Electromechanical Automation Applications Note



 Product:
 Trilogy coils & Positioners

 Rev:
 2.0

 Subject:
 Configuring IForce & Ripped Linear servos to P Series with ACR9000

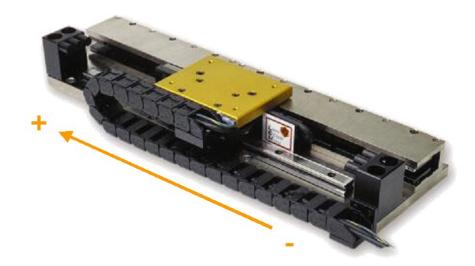
This application note clarifies the connections with the IForce and Ripped motors and positioners to the P Series drives with ACR9000 controller. Parker coils and positioners are supplied with flying lead cables. The new Connector Box option is shown for positioners offering connectorized cables. Version 2.0 of this document and motor files is consistent for standard positive direction (away from the cable exit) as per the catalog and picture below.

1. Wiring

IForce or Ripped coils have different color codes based upon the wiring option (such as WD3 in the part number). I-Force positioners (T1, T2, etc) use coils with WD2 wiring option, a separate MHED module that includes optical limits/ home sensors and magnetic hall-effect feedback, and the encoder readhead and scale.

Trilogy	Color Code Trilogy Positioners	ACR9000 Connection	User Supplied Connections
Limit Power	Orange		+24vdc
Limit Gnd	Violet		24vdc Common
		19, 21, 23	+24vdc Pullup
Home	Brown	20	
-Limit	Light Green	24	
+Limit	Light Blue	22	

Limit and home sensor connections to the ACR9000 on-board I/O are:



Trilogy Coil and Positioner to P Series Wiring

P Series Feedback - Encoder Connector							
	Enco	oder	Tempera	ture	Ha	lls	
	LME	RGH	Positioners		All Trilogy	except	
Pin	Magnetic	Optical	or WD0/1/2/7	WD3/4	Positioners & Coils	210 310 410 WD7/C	Function
14	Brown	Brown					+5V
7	White	White					Ground
12	Green	Green					A/
13	Yellow	Yellow					A
11	Blue	Blue	E.	Ľ			В
10	Red	Red	otic	otic			B/
9	Black	Pink	No connection	No connection			С
8	Orange	Grey	uo	uo			C/
14			0	00	Black	Black	+5V
7			z	z	White	White	Ground
5					Yellow	Brown	HED C
3					Blue	Blue	HED B
1					Green	Green	HED A
Case	Shield				Shield	Shield	Shield

Limits/Home for PD-xxP Indexer

	I/O - HD 50pin					
Pin	HED Head	Function				
21	Orange	+24V				
	_					
13	Light Green	- Limit				
14	Light Blue	+ Limit				
22	Brown	Home				
	Violet	Ground				

Limits/Home for PD-xxC EtherCAT					
	I/O	- HD 20pin		· ←	
Pin	HED Head	Function			
6	Orange	+24V			
11	Light Green	- Limit			
12	Light Blue	+ Limit			
4	Brown	Home			
	Violet	Ground			
				• •	

For Pseries Analog Torque or Velocity applications, the limits and home sensors are connected to the controller. External 24volt power supply. Connect this to Pin 21 or 11 This will also pull-up the inputs to 24volts. These are the opposite the default settings for the inputs but configurable in the Pseries Drive Support Tool software.

External reference for 24volt power supply's (GND or -)

- For Pseries Analog Torque or Velocity applications, the limits and home sensors are connected to the controller. External 24volt power supply. Connect this to Pin 21 or 11 This will also pull-up the inputs to 24volts. This are default settings for the inputs. These are configurable in the P Series Drive Support Tool software.

External reference for 24volt power supply's (GND or -)

NOTES:

Temperature wires (yellow and orange for WD0/1/2/7; or gray and violet for WD3/4) are not connected to Pseries drive. Strip all cables back about 12-inches. Put all wires going into the Feedback connector through one piece of heatshrink For ACR9000, put all limit/home wires (Orange, Purple, Brown, Lt Green, Lt Blue) through another piece of heatshrink.

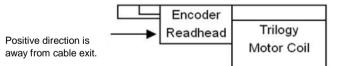
Connect motor cable ground to Pseries heatsink chassis ground.

	Using O	ld Color codes	
	T1, T2, T3 Positioners	T4, TR7, TR10, TR16 Positioners R7, R10, R16 Coils ML50 Coils	
Pin	110 210 310 WD0/1/2/7 coils	110 210 310 WD3/WD4 coils	Function
U	Red & Blue	Red	U
V	White & Green	Brown	V
W	Black & Brown	Orange	W
GND	Drain wire (Coils)	Drain wire	PE
	or Green/Yellow (Positioners)	Ground wire	

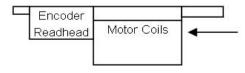
P Series - Motor Connection

For safety ground for the Ironless linear motors, install a ground wire from P Series ground to the coil bar as per 88-028449-01A installation instructions. New cables include this ground wire in the motor cable and are shown below.

	Using Ne	ew Color codes	
		T4, TR7, TR10, TR16 Positioners	ĺ
		R7, R10, R16 Coils	
	T1, T2, T3 Positioners	410 and ML50 Coils	
Pin	110 210 310 WD0/1/2/7/A/C coils	110 210 310 WD3/4/B coils	Function
U	Red/Yellow & Blue/Yellow	Red/Yellow	U
V	White/Yellow & Violet/Yellow	Brown/Yellow	V
W	Black/Yellow & Brown/Yellow	Orange/Yellow	W
GND	Green/Yellow	Green/Yellow	PE



The above connections presumes the motor, readhead and hall cables exit the same direction. For positioners, this is the standard orientation. If the HED is reversed in a custom positioner, consult factory.

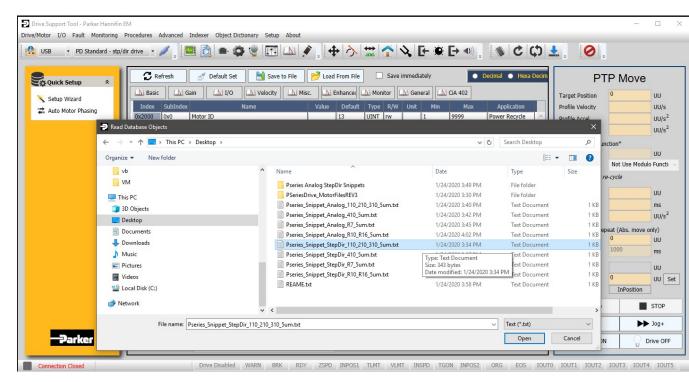


In coil only applications, if the encoder's cable exit faces the opposite way, switch A and A/.

2. P Series Drive Setup



The P Series Indexer (PD-xxP) can be set in different modes: Simple Indexer, Analog Torque, Analog Velocity or Position (5volt Step & direction). Included in the motor files are drive setup files for analog torque or step & direction for the ACR9000. We recommend step & direction to take advantage of the advanced tuning with the Drive Support Tool. The standard cable to connect to the ACR9000 supports both modes.

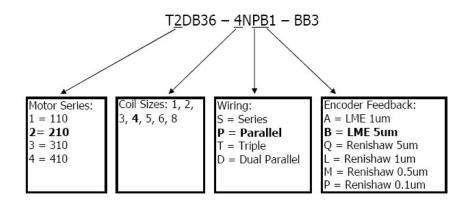


Download the Pseries Analog and Step & Direction Setup files from:

https://community.parker.com/technologies/electromechanical-group/w/electromechanical-knowledgebase/1814/acr9000-pseries-analog-or-step-direction-samples-notes

Select file and click Open. See next page for part number explanation.

Drive Support Tool allows loading motor files using the I-Force and Ripped series coil part numbers. The Trilogy positioner part numbers contain the coil part numbers. Below shows an example of the I-Force T2 positioner part number and the information pertinent for P Series configuration.



Download the Pseries IForce and Ripped motor files from:

https://community.parker.com/technologies/electromechanical-group/w/electromechanical-knowledgebase/1572/p-series-drives-with-mpp-be-sm-j-n-servo-motors-msr-lxr-110-210-310-410-t1-t2-t3-t4-linear-motorstages

From the Object Dictionary, select Load from File and select your motor file:

Quick Setup *	C Refresh 📑 Default Set	🚼 Save to File 📂 Load From File 🗌 S	Save immediately	Decima	al 💿 Hexa Decim	PTP	Move
Setup Wizard	Basic Sain I/O	🛿 Velocity 🔝 Misc. 🖾 Enhanced 🖾 Monito	or 🖾 General 🖾 🤇	CIA 402		Target Position 0	UU
Auto Motor Phasing	Index SubIndex Name	e Value Default Type I	R/W Unit Min	Max A	Application	Profile Velocity	UU/s
Auto Motor Phasing	0x2000 0x0 Motor ID	13 UINT n	w 1	9999 Pow	ver Recycle 🛛 🔿	Drofile Accel	UU/s
nead Data	abase Objects					×	UU/s
$\leftarrow \rightarrow \cdot$	↑ ↑ → This PC → Desktop → PSeriesDriv	/e MotorFilesREV3 → 210		ٽ ~	Search 210	م unctior	
				-		- anctor	UU
Organize 🔻	 New folder 				BEE	- 🔳 😮 📊	ot Use Modulo Funct
To De	0	^ Name	Date modified	Туре	Size	n re-cyc	
vb		210-2WD_T_0.5um KGH.txt	1/24/2020 3:30 PM 1/24/2020 3:30 PM	Text Document	2 KB	/e-cyc	.re
🗔 VM		210-2WD_I_Ium RGH.bdt	1/24/2020 3:30 PM	Text Document	2 KB		UU
This P		210-3WD_Pfum_LME.ba	1/24/2020 3:30 PM	Text Document	2 KB		ms
1115 P		210-3WD_P_ 5um RGH.bdt	1/24/2020 3:30 PM	Text Document	2 KB		UU/s
		210-3WD_Ptxt	1/24/2020 3:30 PM	Text Document	2 KB	eneat	(Abs. move only)
Deski		210-3WD_P_0.5um RGH.txt	1/24/2020 3:30 PM	Text Document	2 KB	0	(ADS. MOVE ONLY)
🔮 Docu		210-3WD_P_1um RGH.txt	1/24/2020 3:30 PM	Text Document	2 KB	10	
- Down		210-3WD_S_ 0.5um RGH.txt	1/24/2020 3:30 PM	Text Document	2 KB		
🎝 Musi		210-3WD_S_ 1um LME.bd	1/24/2020 3:30 PM	Text Document	2 KB		UU
📰 Pictu	ıres	210-3WD_S_1um RGH.txt	1/24/2020 3:30 PM	Text Document	2 KB	0	UU
📑 Video	05	210-3WD_S_ 5um LME.txt	1/24/2020 3:30 PM	Text Document	2 KB		InPosition
		210-3WD_S_5um RGH.txt	1/24/2020 3:30 PM	Text Document	2 KB		
🏥 Loca	I Disk (C:)	210-3WD S .txt	1/24/2020 3:30 PM	Text Document	2 KB		STOP

For users unsure of their wiring or encoder resolution, consider limiting current to the motor with these objects (in 0.1 of a % so 100 is 10%). Default values are 3000, motor's full peak current (3x continuous).

0x2111,0x0,External Positive Torque Limit Value,100

0x2112,0x0,External Negative Torque Limit Value,100

Then Save to Memory and Software Reset. Motor settings do not take effect until a Save and Software Reset.

Users can then go into the Manual Jog panel, enable the motor with Drive ON and jog the motor. The speed has already been set to 100mm/s.

1	Mai	nual	Jo	g	
Speed	10	100		rpm(mm/s)	
-Smoothing -					
Accel Time	20	200		ms	
Decel Time		200		ms	
S-curve Time 0				ms	
Servo-Lock	<				
FB Speed	0			rpm(mm/s)	
FB Position	36		UU		
C Read	•	🗲 Nega	tive	Positive	
P Driv	ve ON		Q	Drive OFF	

Continued next page.

3. ACR9000 Setup

For the ACR9000 with the P Series in Position (Step&Direction) mode, go through the Configuration Wizard, setting the command output in Axes to Stepper, selecting the units and then in the drive setting, select P Series and Trilogy. This will automatically set the drive resolution (greyed out in top right):

Select Drive	ŕ – – – – – – – – – – – – – – – – – – –					
Drive	P Series	~	Drive Resolution (Steppers Only)	200	pulses/mr	n
Select Moto	r					
Motor	Trilogy (5um)			```	~	
Motor Type	O Rotary 💿 Linear					

Then you'll be able to jog either from the Jog/Home/Limits in the configuration wizard or from the Jog/Teach Panel (under Tools in the Project Workspace):

Section 2000: (X) Axis 3	ACR9000:Master 0(Master 0):(X) Axis 3:Jog/Home/	/Limits 🗖 🖾
Actual Position-Scaled 3.8372 Dog Velocity 1	Status Communications Connected	Operations Drive Drive Enabled Trive Not Faulted Enable Drive Disable Drive
Fault Jog Acceleration Pos Limit 10	Hardware Limits Positive Hard Limit Not Tripped Negative Hard Limit Not Tripped Setup	Enable Drive Disable Drive
Neg Limit Incremental Distance Home Kill All Motion	Software Limits Software Limit Not Tripped Setup	Ready to Jog.
Control While Held O Incremental Jog Neg Stop Jog Pos	Position Commanded Position 3.8374 Actual Position 3.8372 Inches	Jog Home Gog Lockout Not Enabled Gog Limit Check Not Enabled Gog Jog Not Active
Kill Motion	Position Error (Servos Only) Max Position Error Not Exceeded Setup Motion Enable	 Not Jogging Positive Not Jogging Negative Jog Not At Speed Jog Not Stopping
Disable Zero Pos Home Array Index T Clear Array	Advison Enable Input Active LED Legend a = not ready = error	Jog Positive Jog Negative Jog Setup
Capture Pos Save Array	Fready	Kill All Motion & Disable All Drives p < Back

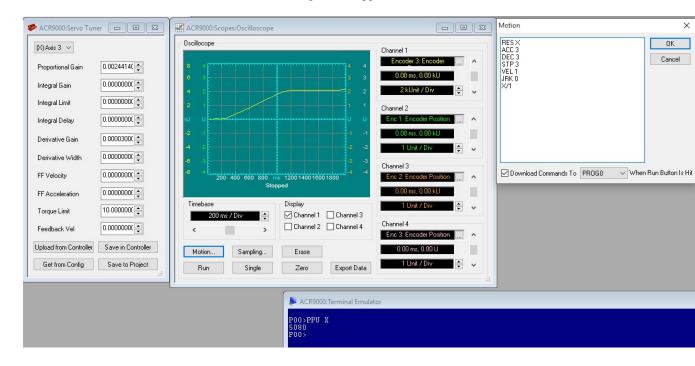
For the ACR9000 with the P Series in Analog Torque mode, go through the Configuration Wizard, setting the command output in Axes to DAC, selecting the units and then in the drive setting, select P Series and Trilogy. This will automatically set the drive resolution (greyed out in top right):

Select Drive Drive P Series Drive Resolution Select Motor Motor Motor Motor Motor Motor Select Motor M	ack Next>
Select Motor Motor Trilogy (Sum) Motor Type Rotary Linear Help Back Next> ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Set Up Position Feedback Type Full Quadrature Package Rotary Package Rotary	ack Next>
Motor Tilogy (5um) Motor Type Rotary © Linear Help < Back Next> ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Set Up Position Feedback Type Full Quadrature Package © Rotary © Linear	ack Next > city Feedback iul Quadrature Rotary © Linear
Motor Type Rotary © Linear Motor Type Rotary © Linear Help < Back Next> ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Set Up Position Feedback Type Full Quadrature Package Rotary © Linear	ack Next > city Feedback iul Quadrature Rotary © Linear
Help < Back	ocity Feedback VIII Quadrature
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback 'ull Quadrature) Rotary O Linear
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback 'ull Quadrature) Rotary O Linear
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback 'ull Quadrature) Rotary O Linear
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback 'ull Quadrature) Rotary O Linear
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback 'ull Quadrature) Rotary O Linear
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback VIII Quadrature
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Image: Constraint of the set of t	ocity Feedback VIII Quadrature
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Set Up Position Feedback Type Full Quadrature Package O Rotary O Linear Package O Rotary O Linear	ocity Feedback VIII Quadrature
ACR9000:Master 0(Master 0):(X) Axis 3:Feedback Set Up Position Feedback Type Full Quadrature Package O Rotary O Linear Package O Rotary O Linear	ocity Feedback VIII Quadrature
Set Up Position Feedback Set up Velocity Feedback Type Full Quadrature Package Rotary Inear Package	ocity Feedback 'ull Quadrature) Rotary () Linear
Set Up Position Feedback Set up Velocity Feedback Type Full Quadrature Package Rotary Inear Package	ocity Feedback 'ull Quadrature) Rotary () Linear
Set Up Position Feedback Set up Velocity Feedback Type Full Quadrature Package Rotary Inear Package	ocity Feedback 'ull Quadrature) Rotary () Linear
Type Full Quadrature Type Full Quadrature Package Rotary Linear	ull Quadrature V
Package O Rotary O Linear Package O Rotary O Linear	Rotary 💿 Linear
	-
Source Encoder 3 V Source Encoder 0 V	
	incoder 0 🗸 🗸
Resolution 200 pulses/mm Resolution 200 pulses/mm	00 pulses/mm
	parcontini

Select the motor based on the linear encoder resolution. On the feedback screen, set the resolution:

	В	Α	Q	L	М	Р
	5um	1um	5um	1um	0.5um	0.1um
	LME	LME	Renishaw	Renishaw	Renishaw	Renishaw
Pulses/mm	200	1000	200	1000	2000	10000

Default tuning gains are decent for an unloaded horizontal stage for a 5um system but setting derivative from 0.00001 to 0.00003 is a good starting point. (Leave proportional set to 0.0024414)

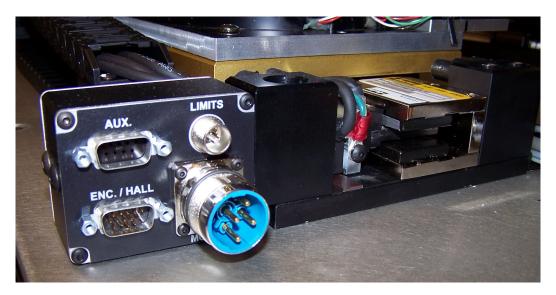


The Servo Tuner under Tools allows for further tuning for the application.

Note: The home and limit sensors are normally closed and thus the home limit should be changed to NC.

🖉 9000:ACR9000:Configuration Wizard:Axes:Axis 0:Dedicated I/0			
Assign Digital Inputs For Specific Functions			
Input Type Onboard	Input 🗾		
Onboard Input 3 Onboard Input 4 Onboard Input 5 Onboard Input 6 Onboard Input 7 Onboard Input 7 Onboard Input 9 Onboard Input 10 Onboard Input 11	< Positive Limit	Onboard Input 0	Input Type N.C. ON.O.
	K Negative Limit	Onboard Input 1	Input Type N.C. C N.O.
	Home Limit	Onboard Input 2	Input Type © N.C. © N.O.
Onboard Input 24 Onboard Input 25 Onboard Input 26	Drive Fault >	Onboard Input 64	
Assign Digital Outputs For Specific Functions			
			- Output Type
Onboard Output 32 Onboard Output 33 Onboard Output 34	Drive Enable >	Onboard Output 40	C N.C. © N.O.
Onboard Output 35	Drive Reset >	Onboard Output 48	C N.C. C N.O.
N.C. = Normally Closed N.O. = Normally Open			
		<u>H</u> elp	< <u>B</u> ack

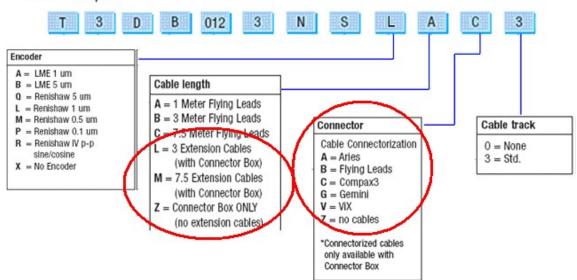
IForce Positioner Connector Box Option



IForce positioners have a connector box option as a standard option. Daedal LXR users will recognize this as similar to the LXR connector box. This allows users to be able to quickly connect IForce positioners to standard Parker drives with connectorized cables. The connector box is available with Flying leads or Parker-drive connectorized cables in 3 or 7.5 meter (10 or 25-foot) for Aries, Compax3 or P Series servo drive/controllers. See distributor extranet configurator for full order options.

Feedback cable P/N: 006-2827-3.0 (3meter) or 006-2827-7.5 (7.5meter)

Power cable P/N: 006-1922-3.0 (3meter) or 006-1922-7.5 (7.5meter)



Order Example:

If you have any questions, please contact:

• Technical Assistance, Applications Engineering Department (e-mail: emn_support@parker.com or call 800-358-9070 North America, 707-584-7558 International)