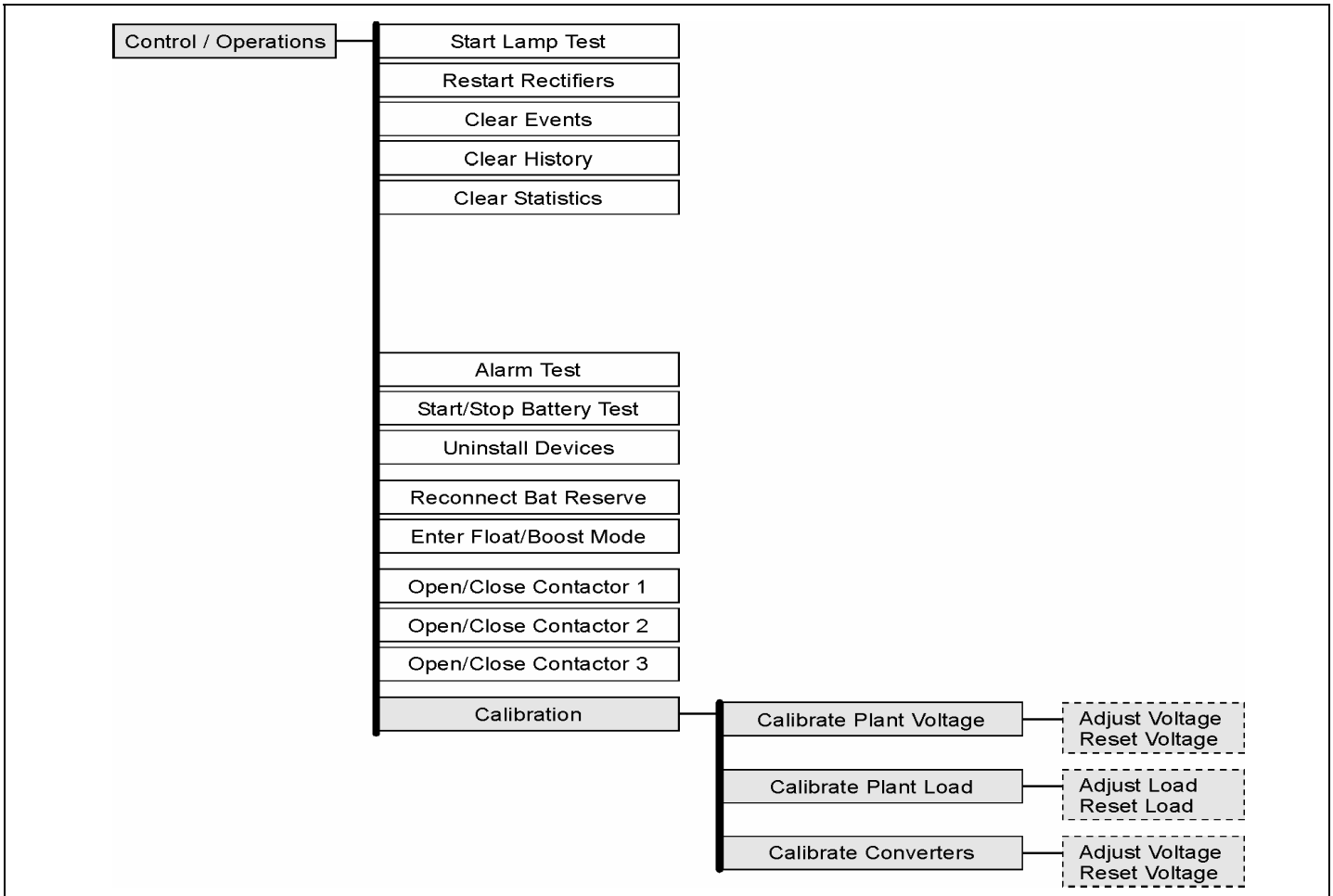
This test verifies that All of the LEDs on the front panel of the controller are functioning properly. No alarms are generated from this test.



Step	Action
1.	From the Default Screen, press the Menu button for the Main Menu.
2.	Using the Up/Down Arrows, Scroll to Control/Operations and press Enter.
3.	Select Start Lamp Test, and press Enter.
4.	Press Enter again to start the test, or Escape to return to the menus.
5.	Observations: • LCD Refreshes • Front Panel LEDs ALL turn on momentarily and return to normal • NO alarms are generated from this test

Front Panel Display Meter Calibration

Using a calibrated digital voltmeter, measure the plant voltage from the front panel test jacks. Follow these steps to calibrate the front panel meter display for Voltage and Current readings:



Step	Action for Voltage Calibration
1.	Using the Meter Calibration Menus, reset the plant voltage reading by selecting RESET VOLTAGE. Press the Enter key to reset the voltage.This will remove any pre-existing user calibrated values if they exist.
2.	Wait at least 5 seconds and press the ESCAPE key.
3.	Select CALIBRATE VOLTAGE. Use the Arrows, and UP/DOWN keys to calibrate the system voltage. Press ENTER to save.
NOTE:	The controller will not allow changes greater than +/- 0.5V of the displayed voltage.
4.	Press the <ESCAPE> key until the default screen is displayed. Verify that the plant voltage reading now agrees with the calibrated DVM.
NOTE:	The DVM reading will be the one to change since Rectifier Manager will adjust rectifier outputs as necessary per the calibration performed.

Test Sequences (Continue)

Step	Action for Current Calibration
NOTE:	The following procedure is applicable only in plants with Load shunts in a plant configured for "Centralized Architecture."
1.	Using a calibrated DVM, measure the plant load from the sense connection points on the plant shunt(s).
2.	Calculate the plant load, in amperes, as measured by the DVM. A. Divide the mV DVM reading by the rated shunt mV value B. Multiply this result by the shunt ampere rating This value is the plant load measured by the DVM, in amperes.
3.	Using the Meter Calibration Menus, reset the plant Current reading by selecting RESET LOAD. Press the Enter key to reset the Load. This will remove any pre-existing user calibrated values if they exist.
4.	Wait at least 5 seconds and press the ESCAPE key.
5.	Select CALIBRATE LOAD. Use the Arrows, and UP/DOWN keys to calibrate the system Load. Press ENTER to save.
NOTE:	The maximum total change is +/-10% of the **cuurent load value**.
6.	Press the <ESCAPE> key until the default screen is displayed. Verify that the plant current reading has been changed.
NOTE:	This operation is performed and verified ONLY if plant load is constant during the calibration procedure.
	Observation: • Displayed System load changes to new value.

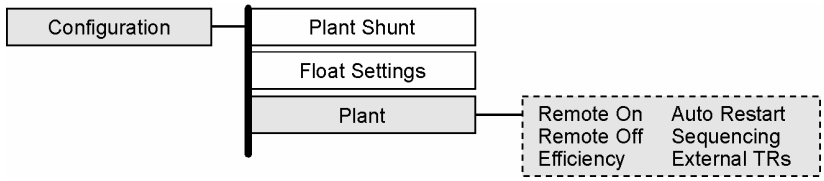
High Float Voltage Alarm – New Installations

Step	Action for Testing the High Float Voltage Alarm
NOTE:	Clear all controller alarms for this test.
NOTE:	The high voltage alarm test is completed by raising the plant voltage above the threshold set for HFV (High Float Voltage) .
NOTE:	Raising the plant voltage on a working system is left to the discretion ofthe user. • This test could disrupt power to working equipment. • If the test is performed, verify that the plant is in FLOAT mode • Rectifier voltage has been set to the normal level after completing the test.
1.	Using the Voltage Alarms Menu Screens, note High Float Alarm threshold value.
2.	Using the Float Settings Menu Screens, select Set Point and note the value.
NOTE:	The next step WILL RAISE the system voltage.
3.	Use the Arrows, and UP/DOWN keys to change the system float voltage setpoint to 0.1V above the High Float Alarm Threshold. Press ENTER to save.
4.	Observe: • The plant voltage increases to the set voltage • Power Minor alarm (PMN) is generated • RECT and MIN LEDs are illuminated
5.	Using the Float Settings Menu Screens, select Set Point.
6.	Use the Arrows, and UP/DOWN keys to change the system float voltage setpoint to it's original value. Press ENTER to save.
7.	Observe: • The plant voltage decreases to the original set voltage • Power Minor alarm (PMN) retires • RECT and MIN LEDs are extinguished

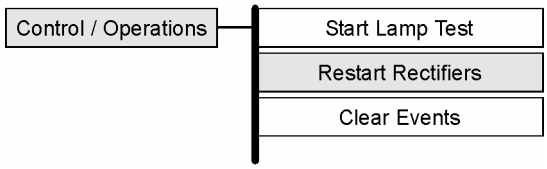
High Float Voltage Alarm – Systems with Actual Loads

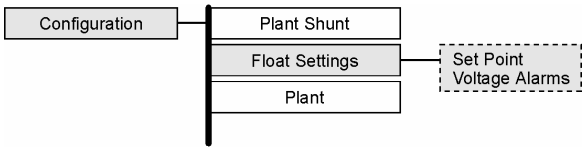
Step	Action for Testing the High Float Voltage Alarm
NOTE:	Clear all controller alarms for this test.
NOTE:	The System Voltage WILL NOT change.
NOTE:	The high float voltage alarm test is completed by changing the threshold for this condition below the system voltage to make it active.
1.	Using the Float Settings Menu Screens, select Set Point and note the value.
2.	Using the Voltage Alarms Menu Screens, note the High Float Alarm threshold value.
3.	Use the Arrows, and UP/DOWN keys to change the High Float Alarm Threshold to 0.1V below the System Voltage. Press ENTER to save.
4.	Observe: • Power Minor alarm (PMN) is generated • RECT and MIN LEDs are illuminated
5.	Using the Voltage Alarms Menu Screens, change the High Float Alarm threshold value to it's original value. Press ENTER to save.
6.	Observe: • Power Minor alarm (PMN) retires • RECT and MIN LEDs are extinguished

High Voltage Shutdown – New Installations Only

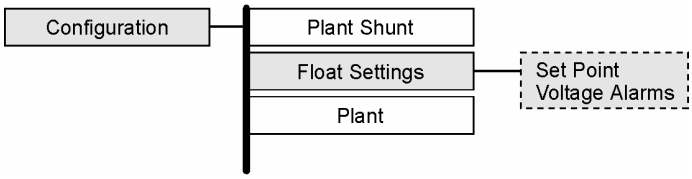
STEP	Action for Testing High Voltage Shutdown Alarm
NOTE:	The High Voltage Shutdown Test is recommended only for new installations where a dummy load is available prior to the application of office load, and batteries are connected.
NOTE:	There are three requirements for a serial rectifier to shut down upon a controller initiated High Voltage Alarm. 1. The plant voltage must be above the level set for the High Voltage alarm at the VOLTAGE ALARMS menu screen: MENU→CONFIGURE→FLOAT SETTINGS→VOLTAGE ALARMS 2. The rectifier must be delivering a current of at least 10% of its capacity. 3. The rectifier's current output must be unbalanced by more than 10% from the average output currents of the other rectifiers. Because item 3 is difficult to achieve in a simulation test of properly functioning serial rectifiers, (even with load share disabled), rectifiers aretested one at a time, rather than as a group. Slightly different test procedures are used for special applications in battery less plants. Serial rectifiers have their own internal restart circuits which will function 3times before the rectifier locks itself out and initiates a High Output Rectifier Fail Alarm to the controller. If there is a sufficient interval between restart and a subsequent shutdown the rectifier resets its restart counter. The controller initiates a restart signal a few seconds after the first RFA (HO) alarm is received. After the second RFA (HO) isreceived, the controller waits 5 minutes before sending one additional restart signal.
1.	Verify the Auto Restart is enabled from the front panel menus: 
2.	Turn off all rectifiers except the rectifier under test by operating their power switches to STBY.
3.	Adjust the dummy load to provide 10 to 30% of the rectifier's output capacity.
4.	Using the Voltage Alarms Menu Screens, note High Voltage Alarm threshold value.
5.	Using the Float Settings Menu Screens, select Set Point and note the value.
NOTE:	The next step WILL RAISE the system voltage.
6.	Use the Arrows, and UP/DOWN keys to change the system float voltage setpoint to 0.1V above the High Voltage Alarm Threshold.. Press ENTER to save.
7.	Controller Observations: • The plant voltage increases • Power Major alarm (PMJ) is generated • RECT and MAJ LEDs are illuminated Rectifier Observations: • When the voltage increases to the HV (FLOAT) level the rectifier shuts down. • The Green ON LED on the rectifier blinks, the ALM LED on the rectifier is not lit. • After 5-6 seconds the rectifier initiates its own restart signal again raising the plant voltage. • The rectifier will shutdown and restart two additional times. • Upon the third shutdown, the rectifier's ALM LED lights and the rectifier's display indicates "HO". • The controller receives the RFA signal from the rectifier and initiates a restart signal 5-6 seconds later. • The rectifier restarts again raising plant voltage. • The rectifier shuts down and restarts 3 additional times.

High Voltage Shutdown – New Installations Only

7.	• The rectifier shuts down and restarts 3 additional times.
	• During these shutdowns the Green ON LED on the rectifier blinks and the ALM LED on the rectifier is not lit.
	• Upon the fourth shutdown, the rectifiers ALM LED lights and the rectifier's display indicates "HO".
	• Any external RFA office alarm has occurred.
	• The controller will wait 5-6 minutes and issue one final restart signal initiating the final sequence of shutdown and restart events before the rectifier locks out, requiring personnel intervention.
	  • Prior to this occurring, change the value of the system voltage to its original value. Press ENTER to save the change.
	  • Restart the rectifier from the front panel by using the menus:
	 

8.	Using the Float Settings Menu Screens, select Set Point. 
9.	Use the Arrows, and UP/DOWN keys to change the system float voltagesetpoint to it's original value This value must be at least 0.5V below the HV alarm threshold setting.Press ENTER to save.
10.	Controller Observations: • The plant voltage returns to it's original value • Power Major alarm (PMJ) retires • RECT and MAJ LEDs are extinguished Rectifier Observations: • Rectifier is operating normally

Battery on Discharge Alarm

STEP	Action for Testing the Battery on Discharge Alarm
NOTE:	If the BD alarm was observed during the High Voltage Shutdown test this test can be disregarded.
1.	From the front panel follow the path (Voltage Alarms): 
2.	Note the setting of the Battery on Discharge Threshold.
3.	With a dummy load added to the plant, operate all rectifiers to STBY until the plant voltage drops below the BD (FLOAT) threshold.
4.	Controller Observations: • PMJ Alarm is active • BD and MAJ LEDs are illuminated
5.	Turn on all rectifiers
6.	Controller Observations: • PMJ Alarm retires • BD and MAJ LEDs are extinguished

Rectifier Fail Alarm

The RFA alarm was observed during the High Voltage Shutdown Test so no separate test is required.

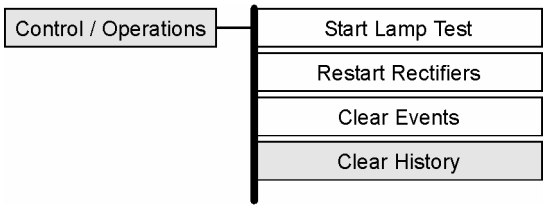
Major Fuse Alarm

Major Fuse Alarm may be tested by placing a blown fuse in the alarm fuse position of any distribution fuse position in the plant or by inserting a paper clip into the alarm indicating hole of its fuse holder.
For distribution circuit breakers, temporarily connect the pins 8 and 9 of any KS22010or KS22012 style circuit breakers together. This is accomplished on the ED83143-30 circuit breaker panels by shorting the (-) panel bus to pin 1 on the P4 connector of its BNL1 alarm board.
Observation: • The DIST and MAJ LEDs and Power Major and MJF alarm relays will be active. • Remove alarm condition and verify that DIST,MAJ LEDs and MJF relay retire.

Alarms should be tested in each distribution bay of the plant to verify the integrity of the alarm bus throughout the plant.
If the distribution bays are equipped with “Bay Fuse Alarm” indicating LEDs, also verify that this LED activates during these tests for the bay in which the alarm originates (andnot in any other).

Clear History

This feature is useful when there is a need to remove unnecessary historical data from thecontroller. An example might be after installation and testing and the controller is ready for operation. There may be history that is of no use to the customer. Also, since the history log has a finite number of entries, user can save the history using a PC, and then clear the logs.



Step	Action
1.	From the Default Screen, press the Menu button for the Main Menu.
2.	Using the Up/Down Arrows, Scroll to Control/Operations and press Enter.
3.	Select Clear History, and press Enter.
4.	Press Enter again to clear the History Log, or Escape to return to the menus.

6 Controller Retrofits

Millennium Basic Controller Retrofit

This section provides a method for changing the standard J85501K-1 Millennium Basic controller with the J85501-P1, Millennium II controller.

NOTE

This procedure will cause the office alarms to operate. Inform the operating company before starting this procedure.

Safety

Action	Verified
Always consider personal safety before beginning any procedure. Reviewthe Safety section.	
Observe antistatic precautions during the procedure.	
Mark and tag all cables associated with the change before starting work.	
Use only insulated tools.	
Make sure the system is properly grounded per the National Electrical Code and local building codes.	
Remove all metal jewelry.	

Retrofit Materials

Material	Verified
Wire cutters and strippers	
18 to 22 AWG wire	
Jewelers screwdriver (Flat and Phillips)	
Small needle nose pliers	
Pen for Marking/Tagging connections	
Digital meter, +/- 0.02%	
Screw Drivers (flat-blade and Phillips)	
ESD wrist strap	
Wire-wrap tool or Amp alarm punch-down tool (Alarm terminations)	
6-32 Nut Driver	

Preparing the Controller

Preparation of the controller consists of:

- Placing the system in Float Mode
- Turn all available rectifiers on
- Noting the Dip Switch Positions that enable/disable features in hardware
- Noting the Alarm Threshold Settings and Rectifier Setpoints
- Placing any battery/load contactors in an independent, safe state
- Power Down

Preparing the Controller (continue)

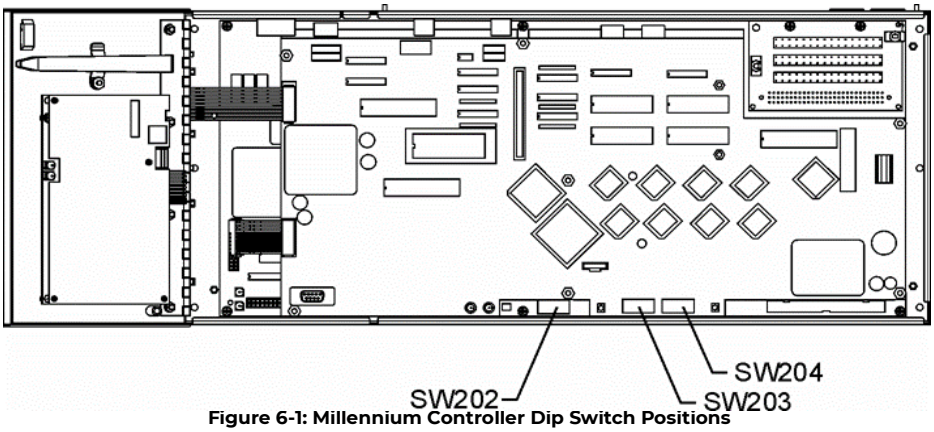
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>NOTE:</td><td>Verify that the Alarm center has been notified of potential alarms being generated.</td></tr>
<tr><td>1.</td><td>Place System in Float Mode
From the Default Display of the controller, note the system mode of operation:
IF the mode is FLOAT, go to Step 2.
If the mode is NOT Float (ex. – BOOST), place the system in FLOAT mode before going to Step 2.</td></tr>
<tr><td>2.</td><td>Turn all Available Rectifiers On
If rectifiers have been manually turned off, turn them back on. Verify that all rectifiers are on and sharing load.</td></tr>
<tr><td>3.</td><td>Noting the Dip Switch Settings
Dip Switch settings determine if some controller features are enabled or disabled. If the Millennium II controller is to have the same configurations,the old settings on SW202 must be noted:
 

Figure 6-1: Millennium Controller Dip Switch Positions
Record the Switch Positions for future reference –</td></tr>
<tr><td>4</td><td>
<table>
<tr><th colspan="3">Basic Controller (BSH) Dip Switch Settings</th></tr>
<tr><th>Switch Position</th><th>Description</th><th>Switch setting (1 or 0)</th></tr>
<tr><td>SW202-8</td><td>Front Panel Configuration</td><td></td></tr>
<tr><td>SW202-7</td><td>Auto Rectifier Restarts</td><td></td></tr>
<tr><td>SW202-6</td><td>Critical = Major Relays</td><td></td></tr>
<tr><td>SW202-5</td><td>Alarm Test</td><td></td></tr>
<tr><td>SW202-4</td><td>HVSD during Alarm Test</td><td></td></tr>
<tr><td>SW202-3</td><td>Boost Mode</td><td></td></tr>
<tr><td>SW202-2</td><td>External Timed Boost</td><td></td></tr>
<tr><td>SW202-1</td><td>Password Reset for Indep Modem</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
Thermal Compensation
Slope thermal compensation information, if implemented in the system, should be recorded, so that it can be programmed when the new controller has been installed.
Record this information by selecting the following menus from the front panel display:
MENU → CONFIG → STC
<table>
<tr><th>ALARM</th><th>Float</th><th>Boost (optional)</th></tr>
<tr><td>High Voltage</td><td></td><td></td></tr>
<tr><td>High Float Voltage</td><td></td><td></td></tr>
<tr><td>Battery on Discharge</td><td></td><td></td></tr>
<tr><td>Rectifier On</td><td></td><td></td></tr>
<tr><td>Very Low Voltage</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

Preparing the Controller (continue)

5.	**Plant Shunt** Shunt information should be recorded, so that it can be programmed when the new controller has been installed. Record this information by selecting the following menus from the front panel display: MENU → CONFIG → PLANT		
6.	**Low Voltage Disconnects** Low voltage disconnect information, if installed in the system, should berecorded, so that it can be programmed when the new controller has been installed. Record this information by selecting the following menus from the front panel display: MENU→CONFIG→LOW VOLTAGE DISCONNECT Note**:** Contactor State cannot be changed by the user.		
	Contactor 1		
	Type		
	Disconnect		
	Reconnect		
	Contactor 2		
	Type		
	Disconnect		
	Reconnect		
	Contactor 3		
	Type		
	Disconnect		
	Reconnect		
7	**Slope Thermal Compensation** Slope thermal compensation information, if implemented in the system, shouldbe recorded, so that it can be programmed when the new controller has been installed. Record this information by selecting the following menus from the front panel display: MENU → CONFIG → STC		
	STC Enabled/Disabled		
	Nominal Temperature		
	Step Temperature		
	Disconnect Temperature		
	Low Temperature		
	Upper Temperature		
	Raise Voltage Enable		
	Temperature Units		
8	**Rectifier Float Setpoints** Rectifier float setpoint determines the system voltage. Record the float setpoint by selecting the following menus from the front panel display: MENU →CONFIG → RECT MANAGER		
	Plant V		
	I limit		
	SHVSD		

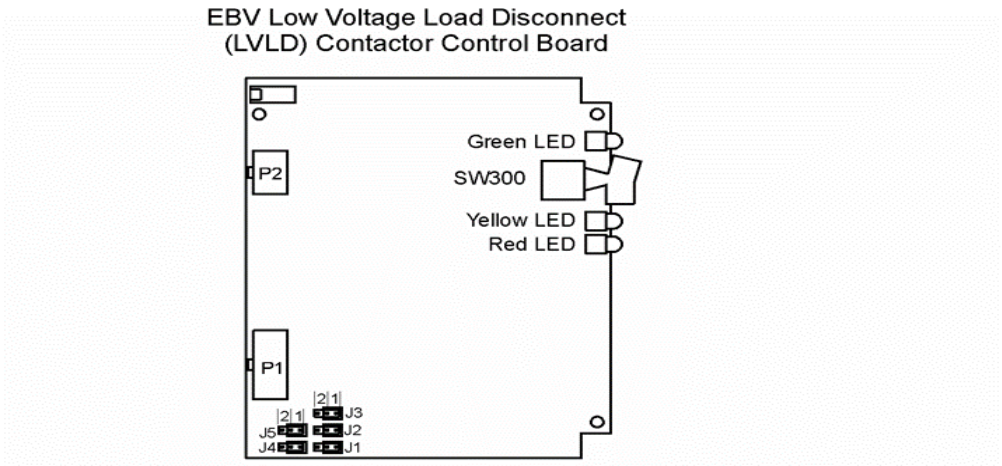
9.

Securing Contactors

If Battery and Load contactors are in the system, contactor control boards should be configured so that they do not OPEN during the controller replacement. To ensure that these contactors do not open, force all LVLD and LVBD contactors closed.

NOTE**:** These contactors may have already been forced closed per customerrequirements. If so, then proceed to the next step.

To force LVLD contactors closed, place SW300 in the up position as shown infigure 6-2 and 6-3.



Manual Contactor Control Switch

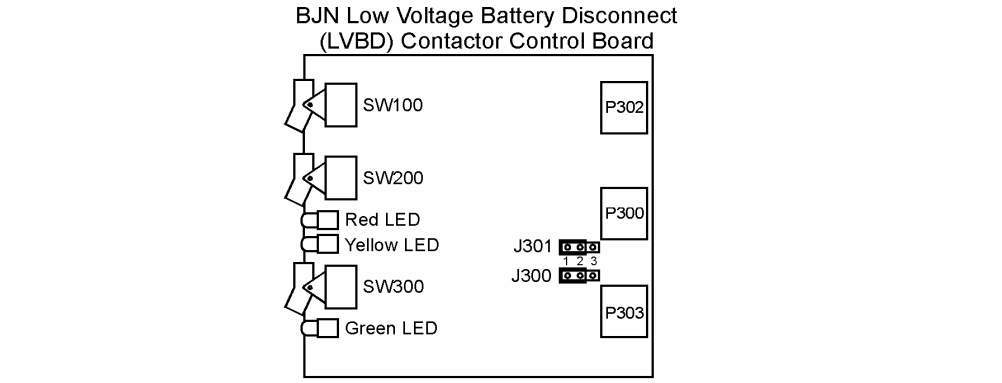
SW300	Contactor State
Down	Under controller control (normal position, shown)
Up	Contactor forced closed

Note Board Orientation.

This switch is not meant to be used to permanently override the LVLD function. It is only to be used temporarily while servicing or testing the equipment.

When powering up the system from an ac failure, SW300 must be in the down position.

Figure 6-2: LVLD Contactor Board SW300



Manual Contactor Control Switch

SW100*	SW200*	SW300	Contactor State
Up	Up	Up	Under controller control (normal position, shown)
x	x	Down	Contactor forced closed
Down	Down	Up	Contactor forced open

x - Switch position doesn't matter

Note Board Orientation.

These switches are not meant to be used to permanently override the LVBD function. They are only to be used temporarily while servicing or testing the equipment.

When powering up the system from an ac failure, switches must be in the up position.

*SW100 and SW200 are redundant switches. If either switch is up, the controller will determine the contactor state. If both switches are not in the up position however, the green LED will not be lit.

Figure 6-3: LVBD Contactor Control Board SW300 Full Height Cabinets

Preparing the Controller (continue)

Contactor Type	Control Board and Switch	To Force Closed,Change to
Load	EBV – SW300	UP
Battery	BJN – SW300	UP for ½ height cabinets Down for full height cabinets

9.

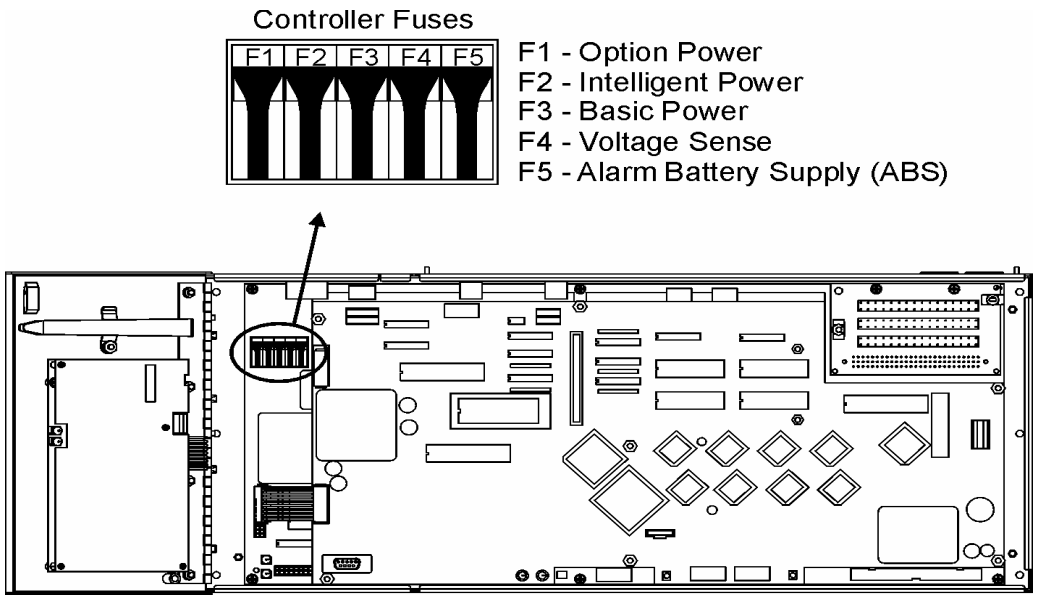


Figure 6-4: Millennium Controller Fuse Positions

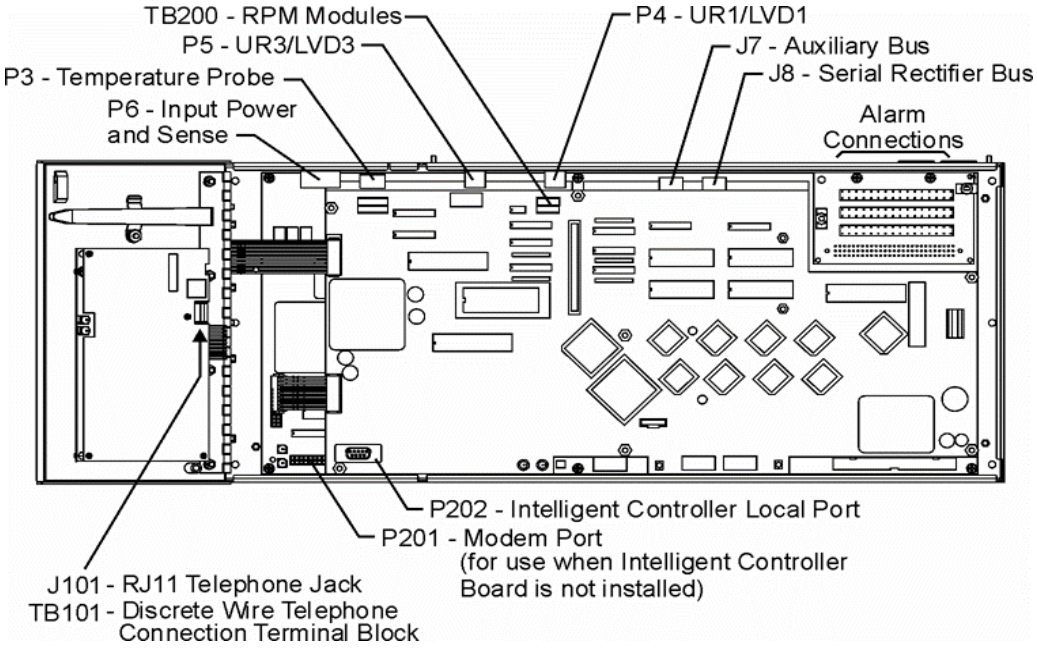


Figure 6-5: Millennium Controller Connections

Preparing the Controller (continue)

10.

Controller Power Down

Step	Action
NOTE:	STOP! Before proceeding with this step, verify that ABS supply (pins 93/94) and DG (pins 95/96) on the BSL board are not connected to anything. IF they are, perform proper transitioning procedures and move these connections toanother source.
a.	Using a fuse puller, remove all 5 controller fuses, BEGINNING with F1. (see Figure 6-4)
b.	Next, locate P6 and the Input Power, Shunt and Regulation cable at the upper left hand corner of the basic (BSH) controller. (see Figure 6-5)
c.	Mark, Tag and Insulate this cable as Input Power.
d.	Remove this connector and reposition the cable so that it is to the right of the controller housing. The Millennium II P6 connector is on the right side.

Removing the Old Controller

Step	Action
1.	**Disconnect Rectifiers from Old Controller** The RJ45 connector is located at top of the BSH board. Remove the cable connected to J8.

Step	Action
a.	On the Basic controller (BSH), locate J8.(see Figure 6-5)
b.	Mark, Tag and Insulate the cable terminating at J8. This is the Rectifier Control Cable.
c.	Remove this cable from J8 and take it out of the Millennium housing.

2. **Remove Alarm Wiring**

Step	Action
a.	On the Basic controller (BSH), locate the BSL alarm block. It is located in the upper right hand corner ofthe BSH board. (see Figure 6-5)
b.	
c.	Mark, Tag and Insulate all connections terminating on this block. You may need to reference a Millennium controller product manual for labeling the connections.
d.	Remove the alarm wires from the alarm block and take them out of the Millennium housing.

3. **Remove Thermal Probe(s)**

Step	Action	
a.	On the Basic controller (BSH), locate P3. It is located at the upper left hand corner of the BSH board, and is white connector. (see Figure 6-5)	
b.		
	If NO cable terminates on P3, then proceed to the next item for removal.	
	If a cable terminates on P3, Mark, Tag and Remove this cable.	

Removing the Old Controller (continue)

<table>
<tr><td>4.</td><td>Remove Modem Connections<table><tr><th>Step</th><th>Action</th></tr><tr><td>a.</td><td>On the Basic controller (BSH), locate P201. It is located on the lower left hand side of the BSH board.(see Figure 6-5)</td></tr><tr><td rowspan="2">b.</td><td>If NO cable terminates on P201, then proceed to the next item for removal.</td></tr><tr><td>If a cable terminates on P201, Mark, Tag andRemove this cable.</td></tr></table></td></tr>
<tr><td>5.</td><td>Remove Controller Display Cable<table><tr><th>Step</th><th>Action</th></tr><tr><td>a.</td><td>On the Intelligent controller (BSJ), locate P1. It islocated at the lower right hand corner of the BSJ board.</td></tr><tr><td>b.</td><td>Mark, Tag and remove this cable.</td></tr></table></td></tr>
<tr><td>6.</td><td>Remove Millennium Controller from the Cabinet Door
With all connectors and wires removed from the Millennium circuit packs:
Make sure that they have been removed from the Millennium housing.
If other wires or cables are connected to the Millennium, then Mark, Tag, Insulate and remove them.
With two people, one supporting the controller, remove all 6 nuts (3on left side and 3 on right side), using a 6-32 hex nut driver. Slowly remove the controller unit from the cabinet door.</td></tr>
<tr><td></td><td>THIS COMPLETES THE CONTROLLER REMOVAL SECTION</td></tr>
</table>

Installing the Millennium II Controller

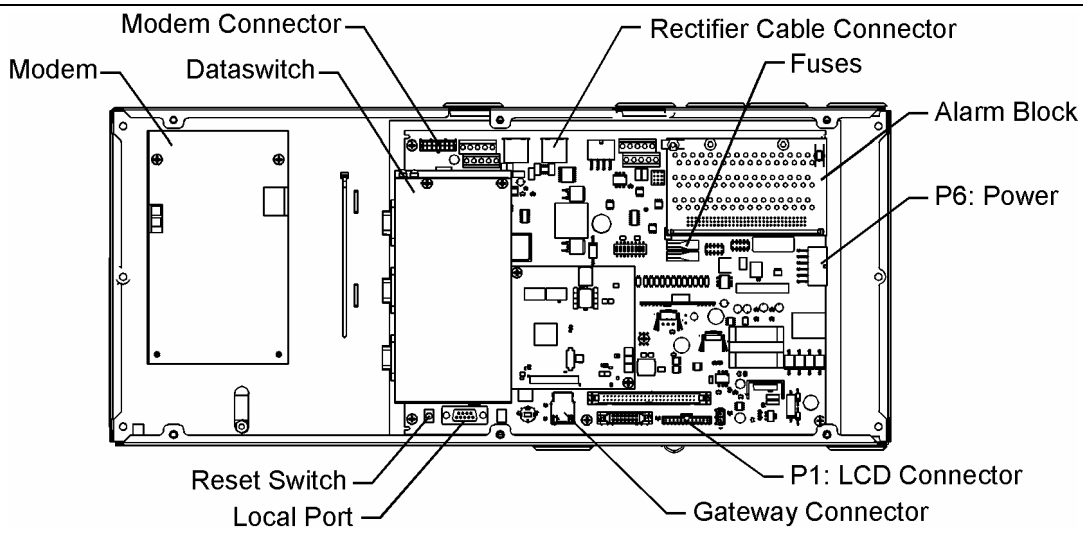


Figure 6-6: Millennium II Connections

Step	Action
1.	**Mount the Millennium II Controller** With two people, one supporting the controller, position the Millennium II controller housing over the six standoffs (3 on left side and 3 on right side) on the inside of the cabinet door. Using a6-32 nut driver, secure the controller housing to the cabinet door.
2.	**Connect the Controller Display Cable**

Step	Action
a.	On the controller locate P1. It is located at thel lower right hand corner of the board. (see Figure-6-6)
b.	Using the existing display cable, pass it through the slot at the bottom of the controller housing and connect it to P1.

3.	**Install Modem Connections**

Step	Action
a.	Inside of the controller housing, determine if a Modem card is installed. It will be located to the left of the MCR1 board. (see Figure 6-6)
b.	If a Modem is installed: Connect the existing telephone cable to the RJ11 connector at the top of the board OR Connect Tip/Ring conductors to TB1 at the top ofthe board. NOTE: Tip is TB1 pin 1 (Pin closest to the RJ11 connector) and Ring is Pin 3. Pin 2 is not used. If a Modem is to be installed: Please see the Modem installation section, in this manual.

Installing the Millennium II Controller (Continue)

4.

Connect Alarm Wiring

Step	Action
a.	On the controller, locate the BSL alarm block. It is located in the upper right hand corner of the MCR1 board. (see Figure 6-6)
NOTE:	**It is very important**, in the next step, to follow the Alarm Input/Output table in this manual when connecting the alarms. Some Pins may have changed their function.
b.	Route the alarm wires through the open holes above the alarm block and terminate them accordingly. Youmay need to reference the Millennium II Alarm Input/Output section for proper connections.

Step	Action

5.

Controller Power Up

Step	Action
NOTE:	F1 is the bottom of the two fuses.
a.	Using a fuse puller, remove F1 on the MCR1 board.This is the controller power fuse. (see Figure 6-6)
b.	Next, locate P6 at the right hand corner of the MCR1 board. (see Figure 6-6)
c.	Route the J6 power connector through the top right opening of the controller housing. Secure this to P6.
d.	Using a fuse puller, Install F1 on the MCR1 board.
e.	Observe the controller power up sequence.

Hardware/Software Dip Switch Settings

Some features which originally required enabling/disabling through a dip switch, nowrequire software enabling.

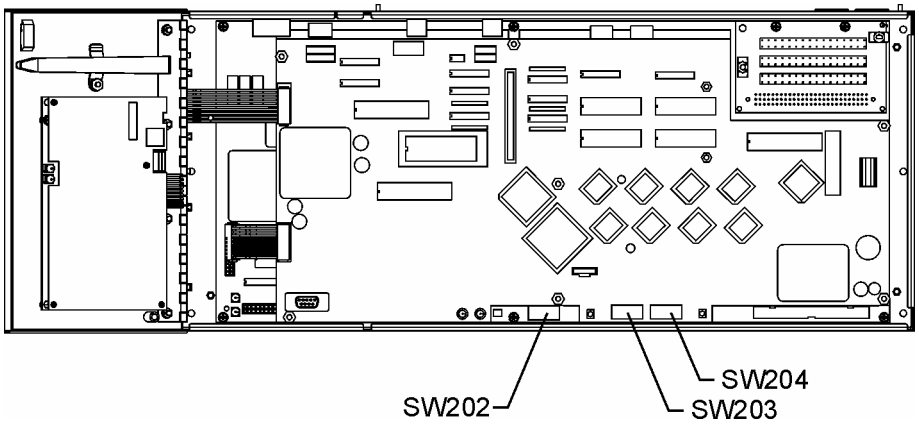
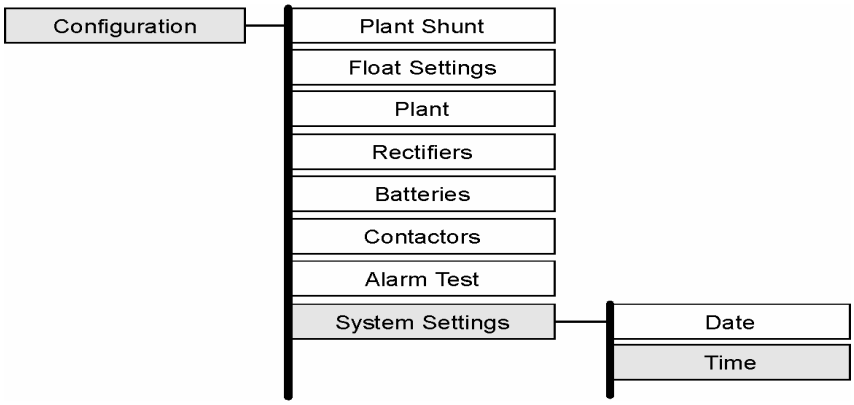
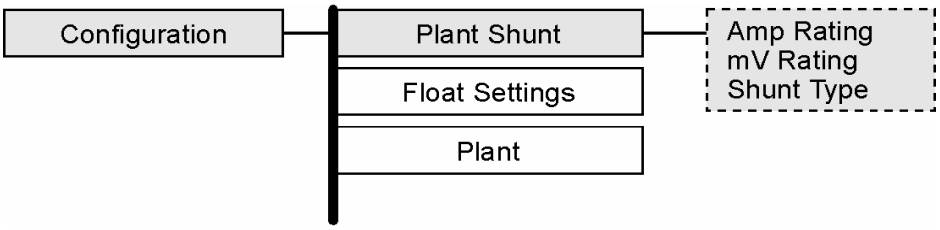
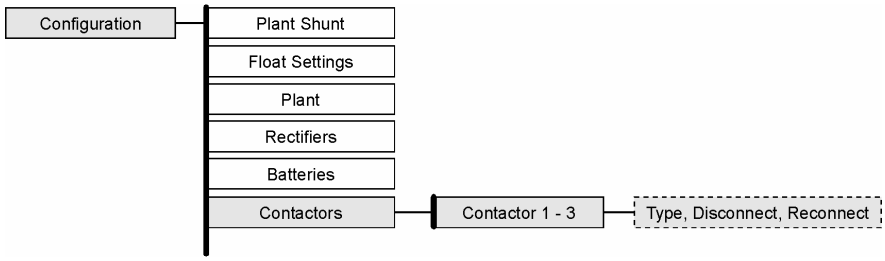


Figure 6-7: Millennium Controller Switch Locations

Installing the Millennium II Controller (Continue)

Millennium Controller – Millennium II Dip Switch Settings Mapping		
Millennium Switch Position	**Description**	**Millennium II Setting**
NOTE:		Position 8 is the leftmost dip switch
SW202-8	Front Panel Configuration	Set SW202-8 to: 0 if Millennium was 0 1 if Millennium was 1
SW202-7	Auto Rectifier Restarts	Using the front panel, go to: Menu → Config → Plant Config Auto Restart to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-6	Critical = Major Relays	Using the front panel, go to: Men → Config → →System Settings Config Crit=Major to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-5	Alarm Test	Using the front panel, go to: Menu → Config → Alarm Test Config Test to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-4	HVSD during Alarm Test	Using the front panel, go to: Menu → Config →Alarm Test Config HV Shutdown to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-3	Boost Mode	Using the front panel, go to: Menu → Config →Alarm Test Config HV Shutdown to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-2	External Timed Boost	Using the front panel, go to: Menu → Config → Rect BoostConfig **Timed** to: Enabled if Millennium was 1 Disabled if Millennium was 0
SW202-1	Password Reset for Indep Modem	Not Applicable for Millennium II

Configuring the Millennium II Controller (Continue)

Step	Action
1.	**Setting the Date/Time**  Set the Time and Date to the present.
2.	**Plant Shunt** Enter this information, recorded earlier, by selecting the following menus from the frontpanel display: 
	Low Voltage Disconnects
3.	Enter the Low Voltage Disconnect information recorded earlier, by selecting the followingmenus from the front panel display: 

Shunt I	
Shunt mV	
Shunt Type	

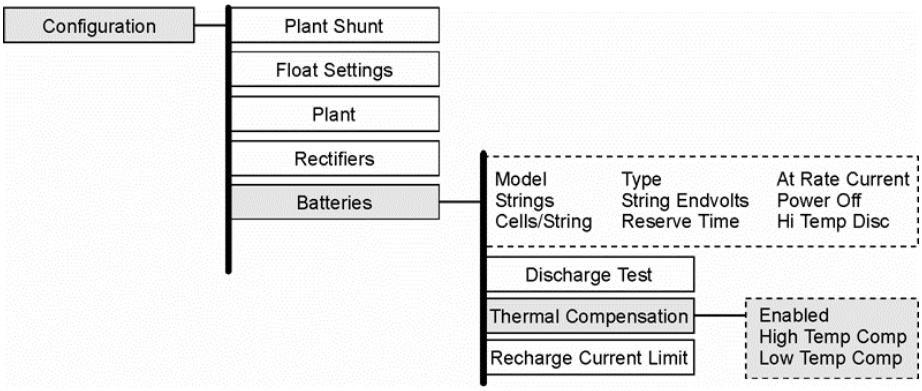
Contactor 1	
Type	
Disconnect	
Reconnect	
Contactor 2	
Type	
Disconnect	
Reconnect	
Contactor 3	
Type	
Disconnect	
Reconnect	

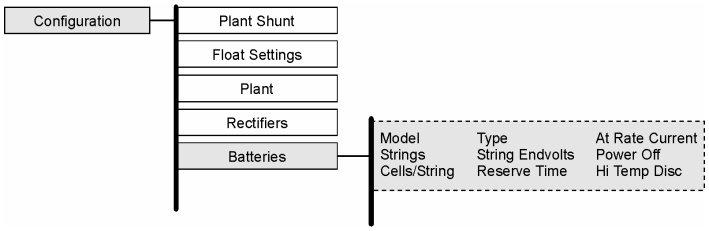
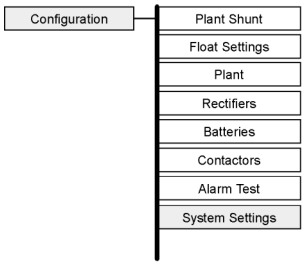
Configuring the Millennium II Controller (Continue)

4

Slope Thermal Compensation

Enter the STC information recorded earlier, by selecting the following menus from the



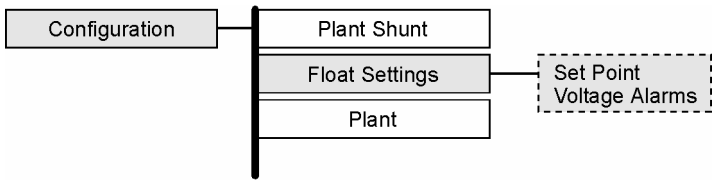
Millennium Controller	Millennium II Configuration Item	Value Recorded from Old Controller
STC Enabled/Disabled	Enabled	
Nominal Temperature	Nominal (Under High Temp Comp)	
Step Temperature	Volt Step Down (Under High Temp Comp)	
Disconnect		
Low Temperature	Low Comp Limit (Under Low Temp Comp)	
Upper Temperature	High Comp Limit (Under High Temp Comp)	
Raise Voltage	Low T Comp (Under Low Temp Comp)	
Temperature Units		
N/A	Decrease (Under High Temp Comp)	Consult customerfor this value in mV/deg C
N/A	Increase (Under Low Temp Comp)	Consult customer for this value in mV/deg C

Configuring the Millennium II Controller (Continue)

5.

Alarm Threshold Settings

Enter the Float Alarm Thresholds recorded earlier, by selecting the following menus fromthe front panel display:

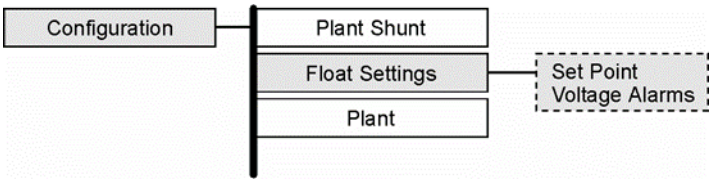


High Voltage	
High Float Voltage	
Battery on Discharge	
Very Low Voltage	

6.

Rectifier Float Setpoints

Enter the float setpoint by selecting the following menus from the front panel display:



Plant V	
I limit	
SHVSD	

7.

Connect Serial Rectifier Cable

The RJ45 connector is located at top of the MCR1 board and is labeled P9. (see Figure 6-6)

Step	Action
a.	Locate P9 (Not to be confused with P7-Aux)
b.	Using the existing serial cable, connect to P9.

8.

Removing the Forced Contactor Conditions

If Battery and Load contactors are in the system, contactor control boards should have be configured so that they did not OPEN during the controller replacement.

NOTE: Contactors may have always been in the FORCED state per customer requirements. If no changes were made to the Contactor States in the “Securing Contactors” section, then DO NOT change the switch positions. To return contactors to their normal state, place SW300 in the position as show in figure 6-2 and 6-3.

Contactor Type	Control Board and Switch	Under Millennium IIControl
Load	EBV – SW300	DOWN
Battery	BJN – SW300	DOWN for ½ height cabinets UP for full height Cabinets

9. If a Gateway or Data Switch option will be used, see the New Installation section for instructions.

Millennium Intelligent Controller Retrofit

This section provides a method for changing the standard J85501K-1 Millennium Intelligent controller with the J85501 -P1, Millennium II controller.

NOTE:

- This procedure will cause the office alarms to operate. Inform the operating company before starting this procedure.
- Inform all personnel responsible for the power system that History and Statistics will be lost, unless written to file before power down

Safety

Action	Verified
Always consider personal safety before beginning any procedure. Review the Safety section.	
Observe antistatic precautions during the procedure.	
Mark and tag all cables associated with the change before starting work.	
Use only insulated tools.	
Make sure the system is properly grounded per the National Electrical Codeand local building codes.	
Remove all metal jewelry.	

Retrofit Materials

Material	Verified
Wire cutters and strippers	
18 to 22 AWG wire	
Jewelers screwdriver (Flat and Phillips)	
Small needle nose pliers	
Pen for Marking/Tagging connections	
Digital meter, +/- 0.02%	
Screw Drivers (flat-blade and Phillips)	
ESD wrist strap	
Wire-wrap tool or Amp alarm punch-down tool (Alarm terminations)	
Laptop PC (System backup)	
6-32 nut driver	

Preparing the Controller

Preparation of the controller consists of:

- Placing the system in Float Mode
- Turn all available rectifiers on
- Backing up the existing configuration so that it may be loaded onto the new controller
- Writing history and statistics files (If required)
- Noting the Dip Switch Positions that enable/disable features in hardware
- Placing any battery/load contactors in an independent, safe state
- Power Down

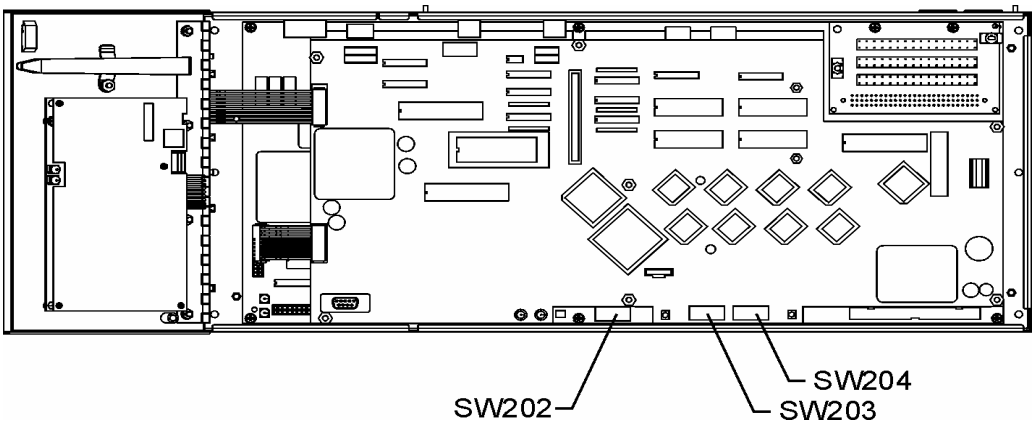


Figure 6-8: Millennium Controller Dip Switch Locations

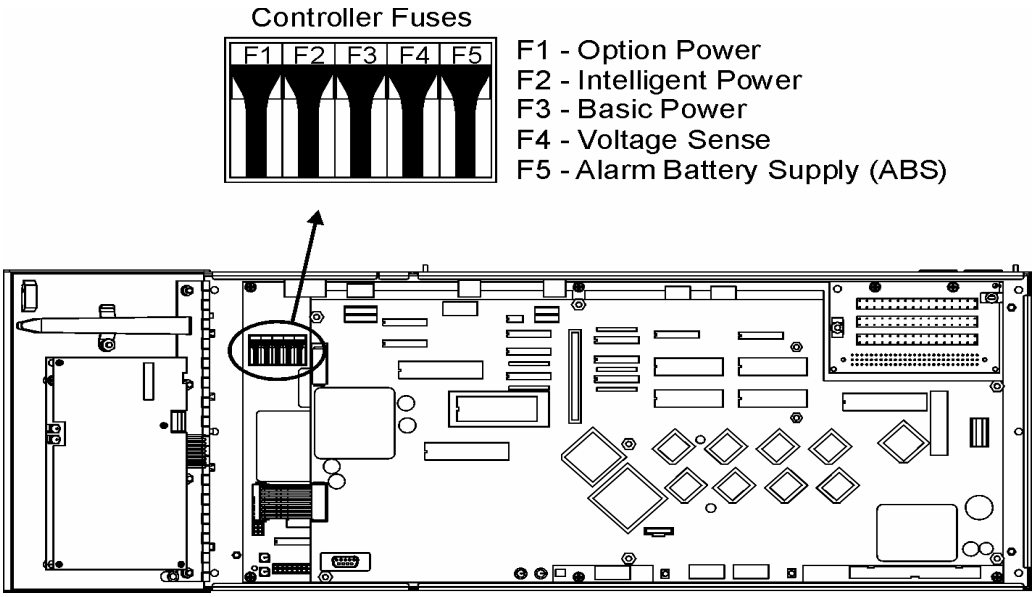


Figure 6-9: Millennium Controller Fuses

Step	Action
Note:	Verify that the Alarm center has been notified of potential alarms being generated.
1	**Place System in Float Mode** From the Default Display of the controller, note the system mode ofoperation If the mode is FLOAT, go to Step 2. If the mode is something other than Float (ex. – BOOST), place the system in FLOAT mode before going to Step 2.
2	**Turn all Available Rectifiers On** If rectifiers have been manually turned off, turn them back on. If they havebeen placed in standby because of the Energy Management feature of the controller, then disable this by changing Dip Switch 204-1 on the intelligent controller board to DISABLED. (see Figure 6-8) Verify that all rectifiers are on and sharing load.

Preparing the Controller (Continue)

3.	**Backup Configuration –A Computer is Required** A system backup is required if the present configuration is to be used in theMillennium II. Configuration items include but are not limited to the following: • Remote Peripheral Monitors • User Defined Alarms • Changes to Standard/Threshold Alarm Default Values • Battery Management Features Using a computer, connect to the Millennium either locally or remotely andperform a backup, saving the file so that it may be loaded into the Millennium II. NOTE**:** If the backup is performed using Easy View: Once connected to the controller, select the FILE → BACKUP menu and proceed with the backup.
4.	**Write History to File** If controller history logs are to be saved, then they must be written to a file. NOTE: History logs CANNOT be loaded into the Millennium II. They can only be printed, viewed and exported to other programs. Using a computer, connect to the Millennium either locally or remotely andwrite the History log(s) to a file. NOTE**:** If using Easy View: Once connected to the controller, select the REPORTS → HISTORY menu and proceed with savingthis information.
5.	**Write Statistics to File** If controller statistics are to be saved, then they must be written to a file. NOTE: Millennium Controller Statistics CANNOT be loaded into the Millennium II. They can only be printed, viewed and exported to other programs. Using a computer, connect to the Millennium either locally or remotely andwrite the Statistics to a file. NOTE**:** If using Easy View: Once connected to the controller, select the REPORTS → STATISTICS menu and proceed with saving this information.

Preparing the Controller (Continue)

6.

Noting the Dip Switch Settings

Dip Switch settings determine if some controller features are enabled ordisabled. If the Millennium II controller is to have the same configurations, the old settings must be noted: (see Figure 6-8)

Record the Switch Positions for future reference –

Basic Controller (BSH) Dip Switch Settings

Switch Position	Description	Switch Setting (1 or 0)
SW202-8	Front Panel Configuration	
SW202-7	Auto Rectifier Restarts	
SW202-6	Critical = Major Relays	
SW202-5	Alarm Test	
SW202-4	HVSD during Alarm Test	
SW202-3	Boost Mode	
SW202-2	External Timed Boost	
SW202-1	Password Reset for Indep Modem	

IntelligentController (BSJ) Dip Switch Settings

Switch Position	Description	Switch Setting(1 or 0)
SW203-8	Remote Rectifier in Standby	
SW203-7	Remote Rectifier Turn On	
SW203-6	Full Access through Local Port	
SW203-5	Full Access through Aux Port	
SW203-4	Full Access through Modem Port	
SW203-3	Modem/Local/Aux Setting Config	
SW203-2	Local Port(Event Log or Terminal)	
SW203-1	Aux Port(RS232 or RS485)	
SW204(4-8)	NOT USED	
SW204-3	Enhanced Remote Security	
SW204-2	Remote Alarm Test	
SW204-1	Rectifier Energy Management	

7.

Securing Contactors

If Battery and Load contactors are in the system, contactor control boards should be configured so that they do not OPEN during the controllerreplacement. To ensure that these contactors do not open, force all LVLD and LVBD contactors closed.

NOTE: These contactors may have already been forced closed percustomer requirements. If so, then proceed to the next step.

To force LVLD contactors closed, place SW300 in the up position asshown in figure 6-2 and 6-3.

Contactor Type	Control Board and Switch	To Force Closed,Change to
Load	EBV – SW300	UP
Battery	BJN – SW300	UP for ½ height cabinets DOWN for full height cabinets

Preparing the Controller (Continue)

8.

Disconnect Rectifiers from Old Controller

The RJ45 connector is located at top of the BSH board. Remove thecable connected to J8. (see Figure 6 -10)

Step	Action
a.	On the Basic controller (BSH), locate J8.
b.	Mark, Tag and Insulate the cable terminating at J8. This is the Rectifier Control Cable.
c.	Remove this cable from J8 and take it out of theMillennium housing.

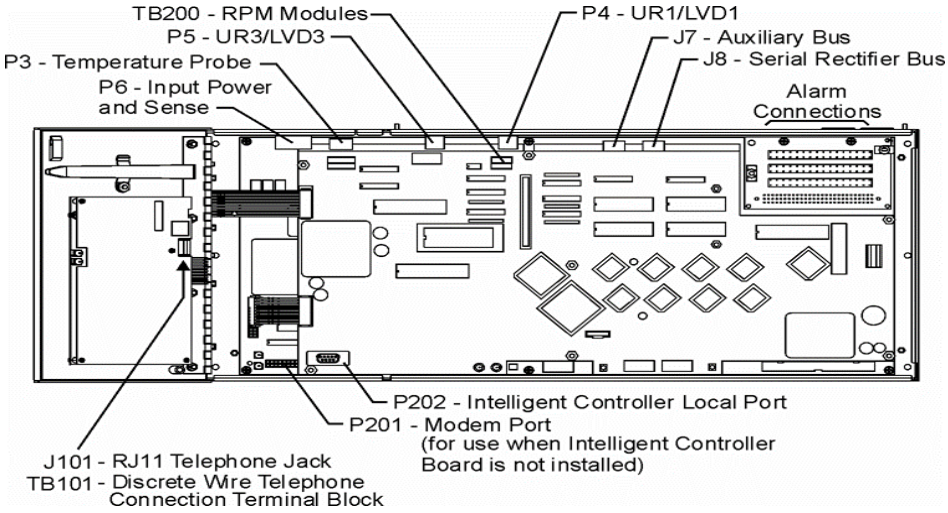


Figure 6-10: Millennium Controller Connections

9.

Controller Power Down

Step	Action
NOTE**:**	STOP! Before proceeding with this step, veirify that ABS supply (pins 93/94) and DG(pins 95/96) on theBSL board are not connected to anything. IF they are, perform proper transitioning procedures and move these connections to another source.
a.	Next, locate P6 and the Input Power, Shunt and Regulation cable at the upper left hand corner of thebasic (BSH) controller. (see Figure 6-10)
b.	Mark, Tag and Insulate this cable as Input Power.
c.	Remove this connector and reposition the cable so that it is to the right of the controller housing. The Millennium II P6 connector is on the right side.

Removing the Old Controller

Step	Action
1.	**Remove Alarm Wiring** a. On the Basic controller (BSH), locate the BSL alarm block. It is located in the upper right hand corner of the BSH board. (see Figure 6-10) b. c. Mark, Tag and Insulate all connections terminating at on this block. You may need to reference a Millennium controller product manual for labeling the connections. d. Remove the alarm wires from the alarm block and take them out of the Millennium housing.
2.	**Remove RPM Wiring (Bus)** a. On the Intelligent controller (BSJ), locate TB200. It is located at the top of the BSJ board. (see Figure 6-10) b. If NO cable terminates on TB200, then proceed to the next item for removal. If a cable terminates on TB200, Mark, Tag and Remove this cable.
3.	**Remove Thermal Probe(s)** a. On the Basic controller (BSH), locate P3. It is located at the upper left hand corner of the BSH board, and is white connector. (see Figure 6-10) b. If NO cable terminates on P3, then proceed to the next item for removal. If a cable terminates on P3, Mark, Tag and Remove this cable.
4.	**Remove Modem Connections** a. On the Intelligent controller (BSJ), locate P201. It is located on the left hand side of the BSJ board. (seeFigure 6-10) b. If NO cable terminates on P201, then proceed to the next item for removal. If a cable terminates on P201, Mark, Tag and Remove this cable.
5.	**Remove Data Switch Cables** a. On the Intelligent controller (BSJ), locate P205. Itis located on the left hand side of the BSJ board. b. If NO circuit board is connected to P205, then proceed to the next item for removal. If a circuit board is connected to P205, with DB9 connectors, Mark, Tag and Remove these cables, making note the Port numbers they are connected to.

Removing the Old Controller (Continue)

6.

Remove PC Serial Port

Step	Action
a.	On the Intelligent controller (BSJ), locate P202. It is located at the bottom of the BSJ board. (see Figure6-10)
b.	If NO cable is connected to P202, then proceed to the next item for removal. If a cable is connected to P202, Mark, Tag and Remove this cable.

7

Remove Aux Port

Step	Action
a.	On the Intelligent controller (BSJ), locate P203. It is located at the top of the BSJ board. (see Figure 6- 10)
b.	If NO cable terminates on P203, then proceed to the next item for removal. If a cable terminates on P203, Mark, Tag and Remove this cable.
c.	On the Intelligent controller (BSJ), locate TB201. Itis located at the top of the BSJ board. (see Figure 6- 10)
d.	If NO wires terminate on TB201, then proceed to the next item for removal. If wires terminate on TB201, Mark, Tag and Insulate these wires and remove them. Make sure to mark:

TB-201 Terminal	Name
1	TX+
2	TX-
3	RX+
4	RX-

8.

Remove Controller Display Cable

Step	Action
a.	On the Intelligent controller (BSJ), locate P1. It is located at the lower right hand corner of the BSJ board.
b.	Mark, Tag and remove this cable.

9

With all connectors and wires removed from the Millennium circuit packs:
Make sure that they have been removed from the Millennium housing.
If other wires or cables are connected to the Millennium, thenMark, Tag, Insulate and remove them.
With two people, one supporting the controller, remove all 6,6-32 nuts (3 on left side and 3 on right side). Slowly remove the controller unit from the cabinet door.
THIS COMPLETES THE CONTROLLER REMOVAL SECTION

Installing the Millennium II Controller

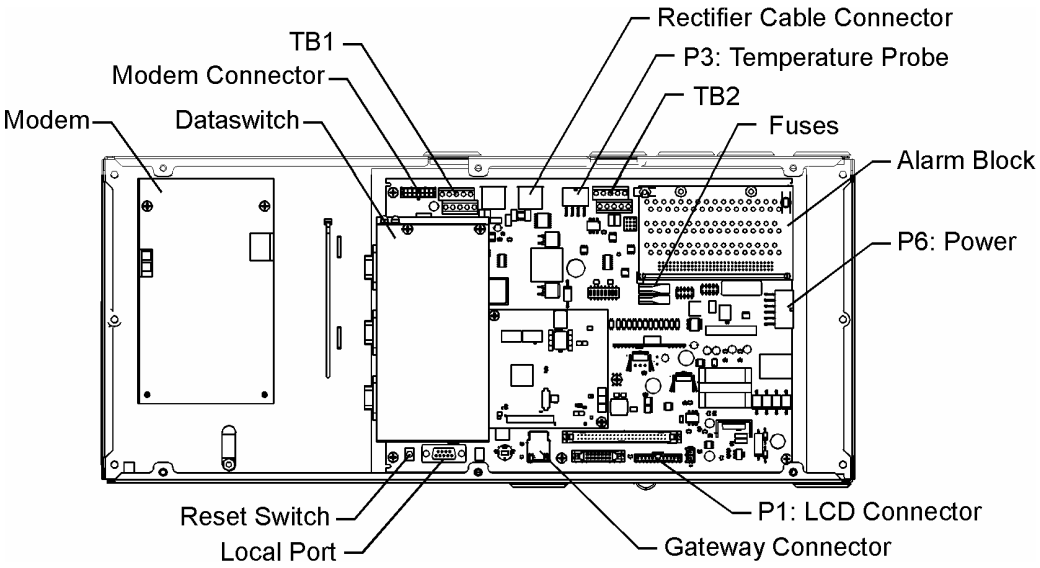


Figure 6-11: Millennium II Controller Connections

Step	Action
1.	**Mount the Millennium II Controller** With two people, one supporting the controller, position the Millennium II controller housing over the six standoffs (3 on leftside and 3 on right side). Using 6, 6-32 nuts, secure the controller housing to the cabinet door. (Torque to 10 in-lbs, or 1.1 N-m)
2.	**Connect the Controller Display Cable**

Step	Action
a.	On the controller locate P1.It is located at the lower right hand corner of the board.
b.	Using the existing display cable, route it through the bottom of the controller housing and connect it to P1

Installing the Millennium II Controller (Continue)

Connect PC Serial Port

Step	Action
3. a.	If NO cable was connected to P202 on the Millennium, then proceed to the next item for connection. If a cable was connected to P202,AND The Front panel display is a L51 display: Verify that J1 on the display is connected to P202 on the MCR1 board. IF NOT, Using the cable assy (Ordering Code – 848570115),connect J1 on the display to P202 on the MCR1 board. Connect the serial port cable to the front of the Display by pulling up on the tab covering the local port. If a cable was connected to P202, AND The Front panel display is a L50 display: Route the serial cable through therectangular opening at the top of the controller housing and connect it to P202 on the MCR1 board. NOTE: Use a DB9-DB9 Ribbon Cable connector so that the controller cover can be installed while using the port.

Install Data Switch Cables

Step	Action
4. a.	
b.	If NO circuit board was connected to P205, on the old Millennium, then proceed to the next item for connection. If a circuit board was connected to P205, with DB9 connectors AND the Data Switch option is installed (circuit pack connected to P205), connect them to Data Switch Ports 1-3. IF the Data Switch card has not yet been installed, please see Data Switch installation section in this manual.

Installing the Millennium II Controller (Continue)

Install Gateway (LAN) Cable

Step	Action
a.	On the controller (MCR1), locate P2 (Gateway LAN). It is located at the bottom of the controller.(see Figure 6-11)
b.	If NO Gateway card was installed in the Millennium, then proceed to the next item forconnection. If Gateway card was installed in the Millennium: 1. Take the existing LAN cable and route it through the top of the controller housing 2. Down the right side 3. Through the bottom of the housing 4. Under the display cable 5. Connect it P2 on the MCR1.

5.

Install Modem Connections

Step	Action
a.	Inside of the controller housing, determine if a Modem card is installed. It will be located to the left of the MCR1 board. (see Figure 6-11)
b.	IF a Modem is installed: Connect the existing telephone cable to the RJ11 connector at the top of the board OR Connect Tip/Ring conductors to TB1 at the top of the board. NOTE: Tip is TB1 pin 1 (Pin closest to the RJ11 connector) and Ring is Pin 3. Pin 2 is not used. If a Modem is to be installed: Please see the Modem installation section, in this manual.

6.

Install Thermal Probe

Step	Action
a.	If NO cable terminated on P3 on the Millennium, then proceed to the next item for connection. If a cable terminated on P3 on the Millennium, connect the old cable to P3 on the Millennium II. P3 is a white connector located at the top of the MCR1 board. (see Figure 6-11)

7.

Connect Alarm Wiring

Step	Action
a.	On the controller, locate the BSL alarm block. It is located in the upper right hand corner of the MCR1 board. (see Figure 6-11)
NOTE:	It is very important, in the next step, to follow the Alarm Input/Output table in this manual when connecting the alarms. Some Pins may have changed their function.
b.	Route the alarm wires through the open holes above the alarm block and terminate them accordingly. Youmay need to reference the Millennium II Alarm Input/Output section for proper connections.

8.

Installing the Millennium II Controller (Continue)

9. **Connect RPM Bus Wire**

Action	
If NO cable terminated on TB200 on the Millennium, then proceed to the next item for connection.	
If a cable terminated on TB200 on the Millennium, connect the old bus cable to TB1 on the Millennium II. (see Figure 6-11)	

NOTE:

Wrap the cable through the EMI inductor bead twice. Place the be ad approximately 3 inches from the end of the cable, closest to the controller.

TB- 1 Pin Assignments	TB-1 Pin Descriptions	RPM Conductor Color	RPM Conductor Description
6	*6	Blue or White	Power/Communications
8	*8	Blue or White	Power/Communications
9 or 10	FGND	Bare wire	Shield

*connections of the bus wire are NOT polarity sensitive.

10

Aux Port Connections

Step	Action
a.	On the controller, locate TB1. It is located at the to pof the board. (see Figure 6-11)
b.	If NO wires terminated on P203 with the old Millennium, then proceed to the next item for installation. If a cable terminated on P203, with the old Millennium, install the wires according to the table below:
c.	If a cable terminated on P203 with the old Millennium, it was most likely a Gateway interface cable. With the Millennium II, since the Gateway is integrated, there is no need to connect a cable to the Aux port, which is a new RJ45 connector anyway.

TB1 on Millennium II	Wires From Millennium
1	TX+
2	TX-
3	RX+
4	RX-

11.

Hardware/Software Dip Switch Settings

Whereas the Millennium controller had 3 sets of dip switches, the Millennium II only has one set. Some features which originally required enabling/disabling through a dip switch, now require software enabling.

Refer to the Switch Settings section in the Removal section.

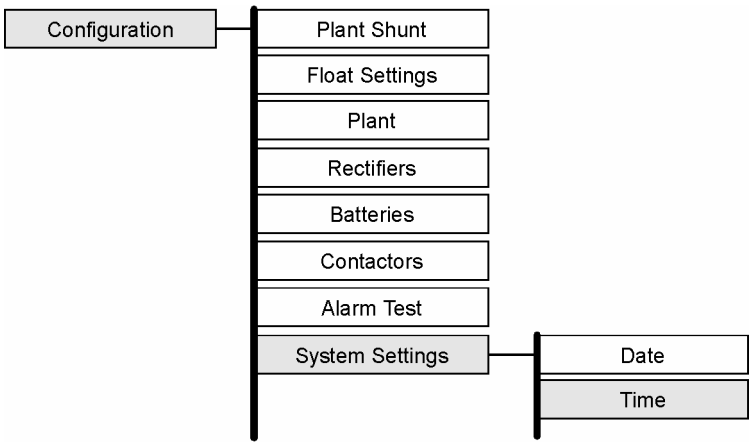
Millennium Controller – Millennium II Dip Switch Settings Mapping

Millennium Switch Position	Description	Millennium II Setting
SW202-8	Front Panel Configuration	Set SW202-8 to: 0 if Millennium was 0 1 if Millennium was 1
SW202-7	Auto Rectifier Restarts	Using the front panel, go to: Menu → Config → Plant

11				Config Auto Restart to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-6	Critical = Major Relays	Using the front panel, go to: Menu→Config→System Settings Config Crit=Major to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-5	Alarm Test	Using the front panel, go to: Menu→Config→Alarm Test Config Test to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-4	HVSD during AlarmTest	Using the front panel, go to:Menu→Config→Alarm Test Config HV Shutdown to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-3	Boost Mode	Using the front panel, go to:Menu→Config→Rect Boost Config Enable to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-2	External Timed Boost	Using the front panel, go to: Menu→Config→Rect Boost Config Timed to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW202-1	Password Reset for Indep Modem	Not Applicable for Millennium II
		Intelligent Controller (BSJ) Dip Switch Settings		
		Millennium Switch Position	**Description**	**Millennium II Setting**
		SW203-8	Remote Rectifier in Standby	Set SW202-4 to: 0 if Millennium was 0 1 if Millennium was 1
		SW203-7	Remote Rectifier Turn On	Using the front panel, go to: Menu→Config→Plant Config Remote On to: Enabled if Millennium was 1 Disabled if Millennium was 0
		SW203-6	Full Access through Local Port	Using the front panel, go to: Menu→Config→Comm Ports→Local Port Config Write to:

11				Enabled if Millennium was 1 Disabled if Millennium was 0
	SW203-5	Full Access through Aux Port	Using the front panel, go to: Menu→Config→Comm Ports→Aux Port Config Write to:	Enabled if Millennium was 1 Disabled if Millennium was 0
	SW203-4	Full Access through Modem Port	Using the front panel, go to: Menu→Config→Comm Ports→ModemPort Config Write to:	Enabled if Millennium was 1 Disabled if Millennium was 0
	SW203-3	Modem/Local/Aux Setting Config	Set SW202-7 to:	0 if Millennium was 0 1 if Millennium was 1
	SW203-2	Local Port (Event Log or Terminal)	Using the front panel, go to: Menu→Config→Comm Ports→Local Port Config Application to:	Event Log if Millennium was 1 Terminal if Millennium was 0
	SW203-1	Aux Port (RS232 orRS485)	Set SW202-5 to:	0 if Millennium was 0 1 if Millennium was 1
	SW204(4-8)	NOT USED	Not Applicable to Millennium II	
	SW204-3	Enhanced Remote Security	Set SW202-6 to:	0 if Millennium was 0 1 if Millennium was 1
	SW204-2	Remote Alarm Test	Not Used	
	SW204-1	Rectifier Energy Management	Using the front panel, go to:Menu→Config→Plant Config Efficiency to:	Enabled if Millennium was 1 Disabled if Millennium was 0

Configuring the Millennium II Controller (Continue)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1.</td><td>Setting the Date/Time
 

Use the above menu screen to set the system date and time.</td></tr>
<tr><td>2.</td><td>Performing a System Restore – A Computer is Required
A system restore is required if the original Millennium configuration is to beused in the Millennium II. Configuration items include but are not limited tothe following:
• Remote Peripheral Monitors
• User Defined Alarms
• Changes to Standard/Threshold Alarm Default Values
• Battery Management Features
Using a computer, connect to the Millennium either locally or remotely andperform a restore, using the correct backup file.
NOTE: If the restore is performed using Easy View: Once connected to the controller, select the FILE → RESTORE menu and proceed with the restore.</td></tr>
<tr><td>3.</td><td>Connect Serial Rectifier Cable
The RJ45 connector is located at top of the MCR1 board and is labeledP9. (see Figure 6-11)
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>a.</td><td>Locate P9 (Not to be confused with P7-Aux)</td></tr>
<tr><td>b.</td><td>Using the existing serial cable, connect to P9.</td></tr>
</table></td></tr>
<tr><td>4.</td><td>Removing the Forced Contactor Conditions
If Battery and Load contactors are in the system, contactor control boards should have be configured so that they did not OPEN during the controller replacement.
NOTE: Contactors may have always been in the FORCED state per customer requirements. If no changes were made to the Contactor States in the “Securing Contactors” section, then DO NOT change the switch positions.
To return contactors to their normal state, place SW300 in the position as shown figure 6-2 and 6-3.
<table>
<tr><th>Contactor Type</th><th>Control Board and Switch</th><th>For Millennium II Control, Change to</th></tr>
<tr><td>Load</td><td>EBV – SW300</td><td>DOWN</td></tr>
<tr><td>Battery</td><td>BJN – SW300</td><td>DOWN for ½ height cabinets UP for full height cabinets</td></tr>
</table></td></tr>
</table>

This page intentionally left blank

7 Troubleshooting

Controller Circuit Pack

After power up, or after a reset, the multicolor LED (Located to the right of the MCR2 board) will be RED while self diagnostics are in progress (which will take about 10 seconds). If all diagnostics pass, the red LED will change to green. If failures are detected during diagnostics the LED will change to Amber. If a terminal is attached to the local port during diagnostics, the diagnostic messages will show which test failed. During normal operation if a failure occurs, the green LED will change to amber. When a failure occurs, perform the following steps.

Step	Action
1.	Press the reset switch (System Reset, located to the right of the serial port connector at the bottom of the MCR1 board). If all diagnostics pass, it is possible that some type of “one time” abnormality occurred to cause thefailure, such as hot-insertion of option boards, shorting backplane pins when installing optional equipment, etc. If the diagnostics did not pass, or if the problem reoccurs, go to the next step.
2.	Remove all optional circuit packs then again press the reset switch on the MCR1 board. If the problem is not resolved, proceed to the next step. If all diagnostics pass, install optional packs one at a time, verifying operation after each.
3.	Replace the MCR1/MCR2 boards and verify the failure is resolved before installing and connecting any optional circuit packs.

Option Cards

The intelligent option boards (Modem, Gateway and data switch) are diagnosed by the microprocessor. If problems are detected the option board’s amber LED is lit, otherwise the green LED is lit. If the amber LED is lit, first reset the MCR1 board and see if the problem clears. If the problem reoccurs, replace the option board.

Controller Alarm Descriptions

Alarm Description	Explanation
ACO Active	Alarm Cut-Off has been initiated to silence local audible alarms. Any subsequent Power Critical, Power Major, or Power Minor alarm disables ACO. A programmable ACO time-out period for each alarm severity resets silenced alarms.
Alarm Battery Supply	Operated ABS fuse (F2) on Millennium II’s MCR1 card.
AC Fail	A rectifier is reporting an ACF to the controller.
Auxiliary Major	A resistive battery potential is present on the AMJ alarm input BSL-64, indicating a major alarm is active in the external equipment connected to this point.
Auxiliary Minor	A resistive battery potential is present on the AMN alarm input BSL-66, indicating a minor alarm is active in the external equipment connected to this point.
Alarm Test Active	Alarm Test is currently active. Any real alarm with a severity of Critical, Major or Minor, other than RFA or HV, aborts an active Alarm Test.
Alarm Test Aborted	Alarm Test has been aborted by an alarm. This is a latch edevent, remaining active until cleared by a user.
Memory Backup BatteryLow	The controller memory battery requires replacement.
Battery Type Conflict	The DC Plant – Battery Type and Battery Management – Battery Test Class attributes (sealed vs. flooded) do not match.
Battery On Discharge	The plant voltage is below the threshold set for BD in the present plant mode, FLOAT or BOOST/BTP. This alarm will not retire immediately upon rectifier restoration after an extended discharge. Plant voltage will not fully recover until depleted battery energy has been replaced. Do NOT adjust the rectifier voltage adjustments if they are at or nearrated output currents.
Battery Test Failed	A Battery Test was aborted before a reserve time could be established. This is a latched event, remaining active until cleared by a user.

Table 7-A: Controller Alarm Descriptions

Controller Alarm Descriptions (Continue)

Alarm Description	Explanation
Bay Interface ID Conflict	The ID for a BIC (Bay Interface Card) connected to the controller's serial bus is the same as that of a previously installed BIC.
Battery Test Active	A Battery Test session has been initiated. (Available onlyin plants with all serial rectifiers. Rectifier voltage has been lowered and the batteries are discharging.) The BD LED and BD relays are active and both the BD and VLV alarm thresholds along with STC (Slope Thermal Compensation) are inhibited while the Battery Test is active.
Configuration Changed	A change has been made to a configuration setting. This is a attached event, remaining active until cleared by a user.
Converter DistributionFuse	A converter distribution module connected to the controller's serial bus is reporting an operated fuse in it's output distribution.
Converter ID Conflict	The ID for a converter connected to the controller's serial bus is the same as that of a previously installed converter.
Connected Equip Alarm 1	Equipment monitored by Galaxy through Data Switch Port-1 is reporting an alarm.
Connected Equip Alarm 2	Equipment monitored by Galaxy through Data Switch Port-2 is reporting an alarm.
Connected Equip Alarm 3	Equipment monitored by Galaxy through Data Switch Port-3 is reporting an alarm.
Connected Equip Alarm 4	Equipment monitored by Galaxy through Data Switch Port-4 is reporting an alarm.
Connected Equip Alarm 5	Equipment monitored through Data Switch Port-5 isreporting an alarm. (Millennium only.)
Connected Equip Alarm 6	Equipment monitored through Data Switch Port-6 isreporting an alarm. (Millennium only.)
Converter Fail	A converter connected to the serial bus has failed.
Converter Fan Major	More than 1 converter fan has failed.
Converter Fan Minor	A single converter fan has failed.
Clock Changed	A change has been made to the Time or Date setting. This is latched event, remaining active until cleared by a user.
Rectifier Current Limit	The rectifiers connected to the controller's serial bus have reached their current limit setting. Plant voltage may, therefore, be lower than that requested in Rectifier Manager.
Minor Comm Fail Alarm	The controller has lost communication with a device that it had previously recognized on its rectifier/converter/BIC serial bus. If one of these devices is to be permanently removed, it is necessary to issue a UNINSTALL DEVICES command to clear the alarm.
Multiple Converter Fail	Multiple converters connected to the controller's serial bus have failed. This threshold is programmable.
Contactor 1 Failed	A contactor controlled by the controller's LVD settings(usually used with all LVBD contactors of a plant) is in the opposite state of that it has been instructed to be in (open if instructed to be closed, closed if instructed to be open).
Contactor 2 Failed	A contactor controlled by the controller's LVD settings(usually used with all LVBD contactors of a plant) is in the opposite state of that it has been instructed to be in (open if instructed to be closed, closed if instructed to be open).
Contactor 3 Failed	A contactor controlled by the controller's LVD settings(sometimes used with some of the LVLD contactors of a plant) is in the opposite state of that it has been instructed to be in (open if instructed to be closed, closed if instructed to be open).
Contactor 1 Open	The contactors controlled by the controller's LVD settings (usually used with all LVBD contactors of a plant) are open(disconnected).
Contactor 2 Open	The contactors controlled by the controller's LVD settings (usually used with some or all LVLD contactors of a plant) are open (disconnected).
Contactor 3 Open	The contactors controlled by the controller's LVD settings (sometimes used with some of the LVLD contactors of a plant) are open (disconnected).
Queue Overflow	The 256 event call-out on alarm memory queue filled, causing events occurring while full to be dropped from the call-out queue. This is a latched event, remaining active until cleared by a user. Usually indicates that programmed phone numbers are not responding.
Number Did Not Respond	Active when both a primary and alternate call-out phone number failed to connect at least 3 times in a row. This is a latched event, remaining active until cleared by a user.
ID Conflict	The ID for a rectifier connected to the controller's serialbus is the same as that of a previously installed rectifier.

Table 7-A: Controller Alarm Descriptions

Controller Alarm Descriptions (Continue)

Alarm Description	Explanation
Energy Management Disabled	The Energy Management feature has been disabled in software, or due to an active BD alarm, Boost mode, or attached rectifiers that are unconfigured or have an invalid load reading.
Excess Plant Drain	Plant load has been reported at greater than the plant shunt size. This is a latched event, remaining active until cleared by a user.
External Password Reset	The administrator password has been reset to it's default (ADMINISTRATOR) by use of the password reset switch on the front of the MCR1 board. This is a latched event, remaining active until cleared by a user. This event is logged into history each time it occurs, regardless of whether it has been cleared previously or not.
Excess Rectifier Drain	A connected rectifier load has been reported at greater than the programmable threshold for this event. This is a latch edevent, remaining active until cleared by a user.
External Transfer Shutdown	A rectifier shutdown is active through external signals intoTR1 to TR4 on Millennium BSL-73, 79, 85, 80.
Excessive Login Attempts	A user has failed 6 times at entering a correct password at login or 3 times when changing security levels. This is a latched event, remaining active until cleared by a user. This event is logged into history each time it occurs, regardless of whether it has been cleared previously or not.
External Fuse Major	A resistive battery potential is present on the FAJ alarm input at Millennium BSL-63, indicating a major fuse or CB alarm is active in the plant distribution circuit connected to this point.
External Fuse Minor	A resistive battery potential is present on the FAN alarm input at Millennium BSL-65, indicating a minor fuse alarm is active in the plant circuit connected to this point. Typically only the capacitor charge circuit fuse alarm is wired here as a minor fuse alarm
History Cleared	A user has cleared the event history record of one of Millennium II's history reports. This is a latched event, remaining active until cleared by a user.
High Float Voltage	Plant voltage is above the programmed threshold for this alarm. The HFV threshold should be set lower than the HV threshold which causes a HVSD signal to be issued to plantrectifiers.
High Voltage	Plant voltage is above the programmed threshold for this alarm. The HV alarm causes a HVSD signal to be issued to plant rectifiers.
Low Current	A connected rectifier has load share enabled, but its presentoutput load is less than a predefined threshold for that rectifier type. (Usually 3% or less of capacity.)
Limited Recharge	The plant load has exceeded the programmed percentage ofthe total rectifier capacity set for this alarm. Rectifier capacity may be inadequate for recharging batteries in an acceptable period of time following an extended battery discharge. This is a latched event, remaining active until cleared by a user.
Low Voltage Disconnect	An externally controlled LVD is open, providing a closure signal to Millennium BSL-61/-62 for alarm purposes.
Low Voltage Disconnect Fail	The monitoring circuit of an external LVD has failed, providing a resistive battery potential signal into Millennium BSL-84.
Manual Off	A connected rectifier has been manually turned off or has lost AC input power.
Major Comm Fail Alarm	The controller has lost communication with two or more devices that it had previously recognized on its rectifier/converter/BIC serial bus. Typically indicates that the serial bus is physically interrupted. If any of these devices is being permanently removed from service, it is necessary to issue UNINSTALL DEVICES command to clear this alarm.
Module Failure	RPM system alarm. A module connected to the RPM serialbuss has failed or has been disconnected.
Multiple AC Fail	The controller has detected more than one AC failure fromconnected rectifiers. This is a programmable threshold.
Multiple MAN Alarm	The controller has detected that more than one rectifier has manually been placed in standby. This is a programmable threshold.

Table 7-A: Controller Alarm Descriptions

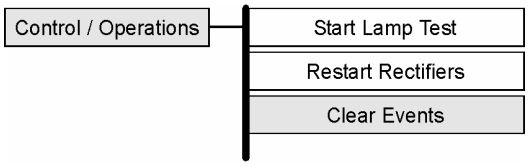
Controller Alarm Descriptions (Continue)

Alarm Description	Explanation
Multiple Rectifier Fail	The number of rectifiers currently processing a RFA alarmhas exceeded the programmable threshold for this alarm.
Measurement Out of Range	RPM system alarm. A channel measurement on a RPM is outside the DC voltage range designed for that RPM type. Often indicates reversed polarity for measurement leads on a unipolar module type.
Module Type Conflict	RPM system alarm. A module has been connected andgiven the address used previously by a module of a different type, without unlocking the previous module's configuration.
Number Not Configured	A call-out number has been assigned as the notification destination for an alarm, which does not have the phone number field defined.
Open String	A battery disconnect circuit is providing a resistive battery potential signal into Millennium BSL-72, indicating that a battery string is presently off line.
Password At Default	One or more of the log-in passwords is at it's default value. All passwords must be set to something other than their default before this event will clear.
Program Line Invalid	The program line for a derived channel, user defined event channel, or RPM control relay channel contains an invalid operand. Typically occurs when a RPM channel value or state is used in a program line and that RPM is disconnected or otherwise goes into a failure mode.
Processor Halt	The controller stopped processing, usually due to a reset orreboot.
Number Did Not Respond	Active when the periodic status call-out phone number failed to connect 4 times in a row. This is a latched event, remaining active until cleared by a user.
Rectifier Fail	A connected rectifier is reporting a failure condition toGalaxy.
Rect/Plant Inconsistency	The plant load has exceeded the total rectifier drain bymore than the factor programmed for this alarm, without causing plant voltage to fall. This is a latched event, remaining active until cleared by a user. Either the plant load reading or the total rectifier drain value is in error.
Redundancy Loss	The programmed number of redundant rectifiers in the system is not sufficient. System load has exceeded the redundancy limit.
Emergency Power Off	Emergency Power off input closure to ground.
Reserve Time Low	The predicted battery reserve time has fallen below the programmed threshold.
Shunt Not Configured	The shunt has been configured for either battery or load type and the value programmed for shunt Amps is invalid.
Self Test Failed	During initial boot, one or more of the tests performed on the controller failed. This is a latched event, remainingactive until cleared by a user.
Thermal Probe Failure	A temperature probe used for the Reserve Time Prediction or Slope Thermal Compensation features is returning a temperature outside of an acceptable range.
User Relay Conflict	Battery management contactor LVD CN1, CN2, or CN3 has been configured for a type other than NONE and associated user relay UR1, UR2, or UR3 has also been assigned to report an alarm condition. This attribute is only applicable in plants not using BIC cards.
Very Low Voltage	The plant voltage is below the threshold set for VLV. This is a critical alarm, indicating that load failures areimminent.
ID Not Configured	A device on the rectifier/converter serial bus has been recognized without an assigned ID.

Table 7-A: Controller Alarm Descriptions

Clear Events

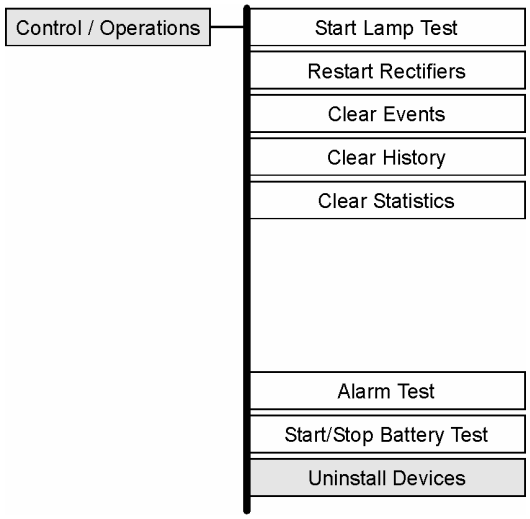
Events that have generated an Alarm and retired, but the Alarm remains active, may be cleared using this feature. Alarms that remain, even though the condition has gone away,are referred to as Latched Events.



Step	Action
1.	From the Default Screen, press the Menu button for the Main Menu.
2.	Using the Up/Down Arrows, Scroll to Control/Operations and press Enter.
3.	Select Clear Events, and press Enter.
4.	Press Enter again to clear the latched events, or Escape to return to the menus.
NOTE:	If the Alarm is a Latched Event and does not retire after performing this operation, the alarm condition most likely still exists.

Uninstall Devices

This feature is used to logically remove serial bus devices that have been physically removed and an alarm generated to indicate this removal. Rectifiers, converters, and BICs are the most common devices that require this feature.



Step	Action
NOTE!	This feature uninstalls ALL devices that have been physically removed.
1.	From the Default Screen, press the Menu button for the Main Menu.
2.	Using the Up/Down Arrows, Scroll to Control/Operations and press Enter.
3.	Select Uninstall Devices, and press Enter.
4.	Press Enter again to Uninstall Devices, or Escape to return to the menus.

This page intentionally left blank

8 Spare Parts

The following table lists the spare parts available for the Galaxy Millennium II Controller Model J85501P-1

Ordering Code	Part Description
848742858	MCR1/MCR2 Boards (May not be ordered separately)
848748871	BSL-3 Alarm Board
108996278	BSL-4 Alarm Board
108851338	Modem Board (BSM5)
108163601	Data Switch Board (BSW1)
847473774	Easy View Software Package
406530725	1-1/3 A fuse (GMT)
406204230	3 A fuse (GMT)
405298308	Terminating Resistor for RPM
406712968	406712968 Inductor Bead for RPM
108324765	Millennium Controller Product Manual (Old Controller)

This page intentionally left blank

9 Product Warranty

A. Seller warrants to Customer only, that:

1. As of the date title to Products passes, Seller will have the right to sell, transfer, and assign such Products and the title conveyed by Seller shall be good;
2. During the warranty period stated in Sub-Article B below, Seller's Manufactured Products (products manufactured by Seller), which have been paid for by Customer, will conform to industry standards and Seller's specifications and shall be free from material defects;
3. With respect to Vendor items (items not manufactured by Seller), Seller warrants that such Vendor items, which have been paid for by Customer, will be free from material defects for a period of sixty (60) days commencing from the date of shipment from Seller's facility.

B. The Warranty Period listed below is applicable to Seller's Manufactured Products furnished pursuant to this Agreement, commencing from date of shipment from Seller's facility, unless otherwise agreed to in writing:

Warranty Period

Product Type	New Product	Repaired Product*
Central Office Power Equipment**	24 Months	6 Months

* The Warranty Period for a repaired Product or part thereof is six (6) months or, the remainder of the unexpired term of the new Product Warranty Period, whichever is longer.

C. If, under normal and proper use during the applicable Warranty Period, a defect or nonconformity is identified in a Product and Customer notifies Seller in writing of such defect or nonconformity promptly after Customer discovers such defect or nonconformity, and follows Seller's instructions regarding return of defective or nonconforming Products, Seller shall, at its option attempt first to repair or replace such Product without charge at its facility or, if not feasible, provide a refund or credit based on the original purchase price and installation charges if installed by Seller. Where Seller has elected to repair a Seller's Manufactured Product (other than Cable and Wire Products) which has been installed by Seller and Seller ascertains that the Product is not readily returnable for repair, Seller will repair the Product at Customer's site.

With respect to Cable and Wire Products manufactured by Seller which Seller elects to repair but which are not readily returnable for repair, whether or not installed by Seller, Seller at its option, may repair the cable and Wire Products at Customer's site.

D. If Seller has elected to repair or replace a defective Product, Customer shall have the option of removing and reinstalling or having Seller remove and reinstall the defective or nonconforming Product. The cost of the removal and the reinstallation shall be borne by Customer. With respect to Cable and Wire Products, Customer has the further responsibility, at its expense, to make the Cable and Wire Products accessible for repair or replacement and to restore the site. Products returned for repair or replacement will be accepted by Seller only in accordance with its instructions and procedures for such returns. The transportation expense associated with returning such Product to Seller shall be borne by Customer. Seller shall pay the cost of transportation of the repaired or replacing Product to the destination designated by Customer.

E. Except for batteries, the defective or nonconforming Products or parts which are replaced shall become Seller's property. Customer shall be solely responsible for the disposition of any batteries.

F. If Seller determines that a Product for which warranty service is claimed is not defective or nonconforming, Customer shall pay Seller all costs of handling, inspecting, testing, and transportation and, if applicable, traveling and related expenses.

9 Product Warranty (Continue)

G. Seller makes no warranty with respect to defective conditions or nonconformities resulting from actions of anyone other than Seller or its subcontractors, caused by any of the following: modifications, misuse, neglect, accident, or abuse; improper wiring, repairing, splicing, alteration, installation, storage, or maintenance; use in a manner not in accordance with Seller's or Vendor's specifications or operating instructions, or failure of Customer to apply previously applicable Seller modifications and corrections. In addition, Seller makes no warranty with respect to Products which have had their serial numbers or month and year of manufacture removed, altered, or experimental products or prototypes or with respect to expendable items, including, without limitation, fuses, light bulbs, motor brushes, and the like. Seller's warranty does not extend to any system into which the Product is incorporated. This warranty applies to Customer only and may not be assigned or extended by Customer to any of its customers or other users of the Product.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S SOLE AND EXCLUSIVE REMEDY SHALL BE SELLER'S OBLIGATION TO REPAIR, REPLACE, CREDIT, OR REFUND AS SET FORTH ABOVE IN THIS WARRANTY.

10 Revision

Revision	Description	Date Dept./Init.
1.2	Updated as per template	11/15/2021
1.3	Updated as per OmniOn template	10/16/2023

OmniOn Power Inc.
601 Shiloh Rd.
Plano, TX USA

omnionpower.com