CHAPTER THREE

Configuration

IN THIS CHAPTER

- Configuration
- Tuning Procedures (GV6K Only)
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Configuration

You can configure the Gem6K's settings for optimum system performance. For most of these settings, configuration is optional—if you do nothing, the drive will use default values the very first time it powers up. If you change any settings, the new settings are saved automatically. Most changed settings are effective immediately, but some require that you issue a reset (software RESET or DRESET command, reset input, or cycle power) before the drive acts upon them.

This chapter will give an overview of all software commands that configure drive settings. For more in depth descriptions about these commands, see the separate *Gemini GV6K/GT6K Command Reference*.

GV6K: At the end of this chapter are procedures you can use to configure the GV6K's tuning settings.

GT6K: At the end of this chapter are procedures you can use to configure the GT6K's damping and stall detect settings, and to match the motor to the drive.

Software Programs for Configuration

Motion Planner , a software program, is located on the Motion Planner CD-ROM. It runs on a personal computer (PC). This program is also available on the Compumotor web site at http://www.compumotor.com.

Information about installing and using *Motion Planner* can be found in the *Gemini GV6K/GT6K Command Reference*.

Overview of Configuration Commands

The sections below present configuration commands in groups organized by function. (*Express Setup*, which was discussed in *Chapter 2 Installation*, gives you a smaller number of configuration commands.)

Motor Settings

If you select a Compumotor motor from the list of motors the software presents to you, the software will send settings to the drive for the motor you selected. No further configuration of motor settings is necessary on your part.

If you use a non-Compumotor motor, or choose to manually configure a Compumotor motor, use the following commands to configure motor settings. Also see *Appendix B – Using Non-Compumotor Motors* for additional instructions.

GV6K Commands	Description
ERES	feedback resolution (encoder or resolver)
DMTIC	continuous current
DMTICD	continuous current derating
DMTKE	motor constant
DMTRES	line-to-line resistance
DMTJ	rotor inertia

DPOLE	number of pole pairs
DMTW	rated speed
DMTIP	peak current
DMTLMN	minimum line-to-line inductance
DMTLMX	maximum line-to-line inductance
DMTD	motor damping
DMTRWC	motor thermal resistance (winding to case)
DMTTCM	motor case (and heatsink) thermal time constant
DMTTCW	motor winding thermal time constant
DPWM	PWM switching frequency
DMTMAX	motor maximum temperature
SHALL	Hall sensor orientation

GT6K Commands	Description
DMTSTT	static torque
DMTIC	continuous current
DMTIND	inductance
DMTRES	phase resistance
DMTJ	rotor inertia
DPOLE	number of pole pairs
DIGNA	current loop gain
DIGNB	current loop gain
DIGNC	current loop gain
DIGND	current loop gain

System Settings

The system settings configure the drive's mode of operation, resolution, fault modes and inertia ratio.

Drive Settings – GV6K

Command	Description	Options:
DMODE	mode of operation:	alignment mode
		controller/drive mode
		autorun[1]
		torque/force tuning mode
		position tuning mode
DMEPIT	electrical pitch of magnets	you enter a number
ORES	encoder output resolution	you enter a number
DMTLIM	torque limit	you enter a number
DMTSCL	torque scale	you enter a number
DMVLIM	velocity limit	you enter a number

[1]Autorun mode commands motion with no program control. It is used during *Express Setup*, and for troubleshooting.

Drive Settings – GT6K

Command	Description	Options:
DMODE	mode of operation:	controller/drive mode
		autorun[1]
DMEPIT	electrical pitch of magnets	you enter a number

DRES	motor step resolution	you enter a number
ORES	step/dir output resolution	you enter a number
DAUTOS	auto standby enable	you enter a number
DMVLIM	velocity limit	you enter a number

[1]Autorun mode commands motion with no program control. It is used during *Express Setup*, and for troubleshooting.

Load Settings – GV6K

Command	Description	Options:
LJRAT	load to rotor inertia ratio	you enter a number
LDAMP	load damping	you enter a number

Load Settings – GT6K

Command	Description	Options:
LJRAT	inertia ratio	you enter a number

Fault Settings – GV6K

Command	Description	Options:
FLTDSB	fault on disable	can be turned on or off
SMPER	maximum position error	you enter a number
SMVER	maximum velocity error	you enter a number
DIFOLD	enable current foldback	can be turned on or off
DMTAMB	motor ambient temperature	you enter a number
KDRIVE	disable drive on kill	can be turned on or off

Fault Settings – GT6K

Command	Description	Options:
FLTDSB	fault on disable	can be turned on or off
ESK	fault on stall	can be turned on or off
KDRIVE	disable drive on kill	can be turned on or off
DSTALL	encoderless stall detection	you enter a number
ESTALL	encoder-based stall detection	can be turned on or off

Input/Output (I/O) Settings

I/O settings configure the drive's digital inputs and outputs, and analog monitors.

Digital Inputs

Command	Description	Options:
LH	hard limit enable	both hard limits disabled
		negative limit only
		positive limit only
		both hard limits enabled
INDEB	input debounce time	can be set in milliseconds
LHAD	hard limit deceleration	you enter a number
LHADA	hard limit average decel.	you enter a number
Input Definition and Sense		configure up to 5 onboard inputs
Limit Definition and Sense		configure 2 onboard limit inputs and 1 home input

Digital Outputs

Command	Description	Options:
Output Definition and Sense		configure up to 7 onboard outputs

Analog Monitors

Command	Description	Options:
DMONAV	analog monitor A variable	**GV6K Options:**
		unused/turn off output
		motor temperature
		drive temperature
		position error
		velocity setpoint
		actual velocity
		acceleration setpoint
		torque/force setpoint
		actual (electrical) torque
		velocity error
		phase A actual current
		phase B actual current
		d-axis commanded current
		d-axis actual current
		q-axis commanded current
		q-axis actual current
		position setpoint
		actual position
DMONAV	analog monitor A variable	**GT6K Options:**
		unused/turn off output
		drive temperature
		velocity setpoint
		acceleration setpoint
		phase A commanded current
		phase A actual current
		phase B commanded current
		phase B actual current
		phase A commanded voltage
		phase B commanded voltage
DMONAS	analog monitor A scaling[1]	you enter a percentage[1]
DMONBV	analog monitor B variable	same choices as DMONAV
DMONBS	analog monitor B scaling[1]	you enter a percentage[1]

[1]Monitor output is scalable from -2000% to +2000%, but is limited to ±10V peak to peak.

Communications Settings

The communication settings configure the drive for RS-232/485 communications.

RS-232/485

Command	Description	Options:
ERRLVL	error level	you enter a number
ECHO	echo enable	can be turned on or off

Tuning Settings – GV6K

Tuning settings are divided into two groups: primary and advanced. Tuning can be done in torque, velocity, or position mode. Tuning procedures for each of these modes are presented later in this chapter. Relevant commands are:

Primary Tuning

Command	Description	Options:
DIBW	current loop bandwidth	you enter a number
DPBW	position loop bandwidth	you enter a number

Advanced Tuning

Command	Description	Options:
DIBW	current loop bandwidth	you enter a number
DPBW	position loop bandwidth	you enter a number
SGIRAT	current (torque) damping ratio	you enter a number
SGVRAT	velocity damping ratio	you enter a number
SGPRAT	position damping ratio	you enter a number
SGPSIG	position/velocity bandwidth ratio	you enter a number
SGINTE	integration selection	you enter a number
DNOTAF	notch filter A frequency	you enter a number
DNOTAD	notch filter A depth	you enter a number
DNOTAQ	notch filter A quality factor	you enter a number
DNOTBF	notch filter B frequency	you enter a number
DNOTBD	notch filter B depth	you enter a number
DNOTBQ	notch filter B quality factor	you enter a number
DNOTLD	notch lead filter frequency	you enter a number
DNOTLG	notch lag filter frequency	you enter a number

Motor Control Settings – GT6K

Motor control settings are divided into two groups: motor matching; and damping .

Motor Matching

Motor matching is used to match the drive to your specific motor. A procedure for performing motor matching is presented at the end of this chapter. Relevant commands are:

Command	Description	Options:
DWAVEF	% 3rd harmonic current waveform component	you enter a number
DPHBAL	phase B balance	you enter a percentage
DPHOFA	phase A current offset	you enter a percentage
DPHOFB	phase B current offset	you enter a percentage

Damping

These commands are used to configure the drive's settings for damping. A procedure for adjusting damping settings is presented later in this chapter. Relevant commands are:

Command	Description	Options:
DACTDP	active damping gain	you enter a number
DDAMPA	damping during acceleration	can be turned on or off
DELVIS	electronic viscosity	can be turned on or off
DABSD	ABS damping	can be turned on or off

Tuning Procedures – GV6K Servo

During the *Express Setup* procedure in *Chapter 2 Installation*, the drive uses default values for tuning parameters, based upon the motor information you entered. That procedure assumes that the motor is ***unloaded***. In the following tuning procedures, you will enter system information that will characterize the load on the motor.

Entering Load Settings

The main load setting you will adjust is LJRAT, which is the load-to-rotor inertia value for your system. The more accurately you know this value, the closer your tuning bandwidth settings will correspond to the actual dynamic performance of your system. If you only know this value approximately, you can adjust this value until you achieve the system performance you desire. The total system inertia is given by the following formula:

*Total system inertia = motor rotor inertia**(1 + *LJRAT*)

If your system has significant mechanical damping, you will also want to adjust the LDAMP setting which specifies system damping provided by the load. If you know that you have significant damping in your system from your load but do not know its exact value, you can adjust this value until you achieve the system performance that you desire.

Both the LJRAT and the LDAMP values can be set in the terminal mode of Motion Planner. During the tuning process you may want to use the terminal emulator to establish appropriate values for these parameters, and then save the drive’s full configuration settings for use with other units.

Position Mode Tuning

For most applications, the default tuning parameters for position mode are set to provide good, stiff motor shaft performance for a given load setting. With the default tuning parameters set in the Express Setup procedure, you need only set the system load-to-rotor inertia ratio and your system will be tuned. If your system has significant mechanical damping, you may need to set the system damping as well. Should you wish to modify the default values and fine tune your system for position mode, use the following procedures

⚠ WARNING ⚠

This procedure causes the motor shaft to move. Make sure that shaft motion will not damage equipment or injure personnel.

Position Mode Tuning Procedure

Primary Tuning Procedure

1. Disable the drive.
2. Configure the drive for *position tuning mode* (DMODE17). In this mode, the drive commands an alternating 1/4 revolution step change in position at a one second repetition rate.
3. Enable the drive and observe your system's response. (If necessary, you can connect an oscilloscope as described in *Advanced Tuning* below.)

   Ringing or an oscillating response indicates that the position loop bandwidth is too high. To eliminate oscillations:

   - decrease bandwidth using the DPBW command.

   A sluggish response indicates that position loop bandwidth is too low. To improve the response:

   - increase bandwidth by using the DPBW command.

   NOTE: Ringing, oscillations, or a sluggish response can also indicate inaccurate drive settings for LJRAT or LDAMP.
4. After you achieve a satisfactory system response, reconfigure the drive for controller/drive mode (DMODE12). This completes the primary tuning procedure.

   If you are unable to achieve a satisfactory response, proceed to the advanced tuning procedure below.

Advanced Tuning Procedure

1. Disable the drive.
2. Configure the drive for *position tuning mode* (DMODE17). In this mode, the drive commands an alternating 1/4 revolution step change in position at a one second repetition rate.

   (In some applications a different move profile may give better results. Choose a move similar to that required by your application, but using fast acceleration and deceleration rates. Be sure the maximum velocity of your move is well below the rated speed of your drive/motor combination.
3. Configure ANALOG MONITOR A to show position error (DMONAV3).
4. Connect one channel of your oscilloscope to the drive's ANALOG MONITOR A (pin 21). Connect your oscilloscope's ground to the drive's ANALOG GROUND (pin 25).
5. Adjust your oscilloscope to display position error. (The analog monitor can be scaled, in percent, with the DMONAS command.)
6. Enable the drive and observe your system's response. Position error will increase during acceleration, but should decay smoothly to near zero without significant ringing or instability.

   Ringing or an oscillating response indicates that the position loop bandwidth is too high, or the position loop damping is too low. To eliminate ringing or oscillations:

   - decrease bandwidth using the DPBW command; then, if necessary:
   - adjust damping by using the SGPRAT command. Use the value that gives the best performance.
   - in applications with backlash or high static friction, disabling the velocity integrator (SGINTE0) can help improve stability.
   - NOTE: In position mode, the velocity loop bandwidth tracks changes in position loop bandwidth by a ratio set by the SGPSIG command.

   A sluggish response indicates that position loop bandwidth is too low, or position loop damping is too high. To improve the response:

   - increase bandwidth by using the DPBW command; then, if necessary:
   - adjust damping by using the SGPRAT command. Use the value that gives the best performance.

   NOTE: Ringing or a sluggish response can also indicate inaccurate drive settings for LJRAT or LDAMP.
7. After you achieve a satisfactory system response, reconfigure the drive for controller/drive mode (DMODE12). This completes the advanced tuning procedure.

If ringing or oscillations persist, and do not seem to be affected by the above adjustments, you may need to use notch filters or lead/lag filters. See the *Filter Adjustments* procedure below.

Filter Adjustments

If the previous tuning procedures did not eliminate ringing or oscillations, then mechanical resonances may be causing problems with your system's response.

Before trying the procedure below, we recommend that you check your mechanical system, especially the mechanical stiffness and mounting rigidity of your system. Use bellows or disk style couplers, not helical couplers. Once you have optimized your mechanical system, filters may allow increased performance, without causing system instability.

Filters can improve response by reducing system gain over the same frequencies that contain resonances. You can then increase the gain for frequencies outside this range, without exciting the resonance and causing instability.

The first procedure below describes how to set the drive's two notch filters, to reduce resonance and improve your system's response. The second and third procedures describe how to set the drive's lead and lag filters.

⚠ WARNING ⚠

These procedures cause the motor shaft to move. Make sure that shaft motion will not damage equipment or injure personnel.

Notch Filter Adjustment Procedure

1. Configure the analog monitor to show q-axis current (DMONAV19).
2. Configure the drive for position tuning mode (DMODE17).
3. Configure DMTLIM to approximately 1/3 of the default value for your Compumotor motor.
4. Connect one channel of your oscilloscope to the drive's ANALOG MONITOR A (pin 21). Connect your oscilloscope's ground to the drive's ANALOG GROUND (pin 25).
5. From the oscilloscope display, observe the system's response to the tuning mode's step input. Note the frequency of the oscillatory current waveform that is superimposed on the 1 Hz step command signal.
6. Using the DNOTAF command, set the notch filter to the frequency noted in Step 5.
7. Using the DNOTAD command, slowly increase the depth of the notch filter from 0.0 to 1.0 until the ringing decreases.
8. Continue to observe the response to the step command signal. Ringing should be reduced or eliminated.
9. Adjust the Q of the filter (DNOTAQ command). Use the following guidelines:
   - Set Q as low as possible. Resonances change with load; therefore, your system will be more robust with a lower Q value. (Default = 1)
   - If Q is too low, system stiffness will be reduced outside the resonant range.
   - If Q is too high, the response peak may shift in frequency.
10. After reducing the resonance, you may notice a second resonance. Use the second notch filter (DNOTBF, DNOTBD and DNOTBQ) to reduce the second resonance. Follow the same procedure as outlined in steps 1 – 9 above.
11. If you are done adjusting filters, reconfigure DMTLIM to its default value. Otherwise, proceed to the *Lag Filter Adjustment* procedure below.

Lag Filter Adjustment Procedure

The lag filter can act as a low pass filter, and reduce the effects of electrical noise on the commanded torque. (It can also reduce the effects of resonance at low frequencies—below 60 Hz—where the notch filters are not effective.)

1. As described in Steps 2 – 3 in the *Notch Filter Adjustment* procedure above, reduce DMTLIM and connect an oscilloscope.
2. Verify that the lead filter is turned off (DNOTLDØ).
3. Configure the drive for position tuning mode. Observe the system's response to the tuning mode's step input.
4. Choose a value for the lag filter (DNOTLG) that reduces low frequency resonance and provides satisfactory system performance.
5. If you are done adjusting filters, reconfigure DMTLIM to its default value. Otherwise, proceed to the *Lead /Lag Filter Adjustment* procedure below.

Lead/Lag Filter Adjustment Procedure

The lead filter can counteract the effects of the lag filter at higher frequencies. Do not use the lead filter by itself—if you use the lead filter, you must also use the lag filter.

1. As described in Steps 2 – 3 in the *Notch Filter Adjustment* procedure above, reduce DMTLIM and connect an oscilloscope.
2. Set the lag filter (DNOTLG) as described above.
3. Configure the drive for position tuning mode. Observe the system's response to the tuning mode's step input.
4. Choose a value for the lead filter (DNOTLD) that improves system performance. This value will typically be higher in frequency than the lag filter setting.
5. You must choose a value for the lead filter that is *higher* in frequency than the lag filter value. However, do not set the lead filter higher than four times the lag filter frequency, or a drive configuration warning will result, and the drive will use the previous filter settings.
6. If you are done adjusting filters, reconfigure DMTLIM to its default value.

Procedure for Configuring Advanced Features – GT6K

The GT6K has advanced motor control features that you can configure for increased damping, increased low speed smoothness, and increased disturbance rejection; and for detecting motor stalls.

Configuring Damping Settings

The GT6K's three damping modes reduce vibration, increase low speed smoothness, and decrease load settling time. These damping modes are independent of each other, and operate within specific velocity ranges.

ABS Damping

ABS damping provides load-invariant damping at extreme low speeds. It targets applications that require minimal zero-speed settling time (for example, pick-and-place applications with varying load).

Command	Function	Velocity Range	Default	Contributing Parameters
DABSD	ABS Damping	0 to 0.2 rps*	Disabled	DMTRES, DMTIND

*motor dependent

Electronic Viscosity

Electronic viscosity targets applications that require reduced low-speed velocity ripple and increased smoothness, as well as aggressive low-speed damping. NOTE: If ABS Damping is enabled, it overrides electronic viscosity in the 0 to 0.2 rps velocity range.

Command	Function	Velocity Range	Default	Contributing Parameters
DELVIS	Electronic Viscosity	0 to 3 rps**	Disabled	DMTJ, DMTSTT, DPOLE DMTIC, DMTIND, LJRAT

**motor and load dependent

Active Damping

Active damping targets applications that require high accelerations, fast settling at commanded speed, mechanical vibration disturbance rejection, and highly stable (non-resonant) motion.

Command	Function	Velocity Range	Default	Contributing Parameters
DACTDP	Active Damping	>3 rps	Enabled (DACTDP4)	DMTJ, DMTIND, DMTSTT, LJRAT

Note: You can use the DDAMPA command to disable ABS damping and electronic viscosity during acceleration rates greater than 50 rps^2. This allows full motor torque to be used during acceleration.

Use the following procedures to configure the damping settings. You can usually find the best setting by using touch or sound. If this is not adequate, use a tachometer attached directly to the motor by means of a stiff coupler.

Configuring ABS Damping (DABSD)

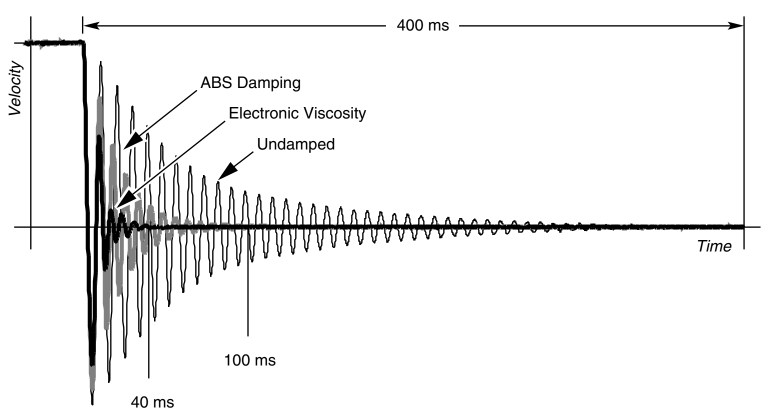
The default setting is *disabled*. (DABSD0)

1. To turn ABS damping *on*, use the DABSD command. (DABSD1)
2. If you use a Parker motor, the following parameters are automatically set when you use Motion Planner to select a motor. You do not need to enter values for them now.

   If you use a non-Parker motor, use the following commands to enter accurate values for the specified motor parameters:

Command:	Motor Parameter:
DMTRES	motor resistance
DMTIND	motor inductance

   The figure below shows performance with ABS Damping, with Electronic Viscosity, and without damping.



Damping Performance

Configuring Electronic Viscosity (DELVIS)

1. Enter an accurate value for the load parameter, using the following command:

Command:	Parameter:
LJRAT	system load-to-rotor inertia ratio

2. If you use a Parker motor, the following parameters are automatically set when you use Motion Planner to select a motor. You do not need to enter values for them now.

   If you use a non-Parker motor, use the following commands to enter accurate values for the specified motor parameters:

Command:	Motor Parameter:
DMTJ	rotor inertia
DMTSTT	static torque
DPOLE	number of motor pole pairs
DMTIC	continuous current
DMTIND	inductance

3. Start with DELVIS set to 0, which is *disabled*. (This is the default setting.)
4. Increase DELVIS until your system performs as you require.
   - 1 - 7 is the full range
   - 5 provides optimal damping
   - 0 is *off*

   The figure above shows performance with Electronic Viscosity, with ABS Damping, and without damping.

Configuring Active Damping (DACTDP)

Using motor and load parameters, the drive calculates the optimum damping setting for your system, and scales this value to a setting of DACTDP20. However, the default setting is DACTDP4.

1. Enter an accurate value for the load parameter, using the following command:

Command:	Parameter:
LJRAT	system load-to-rotor inertia ratio

2. If you use a Parker motor, the following parameters are automatically set when you use Motion Planner to select a motor. You do not need to enter values for them now.

   If you use a non-Parker motor, use the following commands to enter accurate values for the specified motor parameters:

Command:	Motor Parameter:
DMTJ	rotor inertia
DMTSTT	static torque
DMTIND	inductance

3. Begin configuration with low values of DACTDP. Low values yield less aggressive damping.
4. Increase DACTDP until the system performs as you require. The optimum setting is DACTDP20. Note that higher values tend to cause overly aggressive damping, and generate jerk impulses that may result in machine vibration.

Configuring Encoderless Stall Detect Settings

You can use the GT6K's encoderless stall detect function to detect motor stalls. A stall occurs when the motor's rotor loses synchronism with the stator. An external feedback device is not required to detect stalls.

Some machine safety regulations require that external hardware feedback be used. Do not use the GT6K's stall detect function as a replacement for external feedback in such cases.

In order for the drive to detect a stall, the duration of the stall must be greater than 50 milliseconds. NOTE: if you use high values of active damping, extremely aggressive accelerations are possible during which the motor may skip poles (lose position). This loss of position can be less than 50 milliseconds; if so, it will not be recognized as a stall.

Because the command velocity must be in the 3 – 37 rps range for stall detect to be active, the drive will not recognize static loss of position as a stall. Therefore, do not use this function to detect loss of holding torque in vertical applications.

Settings are summarized below.

Stall Detect Settings:

Command:	DSTALL
Default:	Disabled (DSTALL0)
Velocity Range:	3 to 37 rps
Contributing Parameter:	LJRAT

Stall detect performance is based on motor parameters that you set up with Motion Planner. For optimum performance, accurate motor parameters are required.

If you select a Compumotor motor with Motion Planner, the motor parameters are set automatically, according to the motor you have chosen. If you use other motors, see *Appendix B – Using Non-Compumotor Motors*.

Use the following procedures to configure the stall detect settings.

Configuring Stall Detect

The DSTALL command sets the sensitivity for the stall detection circuitry. The default setting is *disabled.* (DSTALL0)

NOTE: Match the motor to the load (see the procedure on the following pages) *before* you configure stall detect settings.

1. Enter an accurate value for LJRAT.

   The LJRAT command sets the system's load-to-rotor inertia ratio. LJRAT must be set accurately in order for stall detect to function properly.

2. Begin configuration with low DSTALL values.

   - 1 - 50 is the full range
   - 0 is *off*

   The table below lists effective ranges of DSTALL values. Enter a value, based on your motor size:

Motor Frame Size:	<u>**Size 23**</u>	<u>**Size 34**</u>	<u>**Size 42**</u>
DSTALL Value Range:	1 – 15	10 – 40	30 – 50

3. Verify the DSTALL value you entered by forcing a stall as you monitor TASX. At the precise moment the stall occurs, TASX Bit #17 should be set. If Bit #17 is set before or after the stall occurs, modify the DSTALL value as follows:

   - If Bit #17 is set *before* the stall occurs, *decrease* the DSTALL value
   - If Bit #17 is set *after* the stall occurs, *increase* the DSTALL value

4. Run the system for an extended period of time to verify that no false stalls are detected.

Configuring Fault on Stall Mode

1. If you enable the Fault on Stall mode (ESK1), the occurrence of a stall will immediately stop pulses from being sent to the motor and will disable the drive (DRIVE0)
2. If Fault on Stall is enabled (ESK1), the stall is reported by the following commands:

   - TASX bit #17
   - TER bit #1

Procedure for Motor Matching – GT6K

Due to slight manufacturing variations, each motor has its own particular characteristics. The drive has three settings—phase offset, balance and waveform—that can be adjusted to match the drive to a specific motor. The factory settings for these parameters will be acceptable in most applications. If you need increased smoothness or accuracy in your system, or if motor resonance causes vibration problems, perform the following procedure. You will match your drive to your motor by adjusting the drive settings, and selecting the best current waveform.

⚠ CAUTION ⚠

Verify correct series or parallel wiring. The label on the motor may be inaccurate if the motor has been rewired after it left the factory.

⚠ WARNING ⚠

The following procedure causes the motor shaft to rotate.

Setting Up Your System for the Motor Matching Procedure

Before beginning the *Motor Matching* procedure, set up your system as follows:

1. The *Motor Matching* procedure below is a *bench top* procedure—temporarily connect the drive, motor, and PC running Motion Planner, but do not permanently mount the components yet.
2. Properly secure the motor
3. Set the motor current at the value recommended for your motor.
4. Do not attach a load to the motor shaft, or anything else that affects or changes the inertia of the rotor. The characteristics you are matching are those only of the drive/motor combination.
5. Before beginning the *Motor Matching* procedure, you must use Motion Planner to configure the drive for your motor. See *Step 4* of *Chapter 2 Installation* for instructions.
6. Apply AC power when necessary to perform the steps below.

Motor Matching Procedure

1. Apply power to the drive, enable the drive, and allow the drive and motor to reach a stable operating temperature. This will take at least 5 minutes, and may take up to 30 minutes. For optimum results, perform the matching procedure at the same ambient temperature at which your application will operate.
2. Launch the *Interactive Motor Matching* procedure of Motion Planner.
3. Select the *PHASE A OFFSET* button. Note the recommended motor speed in the comment box.
4. Using the terminal emulator, set the motor speed to the recommended value for your motor.
5. Vary the motor speed about the recommended value, and find the most resonant operating speed. (Varying the speed makes resonance more noticeable.) You can find the *resonant speed* by touching the motor lightly with your fingertips as you vary the speed. When you notice the strongest vibrations and increased noise, the motor is running at a resonant speed. Note the actual speed; you will use it in the steps below. Return to *Interactive Motor Matching*.
6. Change the *PHASE A OFFSET* adjustment using the left and right arrow keys or by using the touch screen (if available). Adjust the offset for smoothest operation.
7. Select the *PHASE B OFFSET* button.
8. Change the offset adjustment using the left and right arrow keys or by using the touch screen (if available). Adjust the offset for smoothest operation.

9. Select the *PHASE B BALANCE* button.
10. Using the terminal emulator, set the motor speed to one half the speed found in *Step 5*. Vary the motor speed about this setting, and find the most resonant operating speed. Return to *Interactive Motor Matching*.
11. Change the *PHASE B BALANCE* adjustment using the left and right arrow keys or by using the touch screen (if available). Adjust the balance for smoothest operation.
12. Repeat steps 3-10 if necessary.
13. Select the *WAVEFORM* button.
14. Using the terminal emulator, set the motor speed to one fourth the speed found in *Step 5*. Vary the motor speed about this setting, and find the most resonant operating speed. Return to *Interactive Motor Matching*.
15. Change the current waveform using the left and right arrow keys or by using the touch screen (if available). Adjust the current waveform for the smoothest operation.
16. Select the *OK* button when you are finished matching the drive to the motor. By selecting *OK*, you will be storing the adjusted values in the parameter configuration file. *Selecting the CANCEL button will return the adjusted values to the values previously stored in the configuration file.*

This completes the motor matching procedure.