Electromechanical Automation Applications Note

Bulletin # TB433 rev C
Date: **Monday, June 30, 2008**
Product: Trilogy coils & Positioners with Gemini & 6K
Subject: Gemini Motors Table Update

This applications note clarifies the connections with the Trilogy motors and positioners to the Gemini (GV) drives with 6K controller, or the Gemini drive/controller (GV6 or GV6K). Trilogy coils and positioners are supplied with flying lead cables typically. The new Connector Box option is shown for Trilogy positioners offering connectorized cables for Gemini drives.

Step 1: Trilogy to Gemini Wiring

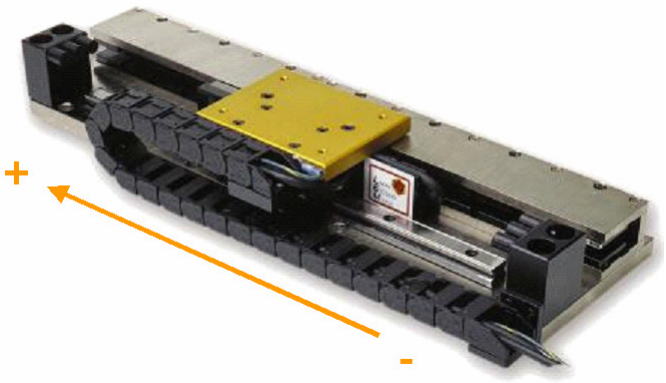
The Trilogy coils have different color codes based upon the wiring option (such as WD3 or WD7 in the part number). The Trilogy I-Force positioners (T1, T2, T3 and T4) use coils with WD2 wiring option, a separate MHED module that includes optical limits/ home sensors and magnetic hall-effect feedback, and the encoder readhead and scale. The Trilogy Ripped positioners (TR05, TR07, TR09, TR10, TR16) use HED connector modules that include both magnetic limits/home and hall-sensors feedback, and encoder readhead and scale.

Trilogy positioners are now available with connectorized cables for plug & play operation. See Page 6.

See next page for Trilogy Coil and Positioner to Gemini Wiring.Llimit and home sensor connections are:

Trilogy	Color Code Trilogy Positioners Ripped & I-Force	GV6, GV6K Pin	6K Pin for Axis1	Gemini or 6K function
Limit Power	Orange	User Supplied +24vdc	User Supplied +24vdc	User Supplied
Limit Gnd	Purple	30	any even pin	Input/Limit Gnd
Home	Brown	31	19	Limit 3 (Home)
+Limit	Light Green	28	23	Limit 1 (Pos)
-Limit	Light Blue	29	21	Limit 2 (Neg)

Note that the above wiring is for the motor moving away from the cable exit as the positive direction.

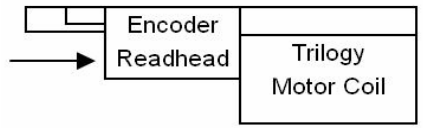


Trilogy Coil and Positioner to Gemini Wiring

Gemini Motor Feedback Connector

Pin	Encoder LME Magnetic	Encoder RGH Optical	Temperature Positioners or WD0/1/2/7	Temperature WD3/4	Halls All Trilogy Positioners & Coils	Halls except 210 310 410 WD7/C	Function
1, 2	Brown	Brown					+5V
3, 4	White	White					Ground
5	Yellow	Yellow					A/
6	Green	Green					A
7	Blue	Blue					B
8	Red	Red					B/
9	Black	Pink					C
10	Orange	Grey					C/
12			Yellow	Grey			+ Thermal
13			Orange	Violet			- Thermal
14					Black	Black	+5V
15					White	White	Ground
16					Yellow	Brown	HED C
17					Blue	Blue	HED B
18					Green	Green	HED A
Case	Shield				Shield	Shield	Shield

NOTES:
Halls C/B/A are reversed at the Gemini, Hall 1/2/3 respectively.
The encoder's A+ and A- are reversed at the drive, A/ and A respectively.
Thermal sensor is not polarity sensitive.
Strip all cables back about 12-inches. Put all wires going into the Feedback connector through one piece of heatshrink
Put all limit/home wires (Orange, Purple, Brown, Lt Green, Lt Blue) through another piece of heatshrink unconnected.
Valid for all Trilogy T1D and T1S positioners built after 12/1/2007. Contact factory for T1S and T1D built before 12/1/2007.
Bellows positioners are same as standard positioners. ex, For B3 positioner, see T3 positioner.
Connect motor cable shield to Gemini chassis shield using saddleclamp (RF ground).



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.

Gemini Motor Connection

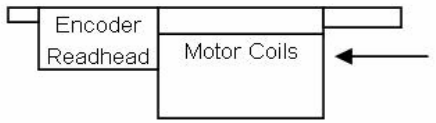
Using Old Color codes

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

For safety ground for the Ironless linear motors, install a ground wire from Gemini 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 New Color codes

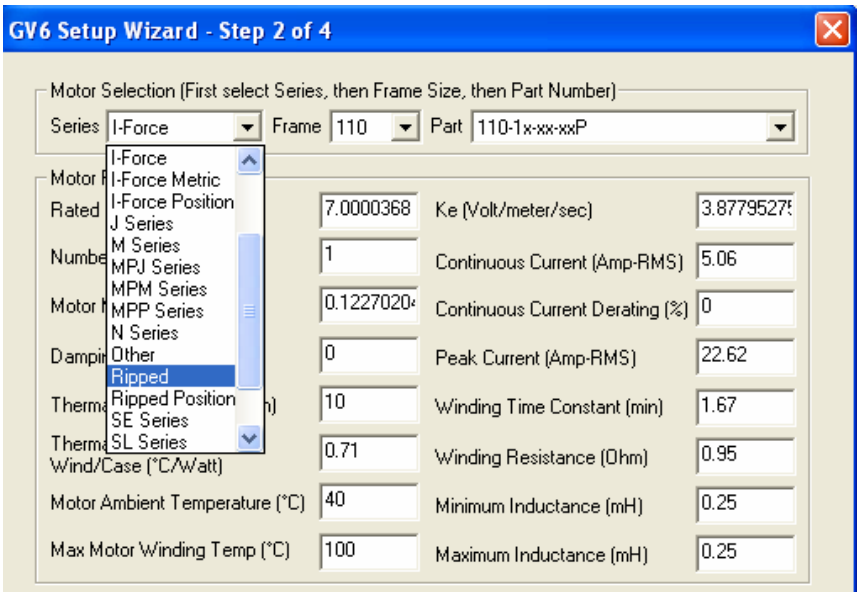
Fcn	T1, T2, T3 Positioners 110 210 310 WD0/1/2/7/A/C coils	T4, TR7, TR10, TR16 Positioners R7, R10, R16 Coils 410 and ML50 Coils 110 210 310 WD3/4/B coils	Function
A	Red/Yellow & Blue/Yellow	Red/Yellow	U
B	White/Yellow & Violet/Yellow	Brown/Yellow	V
C	Black/Yellow & Brown/Yellow	Orange/Yellow	W
GND	Green/Yellow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



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

Step 2: Configure Gemini motor settings

The Gemini motors table database from which MotionPlanner obtains the motor information for the Gemini Setup Wizard has been updated to include both the I-Force and Ripped series linear motors. This allows users to quickly configure the Gemini amplifier parameters through the Gemini Setup Wizard using the motor or positioner standard part numbering.



The Gemini Motor Table update is available for free download on our website at:
http://www.parkermotion.com/scripts/support_downloads.asp#GMT

The Trilogy positioner and coil part numbers are listed. The positioners include all standard encoder resolutions. If using Trilogy coil part numbers, the encoder resolution default is set to 5um. If using a different resolution, modify a standard configuration and change ERES, ORES, DRES and SMPER appropriately in the auto-generated code; for 1um increase by a factor of 5; for .5um increase by 10, for .2um increase by 25; for .1um increase by 50.

After downloading the setup to the Gemini, you are now ready to start programming the Gemini (GV6 or GV6K) or 6K controller.

Gemini and 6K Setup Notes

For 6K or GV6K, set the home sensor to normally closed with the LIMLVL command, i.e. LIMLVL001 for axis1.

For GV6, set the home sensor to nomally closed with the command INLVL111.

For 6K or Gem6K scaling, using the 5um resolution linear encoder for millimeters, set scaling to 200 counts/mm; for inches, set scaling to 5080 counts/inch. For 1um resolution, set scaling to 1000counts for millimeters; for inches use 25400.

For 6K, ERES should be set to the same as the GV's Drive Resolution, shown in Step 3 of the Gemini's Express Setup Wizard. i.e., 12192 counts for T2 positioner with 5um encoder

The above notes presumes users are experienced Gemini and 6K programmers. For full user documentation, see the Gemini and 6K user guides: http://www.parkermotion.com/manuals/literature_user.htm

The temperature switch is not fast enough to protect the motor for peak currents above 2x. If the temperature switch is to be relied on to protect the motor, the peak current (DMTIP) should be reduced to 2x DMTIC or less.

If the internal thermal model is to be relied on to protect the motor, do not power off or reset the amplifier during use. During an e-stop or jam, keep the amplifier alive using the 24v supply, and shut off only AC power. **Do not reset the amplifier or power off**; use the enable/disable commands or signals. Repeatedly resetting the drive can thermally damage the motor.

Troubleshooting Steps

If dealing with extended cables or connectorized cables and needing to troubleshoot a 6K or Gemini with Trilogy linear servo motor, to confirm that the motor and encoder direction match:

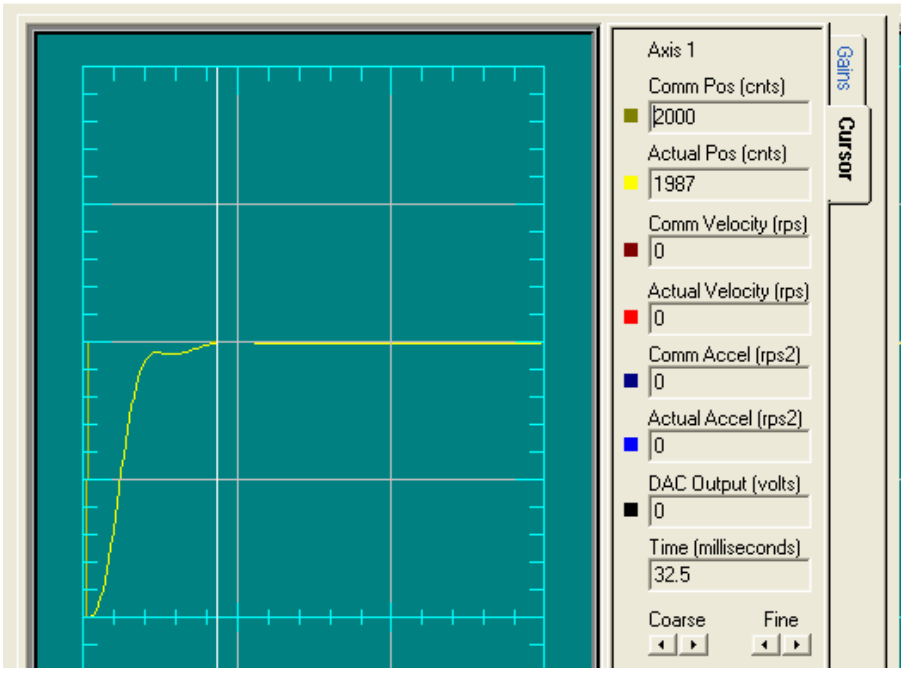
1. Put the Gemini drive into auto-run mode DMODE13 using MotionPlanner's Terminal.
2. Hardware enable the Gemini (Drive I/O connector, jumper pins 1 & 2)

   If using a 6K controller may set AXSDEF0 to stepper to disable the servo gains, DRFEN0 to disable drive fault checking and DRIVE1 to enable.
3. If necessary, software enable the Gemini drive with DRIVE1
4. The Trilogy motor will start moving in the motor's positive direction. To stop motion use !K (Control + K) or DRIVE0. In terminal window, check encoder direction for the GV6, GV6K or 6K with TPE. It should be counting up. If not, invert with setting ENCPOL1.

   Note if using a GV drive, do not use ENCPOL. The GV encoder output polarity to the 6K controller is not affected by ENCPOL; only the internal encoder counter for the GV is affected.

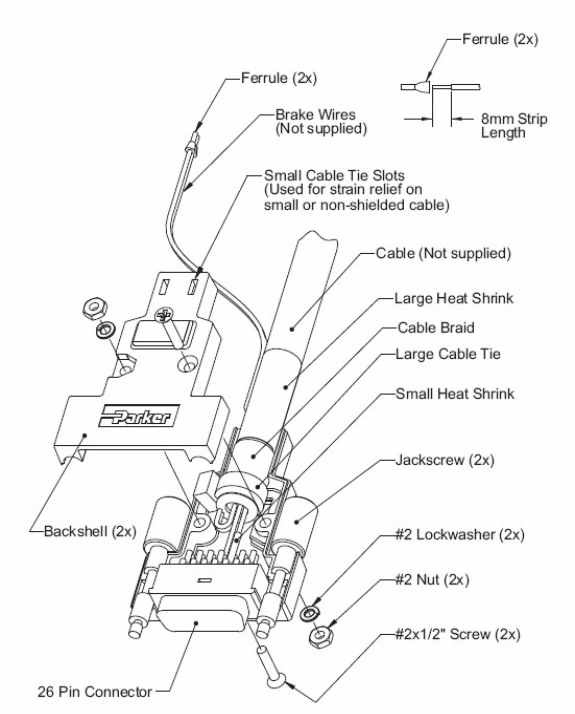
   To exit autorun mode, use DMODE2 for GV drives, use DMODE12 for GV6/GV6K.
5. Now that the encoder and motor directions match, confirm that a small move can be commanded from the terminal window. If the direction is opposite from desired, CMDDIR command can be used. This inverts both the analog DAC command output to and encoder direction from the Gemini drive.
6. To limit force output while using the above troubleshooting steps, DACLIM command from the 6K can be used or DMTLIM within the Gemini.

Basic tuning gains for 6K control are SGP3, SGV1 for an unloaded positioner at 5um resolution. Gemini Servo Tuner for GV6 and GV6Ks or Servo Tuner for 6K can be used. As an example T2D-4P with 5um encoder gains were SGP7 SGV7 SGI0.2 SGILIM1. Move and settle in 32.5msec for a 2000 count step.

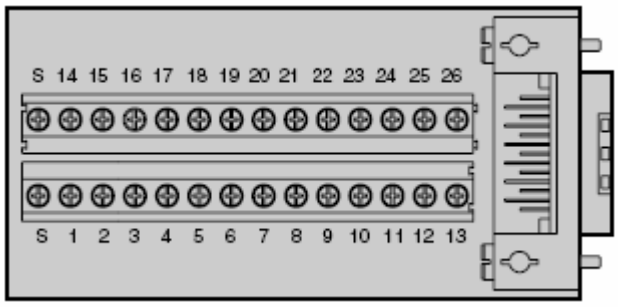


As the limit switches activate close to the positioner hardstops, it is a good idea to use software limits.

For machine installations the Gemini Feedback connector kit is offered. It may be ordered with part number GFB-KIT. For demo purposes, the Gemini connector with terminal strips is offered. Though not for permanent machine installations, this motor feedback adapter board offers the convenience of screw terminals for initial connection setup and demonstrations. It may be ordered with part number GC-26.

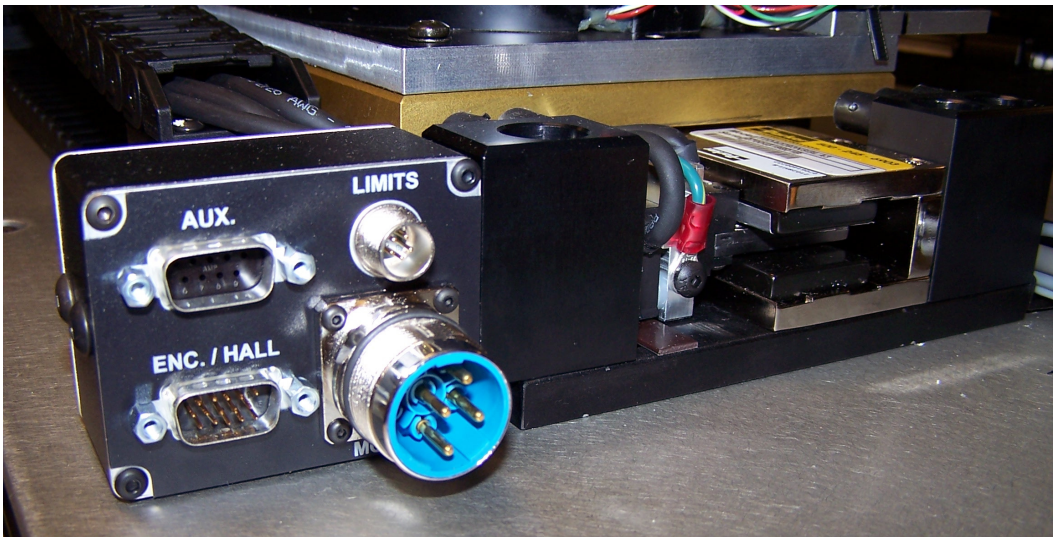


GFB-KIT



GC-26

Trilogy Positioner Connector Box Option



Trilogy positioners have a connector box option as a standard option. Daedal LXR users will recognize this as similar to the LXR connector box. This is allows users to be able to quickly connect Trilogy positioners to standard Parker drives with pre-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, Gemini or ViX servo drive/controllers.

Note that the Connector Box is available on all positioners except parallel and triple wound Ripped Positioners.

Order Example:

T	3	D	B	012	3	N	S	L	A	C	3

Encoder
- A = LME 1 um
- B = LME 5 um
- Q = Renishaw 5 um
- L = Renishaw 1 um
- M = Renishaw 0.5 um
- P = Renishaw 0.1 um
- R = Renishaw IV p-p sine/cosine
- X = No Encoder

Cable length
- A = 1 Meter Flying Leads
- B = 3 Meter Flying Leads
- C = 7.5 Meter Flying Leads
- L = 3 Extension Cables (with Connector Box)
- M = 7.5 Extension Cables (with Connector Box)
- Z = Connector Box ONLY (no extension cables)

Connector

Cable Connectorization
- A = Aries
- B = Flying Leads
- C = Compax3
- G = Gemini
- V = ViX
- Z = no cables

*Connectorized cables only available with Connector Box

Cable track
- 0 = None
- 3 = Std.

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)