

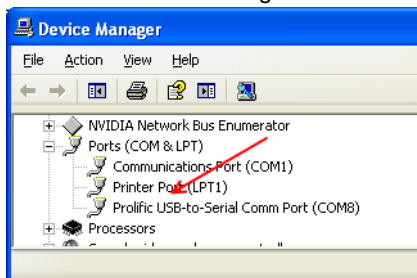
TB232 (Rev2) - Glentek Alpha Drive Setup for CNC11 Systems

This document describes how to setup a Glentek servo drive for use with a CNC11 system using a GPIO4D or OPTIC4 card. Typically the drive backup on Centroid's Dealer Support Site should be used and the wiring diagram should be followed for easy setup and quick turnaround on replacements. Also, see Glentek's document explaining connecting to their drive with a PC and tuning the Torque and Velocity Mode on the Glentek Drive [here](#). The Glentek Alpha drives is the standard drive available at this time.

Connecting to the Drive

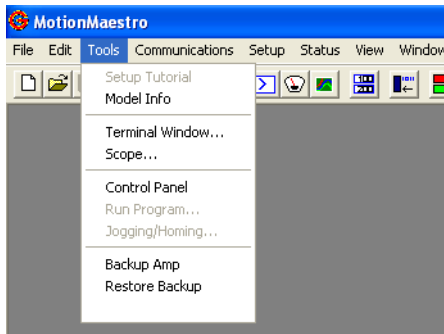
The initial setup will be done between a PC running Glentek's MotionMaestro software and the Glentek drive. Click [here](#) to download the software. The MPU11 and GPIO4D or OPTIC4 are not used in this part of the process. Only the cabling for the motor, encoder, keep alive voltage (if required by the drive) and Motion Maestro software version 1.37 beta 6 and above are needed to setup the motor. Once the cabling is correct, start the Glentek Software and connect the serial cable from the computer to the drive. This may require a USB-to-serial cable.

- Establish communication by clicking the Communications menu and selecting Open.
- Chose the serial port that the PC is connected to and hit Okay.
- The COM Status box on the right side of the screen should turn green. An error will occur if the incorrect COM port is selected.
- If a USB to Serial cable is required, then the COM port being used must be determined by checking the Device Manager. Click the Start button, Run... and type devmgmt.msc and hit Enter. Click the plus sign next to Ports (COM and LPT). Look for a label that has text about USB-to-Serial and note the COM number next to it. If the number is greater than 8, double click it and click the Port Settings tab. Set the port number to a value that does not occur already on the system.



Restoring a Backup

- Click the Tools menu and select Restore Backup.



- Locate the file on disk and select Open. The typical extension for the file is *.bk.
- Once the file has been loaded, click Setup, Save to NVM...
- Close communications with the drive under the Communications Menu and power cycle the drive.
- This method is useful for replacement drives or new systems that are identical to previously wired systems. For new systems the drive/motor combination must be setup from scratch as described below.
- The analog speed command offset must still be set for each drive. See the Setup Analog I/O for Velocity Mode section.

Setup a new Alpha Series Drive

The general procedure for setting up a new drive is as follows: Setup the Motor Parameters, Motor Safety, Commutation, Analog and Digital I/O, and Filters then put the drive in Velocity Mode and Tune the drive. Finally, connect the Glentek drive to the CNC11 system and tune the PID parameters. While making changes on different setup screens in MotionMaestro make sure to Select Save to NVM... often to avoid losing changes. Also, be sure to backup the Drive when done configuring the system for easy swap-out if the drive fails in the future. Before applying power to the motor make sure it is mounted securely in such a way that if it goes out of control it will not cause any harm. One method is to bolt the motor to the machine and leave it uncoupled. Do not apply 3 phase power to the drive until directed. Only logic voltage should be wired to the drive at this time. Create a backup of the drive before making any changes and save it in a secure location.

Setup Initial Motor Parameters

- Click the Setup menu and select Motor Parameters.

	Working	Ampl
Motor Resistance (ohms):	0.91	0.91
Motor Inductance (mh):	3.40	3.40
Nominal DC Buss (volts):	325	325
Proportional Current Gain (%):	47.980	47.980
Integral Current Gain (%):	1.59	1.59

Buttons: ENABLE AMP, Send Values to Amp, Done, Setup Auto/Manual Current Loop Tuning

Text box: This dialog displays the current motor parameters saved in the amplifier and using these parameters

- The motor resistance and inductance should be filled in based on the motor's specifications. **Do not guess at the values entered here.**
- Enter 325 for the Bus Voltage.
- Click the Setup Auto/Manual Current Loop Tuning button and you will be taken to another window where the drive gains will be set automatically.
- Click the Auto Tuning and 3-Phase boxes as well as un-checking the Manual Tuning and 1-Phase boxes.
- Click the Calculate Auto Tuning button and then Send Values to Amp button and finally Done.
- Save to NVM...

Setup Motor Safety

- Bring up the Setup Motor Safety screen from the Setup menu. The motor specific values should be obtained from the motor datasheet. **Do not guess at the values entered here.**

Setup Motor Safety

	Working	Amplifier
Current Limit (amps):	34.00	34.00
Low Speed Electronic Circuit Breaker		
Trip Current (amps):	7.50	7.50
TripTime (sec):	2.00	2.00
Current Fold Back		
Trip Current (amps):		
Rate (amps/sec):		

Buttons: ENABLE AMP, Send Values to Amp, Done

The Motor Safety Setup dialog allows access to amplifier parameters that limit the amplifier to

- The Current Limit should be set to the peak motor current or the current limit of the drive, whichever is lower. The high power drive can do up to 40 amps and the low power goes up to 30 amps.
- The trip current should be set at the constant stall current of the motor.
- The Trip Time should be set at 3 seconds.
- The Current Fold Back should be left at the default value.
- Click Send Values to Amp and then Done when the values are correctly entered.
- (eg: the 1kW SEM motor has a Constant Stall Torque of 7.6 amps and the Current Limit is set to 34 Amps.)
- Save to NVM...

Setup Commutation

- Under the Setup menu click Commutation.

Setup Commutation

Motor

	Working	Amplifier
Linear:	<input type="radio"/>	<input type="radio"/>
Rotary:	<input checked="" type="radio"/>	<input type="radio"/>
Number of Poles:	<input type="text" value="8"/>	<input type="text" value="8"/>
Lines per Revolution:	<input type="text" value="5000"/>	<input type="text" value="5000"/>
Counts per Comm. Cycle:	<input type="text" value="5000.00"/>	<input type="text" value="5000.00"/>
Scaling:	<input type="text" value="858993"/>	<input type="text" value="858993"/>
Comm Count Rollover:	<input type="text" value="5000"/>	<input type="text" value="5000"/>
Comm Cycles/CCR:	<input type="text" value="1"/>	<input type="text" value="1"/>

Phase Lead

	Working	Amplifier
Angle Offset (deg):	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>
Phase Lead (deg/kRPM):	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>

Correction Method

	Working	Amplifier
Hall Edge:	<input checked="" type="radio"/>	<input type="radio"/>
Index-Auto:	<input type="radio"/>	<input type="radio"/>
Index-Manual:	<input type="radio"/>	<input type="radio"/>
None:	<input type="radio"/>	<input type="radio"/>
Index Offset (deg):	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>
Hall Signal Offset (deg):	<input type="text" value="0.00"/>	<input type="text" value="0.00"/>

Commutation Init Method

Brushless

	Working
Hall:	<input checked="" type="radio"/>
Smart Comm:	<input type="radio"/>
Proportional Gain:	<input type="text"/>
Integral Gain:	<input type="text"/>
Derivative Gain:	<input type="text"/>
Initial Current (amps):	<input type="text"/>
Final Current (amps):	<input type="text"/>
Ramping Time (sec):	<input type="text"/>
Timer Ticks (sec):	<input type="text"/>

Others

Brush:	<input type="radio"/>
Induction:	<input type="radio"/>
Two:	<input type="radio"/>

Commutation Waveform

	Working	Amplifier
Sinusoidal:	<input checked="" type="radio"/>	<input type="radio"/>
Trapezoidal:	<input type="radio"/>	<input type="radio"/>

Encoder Data

Position:

- Make sure Rotary is selected for the encoder type and enter 8 for the Number of Poles.
- The Lines per Revolution depends on the encoder being used. Glentek offers a Mecapion encoder which has 5000 lines per revolution which equates to the ppr. This means there are 20000 counts/rev of the encoder. For Centroid's Renco encoders enter 2048 or 4096 for 8192 or 16384 counts per revolution.
- Under the Phase Lead section set both values to 0.0.
- The Correction Method section should be set to Hall Edge and the Index and Hall Signal Offsets should be set to 0.0.
- The Commutation Method should be set to Hall and the Commutation Waveform should be set to Sinusoidal.
- Click Send Values to Amp and then Done.
- Save to NVM...

Setup Encoders

- Click Setup Gearing/Encoders under the Setup menu to bring up the Encoder Divisor menu.
- Make sure the Output Encoder Divisor is at 1 and Send Values to Amp.
- Click Done and Save to NVM...

Setup Analog I/O for Torque Mode

- Click Setup Analog I/O under the Setup menu. Temporarily the drive will be used in Torque mode to make sure the motor turns correctly when commanded a certain direction. This menu will be revisited later after Velocity Mode has been turned on.

The screenshot shows the 'Setup Analog Input/Output' dialog box. It has two main sections: 'Analog Input Setup' and 'Analog Output Setup'.
Analog Input Setup:
 - Working: Signal Gain: 400.00, 400.00 RPM/Volt. Inverted (Inv) checkbox is checked. Signal Offset: 0.0000, 0.0000 Volts.
 - Amplifier: Signal Gain: 41.67, 41.67 %. Inverted (Inv) checkbox is checked.
 - Aux Signal Gain: [empty], [empty] Amps/Volt. Inverted (Inv) checkbox is checked.
 - Aux Signal Offset: [empty], [empty] Volts.
 - Dead Band: 0.0000, 0.0000 Volts.
Analog Output Setup:
 - Signal Source: Test Voltage (dropdown). Signal Gain: 100.00, 100.00 %. Signal Offset: -0.0531, -0.0531 Volts. Signal Test: 0.0000, 0.0000 Volts.
Aux. Analog Output Setup:
 - Signal Source: Test Voltage (dropdown). Signal Gain: 100.00, 100.00 %. Signal Offset: -0.0131, -0.0131 Volts. Signal Test: 0.0000, 0.0000 Volts.
 A 'Done' button is at the bottom right. A text box at the bottom explains the dialog's purpose.

- The Signal Gain should be the Current Limit in the Motor Safety menu divided by 10.
- The 10 comes from the one direction range of analog input voltage.
- The Signal Offset should be set to 0 for this section because it will be set later after Velocity Mode is turned on.
- The Dead Band and Analog Output Setup are not used.
- (eg: We used 34 as the Current limit earlier so 3.4 should be used as the Signal Gain.)
- Save to NVM.

Setup Digital I/O

- Click Digital IO under the Setup menu

The screenshot shows the 'Setup Digital Input/Output' dialog box. It features a table for digital input settings and a section for fault pin functions.
Digital Input Settings Table:

	W/kg	Amp	W/kg	Amp
Limit Positive	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Limit Negative	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Inhibit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motor Over Heated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
** External Reset	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Encoder Fault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Position/Torque Mode Select	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
** Pull Up Limits Inhibit and Reset	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Fault Pin Function:
 - Fault Out, Active Low: (selected)
 - Fault Out, Active High:
 - Amp Ready, Active Low:
 - Amp Ready, Active High:
 - Break Delay Time: [empty] ms
 A 'Done' button is at the bottom right.

- Check the Disable box for Limit Positive, Limit Negative, and Motor Over Heated.
- Make sure the Pull Up Limits Inhibit and Reset box is checked.
- Ensure the Fault Out, Active Low is checked under Fault Pin Function.
- Temporarily check the Disable check box for Inhibit. This will allow the drive to be enabled without the external enable signal. It should be unchecked and have NVM saved after this tuning procedure.
- Click done and Save to NVM...

Trajectory Setup

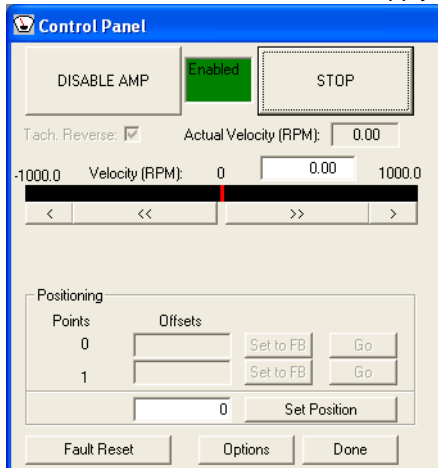
- In the Trajectory Setup menu under Setup click the Acceleration and Deceleration Disabled boxes and click Done.
- Save to NVM...

Setup Filters

- Under the Setup menu there are 4 filters that can be changed.
- Go into each of the first 3 and change the type to NONE, click Send and then Done.
- Leave the FeedBack filter at the default.
- Save to NVM...

Test the Drive in Torque Mode

- Ensure the drive is disabled and apply 3-phase power to the drive now.



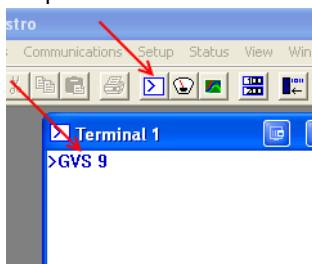
- Open the Faults, Warnings and System Status screens under the Status menu and check for any faults other than Bus Under Volt, Inhibit or External Reset.
- Turn the shaft of the motor and make sure Hall or Encoder error do not occur.
- Save to NVM once more.
- Then bring up the Digital IO screen again and TEMPORARILY Disable the External Reset and Inhibit inputs.
- Select the Options button and change the Minimum and Maximum current to 5 Amps.
- Click Okay to save.
- Bring up the Control Panel under the Tools menu and click Enable Amp. It may be necessary to click Fault Reset as well.
- Click the >> button several times to see if motion results. It is usually necessary to get over an amp or two before motion occurs. The command is positive and make sure positive RPMs result in the Actual Velocity box.
- If the command is positive and the actual RPMs do not have the same sign, click Stop and Disable Amp, then click the Tach. Reverse box. Repeat the above step to verify correct motion.
- If you get half way up the scale and still no motion occurs check the Faults, Warnings, and Digital Inputs menus under the Status menu.
- When done testing motion click Stop and Disable Amp, then Done.
- As long as the motor moves in both directions, then proceed to Velocity Mode tuning of the drive.

Setup Drive for Velocity Mode

Now that the drive is working under Torque Mode it is time to switch to Velocity Mode and tune the associated parameters.

Set GVS value

- Setting the GVS (Gain Velocity Scale) before anything else for Velocity Mode is important to achieving quick accurate tuning.
- Open a Terminal window by pushing the white button with the blue greater than symbol, as indicated.

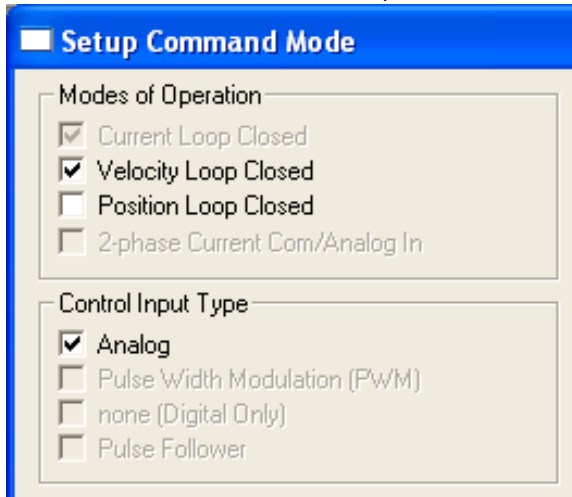


- Type GVS 9 as seen at right then hit the Enter Key.
- Save to NVM... and power cycle the drive.

Select Mode

- The drive must be switched to Velocity Mode now.

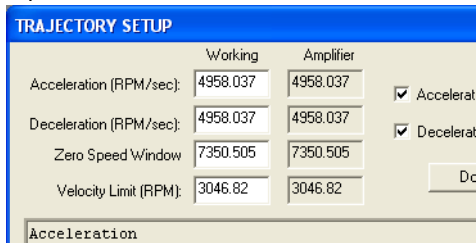
- Click Select Mode under the Setup menu.



- Check the Velocity Loop Closed check box and click Done.
- Save to NVM...

Motor Velocity Limit

- Click the Setup menu and click Trajectory Generation. The bottom text box is the max speed that the Glentek drive will command the motor to move. Set this 10% above the rated speed of the motor for safety and to avoid problems when doing rapid moves.



- Click done and Save to NVM...

Setup Analog I/O for Velocity Mode

- Click Setup Analog I/O under the Setup menu.
- For Velocity Mode use the Signal Gain should be the motor rated RPM plus 10%-15% divided by 10. Adding 10%-15% gives some room above the max RPM of the motor to command additional position from Centroid's PID loop. 10 comes from the one direction range of analog input voltage.
- The Signal Offset should be set using the Scope under the Tools menu under Using The Oscilloscope later in this document.
- The Dead Band and Analog Output Setup are not used.
- For example for a motor rated at 3000 RPM enter $(3000 \text{ RPM} + 450 \text{ RPM}) / 10 \text{ volts} = 345$.
- Click done and Save to NVM...

Setup Servo Tuning

- Open the Servo Tuning window under the Setup menu.
- Leaving these values at default will allow the motor to achieve more fine tuned performance, but it is possible that the drive will perform adequately without tuning.
- Follow Glentek's recommended procedure for Velocity Mode tuning in their document on page 4 [here](#).
- Save to NVM... and backup the Amp.

Connect CNC11 to the Glentek Drive

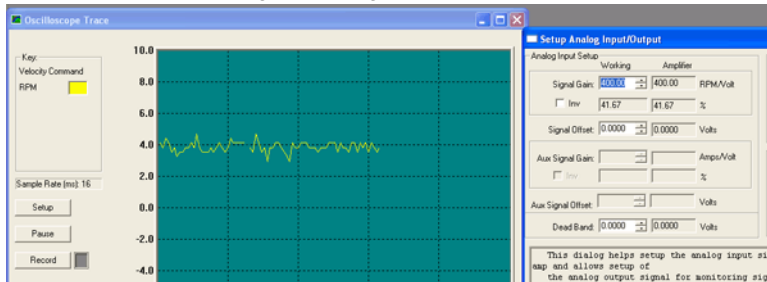
- Once the above setup is complete the MPU11 and GPIO4D or OPTIC4 should be connected to the drive and motion tested. Leave the MotionMaestro software connected with the Faults and Warnings windows open.
- Make sure E-Stop is engaged until you are instructed to jog the motor.
- Ensure reasonable values are set for the encoder counts and Revs / in. or mm / Rev.
- Starting PID values for Velocity Mode with Glentek drives are:

Parameter	Value
Kp	0.01500
Ki	0.00003
Limit	2560000
Kv1	68
Accel	0.30000

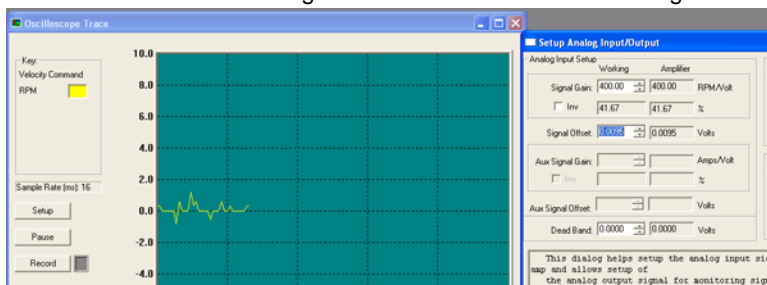
- Go to the PID screen and turn the motor by hand..
- If an error occurs, check in the MotionMaestro software under Status Faults and Warnings to see what could be the problem.
- If the counts go up when turning CCW, then try to Jog the motor under power.
- If the motor runs away or the counts go down when the shaft is turned CCW then the encoder channels may be wired backwards. Try swapping A and /A and B and /B and repeating the test.
- Direction Reversal may also need to be set to get the display to be correct, though it will not fix motor runaway problems.
- Once the motor moves correctly push in E-Stop and proceed to zero the analog input on the Glentek Drive.

Zero Analog command using the Oscilloscope in MotionMaestro

- Under the Tools menu click Scope... to bring up the Oscilloscope function on the drive.
- The Scope can be used to check various things about the drive and aid in tuning.
- The initial use of this function is for zeroing any offset in the analog input signal.
- Set the Y-Axis Min and Max to 1 and -1 initially.
- Under the Trace Attributes Select Velocity Command and Done.
- You should see the signal tracing across the screen somewhere.



- If it is not visible at all click Setup and change the Y -Axis Min and Max to 10 and -10.
- If the value is visible then go back and narrow the Y-Axis range as much as possible.



- Bring up the Analog I/O screen as well.
- Start increasing or decreasing the Signal Offset until the value is right at zero on the Scope.
- Go back to Setup and decrease the band of the Y-Axis so that the Analog Command can be seen to be right at 0VDC. Try +/- 2.
- Click Done on the Analog I/O screen.

- Save to NVM...
- The first image at right shows the Velocity Command before adjusting the offset and the second image shows after the adjustment.

Backup the Drive Parameters

- Make a final backup of the amplifiers parameters by clicking Backup Amp under the Tools menu. Email this file to Centroid Support along with the system report.
- This can now be taken to another drive and loaded on with the Restore Amp option under Tools.
- Keep in mind that the Motor Safety, Setup Motor, Analog Signal Offset should be re-done for each different drive.
- After any changes to a drive please make a backup and save it with a report from the system.

Velocity Mode tuning in CNC11

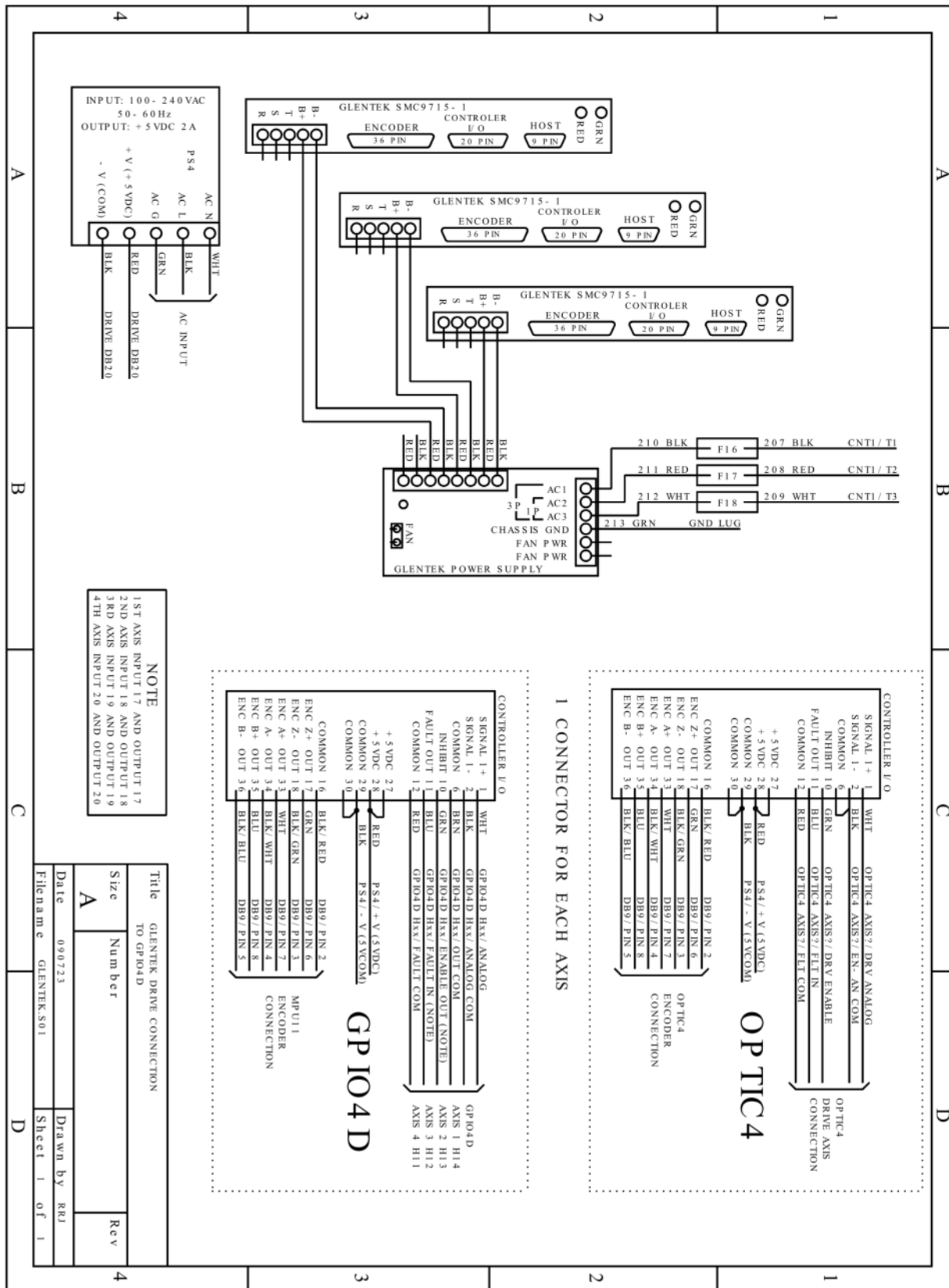
- Follow the Velocity Mode Tuning [Tech. Bulletin 234](#) for ensuring proper positional accuracy.

Glentek Alpha Drive Wiring Schematic

Glentek's drawing for their drive can be found [here](#).

GPIO4D Connection to Glentek Alpha Drive Schematic

Click [here](#) to get the full resolution version of this schematic.



NOTE
 1ST AXIS INPUT 17 AND OUTPUT 17
 2ND AXIS INPUT 18 AND OUTPUT 18
 3RD AXIS INPUT 19 AND OUTPUT 19
 4TH AXIS INPUT 20 AND OUTPUT 20

Title		GLENTEK DRIVE CONNECTION TO GP IO4 D	
Size	Number	Date	090723
A		Filename	GLENTEK.S01
Rev		Drawn by	RRJ
4		Sheet	1 of 1

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