



**LICK APF**

**Azimuth Control Panel**

**Device Setup**

CI No: HBT500917-02

Prepared	Signed Jak Gray	Date 18 June 2009
Checked	Signed	Date
Approved	Signed	Date

-02	5/10/10	Updates from site visit Sept 2010	J Gray	M Blundell
Issue	Date	Description	Checked	Approved

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## **SCOPE**

This document describes the parameters used to configure correct operation of the Azimuth Control panel (ASY500917), of the IceStorm series II enclosure installed at the LICK APF site at Mt. Hamilton, California, USA.

This panel contains the following items that require pre-configuration before correct operation can occur.

- Azimuth master – Baldor 18H Flux Vector Control
- Azimuth slave – Baldor 18H Flux Vector Control

## **APPLICABLE DOCUMENTS**

Baldor Series 18H AC Flux Vector Control, Installation & Operating Manual MN718

Baldor Master Pulse Reference/Isolated Pulse Follower Expansion Board EXB005A01  
Installation and Operating Manual MN1312

### FlexDrive Servo Controllers

Both azimuth controllers are Baldor 18H Flux Vector controls, part number ZD18H207-E.

The part number for the controller describes the following configuration.

<b>ZD18H</b>	Series 18H AC Flux Vector Control
<b>2</b>	Single phase 230VAC supply voltage
<b>07</b>	7.5HP rating
<b>-E</b>	NEMA 1 Enclosure

Both controllers are also fitted with an EXB005A01, pulse follower expansion board.

A DIP switch is fitted to the Pulse Follower expansion board and must be configured, as shown in the following table, for both controllers.

### DIP switch – EXB005A01 Pulse Follower Expansion Board

<i>Switch</i>	<i>Value</i>	<i>Function</i>	<i>Notes</i>
1	FOL	Mode	
2	QUAD IN	Input Type	
3	QUAD OUT	Output Type	
4		<i>not used</i>	<i>May be placed in either position</i>

## *Azimuth Master*

To configure correct operation of the Azimuth Master Drive, the following parameters are entered via the controller keypad. Please refer to Installation & Operating Manual, Section 4 Programming and Operation, for appropriate operating instructions.

**Incorrect use of the Keypad can result in erratic operation, equipment failure or personal injury.**

Be sure to review the Safety Notice in Section 2 of the Installation & Operating Manual.

The parameter names and descriptions given are correct for Firmware version S18-3.21

### **Level 1 programming blocks**

#### **Azimuth Master – Preset Speed**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Preset Speed 1 - 15		rpm	<i>default – NOT USED</i>

#### **Azimuth Master - Accel/Decel Rate**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Accel Time #1	3.0	seconds	<i>default</i>
Decel Time #1	3.0	seconds	<i>default</i>
S-Curve #1	0.0	%	<i>default</i>
Accel Time #2	3.0	seconds	<i>default</i>
Decel Time #2	3.0	seconds	<i>default</i>
S-Curve #2	0.0	%	<i>default</i>

#### **Azimuth Master - Jog Settings**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Jog Speed	200		<i>default</i>
Jog Accel Time	3.0		<i>default</i>
Jog Decel Time	3.0		<i>default</i>
Jog S-Curve	0		<i>default</i>

## *Azimuth Master*

### **Azimuth Master - Keypad Setup**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Keypad Stop Key	REMOTE ON		
Keypad Stop Mode	COAST		
Keypad Run FWD	OFF		
Keypad Run REV	OFF		
Keypad Jog FWD	OFF		
Keypad Jog REV	OFF		
Loc. Hot Start	OFF		

### **Azimuth Master - Input**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Operating Mode	PROCESS		
Command Select	EXB PULSE FOL		
ANA CMD Inverse	OFF		
ANA CMD Offset	0	%	<i>set during offset tuning</i>
ANA 2 Deadband	0.0	volts	
ANA 1 CUR Limit	OFF		

### **Azimuth Master - Output**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
OPTO Out #1	Ready		<i>Used by AZ controller, do not change</i>
OPTO Out #2	At Set Speed		<i>May be set as required for monitoring</i>
OPTO Out #3	Zero Speed		<i>Used by AZ controller, do not change</i>
OPTO Out #4	Keypad		<i>Used by AZ controller, do not change</i>
Zero SPD Set PT	10	RPM	
At Speed Band	100	RPM	
Set Speed	1750	RPM	
Analog Output #1	CMD LOAD CURR		<i>Used by Slave Drive for load sharing</i>
Analog Output #2	PROCESS FDBK		<i>May be set as required for monitoring</i>
Analog Scale #1	100	%	
Analog Scale #2	100	%	
Position Band	6	Counts	

## *Azimuth Master*

### **Azimuth Master - Vector Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
CTRL BASE Speed	1757	RPM	<i>calculated during auto tuning</i>
Feedback Filter	7		<i>calculated during auto tuning</i>
Feedback Align	REVERSE		<i>calculated during auto tuning</i>
Current PROP Gain	250		<i>calculated during auto tuning</i>
Current INT Gain	100	Hz	<i>calculated during auto tuning</i>
Speed PROP Gain	30		<i>calculated during auto tuning</i>
Speed INT Gain	2.00	Hz	<i>calculated during auto tuning</i>
Speed DIFF Gain	2		<i>calculated during auto tuning</i>
Position Gain	0		<b><i>Must be set to 0</i></b>
Slip Frequency	1.38	Hz	<i>calculated during auto tuning</i>
Stator R1	0.885	ohms	<i>auto measured during tuning</i>
Stator X1	1.416	ohms	<i>auto measured during tuning</i>
Prop #####	15000		<i>Default – do not change</i>
Int #####	5000		<i>Default – do not change</i>

### **Level 2 programming blocks**

#### **Azimuth Master - Output Limits**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Operating Zone	QUIET-CONST TQ		<i>8 kHz switching, constant torque</i>
MIN Output Speed	0	rpm	
MAX Output Speed	3300	rpm	
PK Current Limit	14.0	amps	
PWM Frequency	8.0	kHz	
Current Rate Limit	0.001		

#### **Azimuth Master - Custom Units**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Decimal Places			<i>default</i>
Value At Speed			<i>default</i>
Units of Measure			<i>default</i>

## *Azimuth Master*

### **Azimuth Master - Protection**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Overload	FAULT		
External Trip	ON		
Local Enable INP	ON		
Following Error	OFF		
Torque Proving	OFF		

### **Azimuth Master - Miscellaneous**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Restart Auto/Man	MAN		
Restart Fault/Hr	0		
Restart Delay	0		
Factory Settings	NO		<i>Selecting YES will restore all defaults</i>
Homing Speed	100	rpm	<i>not used</i>
Homing Offset	1024	counts	<i>not used</i>

### **Azimuth Master - Security Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Security State	OFF		
Access Timeout	0	seconds	
Access Code	9999		<i>default</i>

### **Azimuth Master - Motor Data**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Motor Voltage	230	VAC	<i>from motor nameplate</i>
Motor Rated Amps	8	amps	<i>from motor nameplate</i>
Motor Rated SPD	1750	rpm	<i>from motor nameplate</i>
Motor Rated Freq	60	Hz	<i>from motor nameplate</i>
Motor Mag Amps	4.9	amps	<i>Set per user manual procedure. Pg. 6-1</i>
Encoder Counts	1024	counts/rev	<i>Standard encoder fitted</i>
Resolver Speed	0		<i>not used</i>
CALC Presets	NO		<i>Select YES to load autotune presets</i>



## *Azimuth Master*

### **Azimuth Master - Brake Adjust**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Resistor Ohms	6	ohms	<i>default</i>
Resistor Watts	0.40	kW	<i>default</i>
DC Brake Current	0	%	<i>default</i>

### **Azimuth Master - Process Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Process Feedback	± 10V		
Process Inverse	OFF		
Setpoint Source	SET POINT CMD		
Setpoint Command	0.0	%	
Set PT ADJ Limit	20.0	%	
Process ERR TOL	10	%	
Process PROP Gain	250		
Process INT Gain	0.00	Hz	
Process DIFF Gain	1000		
Follow I:O Ratio *	1189 : 100*		<i>sets Telescope : Dome encoder ratio</i>
Master Encoder	1024		<i>standard encoder fitted</i>

**Ratio for telescope operation is 11.89 : 1 – enter as 1189 : 100**

**Earlier software versions limit Dome value to range of 1-20    ie. Telescope = 1-65535 : Dome = 1-20**

**If this is the case set ratio to 119 : 10**

### **Azimuth Master – Communications**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Protocol	RS-232		<i>not used</i>
Baud Rate	9600	bps	<i>not used</i>
Drive Address	1		<i>not used</i>

## *Azimuth Slave*

To configure correct operation of the Azimuth Slave Drive, the following parameters are entered via the controller keypad. Please refer to Installation & Operating Manual, Section 4 Programming and Operation, for appropriate operating instructions.

**Incorrect use of the Keypad can result in erratic operation, equipment failure or personal injury.**

Be sure to review the Safety Notice in Section 2 of the Installation & Operating Manual.

The parameter names and descriptions given are correct for Firmware version ....

### **Level 1 programming blocks**

#### **Azimuth Slave – Preset Speed**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Preset Speed 1 - 15		rpm	<i>default – NOT USED</i>

#### **Azimuth Slave - Accel/Decel Rate**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Accel Time #1	3.0	seconds	<i>default</i>
Decel Time #1	3.0	seconds	<i>default</i>
S-Curve #1	0.0	%	<i>default</i>
Accel Time #2	3.0	seconds	<i>default</i>
Decel Time #2	3.0	seconds	<i>default</i>
S-Curve #2	0.0	%	<i>default</i>

#### **Azimuth Slave - Jog Settings**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Jog Speed	200	RPM	<i>default</i>
Jog Accel Time	3.0	Sec	<i>default</i>
Jog Decel Time	3.0	Sec	<i>default</i>
Jog S-Curve	0	%	<i>default</i>

## *Azimuth Slave*

### **Azimuth Slave - Keypad Setup**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Keypad Stop Key	REMOTE ON		
Keypad Stop Mode	COAST		
Keypad Run FWD	OFF		
Keypad Run REV	OFF		
Keypad Jog FWD	OFF		
Keypad Jog REV	OFF		
Loc. Hot Start	OFF		

### **Azimuth Slave - Input**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Operating Mode	PROCESS MODE		
Command Select	EXB PULSE FOL		
ANA CMD Inverse	OFF		
ANA CMD Offset	-1.2	%	<i>set during offset tuning</i>
ANA 2 Deadband	0.0	volts	
ANA 1 CUR Limit	OFF		

### **Azimuth Slave - Output**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
OPTO Out #1	Ready		<i>Used by AZ controller, do not change</i>
OPTO Out #2	At Set Speed		<i>Used to enable process mode *</i>
OPTO Out #3	Zero Speed		<i>Used by AZ controller, do not change</i>
OPTO Out #4	Keypad		<i>Used by AZ controller, do not change</i>
Zero SPD Set PT	10	RPM	
At Speed Band	100	RPM	
Set Speed	0	RPM	<i>Used to enable process mode*</i>
Analog Output #1	CMD LOAD CURR		<i>Used for load sharing</i>
Analog Output #2	PROCESS FDBK		<i>May be set as required for monitoring</i>
Analog Scale #1	100	%	
Analog Scale #2	100	%	
Position Band	6	Counts	

***\*Opto out #2 link to input #13 : process mode enabled only when current speed > Set Speed***

## *Azimuth Slave*

### **Azimuth Slave - Vector Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
CTRL BASE Speed	1658	RPM	<i>calculated during tuning</i>
Feedback Filter	7		<i>calculated during tuning</i>
Feedback Align	REVERSE		<i>calculated during tuning</i>
Current PROP Gain	250		<i>calculated during tuning</i>
Current INT Gain	100	Hz	<i>calculated during tuning</i>
Speed PROP Gain	20		<i>calculated during tuning</i>
Speed INT Gain	4.00	Hz	<i>calculated during tuning</i>
Speed DIFF Gain	0		<i>calculated during tuning</i>
Position Gain	0		<b><i>Must be set to 0</i></b>
Slip Frequency	2.07	Hz	<i>calculated during tuning</i>
Stator R1	0.888	ohms	<i>auto measured during tuning</i>
Stator X1	1.416	ohms	<i>auto measured during tuning</i>
Prop ####	15000		<i>Default – do not change</i>
Int #####	5000		<i>Default – do not change</i>

### **Level 2 programming blocks**

#### **Azimuth Slave - Output Limits**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Operating Zone	QUIET-CONST TQ		<i>8 kHz switching, constant torque</i>
MIN Output Speed	0	rpm	
MAX Output Speed	3300	rpm	
PK Current Limit	14.0	amps	
PWM Frequency	8.0	kHz	
Current Rate Limit	0.001		

#### **Azimuth Slave - Custom Units**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Decimal Places			<i>default</i>
Value At Speed			<i>default</i>
Units of Measure			<i>default</i>

## *Azimuth Slave*

### **Azimuth Slave - Protection**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Overload	FAULT		
External Trip	ON		
Local Enable INP	ON		
Following Error	OFF		
Torque Proving	OFF		

### **Azimuth Slave - Miscellaneous**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Restart Auto/Man	MAN		
Restart Fault/Hr	0		
Restart Delay	0		
Factory Settings	NO		<i>Selecting YES will restore all defaults</i>
Homing Speed	100	rpm	<i>not used</i>
Homing Offset	1024	counts	<i>not used</i>

### **Azimuth Slave - Security Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Security State	OFF		
Access Timeout	0	seconds	
Access Code	9999		<i>default</i>

### **Azimuth Slave - Motor Data**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Motor Voltage	230	VAC	<i>from motor nameplate</i>
Motor Rated Amps	8.0	amps	<i>from motor nameplate</i>
Motor Rated SPD	1750	rpm	<i>from motor nameplate</i>
Motor Rated Freq	60.0	Hz	<i>from motor nameplate</i>
Motor Mag Amps	4.49	amps	<i>Set per user manual procedure. Pg. 6-1</i>
Encoder Counts	1024	counts/rev	<i>standard encoder fitted</i>
Resolver Speed	0		<i>not used</i>
CALC Presets	NO		<i>Select YES to load autotune presets</i>

## *Azimuth Slave*

### **Azimuth Slave - Brake Adjust**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Resistor Ohms	6	ohms	<i>default</i>
Resistor Watts	0.40	kW	<i>default</i>
DC Brake Current	0	%	<i>default</i>

### **Azimuth Slave - Process Control**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Process Feedback	+/- 5V		
Process Inverse	OFF		<i>Has no effect with bipolar input</i>
Setpoint Source	SET POINT CMD		
Setpoint Command	0.0	%	
Set PT ADJ Limit	30.0	%	
Process ERR TOL	1.0	%	
Process PROP Gain	50		
Process INT Gain	0	Hz	
Process DIFF Gain	0.0		
Follow I:O Ratio	1:1		<i>sets Master : Slave encoder ratio</i>
Master Encoder	1024		

### **Azimuth Slave – Communications**

<i>Parameter</i>	<i>Value</i>	<i>Unit</i>	<i>Notes</i>
Protocol	RS-232		<i>not used</i>
Baud Rate	9600	bps	<i>not used</i>
Drive Address	1		<i>not used</i>