ANORAD

Using Logix[™] Motor Database with Anorad Linear Motors

START-UP MANUAL

March 2005 Revision 2 Item Number 814039





Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this motor assembly must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation/Anorad does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:



Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

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Introduction

Using This Application Note	This application note is designed to help you install, integrate and start-up your Anorad Linear Motor with Logix. You do not have to be an expert in motion control. However, this note does assume you have a fundamental understanding of basic electronics, mechanics, as well as motion control concepts and applicable safety procedures.
	The intent of this note is to assist the user in the hardware configuration of the Anorad Linear Motor with Logix Controller.
	Read this entire note before you attempt to installation. Doing so will familiarize you with the Logic components effected and their relationship to each other and the system
	After installation, check all system parameters to insure you have configured your linear motor into your motion system properly.
	Be sure to follow all instructions carefully and lastly but foremost pay special attention to safety concerns.
Requirements	1. RSLogix Version 13 or later.
	2. Firmware for you ControlLogix Components and your Ultra3000 or Kinetix6000 drives must be compatible with your RSLogix Version. Note: To update Ultra3000 firmware, Ultraware is required.
	3. The latest version of the LOGIX Motor Data Base. The data base can be found at http://www.rockwellautomation.com/anorad/products/linearmotors/index.html
Reference Documents	LC Series Linear Motor User Manual, Item Number 814036
	Control Logix Motion Module Setup and Configuration Manual User Manual 1756-UM006F-EN-P

Using Logix Motor Database with Anorad Linear Motors

Electrical Connections for Anorad Linear Motor

The following figures are the motor cable electrical connection for the Anorad Linear Motors



Figure 1 Anorad Linear Motor to Kinetix 6000 Interconnect Diagram

This diagram is for LC-xxx-xxx-OTTRx motors See Appendix A for Anorad LEA, LEB, LEC, LEM, LEU, LF, LCK Motor wiring.



Figure 2 Anorad Linear Motor to Ultra3000 Models 2098-DSD-030x-xx, -075x-xx, -150x-xx, 2098-DSD-HVxxx-xx Interconnect Diagram

This diagram is for LC-xxx-xxx-OTTRx motors See Appendix A for Anorad LEA, LEB, LEC, LEM, LEU, LF, LCK Motor wiring.



Figure 3 Anorad Linear Motor to Ultra-3000 Models 2098-DSD-005x-xx, -010x-xx, -020x-xx Interconnect Diagram

Note 1 - Auxiliary +5V power is required to maintain encoder position when the main AC power is disconnected. To avoid a separate 5V dc auxiliary logic power supply, the 24V to 5V converter breakout board (2090-U3CBB-DMxx) is used to wire the control interface (CN1) connector.



This diagram is for LC-xxx-xxx-OTTRx motors See Appendix A for Anorad LEA, LEB, LEC, LEM, LEU, LF, LCK Motor wiring. Refer to Low Profile Connect illustration (lower left) for proper grounding techniques.

* Wire color shown for Renishaw RGH22 Linear Incremental Encoder with its Reference MARK actuator installed

Motor Phasing

When the motor power and Hall sensor wiring is connected as shown one of the previous figures, the positive direction of motion is when the motor coil is moving toward its power cable as shown in Figure 4.

The feedback incremental linear encoder should be wired such that the position feedback is positive (Phase A+ leads Phase B+) when the motor is moving in the positive direction.

Figure 4 Positive Motor Direction

When properly wired this is considered the positive direction of motion



Installation	1. Create a directory	in your RSLogix computer na	amed c:\motors
	2. Download the LO from the Rockwell directory created in	GIX Motor Database (motic Automation/Anorad website n step one.	on V3.18.1.db or later) e and Save to the
	 Install the LOGIX on Tools/Options "tree" the Options 	Motor Database, go to the F and then select Motion on the window shown in Figure 5 v	RSLogix Menu bar click ne left hand window vill be displayed.
	4. Select User Specifi Base file, and press	ed and Browse to point to th s OK.	e Logix Motor Data
	Figure 5 Options Window		
Workstation Options			×
Categories			
	Change Motion Preference	ces for RSLogix 5000	
Display	Motion Database:		
Font/Color	C Standard (Installed with	h RSLogix 5000)	
Tag Editor Display	User-Specified		
Ladder Editor Display	C:\motors\motion V3.1	15.4.db	Browse
	Name:	Custom Motion Database	
Motion	Revision:	3.15.4	
	Required Major Revision:	3	
	Checksum:	6006336	

Commission the Linear Motor connection.

Using the following menus apply the settings as shown in the tables and text following

Axis Properties: Drive/Motor Tab

1. On Driver/Motor Tab Figure 6 Click on Change Catalog.. button and select the Motor Catalogue Number that corresponds to the motor you are commissioning.

Note that each Anorad Linear Motor Catalogue Number represents a motor coil frame, length, and winding type that can be used with the following motor options:

- Motor OverTemperature Sensor options:
 - Thermal Switch
 - PTC (positive temperature coefficient) thermistor
- Motor Cooling options:
 - No cooling
 - AC, air cooled
 - WC, water cooled

Motor coils must have "Trapeziodal" Hall Effect Feedback Sensors.

When using a 460VAC drive (e.g. 2098-DSD-xxx-HV020, 2094-BM01, etc) the Linear Motor Catalogue number will be shown with an "H" suffix.

When using a 230VAC drive (e.g. 2098-DSD-xxx-020, 2094-AM01, etc) the Linear Motor Catalogue number will be shown with an "L" suffix.

2. Configure parameters as shown in Setting column in Table C and click OK.



Table C Settings for the Drive/Motor Tab

Parameter	Setting	Comment
Loop Configuration	Position Servo	
Drive Resolution	200	5µ Encoder
	1000	1µ Encoder
	2000	0.5µ Encoder
Drive Counts per*	Motor Millimeter	
Real Time Axis Information		
Attribute 1	Position Feedback	

Axis Properties: Motor Feedback Tab

Configure parameters in Figure 7 as shown in Setting column in Table D and click OK.

Figure 7 Motor Feedback Tab



Table D Settings for the Motor Feedback Tab

Parameter	Setting	Comment
Feedback Type	TTL	
Cycles	50	5µ Encoder
	250	1µ Encoder
	500	0.5µ Encoder
per	Millimeters	
Interpolation Factor	4	

Axis Properties: Conversion Tab

RSLogix 5000 - Frank_V13 in JJ_Index.ACD [1756-L63]* _ 8 × File Edit View Search Logic Communications Tools Window Help 🛛 🗸 🗐 RUN Offline Path: AB_DF1-1\1* - * 1 2 8 8 が間間のの No Forces ∃ □ 1/0 No Edits H her ++ 4 0.0 0 Favorites Bt 1 🔁 🔁 🖬 🖂 🔄 Controller Frank V13 🍄 Axis Properties - motor 🖉 Controller Tags 🚞 Controller Fault Handler Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag - Dower-Up Handler General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion 🗄 🔠 Tasks 🗄 🔂 MainTask Positioning Mode Linear • Drive Counts/1.0 mm 200.0 📇 Motion Groups Conversion Constant: based on 200 Counts/Motor Millimeter inear_motor 200000 🗀 Ungrouped Axes E Trends 🗄 🔚 Data Types 🛛 🙀 User-Defined 🛨 🧖 Strings Predefined
 Module-Defined 🗄 🔠 I/O Configuration 🗄 🖞 [2] 1756-M08SE sercos 📇 1 2098-DSD-005-SE drive

Configure parameters as shown in Setting column in Table E and click OK.

Table E Settings for the Conversion Tab

Parameter	Setting	Comment
Positioning Mode	Linear	
Conversion Constant	200	5 micron encoder
	1000	1 micron encoder
	2000	0.5 micron encoder

Axis Properties: Units Tab

Configure parameters in Figure 8 as shown in Setting column in Table F and click OK.

Figure 8 Units Tab



Configure parameters as shown in Setting column in Table F and click OK.

Table F Settings for the Units Tab

Parameter	Setting
Units:	mm
Average Velocity Timebase:	0.25 seconds

Verify Direction and Resolution

Select Controller tags, and Monitor the motor_ActualPostion tag.

R5Logix 5000 - Frank_V13 in JJ_Index.ACD [17 Bile Edit Yiew Search Logic Communications	56-L63]* Tools <u>W</u>	<mark>- [Controller Tags - Frank_¥1</mark> 3(indow Help	control	ler)]				
Rem Run Run Mode No Forces Controller OK Battery OK Redundancy	Path:	AB_DF1-1\1*	+ -(L)-	tput & Compare		<u>a x</u> b		
			our Sho		Cash Tao Na			
Controller Frank_V13			2w. jono 	Valua 🍝	Solic Tragina		Tupa	Ine
Controller Fault Handler		motor WatchEventStatus			I DICE MASK	Decimal	ROOL	108
Power-Up Handler		motor. Watche verificitatus		0		Decimal	POOL	
🗄 📇 Tasks		- motor. Hegc Vent Armed Status		0		Decimal	DOOL	11
📄 🤯 MainTask		-motor. RegE vent 1 Status	. 81	0		Decimal	BOOL	
🖃 🖼 MainProgram		motor.RegEvent2ArmedStatus		0		Decimal	BUUL	50
Program Tags		motor.RegEvent25tatus	10	0	6	Decimal	BOOL	14
		motor.HomeEventArmedStatu:	\$	0		Decimal	BUOL	
E S Motion Groups		-motor.HomeEventStatus		0		Decimal	BOOL	-01
				16#0000_0000		Hex	DINT	
to motor		motor.OutputCamPendingState	as.	16#0000_0000		Hex	DINT	
Ungrouped Axes		➡-motor.OutputCamLockStatus	i.	16#0000_0000		Hex	DINT	
庄 🚞 Trends		+ motor.OutputCamTransitionSta	itus	16#0000_0000		Hex	DINT	
🖻 🔠 Data Types		-motor.ActualPosition		133.5585		Float	REAL	
		-motor.StrobeActualPosition		0.0		Float	REAL	
Endefined		-motor.StartActualPosition		206.0305		Float	REAL	
				0.0	-	Float	BEAL	20.
		-motor Actual/elocity		0.0		Float	BEAL	
[☐ ¶ [2] 1756-M085E sercos		-motor ActualAcceleration		0.0		Float	BEAL	0
1 2098-DSD-005-SE drive				0.0		ELCO.		

1. With the drive DISABLED, move the axis and verify that the ActualPostion tag increases in value as you move in the positive direction.

If the direction of travel does not match what has been defined by the motor power and Hall Sensing wiring, then you can change the direction by changing the encoder wiring using Table G.

Table G Changing Direction by Changing Encoder Wiring

Move		To	
Encoder Phase Drive CN2, pin		Encoder Phase	Drive CN2, pin
A+	1	B+	3
A-	2	В-	4
B+	3	A+	1
B-	4	A-	2

2. Move the axis a know distance, and verify that the ActualPosition tag moves the correct distance in millimeters.

Connection Check and Tests

The following tabs check that the Motor Power (U, V, W), Hall Sensing S1, S2, S3 and the feedback incremental encoder wiring is correct and agrees with Logix motor data base.

Axis Properties: Hookup Tab

Configure parameters in Figure 9 as shown in Setting column in Table H and click OK before running tests.

& PSI only 5000 - Frank V13 in 11 Index withFther	Figure 9 Hookup Tab	(A) X
File Edit View Search Logic Communications Tools	Window Help	
Rem Run No Forces No Edits Redundancy Red Controller OK Battery OK I/O OK Red Controller OK Battery OK I/O OK	Path: AB_DF1-1\1* Image: State of the	
Controller Frank_V13 Controller Tags Controller Tags Controller Fault Handler Power-Up Handler Tasks MainTask MainProgram Unscheduled Programs Motion Groups Motion Groups Tends	Axis Properties - motor X General Motion Planner Units Drive/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune Dynamics Gains Output Limits Offset Fault Actions Tag Test Increment: Image: Conversion Image: Conversion Image: Conversion Test Marker Drive Polarity: Positive Image: Conversion Image: Conversion Image: Conversion Test Feedback Image: Conversion Image: Conversion Image: Conversion Image: Conversion Drive Polarity: Positive Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Drive Polarity: Positive Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Image: Conversion Drive Polarity: Positive Image: Conversion Image: Conversion Image: Conversion Test Feedback Image: Conversion Image:	

Test Setup

Table H Test Setup

Parameter	Setting			
Test increment	100.0 mm suggested			
Drive Polarity	Positive			

- 1. Press the Test Feedback button and then move the axis by hand at least 100mm when prompted.
- 2. Position the stage so that it can move 100 mm in the forward or reverse direction.
- 3. Press the Test Command & Feedback button and follow instructions on screen.

Axis Properties: Tune Tab

When the Hookup Tab: Test Feedback and Test Command and Feedback tests have successfully passed proceed with Tune Tab.

Configure parameters in Figure 10 as shown in Setting column Table I. Leave all other Tune options off at first and follow normal tuning procedures found in Control Logix Motion Module Setup and Configuration Manual User Manual 1756-UM006F-EN-P.

You may find you have to reduce the Velocity Loop Proportional Gain to maintain stability

5000 - Frank_¥13 in JJ_Index_withEthernet.A	CD [1756-L63]*	_ 8 ×		
iew Search Logic Communications Tools Win	dow Help			
	AB_DF1-1\1* B			
Controller Frank_V13 Controller Tags Controller Fault Handler Power-Up Handler Tasks MainTask MainTask MainTask MainTask MainTogram Unscheduled Programs Motion Groups Motion Groups Motion Groups Motion Groups Trends Data Types Strings Predefined Module-Defined Modul	Axis Properties - motor General Motion Planner Units Dirve/Motor Motor Feedback Aux Feedback Conversion Homing Hookup Tune* Damping Factor: 08 Tune Position Error Integrator Velocity Feedforward Acceleration Feedforward Torque Offset OK Cancel Apply Help			

Figure 10 Tune Tab

Table I Setting for Tune Tab

Parameter	Setting	Units	Note
Travel Limit	100	mm	Suggested
Speed	250	mm/sec	
Torque/Force	50	% Rated	
Direction	Forward Bi-directional		
Damping Factor	0.8		(default)

Axis Properties: Limits Tab

The Continuous Torque/Force Limit setting shown in Figure 11 Limits Tab should be set to reflect the motor cooling configuration.





For Anorad Linear motors this field data entry is limited to integer values between 0-150 percent. For standard motors, (NC) no cooling, this value can be set up to 100%, for (AC) air cooled motors this value can be set up to 120%, for (WC) water cooled motors this value can be set up to 150%.

Note: Increasing or decreasing the motor continuous current rating does not change the drives's continuous current limiting.

Table A Ultra-3000 Connectors to other Anorad Linear Motors

Motor Type	Hall Location	S1	S2	S 3	U	v	w
LEA, LEB, LEM	Cable end	BLU	ORN	WHT	RED	BLK	WHT
LEC	Cable end	BLU	WHT	ORN	RED	BLK	WHT
LCK	Cable end	ORN	BLU	WHT	RED	BLK	WHT
LC Series	Cable end	WHT	BLU	ORN	RED	WHT	BLK
LF	Cable end	BLU	WHT	ORN	BLK/RED	BLK/GRN	BLK/WHT

The motor commution phasing and Hall sensor wiring shown is Table A is such that positive direction is when the motor coil is moving towards its power cable.

Anorad/Rockwell Automation 100 Precision Drive Shirley, NY 11967-4710

Web site http://www.anorad.com E-mail anorad@anorad.com

Technical Support: Tel (631) 344-6600 Fax (631) 344-6660 email techsupport@anorad.com

