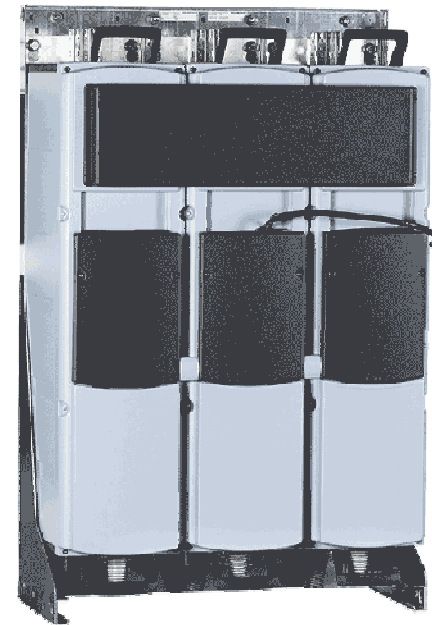




Turn to the Experts.™



Eaton LCX9000 Drive Commissioning and Troubleshooting

EATON LCX9000

Drive Commissioning



Turn to the Experts.™

Procedure to check insulation resistance with a multi-meter

Procedure to check the condition of

- Converter SCR/diodes

- DC Bus Capacitors

- Inverter back diodes

EATON LCX9000



Caution



Internal components and circuit board may present an exposure to high voltages — up to 1,000 volts.

Dangerous voltage may exist in input/output circuits even when the power is disconnected.

High voltages are present even when the motor is not running.

The 9000X Series drives have large capacitive leakage currents due to their high switching frequencies.

EATON LCX9000



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Commissioning: Step #1

Review VFD and it's connected load for proper installation.

1. Incoming power, outgoing motor, and control wiring are each in their own conduit.
2. The source of power for the VFD and it's connected load is of sufficient size to operate the equipment.
3. All wiring has been accomplished according to local codes and to Eaton Electrical specifications for the size of the VFD and it's connected load.
4. The VFD is clean and free of installation debris, equipment, or tools.
5. If installed, remove line and motor connections at the VFD in preparation for pre-power checks.

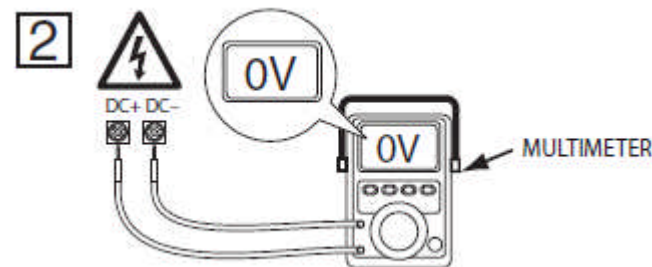
EATON LCX9000



Commissioning: Step #2

Perform Pre-Power meter checks.

1. Confirm all power sources are tagged and locked and are de-energized.
2. With line connections disconnected from VFD test for grounds on L1, L2, and L3 of the VFD. (Minimum 1 Megohm to ground)
3. With motor connections disconnected from VFD test for grounds on motor leads. (Minimum 1 Megohm to ground)



EATON LCX9000

Commissioning: Step #3



Static Checks of the Converter Section



Perform the following with power off and motor leads disconnected

1. Using a digital multimeter with a diode and resistance scale (Fluke 87 or equivalent)
2. Select the diode scale of the multimeter.
3. Use the (B+) and (B-) bus rails as the reference point for both converter and inverter checks.

EATON LCX9000



Commissioning: Step #3

Static Checks of the Converter Section



Perform the following with power off and motor leads disconnected

1. Using a digital multimeter with a diode and resistance scale (Fluke 87 or equivalent)
2. Select the diode scale of the multimeter.
3. Use the (B+) and (B-) bus rails as the reference point for both converter and inverter checks.
4. Use SVX9000 Drive commissioning checklist form



Turn to the Experts.™

EATON LCX9000

B+ & B- on Bus Rail

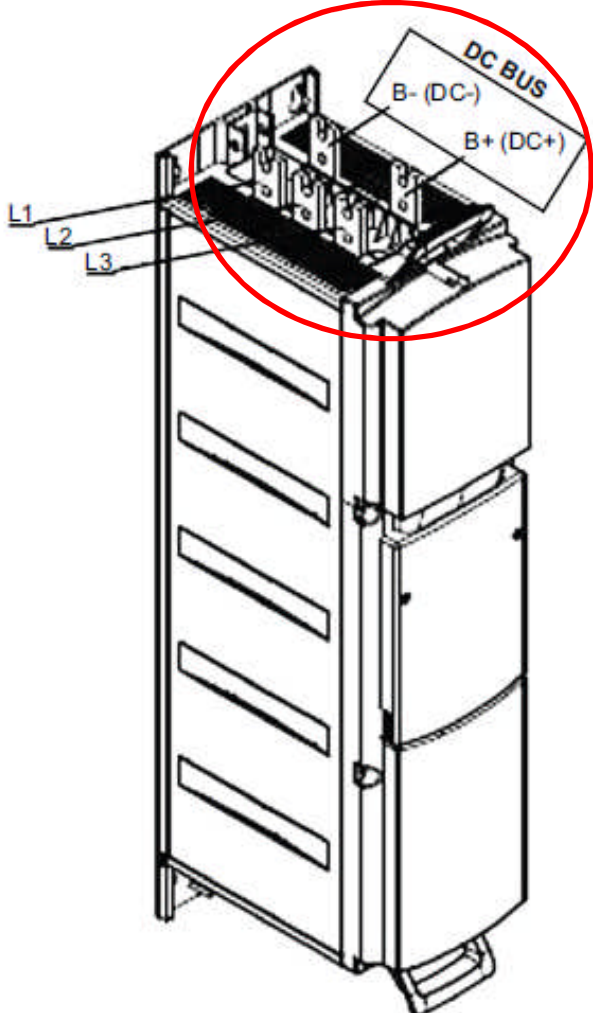


Fig. 1A — DC Bus Location (Typical) for Frame CH72 and CH74



EATON LCX9000

Commissioning checklist in CD



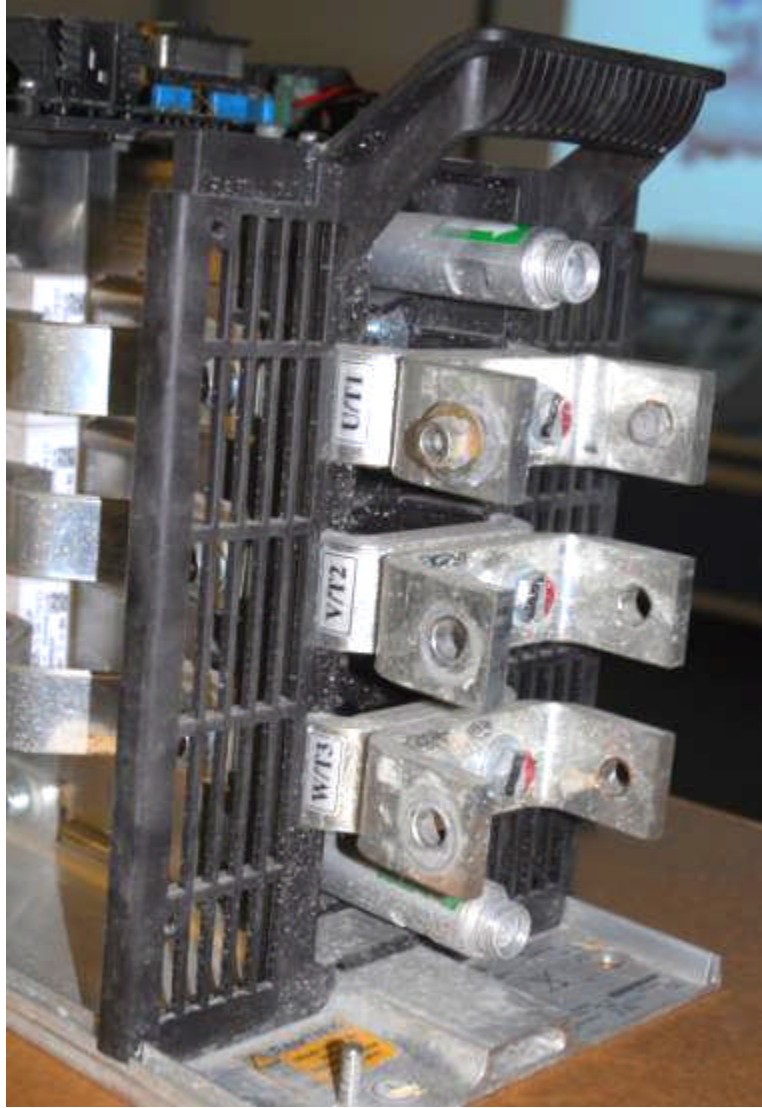
SVX 9000 Drive Commissioning Checklist

Pre-Test Checks	
Procedure	OK?
1. TAG & LOCKOUT ALL POWER SOURCES TO THE VFD PER CUSTOMER & COMMISSIONER POLICIES	
2. Visually inspect application to determine preparedness for operation	
3. Incoming power, outgoing motor and control wiring each in their own conduit	
4. Power source and cabling adequate for VFD and connected load	
5. The VFD is clean and free of installation debris, equipment or tools	
6. If installed, remove line and load side cables from VFD	

Ground Check of Incoming Cables		
Power OFF – Meter on Resistance		
Procedure	Expected Outcome	Value
+Probe to L1 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
+Probe to L2 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
+Probe to L3 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	

Ground Check of Motor Cables		
Power OFF – Meter on Resistance		
Procedure	Expected Outcome	Value
+Probe to T1 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
+Probe to T2 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
+Probe to T3 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	

Ground Check of VFD L1 – L2 – L3		
Power OFF – Meter on Resistance		
Procedure	Expected Outcome	Value
+Probe to L1 Terminal / -Probe to Ground	> 1 Megohm to Ground	
+Probe to L2 Terminal / -Probe to Ground	> 1 Megohm to Ground	
+Probe to L3 Terminal / -Probe to Ground	> 1 Megohm to Ground	



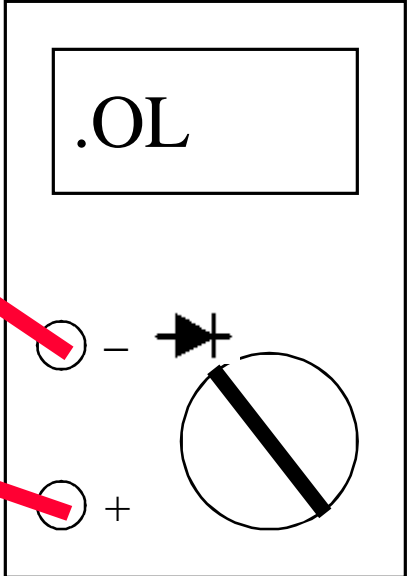
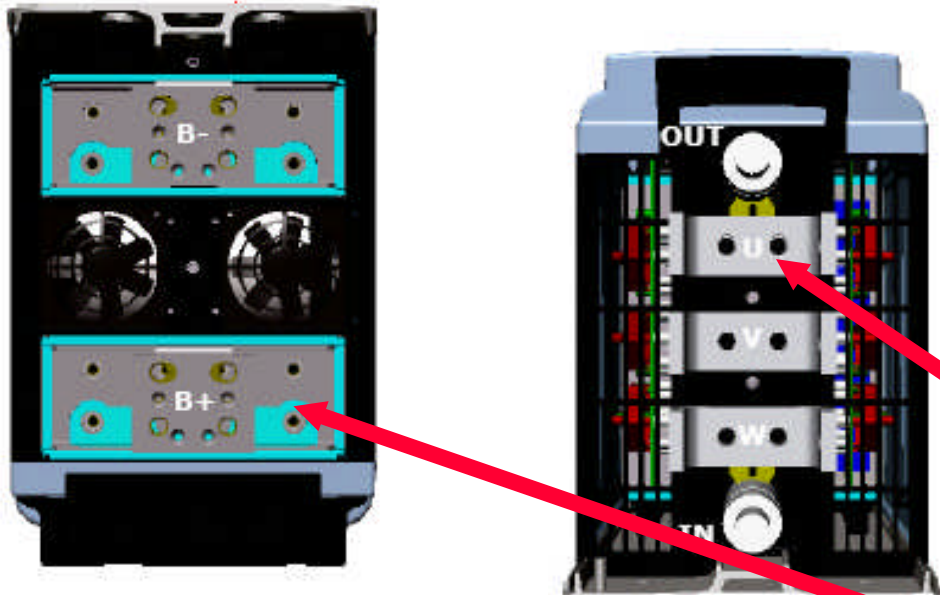
EATON LCX9000



Static Checks: Inverter & Rectifier

Power OFF

Value should increase until "OL" is reached



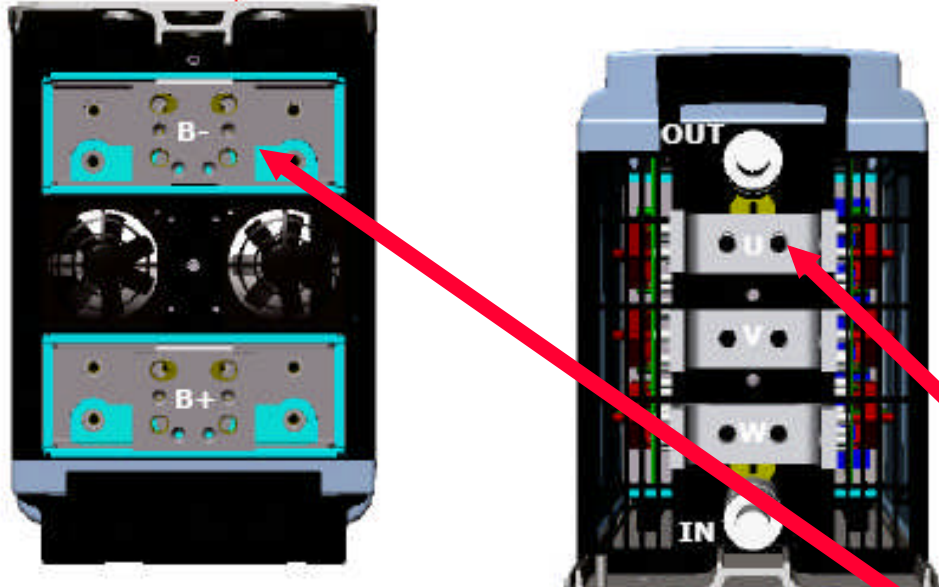
Meter +ve Lead on B-, -ve Lead on B+

DC-	to	input	L1, L2, L3	0,35V
DC+	to	input	L1, L2, L3	1,2V
DC-	to	output	U, V, W	0,3V
DC+	to	output	U, V, W	0,3V

EATON LCX9000

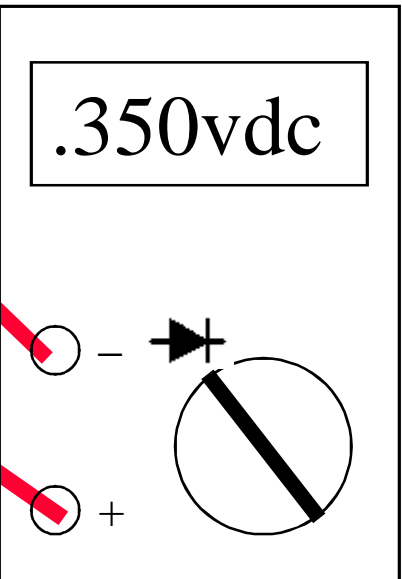


Static Checks: Inverter & Rectifier



Power OFF

Value should be +/- 10% of each other



Meter +ve Lead on B-, -ve Lead on B+

DC-	to	input	L1, L2, L3	0,35V
DC+	to	input	L1, L2, L3	1,2V
DC-	to	output	U, V, W	0,3V
DC+	to	output	U, V, W	0,3V

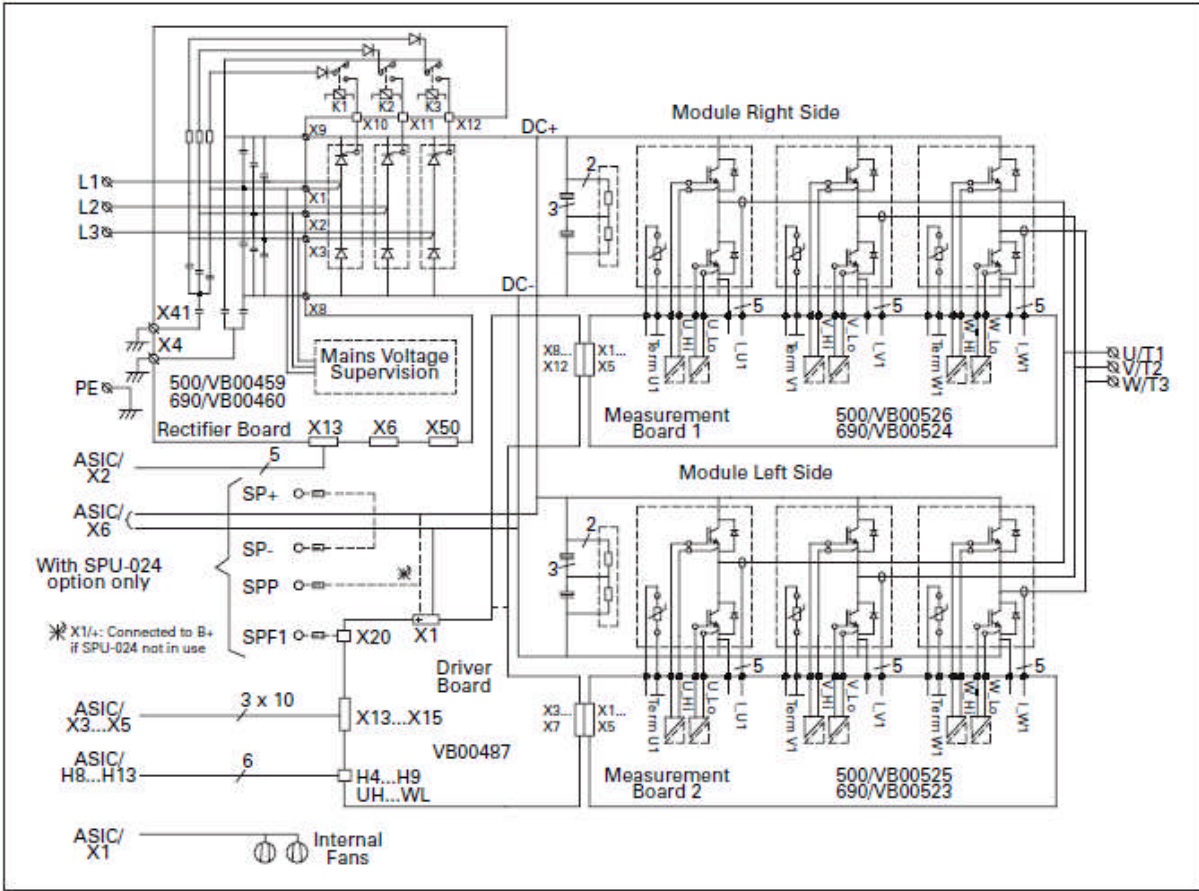
EATON LCX9000



Commissioning: Step #4

Check wiring connections

- 1. Check all wiring for proper connections



EATON LCX9000

Commissioning Report in CD



Turn to the Experts™

EATON Previous Page **Commissioning Report 2010**

This Commissioning Report is to be completed by a certified Eaton Electrical Drives Commissioner and submitted to the Drives TRC at the completion of the VFD commissioning. All sections must be complete to qualify for extended warranty. Record any non-conformances either in the comments section on page 2 or use a separate sheet of paper. Fax or E-mail the completed form to the Drives TRC.

VFD Installed Location

Company Name: _____
 Address: _____
 City, State, Zip: _____
 Contact Name: _____
 Title: _____
 Telephone: _____
 Fax: _____
 Email: _____

VFD Nameplate Information **Equipment Being Operated**

G.O. Number: _____ Application (Fan, Pump, Conveyor, etc.): _____
 Catalog Number: _____ Customer equipment reference designation: _____
 Serial Number: _____

Motor Nameplate Information

Cat/Part Number: _____
 Manufacturer: _____
 Voltage: _____ Speed: _____ Frequency: _____
 HP: _____ FLA: _____ S.F. _____

Confirm Installation Conditions comply with Eaton Electric requirements
(Document all non-conformances in the comments section)

	Yes	No		Yes	No
Ambient Environment	<input type="checkbox"/>	<input type="checkbox"/>	Control Wiring	<input type="checkbox"/>	<input type="checkbox"/>
Enclosure Rating	<input type="checkbox"/>	<input type="checkbox"/>	Motor Power Wiring	<input type="checkbox"/>	<input type="checkbox"/>
VFD Mounting	<input type="checkbox"/>	<input type="checkbox"/>	Grounding	<input type="checkbox"/>	<input type="checkbox"/>
Line Voltage wiring	<input type="checkbox"/>	<input type="checkbox"/>	Inverter Duty Motor	<input type="checkbox"/>	<input type="checkbox"/>
Output Filter	<input type="checkbox"/>	<input type="checkbox"/>			

Pre-power static checks (document all non-conformances in the comments section)

	Pass	Fail		Pass	Fail
Motor and cables meggered	<input type="checkbox"/>	<input type="checkbox"/>	VFD converter checks	<input type="checkbox"/>	<input type="checkbox"/>
Inspect power connections	<input type="checkbox"/>	<input type="checkbox"/>	VFD inverter Checks	<input type="checkbox"/>	<input type="checkbox"/>

Email completed document to Fred.L Jackson@eaton.com
 Eaton Drives Technical Resource Center at 920-282-8070

1

EATON **Commissioning Report 2010**

Record the following power on checks:

Line voltage: phase – phase:	A-B:	B-C:	A-C:
Line voltage: phase – ground:	A-G:	B-G:	C-G:
DC Bus Voltage:	B+ - B-:	B+-G:	B-G:

Record the following operational checks:

Readings recorded at Operating Frequency:

Line Voltage Phase – Phase:	A-B:	B-C:	A-C:
Line Current (each Phase):	A:	B:	C:
Motor Voltage – Monitor:	Output Current – Power Multimonitor:		

Clean Power Rectifier Lead Readings

L14:	L17:	L11:	L13:	L16:
L19:	L12:	L15:	L18:	

VFD Software Application Chosen: _____

Critical Parameter Settings

Minimum Speed:	DIN 1:
Maximum Speed:	DIN 2:
Current Limit:	DIN 3:
Local/Hand Start Source:	DIN 4:
Remote/Auto Start Source:	DIN 5:
Local/Hand Stpt Source Location:	DIN 6:
Remote/Auto Stpt Source Location:	Relay Output 1:
Digital Output:	Relay Output 2:
Carrier Frequency	

Note: If output filter is installed, default Carrier Frequency may not be ideal. Please check with Filter Manufacturer for recommended carrier frequency

Email completed document to Fred.L Jackson@eaton.com
 Eaton Drives Technical Resource Center at 920-282-8070

2

EATON LCX9000

Commissioning Report using software



Turn to the Experts™

Printed: 5/2/2011 12:44:05 PM
 SerialNumber: 10901597
 Device: NXP
 System software: SPX00032V016 (22.30.10124)
 Firmware: 4.61
 Application: Basic (SPX00032V016.VCM, #FUCHST01 1.20)
 Parameter file: C:\AFEngine\jobs\848-10192-2.4.11.par

Index	Text	Value	Unit	Min	Max	ID
P 1.1	Min Frequency	0.00	Hz	0.00	60.00	101
P 1.2	Max Frequency	60.00	Hz	0.00	320.00	102
P 1.3	Accel Time 1	3.0	s	0.1	3000.0	103
P 1.4	Decel Time 1	3.0	s	0.1	3000.0	104
P 1.5	Current Limit	4.00	A	0.37	7.40	107
P 1.6	Motor NP Voltage	230	V	180	690	110
P 1.7	Motor NP Freq	60.00	Hz	8.00	320.00	111
P 1.8	Motor NP Speed	1720	rpm	24	20000	112
P 1.9	Motor NP Current	3.70	A	0.37	7.40	113
P 1.10	Preset Speed 1	10.00	Hz	0.00	60.00	105
P 1.11	Preset Speed 2	40.00	Hz	0.00	60.00	106
P 1.12	Input Phase Supv	3 / Fault, Coast		0	3	730
P 2.2	Waypad Direction	0 / Forward		0	1	123
P 2.3	StopInterlockActive	1 / Yes		0	1	114
P 2.4	OperateMandSide	0 / No		0	1	1680
P 5.3.4	Auton. BackUp	0 / Yes		0	1	820
P 5.5.2	Parameter Lock	0 / Changeable		0	1	819
P 5.5.3	Startup wizard	0 / No		0	1	826
P 5.5.4	Multimon. stans	0 / Changeable		0	1	822
P 5.5.5	OPTAF Remove	0		0	1	832
P 5.6.1	Default page	0.		0	99.99.99.99.99	
P 5.6.2	Default page/OM	1		0	99	
P 5.6.3	Timeout time	60	s	0	65535	804
P 5.6.4	Contrast	18		0	31	805
P 5.6.5	Backlight time	10	min	0	65535	818
P 5.7.1	InterBrakeRel	0 / Not conn.		0	1	821
P 5.7.2	Fan control	0 / Continuous		0	3	825
P 5.7.3	SMI ACK timeout	200	ms	0	5000	823
P 5.7.4	SMI retry	5		1	10	824
P 5.7.5	Sina Filter	0 / Not conn.		0	1	
P 6.1.1.1	All mode	3 / 0...10V		0	5	
P 6.1.1.2	AID mode	1 / 0...20mA		1	5	
P 6.1.1.3	AID mode	1 / 0...20mA		1	4	

Additional Data

Drive Info (9000Drive Ver: 2.0.11 February-02-2011 12:44:11 PM)

VCM Name: SPX00032V016
 System Software: 22.30.10124 (03.11.2009)
 Firmware Interface: 4.61
 Drive Serial Nr: 10901597
 Power Unit: PA000422H1228 (7.2)
 Power Unit Serial Nr: 10901598
 Internal Brake Chopper: Yes
 Internal Brake Resistor: No
 Power Card Serial Nr: 308L7205024
 Control Unit: CR48
 Control Unit Serial Nr: 10751279
 Control Unit Date: 20042007
 Control Card Serial Nr: 56LHT105041
 Control Card Date: 07032007
 Power Unit Date: 04092007
 Power Card Date: 17062007

Applications	Name	Appld	ParVer	AppVer	FirmIntfr
*Basic	#FUCHST01		1.20		4.60
Standard	#FUCHST02		1.21		4.60
Local/Remote	#FUCHST03		1.21		4.60
Multi-Step	#FUCHST04		1.21		4.60
VFD-Control	#FUCHST05		1.21		4.60
MultiPurpose	#FUCHST06		1.22		4.60
PPC Applicat	#FUCHST07		1.21		4.60

I/O and expanders
 Slot A: XN0PTA8, 283.D, 10001.0 , Nr: 28303310002
 Slot B: OPTA2, 273.E, 10002.0 , Nr: 273M6080286
 Slot C: XN0PTB5, 260.C, 10501.8 , Nr: 260C4400074
 Slot D: XN0PTB5, 260.C, 10501.9 , Nr: 260C4360078
 Slot E: XN0PTD3, 261.D, 0.0 , Nr: 261D3310024

Counters
 MS Counter: 90.49 kWh
 Op Day Counter: 153 d
 Op Hour Counter: 05:41:53

Active Faults :

Time	Code	Fault	Type	Op Days	Op Hours
-	52	Keypad Conn	Fault (F)	153	5:31:07
Output Frequency : 0.00 Hz Motor Current : 0.00 A Motor Voltage : 0.0 V Motor Power : 0.0 % Motor Torque : 0.0 % Ready : 0 Run : 0 Direction : 0 Fault : 1 Warning : 0 At reference : 0 C-speed : 1 DC-voltage : 289 V Unit temperature : 26 C Subcode : A 1 Module : Software Submodule : Application					
-	10	Input Phase	Fault (F)	153	4:38:59
Output Frequency : 0.00 Hz Motor Current : 0.00 A Motor Voltage : 0.0 V Motor Power : 0.0 % Motor Torque : 0.0 % Ready : 1 Run : 0 Direction : 0 Fault : 0 Warning : 0 At reference : 0 C-speed : 1 DC-voltage : 292 V Unit temperature : 13 C Subcode : S 1 Module : Power Submodule : Unit					

Fault History :

Time	Code	Fault	Type	Op Days	Op Hours
-	52	Keypad Conn	Fault (F)	153	5:31:07
Output Frequency : 0.00 Hz Motor Current : 0.00 A Motor Voltage : 0.0 V Motor Power : 0.0 % Motor Torque : 0.0 % Ready : 0 Run : 0 Direction : 0 Fault : 1 Warning : 0 At reference : 0 C-speed : 1 DC-voltage : 289 V Unit temperature : 26 C Subcode : A 1 Module : Software Submodule : Application					
-	10	Input Phase	Fault (F)	153	4:38:59
Output Frequency : 0.00 Hz Motor Current : 0.00 A Motor Voltage : 0.0 V Motor Power : 0.0 % Motor Torque : 0.0 % Ready : 1 Run : 0 Direction : 0 Fault : 0 Warning : 0 At reference : 0 C-speed : 1 DC-voltage : 292 V Unit temperature : 13 C Subcode : S 1 Module : Power Submodule : Unit					
-	10	Input Phase	Fault (F)	153	4:38:59
Output Frequency : 0.00 Hz Motor Current : 0.00 A Motor Voltage : 0.0 V Motor Power : 0.0 % Motor Torque : 0.0 % Ready : 1 Run : 0 Direction : 0 Fault : 0 Warning : 0 At reference : 0 C-speed : 1 DC-voltage : 291 V Unit temperature : 13 C Subcode : S 1 Module : Power Submodule : Unit					

Sample
 "Service Info"

EATON LCX9000



Turn to the Experts™

Commissioning report submission

Submit the following items to vfdaftermarketeg@eaton.com with a copy submitted to your local service engineer and a copy included in your startup file

Previous Page Commissioning Report 2010

This Commissioning Report is to be completed by a certified Eaton Electrical Drive Commissioning and submitted to the Drive TRC at the completion of the VFD commissioning. All sections must be complete to qualify for extended warranty. Record any non-compliance either in the comments section on page 2 or use a separate sheet of paper. Fax or E-mail the completed form to the Drive TRC.

VFD Installed Location

Company Name: _____
 Address: _____
 City, State, Zip: _____
 Contact Name: _____
 Telephone: _____
 Fax: _____
 Email: _____

VFD Nameplate Information **Equipment Being Operated**

O.D. Number: _____ Application (Fan, Pump, Conveyor etc): _____
 Catalog Number: _____ Customer equipment reference or designation: _____
 Serial Number: _____

Motor Nameplate Information

Cat/Part Number: _____
 Manufacturer: _____
 Voltage: _____ Speed: _____ Frequency: _____
 HP: _____ FLA: _____ S.F. _____

Confirm installation conditions comply with Eaton Electric requirements (document all non-compliances in the comments section)

	Yes	No	Yes	No
Ambient Environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enclosure Rating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VFD Mounting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Line Voltage wiring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Output Filter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pre-power static checks (document all non-compliances in the comments section)

	Pass	Fail	VFD converter check
Motor and cables meggered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inspect power connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

E-mail completed document to crad@eaton.com
 Eaton Drive Technical Resource Center at 800-525-0001

Commissioning Report 2010

Record the following power on checks:

Line voltage: phase - phase:	A-B:	B-C:
Line voltage: phase - ground:	A-G:	B-G:
DC Bus Voltage:	B+ - B-:	B+ - G:

Record the following operational checks:

Readings recorded at Operating Frequency:

Line Voltage Phase - Phase:	A-B:	B-C:	A-C:
Line Current (each Phase):	A:	B:	C:

Motor Voltage - Monitor: _____ Output Current - Power Multimeter: _____

Clean Power Rectifier Lead Readings

L14:	L17:	L11:	L13:	L16:
L19:	L12:	L15:	L18:	

Software Selection

System Software _____ VFD Software Application Chosen: _____
 File Number: _____

Critical Parameter Settings

Minimum Speed:	DIN 1:
Maximum Speed:	DIN 2:
Current Limit:	DIN 3:
Local/Hand Start Source:	DIN 4:
Remote/Auto Start Source:	DIN 5:
Local/Hand Stpt Source Location:	DIN 6:
Remote/Auto Stpt Source Location:	Relay Output 1:
Digital Output:	Relay Output 2:

SVX 9000 Drive Commissioning Checklist

Pre-Test Checks		
Procedure	Expected Outcome	Value
1. TAG & LOCKOUT ALL POWER SOURCES TO THE VFD PER CUSTOMER & COMMISSIONER POLICIES		OK?
2. Visually inspect application to determine preparedness for operation		
3. Incoming power, outgoing motor and control wiring each in their own conduit		
4. Power source and cabling adequate for VFD and connected load		
5. The VFD is clean and free of installation debris, equipment or tools		
6. If installed, remove line and load side cables from VFD		

Ground Check of Incoming Cables		
Power Off - Meter on Resistance		
Procedure	Expected Outcome	Value
*Probe to L1 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
*Probe to L2 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
*Probe to L3 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	

Ground Check of Motor Cables		
Power Off - Meter on Resistance		
Procedure	Expected Outcome	Value
*Probe to T1 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
*Probe to T2 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	
*Probe to T3 Disconnected Cable / -Probe to Ground	> 1 Megohm to Ground	

Ground Check of VFD L1 - L2 - L3		
Power Off - Meter on Resistance		
Procedure	Expected Outcome	Value
*Probe to L1 Terminal / -Probe to Ground	> 1 Megohm to Ground	
*Probe to L2 Terminal / -Probe to Ground	> 1 Megohm to Ground	
*Probe to L3 Terminal / -Probe to Ground	> 1 Megohm to Ground	

Page 1 of 5

1. Commissioning report
2. SVX9000 Drive commissioning Checklist
3. Service Info

Basic Troubleshooting

Troubleshooting the Drive — The drive can display two kinds of error codes on the ICVC called the Alert and Alarm codes. These codes signal a problem detected during self tuning or drive operation. Alert and Alarm codes are located in the 19XRV Start-Up, Operation and Maintenance Instructions.

Note the following differences between Carrier and Allen-Bradley terminology:

- A warning message on the ICVC is an ALERT
- The same warning viewed with Rockwell Drive Explorer is a VFD ALARM
- A failure resulting in a shutdown is seen as an ALARM on the ICVC and as a VFD FAULT when viewed with Drive Explorer

CONDITION CODES

ICVC ALERT = VFD ALARM

ICVC ALARM = VFD FAULT

EATON LCX9000

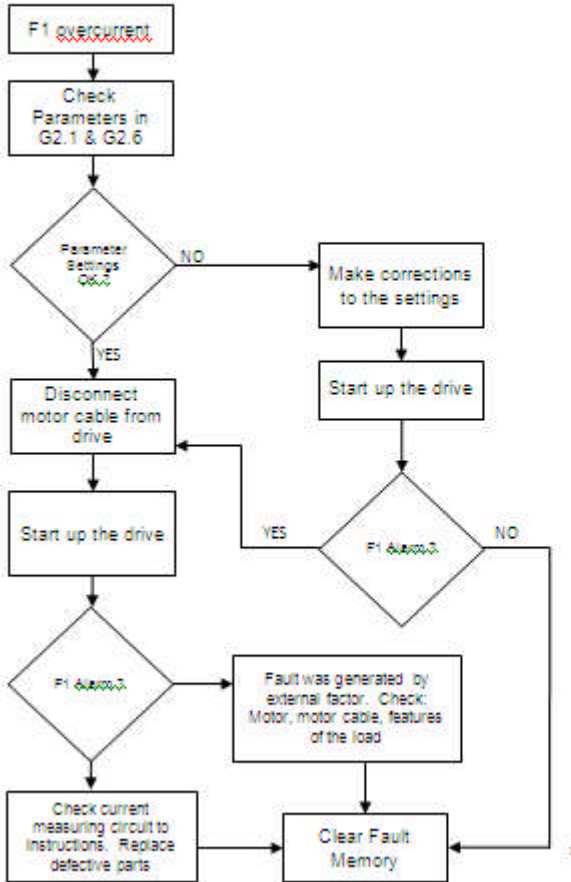
Troubleshooting list



Turn to the Experts™

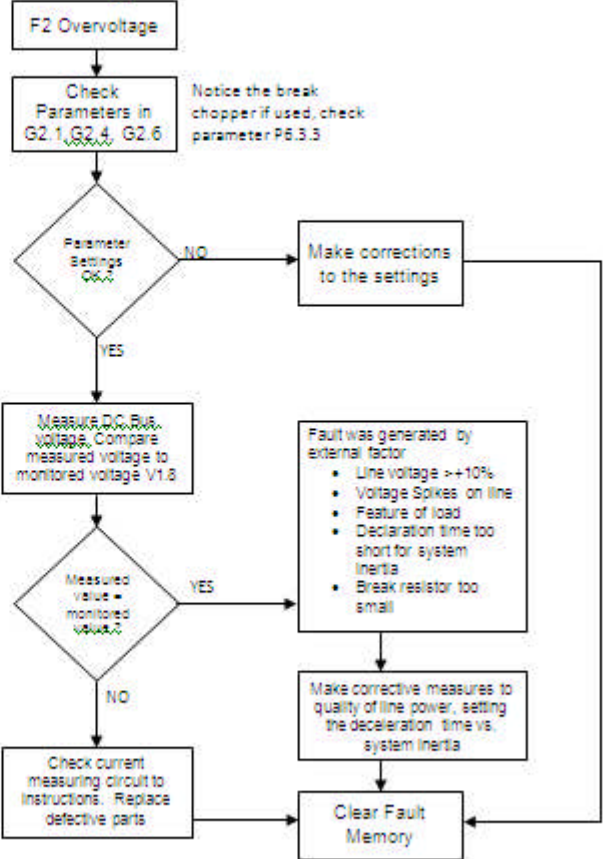
Eaton LCX 9000 Troubleshooting Jan 2012

F1-Overcurrent



Eaton LCX 9000 Troubleshooting Jan 2012

F2 -- Overvoltage



EATON LCX9000

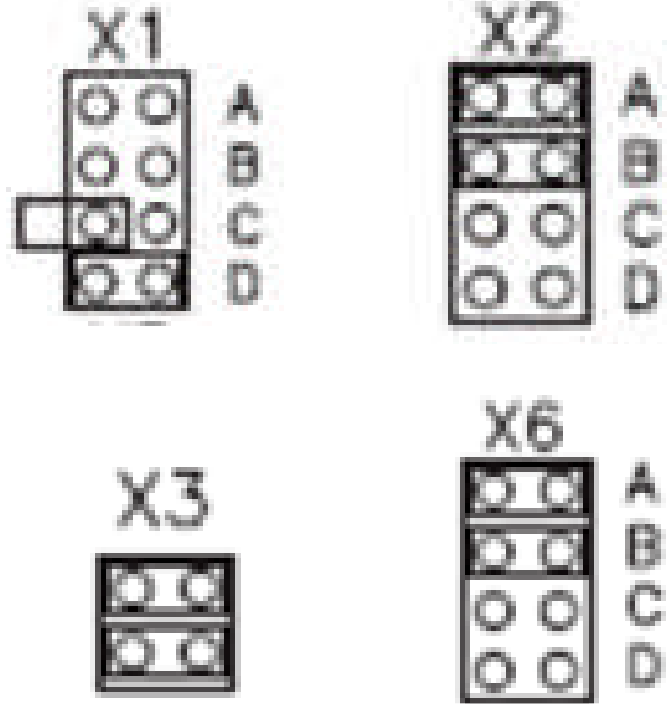
Check Jumper



OPTA9 MULTI-PURPOSE APPLICATION		A9-
REFERENCE OUTPUT	X1	+10V
ANALOG INPUT VOLTAGE (RANGE 0-10 VDC)		2 Vin+
		3 GND
		4 Lin+
I/O GROUND	X2	5 Lin-
ANALOG INPUT CURRENT (RANGE 4-20mA)		6 24Vout
		7 GND
		8 DIN1
CONTROL VOLTAGE OUTPUT	X3	9 DIN2
I/O GROUND		10 DIN3
OPEN		11 CMA
OPEN		12 CONTROL VOLTAGE OUTPUT
EXTERNAL FAULT		13 GND
DIN1-DIN3 COMMON		14 DIN4
CONTROL VOLTAGE OUTPUT		15 DIN5
I/O GROUND		16 DIN6
SPARE SAFETY		17 CMB
ICE BUILD		18 Lout+
REMOTE START		19 Lout-
DIN4-DIN6 COMMON	X6	20 D01
OUTPUT FREQUENCY		
ANALOG OUTPUT		
DIGITAL OUTPUT READY		

OPTA9 Card

X1, X2, X3 & X6 jumper should be properly set when board is replaced



EATON LCX9000



Turn to the Experts.™

Maintenance & Troubleshooting

Notice!

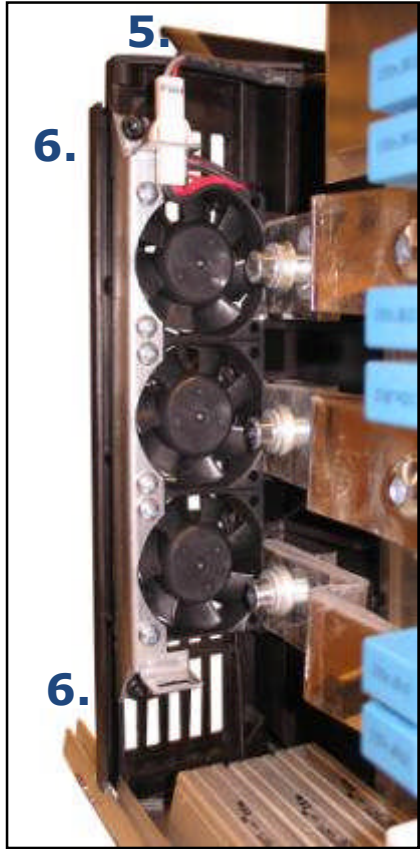
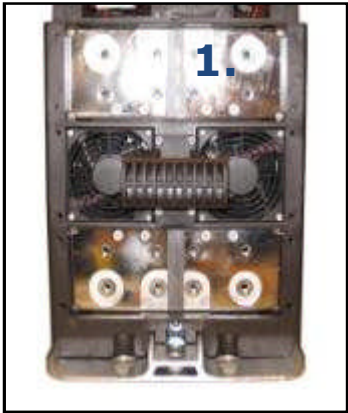
Fans are located on top of drive. Older version drive do not have the connector on the cable!

CH6 units

- 1. Remove the upper handle
- 2. Remove the fans
- 3. Disconnect the fan cable

CH7 units

- 4. Open the plastic cover from the sides
- 5. Disconnect the fan cable
- 6. Remove 2 screws

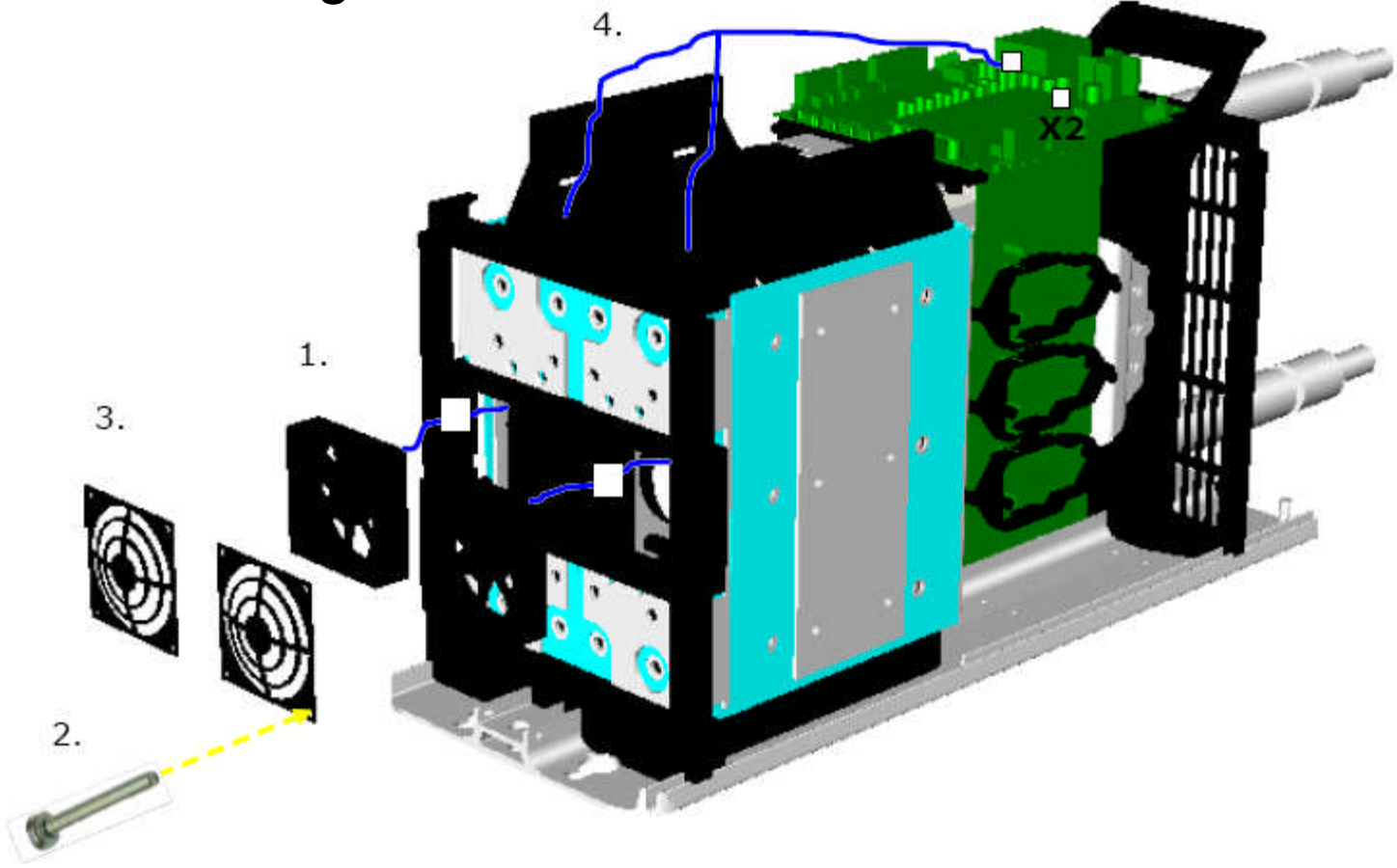


EATON LCX9000

Maintenance & Troubleshooting



Internal Cooling Fans



EATON LCX9000

Maintenance & Troubleshooting



Whenever breakers trip or fuses open conduct static checks

Do the basics first:

- Check Line Voltage

Motor Integrity:

- Disconnect Motor

- Conduct Megger Test

- If necessary conduct Surge Test

- Check Motor

Get temperature reading of all power line connection