

Lucent Technologies
Bell Labs Innovations



Galaxy Vector Controller

ACP-BIC2, BIC3

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Notice:

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

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1 Introduction

General Information

This product manual describes the Lucent Technologies Galaxy Vector Controller (VC). This controller, furnished as an integral part of various Lucent Technologies GPS (Galaxy Power System) series power plants, provides control and alarm functions over a digital serial interface to the plant rectifiers and converters. This control includes the setting of converter output voltage, rectifier output voltage, current limit, high voltage shutdown, rectifier restart, sequencing and boost mode. This serial digital interface system automates the installation and setup process, eliminating the need to use potentiometers to separately set individual rectifier and converter output voltage levels. Versions are available for both +24Vdc and -48Vdc plants, including the 24V Flexent Wireless™ indoor and outdoor systems.

Lucent Technologies rectifiers which currently can interface with the Galaxy Vector Controller (VC) via this state of the art digital serial interface bus include the Model 596A -48V, 50A; Model 596B +24V, 100A; Model 570A -48V, 100A; Model 595A -48V, 200A, and Model 595B -48V, 200A. The 24V Flexent Wireless™ system uses the Lucent 596F rectifiers. Note that not all of these rectifiers support the complete feature set available through the Galaxy VC. For example, a Phase alarm would not be an intelligent piece of information on a single phase rectifier. Refer to the respective rectifier product manual for a complete listing of rectifier features available for a particular model.

The rectifiers and converters are connected to the Galaxy VC using a digital serial bus. The rectifier and converter voltage set points, rectifier load share, high voltage shutdown threshold, boost mode, and low voltage disconnect commands are sent via this bus.

In addition to rectifier control the Galaxy VC provides visual alarm and plant status on the user front panel user display and provides Form C or transfer type contacts for the various alarm conditions.

Converter, rectifier and plant alarms are forwarded to the user through a front panel user display interface and to the user's alarm system through a set of Form C or transfer type contacts for power major and power minor indications.

The topics covered in this manual include general description of the basic features, operation, installation and configuration, acceptance testing, troubleshooting, and repair. Related product manuals for the GPS series power plants, rectifiers and batteries provide similar information for those products.

Customer Training

Lucent Technologies offers customer training on many Power Systems products. For information call 1-972-284-2163. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

Customer Service

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-THE-1PWR (1-800-843-1797). Services provided through this contact include initiating the spare parts procurement process for out of service emergencies, ordering Lucent Technologies documents, and providing other product and service information.

For other customers worldwide, call 001-972-840-0382. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

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Technical support for Lucent Technologies customers is available around the world during the normal product warranty period and also while specific contractual agreements extend this service.

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For other customers worldwide, contact your local field support center or your sales representative to discuss your specific needs.

Product Repair and Return

Repair and return service is provided for Lucent Technologies customers around the world.

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-255-1402 for information on returning of products for repair.

For other customers worldwide, contact your sales representative to discuss your particular circumstances.

Warranty Service

For domestic warranty service, contact your Warranty Service Manager (WSM). For international warranty service, contact your sales representative.

On-Line Power Systems Product Manuals

For Lucent Technologies users logging in from inside the corporate firewall, the address of the "Power Systems On-Line Product Manuals" page is <http://www.cic.lucent.com/lineage.html>.

For customers logging in from outside the firewall, the address is <http://www.lucent8.com/lineage.html>. The annual subscription fee for access to this site is \$25. To obtain a password, follow the instructions on-line or call 1-888-Lucent8 (1-888-582-3688). When prompted for an order number, enter or say "167-790-010."

2 *Product Description*

Overview

The **Galaxy Vector Controller (VC)** is mounted on the inside front door of a GPS plant with the control panel visible on the front of the door. See Figure 2-1. In the Flexent Outdoor system, the Galaxy VC is installed behind the control/display panel, which swings out to provide access to the VC. See Figure 2-2. Basic specifications of the Vector Controller are summarized in Table 2-A.

Table 2-A: Vector Controller Specifications

	BIC2	BIC3
Input voltage range	19 - 30V	36 - 60V
Maximum input power	4.5W	
Alarm contact ratings	60V at .3A	
Plant voltage measurement accuracy ($\pm 0.05\%$ of full scale + 1 count)	$\pm 30\text{mV}$	$\pm 40\text{mV}$
Plant voltage measurement resolution	.01V	
Plant current measurement accuracy	$\pm 1\%$ of full scale	
Plant current measurement resolution	1A	
Thermistor temperature measurement accuracy	$\pm 3^\circ\text{C}$ for battery temperatures from -5°C to $+55^\circ\text{C}$; $\pm 5^\circ\text{C}$ for battery temperatures from below -5°C to -10°C and from above $+55^\circ\text{C}$ to $+85^\circ\text{C}$	
Operating temperature range	-40°C to $+85^\circ\text{C}$	

Batteryless Operation

The Galaxy VC is suitable for use in power plants with or without batteries. In batteryless 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 point.

The Galaxy VC will automatically return to its last configuration.

***Control and
Monitoring
Features***

The Galaxy Vector Controller (Galaxy VC) provides the plants with a wide range of control and monitoring features. These features are accessed through the BWM3 Control Panel, described below and shown in Figure 2-4. The controller consists of a BIC2 (for a 24V plant) or BIC3 (for a 48V plant) Control Board and a BLJ3 terminal connection board. The Flexent Outdoor system uses a BTJ2 termination board. See “BLJ3 Terminal Connection Board,” and “Flexent Outdoor System,” below, for specifics on these connections.

All the connections, such as power, monitoring sensors, alarm inputs and outputs, to the controller are made through the termination board. The control board is mounted on the top of the terminal connection board. Using the Form-C relay contacts on the VC, the controller issues Power Major (PMJ), Power Minor (PMN), Major Fuse alarm (MJF), Battery on Discharge

(BD), AC fail alarm (ACF) and High Voltage/Multiple AC Fail (HV/2ACF) office alarms off the terminal connection board.

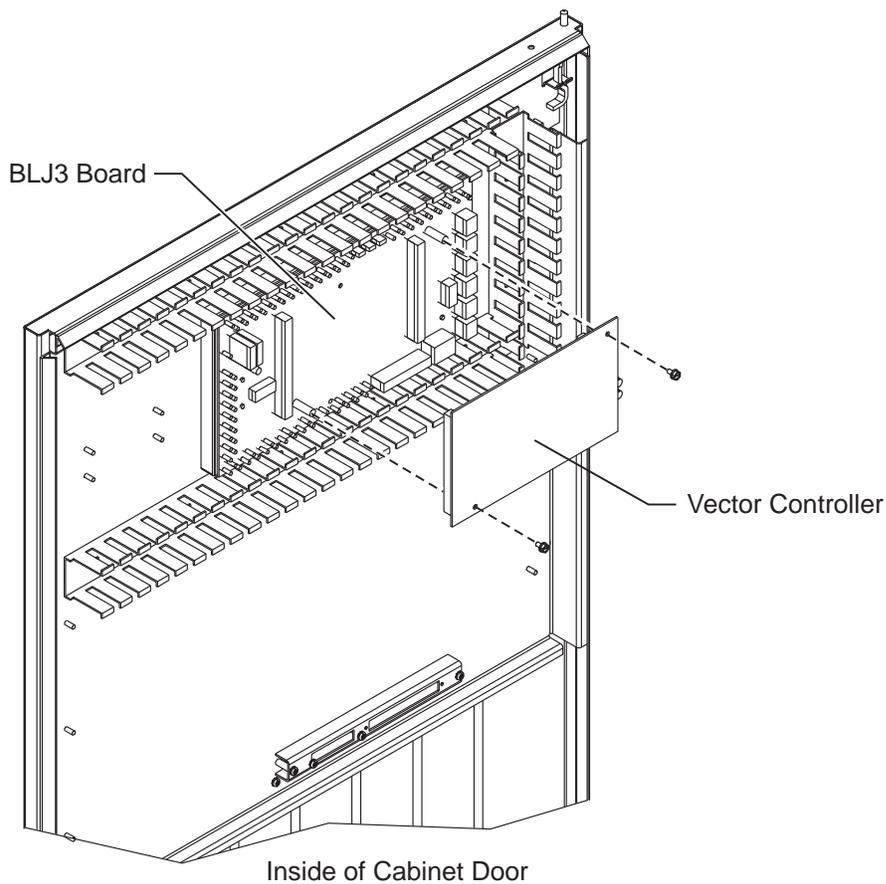


Figure 2-1: Galaxy Vector Controller in a typical GPS plant

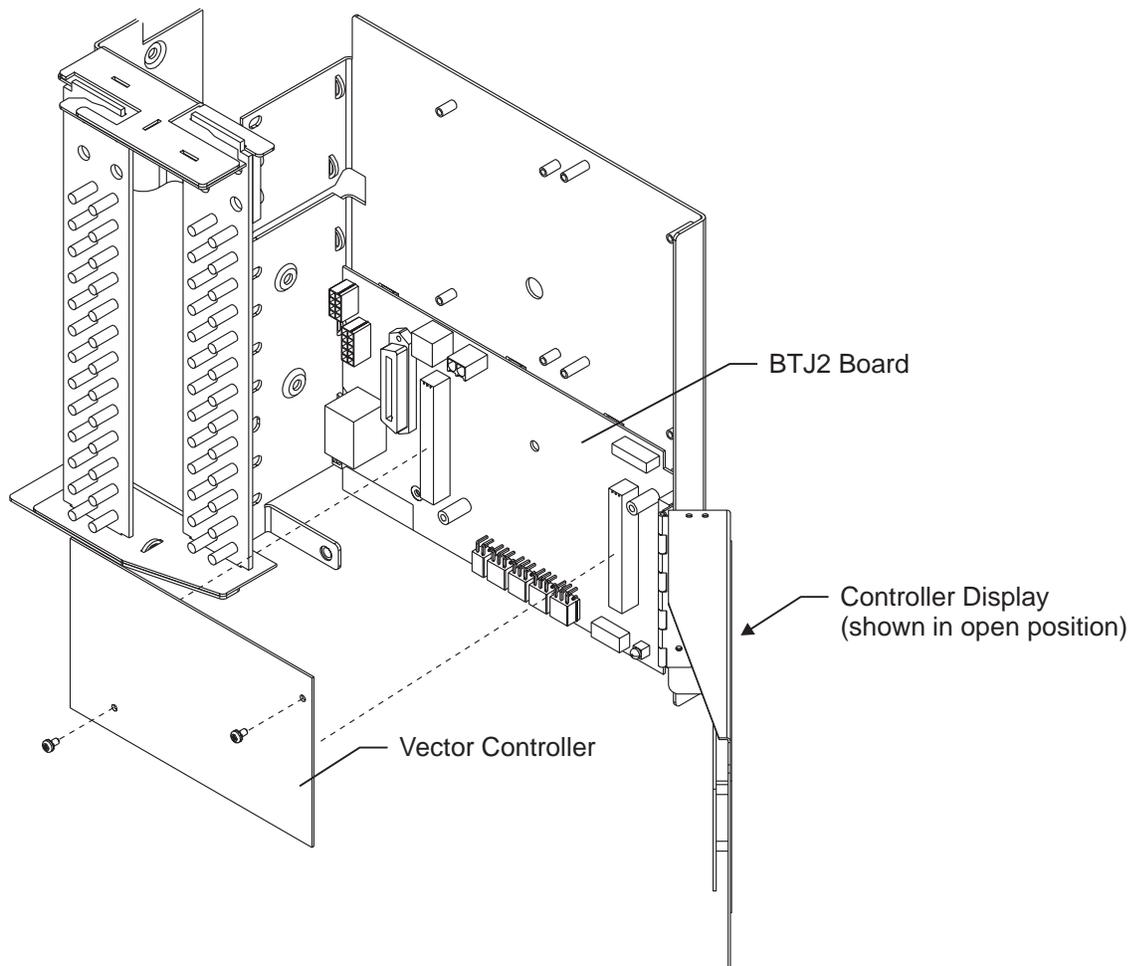


Figure 2-2: Galaxy Vector Controller in a Flexent outdoor plant

***BIC 2 or 3
Control Board***

Refer to Figure 2-3 for the Galaxy Vector Controller control board. This board consists a microprocessor, A/D converter, timers, memory and the connectors to the BLJ3 which is the terminal connection board to the outside of the controller. The control board has two versions, BIC2 and BIC3. BIC2 is for a 24V plant and BIC3 is for a 48V plant. IC27 is the IC (EEPROM) that contains the firmware which determines the BICx operation and in turn has the preset voltage and temperature thresholds for plant operation. Software is updated by replacing IC27 with an EEPROM containing the new code.

There are no user-configurable items on the BIC2 or BIC3 boards.

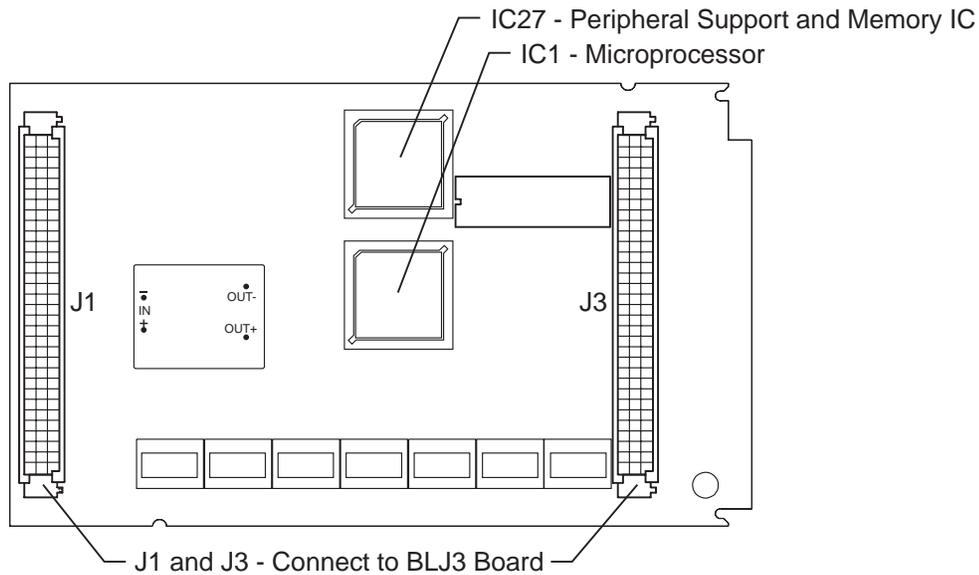


Figure 2-3: Galaxy VC BIC2 or BIC3 controller board

BMW3 Control Panel

Refer to Figure 2-4 for a view of the BMW3 Control Panel. The BMW3 interfaces with the BLJ3 or BTJ2 Connector Board via a 26 pin ribbon designated P2. It provides comprehensive user interface with the Galaxy VC. It is used to view plant voltage and load, configure thresholds and parameters, view active alarms and initiate certain plant operations. This interface consists of a 4-digit, 7-segment display, 16 keys and 18 LEDs. Refer to Table 3-A and 4-A for the alarm IDs and Configuration IDs respectively which can be displayed on the 4-digit, 7-segment

display. Each of the keys and LEDs is defined and explained below.

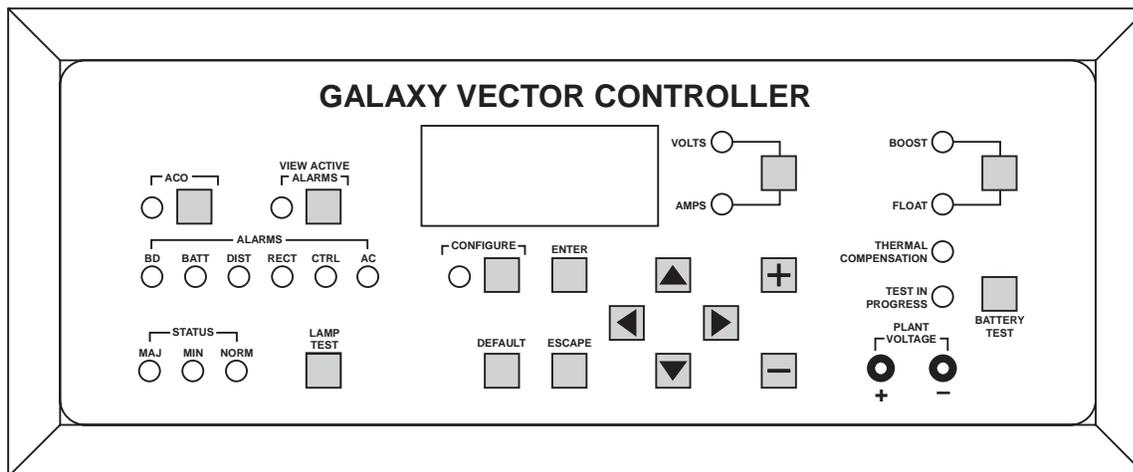


Figure 2-4: BMW3 Control Panel

Table 2-B: BMW3 Control Panel Keys and Functions

Key	Function
VOLTS/AMPS	Switch between voltage and current on the display
LAMP TEST	Causes all LEDs and display segments to activate for 10 seconds. LEDs of all equipment connected to the serial bus will also activate.
ACO	Switch between Alarm Cut Off and On.
BATTERY TEST	Start/stop discharge test
FLOAT/BOOST	Switch between Float and Boost mode (when Boost is enabled).
VIEW ACTIVE ALARMS	Display active alarms. use +, -, ^, v to page through multiple alarms. Configure and View Active Alarms cannot be active simultaneously.
CONFIGURE	Enter Configuration mode. Configure and View Active Alarms cannot be active simultaneously.
ENTER	In Configure mode, accept a configuration parameter.
ESCAPE	In Configure mode, cancel configuration of a parameter.
+ or ^	In Configure mode, increment a parameter value.
- or v	In Configure mode, decrement a parameter value.
< or >	In Configure mode, select a digit to edit.

Table 2-B: BMW3 Control Panel Keys and Functions

Key	Function
DEFAULT	In Configure mode, change a parameter to default value.

Table 2-C: BMW3 Control Panel LEDs and Functions

LED	Function
VOLTS	Indicates that plant voltage or converter voltage is displayed.
AMPS	Indicates that plant current, total converter current, or battery current is displayed.
ACO	Indicates that Audible Alarm Cutoff is active.
THERMAL COMPENSATION	Indicates that the plant voltage has been adjusted by the Thermal Compensation feature.
FLOAT	Indicates that the plant is in Float mode.
BOOST	Indicates that the plant is in Boost mode and blinks while editing boost duration.
TEST IN PROGRESS	Indicates battery test in progress; blinks when selecting battery type.
VIEW ACTIVE ALARMS	Indicates Active Alarm display mode. Configure and View Active Alarms cannot be active simultaneously.
CONFIGURE	Indicates parameter configuration mode and blinks while a parameter is being viewed or edited. Configure and View Active Alarms cannot be active simultaneously.
MAJOR	Indicates that a Major alarm is active. If the MAJOR LED is lit, MINOR and NORM LEDs will not be.
MINOR	Indicates that a Minor alarm is active. If the MINOR LED is lit, there are no Major alarms active and the MAJOR and NORM LEDs will not be lit.
NORM	Indicates that no alarms are active. If the NORM LED is lit, MAJOR and MINOR LEDs will not be.
BD	Discrete alarm indicating that Battery on Discharge alarm is active.
BATT	Discrete alarm indicating that an alarm affecting the Battery is active.
DIST	Discrete alarm indicating that an alarm affecting the Distribution is active.
RECT	Discrete alarm indicating that an alarm affecting the Rectifier is active.
CTLR	Discrete alarm indicating that an alarm affecting the Controller is active.

Table 2-C: BMW3 Control Panel LEDs and Functions

LED	Function
AC	Discrete alarm indicating that an alarm affecting the AC service is active.

BLJ3 Terminal Connection Board

Refer to Figure 2-5 for a view of the BLJ3 Terminal Connection Board. Each input/output port of the BLJ3 is defined and explained below with the required user information.

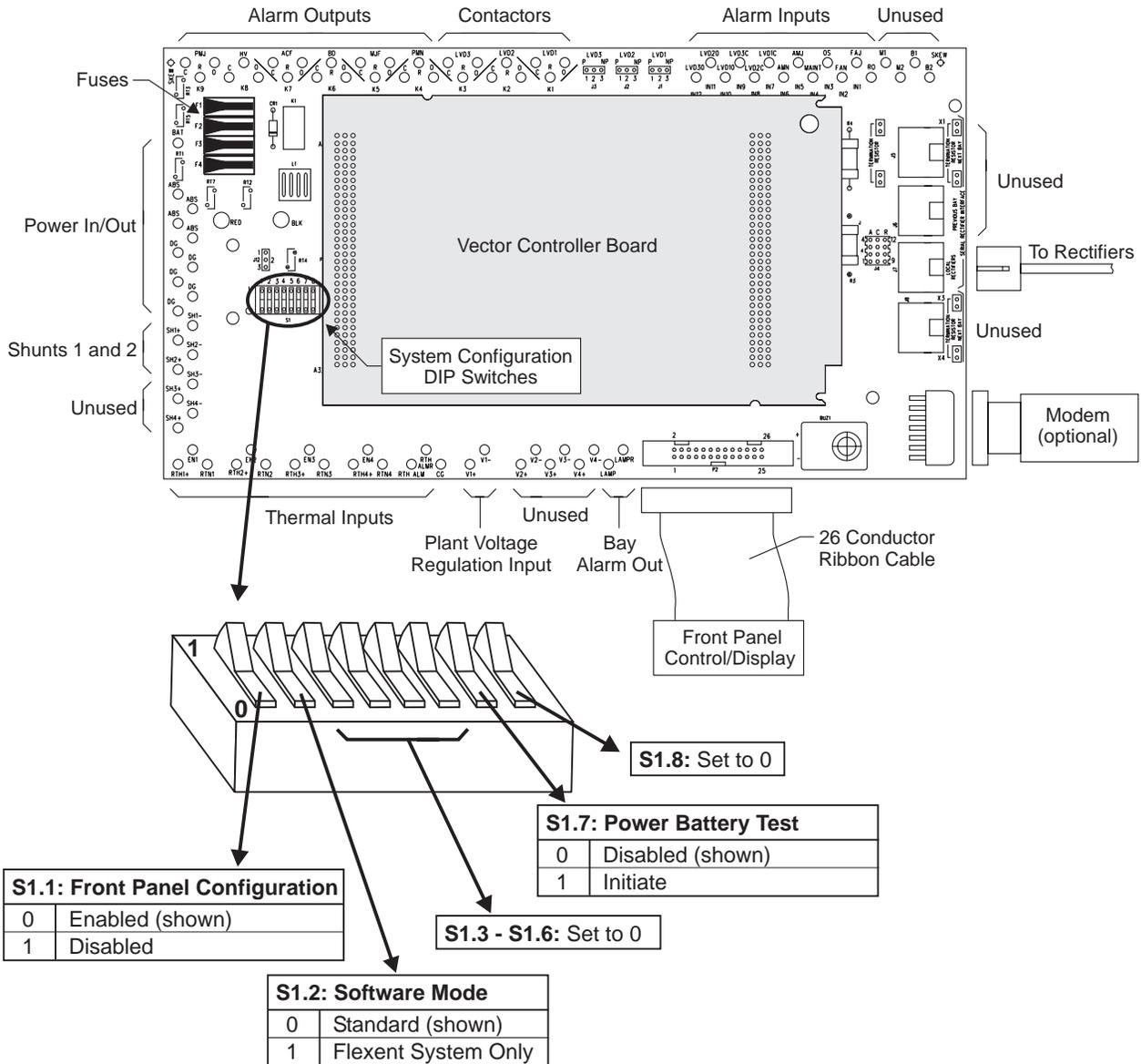


Figure 2-5: Galaxy Vector Controller BLJ3 terminal connection board (also used in Flexent indoor applications)

Many terminations are provided on the BLJ3 board. Some of these are used only on circuit boards other than the Vector Controller.

B1: B2: M1: M2: These input terminals are not used for Vector applications.

RO: Input terminal for RO (Reserve Operation) battery voltage level signal.

Contactor control board (Indoor System only): This board, mounted inside the cabinet remotely from Vector, provides manual activation of the contactor and also provides activation of the contactor upon instruction from the VC.

Alarm board: provides visual indication when a load circuit breaker has been tripped. It also provides the alarm sense (MJF) input signal for the VC.

BSM3 modem board: A modem connector is provided on the BLJ3 board. See Appendix A for settings and procedures for using the optional BSM3 modem board.

Battery Shunt provides a voltage proportional to the current through it. The shunt typically is a 1000 Amp/50mV shunt.

Alarm input (from IN1 to IN12): These are alarm input terminals. See Table 2-D.

Table 2-D: BLJ3 Alarm Input Terminals

BLJ3 Input Connection	Input Name	Alarm Asserted	Description
IN1	FAJ	Closure to Batt	Fuse major alarm input
IN2	FAN	Closure to Batt	Fuse minor alarm input (not used for VC)
IN3	OS	Closure to Batt	Battery open string alarm input (not used for VC)
IN4	MAINT	Open to Batt	Maintenance (open connector)
IN5	AMJ	Closure to Batt	Auxiliary major alarm input
IN6	AMN	Closure to Batt	Auxiliary minor alarm input (not used for VC)
IN7	LVD1C	Closure to Batt	Low voltage disconnect contactor 1 closure status input (not used for VC)
IN8	LVD2C	Closure to Batt	Low voltage disconnect contactor 2 closure status input (not used for VC)

Table 2-D: BLJ3 Alarm Input Terminals

BLJ3 Input Connection	Input Name	Alarm Asserted	Description
IN9	LVD3C	Closure to Batt	Low voltage disconnect contactor 3 closure status input (not used for VC)
IN10	LVD1O	Closure to Batt	Low voltage disconnect contactor 1 open status input
IN11	LVD2O	Closure to Batt	Low voltage disconnect contactor 2 open status input
IN12	LVD3O	Closure to Batt	Low voltage disconnect contactor 3 open status input (not used for VC)

J1 to J3: These are LVD contactor configuration pins. See Table 2-E.

Table 2-E: LVD Contactor Configuration Jumpers

Jumper Name	Pin 1 and 2 shorted (with jumper)	Pin 2 and 3 shorted (with jumper)
J1	LVD1 present	LVD1 not present
J2	LVD2 present	LVD2 not present
J3	LVD3 present	LVD3 not present (always with jumper for VC)

LVD1, LVD2 and LVD3: These are relay contact outputs (form C type) for LVD contactor application. These terminals can be connected to the contactor drive boards. LVD1 and LVD2 contacts are rated for 2 amps. LVD3 is not used in Vector controller applications. See Table 2-F.

Table 2-F: LVD Drive Terminals

	Name	LVD1	LVD2	LVD3
O	K1	Normally open contact	Normally open contact	Normally open contact
C	K2	Normally closed contact	Normally closed contact	Normally closed contact
R	K3	Return	Return	Return

Office alarm relay output: All user output relays are isolated Form-C or transfer type, a combination of normally open and normally closed contacts with the middle or return contact in common. The de-energized state of these relays is the alarm state, with an alarm condition resulting in a closure of the

normally closed contact to the return contact and opening of the normally open contact to the return contact. PMJ, HV/2ACF, ACF, BD, MJF, PMN are the office alarm output terminations to the Vector Controller Form C relays. See Tables 2-G and 3-A.

Table 2-G: BLJ3 Office Alarm Relay Output Terminations

Alarm	Description	Termination
PMJ NO	Power Major Normally open	PMJ/K9 - O
PMJ RTN	Power Major Return	PMJ/K9 - R
PMJ NC	Power Major Normally closed	PMJ/K9 - C
PMN NO	Power Minor Normally open	PMN/K4 - O
PMN RTN	Power Minor Return	PMN/K4 - R
PMN NC	Power Minor Normally closed	PMN/K4 - C
BD NO	Battery on Discharge Normally open	BD/K6 - O
BD RTN	Battery on Discharge Return	BD/K6 - R
BD NC	Battery on Discharge Normally closed	BD/K6 - C
MJF NO	Major Fuse Normally open	MJF/K5 - O
MJF RTN	Major Fuse Return	MJF/K5 - R
MJF NC	Major Fuse Normally closed	MJF/K5 - C
2ACF NO	Multiple AC Fail Normally open	HV/2ACF - O
2ACF RTN	Multiple AC Fail Return	HV/2ACF - R
2ACF NC	Multiple AC Fail Normally closed	HV/2ACF - C
ACF NO	Single AC Fail Normally open	ACF/K7 - O
ACF RTN	Single AC Fail Return	ACF/K7 - R
ACF RTN	Single AC Fail Normally closed	ACF/K7 - C

BAT: This is the terminal for the connection to the battery discharge bus. All power supplied to the controller comes from this terminal and is fused through F2. It is +24V to BIC2 and -48V to BIC3.

F1: The fuse for the ABS circuits. This fuse is rated at 2A.

F2: The fuse for the BIC2/3 and BLJ3 circuits.

F3, F4: Spare fuses.

ABS: Fused battery voltage supplies for user application (four available).

DG: Discharge Ground (five terminals available). One of five terminals is connected for BAT RTN, providing power return of controller power.

Battery Shunt and Voltage Sense Inputs: All the shunt inputs are 50mv full scale. See Table 2-H.

Table 2-H: Battery Shunt and Plant Voltage Sense Inputs

Signal Name	Description	Termination
+Vsense (RB)	(+) Remote Regulation input for BICx	V1+
-Vsense (RG)	(-) Remote Regulation input for BICx	V1-
Shunt1+	+ input from battery shunt during discharge	SH1+ See note 1
Shunt1-	- input from battery shunt during discharge	SH1- See note 1
Shunt2+	Currently not used (Note 2)	SH2+ See note 1
Shunt2-	Currently not used (Note 2)	SH2- See note 1

Note 1: The BLJ3 requires 100K resistors in series with the shunt signals external to the board.

Note 2: When no shunt is available to connect to Shunt 2 inputs, the Shunt 2 inputs must be jumpered together.

SH3 and SH4 are not used in the Vector Controller.

All the shunt inputs must have 100K Ω 1% resistors in series with each lead.

J12 (BLJ3 only): This jumper is factory set. This jumper determines the Controller Ground (CG) reference. Which bus the shunt is installed into, battery (+) or DG (-), determines which position J12 is in. For the current systems this jumper should be in the 1-2 position as the shunt is in the battery (+) bus. On the BTJ2 board this function is hardwired.

Thermal probe connections: There are four thermistor inputs. Each thermistor is connected to the RTH#+ and RTN#, where # = 1 through 4. RTH#+ and EN#+ is jumpered if this thermistor terminal is used. For the indoor system the thermal probe and cable are factory installed to the appropriate wire terminations on the BLJ3 board.

BTJ2: Four 6 pin Molex min-fit Jr. connectors (J9-12) are provided for Temperature probe inputs. The appropriate probe and cable set is orderable.

For BTJ2 the 210E is connected using a 6 foot cable set connected to Probe #1 input (J9). See Figures 4-1 and 4-2 for 210E connections to these points.

RTH ALM and RTH ALMR: These are thermistor alarm input and return from 210E module. See Figures 4-1 and 4-2 for 210E connections to these points.

CG: Controller ground which is connected to bus on which shunt(s) are mounted. This pin can be used to reference the 210E to the VC's ground.

V1+ and V1-: Plant voltage sense leads. Each lead must be fused at the bus bar.

TP1 and TP2: Test points for plant voltage measurement and calibration.

V2+, V2-, V3+, V3-, V4+, V4-: These terminals are not used in the Vector Controller.

LAMP and LAMPR: LAMP is the terminal used to send battery voltage to the bay lamp and LAMPR is connected to DG.

P2: This is the 26 pin connector to the control/display panel (BMW3).

P1 and P3: These two 96 pin connectors are the connections to the control board.

J7: A RJ45 connector for serial rectifier control bus.

J4 and J11: For the Vector Controller function, these jumpers must be used to short each C and R pin on the J4 and J11.

J5, J7, J8, J9, J10 are not used in the Vector Controller.

P4: This is the serial factory test port (factory use only).

BUZ1: This is the buzzer for the audible alarm.

**Control Signal
Inputs**

Table 2-I lists control signal inputs.

Table 2-I: BLJ3 Control Signal Inputs

Control Signal Name	Description	Indoor Input Connection
RO	Reserve Operation	RO (closure to BAT)
PBT	Power Battery Test	PBT (closure to BAT)

**Control Signal
Outputs**

LVD1 coil power is provided to the battery contactor coil to close the battery contactor under all conditions except when the battery voltage has discharged below the LVD disconnect threshold as determined by the VC. The VC generates the disconnect instruction by activating a relay whose Form C contact positions are interpreted by the BJNx board to disconnect power to the contactor coil. When the BTJ2 is installed, the function of the BJNx is provided by the BTJ2. The BTJ2 board disconnects the power to the contactor coil upon this instruction from the VC.

The indoor system LVD1 connections at the BLJ3 are at LVD1 (K1) Form C relay output. NO, NC, and Return. All of these connections are required by the BJNx to disconnect the contactor. The Contactor Open signal, which is returned from the BJNx to the BLJ3, is connected to LVDO.

The outdoor system LVD1 contactor connections are to the BTJ2 - J23 connector. See table 2-F for definition.

BLJ3 Power Connections Table 2-J shows power connections from plant to BLJ3 (Factory wired).

Table 2-J: Power Connections From Plant to BLJ3

Description	Input Termination	Associated Fuse	Plant Termination
(+) PWR Controller	BAT	F2	Charge Bus (Rectifier bus)
(-) PWR Controller	DG		Discharge Return Bus
LVD power #1	See note 1	NA	Charge Bus (Rectifier bus)
LVD power #2	See note 1	NA	Battery Bus
Aux. Bat. Source	ABS See note 2	F1	NA

Note 1: LVD control power, from the power buses for the indoor system, is connected to the BJNx LVD controller board

Note 2: BLJ3 user available fused (F1) power terminations are labeled ABS. DG terminations are also provided for user termination on the BLJ3. These terminations are labeled DG.

**BTJ2
Termination
Board**

Figure 2-6 shows the BTJ2 termination board used in the Flexent outdoor systems.

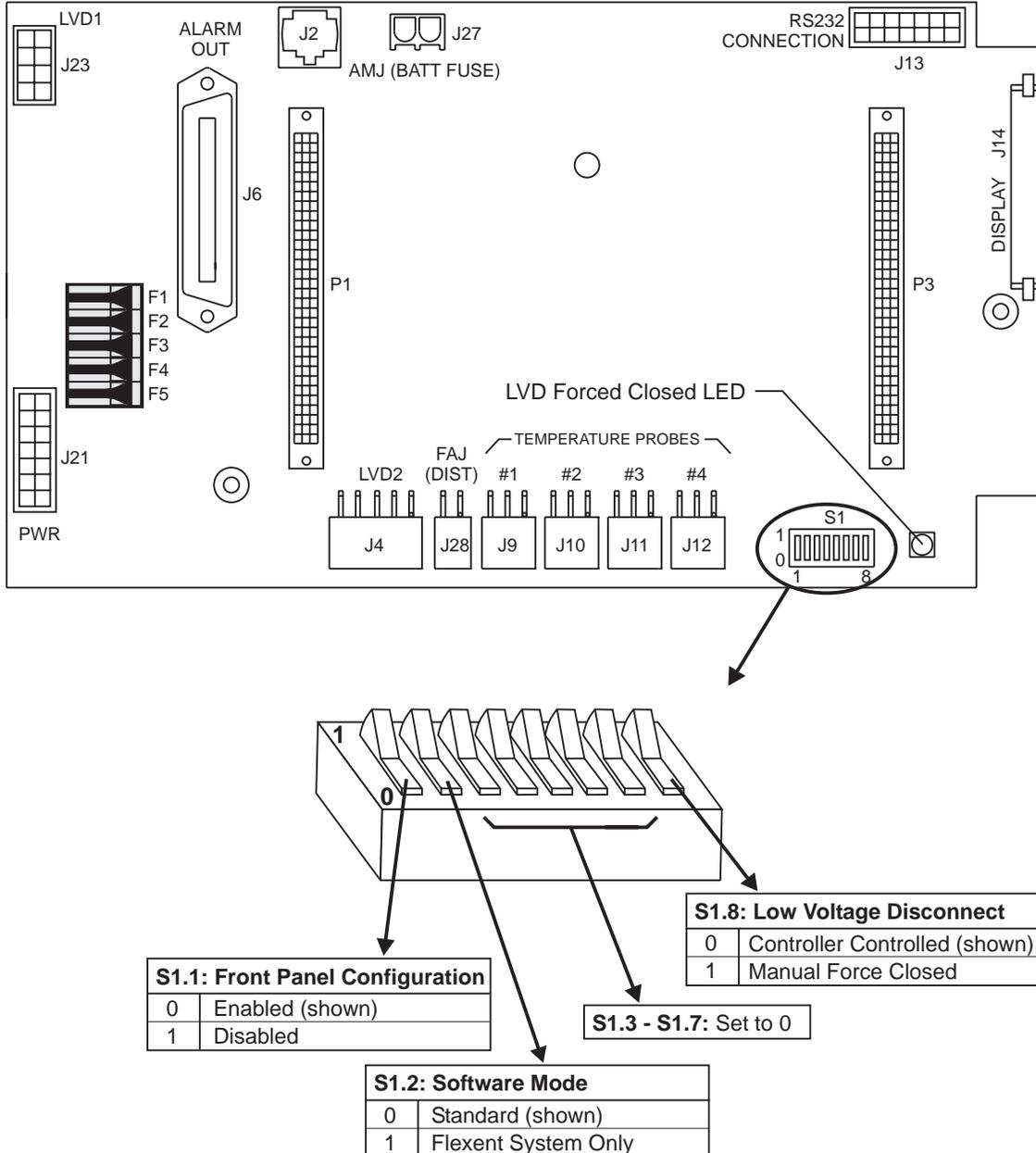


Figure 2-6: Galaxy Vector Controller BTJ2 terminal connection board (Flexent outdoor systems)

**BTJ2 Fuses and
Connectors**

BTJ2 fuses and connectors are described below.

All fuses are 5A.

- F1 – BIC4 Controller power
- F2 – Vsense +
- F3 – LVD power from Charge Bus (Rectifier)
- F4 – LVD power from Battery Bus
- F5 – Spare

Power connections: Table 2-K shows power connections from plant to BTJ2 through the 14 pin Molex connector J21.

Table 2-K: BTJ2 Power Connections (J21)

Pin Number	Signal Name	Description
1	Shunt 1 (-)	Connection to Battery shunt terminal nearest Charge bus (rectifier bus)
2	NC	
3	NC	
4	Shunt 2 (-)	Shunt input for possible future use
5	NC	
6	NC	
7	Controller Power	Controller positive power input, Factory wired to Charge bus (rectifier bus)
8	DG	Controller negative power input
9	Shunt 1 (+)	Connection to Battery shunt terminal closest to (+) terminals of the batteries
10	Vsense (-)	Connection to DG, Rectifier (-) bus, Remote sense
11	Shunt 2 (+)	Shunt input for possible future use
12	LVD Battery Bus	Power from the battery bus for power to the LVD circuitry on the BTJ2
13	LVD Charge bus	Power from the Charge bus for power to the LVD circuitry on the BTJ2
14	Vsense (+)	Connection to the Charge bus, Rectifier (+) bus. Remote sense

J2 – RJ45 connector for Rectifier communication: Pin 1 and 2 is communication pair. Pin 3 is isolated ground. Pin 4 is chassis ground. All rectifiers are connected to this connector in a parallel daisy chain..

J23 – LVD1 control: Table 2-L lists pin numbers and signal names for the 8 pin Molex connector J23.

Table 2-L: BTJ2 LVD1 Control Connections (J23)

Pin Number	Signal Name	Description
1	LVD_NO	Form-C output (Note 1)
2	LVD_C	Form-C output (Note 1)
3	LVD_NC	Form-C output (Note 1)
4	Coil +	Controlled +24V to contactor coil
5	Maint RTN	Current limited +24 Volts for Maint alarm
6	Maint IN	Maintenance alarm input
7	LVD1 RTN	Current limited +24 volts for LVD1 state (LVD open alarm)
8	LVD1 State	

Note 1: These outputs are selected if J15-17 are jumpered in the 2-3 position.

J4 – LVD2 control: Table 2-M lists pin numbers and signal names for the 10 pin Molex connector J4.

Table 2-M: BTJ2 LVD2 Control Connections (J4)

Pin Number	Signal Name
1	LVD2_NC
2	LVD2_C
3	LVD2_NO
4	NC
5	LVD2_ST
6	NC
7	NC
8	NC
9	NC
10	NC

J5: Not used.

J6: Table 2-N lists office alarm outputs on connector J6.

Table 2-N: BTJ2 Office Alarm Relay Output Terminations (J6)

Alarm	Description	Termination
PMJ NO	Power Major Normally open	J6-1
PMJ RTN	Power Major Return	J6-2
PMJ NC	Power Major Normally closed	J6-3
PMN NO	Power Minor Normally open	J6-4
PMN RTN	Power Minor Return	J6-5
PMN NC	Power Minor Normally closed	J6-6
BD NO	Battery on Discharge Normally open	J6-7
BD RTN	Battery on Discharge Return	J6-8
BD NC	Battery on Discharge Normally closed	J6-9
MJF NO	Major Fuse Normally open	J6-10
MJF RTN	Major Fuse Return	J6-11
MJF NC	Major Fuse Normally closed	J6-12
2ACF NO	Multiple AC Fail Normally open	J6-14
2ACF RTN	Multiple AC Fail Return	J6-15
2ACF NC	Multiple AC Fail Normally closed	J6-16
ACF NO	Single AC Fail Normally open	J6-22
ACF RTN	Single AC Fail Return	J6-23
ACF RTN	Single AC Fail Normally closed	J6-24

J27 – AMJ (Bat Fuse): Requires a closure between pin 1 and 2 to activate alarm.

J28 – FAJ (Dist): Requires a positive bus voltage at pin 1 to activate alarm. Pin 1 connects to J2 pin 1 of the alarm board, which provides this alarm signal. The input to the alarm board is from the load circuit breakers.

J28: Pin 3 provides DG connection to the alarm board. This DG connection provides DG for alarm board LED operation. Pin 2 is a current limited (50-ma) battery bus supply for possible future use.

J9-J12 Thermal Inputs: Table 2-O lists pin numbers and descriptions for these 6 pin Molex connectors.

Table 2-O: BTJ2 Thermal Input Connections (J9-J12)

Pin Number	Description
1	RTH ALM
2	NC
3	NC
4	RTHx +
5	RTHx RTN
6	RTHx EN

“x” is temperature probe number 1 through 4.

J13 – RS-232: Table 2-P lists pin numbers and descriptions for this 14 pin AMP connector.

Table 2-P: BTJ2 RS-232 Connections (J13)

Pin Number	Description
1	TXD
2	RTS
3	DTR
4	RXD
5	CTS
6	DSR
7	DCD
8	NC
9	MODEM GRN
10	MODEM YEL
11	DGND 100 ohm terminated
12	MODEM PRESENT
13	+5 Volts
14	DGND

J14 – Display: Table 2-Q lists pin numbers and descriptions for this 14 pin AMP connector.

Table 2-Q: BTJ2 Display Connections (J14)

Pin Number	Description
1	+5 Volts

Table 2-Q: BTJ2 Display Connections (J14)

Pin Number	Description
2	Display connected
3	DGND
4	Key Mon AE
5	Key Mon BE
6	Key Mon CE
7	Key Mon DE
8	Key Mon EE
9	KEYPRESS
10	DGND
11	NC
12	NC
13	MOSI
14	SCLK
15	DGND
16	LED SELECT
17	OUT ENABLE
18	DGND
19	PMJ LED
20	DGND
21	CNRL LED
22	DGND
23	NC
24	NC
25	Plant Voltage +
26	Plant Voltage -

3 *Operation*

Office Alarm Contacts

The basic Galaxy VC issues PMJ, PMN, MJF, BD, ACF and HV/2ACF office alarms off the BLJ3 Board. Refer to Table 2-G for a description of their output terminals. Refer to Table 3-A for a listing of the various available alarms and their mnemonics. Refer to Table 3-B for a listing of alarm relays and their associated front panel LEDs.

Alarm Descriptions

To see active alarms, press View Active Alarm key, then \wedge or \vee to page through alarms. A mnemonic abbreviation (MNEM) for each alarm is displayed on the BMW3 Control Panel. See Table 3-A. These mnemonics are given in parentheses () in the descriptions below.

NUM-1/Very Low Voltage Alarms and NUM-2/Battery on Discharge (LLO and bod)

When rectifier output is insufficient to maintain the load current at the set voltage (typically because of an ac power failure), the plant bus voltage will drop. When this voltage drops below the battery voltage, the batteries will start providing current to the load. Any time that the plant voltage is below the threshold selected for BD, the Battery on Discharge alarm (bod) activates. If the plant voltage continues to drop, a second, lower threshold can be reached, activating a Very Low Voltage alarm (LLO). Default values for these thresholds are set at the factory. These thresholds can be changed by the operator in the configuration mode as described in the Installation and Configuration section of this manual (Section 4).

Note that a BD alarm does not necessarily mean that the batteries are discharging, only that the present voltage is lower than the

Table 3-A: Alarm Identification

NUM	ID	MNEM	Description	Alarm Status	BMW LED	BIC/BLJ Relay
0	nonE	nonE	No Active Alarms Present	Norm	None	None
1	LLO	LLO	Very Low Voltage	Major	BATT	None
2	bod	bod	Battery on Discharge	Major	BD	BD
3	HFO	HFO	High Float Voltage	Minor	RECT	None
4	HO	HO	High Voltage	Major	RECT	HV
5	SEnS	SEnS	Voltage Sense Fuse Alarm	Major	CTRL	None
6	ACF	ACF	AC Fail	Minor	AC	ACF
7	nACF	nACF	Multiple AC Fail	Major	AC	ACF
8	rFA	rFA	Rectifier Fail	Minor	RECT	None
9	nrFA	nrFA	Multiple Rectifier Fail	Major	RECT	None
10	rid	rid	Invalid Rectifier ID	Major	RECT	None
11	rOFF	rOFF	Rectifier Manual Off Alarm	Minor	RECT	None
12	rPHA	rPHA	Rectifier Phase Alarm	Minor	AC	None
13	CFA	CFA	Converter Fail	Minor	RECT	None
14	nCFA	nCFA	Multiple Converter Fail	Major	RECT	None
15	Cid	Cid	Invalid Converter ID	Minor	RECT	None
16	CdSt	CdSt	Converter Distribution Alarm	Major	DIST	MJF
17	CFn	CFn	Converter Fan Minor	Minor	RECT	None
18	CFJ	CFJ	Converter Fan Major	Major	RECT	None
19	FAJ	FAJ	Major Fuse	Major	DIST	MJF
20	AUJ	AUJ	Auxiliary Major	Major	None	None
21	LSb	LSb	Load Share Imbalance	Minor	RECT	None
22	C1O	C1O	Contactors 1 Open	Major	BATT/DIST	None
23	C1F	C1F	Contactors 1 Failed	Major	BATT/DIST	None
24	C2O	C2O	Contactors 2 Open	Major	BATT/DIST	None
25	C2F	C2F	Contactors 2 Failed	Major	BATT/DIST	None
26	btA	btA	Battery Thermal Alarm	Major	BATT	None
27	tPA	tPA	Temperature Probe Failure	Minor	CTRL	None
28	OCOn	OCOn	Open Connection Alarm	Major	CTRL	None

Table 3-B: Office Alarm Relays and Front Panel LEDs

Asserted Condition	Alarm Relays	Front Panel LEDs
High voltage [HV]	PMJE, HV	RECT (yellow), MAJ (red)
High float voltage [HFV]	PMNE	RECT (yellow), MIN (yellow)
Battery on discharge [BD]	PMJE, BD	ACO (red), MAJ (red)
Very low voltage [VLV]	PMJE	RECT (yellow), MAJ (red)
Single ac fail [ACF]	PMNE, ACF	AC (yellow), MIN (yellow)
Multiple ac fail [MACF]	PMJE, ACF	AC (yellow), MAJ (red)
Single rectifier fail [RFA]	PMNE	RECT (yellow), MIN (yellow)
Multiple rectifier fail [MRFA]	PMJE	RECT (yellow), MAJ (red)
Single converter fail [CFA]	PMNE	RECT (yellow), MIN (yellow)
Multiple converter fail [MCFA]	PMJE	RECT (yellow), MAJ (red)
Major fuse (Controller, FAJ input) [MJF]	PMJE, MJF	DIST (yellow), MAJ (red)
Low voltage battery disconnect [LVBD]	PMJE	BATT (yellow), MAJ (red)
Low voltage load disconnect [LVLD]	PMJE	DIST (yellow), MAJ (red)
LVD1 fail [LVDA]	PMJE	DIST (yellow), MAJ (red)
LVD2 fail [LVDA]	PMJE	DIST (yellow), MAJ (red)
Controller fail [CTLR]	PMJE	CTLR (yellow), MAJ (red)
Slope thermal compensation active		STC (yellow)
Defective battery temperature probe [TPA]	PMNE	CTLR (yellow), MIN (yellow)
Voltage sense fuse alarm	PMJE	CTLR (yellow), MAJ (red)
Rectifier manual off alarm	PMNE	RECT (yellow), MIN (yellow)
Rectifier phase alarm	PMNE	RECT (yellow), MIN (yellow)
Rectifier half power alarm	PMNE	RECT (yellow), MIN (yellow)
Auxiliary major alarm	PMJE	MAJ (red)
Battery thermal alarm	PMJE	BATT (yellow), MAJ (red)
Controller unpowered	PMJE, PMNE, MJF, BD, ACF, HV	
Connector open	PMJE, PMNE	CTLR (yellow), MAJ (red)
Alarm cut off		ACO (yellow)
Display volts		VOLT (yellow)
Display amps		AMPS (yellow)

set point for this alarm. This alarm may be activated by an incorrectly set BD threshold or plant voltage set point. Following the restoration of ac power after a battery discharge of significant depth, this alarm will remain active for some time during the recharge period, until the batteries have recharged to a level which allows the plant voltage to rise above the BD threshold.

BD threshold default is set at 25.54V standard (Flexent 25.0V) in 24V systems and 51.1V in 48V systems with slope thermal compensation disabled. In systems with slope thermal compensation, the BD threshold should be 0.5V below the slope upper temperature voltage for 24V systems and 1.0V below the slope upper temperature voltage for 48V systems where slope upper temperature = FSP - (number of cells) [(btut -btnt) btus]. See Table 4-A and Figure 3-1. These levels generally avoid nuisance alarms from transient conditions yet provide alarm indications early in a true BD event, so that sufficient time is provided for maintenance personnel to respond before battery reserve is exhausted. VLV should be activated towards the end of the battery reserve voltage to indicate a critical service condition.

NUM-3/High Float Voltage Alarm (HFO) and NUM-4/High Voltage Alarm (HO) and Shutdown

Because of the importance of protecting the batteries and load from overvoltage conditions, three high voltage thresholds are provided. Two are controlled by the Galaxy VC and one backup threshold is hard-wired into Lucent rectifiers. The two lowest thresholds (HFO) and (HO) are preset at the factory but can be adjusted through the control panel or remotely. The third threshold (ISHVSD) is generated by the controller by adding 1.50V to the (HO) threshold. This value is then transmitted to the rectifier and stored. Each rectifier compares its own output voltage to this threshold value and initiates internal shutdown if the value is exceeded. “High Voltage” and “High Float Voltage” are set in the Galaxy VC in the Configuration mode. See Section 4, Installation, Configuration and Operation. Table 4-A lists the default values.

The Galaxy VC is equipped to detect a high voltage condition on the plant bus. Such a high voltage condition may typically be caused by lightning-induced transients on the commercial ac or a rectifier failure may cause an individual rectifier to go high. To prevent a high voltage condition from damaging the connected load, the VC also sends a signal for the rectifiers to shut down if the plant voltage goes above a second threshold.

When the plant voltage increases above the threshold for “High Float Voltage,” it issues the High Float Voltage alarm (HFO) as a minor. If the voltage continues to rise and reaches the threshold for “High Voltage,” that alarm (HO) is issued as a major and a shutdown signal is issued simultaneously to the plant rectifiers.

Any rectifier which is producing at least 10% of its rated capacity and is 10% over the average of all rectifier outputs in the plant, will respond to this shutdown signal by shutting down with a RFA or ALM condition active and reported back to the VC. A restart attempt initiated by the controller will occur 4 seconds after the controller receives the RFA signal from the rectifier. The rectifier then attempts to restart three times. During the restart sequence, the rectifier, recognizing that its output current exceeds the average rectifier current, will shut down and try again up to three times.

For plants with the battery thermal lower temperature compensation disabled, the High Float Voltage threshold is usually set approximately 0.75V above float for a 48V plant and 0.5V above float for a 24V plant. High Voltage shutdown threshold is then usually set approximately 2.5V above float for a 48V plant and 1.0V above float for a 24V plant. In plants with battery thermal lower temperature compensation enabled, the High Float Voltage threshold is usually set approximately 0.8V above the maximum voltage due to low temperature in a 48V plant and 0.5V in a 24V plant.

High Voltage (HO) shutdown is usually 0.5V above the High Float Voltage threshold for 48V plants and 0.25V above the High Float Voltage threshold in 24V plants. Like the BD and VLV thresholds, these are set in the Galaxy VC in the configuration mode as described in the Installation, Configuration and Operation section of this manual (Section 4).

NUM-5/Voltage Sense Fuse Alarms (SEnS)

A lack of voltage on the Vsense +/- pair to the Vector Controller as a result of a broken connection or a blown fuse while the VC is still powered results in a Voltage Sense Fuse alarm (SEnS) and a displayed voltage of 16.xx volts.

Sanity Fail in the Galaxy VC microprocessor or loss of power to the VC result in operation of the PMJ alarm. This PMJ defaults to the alarm state if the VC is removed from the BLJ3.

NUM-6/AC Fail and NUM-7/Multiple AC Fail Alarms (ACF and nACF)

If the proper ac input voltage is not available to any plant rectifier which is connected to the serial rectifier bus, an AC Fail alarm (ACF) activates as a PMN. More than one ACF results in

a Multiple AC Fail alarm (nACF), changing this alarm status to a PMJ.

NUM-8/Rectifier Failure and NUM-9/Multiple Rectifier Failure Alarms (rFA and nrFA)

Various rectifier failure modes cause a rectifier failure signal to be issued to the controller, such as high voltage, temperature over threshold, fan failure, and rectifier circuit breaker/fuse open. Additionally, when rectifiers are removed or fail to communicate with the VC, a RFA alarm is generated. This RFA alarm is cleared by setting the USL parameter to 1 (see Configuration, Section 4). The RFA signal results in a RFA alarm (rFA) and Power Minor alarm being issued by the VC. More than one RFA at any time results in a Multiple Rectifier Failure alarm (nrFA) and Power Major. The VC does not attempt restarts for RFAs caused by TA (Thermal Alarm), CB/fuse trip, or Fan Failure.

NUM-10/Rectifier ID (rid) alarm

This alarm occurs when rectifier ID numbers are duplicated or are zero. Refer to the rectifier manuals for setting and viewing the rectifier ID numbers.

NUM-11/Rectifier Manual Off alarm (rOFF)

Whenever the rectifier is manually turned to standby, this alarm will occur. A switch on the front panel for each rectifier allows the user to manually turn the rectifier on or standby. When the switch is in standby position, the rOFF alarm is on.

NUM12/Rectifier Phase alarm (rPHA)

This alarm is for multiphase rectifier. When AC is lost in one or more phase but not all phases, this alarm (rHPA) occurs.

NUM-13/Converter Failure and NUM-14/Multiple Converter Failure alarm (CFA and nCFA)

Converter failure alarms are generated for various reasons. These include failure in the converter, the converter is removed, the converter interface board is removed, or communication is lost with the converter interface board. The removed CFA is cleared by setting the USL parameter to 1 (see Configuration, Section 4).

NUM-15/Converter ID (Cid) alarm

This alarm occurs when converter ID numbers are other than 1 through 8, or are duplicated. Refer to the converter section of the plant manual for setting and viewing ID numbers.

NUM-16/Converter Distribution alarm (CdSt)

Any fuse or breaker open at the converter output side (-48v distribution) will cause this alarm.

NUM-17/Converter Fan Minor (CFn) and NUM-18/ Converter Fan Major (CFJ)

The converter carrier 597B has two fans. If one fan in a carrier fails, the controller reports a Converter Fan Minor alarm. If both fans fail, the controller reports a Converter Fan Major alarm.

NUM-19/Major and NUM-20/Auxiliary Fuse Alarms (FAJ, AUJ and AUn)

To create an alarm, the input must be connected to Bat. This battery voltage typically will have a series 1K ohm resistor between Bat and alarm input.

The operation of an output distribution fuse or circuit breaker places battery voltage onto the FAJ of the BLJ3 board, activating the Major Fuse alarm (FAJ).

Auxiliary Major (AUJ) can be user-assigned for any supplemental alarm monitoring for which a battery voltage signal (through 1K ohms) can be obtained, which is asserted by a signal to the AMJ terminal on the BLJ3 board.

Auxiliary Minor (AUn) can be user-assigned for any supplemental alarm monitoring for which a battery voltage signal (through 1K ohms) can be obtained, which is asserted by a signal to the AMN terminal on the BLJ3 board.

NUM-21/Load Share Balance Alarm (LSb)

This alarm is generated when the current share function is enabled and the rectifiers do not share the current equally or within the current share boundaries. The controller monitors the current (I_{rect}) delivered by each of the rectifiers and determines the total current delivered by the plant as the sum of all rectifier

currents. The average rectifier current (I_{avg}) is calculated by dividing the total current by the number of active rectifiers in the plant. If, for any rectifier, actual rectifier current I_{rect} is different from the average rectifier current I_{avg} by 10A or more for 5 minutes, then the controller will issue a Rectifier Current Imbalance Alarm (LSb). This alarm will retire when the difference between the I_{rect} and I_{avg} drops below 10A.

NUM-22/Contactor 1 Open, NUM-24/Contactor 2 Open, NUM-23/Contactor 1 Failure, NUM-25/Contactor 2 Failure alarm (C1O, C2O, C1F, C2F)

A Contactor Open alarm (C1O or C2O) is reported whenever the Galaxy VC senses that a contactor is open. This alarm is processed by the VC as a PMJ.

A Contactor Fail alarm (C1F or C2F) is reported whenever the Galaxy VC senses that a contactor that should be open or closed is in the opposite state (closed or open). This alarm is also processed as a PMJ.

**NUM-26/Battery Thermal Alarms (btA)
NUM-27/Temperature Probe Failure (tPA)**

See Figure 3-1. Galaxy VC reports a Battery Thermal Alarm (btA) when the temperature rises above the configured set point. See Section 4, "Installation, Configuration and Operation," for information on battery thermal compensation settings. Galaxy VC reports a Thermal Probe Alarm (tPA) when thermal compensation is enabled and a temperature probe is disconnected or returns a grossly inaccurate reading to the Thermal Compensation circuit.

NUM-28/Open Connection Alarm (OCOn)

Input Number 4 (MAINT) of the BLJ3 terminal connection board should be connected to battery voltage during normal operating conditions. This connection may be looped through one or more circuit packs so that if the connection path is interrupted, the Open Connection Alarm (OCOn) is activated.

Plant Features

Load and Battery Contactor Features and Alarms

The Galaxy VC has two distinct circuits for controlling the state of external Load and Battery Disconnect Contactors. Terminal LVD1 and LVD2 on the BLJ3 board provide the interface from the VC to separate contactor driver circuits which must be furnished as part of the plant circuitry.

Each contactor can be configured as none, load, or battery.

When configured as a battery contactor:

- The contactor is open when the plant voltage is less than the respective low voltage battery disconnect threshold.
- The contactor is closed when the plant voltage is greater than the respective low voltage battery reconnect threshold. At power up, the contactor is closed and there is an 18 second delay before the controller determines the correct state of the contactor.

When configured as a load contactor:

- The contactor is open when the plant voltage is less than the respective low voltage load disconnect threshold.
- The contactor is closed when the plant voltage is greater than the respective low voltage load reconnect threshold. Additionally, there must be no active ac failure and rectifier phase alarms, since the load would immediately disconnect after reconnecting. At power up, there is an 18-second delay before the load is reconnected to allow the rectifiers to walk in.

Refer to the Alarm Descriptions section for alarms associated with these two contactors (Contactor Open and Contactor Fail).

Refer to the associated plant documentation for information on connecting these Load and Battery Disconnect driver circuits to the BLJ3 terminal connection board.

Thermal Compensation Features and Alarms

The Galaxy VC has a flexible Thermal Compensation feature which provides voltage compensation from that level established by the Plant Float Set-Point (FSP), dependent on the

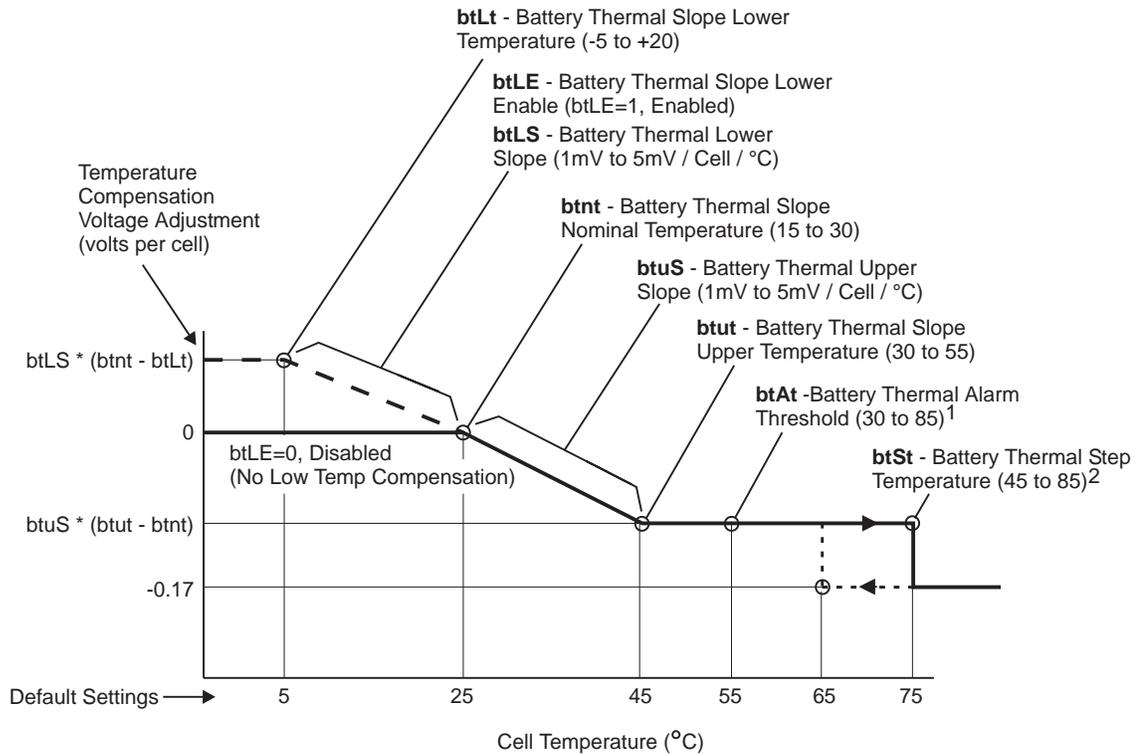
highest temperature monitored by thermistors located at the plant batteries. Thermal Compensation should only be enabled when the VC is used in a plant containing “sealed” or valve regulated “maintenance free” batteries. This feature requires the use of external thermistors at the plant batteries to monitor cell temperatures. Refer to the Installation section for more details on wiring and configuring this feature.

Thermal Compensation lowers plant voltage from the FSP for monitored battery temperatures which are above the ideal temperature established during configuration as the Battery Thermal Slope Nominal Temperature (btnt). Lowering the plant voltage helps to keep the batteries at their optimum state of charge while protecting them from thermal runaway. Thermal runaway is a complex sealed battery phenomenon where, for one or more of a number of reasons, one or more cells in a string are unable to dissipate the internal heat generated by their charging current and experience an increase in internal temperature. By lowering the float voltage as cell temperature increases, the float current is lowered to a point where this destructive behavior can be avoided. If a cell failure is imminent and the cell temperature continues to rise above the threshold configured for Battery Thermal Step Temperature (btSt), plant voltage drops in a single step to a level which keeps from overcharging the remaining cells in the string and damaging them also. Refer to Figure 3-1 for a graphical view of Battery Thermal Compensation and the relationship of its various set points. Figure 3-2 shows the same information for the Flexent system.

Refer to the Alarm Descriptions section for the Battery Thermal Alarm and Temperature Probe Failure Alarm.

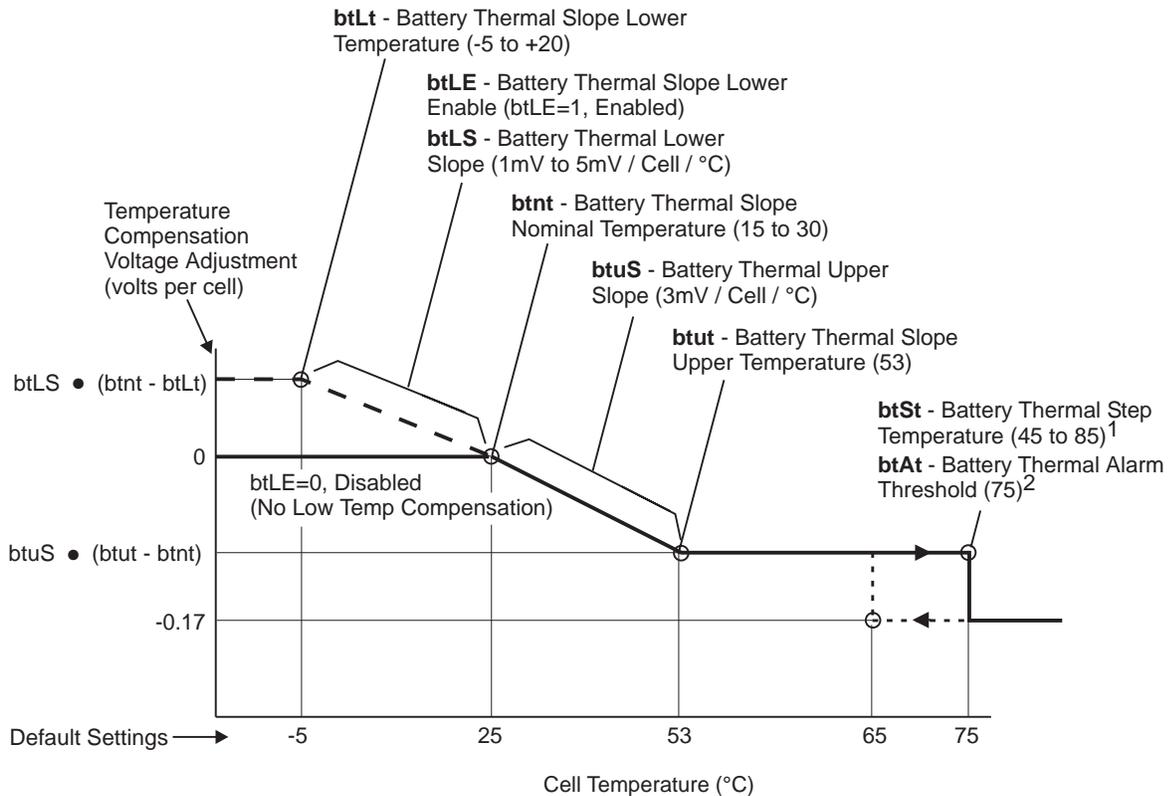
The Galaxy VC can also increase plant voltage above that set by the FSP for colder environments, again seeking to keep batteries in such an environment at their optimum charge state. Since this feature results in an increase in plant voltage, it is activated

through a second enable switch during configuration. Again, refer to Figure 3-1 or 3-2.



1. The Battery Thermal Alarm occurs when the temperature rises above the btAt set point. It retires when the temperature decreases to 10 °C below the btAt set point (45 °C default).
2. Plant voltage decreases 0.17 volts per cell when the temperature increases above the btSt set point. It is increased 0.17 volts per cell when the temperature decreases to 10 °C below the btSt set point, as indicated by the dashed line (65 °C default).

Figure 3-1: Battery Thermal Compensation set points (standard)



1. Plant voltage decreases 0.17 volts per cell when the temperature increases above the btSt set point. It is increased 0.17 volts per cell when the temperature decreases to 10 °C below the btSt set point, as indicated by the dashed line (65 °C default).
2. The Battery Thermal Alarm occurs when the temperature rises above the btAt set point. It retires when the temperature decreases to 10 °C below the btAt set point (65 °C default).

Figure 3-2: Battery Thermal Compensation set points (Flexent)

Note: Any time that Battery Thermal Compensation is actively changing the plant voltage above or below that set by the FSP parameter during configuration, the green Thermal Compensation LED of the Display will be active. This is not an alarm condition, only an indication to the user that plant voltage is different than that set by the FSP parameter.

Rectifier Sequencing

Rectifier Sequencing is a feature which allows the VC to bring the plant rectifiers back on line one at a time following an ac power interruption. This serves to minimize their impact on the

ac service, especially useful in avoiding loading down an emergency generator with an inrush surge.

The Reserve Operation (RO) engine signal (closure) notifies the VC that a backup engine is supplying stable ac power to the rectifiers. A certain number of rectifiers will be started in sequence. The number of rectifiers, which should be on in engine condition, is configurable. Refer to section 4 for detail. The number of ON rectifiers is usually determined by the capacity of the engine.

When a rectifier reports an ACF to the VC, the VC places that rectifier into standby. As rectifiers report good ac, they are turned on at 1 second intervals. When the VC senses RO signal, it pauses 10 seconds and starts the configured number of rectifiers at 1 second interval.

While RO is active, the VC will maintain the configured number of rectifiers on. When RO retires, the VC turns the remaining rectifiers on at 1 second interval.

Shunt Types and Sizes

The VC provides three separate methods and up to two separate shunt signals for use in determining the plant current to display when AMPS is selected on the BMW3 Front Display. The 2 shunt signals used connect to the BLJ3 board SH1+,- and SH2+,- as shown in Figure 2-2, and are 50 mV signals in the range of 0-9999 amps. Refer to the configuration section of this manual for additional details.

Float Mode Controls and Thresholds

Float mode is the default mode of operation and is active if the Boost mode LED is not active on the BMW3 Display. Plant voltage, while in Float mode, is determined by the configuration parameter Plant Float Set Point (FSP), and may be adjusted by the Battery Thermal Compensation circuit, if enabled. There is no individual adjustment of plant rectifiers in this digital serial bus interface arrangement. Load share among plant rectifiers is automatic in all plant modes and will take effect within several seconds of a new rectifier being added to the bus and turned on.

The FSP chosen should correspond to the battery type used and the battery manufacturer's recommendations. For example, Lucent Technologies KS20472 Round Cell (flooded) battery

floats at 2.17 volts per cell (VPC). A 12 cell, 24V plant would therefore have a FSP of $2.17 \times 12 = 26.04\text{V}$. The Lucent Technologies KS23619 Enhanced VR (Valve regulated) battery floats at 2.27 VPC, if Battery Thermal Compensation is enabled or 2.25 VPC if used without Battery Thermal Compensation. A 12 cell, 24V plant using this battery would have a desired FSP of $2.27 \times 12 = 27.24\text{V}$ with or $2.25 \times 12 = 27.00\text{V}$ without Battery Thermal compensation.

Rectifier Current Limit in Float mode (FCL) is an adjustable configuration parameter from 30% to 110% of rectifier capacity. This parameter can be important in limiting the recharge current available following a deep discharge in a plant using a “sealed” or valve-regulated battery type to a level which is safe for that battery and not cause unnecessary internal pressure buildup and venting. Typically, this maximum safe recharge rate for “sealed” or valve-regulated battery types in the industry is in the range of 1/10 of the 8 or 10 hour rating. Refer to your specific battery manufacturer for recommendations regarding the battery type used. The following typical example shows the use of the FCL feature to maintain the maximum recharge rate decided upon.

Consider a plant with three strings of 2VR375E Lucent Technologies KS23619 Enhanced VR Series batteries, four 100A rectifiers and a 200 amp typical load. When ac power returns following a significant discharge, 200 amps will be available for recharging these batteries, a rate of 67A per string (200A / 3 strings). Recharge should be limited to approximately 40A per string (1/10 of 375) however, reducing the possibility of venting and life depreciation of the batteries. Calculate current limit for limiting recharge to 40A per string as follows:

$$\text{CL} = [\text{Plant Load} + (\text{Max Recharge per String} \times \# \text{ Strings}) / (\text{Rect Cap} \times \# \text{ Rect})] \times 100$$

$$\text{CL} = [200 + (40 \times 3) / (100 \times 4)] \times 100$$

$$\text{CL} = [(200 + 120) / 400] \times 100$$

$$\text{CL} = (320 / 400) \times 100 = 80\%$$

Check for N + 1 redundancy with this CL value with the following statement:

$$\text{Plant Load} < [\text{Rect Cap} \times (\# \text{ Rect} - 1) \times \text{CL}] / 100$$

$$200 < [100 \times (4 - 1) \times 80] / 100$$

$$200 < [(100 \times 3) \times 80] / 100$$

$$200 < (300 \times 80) / 100$$

$$200 < 240$$

Float mode adjustments are also available for High Float Voltage Float Threshold (FHFO) which activates the High Float Voltage (alarm only) minor when exceeded and the High Voltage Float threshold (FHO) which activates the High Voltage major alarm and rectifier shutdown. Battery on Discharge Float Threshold (Fbd) and Very Low Voltage Threshold (LLO) are additional Float mode configuration parameters. Refer to the Alarm Descriptions section for additional information regarding these alarms.

***Battery Recharge
Current limit***

The battery recharge current limit feature enables the Vector Controller to limit the recharge current flowing into a battery section during the charge cycle. This feature is available only in plants that have at least one battery shunt to monitor the battery current. It can be enabled or disabled using the front panel display or EasyView[®] Interface. The recharge current flowing into the battery section can be limited to any value between 10 and 1000A.

The Vector Controller can monitor up to two shunts connected to two battery sections, each battery section can contain one or more battery strings. The controller will limit the current flowing through the shunts thereby limiting the charging current into the batteries. This feature will not have any impact on the discharge current flowing from the battery. The controller will maintain the recharge current within 10% of the set level.

***Battery Discharge
Test***

The purpose of the test is to verify the battery capacity connected to the plant. The reserve time can be predicted after the test and stored in the memory for future retrieval. By discharging about 20% of the battery capacity, the controller can predict the total reserve time if 100% battery capacity will be discharged at the same load condition.

This function can be enabled in the configuration process by setting bdtE to "1." Refer to section 4 for detail. If the function

is enabled, this test can be activated by manually pressing the Battery Test button on the BMW3 control panel. Pressing the Battery Test button again during the test will abort the test.

After pressing the Battery Test button, use the up (^) and down (v) arrow keys to select either “0” for flooded battery or “1” for sealed battery. Press Battery Test again to start the test. The factory default is “1” for sealed or valve regulated batteries. However, the next test will use the previous battery selection as default.

During the test, rectifiers are set at a lower voltage. The set voltage is $\text{MAX}\{\text{LVD1 threshold} + \Delta\text{V}; \text{LVD2 threshold} + \Delta\text{V}; \text{EDV}\}$, where $\text{EDV} = 22\text{V}$ for 24V plant and 44V for 48V plant, $\Delta\text{V} = 0.6\text{V}$ for 24V plant and 1.2V for 48 plant. The plant mode will returned to float mode automatically if this set voltage is reached during the test.

The test will stop automatically whether it is successful or not. If it is successful, an error code “0” is stored. Otherwise, a negative number will be stored as an error code, such as -1, -2 and -3. Refer to the configuration process in section 4. During the test, the Batt Test LED will light. Any alarm occurring during the test will abort the test, and cause the plant to return to float mode.

The test results, error code, battery reserve time and load current, will be stored in memory. User can retrieve them under the configuration menu. Refer to the configuration process in Section 4.

Boost Mode Controls and Thresholds

Boost mode is a feature of the Galaxy VC which allows the user to temporarily raise the plant voltage to a higher, predetermined level for a specified period of time. This feature may be useful in plants using a flooded battery type where the batteries are displaying symptoms of an undercharged state such as differing cell voltages or in the case of the Lucent Technologies KS20472 Round Cell, lead-sulfate crystals visible on the vertical positive plate columns. Boost mode may also be used to accelerate the recharge of discharged strings to their full charge condition.

Plant voltage, while in Boost mode, is determined by the configuration parameter Plant Boost Set- Point (bSP). Refer to “Plant Boost Mode Settings” in Section 4. Like Float mode,

there is no individual adjustment of plant rectifiers and load share among plant rectifiers is automatic.

Boost voltage (bSP) is again determined from the battery manufacturer's recommendations, but must also be less than the maximum voltage rating of all connected loads since Boost Mode raises the entire plant bus voltage. Typical boost levels and durations used might include 2.25 VPC for 96 hours, 2.27 VPC for 72 hours, or 2.30 VPC for 48 hours. **Do not exceed the maximum voltage rating of any connected load.**

Boost is typically not used with "sealed" or valve regulated battery types or is completed at significantly lower levels than that of flooded battery design to avoid the build up of pressure and venting noted under the Float mode section on Float Current Limit. When Boost mode is disabled under configuration, the Float/Boost switch and Boost LEDs on the BMW3 Display are disabled.

Once enabled, Boost mode is entered by pressing the Float/Boost switch on the BMW3 Display while in Float mode. The Boost LED will blink and the present Boost duration will be displayed in hours. This Boost duration can be edited with 0 and 24 hour minimum and maximum values (0 = forever) and Boost mode initiated by pressing ENTER at this point. Pressing ESCAPE prior to initiating Boost returns the display to the default Voltage Display mode without placing the plant into Boost mode. Once Boost is initiated, the VC can be returned to Float mode by pressing the Float/Boost switch again. If a High Voltage, High Float Voltage or RFA alarm occurs in Boost mode, the plant will return immediately to Float mode. AC Fail and Phase Fail alarms will not affect Boost mode.

Boost mode has its own configuration parameters for Rectifier Boost Current Limit (bCL), High Float Voltage Boost Threshold (bHFO), and High Voltage Boost Threshold (bHO), all of which control these respective features and alarms whenever Boost mode is active.

Auto Timed Boost

The plant will go into Boost mode automatically if the following conditions occur:

- Boost is enabled (bEn is 1)

- Autoboot factor (bAF is not 0). The autoboot is disabled when set at 0, but when enabled the autoboot factor can range from 1 to 9.
- A battery on discharge alarm occurs with AC Failure alarms, or rectifier phase alarms occur for at least four minutes.

When all rectifier phase and AC Failure alarms retire, the plant automatically goes into boost mode.

The duration of the boost period will be BD and AC Failure or Phase alarm duration multiplied by the autoboot factor. The maximum boost duration is limited to 24 hours.

If AC Failure alarms and Phase alarms are asserted while the plant is in autoboot mode, the plant re-enters float mode, retaining the remaining boost duration. If the Battery on Discharge (BD) alarm asserts while the AC Failure or phase alarm is active, the new multiplied time will be added to the boost duration. When the AC Failure and Phase alarms retire, the plant re-enters the boost mode for the remaining boost duration.

During autoboot, if the plant has a High Voltage, High Float Voltage, or RFA alarm, the plant returns to float mode and the remaining autoboot time is cancelled.

***Plant Generator/
Battery Test
(PBT)***

Plant Battery Test is a feature that is available with the Vector controller. When the controller receives an external PBT signal, it resets all the rectifier output voltages to 22V and performs a Battery Discharge test. BD LED blinks during this test. The plant returns to float mode after the PBT retires or after the Discharge Test is finished.

The controller does not reset the output voltage to 22V, even if the PBT signal is asserted, if there are any active major alarms or if the serial communication alarm is active. If any major alarm occurs during the test, the plant recovers to float mode and sets all rectifiers back to previous float setting.

***Remote Access
and Monitoring***

The Vector controller offers a local and remote (modem) access capability to communicate and configure a limited set of features using personal computers. It is possible to communicate with the Vector controller by two means:

1. By using any ANSI (American National Standards Institute) character-based terminal including terminal emulators. The T1.317 command language is the human-to-machine interface used for this communication.
2. By using Galaxy EasyView, which combines both a communications package and a user friendly Microsoft Windows interface.

The Vector controller provides one remote access port. It may be accessed remotely or from a terminal device. The port interfaces with a remote access interface card (BSM3) that provides modem and RS-232 access.

Once logged into the controller, users type in commands to access measurements, configuration and control parameters in the system. The command line interface used for incoming connections is a version of T1.317 adapted for low end controllers. Two levels of security, User and Super-user, are provided to protect incoming access and to prevent any unauthorized access.

The controller can be configured to dial out on alarm and dial out when all alarms are cleared using the internal modem. The port settings, configuration and command language used for remote access as well as the error messages is described in the Appendices A and B.

***Remote Rectifier
Standby***

The rectifiers can be placed in standby after accessing them through the local port or through a modem. Once the rectifier is placed in standby, it will automatically recover from this state when the plant voltage drops below the BD threshold level, when the active rectifiers cannot supply the plant demand.

***Dial-out On
Alarm***

This function requires the optional BSM3 modem card. See Appendix A for description. By default, the controller is configured not to dial-out at all. It can be configured to dial-out to a primary phone number or an alternate phone number, used if the controller fails connect to the primary phone number. The controller attempts to dial-out when an alarm occurs that it has not reported yet and when all alarms clear.

Phone numbers may be up to 25 characters long and may contain any of the following characters: 0123456789,()#* or space.

Configuring the phone numbers enables the controller to dial-out. The phone number must be the number of a modem. After the controller connects to the remote modem it will send an alarm report. The alarm report is the same report generated by the T1.317 “ala” command with addition of the site id at the beginning of the report.

When attempting to dial-out, the controller first attempts to dial the primary phone number. It makes up to three attempts, at 1-minute intervals, to connect to the primary phone number. If unsuccessful, the controller makes up to three attempts, at 1-minute intervals, to connect to the alternate phone number. If still unsuccessful, the controller waits for 15 minutes and then repeats this cycle. The controller attempts the cycle 6 times before giving up completely. If the controller successfully contacts either the primary or alternate phone number it sends the alarm report and then disconnects.

Whether or not the controller successfully connects with the primary or alternate phone number, it makes a new attempt to dial-out when a new alarm occurs or all active alarms clear.

The alarm report includes the site ID followed by all active alarms in the system or the message NO ALARMS if no alarms are active in the system.

must be completed. The installation of this circuitry is covered in the appropriate plant product manual. These connections are typically factory wired.

If the plant batteries are the “sealed” or maintenance free valve regulated type, Battery Thermal Compensation may be used. This feature requires 10K Ω thermistor devices. If more than four devices are needed, a 210E thermistor multiplexer may be used. The 210E must be wired into the BLJ3 RTH1+, EN1, RTN1, CG, RTH ALM, and RTH ALMR as shown in Figure 2-6. The installation of this equipment is covered in its respective product manual. These connections may be factory or field wired.

The Galaxy VC performs rectifier sequencing based on the state of the ACF alarms from the rectifiers and Rectifier RO (Reserve Operation engine) signal terminated at BLJ3 RO terminal. If this feature is to be used, complete this wiring as described in Section 3.

Thermistor input and alarm connections for the 210E thermistor multiplexer unit are shown in Figure 4-1 (BLJ3 board) and Figure 4-2 (BTJ2 board).

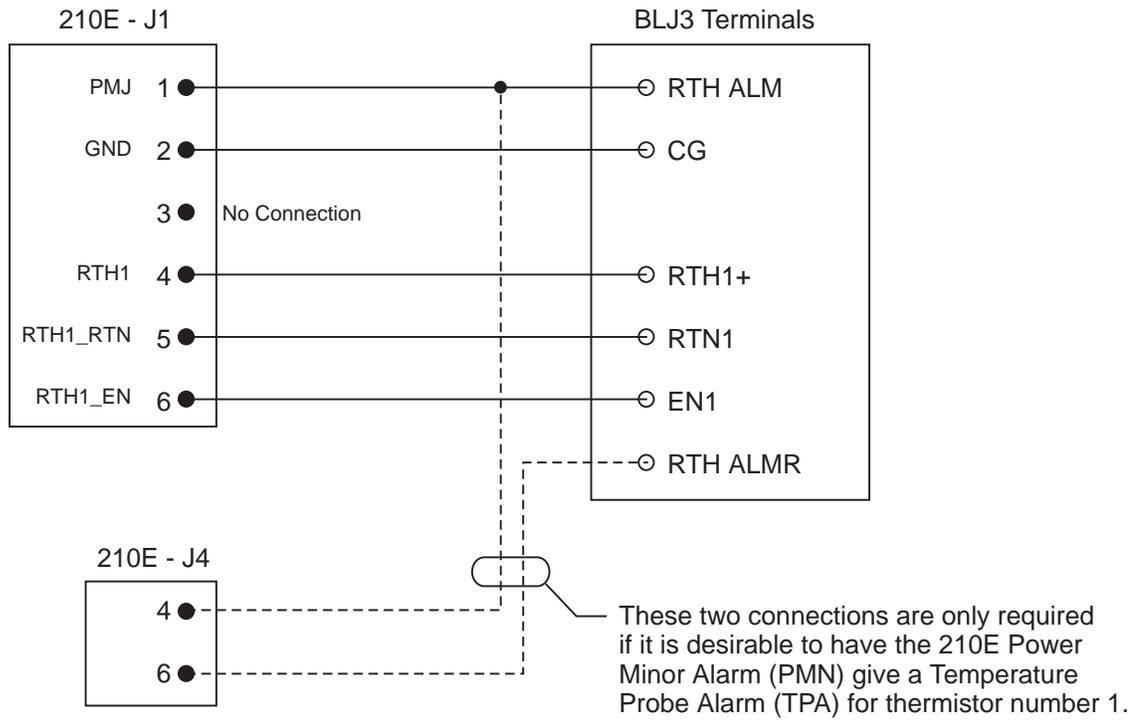


Figure 4-1: 210E thermistor multiplexer connections to BLJ3

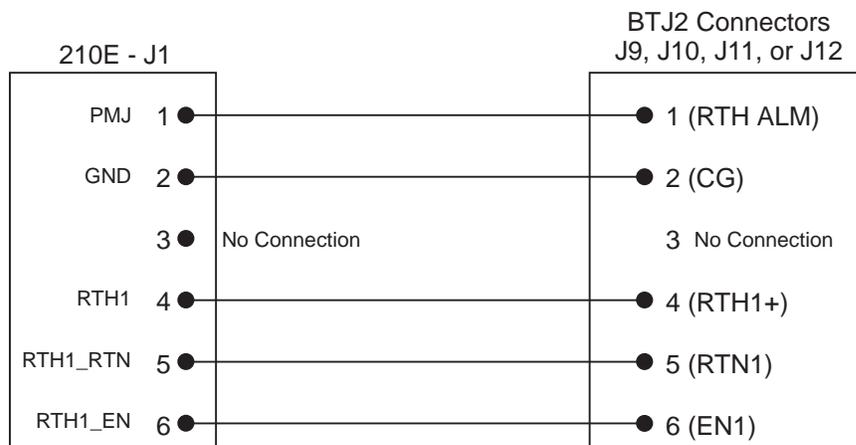


Figure 4-2: 210E thermistor multiplexer connections to BTJ2

Configuration

All rectifiers must be numbered uniquely. Valid numbers for rectifiers are 1 through 24. Refer to the appropriate sections of the plant manuals for setting ID numbers.

SW1 and Navigation of the BMW Display in Configuration Mode

SW1-1 of the BLJ3/BTJ2 board is a hardware enable switch for Configuration mode of the BMW3 Control Panel. If SW1-1 is not enabled (in position 1), the CONFIGURE switch of the display only permits the user to access and view the configuration parameters, but not to change any of them. To allow configuration changes, move SW1-1 to position 0. Once configuration has been completed, it is a good practice to disable (position 1) SW1-1 to prohibit someone from mistakenly changing these parameters.

Configuration mode is entered by pressing the CONFIGURE key while in the default Voltage Display mode. After entering this mode, the CONFIGURE LED will light and the first parameter of the configuration menu will be displayed. Refer to Table 4-A for a description of the parameters of the configuration menu. Note that two columns of default values are shown, for standard and Flexent applications. The defaults are determined by SW1-2.

Once in configuration mode, use either the + and - keys or the ^ and v keys to select a parameter to edit and the ENTER key to choose a parameter to edit. While in configuration mode, the CONFIGURE LED will blink. Use the < or > keys to select a digit in the displayed parameter to change and the + and - or ^ and v keys to increase or decrease the value of the selected digit. The DEFAULT key may also be used while editing a parameter to set it to its factory default, as defined in Table 4-A. If an attempt is made to set a parameter higher than allowable, the maximum value will be displayed. Likewise, an attempt to set a parameter lower than allowed results in display of the minimum value.

Table 4-A: Configuration Parameters

NUM	ID	MNEM	Description	Range	Default Settings	
					Standard	Flexent
1	bdtE	bdtR	Battery Discharge Test Results Error Code 0 : Test completed (new results) -1 : User aborted test (previous results) -2 : Alarm aborted test (previous results) -3 : Test failed (invalid results) Reserve Time ___ : Reserve time not available (test not run or test failed) hh.h : Reserve time in hours and tenths or hours Load _____ : Load not available (test not run or test failed) ddd : Load (amps) at beginning of test	Error Code Reserve Time Load	Error Code	Error Code
2	bdtE	bdtE	Battery Discharge Test Enable	0 to 1 (0=disable, 1=enable)	0	0
3	StYP	StYP	Shunt Type	0 to 2 (0=none, 1=plant, 2=battery)	2	2
4	SH1A	SH1A	Shunt 1 Size	0 to 9999A (0=disable, other=shunt rating)	800	1000
5	SH2A	SH2A	Shunt 2 Size	0 to 9999A (0=disable, other=shunt rating)	0	0
6	FSP	FSP	Plant Float Set Point	22 to 28V, 44 to 56V	27.24, 54.48	27.24
7	FCL	FCL	Rectifier Float Current Limit	30 to 110%	100	110
8	FHO	FHO	High Voltage Float Threshold	25 to 30V, 50 to 60V	28.24, 57	28.5
9	FHFO	FHFO	High Float Voltage Float Threshold	25 to 30V, 50 to 60V	27.74, 56	27.74
10	bd	bd	Battery on Discharge Threshold	23 to 27.5V, 46 to 55V	25.54, 51.1	25.0
11	LLO	LLO	Very Low Voltage Threshold	20 to 25.5V, 40 to 51V	23, 46	23.00
12	rCL	rCL	Battery Recharge Current Limit	10 to 1,000A	1,000A	1,000A
13	rCLE	rCLE	Battery Recharge Current Limit Enable	0 to 1 (0=disable, 1= enable)	0	0
14	btAt	btAt	Battery Thermal Alarm Threshold	30 to 85 Deg C	55	75°C
15	btSt	btSt	Battery Thermal Step Temperature	45 to 85 Deg C	75	75°C
16	btut	btut	Battery Thermal Slope Upper Temp	30 to 55 Deg C	45	53°C
17	btnt	btnt	Battery Thermal Slope Nominal Temp	15 to 30 Deg C	25	25°C
18	btLt	btLt	Battery Thermal Slope Lower Temp	-5 to 20 Deg C	0	-5°C
19	btuS	btuS	Battery Thermal Upper Slope Per Cell	1 to 5 mV/Deg C	3	3
20	btLS	btLS	Battery Thermal Lower Slope Per Cell	1 to 5 mV/Deg C	3	3
21	btLE	btLE	Battery Thermal Slope Lower Enable	0 to 1 (0=disable, 1=enable)	0	0
22	btEn	btEn	Battery Thermal Compensation Enable	0 to 1 (0=disable, 1=enable)	0	1

Table 4-A: Configuration Parameters (Continued)

NUM	ID	MNEM	Description	Range	Default Settings	
					Standard	Flexent
23		C1Ld	Contactors 1 Low V Disconnect Threshold	20 to 26V, 40 to 52V	21, 43.2	21.25
24		C1Lr	Contactors 1 Low V Reconnect Threshold	20 to 26V, 40 to 52V	22.2, 44.4	25
25		C1ty	Contactors 1 Type	0 to 2 (0=none, 1=load, 2=battery)	0	2
26		C2Ld	Contactors 2 Low V Disconnect Threshold	20 to 26V, 40 to 52V	21, 43.2	N/A
27		C2Lr	Contactors 2 Low V Reconnect Threshold	20 to 26V, 40 to 52V	22.2, 44.4	N/A
28		C2TY	Contactors 2 Type	0 to 2 (0=none, 1=load, 2=battery)	0	0
29		bSP	Boost Plant Set Point	24 to 30V, 48 to 60V	27.24, 55.2	N/A
30		bCL	Boost Rectifier Current Limit	30 to 110%	100	N/A
31		bHO	Boost High Voltage Threshold	26 to 30V, 52 to 60V	28.24, 57	N/A
32		bHFO	Boost High Float Voltage Threshold	25 to 30V, 50 to 60V	27.74, 56.2	N/A
33		bAF	Boost Auto Mode Factor	1 to 9 (1-9 times BD duration)	1	N/A
34		bAE	Boost Auto Mode Enable	0 to 1 (0=disable, 1=enable)	0	0
35		bEn	Boost Enable	0 to 1 (0=disable, 1=enable)	0	0
36		CSP	Converter Voltage Set-Point	46 to 57V	50	N/A
37		CLd	Converter Low V Disconnect Threshold	20 to 26V	21	N/A
38		CLr	Converter Low V Reconnect Threshold	20 to 26V	22.2	N/A
39		CLdE	Converter Low V Disconnect Enable	0 to 1 (0=disable, 1=enable)	0	N/A
40		CFPC	Converter Control Panel V Calibration	46 to 57V	Converter V	N/A
41		FPC	Control Panel Voltage Calibration	22-28V, 44 to 56V	Plant V	N/A
42		SH1C	Control Panel Shunt 1 Calibration	-9999 to 9999A	Shunt 1 A	N/A
43		SH2C	Control Panel Shunt 2 Calibration	-9999 to 9999A	Shunt 2 A	N/A
44		rOnE	Rectifiers On Engine	1 to 24	24, 1	24
45		USL	Update Serial Link and Clear Alarms	0 to 1 (0=do nothing, 1=update)	0	0
46		id	Identifiers Enable	0 to 1 (0=numeric, 1=alphanumeric)	1	1
47		rEL	Display Software Release			

To save changes made to a parameter value and return to the configure menu, press the ENTER key. To return to the configure menu without saving any changes to a parameter, press the ESCAPE key. To exit configuration mode and return to the default Voltage Display mode, press ESCAPE while viewing the configuration menu. If no key is pressed for 30 seconds, the display will return to the Voltage Display mode automatically.

Refer to Table 4-A as each of the Configuration Parameters is explained in the following sections.

**Battery Discharge
Test Results (bdtr)**

This is the record data (not manually changeable) for the battery test result. Refer to the battery discharge test operation for detail test procedure and results.

The default display is the error code in this field. “0” means the most recent test is successful and the new result (reserve time and load current during test) has been recorded. “-1” indicates that the most recent test has been aborted by user and the previous successful test result (reserve time and load current during test) is recorded. “-2” implies the most recent test has been aborted due to alarms and the previous successful result (reserve time and load current during test) is recorded. While “-3” indicates that the most recent test failed and no test result (reserve time and load current during test) is recorded.

By pressing the up and down keys, the user can view the battery reserve time. The battery reserve time is displayed in the form of hours and tenths of hours (hh.h) if test results are available.

By pressing the up and down keys again, the user can view the load current when the test started. The load current is displayed in the form of Amps without decimal point (dddd) if the test results are available. Otherwise, load current displayed here could be old or no load current display.

**Battery Discharge
Test Enable
(bdTE)**

Two settings are available, “1” or “0”. “1” means enable the battery discharge test and “0” means disable the battery discharge test. Press ENTER to save one of the two settings. When the test is enabled, the battery test key will be enabled. Otherwise, the battery test key is disabled.

**Shunt Type/Size
(StYP)**

Three separate methods and up to two separate shunt signals can be used for determining the plant current to display when AMPS is selected on the BMW3 Front Display. The two shunt signals, if used, connect to the BLJ3 SH1+,- and SH2+,- as shown in Figure 2-4, and are 50 mV signals in the range of 0-9999 amps.

The method used by the VC is determined by configuration parameter NUM-1, Shunt Type (StYP). The three choices for this parameter are 0 = “none”, 1 = “plant”, and 2 = “battery”.

None: If no shunt is used or connected to the BLJ3 board, this parameter results in the current displayed to be the sum of the individual rectifier loads. This will not be a true “load” current, but will also include the portion of the rectifier loads which is float or recharge current for the batteries. For a batteryless application however, this would be an accurate depiction of plant load.

Plant: If one or both of the shunt signals received on the BLJ3 board is monitoring load current, this parameter displays that load or the sum of both loads if two are used. Battery float or charge current can be determined by subtracting this load current from the sum of the individual rectifier loads. The use of 2 separate shunt signals allows loads to separate distribution bays or loads to be monitored separately. If the current is displayed as “Err,” the system may contain a battery shunt or may be improperly wired.

Battery: Placing one or both shunts in the charge/discharge path of the plant batteries and choosing this configuration parameter results in a current display that is the difference of the sum of the individual rectifier currents and the sum of the battery charge currents from the two shunts if both shunts are used in the charge/discharge path.

***Shunt Size
(SH1A, SH2A)***

Configuration parameters NUM-4 and 5, Shunt 1 Size (SH1A) and Shunt 2 Size (SH2A) are used to configure the full scale load rating of the 2 available shunts. Each shunt range is from 1 to 9999 amps and 0 disables that shunt.

***Plant Float Mode
Settings (FSP,
FCL, FHO,
FHFO, bd, LLO)***

Configuration parameters NUM-6 to 10 are settings which are active anytime the plant is in Float mode.

NUM-6/Plant Float Set-Point (FSP): This is the voltage that all plant rectifiers will be set to while in Float mode. If Battery Thermal Compensation is enabled and active, actual plant voltage will be adjusted from FSP based on the highest battery temperature monitored.

NUM-7/Rectifier Float Current Limit (FCL): Rectifier current limit is adjustable from 30 to 110% of rectifier capacity while in Float mode.

NUM-8/High Voltage Float Threshold (FHO): Plant voltage monitored above this threshold results in a High Voltage alarm and shutdown while in Float mode.

NUM-9/High Float Voltage Float Threshold (FHFO): Plant voltage monitored above this threshold results in a High Float Voltage alarm (no shutdown) while in Float mode.

NUM-10/Battery on Discharge Float Threshold (bd): Plant voltage monitored below this threshold results in a Battery Discharge alarm while in Float and Boost mode.

***Very Low Voltage
Threshold (LLO)***

NUM-11/Very Low Voltage Threshold (LLO): In any plant mode, plant voltage monitored below this threshold results in a Very Low Voltage alarm.

***Battery Recharge
Current Limit
Settings (rCL,
rCLE)***

NUM-12/Battery Recharge Current Limit (rCL): The maximum current flowing into battery during the recharge period is adjustable to any value between 10A and 1000A. At least one battery must be present to have this function.

NUM-13/Battery Recharge Current Limit Enable (rCLE): 0 disables and 1 enables Battery Recharge Current Limit.

***Battery Thermal
Compensation
Settings (btAt,
btSt, btut, btnt,
btLt, btuS, btLS,
btLE, btEn)***

Refer to Figure 3-1 for a graphical representation of the various Battery Thermal Compensation settings.

NUM-14/Battery Thermal Alarm Threshold (btAt): A monitored battery temperature above this threshold results in a Battery Thermal alarm.

NUM-15/Battery Thermal Step Temperature (btSt): A monitored battery temperature above this threshold results in a “step” decrease in plant voltage to a level corresponding to 0.17 volts per cell (VPC) below the Plant Float Set-Point (FSP).

NUM-16/Battery Thermal Slope Upper Temperature (btut): The upper temperature where Battery Thermal Compensation will have reduced plant voltage to a level corresponding to $btuS * (btut - btnt) * \text{cells-per-string}$ below the FSP. Plant voltage will be reduced proportionally at any temperature between this point and the Battery Thermal Slope Nominal Temperature (btnt).

NUM-17/Battery Thermal Slope Nominal Temperature

(btnt): The zero compensation temperature point. Temperatures monitored between this point and the Battery Thermal Slope Upper Temperature (btut) will result in a proportional decrease of plant voltage to a level corresponding to $btuS * (btut - btnt) * \text{cells-per-string}$ below the FSP at the btut. If Battery Thermal Slope Lower Compensation is enabled, temperatures monitored between this point and the Battery Thermal Slope Lower Temperature (btLt) will result in a proportional increase of plant voltage to a level corresponding to $btLS * (btnt - btLt) * \text{cells-per-string}$ above the FSP at the btLt.

NUM-18/Battery Thermal Slope Lower Temperature

(btLt): The lower temperature where, if Battery Thermal Slope Lower Compensation is enabled, Battery Thermal Compensation will have increased plant voltage to a level corresponding to $btLS * (btnt - btLt) * \text{cells-per-string}$ above the FSP. Plant voltage will be increased proportionally at any temperature between this point and the Battery Thermal Slope Nominal Temperature (btnt).

NUM-19/Battery Thermal Upper Slope Per Cell (btuS): The slope rate for the voltage decrease per cell when the battery temperature is above the btnt (Battery Thermal Slope Nominal Temperature).

NUM-20/Battery Thermal Lower Slope Per Cell (btLS): The slope rate for the voltage increase per cell when the battery temperature is below the btnt (Battery Thermal Slope Nominal Temperature).

NUM-21/Battery Thermal Slope Lower Enable (btLE): 0 disables and 1 enables Battery Thermal Slope Lower Compensation. Since btLE increases plant voltage rather than decreasing it based on temperature, the option is provided to disable it separately from the entire feature so that equipment loads sensitive to high voltages can be protected.

NUM-22/Battery Thermal Compensation Enable (btEn): 0 disables and 1 enables the Battery Slope Thermal Compensation

**Low Voltage
Disconnect
Contactor 1/2
Settings (C1Ld,
C2Ld, C1Lr,
C2Lr, C1tY, C2tY)**

NUM-23/Contactor 1 Low Voltage Disconnect Threshold (C1Ld)

NUM-26/Contactor 2 Low Voltage Disconnect Threshold (C2Ld): The low voltage at which a signal will be sent to the respective contactor driver circuit, causing it to open, disconnecting either the load or the batteries, depending on the contactor's location in the circuit.

NUM-24/Contactor 1 Low Voltage Reconnect Threshold (C1Lr)

NUM-27/Contactor 2 Low Voltage Reconnect Threshold (C2Lr): The low voltage at which a signal will be sent to the respective contactor driver circuit, causing it to close, reconnecting either the load or the batteries, depending on the contactor's location in the circuit.

NUM-25/Contactor 1 Type (C1tY)

NUM-28/Contactor 2 Type (C2tY): The contactor type can be set to one of these three choices:

- 0 no contactor available
- 1 load contactor
- 2 battery contactor

**Plant Boost Mode
Settings (bSP,
bCL, bHO,
bHFO, bAF, bEn)**

Configuration parameters NUM-29 to 34 are settings which are active anytime the plant is in Boost mode.

NUM-29/Plant Boost Set-Point (bSP): This is the voltage that all plant rectifiers will be set to while in Boost mode.

NUM-30/Rectifier Boost Current Limit (bCL): Rectifier current limit is adjustable from 30 to 110% of rectifier capacity while in Boost mode.

NUM-31/High Voltage Boost Threshold (bHO): Plant voltage monitored above this threshold results in a High Voltage alarm and shutdown while in Boost mode.

NUM-32/High Float Voltage Boost Threshold (bHFO): Plant voltage monitored above this threshold results in a High Float Voltage alarm (no shutdown) while in Boost mode.

NUM-33/Boost Auto Mode Factor (bAF): A value from 1 to 9 sets the factor that determines how long the plant is in boost mode after a discharge. The Boost Enable parameter must be set to 1 (enabled) for this feature to be available.

NUM-34/Boost Auto Enable (bAE): 0 disables and 1 enables the auto boost feature. The Boost Enable parameter must be set to 1 (enabled) for this feature to be available.

NUM-35/Boost Enable (bEn): 0 disables and 1 enables the manual timed Boost feature.

**Converter
Settings (CSP,
CLd, CLr, CLdE,
CFPC)**

Configuration parameters NUM-36 to 40 are settings which affect the operation of any converters which are connected to the serial bus.

NUM-36/Converter Voltage Set-Point (CSP): This is the output voltage that all converters will be set to by VC.

NUM-37/Converter Low Voltage Disconnect Threshold (CLd): The low plant voltage at which the converters are placed into standby.

NUM-38/Converter Low Voltage Reconnect Thrshold (CLr): The low plant voltage at which the converters are retired from standby.

NUM-39/Converter Low Voltage Disconnect Enable (CLdE): 0 disables and 1 enables the converter low voltage disconnect feature.

NUM-40/Converter Front Panel Voltage Calibration (CFPC): The voltage displayed here initially is the uncalibrated plant voltage as seen by the controller. Adjust the displayed voltage until it matches the voltage displayed on a calibrated voltmeter measuring the voltage across the converter's output.

**Voltage and
Current
Calibration (FPC,
SH1C, SH2C)**

Controller voltage and current sensing may be calibrated to a known, calibrated meter.

Caution:

This calibration affects all controller functions using plant voltage and/or current values. These functions include the float and boost set points.

NUM-41/Front Panel Voltage Calibration (FPC): Adjust the displayed voltage until it matches the voltage displayed on a calibrated voltmeter measuring the plant or converter output voltage.

NUM-42/Front Panel Shunt 1 Calibration (SH1C) and NUM-43/Front Panel Shunt 2 Calibration (SH2C):

1. Record the configured values of shunt sizes (SH1A, SH2A) and shunt type (STYP)
2. Disable shunt 2 (configure SH2A = 2)
3. Configure STYP = 1 (plant)
4. Measure shunt 1 voltage with a calibrated milli-voltmeter
5. Calculate the current:

$$I = \frac{V \times \text{Shunt Ampere Capacity}}{0.050}$$

6. Configure SH1C to the calculated value by adjusting the displayed value
7. Enable shunt 2 and disable shunt 1 (configure: SH1A = 2, SH2A = value recorded in step 1)
8. Repeat steps 4, 5 and 6 for shunt 2
9. Enable shunt 1 (configure SH1A = value recorded in step 1)
10. Restore shunt type (configure STYP = value recorded in step 1)

**Reserve
Operation Engine
(rOnE)**

NUM-44(Reserve Operation Engine) rOnE: When a backup engine is running to supply the power to the rectifiers, certain number of rectifiers in the plant are allowed to be turned on due to the engine capacity. The number can be selected between 1 and 24. The default number is 24 (maximum rectifiers on).

***Serial Bus
Updating and
Clearing***

Once a rectifier is connected to the digital serial bus and recognized by the Galaxy VC, it is remembered and a Rectifier Fail Alarm (RFA) will be active if it is removed. If the controller is indicating Rectifier Fail Alarm (RFA) and no alarm is indicated by the LEDs of the rectifier, it may be necessary to clear the Galaxy VC rectifier memory. Update Serial Link and clear Alarms (USL) to reset the Galax VC rectifier memory and sent a clear alarms message to the rectifiers by configuring USL **NUM-45** = 1 (0 = nothing, 1 = Update the Link).

Note: A few moments after executing Update Link and Clear Alarms the controller alarm RFA should clear and each rectifier should display no alarms. If alarms continue to be displayed, see Section 5, Troubleshooting. USL will not restart the rectifier at any time.

***Choice of
Identifiers or
Numeric Codes***

Throughout this section, both the Numeric codes of all configuration parameters and their Mnemonic Identifier codes have been used in the parameter descriptions. Both are also displayed in Table 4-A for reference. Configuration parameter **NUM-46**/Identifiers Enable (Id) allows a choice between the Mnemonic Identifier codes (default) and the Numeric codes for all configuration parameters and all active alarm codes shown in Table 3-A. 0 = Numeric codes, 1 = Mnemonic Identifier codes.

***Software Release
Information***

The final parameter in configuration mode is **NUM-47**/Display Software Release (rEL) and is actually just a report of the present software release active in the BIC2 or BIC3 control board microprocessor.

***Front Panel
Operation***

Voltage Display Mode

Voltage Display is the default operating mode. Plant voltage is displayed while in this mode. Regardless of the active display mode, if no key is pressed for 30 seconds, the VC returns to Voltage Display mode and the VOLTS LED is active. The VOLTS/AMPS switch toggles between Voltage Display mode and Current Display mode. The +, -, ^, v keys toggle between plant and converter voltages while in this mode. The symbol for Plant or Converter is displayed briefly, followed by the value. If no key is pressed within 30 seconds, the display goes back to its default mode, the Plant Voltage display.

Current Display Mode

This mode is entered from the Voltage Display mode by pressing the VOLTS/AMPS switch one time and is indicated by the AMPS LED. While in this mode, the +, -, ^, v keys toggle between plant current, battery current and converter current. While viewing the plant current the display value depends on the Shunt Type (StYP) configuration parameter (none, plant, or battery). Battery current is available when shunt type is “battery.”

None (0): If no shunt is used or connected to BLJ3 SH1+,- and SH2+,- this parameter displays a current reading that is the sum of the individual rectifier loads.

Plant (1): If one or both of the shunt signals received on BLJ3 SH1+,- and SH2+,- is monitoring load current, this parameter displays that load or the sum of both loads if two are used.

Battery (2): Placing one or both shunts in the charge/discharge path of the plant batteries and choosing this configuration parameter displays a current reading that is the difference of the sum of the individual rectifier currents and the sum of the battery charge currents.

View Active Alarms Mode

This mode is entered by pressing the VIEW ACTIVE ALARMS switch while in Voltage Display or Current Display mode and is indicated by an active VIEW ACTIVE ALARMS LED. While in this mode, a code for an active alarm is displayed. Refer to Table 3-A for a listing of all available alarm conditions and their Mnemonic Identifier and Numeric Identifier codes. The + and - or ^ and v keys may be used to scroll through the list of active alarms. When no alarm is present, this mode displays nonE or 0. To exit View Active Alarms mode, press ENTER, ESCAPE, VOLTS/AMPS, or VIEW ACTIVE ALARMS again. If no key is pressed for 30 seconds, the VC returns to the Voltage Display mode automatically.

5 *Troubleshooting*

Replacing Circuit Packs Table 5-A lists the circuit packs available as replacements in the Galaxy VC Controller.

Table 5-A: Replacement Circuit Packs and Temperature Modules

Designation	Description	Ordering Number
210E	Thermal Probe Multiplexer	107789513
BMW3	VC Control Panel	108402017
BIC2	24V VC Control Board	108173782
BIC3	48V VC Control Board	108259615
BSM3	Modem Board	108415647
BLJ3	Connection Board	848262622

Checking the highest battery temperature

If temperature probes are connected to the controller and thermal compensation is enabled, the highest battery temperature can be calculated based on the plant voltage. Temperatures between the battery thermal lower temperature and the battery thermal nominal temperature can be calculated if the raising of plant voltage is also enabled.

Calculate the temperature as follows:

$$\text{voltage difference} = \frac{(\text{plant set point} - \text{plant voltage reading})}{\text{cells per string}}$$

where cells per string is the number of 2-volt cells per string.

If voltage difference ≥ 0.17 , the highest battery temperature is at least as high as the battery thermal step temperature hysteresis value, which is the battery thermal step temperature – 10 degrees C.

If voltage difference = 0.1, the highest battery temperature is between the battery thermal upper temperature and the battery thermal step hysteresis value.

If voltage difference > 0 and voltage difference < 0.10 ,
temperature = thermal nominal temp + voltage difference \times
(thermal upper temp – thermal nominal temp)

Note: This will be a temperature in the range of the battery thermal nominal temperature setting and the battery thermal upper temperature setting.

If voltage difference ≤ -0.10 , the highest battery temperature is at or lower than the battery thermal lower temperature setting.

If voltage difference < 0 and voltage difference > -0.10 ,
temperature = thermal lower temp – voltage difference \times
(thermal nominal temp – thermal lower temp)

Note: this will be a temperature in the range of the battery thermal lower temperature setting and the battery thermal nominal temperature setting.

***Inaccurate Plant
Voltage Readings***

If the Thermal Compensation LED is on, this indicates that the plant voltage is altered to higher or lower battery temperature. Temporarily disabling the Battery Thermal Compensation Enable setting (set btEn to 0) will return the plant voltage to the set point.

The plant voltage may also differ from an external meter due to user calibration of the external voltmeter. See to the plant voltage configuration section.

***Inaccurate Plant
Current Readings***

The plant current may need to be calibrated, or re-calibrated. See Configuration, Section 4. If the current is displayed as “Err,” the system may contain a battery shunt or may be improperly wired.

The plant current may also differ from an external meter due to user calibration of the external voltmeter. See the plant current configuration section.

Temperature Probe Alarm (tPA) is present

The tPA alarm indicates that either there is something wrong with the temperature connections, or that there is a problem with one of the external temperature processing units. Additionally, the tPA alarm indicates that the thermal compensation feature is enabled, and no temperature probes are present. If there are no temperature probes connected to the VC, then disable the Battery Thermal Compensation Enable setting (set btEn to 0).

Unexplained Rectifier Failure Alarm (rFA) and Multiple Rectifier Failure Alarm (nrFA)

Rectifiers that are removed from the plant will generate rFA alarms and perhaps nrFA alarms. To clear these alarm conditions, set the Update Serial Link (USL) parameter to 1.

Note: A few minutes after executing Update Link and Clear Alarms, the controller alarm RFA should clear and each rectifier should display no alarms. If alarms continue to be displayed, see the Troubleshooting section in the Plant Product Manual.

Unexplained Converter Failure Alarm (CFA) and Multiple Converter Failure Alarm (nCFA)

Converters that are removed from the plant will generate CFA alarms and perhaps nCFA alarms. To clear these alarm conditions, set the Update Serial Link (USL) parameter to 1.

Note: A few minutes after executing Update Link and Clear Alarms, the controller alarm CFA should clear and each inverter should display no alarms. If alarms continue to be displayed, see the Troubleshooting section in the Plant Product Manual.

Rectifier Id (rid) alarm is set

Verify all rectifiers are numbered between 1 and 24. Refer to numbering procedure in rectifier manual.

Converter Id (Cid)

Verify all converters are numbered between 1 and 8. Refer to numbering procedure in bay manual.

6 ***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. Upon shipment, Seller's Manufactured Products will be free from defects in material and workmanship, and will conform to Seller's specifications or any other agreed-upon specification referenced in the order for such Product;
3. With respect to Vendor items, Seller, to the extent permitted, does hereby assign to Customer the warranties given to Seller by its vendor of such Vendor Items, such assignment to be effective upon Customer's acceptance of such Vendor Items. With respect to Vendor items recommended by Seller in its specifications for which the vendor's warranty cannot be assigned to Customer, or if assigned, less than Sixty (60) days remain of the vendor's warranty or warranty period when the Vendor's items are shipped to Customer or when Seller submits its notice of completion of installation if installed by Seller, Seller warrants that such Vendor's Items will be free from defects in material and workmanship on the date of shipment to Customer. In such an event, the applicable Warranty Period will be sixty (60) days.

B. The Warranty Period listed below is applicable to Seller's Manufactured Products furnished pursuant to this Agreement, unless otherwise stated:

C. If, under normal and proper use during the applicable Warranty Period, a defect or nonconformity is identified

WARRANTY PERIOD

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

*The Warranty Period for a repaired Product or part thereof is as listed or, in the case of Products under Warranty, is the period listed or the unexpired term of the new Product Warranty Period, whichever is longer.

**The Warranty Period for Products ordered for Use in Systems or equipment Manufactured by and furnished by Seller is that of the initial Systems or equipment.

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 repair or replacing Product to the destination designated by Customer within the Territory.

- E. The defective or nonconforming Products or parts which are replaced shall become Seller's property.
- 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.
- 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 with respect to expendable items, including, without limitation, fuses, light bulbs, motor brushes, and the like.
- H. 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.

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Appendix Communications

A

Port Settings This section describes the communication port settings for the BSM3 internal modem, external modem, and RS-232 terminal. Figure A-1 shows the BSM3 modem board.

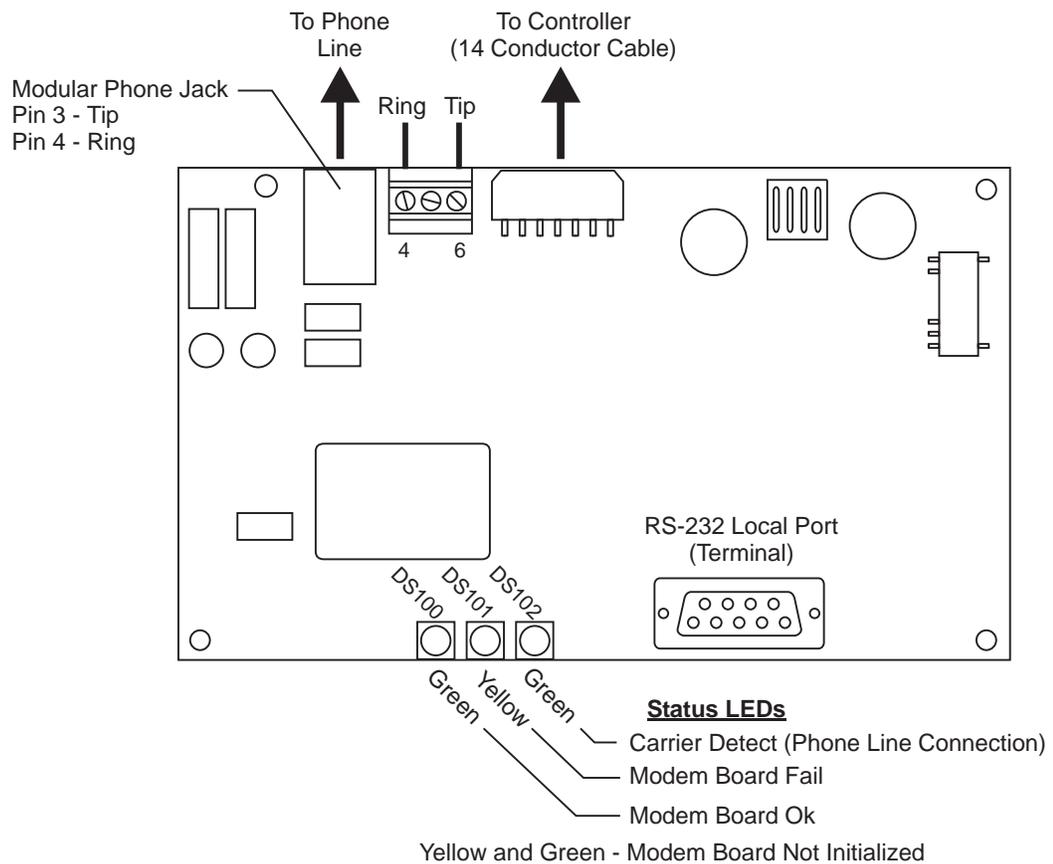


Figure A-1: BSM3 modem board

The controller communicates with the BSM3 internal modem and an external modem at the same communication settings. These settings are as follows:

baud rate: 2400
data bits: 8
stop bits: 1
parity: none

The controller communicates over the RS-232 terminal interface using the following settings:

baud rate: 9600 default, auto baud from 1200 to 19200
data bits: 8
stop bits: 1
parity: none

Logging in

This section describes how to log into the system. The first step to logging in is to get to an "ENTER PASSWORD: " prompt. From a modem, dial into the controller and wait for the modem to connect. After the modem connects you will be presented with the log-in prompt. If you don't see the log-in prompt after the modem connects, you may have to press the ENTER key in order to see the prompt.

From a terminal connected to the RS-232 port, simply press ENTER until you are presented with the log-in prompt. The number of ENTER keys required will depend on the baud rate you are trying to connect at. The controller will adjust its baud rate automatically until it recognizes the carriage return character (ASCII 13) sent by pressing ENTER.

At the "ENTER PASSWORD" prompt type the user or super-user password. The default password for each level of security is listed below.

lineage	default user password
super-user	default super-user password

In general, the user and super-user may view any measurement, configuration, or control parameter. The super-user can also set configuration and control parameters as well as change system passwords.

After receiving the correct password, the controller will respond with one of the following command line prompts:

- * user command line prompt
- ** super-user command line prompt

When these prompts appear the controller is ready to accept commands. If the port is idle for 15 minutes then the session will terminated.

Appendix T1.317 Objects and Attributes

B

The command language is based on the T1.317 standard. The T1.317 standard has been adapted to the needs of a low-end controller. This section describes the commands, objects and attributes used to access measurements, configuration, and control parameters in the controller.

Objects and Attributes

The T1.317 standard organizes system parameters called attributes into groups called objects. The tables below lists the objects supported for remote access.

An object-attribute pair uniquely identifies a measurement, configuration, or control parameter. For example, the object-attribute pair "dc1,vdc" identifies the plant voltage while the object-attribute pair "dc1,adc" identifies the plant load current. In each of these examples "dc1" identifies the plant object and "vdc" and "adc" identify DC voltage and DC current respectively. The table below summarizes the object-attribute pairs in the system along with the commands that can be used with the pair and the valid range that the attribute may have. Commands are defined in detail in the following section.

Table B-1: Power System

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
ps1,des	Power system description	√			text	"Lucent Vector Controller"
ps1,sid	Site ID	√	√		text	Up to 15 characters:""
ps1,swv	Software version	√			text	Vector software version
ps1,usl	Update serial link & clear alarms	√		√	number	1

Table B-2: DC Plant

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
dc1,slt	Plant state	√		√	text	"FLOAT", "BOOST"
dc1,vdc	Plant voltage	√			number	dd.dd V
dc1,adc	Plant load current	√			number	ddd A
dc1,sht	Plant shunt type	√	√		text	"NONE", "LOAD", "BATTERY"
dc1,sha1	Plant shunt 1 size	√	√		Number	0-9999:800 0 means none
dc1,sha2	Plant shunt 2 size	√	√		Number	0-9999 0 means none
dc1,trd	Plant Total Rectifier Drain	√			number	ddd A

Table B-3: Alarm Thresholds

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
hva1,fth	High float voltage	√	√		number	25-30: 28.24V or 50-60: 57V
hva1,bth	High boost voltage	√	√		number	26-30: 28.24V or 52-60: 57V
hfv1,fth	Abnormal high float voltage	√	√		number	25-30: 27.74V or 50-60: 56V
hfv1,bth	Abnormal high boost voltage	√	√		number	25-30: 27.74V or 50-60: 56.20V
bda1,thr	Battery on discharge	√	√		number	23-27.50: 25.54V or 46-55: 51.10V
vla1,thr	Very low voltage	√	√		number	20-25.5: 23V or 40-51: 46V
bta1,thr	Battery thermal alarm	√	√		number	30:85: 55°C

Table B-4: Rectifier Management

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
gm1,fsp	Rectifier float set-point	√	√		number	22-28.5: 27.24V or 44-56: 54.48V
gm1,bsp	Rectifier boost set-point	√	√		number	24-30: 27.24V or 48-60: 55.20V
gm1,fcl	Rectifier float current limit	√	√		number	30-110: 100%
gm1,bcl	Rectifier boost current limit	√	√		number	30-110: 100%
gm1,rone	Rectifiers on while on engine	√	√		number	1-24

Table B-5: Rectifiers (xx is 01 to 24)

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
gxx,sts	Individual rectifier state	√		√	text	"ON","OFF","STANDBY", "VACANT"
gxx,adc	Individual rectifier current	√			number	ddd

Table B-6: Battery Reserve Management

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
br1,cle	Batt recharge current limit enable	√	√		number	0:disable 1:enable
br1,clt	Battery recharge current limit	√	√		number	10- 1000 A
br1,btc	Battery test class	√	√		text	"FLOODED", " SEALED "
br1,bte	Battery test enable	√	√		number	0:disable 1:enable
br1,btr	Battery test results	√			mixed	<i>result, reserve, load code: ok, aborted, failed reserve: dd.d (hours) load: dddd (amps)</i>
br1,bts	Battery test state	√		√	number	0:inactive 1:active

Table B-7: Battery Sections

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
b01,adc	Battery section 1 current	√				<i>dddd A</i>
b02,adc	Battery section 2 current	√				<i>dddd A</i>

Table B-8: Controller Battery Temperature Channels

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
ct1,val	Controller battery temp chan 1√					<i>dd °C</i>
ct2,val	Controller battery temp chan 2√					<i>dd °C</i>
ct3,val	Controller battery temp chan 3√					<i>dd °C</i>
ct4,val	Controller battery temp chan 4√					<i>dd °C</i>

Table B-9: Converter Plant

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
cp1,vdc	Converter output voltage	√			number	dd.d V
cp1,adc	Converter load current	√			number	dd.d A
cp1,vsp	Converter float set-point	√	√		number	46-57: 50V
cp1,dth	Converter disconnect threshold	√	√		number	20-26: 21.00V
cp1,rth	Converter reconnect threshold	√	√		number	22-26: 22.20V
cp1,lvd	Converter low voltage disconnect	√	√		number	0:disable 1:enable

Table B-10: Boost Management

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
bs1,bse	Boost enable	√	√		number	0:disable 1:enable
bs1,abe	Auto boost enable	√	√		number	0:disable 1:enable
bs1,amf	Auto Boost multiplication factor	√	√		number	1-9
bs1,tmd	Manual boost duration	√	√		number	1-250:8 hours

Table B-11: Battery/Load Contactor

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
cn1,typ	Contactora 1 type	√	√		text	"NONE","LOAD","BATTERY"
cn1,dth	Low voltage disconnect threshold	√	√		number	20-26: 21V or 40-52: 43.20V
cn1,rth	Low voltage reconnect threshold	√	√		number	20-26: 22.20V or 40-52: 44.40V
cn2,typ	Contactora 2 type	√	√		text	"NONE","LOAD","BATTERY"
cn2,dth	Low voltage disconnect threshold	√	√		number	20-26: 21V or 40-52: 43.20V
cn2,rth	Low voltage reconnect threshold	√	√		number	20-26: 22.20V or 40-52: 44.40V

Table B-12: Slope Thermal Compensation

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
sc1,slt	State	√	√		number	0:disable 1:enable
sc1,rve	Raise voltage enable	√	√		number	0:disable 1:enable
sc1,ltt	Lower temperature	√	√		number	-5-20: 0°C
sc1,ntt	Nominal temperature	√	√		number	15-30: 25°C
sc1,utt	Upper temperature	√	√		number	30-55: 45°C
sc1,spt	Step temperature threshold	√	√		number	45-85: 75°C
sc1,lsp	Lower temperature slope per cell	√	√		number	1-5: 3mV/°C
sc1,usp	Upper temperature slope per cell	√	√		number	1-5: 3mV/°C

Table B-13: Call-Out

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
p1,phn	Primary phone number	√	√		text	Up to 25 characters:""
a1,phn	Alternate phone number	√	√		text	Up to 25 characters:""

Table B-14: Serial Ports

OBJ,ATTR	DESCRIPTION	Related Commands			TYPE	RANGE OF VALUES
		STA	CHA	OPE		
mp1,bdr	Modem baud rate	√	√		number	1200, 2400 ,4800,9600, and 19200
mp1,ins	Modem initialization string	√	√		text	Up to 25 characters: " at&fev&c1h0 "
mp1,hsh	Modem handshaking	√	√		text	"NO": none "SW": xon and xoff
mp1,nrg	Modem number of rings before answering	√	√		number	1 - 9 rings
lp1,bdr	Local RS-232 baud rate	√	√		number	"AUTO" ,1200,2400,4800,9600, and 19200
lp1,hsh	Local RS-232 handshaking	√	√		text	"NO": none "SW": xon and xoff "HW": cts and rts

Commands

This section describes each of the remote access commands supported by this controller.

ala Report Active Alarms

Syntax ala

Description:

This command reports all the active alarm conditions in the plant. One alarm message is listed per line in the report. The table below lists the alarm messages.

Table B-15: Alarm Messages

MAJ,Multiple Rectifier
MAJ,Multiple AC Fail
MAJ,Rectifier ID Conflict
MAJ,Very Low Voltage
MAJ,Battery On Discharge
MAJ,High Voltage
MAJ,Sense Fuse
MAJ,Multiple Converter Fail
MAJ,Converter Distribution Fuse
MAJ,Converter Fan Major
MAJ,Fuse Major
MAJ,Auxiliary Major
MAJ,Contactor 1 Open
MAJ,Contactor 1 Failed
MAJ,Contactor 2 Open
MAJ,Contactor 2 Failed
MAJ,Battery High Temp
MAJ,Open Connection
MIN,Rectifier Fail
MIN,AC Fail
MIN,Phase Fail
MIN,Manual Off
MIN,High Float Voltage
MIN,Converter Fail
MIN,Converter ID Conflict
MIN,Converter Fan Minor
MIN,Load Share Imbalance
MIN,Thermal Probe Failure

If no alarms are active "NO ACTIVE ALARMS" is reported.

bye Log-off

Syntax bye

Description:

This command is used to terminate remote access session. If the user is connected via a modem, the controller will command the modem to hang-up the line.

cha Change Value

Syntax cha *obj,attr=value*
where: *obj,attr* is an object-attribute pair. For example, ps1,sid.

Description:

This command is used to change system configuration parameters. A couple of examples are listed below to illustrate how this command works.

```
cha ps1,sid="My Plant" - change the site id to My Plant
cha p1,phn="123456789"- change the primary phone number to 123456789
```

You must be logged in as a super-user to use this command.

login Login

Syntax login "*password*"
where: *password* is either the user or super-user password

Description:

This command is used to log-in as a user or super-user. For example, if you are currently logged into the controller as a user but would like to change the site id you must first use this command to log-in as a super-user.

ope Operate a Control

Syntax ope *obj,attr=value*
where: *obj,attr* is an object-attribute pair. For example, dc1 ,pbt.

Description:

This command is used to operate a system control parameter. A couple examples are listed below to illustrate how this command works.

```
ope dc1,pbt=1          start a plant battery test
ope dc1,stt="boost"    place plant into boost mode
```

You must be logged in as a super-user to use this command.

pas Change Passwords

Syntax pas *t,"password", "password"*
where: *t* is u to change the user password or s to change the super-user password
password is the new password

Description:

This command changes either the user or super-user password. You must be logged in as a super-user to use this command. The password is sent twice in order to avoid mistakes. The password must have at least 6 characters but no more than 15 characters.

sta Report Status

Syntax `sta obj,att`

where: *obj,att* is an object-attribute pair. For example, ps1,sid.

Description:

This command reports the value of the measurement, configuration, or control parameters in the system. A couple of examples are listed below to illustrate how this command works.

```
sta dc1,vdc      - report plant voltage
sta dc1,adc      - report plant load current
```

The command line would respond as follows for first command listed above.

```
* sta dc1,vdc
:DC1
VDC=-52.48
.
* _
```

The “*” in the example above is the user command line prompt. The line “:DC1” indicates that the information that follows is for the plant object. The line starting with “VDC” identifies the DC voltage. The “.” line is the end-of-command identifier.

Error Messages

While logging into the vector controller or while entering commands you may encounter one or more of the following error messages:

Table B-16: Error Messages

Error Message	Description
!-112,SYNTAX ERROR	Unrecognizable command was entered.
!-220,SECURITY	Super-user command was entered by a mere user.
!-221,EXCESSIVE LOGIN ATTEMPTS	Too many attempts were made to login with an unrecognized password.
!-223,INVALID PASSWORD	New password contains an illegal character.
!-224,NEW PASSWORD MISMATCH	First and second copy of new passwords don't match
!-304,INVALID PARAMETER	An attempt was made to change a parameter to an illegal value.
!-319,INVALID ATTRIBUTE	An invalid object id was specified in the command or, a command referred to an attribute that doesn't support it.
!-320,INVALID OBJECT	An invalid object id was specified in the command

Appendix C ***Regulatory Statements***

FCC Part 68 Regulatory Statement

The BSM3 modem board complies with Part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains the FCC registration number.

FCC Registration Number: Pending

A FCC Compliant modular jack is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular plug which is Part 68 compliant. See installation instructions for details.

If this equipment causes harm to the telephone network, the telephone company will notify Lucent in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify Lucent as soon as possible. The customer also has the right to file a complaint with the FCC if necessary.

The end use customer may make changes in its facilities, equipment, operations or procedures that could affect the operation of this equipment. If this happens, the customer will provide advance notice in order for Lucent to make any necessary modifications to maintain uninterrupted service.

Customers who experience trouble with the BSM3 should contact Lucent technologies at 1-800-225-7822. If the equipment is causing harm to the network, the customer can

remove the equipment from the network until the problem is solved.

The purchaser of this product should not make any repairs to the BSM3. Repairs are to be made only by Lucent Technologies or its licensees. Unauthorized repairs void registration and warranty.

This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)

***Industry
Canada
Certification***

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

NOTICE: The Ringer Equivalence Number(REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.