INSTALLATION & OPERATION MANUAL

Omega Series
Digital - High Bandwidth
PWM Brushless Servo Amplifiers

GLENTEK

Model SMB/SMC 9715
Model SMB/SMC 9808
Model SMB/SMC 9815
Model SMB/SMC 9830
Model SMB/SMC 9845
Model SMB/SMC 9875

SMB Designates Buss Powered Logic
SMC Designates Separate Keep Alive Logic Power

Congratulations, You Cared Enough to Buy the Very Best!

Manual Revision Date: 03 Mar 2008

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Overview

This manual guides the application engineer through the steps necessary for installation of the Omega series digital amplifiers.

All features of the Omega series digital amplifier are explained and the procedures for installation and tuning are covered. The following sections are presented in an order that will make installation easy for most first time users of the Omega series digital amplifiers.

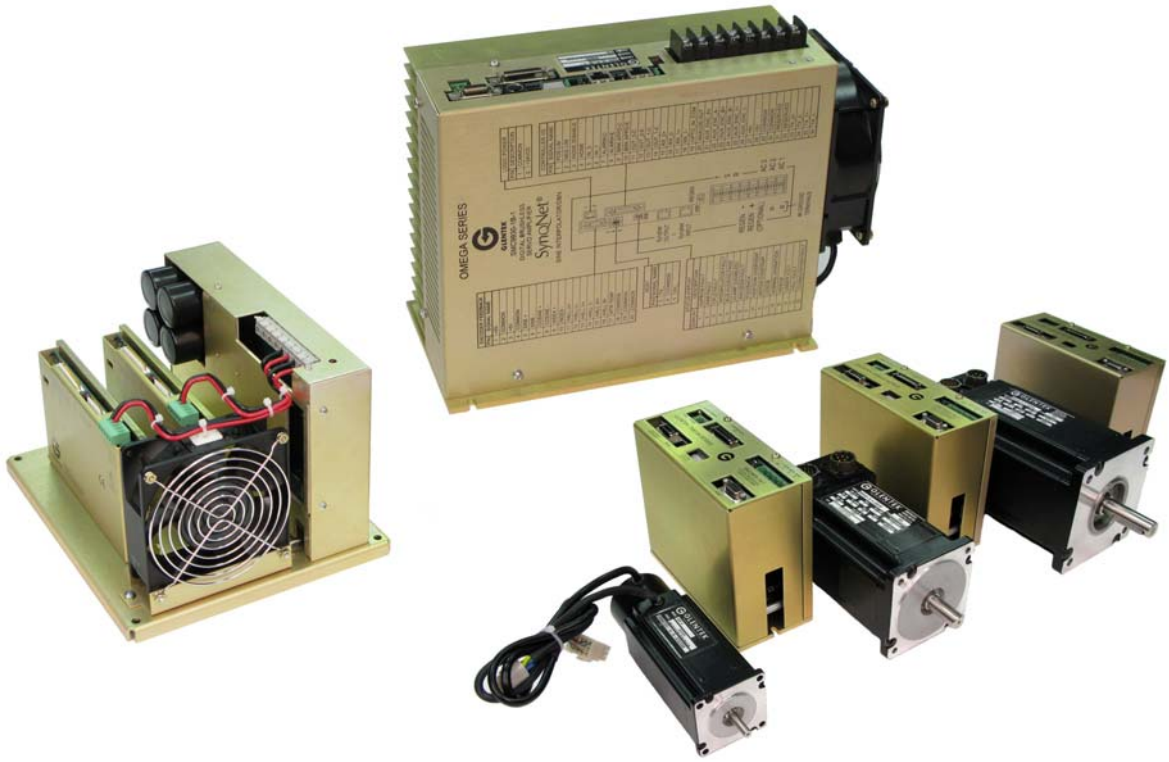
The “Product Description” and “Features” sections provide the application engineers data for system integration of the Omega series digital amplifiers.

Next, MotionMaestro© software is introduced. Enough material is given here to familiarize the application engineer with the software tools necessary to setup, install and run a motor using the Omega series digital amplifiers. For additional information refer to the MotionMaestro© Software Guide at www.Glentek.com.

The application engineer is then guided through a step by step procedure for setup and tuning a digital servo system.

As always, Glentek application engineers are available to help you in your specific application goals. If you have any questions at all, we strongly encourage you to contact us and we will help in any way we can.

Again, thank you and we look forward to providing you a product that will make your system perform at its very best level.



Product Description

Glentek's Omega Series Digital PWM Brushless Servo Amplifiers offer the latest in high performance DSP control of both rotary and linear brushless servo motors. With extensive utilization of surface mount technology and special heat transfer techniques, the Omega Series offers one of the world's most powerful products for a given form factor.

The Full Feature servo amplifier operates in current (torque) mode or velocity (RPM) mode, accepts a +/-10V analog input as a command reference and commutates the motor sinusoidally for ultra smooth operation at low speeds. The amplifier utilizes an incremental encoder to derive the velocity signal and to commutate the motor. The absolute commutation angle is usually determined using Hall sensors or encoder commutation tracks. However, in some cost sensitive applications where slight motor movement is acceptable upon power up, the amplifier can perform a power-on phase finding algorithm which eliminates the need for Hall sensors or Commutation tracks. Special versions are also available that decode Sanyo Denki, Tamagawa and Yaskawa reduced wire encoders. All modes of operation can also be supported utilizing synchro resolver feedback instead of an encoder. It is best to consult Glentek's sales application group. Also, we can customize a serial port digital interface to adapt to your controller as required to meet your protocols. We are currently doing this for high speed Ethernet ports.

Current (Torque) Mode Servo Amplifier

The current mode servo amplifier accepts a +/-10V analog input as a current command. For this mode of operation, the amplifier provides high current loop bandwidth for high acceleration and high speed applications. The Glentek's high bandwidth current mode amplifier is utilized in high performance linear motor digital positioning systems.

Velocity (RPM) Mode Servo Amplifier

The velocity mode servo amplifier accepts a +/-10V analog input as a velocity command. For this mode of operation, it is always best to use a high line count rotary encoder, typically 5000 or 8192 lines per revolution as this will give the smoothest response at low speeds. High line count and commutation tracks are always recommended. Glentek's high gain / high bandwidth velocity mode amplifiers are preferred and utilized in many very high performance digital positioning systems.

2-Phase Current Mode Servo Amplifier

The 2-Phase Current Mode servo amplifier accepts two +/-10V analog inputs as current command references for two of the motor phases. The third phase is derived from the two reference phases. This model amplifier does not use any feedback devices and is used with controllers that provide the commutation.

Pulse and Direction Position Mode Servo Amplifier

The Pulse Follower servo amplifier incorporates all the features of the Full Feature servo amplifier and also accepts two digital pulse inputs as a position command input. The pulse inputs at the amplifier are terminated by differential line receivers which can be configured to four modes of pulse and direction position mode servo amplifiers. The motor position and speed are a function of the number of pulses and the rate of the pulses respectively. They are described as follows:

For Pulse Follower Position Mode Tuning, see page 46 and 47.
For Command Signal Inputs, see page 15.

Pulse (step) and Direction mode

The first input is a pulse train used to establish the absolute distance and velocity of the command and the second input is a direction signal used to establish the direction of rotation of the command. Many stepper motor controllers provide this pulse type and allows upgrading a stepper motor system to a servo motor system without the need to change controllers.

CW/CCW Pulse (step) mode

The first input is a pulse train to command positive (CW) moves and the second input is a pulse train to command negative (CCW) moves. This pulse type is also generated by some older stepper motor controllers and may be useful in upgrading to a servo motor system.

Encoder Follower mode

Two pulse inputs in quadrature, such as the output of an incremental encoder or an encoder pot determine both command distance and direction. This pulse decoding is useful to slave one motor to another by connecting the master motor's encoder output to the slave motor's pulse inputs.

Features & Standard Operating Conditions

- **Digital current loops:** Current loop bandwidths up to 3 kHz.
- **Digitally tuned:** All parameters set digitally. No potentiometers to adjust. DSP control for the ultimate in high performance.
- **Silent operation:** 25 kHz PWM standard.
- **Complete isolation:** Complete optical isolation between signal and power stage.
- **Wide operating voltage:** 30-370 VDC for Amplifier modules. All stand-alone and multi-axis versions can be ordered for operation from either 110-130 VAC or 208-240 VAC (single or 3-phase, 50/60 Hz).
- **Direct AC operation:** The stand-alone units and multi-axis chassis include DC power supply, cooling fans and a regen clamp with dumping resistor.
- **Fault protection:** Short from output to output, short from output to ground, amplifier RMS over current, amplifier under/over voltage, amplifier over temperature, motor over temperature.
- **RS-232 or RS-485/422:** High speed (115.2K baud) serial communication interface for set-up and tuning.
- **Software configurable:** Glentek's Windows™ based MotionMaestro© software provides ease of set-up, monitoring and tuning with no previous programming experience required. This software is Windows™ 95/98/2000/XP and NT compatible.
- **Non-volatile memory:** All parameters are stored in non-volatile memory for reliable start up. In addition, up to two different configurations can be stored in the amplifier's non-volatile memory.
- **Dedicated inputs:** +/- position limits, inhibit, fault , motor over temp and reset Signal, +/- 10V analog input.
- **Dedicated outputs:** Selectable analog monitor signal, fault discrete and divided encoder output.
- **Three basic models:** Covering almost all servo needs, the Omega Series includes a full feature current/velocity amplifier, a 2-phase input current amplifier, and a pulse following amplifier.
- **Encoder output divider:** The encoder input signal can be divided by user selectable integer 1-8 for the encoder output signal.
  Note: Non-standard frequency divisors can be ordered on request.
- **Encoder feedback:** Accepts encoder signals up to 4.3 MHz. Special versions are also available that decode Sanyo Denki, Tamagawa and Yaskawa reduced wire encoders.
- **Status indicator:** 7-segment display indicates amplifier status and diagnostics.
- **Sinusoidal commutation:** For the ultimate in efficiency and smooth motion, Commutates from almost any resolution linear or rotary encoder.
- **External logic supply input** (SMC98XX) 24 to 48VDC, 600mA min@ 24VDC, or 500mA min@ 110VAC Powers all amplifier logic and encoder

- **SMT construction:** Provides ultra compact size, cost competitive package and high reliability.
- **Parametric filtering:** Provides control engineers advanced filtering to eliminate un wanted system mechanical resonance.

Standard Operating Conditions

Temperature

Min. = 0º C
Max. = 60º C

Humidity Range

5-95% Non-condensing

Altitude

This amplifier is rated for up to 1000m, above which performance may deteriorate.

Shock

Do not expose the amplifier to sudden shock (dropping, shaking, etc…)

Vibration

Do not install the amplifier in an area prone to constant vibration.

Electromagnetic Interference

Do not install the amplifier near sources of EMI

Atmospheric Pollutants

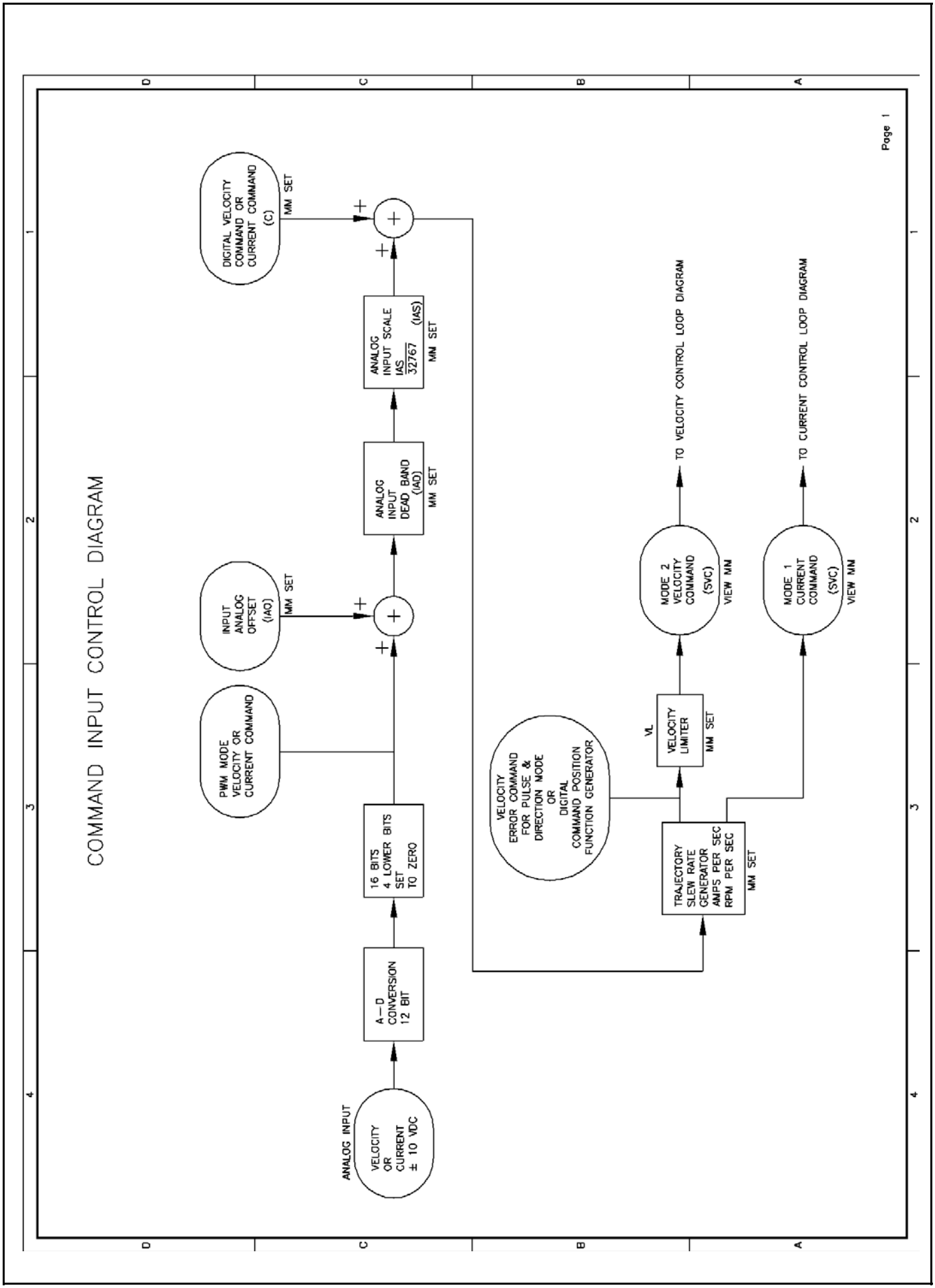
Do not install the amplifier in an environment where the atmosphere contains pollutants such as dust, corrosives, etc...

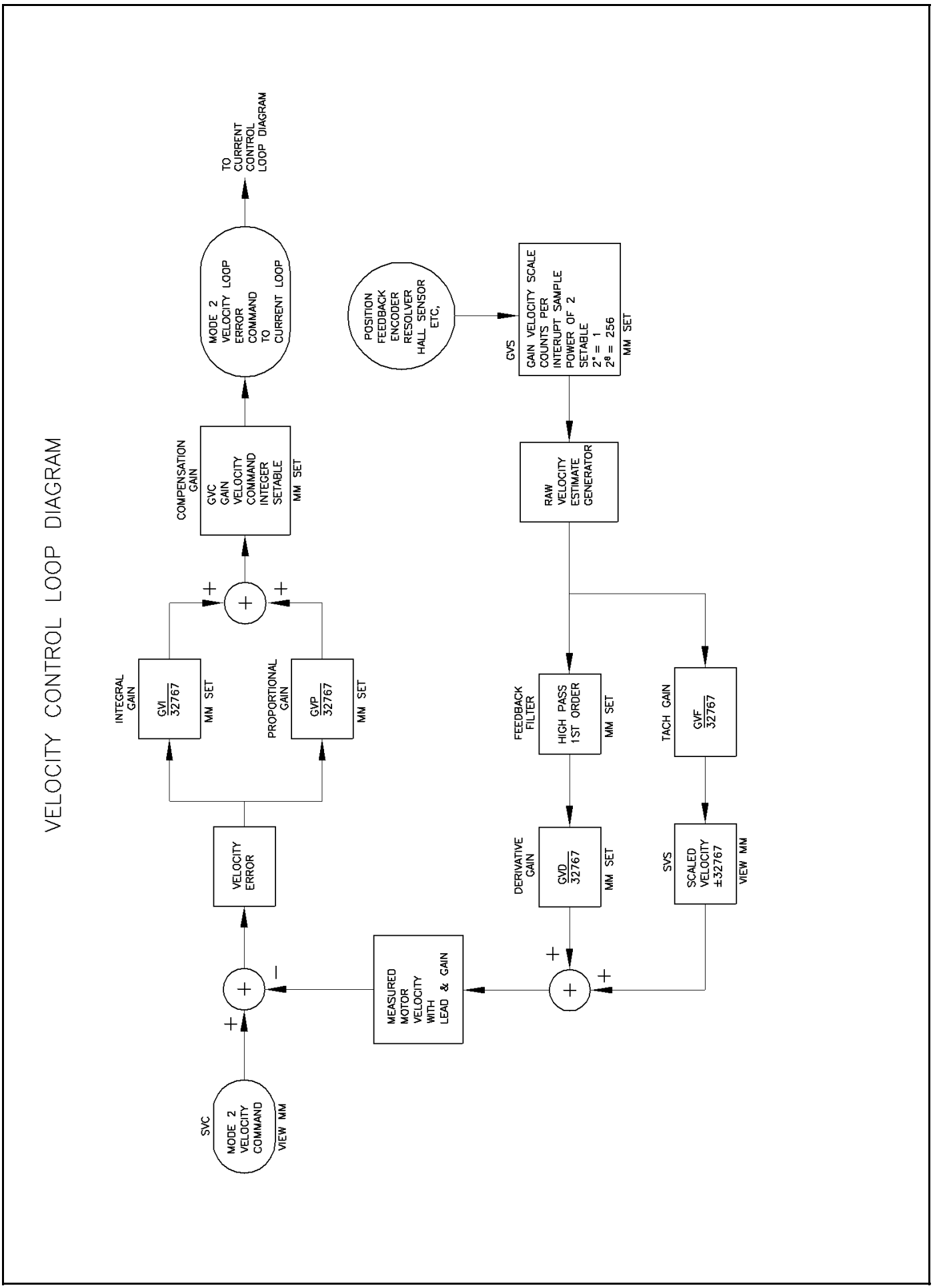
Water

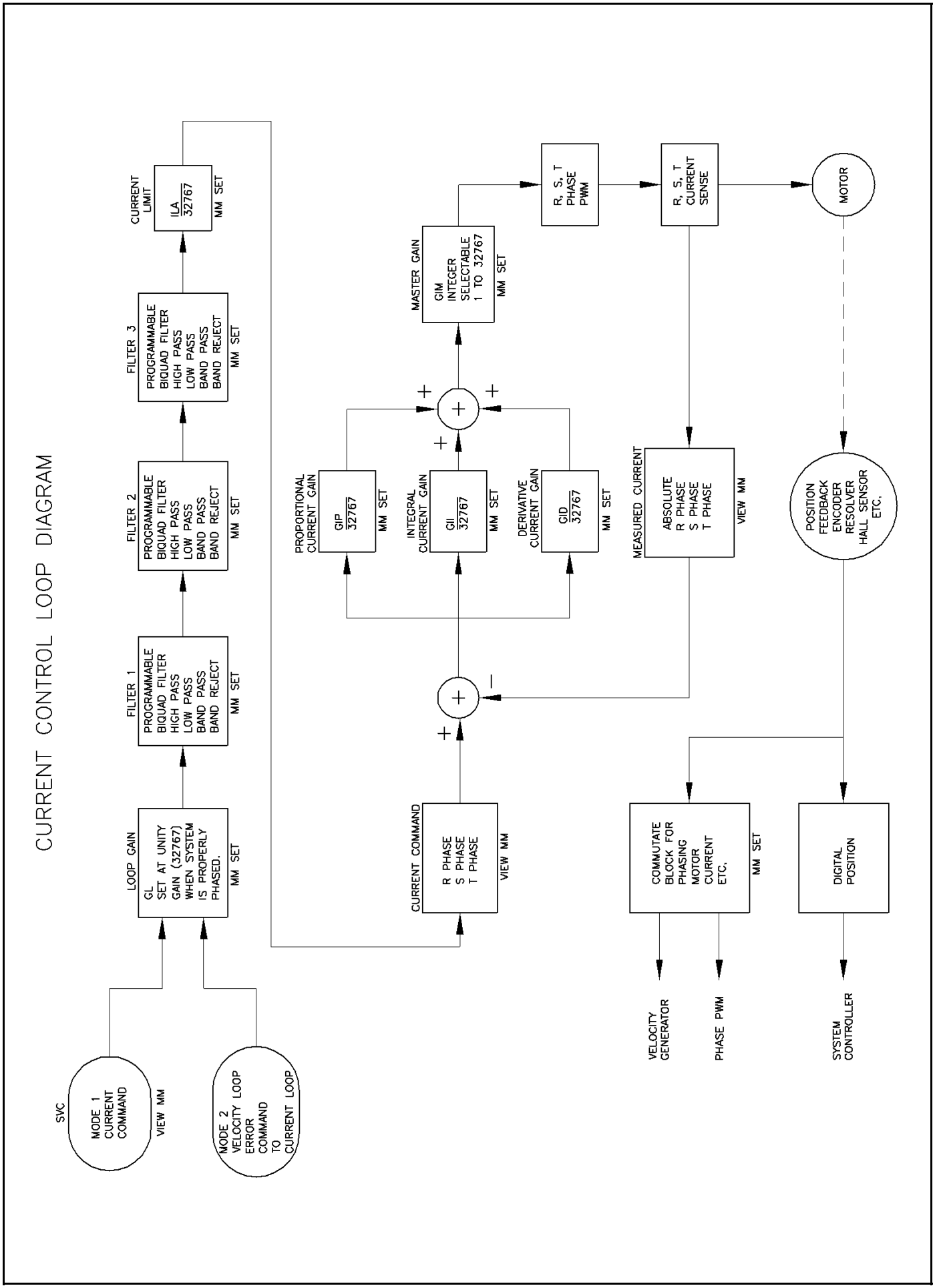
Keep the amplifier away from all water hazards, including pipes that may accumulate condensation and areas that can become excessively humid.

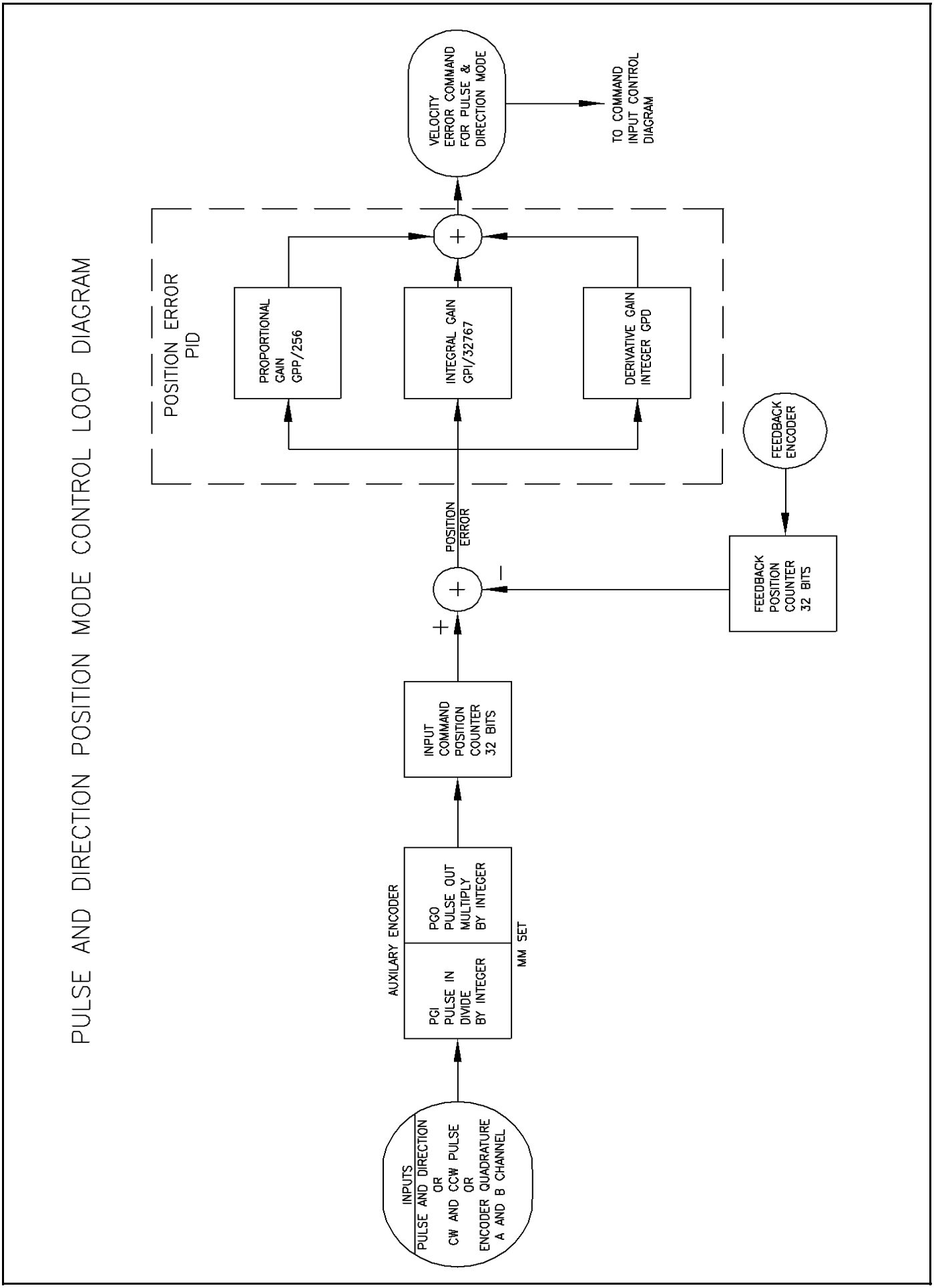
Overheating

Ensure that the amplifier's air vents are not obstructed. Allow a clearance of 75mm (minimum) above the amplifier for proper ventilation.


COMMAND INPUT CONTROL DIAGRAM
Page 1
ANALOG INPUT
VELOCITY OR CURRENT ± 10 VDC
A–D CONVERSION 12 BIT
16 BITS 4 LOWER BITS SET TO ZERO
PWM MODE VELOCITY OR CURRENT COMMAND
INPUT ANALOG OFFSET (IAO)
MM SET
ANALOG INPUT DEAD BAND (IAD)
MM SET
ANALOG INPUT SCALE IAS 32767 (IAS)
MM SET
DIGITAL VELOCITY COMMAND OR CURRENT COMMAND (C)
MM SET
VELOCITY ERROR COMMAND FOR PULSE & DIRECTION MODE OR DIGITAL COMMAND POSITION FUNCTION GENERATOR
TRAJECTORY SLEW RATE GENERATOR AMPS PER SEC RPM PER SEC
MM SET
VL
VELOCITY LIMITER
MM SET
MODE 2 VELOCITY COMMAND (SVC)
VIEW MM
TO VELOCITY CONTROL LOOP DIAGRAM
MODE 1 CURRENT COMMAND (SVC)
VIEW MM
TO CURRENT CONTROL LOOP DIAGRAM

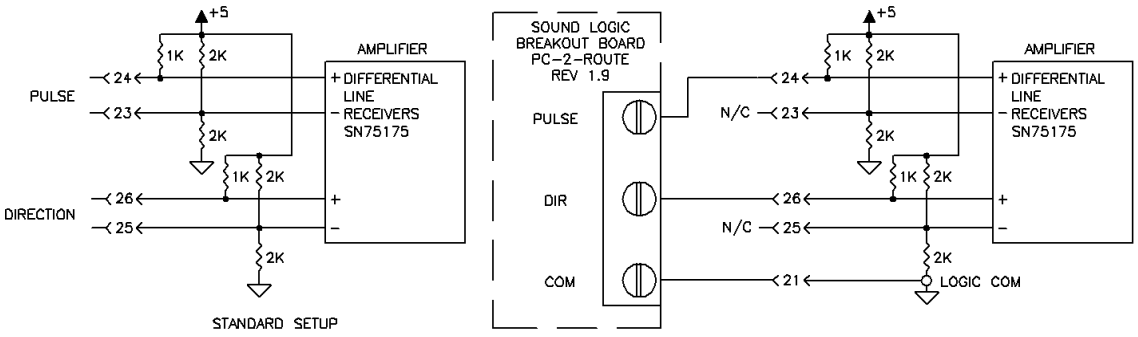

VELOCITY CONTROL LOOP DIAGRAM
SVC
MODE 2 VELOCITY COMMAND VIEW MM
VELOCITY ERROR
MEASURED MOTOR VELOCITY WITH LEAD & GAIN
INTEGRAL GAIN
GVI / 32767
MM SET
PROPORTIONAL GAIN
GVP / 32767
MM SET
COMPENSATION GAIN
GVC GAIN VELOCITY COMMAND INTEGER SETABLE
MM SET
MODE 2 VELOCITY LOOP ERROR COMMAND TO CURRENT LOOP
TO CURRENT CONTROL LOOP DIAGRAM
POSITION FEEDBACK ENCODER RESOLVER HALL SENSOR ETC,
GVS
GAIN VELOCITY SCALE COUNTS PER INTERUPT SAMPLE POWER OF 2 SETABLE 2^0 = 1 2^8 = 256
MM SET
RAW VELOCITY ESTIMATE GENERATOR
FEEDBACK FILTER
HIGH PASS 1ST ORDER
MM SET
DERIVATIVE GAIN
GVD / 32767
MM SET
TACH GAIN
GVF / 32767
SVS
SCALED VELOCITY ±32767
VIEW MM


CURRENT CONTROL LOOP DIAGRAM
SVC
MODE 1
CURRENT
COMMAND
VIEW MM
MODE 2
VELOCITY LOOP
ERROR
COMMAND
TO
CURRENT LOOP
LOOP GAIN
GL
SET AT UNITY
GAIN (32767)
WHEN SYSTEM
IS PROPERLY
PHASED.
MM SET
FILTER 1
PROGRAMMABLE
BIQUAD FILTER
HIGH PASS
LOW PASS
BAND PASS
BAND REJECT
MM SET
FILTER 2
PROGRAMMABLE
BIQUAD FILTER
HIGH PASS
LOW PASS
BAND PASS
BAND REJECT
MM SET
FILTER 3
PROGRAMMABLE
BIQUAD FILTER
HIGH PASS
LOW PASS
BAND PASS
BAND REJECT
MM SET
CURRENT
LIMIT
ILA
32767
MM SET
CURRENT COMMAND
R PHASE
S PHASE
T PHASE
VIEW MM
PROPORTIONAL
CURRENT GAIN
GIP
32767
MM SET
INTEGRAL
CURRENT GAIN
GII
32767
MM SET
DERIVATIVE
CURRENT GAIN
GID
32767
MM SET
MASTER GAIN
GIM
INTEGER
SELECTABLE
1 TO 32767
MM SET
R, S, T
PHASE
PWM
R, S, T
CURRENT
SENSE
MOTOR
MEASURED CURRENT
ABSOLUTE
R PHASE
S PHASE
T PHASE
VIEW MM
POSITION
FEEDBACK
ENCODER
RESOLVER
HALL SENSOR
ETC,
COMMUTATE
BLOCK FOR
PHASING
MOTOR
CURRENT
ETC,
MM SET
DIGITAL
POSITION
VELOCITY
GENERATOR
PHASE PWM
SYSTEM
CONTROLLER

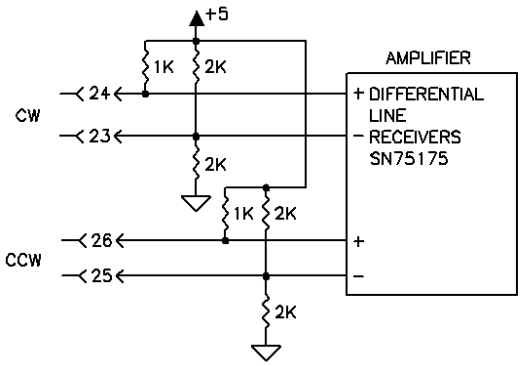

PULSE AND DIRECTION POSITION MODE CONTROL LOOP DIAGRAM
INPUTS
PULSE AND DIRECTION
OR
CW AND CCW PULSE
OR
ENCODER QUADRATURE
A AND B CHANNEL
AUXILARY ENCODER
PGI
PULSE IN
DIVIDE
BY INTEGER
PGO
PULSE OUT
MULTIPLY
BY INTEGER
MM SET
INPUT
COMMAND
POSITION
COUNTER
32 BITS
POSITION
ERROR
FEEDBACK
POSITION
COUNTER
32 BITS
FEEDBACK
ENCODER
POSITION ERROR
PID
PROPORTIONAL
GAIN
GPP/256
INTEGRAL GAIN
GPI/32767
DERIVATIVE GAIN
INTEGER GPD
VELOCITY
ERROR COMMAND
FOR PULSE &
DIRECTION MODE
TO COMMAND
INPUT CONTROL
DIAGRAM

Command signal, Pulse and Direction Position Mode

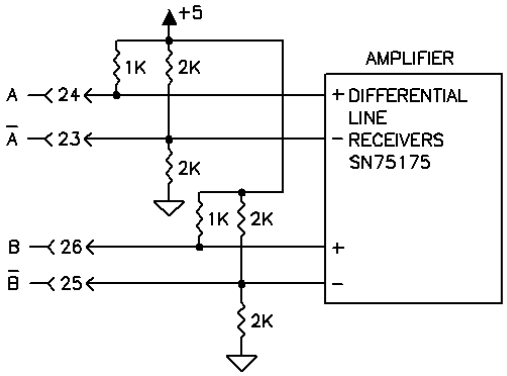
Pulse (step) and Direction mode:



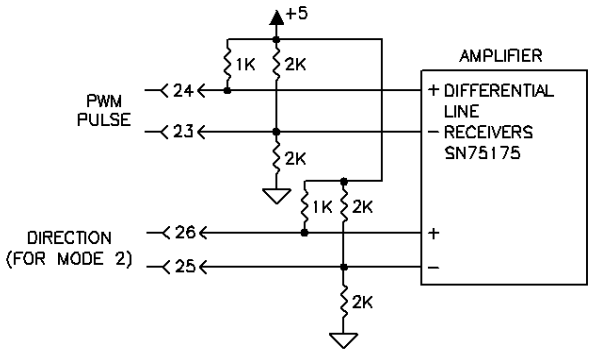
CW/CCW Pulse (step) mode:



Encoder Follower mode:



PWM (Duty Cycle) mode:



Amplifier Setup Software

MotionMaestro© is Glentek's Windows based application software that was designed to communicate with the Omega series digital amplifier. MotionMaestro© has many dialogs with values shown in engineering units to make it easy to select and setup the features of the amplifier. MotionMaestro© utilizes the standard ASCII command set and protocols. Although it is not necessary to use MotionMaestro©, installation, setup and tuning is made easier through its use. For more information please refer to the MotionMaestro© Software Guide at www.Glentek.com.

MotionMaestro© has many features that allow application engineers to easily configure a digital amp to an application. It has a terminal mode that operates at 115k baud transmission rates, an oscilloscope that can be used to monitor amplifier signals and a tuning dialog that can be used to control the motor input. By using the oscilloscope and tuning dialog, one can monitor step response to determine filter parameters for optimal control loop performance.

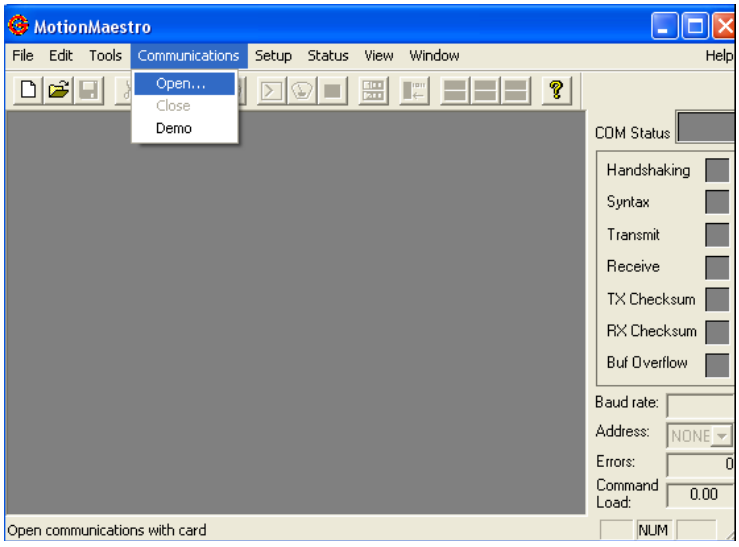
MotionMaestro© Installation

MotionMaestro© requires Windows95, Windows 98 SE, Windows ME, Windows NT 4.0, Windows 2000 or Windows XP operating system running on a PC with at least one serial port. It is suggested that you have no less than 3 megabytes of application program disk space remaining on the hard drive prior to installation. The MotionMaestro© install disk is setup to utilize Install Shield to simplify installation. There are only a few setup options offered. In general you can press NEXT or YES until installation is complete. When installation is completed, you will find a MotionMaestro© shortcut on the windows Start\Programs menu.

DO NOT RUN MOTIONMAESTRO© UNTIL YOU HAVE READ ALL OF THIS SECTION.

The MotionMaestro© installation program is named Setup.exe. It is found on disk1 of the distribution floppies or in the MotionMaestro© \disk1 directory of the distribution CD.

The installation will create a Glentek folder in the Program Files folder. A MotionMaestro©_X_X folder is created where _X_X matches the version number. You can have multiple versions of MotionMaestro© installed, if you wish, and they will be placed into their own directories.



Open - Used to make connection with a amplifier

When MotionMaestro© is directed to establish communications with the amplifier, the amplifier is queried for a model ID and Firmware version. MotionMaestro© will configure itself and select the appropriate configuration files based on the amplifier returned values.

There are extensive help screens under the Help menu. Select Help Topics and you can read about the usage of MotionMaestro© and it's features.

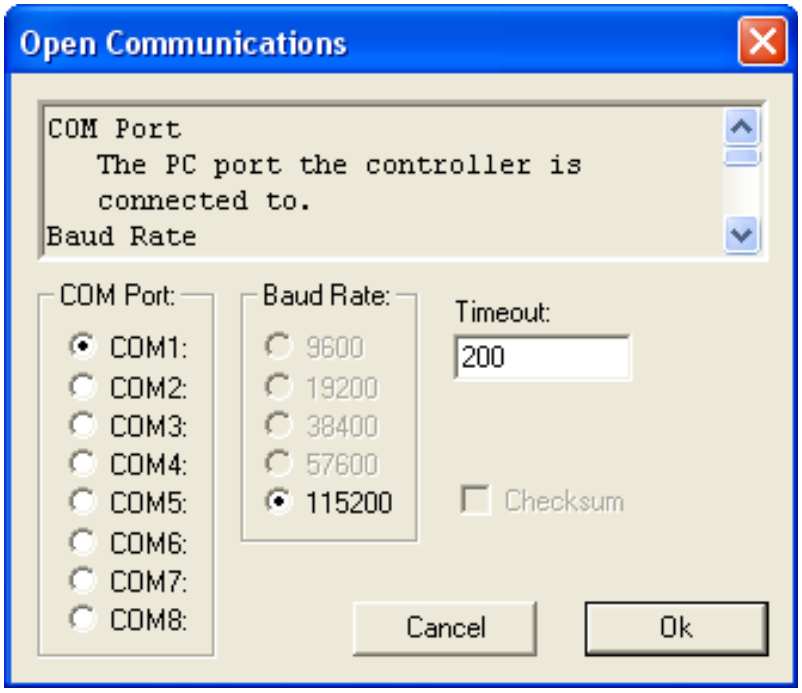
MotionMaestro© amplifier setup features.

This section of this manual is an introduction to MotionMaestro's© features that are required for installation and setup of the Omega series amplifiers. Only those features of MotionMaestro© required for defining motor characteristics are covered. This is not meant to be a step by step tutorial. The "Connecting the Amplifier to the motor" section is intended as a tutorial for motor setup. You may need to refer to this section when setting up a motor. The following features are reviewed here.

1. Opening of communications.
2. Model Information.
3. Digital I/O setup.
4. Mode setup.
5. Motor Parameters.
6. Motor Safety.
7. Commutation Setup.
8. Encoder Setup.
9. Trajectory Generator.
10. Filters.
11. Oscilloscope.
12. Terminal Window.
13. Amplifier Status.
14. Control Panel.
15. Motor Tuning.
16. Saving parameters.
17. Backing up a copy of amplifier parameters.

Opening of communications

Before MotionMaestro© can be used, communications must be established between the amplifier and the PC that MotionMaestro© is running on. Before opening communications in MotionMaestro©, you must have a serial communications cable wired as described in the hardware section of this manual. This can be a RS-232 or RS-485/422 wiring. You may also need to set the serial port on your computer as described in the system setup section.



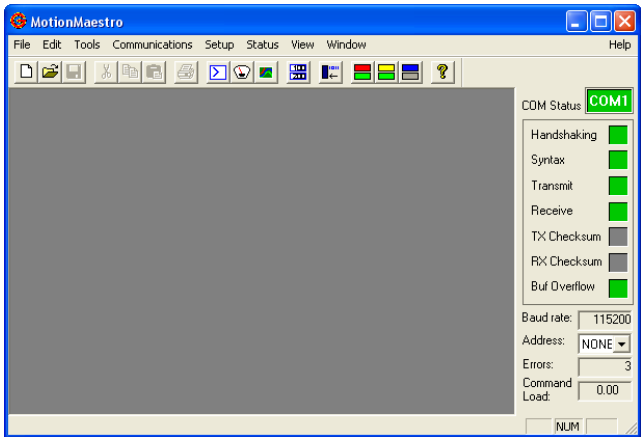
Open Communications dialog box

Open communications by selecting the "Open" option on MotionMaestro's© main menu tool bar.

Select the COM port that you connected the serial port cable to and ensure that a baud rate of 115200 is selected. When you press OK MotionMaestro© will query the amplifier to determine what amplifier model is connected. If communications is established, you should see a screen similar to the following with all green communications status indicators.

When communications cannot be opened, a dialog is presented indicating so. If you cannot open communications please check your cable, PC COM port settings and power to the amplifier.

To the right, MotionMaestro's main window is shown where communications are successfully opened and various setup and monitoring screens are activated. These active screens do not necessarily need to remain within MotionMaestro's main window, they may reside anywhere on the Windows desktop.

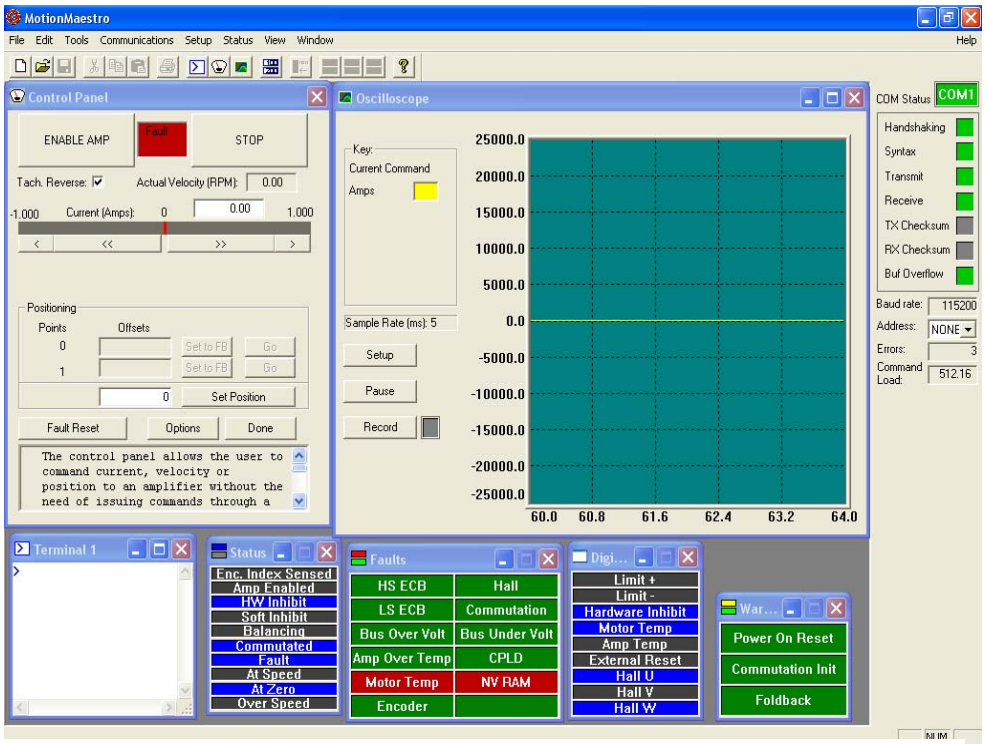


MotionMaestro's main window

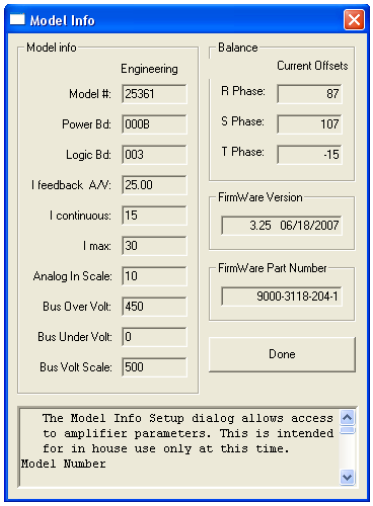
Model Information

For informational purposes, you can refer to the Model Info dialog to view the design features and limits of the particular amplifier. To view this dialog, you must select the "Tools" option on MotionMaestro's© main menu tool bar, then select "Model Info".

Here you will be able to view your firmware version and date, amp model number, power board number and logic board number.



MotionMaestro's Sever activated windows.

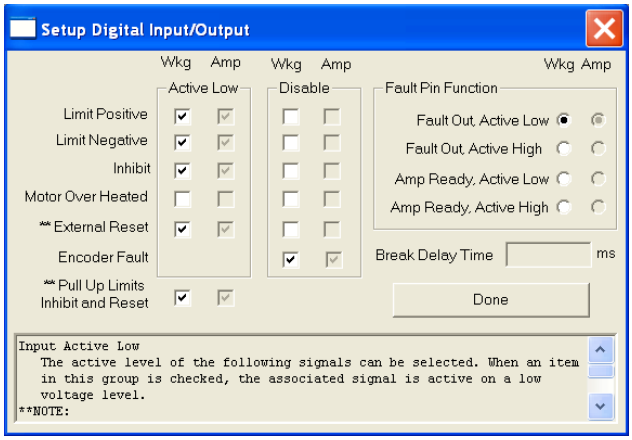


Model Info Box.

In addition, MotionMaestro's Model Info dialog window will display amplifier settings. For example, on the left these settings are current balance offsets, current feedback, continuous current and peak current settings. These settings, in addition to the Bus under-voltage and over-voltage settings, are useful informational tools and are required if the user performs his own scaling of amplifier values.

Digital I/O setup

The Digital I/O settings can be used to tailor the amplifier digital signal inputs to the requirements of your application. Failure to properly setup the Digital I/O signals may result in the amplifier powering up in a fault condition. (Or worse yet a reset condition). To view this dialog, select the "Setup" option on MotionMaestro's© main menu tool bar, then select "Digital IO...". Digital I/O signals can be active high or active low depending on the applications. The Motor Over Heated condition is a good example. From this window you can modify what state the amplifier considers to be a Motor Over Heated fault condition, either high or low.



Dialog box for setting amplifier mode.

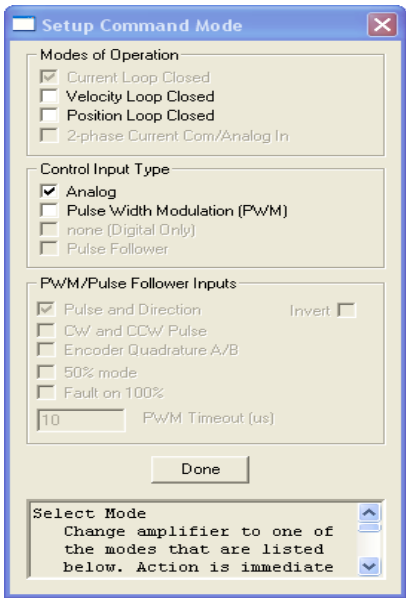
On this window there are two sets of check-boxes, for each signal, Wkg and Amp. Amp displays the current amp setting while Wkg displays the users choice. The amp is automatically updated as the Wkg box changes.

Amplifier mode setup

The full featured amplifier can operate in either current or velocity mode. By selecting the "Setup Mode..." item on the "Setup" option menu, you can configure the amplifier to operate in desired mode.

MotionMaestro© uses the Mode setting to determine text and options on many of the dialog display windows. For example, when the Omega series amplifiers are in current mode, parameters on the **Tuning** dialog pertaining to the velocity loop are not available.

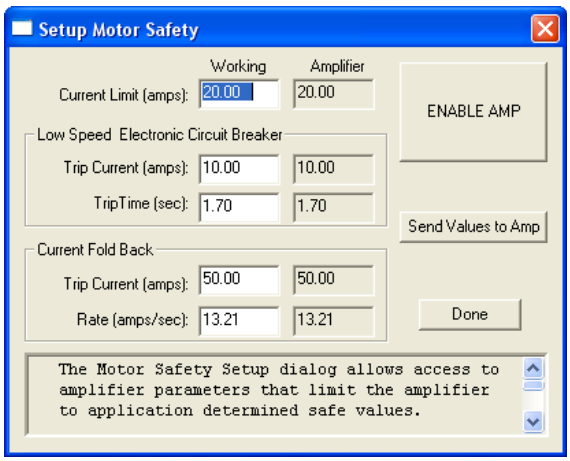
Engineering unit scaling used internally by MotionMaestro© is also adjusted to reflect proper units based on mode.



Dialog box for setting amplifier mode.

Motor Safety

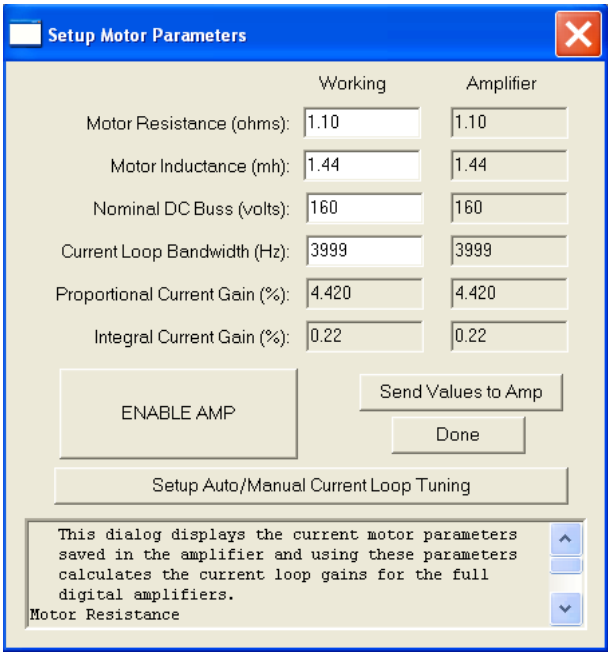
Motor safety is where limits to protect the motor are entered. The "Motor Safety Setup" dialog is available from the "Setup" menu. There are two sets of boxes, one labeled Working, the other Amplifier. Amplifier displays the current amp setting while Working displays the users selection. Here you can setup a maximum current limit, current foldback and low speed Motor safety is where limits to protect the motor are entered. In order to update the motor parameters in the amplifier, the amp must be disabled. You can do this by clicking on the "Disable/Enable Amp" button first, then the "Send Values To Amp" button. Pressing F1 displays the dialogs help text. After the values are sent to the amp, you may test the values by enabling the amplifier.



Dialog box for setting up motor safety parameters.

Motor Parameters Setup

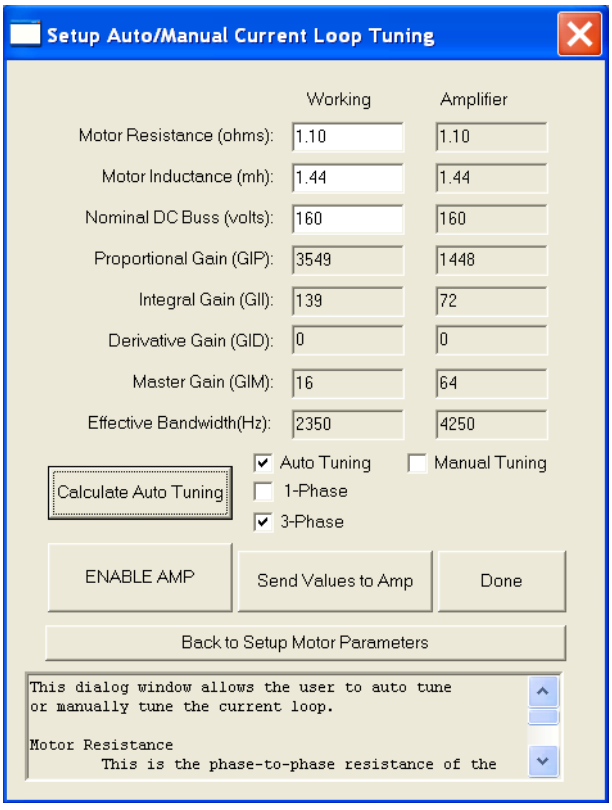
Note: Glentek recommends that you skip the "Setup Motor Parameters" tuning, and use the "Setup Auto/Manual Current Loop Tuning" window shown below.



Dialog box for entering motor parameters.

Select "Motor Parameters" on the "Setup" menu to activate the Motor Parameters dialog. The Motor Parameters dialog is used to set digital current loop gains. MotionMaestro© will calculate current loop gains based on the values entered. Select "Motor Parameters" on the "Setup" menu to activate this dialog.

Motor Resistance and Inductance are entered as phase to phase values. If these values are not indicated on the motor label, you can determine these values by measuring the resistance or inductance between two motor wires connecting two phases of the motor. Nominal DC bus voltage is the regulated bus voltage, 160 or 320 volts typically. Current loop bandwidth is a measure of the current loops responsiveness. Generally you want this to be as high as possible. A good starting point is 1500 Hz. In order to update the motor parameters in the amplifier, the amp must be disabled. You can do this by clicking on the "Disable/Enable Amp" button first then the "Send Values To Amp" button. Pressing F1 displays the dialogs help text.



Dialog box for entering motor and current loop auto/manual tuning parameters.

Auto/Manual Current Loop Tuning Setup

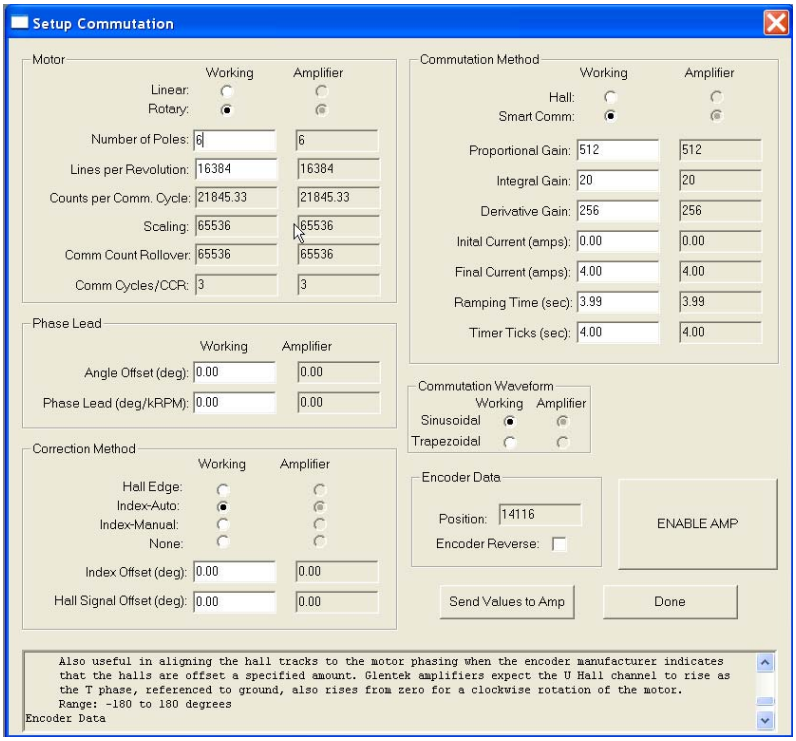
Select "Setup Auto/Manual Current Loop Tuning" button on the "Setup Motor Parameters" window to activate this dialog.

Motor Resistance, Inductance, and Nominal DC Buss voltage can be entered here if not already done so in the "Setup Motor Parameters" window. 1-Phase is selected when amplifier drives brush type DC motor or voice coil motor. 3-Phase is selected when amplifier drives 3 phase brushless motor.

There are two tuning methods that a user can choose. The auto tuning method is most accurate and recommended. In order to activate this method, Auto Tuning and motor type boxes are checked, then Calculate Auto Tuning button is depressed. The Proportional, Integral, Derivative, Master gains, and Effective Bandwith values are automatically calculated and optimized. Refer to page 38 for more detail information. You may also opt to use manual tuning method where the gains can be altered. In this mode, the Manual Tuning and motor type boxes are checked. Then all current loop gains may be adjusted and the new values send to the amplifier while viewing the current loop response with an oscilloscope or running a bode plot. For manual tuning setup information, refer to page 39.

Commutation Setup

The Commutation dialog window allows you to define a motor's commutation characteristics. Here you specify motor commutation parameters, correction and methods, and encoder positioning. In the motor section, most of the boxes are calculations based on your selected motor parameters. Select "Commutation…" on the "Setup" menu to activate the dialog on the right.



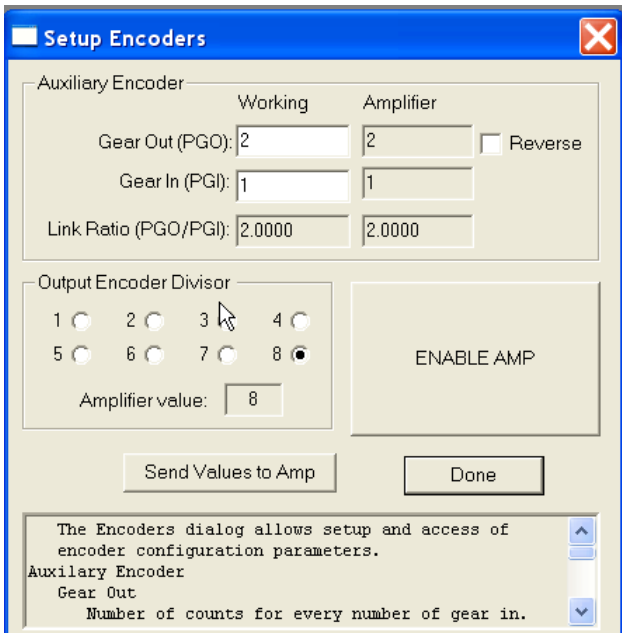
Dialog box for setting up motor commutation.

If Hall sensors or encoder commutation tracks are utilized, they need to be selected under "Commutation Method". Then, "Hall Edge" needs to be chosen as correction type. For information on Smart-Comm, refer to the smart-comm section, pages 66 and 67. Finally, "Number of Poles" and "Lines per Revolution" need to be entered (Rotary). Selecting linear instead of rotary will display parameters that are specific to a linear motor.

"Counts per Comm. Cycle", "Scaling", "Comm Count Rollover" and "Comm Cycle/CCR" are for engineering reference only and are calculated based on the motor and the encoder parameters entered.

The "Index-Manual" function allows you to offset the encoder index pulse.

For additional information on edit box parameters, you may go to the help dialog at the bottom of the "Setup Commutation" window. You can scroll through the help dialog with the up or down arrows or press F1 to view the dialog help text in notepad.



Encoder Setup Dialog

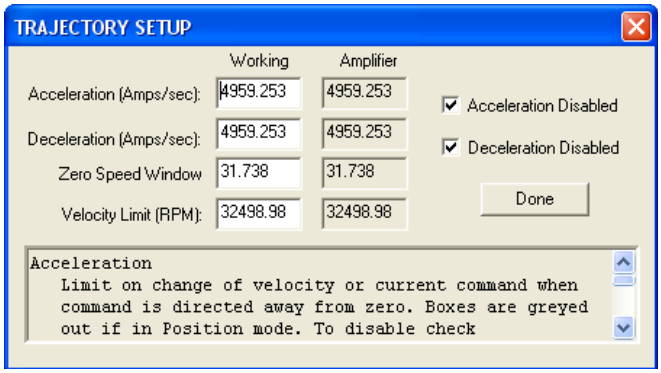
The working column represents modified values that are sent to the amplifier when clicking the "Send Values to Amp" button. In order to update the commutation values, the amp must be disabled. You can do this by clicking on the "Disable/Enable Amp" button.

Encoder Setup

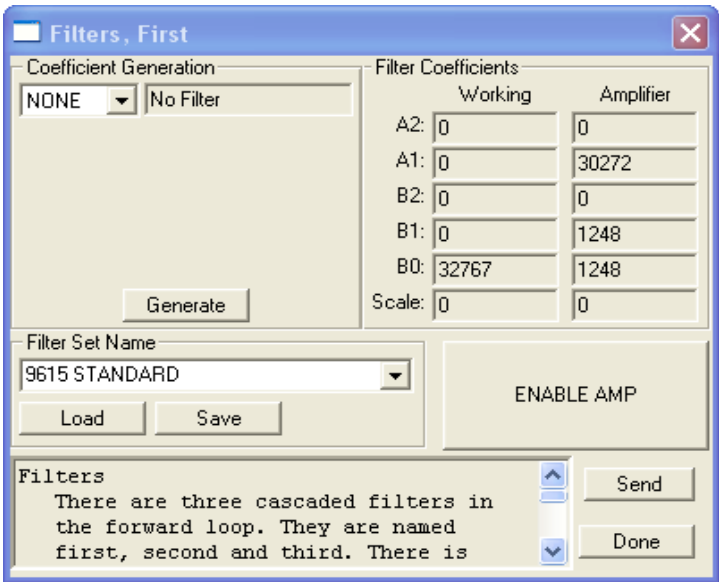
To view the Encoder dialog window, you select the "Setup" option on MotionMaestro's© main menu tool bar, then select "Encoders...". The encoder setup dialog allows setup and access to the encoder configuration parameters. Encoder Output Divisor selects the frequency ratio between the encoder resolution from the encoder and the encoder resolution to the controller. In addition, you may choose the gear and link ratio of an auxiliary encoder.

Trajectory Generator Setup

The Trajectory setup dialog window will allow you to limit the change of velocity or current command. When command is directed away from zero it's "acceleration" or when directed toward zero it's "deceleration". You can view this dialog by selecting the "Setup" option on MotionMaestro's© main menu tool bar, then select "Trajectory Generator...".



Trajectory Setup Dialog



Filters Setup Dialog

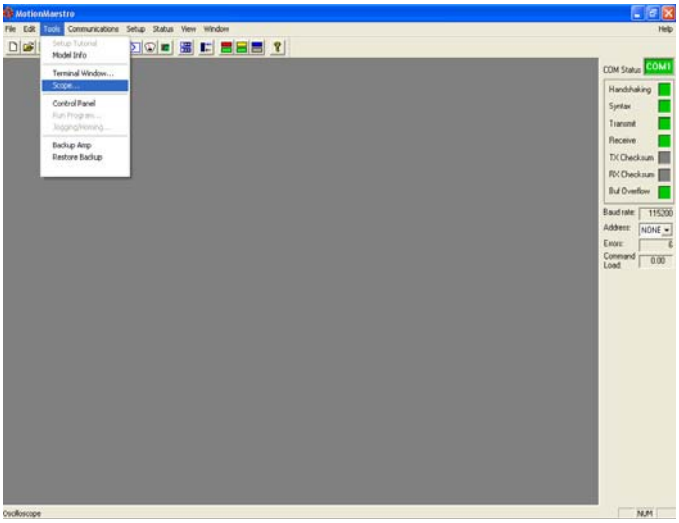
Filters Setup

To view the filter dialog window, select the "Setup" option on MotionMaestro's© main menu tool bar, then select "Filters...". At this point, select which of the four filters you would like to view/program. Three of the filters are cascaded filters in the forward loop and one is a filter in the encoder feedback loop. All four filters can be edited and displayed at the same time, but need to be opened one a time.

From these windows, MotionMaestro© allows you to enter values for defined filter equations. These equations were derived using the Tustin transform to convert variables in the frequency domain to coefficients for the digital domain equations. The first step in generating new coefficients is to select the type of filter desired., such as LL1, LP1,CLP1, etc. Once the type of filter is selected, the appropriate input edit boxes will be displayed.

Oscilloscope Setup

The Oscilloscope can either be accessed under the "Tools" option on MotionMaestro's© main menu or via a button on the toolbar.

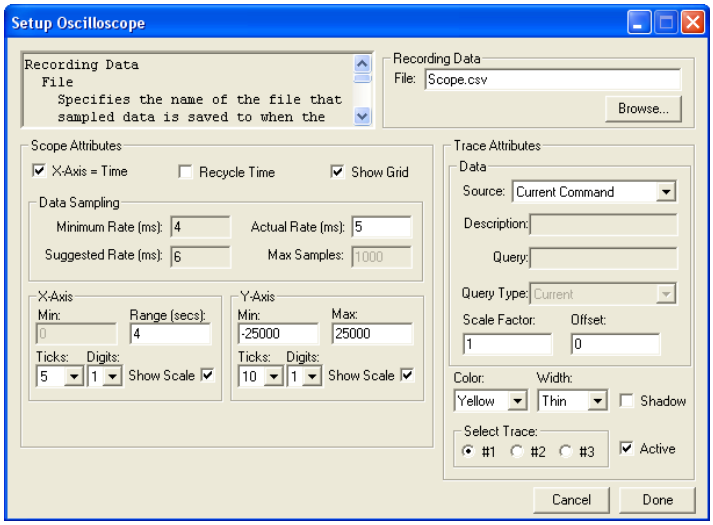


Scope in Tools tab

There is a “setup” window and a “trace display” window for the Oscilloscope. The Oscilloscope setup window provides for setup of the parameters needed to define the signals to be displayed on the Trace Window.

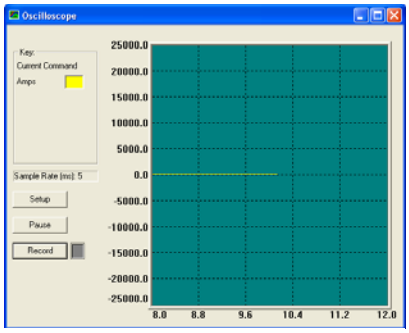
“Scope Attributes” define the X-Y attributes of the Trace display. An example is X-Axis = Time, this sets the units of the X axis to time. The range can be set for both the X and Y Axis, along with the data rate parameters.

“Trace Attributes” alters the data source and turns on/off different traces. You can monitor up to three traces at one time. All traces are color coded on the Oscilloscope Trace screen.



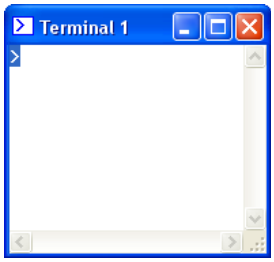
Setup Screen

The Recording Data section is useful for recording test data to a file. The “File” specifies the name of the file that sampled data will be saved to when the record button is activated on the “Trace display” window. By default these files are saved as .csv file type. When .csv is the file type, the files can be viewed with Microsoft EXCEL.



Oscilloscope Display Screen

The Oscilloscope Trace display screen can display up to three active traces on the display. Each trace is color coded and labeled in the key. The sample rate is also displayed for convenience. The screen can be resized for versatility. Depressing the record button will allow you to record a portion of the trace waves. When record is activated a red light will be displayed near the button.

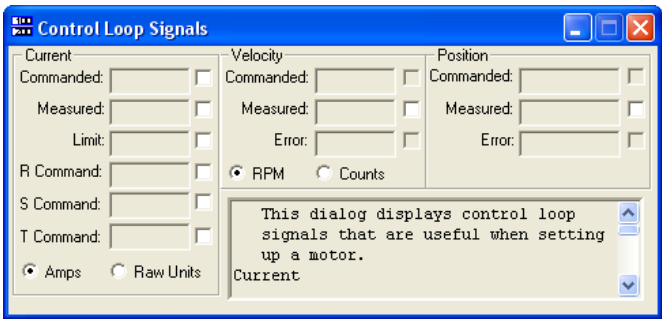


Terminal Window

The Terminal Window can either be accessed under the “Tools” option on MotionMaestro’s© main menu or via a button on the toolbar. The Terminal has direct communication to the amplifier. You can command the amplifier by typing commands to the terminal window. For example, typing BV then the enter key will send the request to read the Bus Voltage in the amplifier. If you wanted to change the Bus Voltage you would type BV200 then press enter. This would change the Bus Voltage to 200. Query command use just the ASCII letters of the command, where set commands use both Letters and a numerical value for an argument. **Caution** must be used when this window is activated due to the possibility of entering commands which would have undesirable effects.

Amplifier Status

MotionMaestro© has a variety of status displays that assists the application engineer in setting up amplifier or diagnosing a amplifier setup. Rather than showing all possible status on one dialog, MotionMaestro© has been designed so that only those applicable to the situation at hand can be displayed. These dialogs continuously send queries to the amplifier to determine the amplifiers current status. The size and location of each status display is saved when exiting the display. When returning to the status the last size and position is used in positioning the window. F1 can be pressed to obtain help on the various items or status in the current dialog.



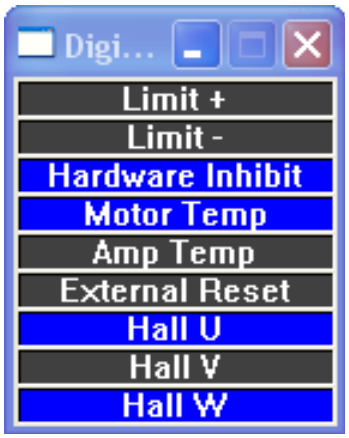
Dialog for observing control loop status

Control Loop Signals

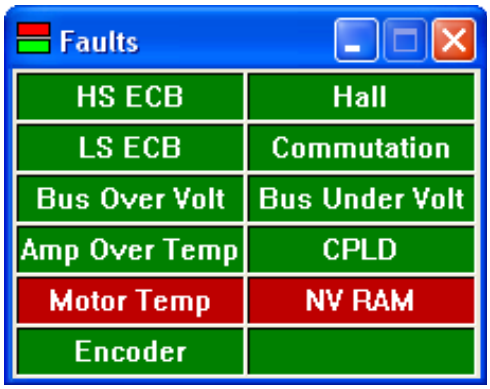
This dialog is useful for determining if an amplifier control loop is responding properly. Commanded and measured current can be displayed as well as the motors current velocity and position. Display this dialog by selecting “Status\Control Loop Signals...” or by utilizing MotionMaestro’s toolbar.

Digital Inputs

This dialog indicates the state of digital inputs coming into the amplifier. Digital inputs are those inputs that can be characterized as being active or inactive. They are typically associated with one of the controller input and output signal pins. See the associated pin in the hardware section for a description of the digital input of interest. Display this dialog by selecting “Status\Inputs\Digital…” or by utilizing MotionMaestro’s toolbar .



Status Display Digital inputs.



Amplifier fault status display.

Faults

Faults occur on conditions that make it impossible to operate the amplifier in a safe and stable condition. When a fault condition occurs, the amplifier is disabled. The amplifier must be reset either with the hardware reset switch or with software (Control Panel dialog) or through the external reset pin. Conditions that cause faults are over currents, high or low bus voltages, excessive operating temperatures, and faulty sensors or amplifier hardware. An external fault can be generated by the controller through the /FAULT pin. See the hardware section for additional information on /FAULT. Display this dialog by selecting “Status\Faults ” or by utilizing MotionMaestro’s toolbar.

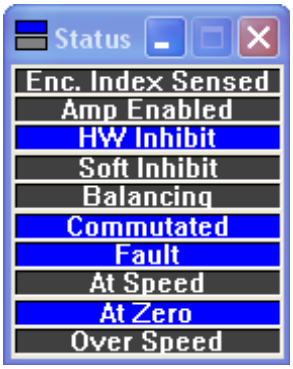
Warnings

A warning status indicates that the amplifier is fully operational, but that it is operating in an unusual mode or in a condition that warrants attention. Current fold back is such a condition. Display this dialog by selecting “Status\Warnings…” or by utilizing MotionMaestro’s toolbar.

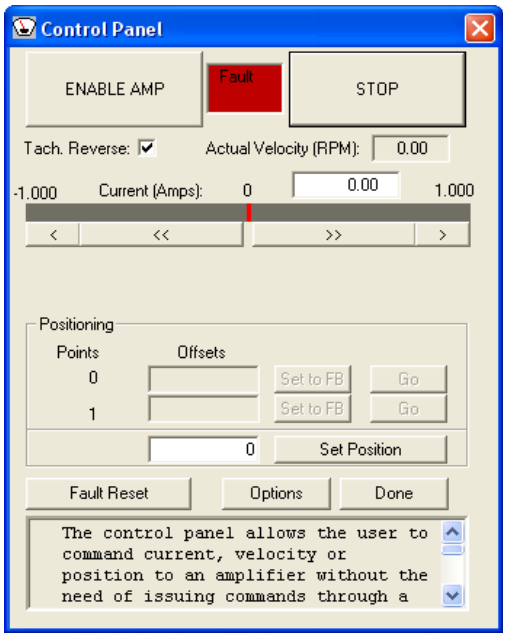
The Warning dialog

Status

All other amplifier conditions that are not a fault or warning are displayed on the Status dialog. This status display is useful for diagnostics, setup or monitoring during operation. Display this dialog by selecting "Status \System Status…" or by utilizing MotionMaestro's toolbar.



The System status display.

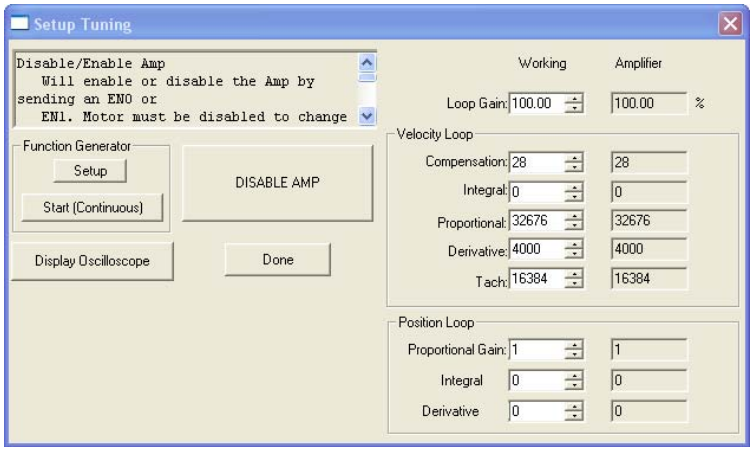


The Control Panel display

Control Panel

A properly connected motor can be controlled using the control panel. The control panel displays the amplifiers commanded current or velocity along with the motors actual velocity. From the control panel, you can easily command the motor. The control panel can be accessed through the "Tools" pull down menu or from the control panel icon on the tool bar.

You may set positioning offsets or an exact position by depressing the "Set Position" button. The Option button will allow you to set the maximum and minimum current, velocity, and position.



Dialog box for tuning the motor.

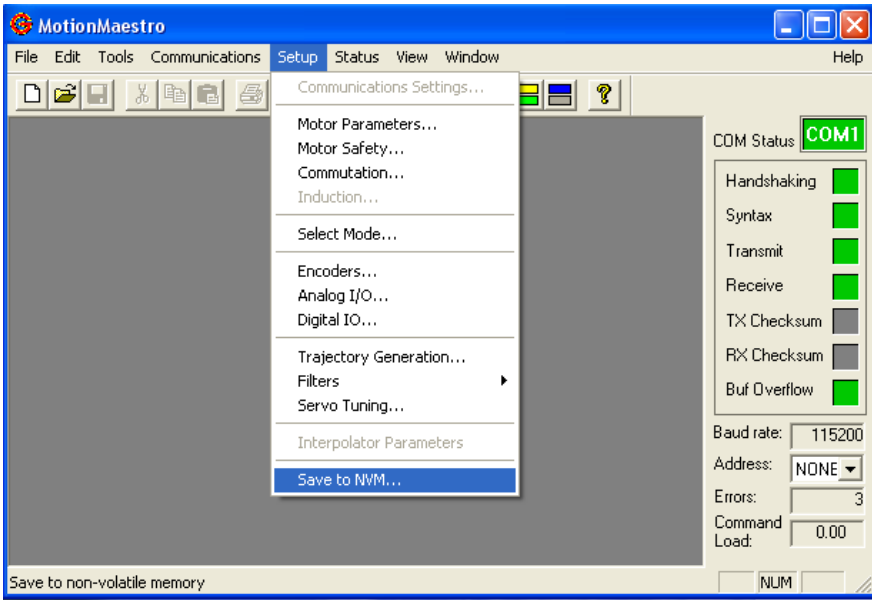
Motor Tuning

Fine tuning of motor control loop parameters is accomplished with the "Tuning" dialog. This dialog is accessed through the "Servo Tuning" item on the "Setup" menu and is shown below.

This dialog has many tools and features for tuning a motor. Real time motor velocity is always available. One can activate the motor with the "Continuous Step Response" button of the Function Generator. Then by viewing the response pattern on the scope you can see if changes to the tuning parameters improve or diminish performance. If in Velocity mode, velocity loop parameters can be altered. The Oscilloscope can query the amplifier down to a period of 2 milliseconds, which is adequate for most tuning requirements. The Tuning section describes in detail how a motor is tuned.

Saving parameters to non-volatile memory

After a motor is configured and tuned to the applications satisfaction, the parameters must be saved to the amplifier's non-volatile memory. Upon power up or reset, the last saved parameters are loaded in the amplifier. The parameters can be saved to non-volatile memory by selecting the "Save to NVM…" option on the setup menu, as illustrated below.

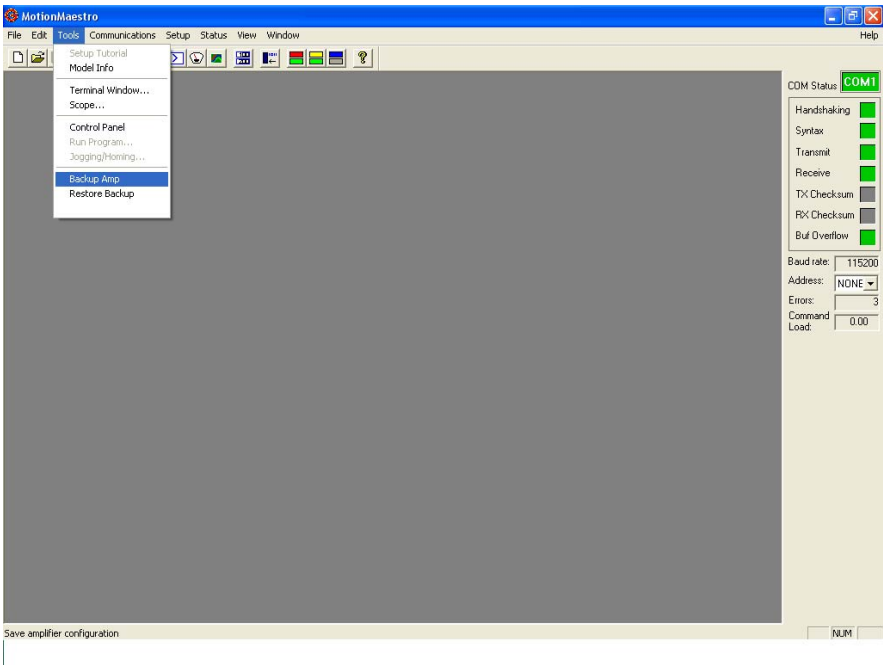


Saving parameters to amplifier non-volatile memory

Creating a back up copy of amplifier parameters on disk

An amplifier's current parameter settings can be saved to disk file that can later be used to configure another amplifier or to restore an amplifier's parameter settings. This is useful in production environments or where an application has several similar motors.

Select "Backup Amp" on the "Tools" menu to backup these parameters. You will be presented with a Windows style "Save File" dialog. Here you can give the file a meaningful name and location to save the file to. Restore backed up files to an amplifier with the "Restore Backup" selection.



Backing up amplifier parameters to a file on disk.

Amplifier Connection Interface

This section describes the amplifier connections and how they are used in the typical application. Refer to the specific amplifier's installation drawing in Appendix N. This drawing indicates the location of the pins described below along with the location of the connector they can be found on.

Status Display

A diagnostic LED is provided for determining the general operating condition of the amp. It is a 7-segment LED display. When 5 volts are being supplied to the logic section of the amp, the decimal point is lit.

When Hall sensors are being used and the amp is operating normally, one of the outer six segments is lit. Each of the six outer segments represent one of the six Hall states in a commutation cycle of a motor. A commutation cycle consists of two poles. In an 8-pole motor the LED will cycle through its six outer segments 4 times for one revolution of a rotary motor. When Hall sensors are not being used the display will show a 0, all outer segments of the LED are lit.

When the motors current is clamped, (i.e. held to zero), or the amplifier is in a fault condition, one of the following characters will be displayed as is appropriate to the fault or state.

Note: See Appendix B (page 54) for more information on Amplifier status codes

Controller Input and Output Signals

Signals that typically are connected to an external controller are described in this section. These signals include: the primary command signal interface to the amplifier, an encoder output signal, limits, inhibits, analog output, reset and common.

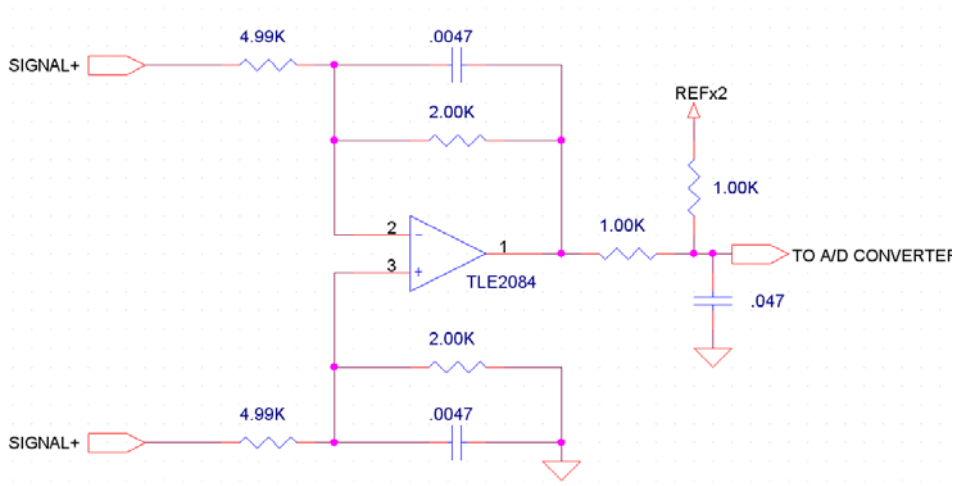
The following is a list and description of the possible controller I/O signals that can be found on an installation drawing. Each amplifier may have these on different types of connectors depending on the model that was ordered. It is important to refer to appendix A-K.

Signal	Description
SIGNAL 1	Command signal analog input 1, differential signal input.
SIGNAL 2	Command signal analog input 2, differential signal input.
ANALOG OUT	User configurable analog output.
+ LIMIT	Inhibits the motor in the plus direction.
- LIMIT	Inhibits the motor in the minus direction.
INHIBIT	Inhibits the motor in both directions.
/FAULT	Active low fault, Output.
RESET IN	Resets latched faults.
ENCODER A	Encoder A channel Output
ENCODER B	Encoder B channel Output
ENCODER Z	Encoder Z index Output (reference)
+ 5V OUT	5 volt source positive output
PULSE	Pulse signal of Pulse & Direction interface, differential signal input.
DIR	Direction signal of Pulse & Direction interface, differential signal input.

For the actual pin out of above signals, see Controller I/O connector on page 53.

Analog Input, Command Signal

Pins SIGNAL 1(+) and SIGNAL 1(-) are the command input pins. There is a primary and secondary command input. The command input takes a differential analog signal as referenced to the amplifiers' ground. Input voltage is expected to range from -10 volts to +10 volts. The analog signal is converted using a 12 bit ADC. The analog input stage is a difference amplifier with a differential input impedance of 10Kohm. If a single-ended input is desired, then Signal(-) should be connected to Signal common, and the command input should be connected to Signal(+). This will maintain the proper input gain for a +/-10V input range. In this configuration, the single-ended input impedance is 5Kohm. If the signal polarity is incorrect, the signal gain may be inverted in the software setup using MotionMaestro© (e.g. –50% instead of +50%.)



Command Signal Analog Input Schematic.

PWM (Duty Cycle) Mode Servo Amplifier

The PWM mode is designed to be compatible with most of the motion control chipsets available on the market today i.e. National, HP and PMD. In the PWM (Duty Cycle) mode, a constant frequency pulse is applied to the pulse / PWM input and the duty cycle of this pulse controls the speed or current (torque) of the motor.

There are two modes as shown below:

Mode 1:

50% duty cycle = 0 speed (velocity) or current (torque)

0% duty cycle = maximum negative speed or current (CCW)

100% duty cycle = maximum positive speed or current (CW)

Mode 2:

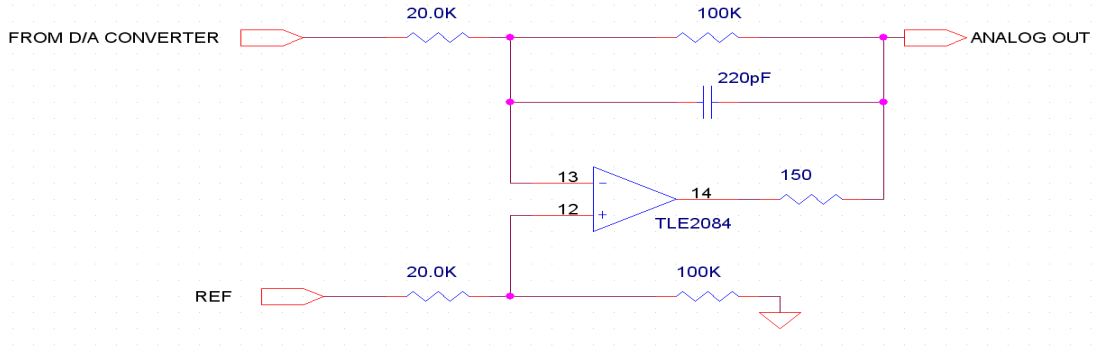
0% duty cycle = 0 speed or current

100% duty cycle = maximum speed or current

In this mode, the direction channels (DIR + / DIR -) are used to select direction of rotation.

Analog Output

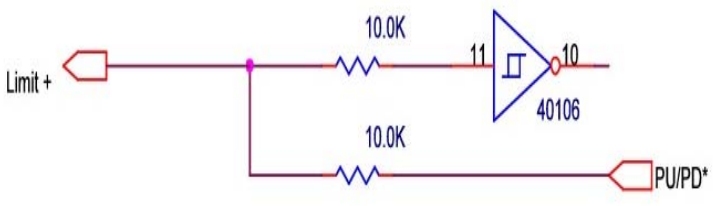
Analog out is a user selectable analog output. The output ranges from -10 volts to +10 volts and has 12-bit resolution. The analog output signals can be found in the Motion Maestro Guide at www.Glentek.com. The analog output can be used to monitor amplifier signals at the servo update frequency. By doing so, the application engineer can determine the amplifiers true response to commanded signals. The analog output is for reference use only. It is not intended for control purposes. At power on, its value is undetermined until the power on reset has completed. During some amplifier functions, this output is temporarily disabled. These functions include saving and recalling parameters from non-volatile memory. The output is filtered to minimize the switching noise from the PWM amplifier. The analog output is updated once per PWM cycle.



Analog Output Schematic

Discrete Inputs

Limit+, Limit-, Hardware inhibit, and amplifier reset are all single ended discrete inputs using the following circuit.



Discrete Input Schematic

Limits

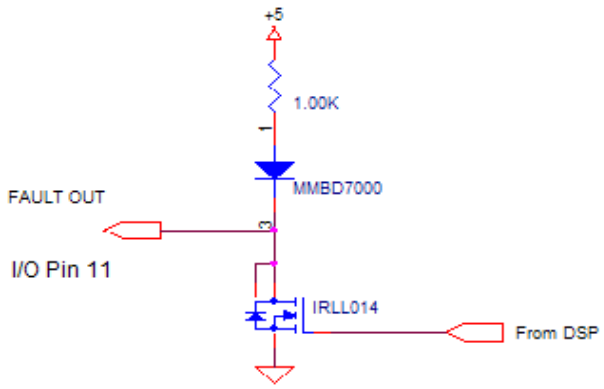
The signals LIMIT+ and LIMIT– can be active low or active high based on a user selected setting, (See Digital I/O Setup). If LIMIT+ is activated then positive current through the motor is brought to zero. If LIMIT– is activated then negative current through the motor is brought to zero. These pins are normally high at 5 volts. Although when the current is brought to zero the motor is free to rotate by externally applied forces.

Amplifier Hardware Inhibit

An external discrete input is available for amplifier INHIBIT. When activated the amplifier is disabled. The display indicates C for clamped. The motor is free to rotate via externally applied forces. This pin can be configured as active high or low, (See Digital I/O Setup).

Amplifier Reset

The amplifier can be externally commanded to reset with the RESET IN pin. This pin can be configured as active high or low. The amplifier flashes 8, all seven segments lit, while in reset.



Fault output Schematic

Amplifier Fault Output

An external discrete fault output is available. This pin can be configured as either a active high or active low. The circuit above is used.

Encoder Output

The encoder out signals are differential output signals. The Encoder output pins are buffered, divided down representation of the motor encoder. The motor's encoder can be divided by 1-8. Dividing the encoder output by 1, 2, 4, 8, 16, 32, 64 or 128 can be configured as an option. Encoder channels A, B and Z are available as pins ENCODER A+, ENCODER A-, ENCODER B+, ENCODER B-, ENCODER Z+ and ENCODER Z-.

External Encoder Power

To work reliably, some encoders require more current and/or a higher voltage than can be supplied by the amplifier. An external 5 or 12 volt source can be connected to the ENC + 5 IN pin. This power will be supplied to the encoder at the +V pin (see Encoder Feedback).

Power Input and Output Signals

The signal names for power are listed below:

Pin Name	Description
B-	Input - Negative side of DC buss voltage.
B+	Input - Positive side of DC buss voltage.
PHASE T	Output - Motor phase T.
PHASE S	Output - Motor phase S.
PHASE R	Output - Motor phase R.

Bus Power

DC bus power is received at pins B- and B+. DC bus power can be used for both the logic and power section of the amplifier.

SMC98XX utilizes separate keep alive voltages (24VDC or 110VAC) for logic power depending on the model purchased, reference page 34.

Motor Power

Motor power is delivered at pins PHASE T, S and R. The motor power is Pulse Width Modulated signals used to drive the motor.

NOTE: It is best not to connect the motor power pins until it is established that the logic section is working and operational. This means that with the DC bus pins connected, one should be able to communicate with the amplifier via a serial cable and the motor encoder and Hall sensors should be functioning properly. This can all be determined without connecting the motor power.

PC Interface

The PC interface can be found at the HOST connector. A RS-232 (or optional RS-485/422) interface is on the external of the amplifier. This port is the primary means of communication with the amplifier for setup and control. The port utilizes a DB-9 (or optional RJ45) type connector.

The HOST port, when configured as RS232 (independent of the connector type), is more reliable when a three wire cable is used. For a DB-9 connector, wire only, DB-9 pins 2,3 and 5 straight through. A null-modem will not work. Using a fully wired DB-9 may cause some computers to have communication problems.

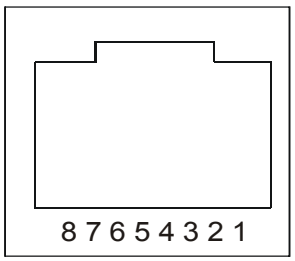
For the amplifier with an RJ45 connector, the serial cable can be made or purchased for communicating with a PC by configuring a cable with one end being a male RJ45 plug and the other end being a DB9 female connector. The pin-out names are on the following page. Remember that there is no standard for an RS-485 connector.

DB-9 female Pin - Description	Glentek Amplifier DB-9
1 - Data Carrier Detect	RX- (RS485)
2 - Received Data	TX232/CLK-
3 - Transmitted Data	RX232/RFS-
4 - Data Terminal Ready	n/c

5	- Signal Common	GND
6	- Data Set Ready	RX+ (RS485)
7	- Request to Send	n/c
8	- Clear to Send	TX+ (RS485)
9	- Ring Indicator	TX- (RS485)

The pin-out for the RJ/45 connector on the amplifier is shown below. A cable wired to a DB-9 connector, as shown below, will work with most RS-232 connections. RS-485 wiring depends on the pin-out of the RS-485 card communicating with the amplifier.

DB-9 pins Female		RJ/45 pins Male	AMP Pin description
6	<---------->	1	485 RX+
1	<---------->	2	485 RX -
4	<---------->	3	n/c
5	<---------->	4 *	GND
2	<---------->	5 *	232 TX
3	<---------->	6 *	232 RX
8	<---------->	7	485 TX+
9	<---------->	8	485 TX-
….7			n/c



Female RJ45 pin-out

Note: RS-232 requires connecting only the 3 pins marked with an asterisk above. If required, Glentek can customize a serial port digital interface to adapt to your controller as required to meet your protocols. We are currently doing this for high speed Ethernet ports.

Optional Relay Output

This 2 pin connector provides an interface for the relay. The relay is optional and not part of the standard product.

Encoder Feedback

The following pin description defines the main encoder input port.

Signal	Description
+5V	Amplifier supplied 5 volt source (output)
ENCODER A	Encoder A channel input
ENCODER B	Encoder B channel input
ENCODER Z	Encoder Z channel input
HALL 1	Hall sensor 1 input
HALL 2	Hall sensor 2 input
HALL 3	Hall sensor 3 input
MTR TEMP	Motor over temperature switch input

Encoder Power, Amplifier Supplied

The amplifier can supply 5 volts of encoder power. It is accessible at the +5V pin. The source is rated at 150ma.

Encoder Channels A, B and Z

The encoder input uses a SN75175 differential line receivers. An encoder edge is considered valid if it holds a single state for three full encoder clock cycles. An encoder clock cycle is 1/26MHz. If an encoder clock is running at a perfect 50% duty cycle, then the shortest possible edge time is 1/26Mhz. Since the signal must pass through the 3-stage filter, the **minimum edge time** for an encoder signal is 3/26MHz or 115ns. This is equivalent to a single channel signal frequency of 8.67Mhz/2 (there are two edges in an encoder signal) or 4.33Mhz. Since encoder signals are not perfectly square or perfectly at a 50 percent duty cycle, the maximum encoder frequency will be somewhat below this.

If the Z channel on the encoder is being utilized, and the Z channel signal width is equal to ½ or a full quadrature pulse, then this signal rate is not affected. If the Z pulse is a quarter of a full quadrature pulse then the minimum edge time is increased to 231ns.

The Z channel is edge sensitive such that swapping Z and Z* does not change the behavior of the amplifier.

Hall Channels 1, 2 and 3

SN75175 differential line receiver inputs. Compatible with differential or single-ended commutation tracks or Hall sensors. Single-ended connections should be made to the "+" input while leaving the "-" input unconnected.

Power-on phase-finding routines available for operation without commutation tracks or Hall sensors.

External Event Fault

The amplifier can be faulted on an external event with the MTR TEMP pin. This pin can be configured as active high or low. The amplifier displays lower case h when this signal is active, latches the fault and disables the amplifier.

Reset

This switch performs a reset. A reset clears all faults, resets the DSP and initializes the amplifier.

Connecting The Amplifier To The Motor

This section outlines how to connect an amplifier to a motor. In this section, you will connect your PC serial port to the amplifier establishing communication with the amplifier. After you have completed this, you will be ready to tune the amplifier.

External Wiring of The Amplifier

Serial Port

Purchase or manufacture a serial cable as described on page 31 under the description for PC Interface. Connect the female DB-9 connector to the PC that has your terminal software installed. Place the other end of the cable into the HOST port of the amplifier. The default serial port settings are:

Baud rate:	115200
Data bits:	8
Stop bits:	1
Parity:	None

There is no settable software protocol. Set your PC to raw ASCII.

Encoder and Hall

Manufacture an encoder cable that will be connected to the encoder feedback port. Use the pin out description under Encoder Feedback above and the installation drawing as a guide. (See page 32)

For the encoder, wire differential channels A, B and Z to the matching amplifier pins. Wire the encoder +5 volt to pin +V. Wire the encoder ground to a COMMON pin.

Hall sensor wires should be wired to their matching amplifier pins HALL 1+, HALL 2+ and HALL 3+. A rotation of the motor should activate Hall 1, 2 and 3 sequentially. Ensure that 5 volts and ground are provided to the Hall sensors through either an external 5 Volts or from the amplifiers +5V pin. If encoder power is supplied from amplifiers +5V pin, make sure that the encoder's current draw is less than the current rating of the +5V pin. (Less than 150 mA)

IMPORTANT: Use proper shielding for the encoder logic cable. Tie amplifier common to encoder ground and cable shield. **DO NOT** tie cable shield or encoder ground to motor case.

Applying Power

For this test, be sure that the encoder is connected and the motor power cable is not connected.

Testing of the amplifier communication with your PC requires that only logic power be turned on at the amplifier. Depending on the model amplifier you have, you will have to do one of the following:

1. Apply bus power to terminal B+ and B- (motor not connected)
2. Apply 24VDC keep alive logic power
3. Apply 110VAC keep alive logic power

After the logic power is turned on, the LED status display will light indicating that the amplifier logic is powered.

Amplifier Tuning

Glentek's digital servo amplifiers are tuned utilizing our proprietary motion control software, Motion-Maestro©. Tuning is a process where coefficients of the servo amplifier's internal equations are optimized to match the motor and the inertial load of the system it is driving. It is important to achieve a high gain, high bandwidth, critically damped velocity loop. Reference, Fig A, page 44. This will result in optimum position loop performance.

Parameter Setup

Note: Make sure that the amplifier is disabled at this time.

When any parameters are changed it is necessary to send these changes to the amplifier. Then it is very important to save to non-volatile memory to ensure the amplifier has the same parameters that were changed.

Start MotionMaestro©, establish communication with the amplifier (see page 17 under "Opening Communications" section), and go to "Setup", and select "Select Mode" dialog. Be sure that the amplifier is configured for current mode by de-selecting all other modes. The current mode is default and can not be de-selected as Motor/amplifier checkout is done in current mode.

Enter the "Setup\Motor Parameters" dialog. Refer to page 20 for more detail. It is very important that motor values entered into **MotionMaestro**© match those of the motor you are driving. Enter the motor resistance, Inductance, the bus voltage and the current loop bandwidth desired, a good starting point is 1500 Hz.

Enter the "Setup\Motor Safety" dialog. Set the Current limit to the rated limit of the motor or the rated limit of the amplifier, whichever is smaller. Set the fold back threshold to a value under the current limit. How much the threshold is set under the current limit depends on the dynamics of your application. Start with a value 5 percent under the current limit. If you are not using current fold back then set the fold back threshold to a value above or equal to the current limit. Set the Electronic Circuit Breaker (ECB) value. The low speed ECB protects the motor and amplifier from conditions when the current remains at the current limit for excessive periods of time. Set the LS/ECB threshold to the maximum continuous current of the motor or amplifier, whichever is less. Start with a 2 to 4 second filter time.

Enter the "Setup\Commutation" dialog. Configure the amplifiers commutation characteristics as indicated on the dialog. For rotary motors, enter the number of line counts per revolution, not the number of quadrature counts per revolution, which is always four times the line counts. This should be found on the encoder nameplate (if lines per revolution and number of poles are not documented for the motor (See appendix E "Determining Encoder Resolution and Number of Poles"). This number will need to be derived if linear scales are used. Select an appropriate commutation initialization method. See appendix H "Amplifier Terms and Technology" for details. Disable the amp, if it is not already, and send the parameters to the amplifier.

Enter the "Setup\Filters" dialog. Set Filter 1, Filter 2 and Filter 3 at "NONE", no filter. Sometimes Filter 3 is set at 320 Hz LP1 (Low Pass Filter) as default when used for velocity mode. Send the new parameters to the amplifier.

At this point you may want to save the parameters in non-volatile memory. Select "Setup\Save to NVM" from the menu bar. (**MotionMaestro**©: Setup > Save to NVM…)

You may also choose to save the current parameters in the amplifier by saving them to hard disk. Select "Tools\Backup Card" from the menu bar.

Motor Phasing

Before attempting this section, be sure you have completed the Parameter Setup section on page 35.

Applying power and phasing the motor:

1. Turn the power on without connecting the motor power leads to the amplifier, and configure the amplifier in current mode by choosing “Current Loop Closed” option under “Modes of Operation”. Actually this is done by deselecting all other modes. The current mode is default and can not be deselected.
   MotionMaestro©: Setup > Select Mode…
2. Save to NVM.
   MotionMaestro©: Setup > Save to NVM…
3. Turn the Bus power off.
   3.1 If you are phasing a non Glentek motor go to and perform the steps outlined. (Matching motor phase leads to amplifier commands using Hall sensors). For Glentek motors connect the motor power leads R, S and T (or Phase A, B and C) to the amplifier. Be sure that the motor case ground is properly grounded to the chassis ground. Go to appendix D step F, on page 56 and perform the steps outlined.
   Note: It is safer if the motor shaft is disconnected from the load.
   3.2 You are now ready to safely apply power to the motor in preparation for tuning.
4. Turn the Bus power back on with the motor power leads connected.
   From the MotionMaestro© “Control Panel” window, slowly increase the current command by pressing “>>” (positive command) button not more that 1-2Amps current command. If the motor does not move or lock up, then the motor wiring is probably incorrect, repeat step3. If “Actual Velocity (RPM)” box displays motor RPM other than 0, go to next step.
5. Increase the current command until getting approximately 500 RPM.
   Note: 1. The “Actual Velocity (RPM)” should show a positive number
   2. If the “Actual Velocity (RPM)” shows a negative number when positive current was commanded, change “Tach Reverse” in control panel window.
6. Try the opposite direction by pressing “<<” button until the motor rotates to the other direction.
   Note: The “Current (Amps)” box and “Actual Velocity (RPM)” boxes should indicate negative numbers.
7. The “Actual Velocity” (RPM) for both positive and negative command should display similar RPM values, for equal + and - values of current. If you see differences in RPM, motor hall sensors (commutation tracks) may have some offset. Increment the Commutation Angle Offset to a value in MotionMaestro's© “Setup\Commutation” dialog to achieve equal RPM in both directions.
8. Stop the motor and close the “Control Panel”.
9. Save the configuration to non-volatile memory.
   MotionMaestro©: Setup > Save to NVM…

Current Loop Tuning

This section describes a current loop tuning procedure where the user can select the current loop auto tuning or the current loop manual tuning methods. Tuning for both methods is carried out through the "Setup Auto/Manual Current Loop Tuning" window.

Note: A general description of Setup Auto/Manual Current Loop Tuning is as follows:

Motor Resistance

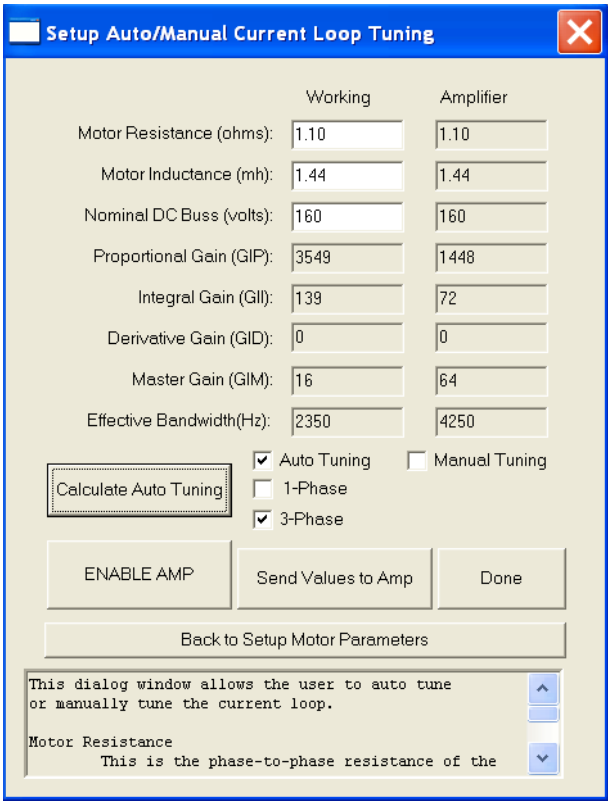
This is the phase-to-phase resistance of the motor for 3-phase motor and the Motor+ to Motor- resistance for 1-phase application. Typically the resistance is listed on the manufacturers motor plate. If not, please measure with an ohm meter.
Range: 0.01 to 326.77 ohms.

Motor Inductance

This is the phase-to-phase inductance of the motor for 3-phase motor and the Motor+ to Motor- inductance for 1-phase application. Typically the inductance is listed on the manufacturers motor plate. If not, please measure with an inductance meter.
Range: 0.01 to 326.77 milli-henries.

Nominal DC Buss

The rectified bus voltage supplied to the amplifier between B+ and B-. For AC input power voltages the following relationships apply.
120 VAC = 160 volts DC.
230 VAC = 325 volts DC.
Range: 40 to 500 volts.



Dialog box for entering motor and current loop auto/manual tuning parameters.

Proportional Gain

The current loop proportional gain.
Range: 1 to 32767.

Integral Gain

The current loop integral gain.
Range: 1 to 32767.

Derivative Gain

The current loop Derivative gain.
Range: 1 to 32767.

Master Gain

The current loop Master gain is a scalar multiplier for proportional, integral and derivative gain.
Range: 1 to 32767.

Effective Bandwidth

Effective bandwidth is the small signal current loop bandwidth. It is derived from motor inductance, resistance and Buss voltage.

Auto Tuning

This tuning mode automatically calculates and optimizes the current loop bandwidth and step function response. The resulting proportional, integral, derivative and master gains are automatically calculated and displayed.

Manual Tuning

This tuning mode is selected for special applications. In this mode, you may adjust all current loop gains and send them to the amplifier while viewing the current loop response with an oscilloscope or running bode plot.

1-Phase

1 Phase is selected when amplifier drives brush type DC motor or voice coil.

3-Phase

3-Phase is selected when amplifier drives three phase brushless motor.

Calculate Auto Tuning

Press Calculate Auto Tuning button after all motor parameters and DC buss voltage data is entered, and Auto Tuning is checked. The proportional, integral, master gain, and effective bandwidth in working column are automatically set and displayed after pressing the button.

Disable/Enable Amp

Enables or Disables the amplifier.

Send Values to Amp

Press this button to send the working parameters to the amplifier. They are not saved to the amplifier non-volatile memory. If you do want to save to NVM, please go to 'Setup' and press 'Save to NVM'. The motor must be disabled before this can be performed. The effective bandwidth is calculated before sending the working parameters when Manual Tuning is selected. The warning message "System could be unstable, please lower the gain" may pop up when the estimated small signal current loop bandwidth exceeds the system limit. But the 'Send Values to Amp' procedure is still executed. Be careful when turning system on in this situation.

Current Loop Auto Tuning

Note: Glentek recommends that this auto tuning method of current loop tuning be used in all applications whenever possible.

This section describes the current loop auto tuning procedure where the Proportional, Integral, Derivative, Master gains, and Effective Bandwith are automatically calculated and optimized for a particular motor.

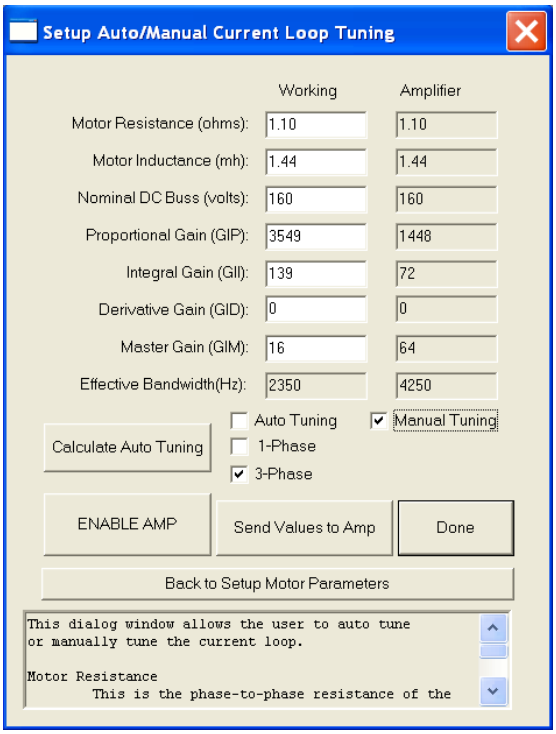
1. Enter the “Setup\Motor Parameters” dialog.
2. Click and select “Setup Auto/Manual Current Loop Tuning” to enter current loop auto tuning dialog window. This dialog window allows the user to auto tune or manually tune the current loop.
3. Enter the Motor Resistance, Inductance, and Nominal DC Buss voltage here if not already done so in the “Setup Motor Parameters” window.
4. Select the appropriate motor type (i.e. 1-Phase or 3-Phase) and Auto Tuning boxes, then press the Calculate Auto Tuning button. The Proportional, Integral, Derivative, Master gains, and Effective Bandwidth values are automatically calculated and optimized.
5. Send the new parameters to the amplifier.
6. At this point you may want to save the parameters in non-volatile memory. Select “Setup\Save to NVM” from the menu bar. (**MotionMaestro**©: Setup > Save to NVM…)
7. You may also choose to save the current parameters in the amplifier by saving them to hard disk. Select “Tools\Backup Amp” from the menu bar.

Current Loop Manual Tuning

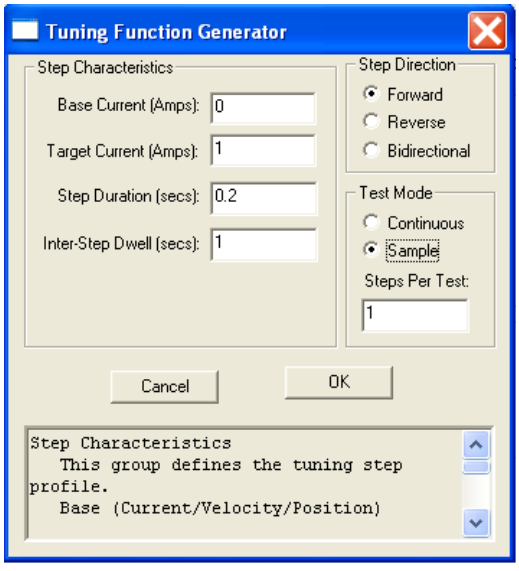
Note: This section outlines the procedure for custom adjustment of the Proportional, Integral, Derivative, and Master gains obtained in Current Loop Auto Tuning on page 38. Glentek does not recommend manual current mode tuning unless you first consult with a Glentek applications engineer.

This section provides additional tuning information for applications where the user desires to individually adjust the Proportional, Integral, Derivative, and Master gains of the current loop. Before attempting this section, be sure to have the amplifier and motor phasing configured correctly, refer to page 36.

1. Be sure to disable the amplifier.
2. **MotionMaestro©**: Setup > Motor Parameters…
3. Select "Setup Auto/Manual Current Loop Tuning" to enter current loop tuning dialog window.
4. Enter the appropriate motor resistance, inductance, and operating bus voltage if not already done so.
5. Select the motor type (i.e. 1-Phase or 3-Phase) and the Manual Tuning check boxes.
6. Set the desired gain Proportional, Integral, Derivative, and Master gains parameters. If you don't know what values to start with, go to "Current Loop Auto Tuning" first, and then return back to this step.
7. Click on the Send Values to Amp button to send the newly entered parameters to the amplifier.
8. **MotionMaestro©**: Setup > Filters. Set Filter 1, Filter 2 and Filter 3 at "NONE", no filter.
9. **MotionMaestro©**: Setup > Servo Tuning…
10. Set "Loop Gain" at 100 (100%).
11. Next, setup an excitation signal needed during current mode tuning. In the "Function Generator" group of the tuning dialog window, press "Setup" and do the followings.
    - 11.1 In the "Tuning Setup" dialog window, enter "Base Current (Amps)". 0 Amps.



Dialog box for entering motor and current loop auto/manual tuning parameters.

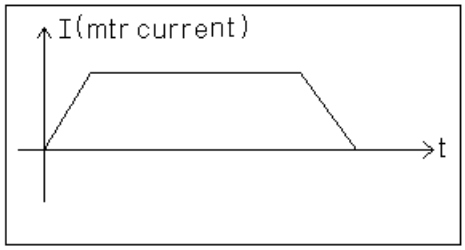


Dialog box for entering step function parameters.

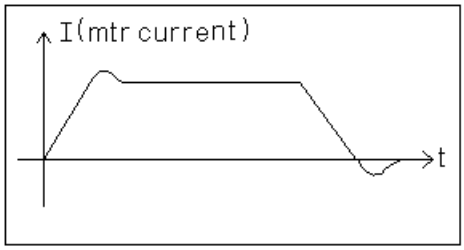
- 11.2 Enter "Target Current (Amps)". (1 Amps or your selection) Try to keep current to less than 1/3 continuous rating of motor for this test.
- 11.3 Enter "Step Duration". 0.2 to 0.5 secs.
- 11.4 Enter "Inter-Step Dwell". 1.0 secs.
- 11.5 Choose "Step Direction". Forward.
- 11.6 Choose "Test Mode". Sample.
- 11.7 Select "OK" to close window.

Note: You may want to change these values after you start tuning to see the rising and falling edges of the waveforms better. If the control system you are tuning has an analog current command output, you can use it for tuning. However, if you prefer, you can remove the analog current command from your control system and use a DC box that has an analog step output current command which you can use for tuning.

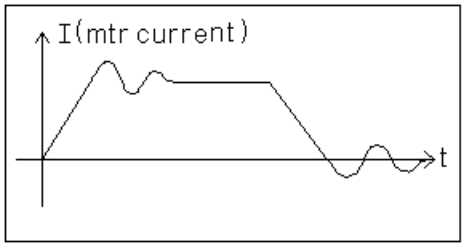
12. **MotionMaestro**©: Setup > Analog I/O…
13. In the "Analog Output Setup" group of the Setup Analog Input/Output window, select "Current Measured" as the signal source and do the followings.
    13.1 Set "Signal Gain" to 100%.
    13.2 Attach a digital volt meter across the "Analog Out" pin of the controller I/O port and Common.
    13.3 Zero out any offset by adjusting the "Signal Offset" values in **MotionMaestro**©.
14. Save to NVM.
    MotionMaestro©: Setup > Save to NVM…
15. Attach an oscilloscope probe to the "Analog Out" pin of the controller I/O port and the probe return to a Common pin.
16. Enable the amplifier.
17. Go back to the "Tuning Setup" window, and press the "Start (Continuous)" button in the "Function Generator" group.
    Note: Press "OK" when the "Execute Test" pop up window appears.
18. The oscilloscope waveform should show a critically damped response or possibly a small over-shoot.
19. The following illustrations provide a reference for the waveforms on the Oscilloscope. Figure A or B are the preferred current loop response.
20. Repeat procedure from step 1 until desired response waveform is obtained.
21. Save to NVM.
    MotionMaestro©: Setup > Save to NVM…



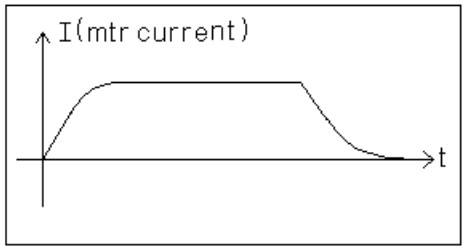
A.) Critically Damped Signal



B.) 1 Hook Overshoot Signal



C.) Under Damped Signal



D.) Over Damped Signal

Note: You may also run Bode plot for current loop manual tuning.

Current (Torque) Mode Tuning

In this mode of operation, which is also commonly referred to as torque mode, a current in the motor is produced which is directly proportional to the input signal. Be sure you have completed the Motor Phasing section on page 36.

Signal Gain Setting

1. **MotionMaestro**©: Setup => Select Mode...
   Select "Current Loop Closed" (selected by default, and can not be deselected) only.
2. **MotionMaestro**©: Setup > Analog I/O…
   In the "Signal Gain" box, enter the amps per volt scale for the signal input. For example, if the peak current for your application is 20 amps, and your maximum differential input command voltage is 10 volts, then you would enter 2.0 in the "Signal Gain" box.
3. Save the configuration to non-volatile memory.
   MotionMaestro©: Setup > Save to NVM…

Signal Offset (Balance) Setting

1. Command 0V (from controller) to the amplifier "Signal 1+" and "Signal 1-" inputs.
2. **MotionMaestro**©: Tools > Scope…
   2.1 Select "Current Command" option from "Source "pull down menu under "Trace Attributes" .
   2.2 In the " Y-Axis Range", set the values to –1 min and +1 max.
   2.3 Press "Done" to display oscilloscope.
   2.4 You should see a trace scanning across the scope.
3. **MotionMaestro**©: Setup > Analog I/O…
   Adjust the "Signal Offset" box in "Analog Input Setup" section until the "Current Command" waveform sweeps at "0" Amp on the oscilloscope.
4. Save the configuration to non-volatile memory.
   MotionMaestro©: Setup > Save to NVM…

Velocity (RPM) Mode Tuning

For this section, refer to the Velocity Control Loop Diagram (page 12). Before starting this section, be sure you have completed the amplifier current mode tuning section. (pages 35 & 36)

GVS (Gain Velocity Scale) Setting

Before starting the velocity tuning, be sure to select a proper GVS (gain velocity scale) multiplier. At this time, you can refer to the VELOCITY CONTROL LOOP DIAGRAM in page 12.

The encoder counts per revolution are sampled and velocity is computed at a 25KHz interrupt sampling rate. The GVS number is set as a power of 2. Example: GVS of 8 = 2^8 = 256.

If you do not initially set the GVS number, the amplifier will select 256 as a default value. Each edge of the encoder quadrature channels is counted and multiplied by the GVS number and stored to represent scaled velocity. The GVS number is chosen such that encoder edge count at maximum RPM is scaled below 32,768. For low resolution encoders, the GVS number should be increased. The standard default number for GVS is 256 and it is chosen for a 8,192 line encoder rotating at a maximum of 5,000 RPM.

The 256 GVS value is calculated as follows:

(8,192 * 4 counts / rev) * (5,000 rev / min) * (1 min / 60 sec) = 2,730,667 counts / sec

At a 25KHz interrupt sample rate, you will get

2,730,667 / 25000 = 109 counts / sample interrupt

109 * 256 (GVS) = 27,904 which is less than 32,768 as it should be.

Typical value for 5,000 line encoder @ 4,000 RPM is a GVS value of **9** = 2^9 = 512

Typical value for 2,000 line encoder @ 4,000 RPM is a GVS value of **10** = 2^10 = 1024

Typical value for 1,000 line encoder @ 4,000 RPM is a GVS value of **11** = 2^11 = 2048

To change the GVS pre-scale, you will have to use the terminal window (Tools > Terminal Window).

If you type GVS followed by pressing the enter key, you should get a response of 8. To change it to 9, type GVS 9 and press enter, then you can type GVS and press enter to verify the change. The rest of the gains can be set in the servo tuning window as long as the velocity loop option is selected.

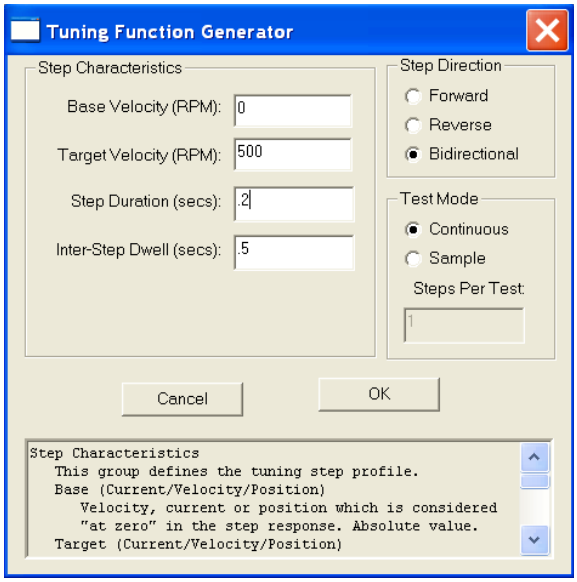
Note: Any time you change GVS or GVF (Tach Gain), the conversion to RPM will change. Any **MotionMaestro**© features that use RPM conversions will have to be closed and re-opened to recalculate the proper RPM conversion. These include the control panel, the scope, the control loop signals status display and the function generator in the servo tuning window.

Velocity Loop PID Setting

After finishing GVS setting be sure amplifier is disabled and go to:

1. **MotionMaestro**©: Setup => Select Mode…..
   Select "Velocity Loop Closed"
2. **MotionMaestro**©: Setup > Servo Tuning…
   Set "Loop Gain" at 10 (10%), at final alignment it is always set at 100 (100%). It is only used for initial phasing purposes. The purpose of "Loop Gain" is to allow "soft" closing of velocity and position loops during initial startup, preventing runaway.
   The following velocity loop coefficient values should be used for initial tuning:
   - 2.1 Compensation Gain: 1
   - 2.2 Integral Gain: 0
   - 2.3 Proportional Gain: 32767
   - 2.4 Derivative Gain: 0
   - 2.5 Tach Gain: 16384
   - 2.6 Current Loop Bandwidth: 1500 Hz
   - 2.7 Filters 1 and 2 set at "NONE" ; Filter 3: 320 Hz (LP1)
   - 2.8 **MotionMaestro**©: Setup > Filters > Feed Back Filter
     - 2.8.1 Set for HP1 under Coefficient Generation
     - 2.8.2 Enter 30 for Bandwidth, and press "Generate" button.
     - 2.8.3 Press "Save" button under Filter Set Name
     - 2.8.4 Press "Send" button to send to amplifier.
3. Next, setup an excitation signal needed during velocity tuning.
   MotionMaestro©: In the "Function Generator" group of the tuning dialog window, press "Setup" and do the followings.
   - 3.1 "Tuning Setup" dialog window will appear.
   - 3.2 Enter "Base Velocity (RPM)". 0 RPM.
   - 3.3 Enter "Target Velocity (RPM)". (500 or your selection) Try to keep it under 1000 RPM.
   - 3.4 Enter "Step Duration (0.2 secs),
   - 3.5 Enter "Inter-Step Dwell (0.5 secs).
   - 3.6 Choose "Step Direction" (Bidirectional).
   - 3.7 Choose "Test Mode" (Continuous).
   - 3.8 Select "OK" to close window.

   Note: You may want to change these values after you start tuning to see the accel and decell waveforms better. If the control system you are tuning has an analog velocity command output, you can use it for tuning. However, if you prefer, you can remove the analog velocity command from your control system and use a DC box that has an analog step output velocity command which you can use for tuning.



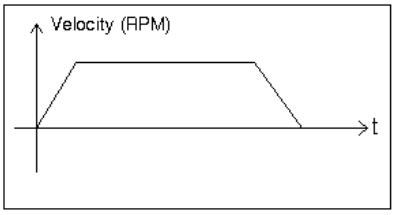
4. Next the Scope function needs to be setup and started to display the system velocity response. Press the “Display Oscilloscope” button on the Tuning Dialog window to open the “Setup Oscilloscope” dialog window, and do/select the followings.
   4.1 Select X-Axis = time
   4.2 Enter Data sampling “Actual Rate (mS)” select time equal to or greater than the shown default. The shown default is calculated based on **MotionMaestro**© activity and could be too high if activity is increased.
   4.3 Select under “Data Attributes” “Source dropdown” the “Velocity Measured” option
   4.4 Enter “ X-Axis Range”: oscilloscope sweep speed
   4.5 Enter “ Y-Axis Range”: Sets the Y axis plus and minus maximum values.
   Note: The maximum values should be higher than the actual “Target Velocity (RPM)” from step 3.3.
   4.6 Press “Done” to display oscilloscope
   4.7 You can always go back to the “Setup Oscilloscope” window to reset the ranges by clicking “Setup” in the “Oscilloscope” window.
   4.8 You should see a trace scanning across the scope. If you do not, press “Setup” button, and adjust the scope until a trace is visible.

5. Enable the amplifier.

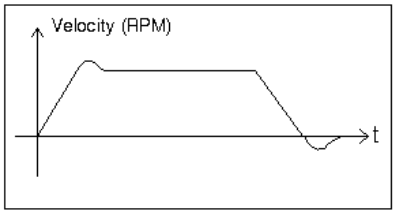
6. Go back to the “Tuning Setup” window, and press the “Start (continuous)” button in the function generator group.
   Note: Press “OK” when the “Execute Test” pop up window appears.

7. Slowly increase the “Compensation” until the oscilloscope waveform shows critically damped response.
   7.1 This should be achieved without the system becoming unstable.
   7.2 The compensation can be increased or decreased by the up and down arrow keys on the keyboard when the compensation edit box on tuning dialog of **MotionMaestro**© has the focus.

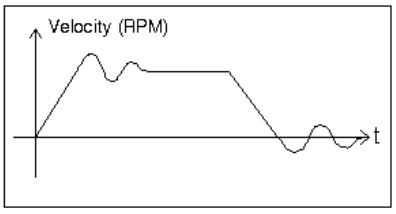
8. The following illustrations provide a reference for the waveforms on the Oscilloscope.
   Figure A, a critically damped signal is an ideal response for most applications.



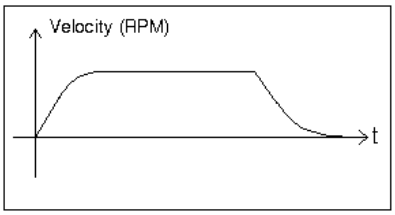
A.) Critically Damped Signal



B.) 1 Hook Overshoot Signal



C.) Under Damped Signal



D.) Over Damped Signal

9. Tuning suggestions:
   9.1. In most cases, increasing compensation value should tune the amplifier to the application. Try to achieve compensation value of six or better for high gain loop.

   9.2 Integral gain may be increased to achieve stiffness at zero speed. However, do not add too much as system may become unstable.

   9.3 In systems with high inertia, you may want to increase derivative gain toward 25,000, and in systems with low inertia, you may want to decrease derivative gain toward 10,000 to achieve a critically damped response.

10. When you are satisfied with the tuning, save the parameters to non-volatile memory.
    MotionMaestro: Setup > Save to NVM…

When tuning is completed, you can save the amplifier parameters to a backup file by using MotionMaestro's Backup command. You will find this command under the Tools pull-down menu. Select Backup amplifier. You will be prompted for a file name. The file can later be found under the application directory with a .bk file type descriptor. At a later time this file can be used to quickly load default parameters for an application.

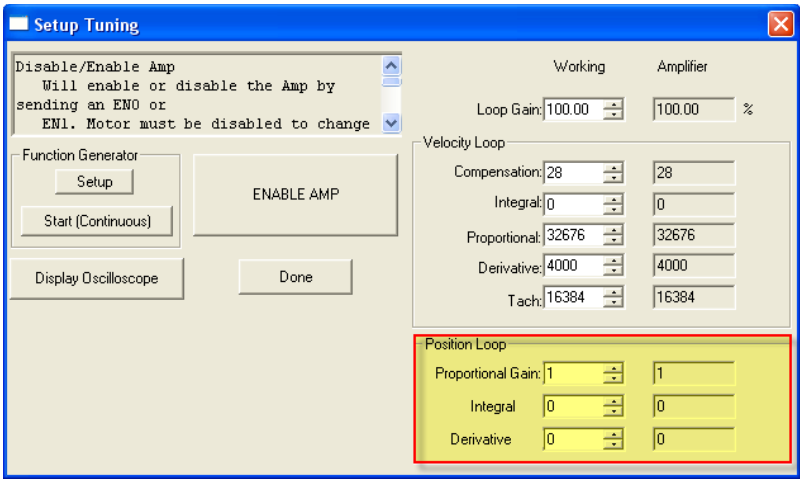
2-Phase Current (Torque) Mode Tuning

1. This section is for users who purchased a dedicated 2 phase current mode amplifier.
2. Save to NVM.
   MotionMaestro©: Setup > Save to NVM…
3. Turn the power off, and connect the motor leads (R, S and T) to the amplifier, and 2 signal inputs (signal 1+/-, signal 2+/-) with Common from the controller to the amplifier.
   3.1 Make sure to connect the motor leads properly.
   Signal Controls: R-phase signal 1, S-phase signal 2, T-phase signal 3.
4. Turn the power back on and open the “Analog I/O” window.
   MotionMaestro©: Setup > Analog I/O…
5. With zero value signal on both of the input signals, adjust “Signal Offset” and “Aux Signal Offset” to null the R and S commands.
   5.1 Use scope to monitor these commands.
   MotionMaestro©: Tools > Scope… or Scope icon on the tool bar.
   5.2 On the Scope set up window
   For trace 1 Select “R Current Commanded” option from “Source” under “Data Attributes”
   For trace 2 Select “S Current Commanded” option for “Aux Signal Offset”
   5.3 Go back to the Analog I/O setup window and adjust the analog offsets to get a zero value on the commanded signal traces. This will null all offsets from the controller and the amplifier.
6. Set “Signal Gain”, and “Aux Signal Gain” to the desired Amps/V.
   6.1 Note: Both gains should be set to the same value.
   MotionMaestro©: Setup > Analog I/O…
7. Stop the motor and close the “Control Panel”.
8. The controller connection to the analog inputs can be verified by commanding 1V to each signal input. Use the MotionMaestro© Scope to check that the commanded input is as expected.
   For Example: If the signal gains are set to 2.5A/V, 1V is commanded to both inputs simultaneously, and the current limit is greater than 5A, then the MotionMaestro© Scope should display 2.5A on phase R and S current commands and –5.0A on phase T current command.

Pulse Follower Position Mode Tuning (ref. to pulse/direction control dia., page 14)

To operate in this mode, you must first optimize and tune the velocity loop for the highest gain and critically damped response. See Velocity Tuning (pages 42 - 45). Be sure to save velocity loop coefficients to NVM before you continue. Next, disable amplifier and go to position control mode and tune the position loop as follows:

1. **MotionMaestro©**:
   Setup => Select Mode…..
   Select "Velocity Loop Closed", "Position Loop Closed" and "none (Digital Only)."



2. **MotionMaestro©**:
   Setup => Servo Tuning
   Start by setting proportional gain to 64, integral and derivative gain to 0. (Under Position loop)

3. Next setup a excitation signal needed during position tuning.
   MotionMaestro©: In the "Function Generator" group of the tuning dialog window, press "Setup" and do the followings (ref pg 43).
   - 3.1 "Tuning Setup" dialog window will appear.
   - 3.2 Enter "Base Position". 0 counts.
   - 3.3 Enter "Target Position". Value of encoder lines per revolution (this should result in a 90º move).
   - 3.4 Enter "Step Duration. 1 sec
   - 3.5 Enter "Inter-Step Dwell. 1 sec
   - 3.6 Choose "Step Direction" (Bidirectional).
   - 3.7 Choose "Test Mode" (Continuous).
   - 3.8 Select "OK" to close window.

   Note: You may want to change these values after you start tuning to see the waveforms better.

4. First keep position loop integral and derivative gain to zero, increase position loop proportional gain to as high as possible without excessive oscillation. Next, add derivative gain to help calm down the oscillation. Then add as much integral gain as possible to achieve a quick response. Observe the response all the time.

The feedback encoder quadrature edges are counted into a 32 bit position feedback counter and this counter is compared with a scaled input command 32 bit counter. The position difference is then amplified by a proportional integer gain and used as an error velocity command. This command is used as an input to the velocity loop, see COMMAND INPUT CONTROL DIAGRAM, page 11. Go to trajectory generator window (page 22) and disable acceleration and deceleration limits by checking appropriate boxes. Set maximum speed of motor into velocity limit box.

To View the position following error go to the Control Loop Signal window (page 24) and select commanded, measured and error in the position box. The following error is also located on the oscilloscope window. If the error is less than 100 counts the motor will follow always within 1.8°, reference to example describing 5000 line encoder on page 46. For more info refer to the MotionMaestro guide at www.Glentek.com.

Also when used as an encoder follower, the count (lines) per revolution of the encoder must be such that they are either both binary or both decimal.

To reverse the motor rotation, go to MotionMaestro Setup > Encoder and check or uncheck on "Reverse" check box under Auxiliary Encoder section. (refer to "Encoder Setup Dialog" on page 21)

To set PGI (Gear In) and PGO (Gear Out), refer to "Setup Encoders" window on page 21.

It is important to note from the scaling example shown below to scale command pulses to increment 1.8 º of the motor. The encoder counts must be divisible by 200.

An example of pulse system scaling is described as follows:
1. Feedback Encoder = 5,000 lines per revolution
2. Desired motor rotation per input pulse = 1.8 º

1 rev (360 º) of feedback encoder = 5,000 * 4 = 20,000 counts
1.8 º / 360 º * 20,000 = 36,000 / 360 = 100 counts
Therefore, each input pulse must increment the input command counter by 100 counts. To achieve this, set PGI to 1 and PGO to 100 such that 1 pulse in = 100 pulses out.

An additional example of encoder follower scaling is described as follows:
1. Input command encoder (master) = 2,000 lines per revolution
2. Feedback following encoder (slave) = 5,000 lines per revolution
3. Desired following ratio = 1 revolution to 1 revolution

Set PGI = 2 and PGO = 5
For every 2 pulses of the input cammand encoder (master), the input command position counter will be incremented by 5 counts.

To further explain the above scaling example, we have provided an additional description as follows:

Let us pick the example where we have a shaft somewhere in a system that has a 2000 line encoder mounted to it and we want to remotely slave another shaft to this encoder. On this remote shaft, we mount a servo motor with a 5000 line encoder. Then, we connect the 2000 line encoder to the inputs of the remote servo amplifier in the pulse follower mode and set PGI = 2 and PGO = 5. This sets up the ratio for every two counts of the 2000 line encoder the 32 bit input command position counter (see diagram on page 14) is incremented by 5 counts. Now the remote servo will follow on a 1 to 1 ratio.

To reverse the motor rotation while in pulse follower position mode go to the setup command mode window (page 19) and change setting of invert box.

PWM Mode Tuning

For this section, refer to:
COMMAND INPUT CONTROL DIAGRAM, page 11, and PWM (Duty Cycle) Mode Servo Amplifier, page 28.

As you can see, depending on if you want to command velocity or current (torque), you will have to either tune the velocity loop or current loop as required.

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Appendices

APPENDIX A

A - Servo Drive Connections

A - 1. Servo Drive Motor and Power Connectors

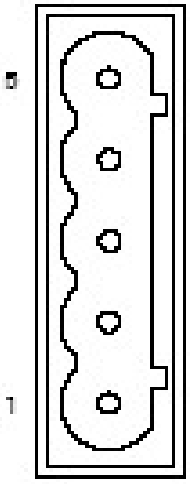


Table A - 1. Module Power/Motor Mating Connectors

Description/Type	5-Pin Female Mating Connector
Right angle	Phoenix GMVSTBW 2,5/5-ST-7,62
Inline	Phoenix GMSTB 2,5/5-ST-7,62

Table A - 2. Module Power/Motor Designations

Pin#	I/O	Name	Function
1	Input	B-	DC Bus Return
2	Input	B+	DC Bus +
3	Output	T	Motor Phase T
4	Output	S	Motor Phase S
5	Output	R	Motor Phase R

Table A - 3. Stand-Alone Motor Power Mating Connectors

Description/Type	3-Pin Female Mating Connector
Right angle	Phoenix GMVSTBW 2,5/3-ST-7,62
Inline	Phoenix GMSTB 2,5/3-ST-7,62

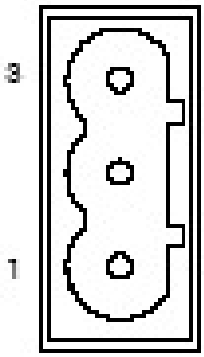
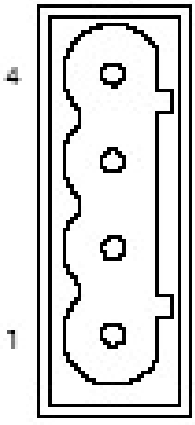


Table A - 4. Stand-Alone Motor Power

Designations Pin#	I/O	Name	Function
1	Output	T	Motor Phase T
2	Output	S	Motor Phase S
3	Output	R	Motor Phase R

Table A - 5. Stand-Alone AC Power Mating

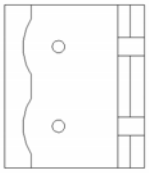


Connectors Description/ Type	4-Pin Female Mating Connector
Right angle	Phoenix GMVSTBW 2,5/4-ST-7,62
Inline	Phoenix GMSTB 2,5/4-ST-7,62

Table A - 6. Stand-Alone AC Power

Designations Pin#	I/O	Name	Function
1	Input	AC	AC, single phase/three phase
2	Input	AC	AC, single phase/three phase
3	Input	AC	AC (three phase only)
4	Input	Gnd	Chassis Gnd

Table A - 7. External Logic Supply Input Mating Connector (SMC9815 only)



Connector Description/Type	2-Pin Female Mating Connector
Right angle	Phoenix P/N: GMVSTBW 2,5/2-ST-5,08 Glentek P/N: EJ741V02

Table A - 8. External Logic Supply Input Power Designations (SMC9815 only)

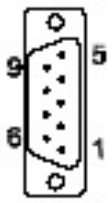
Pin #	I/O	Description
1	Input	COMMON
2	Input	24 to 48VDC, 600mA max. @ 24VDC Powers all amplifier logic and encoder

A - 2. Servo Drive Serial Communications Connector

Table A - 9. DB-9 Serial Communications Mating Connectors

Description/Type	9-Pin Male Mating Connector
Sub Miniature D, 9-Pin	Commercial, DB-9

Table A - 10. RS-485/422 Communications Designations



Pin#	I/O	Name	Function
1	Input	-RX-	Receive
2		-	Reserved
3			Reserved
4		-	No Connection
5	Power	GND	Ground
6	Input	RX+	Receive +
7		-	No Connection
8	Output	TX+	Transmit +
9	Output	TX-	Transmit

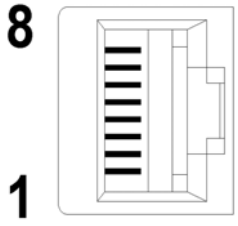
Table A - 11. RS232 Communications Designations

Pin#	I/O	Name	Function
1		-	No Connection
2	Output	TX	Transmit
3	Input	RX	Receive
4		-	No Connection
5	Power	GND	Ground
6		-	Reserved
7		-	No Connection
8		-	Reserved
9		-	Reserved

Table A - 12. RJ-45 Serial Communications Mating Connectors

Description/Type	8-Pin Male Mating Connector
Standard Commercial, RJ-45	Commercial, RJ45

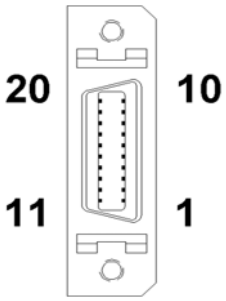
Table A - 13. RJ-45 Communications Designations



Pin#	I/O	Name	Function
1	Input +	RS-485 RX +	RS-485 Receive +
2	Input -	RS-485 RX -	RS-485 Receive -
3		NC	
4	Input/output	Ground	Ground
5	Output	RS-232 TX	Transmit
6	Input	RS-232 RX	Recieve
7	Output	RS-485 TX +	RS-485 Transmit +
8	Output	RS-485 TX -	RS-485 Transmit -

A - 3. Servo Drive Motor Encoder Connector - Encoder Feedback

Table A - 14. Encoder Feedback Mating



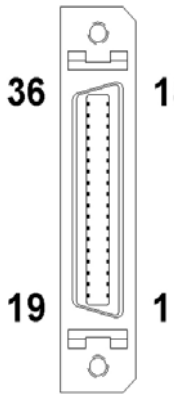
Connectors Description/Type	20-Pin Male Mating Connector	20-Pin Male Mating Backshell
Mini D Ribbon, 28-30 AWG, Insulation Displacement, Plastic Backshell, Squeeze Latch	AMP 2-175677-2	AMP 176793-2
Mini D Ribbon, 28-30 AWG, Insulation Displacement, Metal Backshell, Squeeze Latch	3M 10120-6000EC	3M 10320-A200-00
Mini D Ribbon, 24-30 AWG, Solder Cup, Plastic Backshell, Squeeze Latch	3M 10120-3000VE	3M 10320-52F0-008

Table A - 15. Encoder Feedback

Designations Pin#	I/O	Name	Function
1	Power	Enc Pwr	Encoder +5 VDC Power
2	Power	Enc Com	Encoder Common
3	Power	Hall Pwr	Hall Sensor +5 VDC Power
4	Power	Hall Com	Hall Sensor Common
5	Input	Enc A+	Encoder Channel A+
6	Input	Enc A-	Encoder Channel A- (not)
7	Input	Enc B+	Encoder Channel B+
8	Input	Enc B-	Encoder Channel B-(not)
9	Input	Enc Z+	Encoder Channel Z+
10	Input	Enc Z-	Encoder Channel Z- (not)
11	Input	Hall 1+	Hall Sensor 1+ Signal
12	Input	Hall 1-	Hall Sensor 1- Signal (not)
13	Input	Hall 2+	Hall Sensor 2+ Signal
14	Input	Hall 2-	Hall Sensor 2- Signal (not)
15	Input	Hall 3+	Hall Sensor 3+ Signal
16	Input	Hall 3-	Hall Sensor 3- Signal (not)
17	Input	Mtr Temp SW	MotorTemp Switch Input
18	Input	Mtr Temp Gnd	MotorTemp Switch Common
19	Power	Gnd	Common
20	Power	Gnd	Common

A - 4. Controller I/O Connectors

Table A - 16. I/O Mating Connectors



Description/Type	36-Pin Male Mating Connector	36-Pin Male Mating Backshell
Mini-D Ribbon, 24-30 AWG, Solder cup. Plastic backshell, squeeze latch	3M10136-3000VE	3M10336-52F0-008

Table A - 17. I/O Connection Designations

Pin#	I/O	Name	Function
1	Input	Signal 1 +	Analog 1 command signal +
2	Input	Signal 1 -	Analog 1 command signal – (not)
3	Input	Signal 2 +	Analog 2 command signal +
4	Input	Signal 2 -	Analog 2 command signal – (not)
5	Reserved	Reserved	Reserved
6	Output	Common	Analog out common
7	Output	Analog Out	Analog out
8	Input	+ Limit	Limit switch +
9	Input	- Limit	Limit switch -
10	Input	Hw inhibit	Hardware inhibit
11	output	fault out	Fault out
12	Input	Common	I/O return
13	Input	Reset In	Reset Amp
14	Input	Mtr Temp	Motor temp input
15	Reserved	Reserved	Reserved
16	Input	Common	I/O return
17	Output	Encoder Z +	Encoder Z + output
18	Output	Encoder Z -	Encoder Z - output
19	Input	Common	I/O return
20	Input	Common	I/O return
21	Input	Common	I/O return
22	Input	Common	I/O return
23	Input	Pulse -	Pulse input -
24	Input	Pulse +	Pulse input +
25	Input	Direction -	Direction input -
26	Input	Direction +	Direction input +
27	Output	+5V Out	+ 5 volts out (9815 only) 150 mA max
28	Output	-5V Out	+ 5 volts out (9815 only) 150 mA max
29	Output	Common	V out return
30	Output	Common	V out return
31	Reserved	Reserved	Reserved
32	Reserved	Reserved	Reserved
33	Output	Encoder A+	Encoder A+ output
34	Output	Encoder A-	Encoder A- output
35	Output	Encoder B+	Encoder B+ output
36	Output	Encoder B-	Encoder B- output

APPENDIX B

B - Amplifier Status Codes

This appendix contains definitions of status codes displayed at the amplifier.

The following list defines the condition for each of the display values.

Display	Name	Description
1	EEPROM Fault*	Parameter EEPROM checksum fault
2	RAM Fault*	Power up RAM read/write test failed
3	CPLD Fault*	CPLD communication timeout
4	Interpolator Fault*	Interpolator processor not responding
8	Reset (Flashing)	N/A
b	Bus Over Voltage	DC bus exceeded 450VDC nominal (for 320VDC input) DC bus exceeded 230VDC nominal (for 160VDC input)
C	Clamp (Disabled)	Output stage disabled
E	Encoder Fault	Encoder fault detected
F	Foldback	Foldback condition active
H	Heatsink Over Temperature	Heatsink thermal switch tripped (65ºC typical)
h	Motor Over Temperature	Motor thermal switch / thermister tripped
L	LS/ECB	Motor RMS over current
0	Normal Operation	Amp enabled (no Hall only)
S	HS/ECB	Output short circuit detected (50A for standard
U	Bus Under Voltage	DC bus below 150VDC nominal (for 320VDC input)
⎯	Hall Fault	Invalid hall state (000 or 111)
⎯ ⎯	Commutation Fault	Hall angle does not match encoder counter angle
.	Decimal Point Only	Drive processor is in reset
Single outer	Amp Enabled, Hall	Amp enabled

APPENDIX C - SMB/SMC97XX, 98XX Ratings and Specifications

This appendix contains specifications for the application engineer which are necessary to utilize the SMX97XX, and SMX98XX series amplifiers.

Amplifier Model Number	Input power (Buss Voltage B+)	Output Power (Amps)		Available Packaging Configurations
		Cont. (Rated)	Peak	
SMB9808-1A-1 SMC9808-1A-1	110-130 VAC or 208-240 VAC	4*** 8****	8*** 16****	Stand-Alone
SMB9715LP-1 SMC9715LP-1 SMB9815LP-1 SMC9815LP-1	30-370 VDC	10****	20****	Module
SMB9715LP-MM*-N* SMC9715LP-MM*-N* SMB9815LP-1A-1 SMB9815LP-MM**-N** SMC9815LP-1A-1 SMC9815LP-MM**-N**	110-130 VAC or 208-240 VAC	10	20	Stand-Alone and Multi-Axis
SMB9715-1 SMC9715-1 SMB9815-1 SMC9815-1	30-370 VDC	15****	30****	Module
SMB9715-MM*-N* SMC9715-MM*-N* SMB9815-1A-1 SMB9815-MM**-N** SMC9815-1A-1 SMC9815-MM**-N**	110-130 VAC or 208-240 VAC	15	30	Stand-Alone and Multi-Axis
SMB9715HP-1 SMC9715HP-1 SMB9815HP-1 SMC9815HP-1	30-370 VDC	20****	40****	Module
SMB9715HP-MM**-N** SMC9715HP-MM**-N** SMB9815HP-1A-1 SMB9815HP-MM**-N** SMC9815HP-1A-1 SMC9815HP-MM**-N**	110-130 VAC or 208-240 VAC	20	40	Stand-Alone and Multi-Axis
SMB9830-1A-1 SMC9830-1A-1	110-130 VAC or 208-240 VAC	30	60	Stand-Alone
SMB9845-1A-1 SMC9845-1A-1	110-130 VAC or 208-240 VAC	45	80	Stand-Alone
SMB9875-1A-1 SMC9875-1A-1	110-130 VAC or 208-240 VAC	75	120	Stand-Alone

* Refer to page 79 & 81
** Refer to page 86 & 89

*** With no forced air cooling
**** With forced air cooling

Power, Input and Output

Refer to table on page 53.

Signal Inputs

Input Source	Maximum Voltage VDC	Minimum Impedance Ohms	Current Gain Amp/Volt
Differential	+/- 10	10,000	0 - 5
Single Ended	10	10,000	0 - 5

Digital Inputs

Input Source	Specification
Limit +	See *
Limit -	See *
Inhibit	See *
Reset	See *
Motor Temp	See *
*	40V max. -.5V min. Terminated by 10k Ohms. Digital inputs have hysteresis with thresholds at 1/3 and 2/3 of 5V.

Outputs

Output	Specification
Fault (as output)	Active low, open collector output can sink 500 mA max.
Analog Out	User selectable D/A. Output +/- 10V.
Encoder Outputs:	26C31 differential line driver.

System

Feature	Specification
Frequency response	
Velocity Loop:	Implementation dependent.
Current Loop:	Typical, depending on motor inductance, 2kHz typical. (Bandwidths available up to 3 kHz.)

Notes

1) All data in this section is based on the following ambient conditions: 25 °C (77 °F)
2) Forced air cooling is required to meet the maximum power ratings specified.
3) The amplifier module (SMB9715-1, SMB9815-1, SMC9715-1, and SMC9815-1) require an external DC power supply.

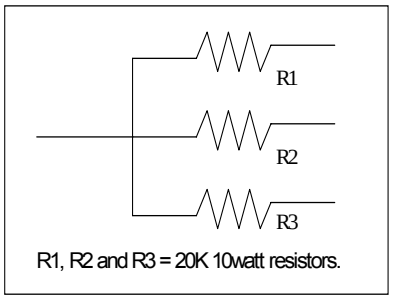
APPENDIX D

D - Matching Motor Phase Leads to Amplifier Commands Using Hall Sensors.

Below you will find the steps necessary to insure that the command phases of a digital amplifier are properly matched to any three-phase motor that has Hall sensors. This method applies to a fully digital amplifier with digital current loops. Section labeled “System Setup” must have been completed before attempting this appendix.

Please read this procedure prior to working with the motor and amplifier.

It is intended that this procedure be done once by the engineering staff, whereupon they will incorporate the findings into production drawings, wiring labels and procedures.



Specification for resistive load

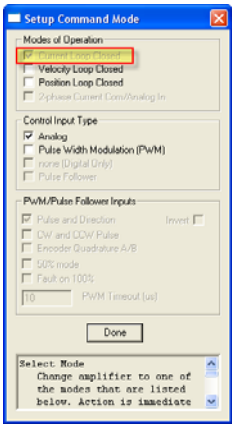
A) Locate or prepare the required equipment.
   1. A 2 channel oscilloscope
   2. A 3-phase Y-connected resistive load as illustrated below.
   3. A computer with MotionMaestro© installed.

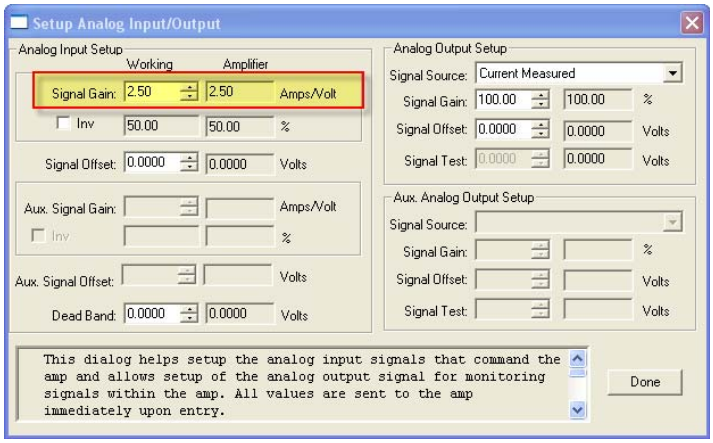
B) With the power off, connect the motor encoder outputs and the Hall sensor outputs to the amplifier. **Leave the motor power leads disconnected**. Connect the RS232 serial cable from the amplifier to the serial port on the computer (MotionMaestro©).

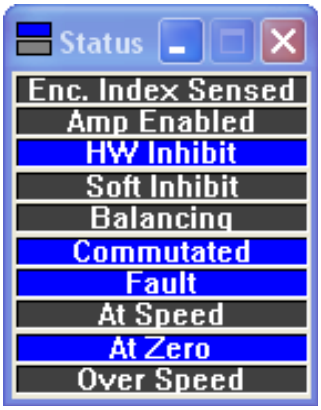
C) Apply power to the amplifier and establish communications between the amplifier and MotionMaestro©.

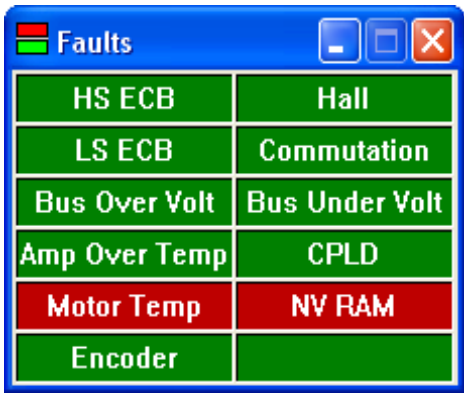
D) Prepare the amplifier using the following dialogs.

   1.) Insure that the amplifier is in **current mode**. Deselect all modes except the **current mode**.





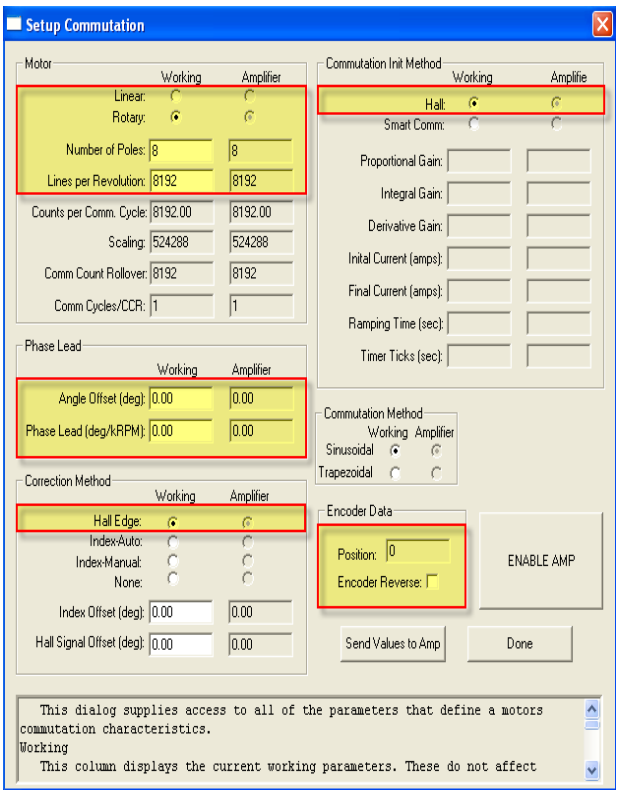




2.) Set the analog command input signal gain to zero. Use the Setup Analog Input/Output dialog as shown.

3.) Check then clear all faults by referring to the Amplifier Faults and Amplifier Status displays on the toolbar. For example, if there is an External Inhibit status warning you must open the Setup Digital IO dialog and check the inhibit box, then fix all remaining amplifier faults. After all faults have been corrected a fault reset must be completed. You may perform a reset by typing RST at the terminal window or by opening the Control Panel and depressing the "**Fault Reset**" button. **Commutation alignment can not begin until all faults are cleared**.

E) From the MotionMaestro© "Setup" menu, open the "Commutation" dialog and setup the following items:

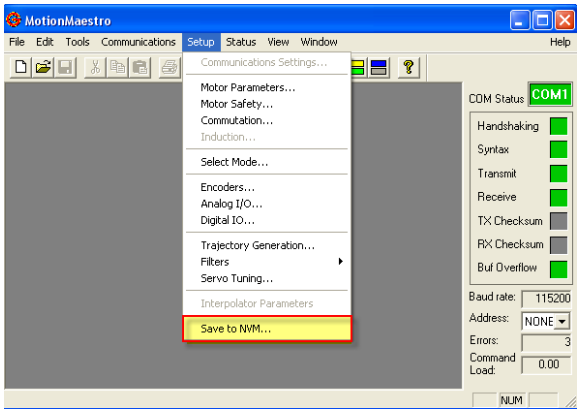


1) Motor type. Are you phasing a rotary or linear motor?
2) **Number of Poles.
3) **Encoder resolution.
4) Commutation angle offset = 0 (-30 degrees if Halls aligned phase to neutral?)
5) Commutation phase advance gain = 0
6) Init Method = Hall
7) Correction Method = Hall
8) Depress "Send Values To Amp" button

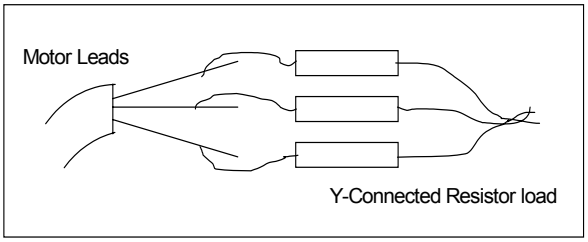
NOTE: ** Refer to Appendix F if motor Poles and Encoder Resolution are unknown.

F) With the Commutation dialog still open, enable the amplifier. You will see on the amp, one segment lit on the seven segment display. This display segment indicates the Hall state. Rotate the motor shaft by hand, such that the LED segments rotate clockwise as viewed from the top of the amplifier. Verify the Encoder Data Position counts up in the Commutation dialog. If not, check the Encoder Data Reverse box. The Encoder Data Position should now count up as the seven segment display cycles clockwise.

G) Save the new settings by selecting "Save to NVM" from the Setup menu. Answer Yes when prompted to save.



H) Connect the 3-phase Y-connected resistor load to the **Motor** power leads for monitoring the motor back EMF (BEMF). **NOTE: do not connect the motor leads or the resistor load to the amplifier.**



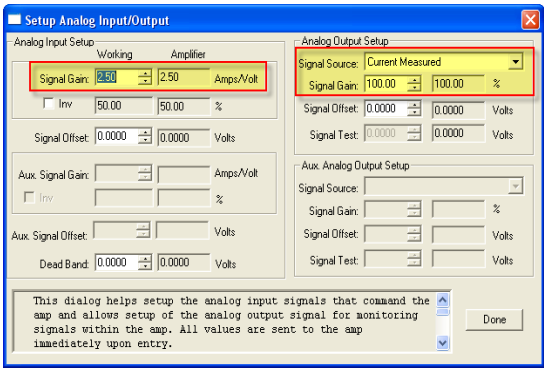
3-phase Y-connected resistor load

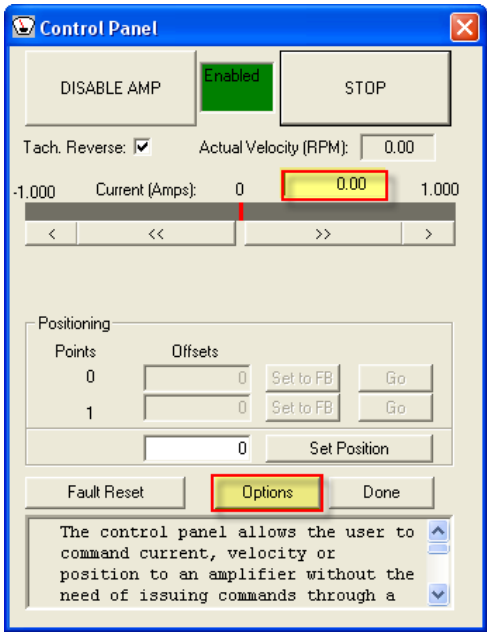
I) Connect the channel 1 scope probe to the amplifiers Analog Out pin. Connect the channel 1 scope common to the amplifiers Common pin. Set the channel 1 vertical scale to around **2V per division**. From the "Setup Analog Input/Output" dialog, Set the Analog Output Signal Source to "R Current Command" and directly below change the Analog Output Signal Gain to 100 percent.

J) Connect the channel 2 scope probe to one of the motors leads. Connect the channel 2 scope common to the center of the Y-connected resistor load. Set the channel 2 vertical scale to around **2V per division**. Set the horizontal scale to around **100 ms per division**. Scaling may need to be changed in order to best see the data.

K) Open the Control Panel. The square colored status box will give you the amplifier status. If the box is yellow or disabled then press the "Enable/Disable Amp" button. If the box is red the amp has a fault and must be cleared before you can proceed.

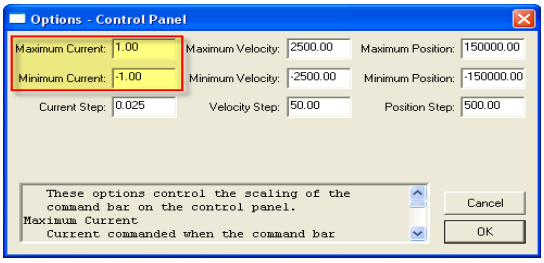
L) From the Control Panel, apply a digital current command of **10 amps** to the amplifier. To do this you may have to expand the range that can be commanded from the control panel by selecting the Options button.





M) **Find the phase R motor lead.**
Rotate the motor by hand and verify the trace on channel 1 (phase R current command) follows a sinusoidal pattern. Move the channel 2 scope probe to each motor lead to determine which BEMF waveform is in phase or 180° out of phase with the phase R command. Label this lead Phase R.

NOTE: For each phase, R, S and T, one direction of rotation should cause the back EMF (BEMF) to be in phase with the command while the reverse rotation direction should cause the BEMF to be 180° out of phase. Determine which direction of rotation is in phase for the phase R motor lead, then rotate the motor in that same direction when determining the S and T motor leads. Once the phases are labeled, double check that the phase R and S motor leads result in waveforms that are in phase with the corresponding digital current commands on the amplifier when rotating the motor in the same direction for both.



ALSO: This method of matching motor leads to the amplifier requires that the motor's Hall sensors transitions are aligned with the motor phase to phase BEMF zero crossings. If the Hall sensors are aligned with the motor's phase to neutral BEMF, then the commutation offset angle must be set to ±30 degrees (you have to try both) before comparing the commands to the BEMF waveforms.

N) **Find the phase S motor lead.**
In MotionMaestro©, change the Analog Output Signal Source *S Current Command*. Place the channel 2 scope probe on one of the two remaining motor leads. Rotate the motor in the same direction that was used for phase R above. Determine which of the remaining two leads of the motor result in a waveform that is in phase with the phase S command. Label this lead Phase S. Move the channel 2 probe to the remaining motor lead.

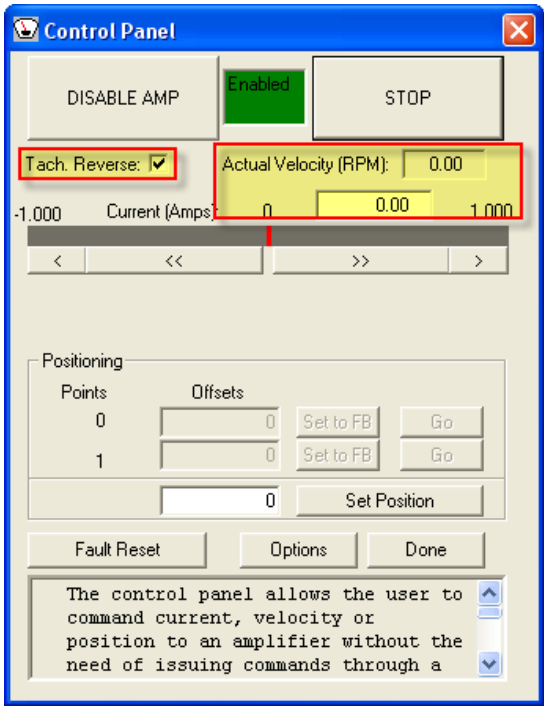
O) **Find the phase T motor lead.**
Same procedure as above with the analog output source set to *T Current Command*. If phase R and phase S where properly found, phase T will be the remaining motor wire. Label this lead phase T.

P) Set the current command back to **0 by clicking the STOP button on the Control Panel.** Reset any current limits, foldback thresholds to the desired operational settings. Reset the Control Panel options to appropriately safe values. Set the Analog Input Signal Gain back to the desired operational value.

Q) Save the settings by selecting "Save to NVM" from the Setup menu.

R) Remove the amplifier's power. Remove the scope probes. Connect the motor R, S, and T leads to the amplifier's R, S, and T terminals respectively.

S) Apply power to amplifier. The amplifier should still be in **Current Mode** and **Enabled** (unless the external inhibit is active). From the Control Panel, see following picture, issue a digital current command of **0.5 to 2 amps**, enough so the motor begins to rotate.



T) While the motor is rotating, verify that the sign of the actual velocity matches the sign of the commanded current. If NOT mark the **Tach Reverse** checkbox on the control panel and verify that the signs now match. Command the opposite polarity current to the motor, **-.5 to -2.0 amps** and verify that the motor reverses direction and runs at approximately the same speed. The signs of the current command and actual velocity should still match.

U) Set the current command back to 0 by clicking on the **STOP** button of the Control Panel. Save the settings by selecting “Save to NVM” from the setup menu.

The motor should now be properly commutated and phased.

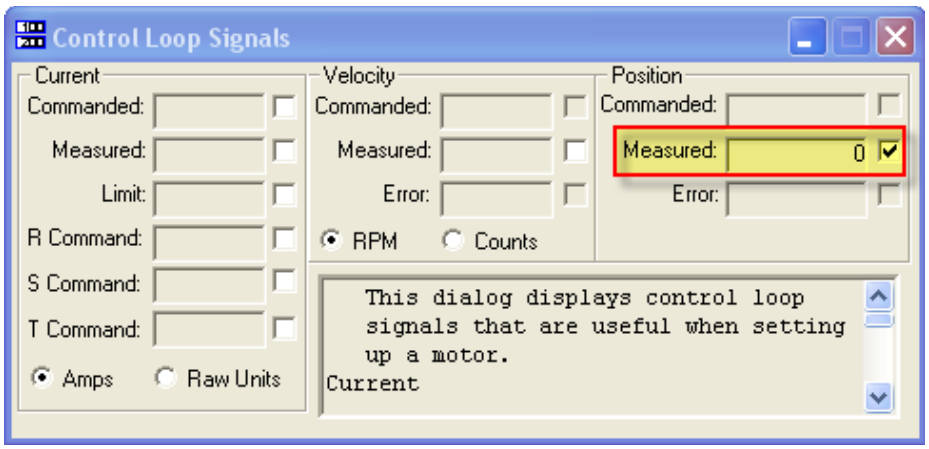
APPENDIX E

E – Determining Encoder Resolution and Number of Poles.

A) **Encoder Resolution**

From the MotionMaestro© Status menu, open the “Control Loop Signals” dialog . Check the box that allows you to monitor “Measured” “position” of the encoder, then mark a start position on the motor shaft. Turn the shaft 360 degrees clockwise and monitor the encoder position in the Control Loop Signals dialog. Note the change in encoder counts. Take the change in encoder counts per 1 revolution (360 degrees) and divide by four (4). This is your Lines of Resolution that you will enter in your Commutation dialog. (Note: For better accuracy, you may rotate by 10 turns and divide by 40 instead of 4.)

Common encoder line counts include but are not limited to 250. 256. 500, 512, 1000, 1024, 2000. 2048, 2500, 4096, 5000, 8192, and 10,000 lines/revolution.

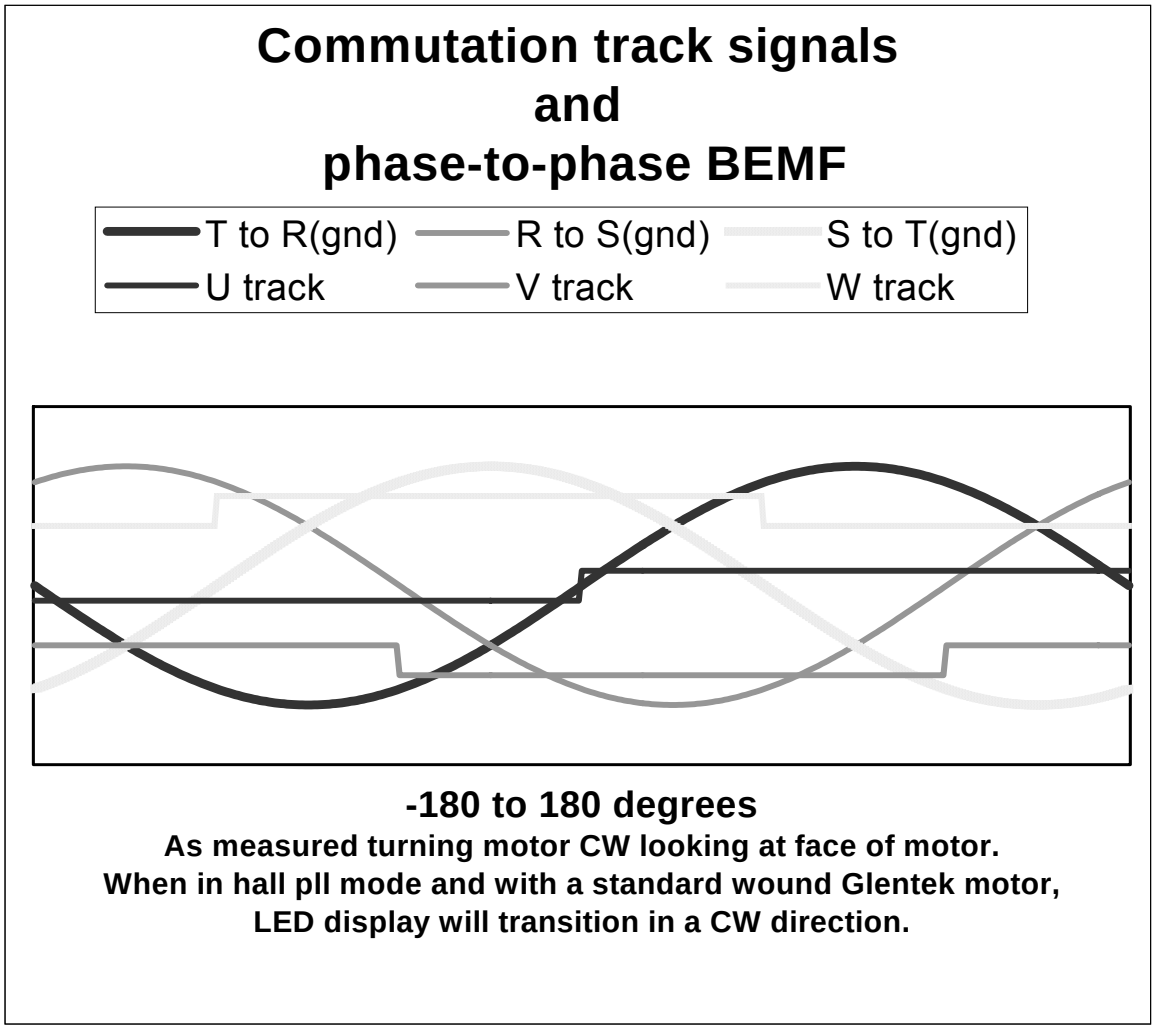


B) **Number of Poles** (Note: requires Hall sensors)

Enable the amplifier. Mark a start position on the motor shaft. You will be monitoring the seven segment display on the amplifier as shaft is rotated. Note the lit segment before rotating the motor shaft, now turn the shaft 360 degrees clockwise. As you are rotating shaft, count the number of times the seven segment display goes through a full led rotation. Take the number of full LED cycles and multiply by two. This is the Number of Poles that you will enter in your Commutation dialog.

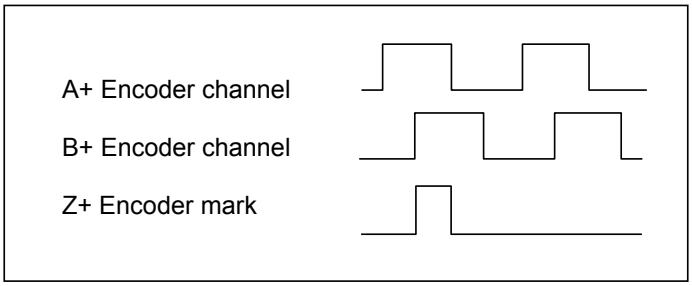
APPENDIX F

F – Commutation Track Signals and Phase-to-Phase BEMF.



Encoder Outputs

The following illustrates the encoder signals for a standard Glentek motor that is correctly commutated where the encoder is not reversed (FER=0) and the tachometer feedback is reversed (TR=1).



APPENDIX G

G – European Union EMC Directives

Electromagnetic Compatibility Guidelines For Machine Design

This document provides background information about Electromagnetic Interference (EMI) and machine design guidelines for Electromagnetic Compatibility (EMC).

Introduction

Perhaps no other subject related to the installation of industrial electronic equipment is so misunderstood as electrical noise. The subject is complex and the theory easily fills a book. This section provides guidelines that can minimize noise problems.

The majority of installations do not exhibit noise problems. However, these filtering and shielding guidelines are provided as counter measures. The grounding guidelines provided below are simply good grounding practices. They should be followed in all installations.

Electrical noise has two characteristics: generation or emission of electromagnetic interference (EMI); and response or immunity to EMI. The degree to which a device does not emit EMI, and is immune to EMI is called the device's Electromagnetic Compatibility (EMC).

Equipment, which is to be brought into the European Union legally, requires a specific level of EMC. Since this applies when the equipment is brought into use, it is of considerable importance that a drive system, as a component of a machine, be correctly installed.

"EMI Source-Victim Model" shows the commonly used EMI model. The model consists of an EMI source, a coupling mechanism and an EMI victim. A device such as servo drives and computers, which contain switching power supplies and microprocessors, are EMI sources. The mechanisms for the coupling of energy between the source and victim are conduction and radiation. Victim equipment can be any electromagnetic device that is adversely affected by the EMI coupled to it.

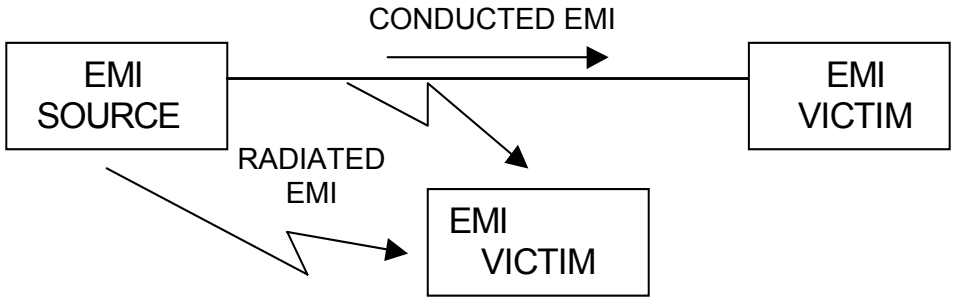


Figure 1- EMI Source-Victim Model

Immunity to EMI is primarily determined by equipment design, but how you wire and ground the device is also critical to achieving EMI immunity. Therefore, it is important to select equipment that has been designed and tested for industrial environments. The EMI standards for industrial equipment include the EN61000-4-X series (IEC 1000-4-X and IEC8O1-X), EN55011 (CISPR11), ANSI C62 and C63 and

MIL-STD-461. Also, in industrial environments, you should use encoders with differential driver outputs rather than single ended outputs, and digital inputs/outputs with electrical isolation, such as those provided with optocouplers.

The EMI model provides only three options for eliminating the EMC problem:

- Reduce the EMI at the source,
- Increase the victim's immunity to EMI (harden the victim),
- Reduce or eliminate the coupling mechanism,

In the case of servo drives, reducing the EMI source requires slowing power semiconductor switching speeds. However, this adversely affects drive performance with respect to heat dissipation and speed/torque regulation. Hardening the victim equipment may not be possible, or practical. The final and often the most realistic solution is to reduce the coupling mechanism between the source and victim. Filtering, shielding and grounding can achieve this.

Filtering

As mentioned above, high frequency energy can be coupled between circuits via radiation or conduction. The AC power wiring is one of the most important paths for both types of coupling mechanisms. The AC line can conduct noise into the drive from other devices, or it can conduct noise directly from the drive into other devices. It can also act as an antenna and transmit or receive radiated noise between the drive and other devices.

One method to improve the EMC characteristics of a drive is to use an isolation AC power transformer on the amplifier's input power. This minimizes inrush currents on power-up and provides electrical isolation. In addition, it provides common mode filtering, although the effect is limited in frequency by the interwinding capacitance. Use of a Faraday shield between the windings can increase the common mode rejection bandwidth, (shield terminated to ground) or provide differential mode shielding (shield terminated to the winding). In some cases an AC line filter will not be required unless other sensitive circuits are powered off the same AC branch circuit.

NOTE:" Common mode" noise is present on all conductors that are referenced to ground. "Differential mode" noise is present on one conductor referenced to another conductor.

The use of properly matched AC line filters to reduce the conducted EMI emitting from the drive is essential in most cases. This allows nearby equipment to operate undisturbed. The basic operating principle is to minimize the high frequency power transfer through the filter. An effective filter achieves this by using capacitors and inductors to mismatch the source impedance (AC line) and the load impedance (drive) at high frequencies.

For drives brought for use in Europe, use of the correct filter is essential to meet emission requirements. Detailed information on filters is included in the manual and transformers should be used where specified in the manual.

AC Line Filter Selection

Selection of the proper filter is only the first step in reducing conducted emissions. Correct filter installation is crucial to achieving both EMIL attenuation and to ensure safety. All of the following guidelines should be met for effective filter use.

1) The filter should be mounted to a grounded conductive surface.

2) The filter must be mounted close to the drive-input terminals, particularly with higher frequency emissions *(5-30* MHz). If the distance exceeds 600mm (2 feet), a strap should

be used to connect the drive and filter, rather than a wire.

3) The wires connecting the AC source to the filter should be shielded from, or at least separated from the wires (or strap) that connects the drive to the filter. If the connections are not segregated from each other, then the EMI on the drive side of the filter can couple over to the source side of the filter, thereby reducing, or eliminating the filter effectiveness. The coupling mechanism can be radiation, or stray capacitance between the wires. The best method of achieving this is to mount the filter where the AC power enters the enclosure. "AC Line Filter Installation" shows a good installation and a poor installation.

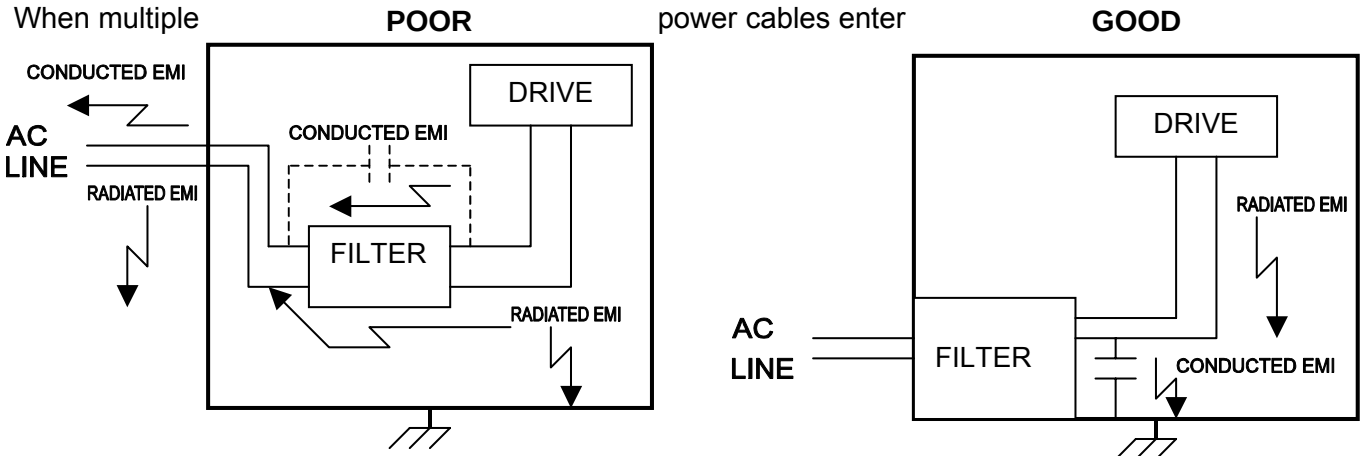
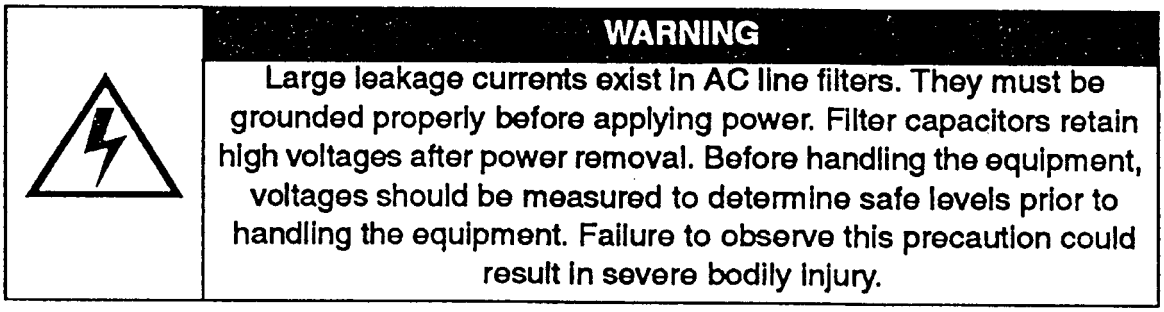


Figure 2- AC Line Filter Installation

A unfiltered line can contaminate a filtered line external to the enclosure. Therefore, all lines must be filtered to be effective. The situation is similar to a leaky boat. All the holes must be plugged to prevent sinking.

If the filter is mounted excessively far from the drive, it may be necessary to mount it to a grounded



conductive surface, such as the enclosure, to establish a high frequency (HF) connection to that surface. To achieve the HF ground, direct contact between the mounting surface and the filter must be achieved. This may require removal of paint or other insulating material from the cabinet or panel.

The only reasonable filtering at the drive output terminals is the use of inductance. Capacitors would slow the output switching and deteriorate the drive performance. A common mode choke can be used to reduce the HF voltage at the drive output. This will reduce emission coupling through the drive back to the AC line. However, the motor cable still carries a large HF voltage and current. Therefore, it is very important to segregate the motor cable from the AC power cable. More information on cable shielding and segregation is contained in the section on shielding.

Grounding

High frequency (HF) grounding is different from safety grounding. A long wire is sufficient for a safety ground, but is completely ineffective as a HF ground due to the wire inductance. As a rule of thumb, a wire has an inductance of 8 nH/in regardless of diameter. At low frequencies it acts as constant impedance, at intermediate frequencies as an inductor, and at high frequencies as an antenna. The use of ground straps is a better alternative to wires. However the length to width ratio must be *5:1,* or better yet 3:1, to remain a good high frequency connection.

The ground system's primary purpose is to function as a return current path. It is commonly thought of as an equipotential circuit reference point, but different locations in a ground system may be at different potentials. This is due to the return current flowing through the ground systems finite impedance. In a sense, ground systems are the sewer systems of electronics and as such are sometimes neglected.

The primary objective of a high frequency ground system is to provide a well-defined path for HF currents and to minimize the loop area of the HF current paths. It is also important to separate HF grounds from sensitive circuit grounds. "Single Point Ground Types" shows single point grounds for both series (daisy chain) and parallel (separate) connections. A single point, parallel connected ground system is recommended.

Figure 3-Single Point Ground Types

A ground bus bar or plane should be used as the "single point" where circuits are grounded. This will minimize common (ground) impedance noise coupling. The ground bus bar (GBB) should be connected to the AC ground, and if necessary, to the enclosure. All circuits or subsystems should be connected to the GBB by separate connections. These connections should be as short as possible and straps should be used when possible. The motor ground conductor must return to the ground terminal on the drive, not the GBB.

Shielding and Segregation

The EMI radiating from the drive enclosure drops off very quickly over distance. Mounting the drive in an enclosure, such as an industrial cabinet, further reduces the radiated emissions. The cabinet should have a high frequency ground and the size of the openings should be minimized. In addition, the drive is considered an "open" device that does not provide the proper IP rating for the environment in which it is installed. For this reason the enclosure must provide the necessary degree of protection. An IP rating or Nema rating (which is similar to IP) specifies the degree of protection that an enclosure provides.

The primary propagation route for EMI emissions from a drive is through cabling. The cables conduct the EMI to other devices, and can also radiate the EMI. For this reason, cable segregation and shielding are important factors in reducing emissions. Cable shielding can also increase the level of immunity for a drive. For example:

- Shield termination at both ends is extremely important. The common misconception that shields should be terminated at only one end originates from audio applications with frequen-

cies <20 kHz. RF applications must be terminated with the shield at both ends, and possibly at intermediate points for exceptionally long cables.

- When shielded cables are not terminated at the cable connection and pass through the wall of a cabinet, the shield must be bonded to the cabinet wall to prevent noise acquired inside the cabinet from radiating outside the cabinet, and vice versa.

- When shielded cables are terminated to connectors, the shield must be able to provide complete 360^0 coverage and terminate through the connector backshell. The shield must *not* be grounded inside the connector through a drain wire. Grounding the shield inside the connector couples the noise on the shield to the signal conductors sharing the connector and virtually guarantees failure to meet European EMC requirements.

- The shield must be continuous. Each intermediate connector must continue the shield connection through the backshell.

- All cables, both power and signal should use twisted wire pairing.

The shield termination described above provides a coaxial type of configuration, which provides magnetic shielding, and the shield provides a return path for HF currents that are capacitively coupled from the motor windings to the frame. If power frequency circulating currents are an issue, a 250 VAC capacitor should be used at one of the connections to block 50/60 Hz current while passing HF currents. Use of a properly shielded motor cable is essential to meet European EMC requirements.

The following suggestions are recommended for all installations.

1. Motor cables must have a continuous shield and be terminated at both ends. The shield must connect to the ground bus bar or drive chassis at the drive end, and the motor frame at the motor end. Use of a properly shielded motor cable is essential to meet European EMC requirements.

2. Signal cables (encoder, serial, and analog) should be routed away from the motor cable and power wiring. Separate steel conduit can be used to provide shielding between the signal and power wiring. Do not route signal and power wiring through common junctions or raceways.

3. Signal cables from other circuits should not pass within 300 mm (1 ft.) of the drive.

4. The length or parallel runs between other circuit cables and the motor or power cable should be minimized. A rule of thumb is 300 mm (1 ft.) of separation for each 10 m (30 ft.) of parallel run. The 300 mm (1 ft.) separation can be reduced if the parallel run is less than 1 m (3 ft.).

5. Cable intersections should always occur at right angles to minimize magnetic coupling.

6. The encoder mounted on the brushless servomotor should be connected to the amplifier with a cable using multiple twisted wire pairs and an overall cable shield. Encoder cables are offered in various lengths that have correct terminations.

Persistent EMI problems may require additional countermeasures. The following suggestions for system modification may be attempted.

1. A ferrite toroid or “doughnut” around a signal cable may attenuate common mode noise, particularly RS-232 communication problems. However, a ferrite toroid will not help differential mode noise. Differential mode noise requires twisted wire pairs.

2. Suppress each switched inductive device near the servo amplifier. Switch inductive devices include solenoids, relay coils, starter coils and AC motors (such as motor driven mechanical timers).

3. DC coils should be suppressed with a “free-wheeling” diode connected across the coil.

4. AC coils should be suppressed with RC filters (a 200 Ohm 1/2 Watt resistor in series with a *0.5* uF, 600 Volt capacitor is common).

Following these guidelines can minimize noise problems. However, equipment EMC performance must meet regulatory requirements in various parts of the world, specifically the European Union. Ultimately, it is the responsibility of the machine builder to ensure that the machine meets the appropriate requirements as installed.

RECOMMENDATIONS FOR GLENTEK AMPLIFIERS

All amplifiers installed in a NEMA 12 enclosures or equivalent with wiring in metal conduit or enclosed metal wire trough (see Shielding and segregation).

Use Glentek shielded feedback and motor cables.

An AC line filter properly installed in a NEMA 12 enclosure or equivalent (see Filtering).

AC line filters for single-phase applications

1A-15A	input current, 120-250VAC use: Schaffner FN2070-16 or equivalent.
15A-25A	input current, 120-250VAC use: Schaffner FN2070-25 or equivalent.
25A-36A	input current, 120-250VAC use: Schaffner FN2070-36 or equivalent.

AC line filters for 3-phase applications

1A-15A	input current, 120-250VAC use: Schaffner FN258-16 or equivalent.
15A-25A	input current, 120-250VAC use: Schaffner FN258-30 or equivalent.
25A-36A	input current, 120-250VAC use: Schaffner FN258-42 or equivalent.
36A-50A	input current, 120-250VAC use: Schaffner FN258-55 or equivalent.
50A-75A	input current, 120-250VAC use: Schaffner FN258-75 or equivalent.
75A-100A	input current, 120-250VAC use: Schaffner FN258-100 or equivalent.

EUROPEAN UNION
DECLARATION OF INCORPORATION
MOTION CONTROL SYSTEMS

Classified as Components of Machinery

Model Series SMX9Yaa

Council Directive 89/392/EEC Machinery Directive

The Products cited below and their accessories comply with the following Safety of Machinery Standards when installed and operated in accordance with the Instructions provided in the Operation & Installation Manuals. The products are declared to comply by virtue of Design Third Party Evaluations and Testing. EMC Testing and Product Safety Evaluations and Risk Assessments were conducted by Intertek ETL SEMKO, an independent Nationally Recognized Test Laboratory, located in Laguna Niguel, CA 92677, USA.

As components of Machinery, please be advised that:

1. These are not individually classified as machinery within the scope of directive 89/392/EEC.
2. These are intended to be incorporated into machinery or to be assembled with other machinery to constitute machinery covered by directive 89/392/EEC, as amended.
3. As such, do therefore not in every respect comply with the provisions of directive 89/392/EEC.

SAFETY STANDARDS

EN60204-1 (IEC204-1)	Electrical Equipment of Industrial Machines
	Collateral Test Standards, Specified by EN60204-1
EN61000-6-4:2001	EMC – Emission standard for industrial environments
EN61000-6-2:2001	EMC – Immunity for industrial environments
	Collateral Test Standards, Specified by EN61000-6-2

Manufacturers Name:	GLENTEK INC.
Manufacturers Address:	208 Standard Street El Segundo, CA 90245, USA
Description of Equipment:	Motion Control Systems including Amplifiers and Servo Motors
Model / Type Reference:	Omega series: SMX9Yaa, where X can be A, B or C, Y can be 1-9 and aa represents amp rating which can be 08, 15, 20, 30, 45, or 75. Maybe followed by bbb-, may be followed by ccc-, may be followed by ddd-, may be followed by ef-, may be followed by g-, may be followed by h where b,c,d,e,g, and h can be 0 to 9 and f can be A-E.

The undersigned hereby declares that the equipment specified above conforms to the noted Directives and Standards.

MANUFACTURER

Helen M. Vasak

HELEN M. VASAK

SECRETARY-TREASURER

1-22-2008

Prepared By: Intertek Testing Services, Laguna Niguel, CA
Confirmed By: John Quigley, Quality Manager

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APPENDIX H

H - Amplifier Terms and Technology

This appendix contains information that describes and explains the terms and concepts referred to in this manual. The information contained here is generic to amplifiers and motion control technology in general and does not apply specifically to the SMX9700 and SMX9800 series amplifiers. The TERMS section is a glossary that defines the terms used when discussing amplifiers. The TECHNOLOGY section describes methods or concepts that involves the usage of multiple terms.

TERMS

Analog Current Command Mode

Analog current mode, also called Torque mode or Current mode, indicates that the amplifier is being commanded by an analog signal and that the amplifiers' control loop is controlling current. This command mode is used when one needs to control torque. The analog signal, in volts, is a scaled representation of desired current as measure at the output. For instance -10 volts to 10 volts at the analog input becomes -15 amps to 15 amps at the amplifiers output. The scaling is different for different amplifiers.

Analog Velocity Command Mode

Analog velocity mode indicates that the amplifier is being commanded by an analog signal and that the amplifiers' control loop is controlling velocity. This command mode is used when one needs to control the speed of some device. The analog signal, in volts, is a scaled representation of desired velocity as measured at the output. For instance -10 volts to 10 volts at the analog input becomes -3000 rpm to 3000 rpm at the device being moved. The scaling is can often be configured by the application engineer.

Command Mode

A term used to refer to the method by which a command is given to an amplifier. The amplifier uses this command in its' control loop as a target to be achieved. The command mode usually includes how the amplifier is to interpret the command. That is, is the command to represent current, velocity or position. There are many forms and methods by which commands are submitted to an amplifier. Traditionally the command was given as an analog voltage input to the amplifier. Today there is analog, digital, serial communications or some combination of these.

Commutation

Commutation is the term used to describe the method by which current is applied to the windings of a motor such that the applied current moves the motor in a desired direction, or to a desired position, with the minimum current. Brushes are the method of commutation in a brush motor. In a three phase brushless motor, Sinusoidal Commutation is the usual method of commutation. See Sinusoidal Commutation.

Commutation Initialization Method

In order to properly commutate a brushless motor, the servo drive must know the absolute position of the rotor with respect to the motor windings in the stator. Since incremental shaft encoders only supply "relative" rotor position, the servo drive must perform a power-on, phase-finding scheme to determine the absolute position of the shaft. This is known as commutation initialization. Once the absolute position is determined, the position from the encoder can be used to maintain the absolute position. The SMX98XX/SMX97XX amplifiers have two power-on commutation initialization methods available for

finding the absolute position of the rotor. The Smart-Comm method requires the rotor to move; the second scheme, Hall, does not require motion. The Hall method does require the addition of Hall sensors or commutation tracks. Commutation tracks are simulated Hall sensors built into the shaft encoder.

Hall Commutation Initialization

Hall commutation initialization is a method that relies on sensors to give an approximation of the initial commutation angle of a motor. Hall initialization uses Hall sensors or commutation tracks (simulated Hall sensors built into the shaft encoder) to determine the rotor angle. In a brushless motor three Hall sensors are used to detect rotor position. The three Hall sensors employed are commonly named U, V and W; S1, S2 and S3; or A, B and C. The l sensors are digital (on/off) devices and therefore the combination of the three can result in eight different states. The sensors are aligned with the motor in a way that causes the output of the sensors to transition through six of the eight possible states as the motor is rotated through 360 electrical degrees. Each Hall state corresponds to 60 electrical degrees. Only one sensor changes states at any given transition.

At power up, the servo drive reads the state of the Hall sensors and from this state can determine within ±30 electrical degrees where the motor shaft is located. This is close enough to start commutating the motor, so the servo drive uses this approximation as the actual rotor position. Once motion is commanded (position, velocity or torque), the servo drive starts commutating with this value and watches for a transition of the Halls state. Upon this transition, the servo drive knows the exact location of the rotor shaft and updates the commutation angle based on this known location.

The hall method does not move the rotor shaft at power up. Instead, it uses a non-optimal commutation angle at start-up and corrects to the optimal commutation angle upon the first Hall state transition once motion is commanded.

Phase Lead

Phase lead is a gain applied to the commutation angle based on the velocity of the motor. Units are usually in degrees of commutation angle per 1000 rpm (degrees/krpm). Usually the phase angle is advanced for a positive velocity. An ideal phase lead at a given rpm in a specific application will minimize current in the motor. Phase lead is useful in applications where a velocity is held constant for a long period of time, particularly if the velocity is held at or near the rated speed of the motor. Spindle motors are a good application where phase lead is used. Appropriately used phase lead will reduce power consumption. This being said, most applications do not make use of phase lead.

Sinusoidal Commutation

In sinusoidal commutation a sinusoidal current is applied to each phase of the motor to cause the motor to rotate. In a three phase motor, the relationship of the currents applied in the three phases for a positive rotation of the rotor is:

$$IR(\theta e) = I * \sin(\theta e),$$
$$IS(\theta e) = I * \sin(\theta e - 120°),$$
$$IT(\theta e) = I * \sin(\theta e - 240°);$$

where:

IR, IS, and IT are the currents applied to phase R, S, and T respectively,
I is the amplitude of the commanded current,
θe is the “electrical angle” of the applied currents.

The relationship between the electrical angle, θc, and the mechanical angle (the angle of the rotor), θm, is:

$$\theta m = \theta c \times 2/N,$$

where
N is the number poles in the motor.

For example, a 4-pole motor (two North poles and two South poles) will rotate 180 mechanical degrees as the currents applied are varied through 360 electrical degrees.

Smart-Comm

Smart-Comm commutation is a method that does not rely on encoder commutation tracks or hall sensors for motor commutation. It is important to note that the smart-comm algorithm always returns the motor shaft to its initial starting position after moving the motor shaft a few encoder counts to determine the correct commutation angle. The following gain variables listed below can be used to additionally tune the algorithm if it is desired.

If you are planning to use smart-comm, be sure to contact your Glentek sales agent first, and he/she can have these following variables preset at the factory before shipment. However, the default value in the amplifier will work for most cases.

Proportional Gain: This value should initially be set to a low value. The default value is 1024 and this should be a low enough value to start off with in most situations. Depending on the shaft size or the inertia of the motor, the beginning Proportional Gain may need to be set lower than the default value. The higher the Proportional Gain value is set to, it will make the shaft have less movement during commutation initialization. The max value for this value is 32767.

Integral Gain: This value can be initially set to 0. If a high Proportional Gain can be achieved, there will be very little movement during commutation initialization, and Integral Gain may not be necessary. However, any value of Integral Gain will pull the motor back to its original position. The higher the integral gain the faster this will happen. This value should be relatively low and the max value should be no more than 100.

Derivative Gain: This value can be initially zero but after the Proportional Gain is set then the Derivative Gain can be set as high as possible, typically 1/2 of Proportional Gain.

Initial Current: This value can always be 0. The only reason to use it would be to reduce the total initialization time by giving the current a head start. This is especially true if the Final Current is a large number.

Final Current: This value must be greater than the Initial Current. The Final Current should be enough to make the motor shaft move or enough current to make the load move. Typically, the final current is set at the motor's rated stall current.

Ramping Time: This value is the amount of time that it will take the to change the initial current to the final current. This value is in seconds.

Timer Ticks: This value is the amount of time that the commutation initialization will take. This value must be greater than the Ramping Time. This value is in seconds.

Smart-Comm Tuning

1. First, open “Setup Commutation” window (refer to page 21) and set the number of poles of the motor and the lines per revolution of the encoder.

2. If the motor has an encoder with an index pulse, check the “Index-Auto” button under “Correction Method”. If the encoder does not have an index pulse, check “None”.

3. For smart-comm method, check “Smart-Comm” button under “Commutation Method”.

4. Start with the default values for tuning. At this time, be sure to set the “Final Current” at the motor’s rated stall current.

5. Send these values to the amplifier by pressing “Send Values to Amp” button.

6. Make sure the amplifier is in current mode.

7. Then save to Non-Volatile Memory (NVM) under the setup pull-down menu. (page 26)

8. Next, the amplifier needs to be reset for these settings to take effect. Press the reset button on the amplifier.

9. As soon as the amplifier is enabled, the motor should be correctly commutated and ready for the next step.

10. Using “Control Panel” (page 25), command +/- current to the motor and see if the RPMs are equal for the same +/- commanded currents. If the motor does not rotate when the current is commanded, open the “Setup Commutation” window and change the “Encoder Reverse” box setting. Then, repeat the steps 7, 8, 9 and 10.

11. Refer to page 61 step “T” for phasing the velocity loop (Tach).

12. If you need further assistance, contact your Glentek sales agent, and he/she will gladly assist you to optimize your system.

TECHNOLOGY

Selection of a commutation initialization method

The first step in selecting a commutation initialization method is to determine whether motion can be tolerated upon power up. If motion is not acceptable, then the motor must be equipped with Hall sensors or commutation tracks and Hall initialization should be used. If motion is acceptable at power up, then the second item which will prevent Smart-Comm initialization from working properly is the presence of large external torque applied on the motor rotor. If large external torque exist which either resist rotor motion (such as a break or excessive friction), or cause the rotor to rotate (such as a gravity), then Smart-Comm can result in a non-optimal commutation angle. This occurs because these modes both rely upon finding equilibrium between the applied motor current and the rotor position; an external torque will alter this equilibrium position. If a large enough current is applied during initialization, this external torque can be overcome and an acceptable commutation angle can be achieved.

If Smart-Comm is selected, the amount of current to the motor during initialization must be set. The values such as initial current and final current need to be set for commutation initialization to occur. The default value can be used as a basis. After following the process outlined in the Terms appendix (page 74 and page 75) these values can be tuned to the application necessary.

APPENDIX I

I - Amplifier Model Numbering

This appendix explains the model numbering system for Glentek's Omega Series Digital servo amplifiers. The model numbering system is designed so that you, our customer, will be able to quickly and accurately create the model number for the amplifier that best suits your needs. This manual contains complete model numbering information for the following amplifier types:

SMB/SMC 9715	**SMB/SMC 9830**
SMB/SMC 9808	**SMB/SMC 9845**
SMB/SMC 9815	**SMB/SMC 9875**

In order to minimize confusion, the above three amplifier types have their own respective model numbering sections on the pages that follow. In order to accurately select a complete part number, please follow the steps shown below:

1. Select the amplifier type which meets your power requirements (i.e. SMB98XX, SMC98XX) and proceed to that section of model numbering.

2. Select the industry standard mounting configuration which meets your needs (i.e. Module, Stand Alone or Multi-Axis).

3. Utilize the model number key in conjunction with the tables at the beginning of each section to select the complete model number for your requirements. Note: A complete model number example follows the model number key and includes a full description of the individual codes which make up the complete model number.

The difference between SMB98XX and SMC98XX.

1. SMB98XX uses Buss input to power up the logic board and encoder.

- Advantage: Only requires one input power source to operate the amplifier

- Disadvantage: In case of input power failure, the amplifier will shut down completely including the logic board and encoder.

2. SMC98XX requires external 24VDC or 110VAC "Keep Alive" or 5VDC input to power up the logic board and encoder. (110VAC is for SMC9830,9845,9875) (5VDC is for SMC9715)

- Advantage: As long as the external 24VDC or 110 VAC or 5VDC stays on, the logic board and encoder power will stay alive even if the BUS input shuts down.

- Disadvantage: Needs two separate input power sources (external 24VDC or 110VAC or 5VDC & Buss input) to operate the amplifier.

SMB9715 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

XXX	Power	Power Input Voltage Module (VDC)	Continuous Current (Amps)	Peak Current (Amps)
000	Standard	190 - 340	15	30
001	High	190 - 340	20	40
002	Low	190 - 340	10	20
003	Standard	70 - 190	15	30
004	High	70 - 190	20	40
005	Low	70 - 190	10	20

MM	Mounting
Omit	1 - axis Module
2A	2 - axis Chassis
4A	4 - axis Chassis

F	Fan Power
1	115VAC
2	230VAC

N	Number of Amplifiers Installed
1	1 Amplifier Installed
2	2 Amplifiers Installed
3	3 Amplifiers Installed
4	4 Amplifiers Installed

SMB9715 Amplifier Module Numbering Key

SMB9715 Module

SMB9715 - XXX - 1

Model number key:

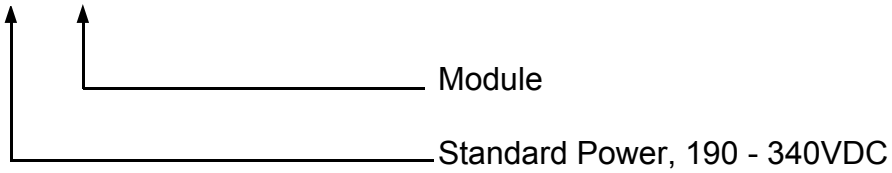
SMB9715 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

1 Single amplifier module.

Example:

SMB9715 - 000 - 1



SMB9715 Multi - Axis Amplifier

SMB9715 - XXX - MM - N - F

Model number key:

SMB9715 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

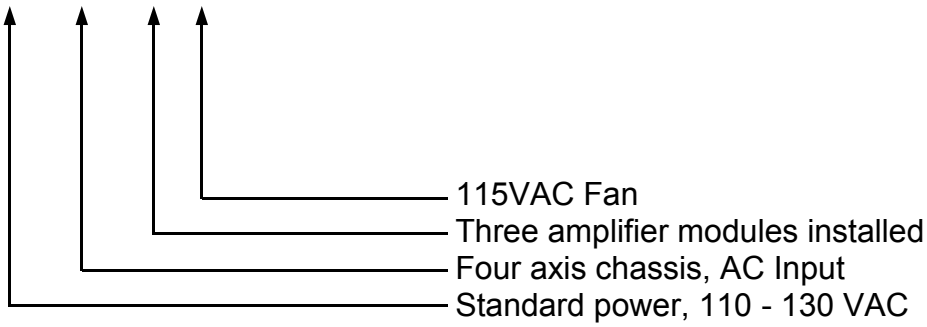
MM Mounting Configuration Code.

N Number of amplifiers installed.

F Fan Power..

Example:

SMB9715 - 003 - 4A - 3 - 1



SMC9715 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

XXX	Power	Power Input Voltage Module (VDC)	Continuous Current (Amps)	Peak Current (Amps)
100	Standard	190 - 340	15	30
101	High	190 - 340	20	40
102	Low	190 - 340	10	20
103	Standard	70 - 190	15	30
104	High	70 - 190	20	40
105	Low	70 - 190	10	20

MM	Mounting
Omit	1 - axis Module
2A	2 - axis Chassis
4A	4 - axis Chassis

F	Fan Power
1	115VAC
2	230VAC

N	Number of Amplifiers Installed
1	1 Amplifier Installed
2	2 Amplifiers Installed
3	3 Amplifiers Installed
4	4 Amplifiers Installed

SMC9715 Amplifier Module Numbering Key

SMC9715 Module

SMC9715 - XXX - 1

Model number key:

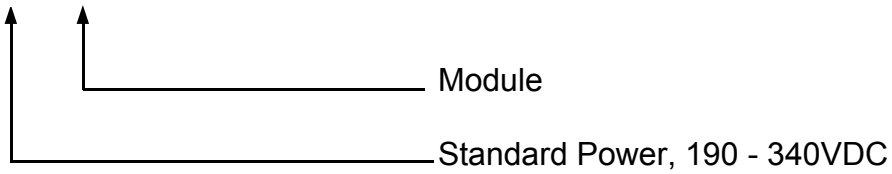
SMC9715 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

1 Single amplifier module.

Example:

SMC9715 - 100 - 1



SMC9715 Multi - Axis Amplifier

SMC9715 - XXX - MM - N - F

Model number key:

SMC9715 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

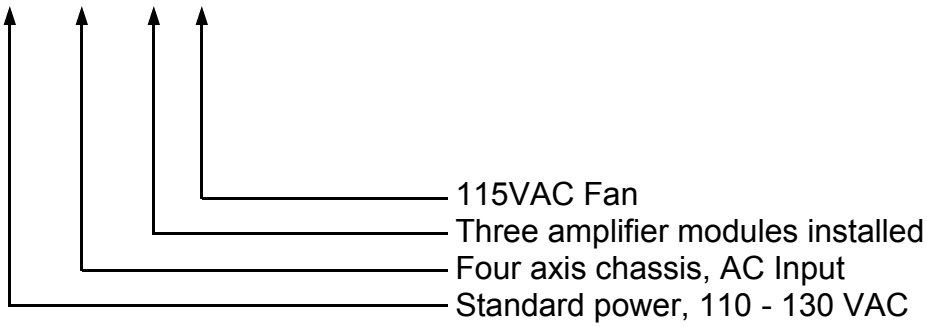
MM Mounting Configuration Code.

N Number of amplifiers installed.

F Fan Power..

Example:

SMC9715 - 103 - 4A - 3 - 1



SMB9808 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

Notes:

* With no forced air cooling
** With forced air cooling

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

XXX	Power	Power Input Voltage	Continuous Current (Amps)	Peak Current (Amps)
		Stand Alone / Chassis (VAC)		
000	Standard	208 - 240	4* 8**	8* 16**
003	Standard	110 - 130	4* 8**	8* 16**

SMB9808 Stand Alone Amplifier

SMB9808 - XXX - YYY - 1A - 1

Model number key:

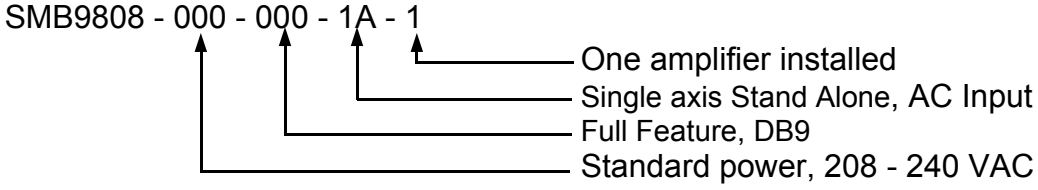
SMB9808 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1A Mounting Configuration Code, Single axis Stand Alone.

Example:



SMC9808 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

Notes:

* With no forced air cooling
** With forced air cooling

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

XXX	Power	Power Input Voltage	Continuous Current (Amps)	Peak Current (Amps)
		Stand Alone / Chassis (VAC)		
100	Standard	208 - 240	4* 8**	8* 16**
103	Standard	110 - 130	4* 8**	8* 16**

SMC9808 Stand Alone Amplifier

SMC9808 - XXX - YYY - 1A - 1

Model number key:

SMC9808 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1A Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example: SMC9808 - 100 - 000 - 1A - 1

- One amplifier installed
- Single axis Stand Alone, AC Input
- Full Feature, DB9
- Standard power, 208 - 240 VAC

SMB9815 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when

XXX	Power	Power Input Voltage		Continuous Current (Amps)	Peak Current (Amps)
		Module (VDC)	Stand Alone / Chassis (VAC)		
000	Standard	190 - 370	208 - 240	15	30
001	High	190 - 370	208 - 240	20	40
002	Low	190 - 370	208 - 240	10	20
003	Standard	70 - 190	110 - 130	15	30
004	High	70 - 190	110 - 130	20	40
005	Low	70 - 190	110 - 130	10	20
006	Standard	30 - 70	Not Available	15	30
007	High	30 - 70	Not Available	20	40
008	Low	30 - 70	Not Available	10	20

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

MM	Mounting
Omit	1 - axis Module
1A	1 - axis Stand Alone
2A	2 - axis Chassis
4A	4 - axis Chassis

N	Number of Amplifiers Installed
1	1 Amplifier Installed
2	2 Amplifiers Installed
3	3 Amplifiers Installed
4	4 Amplifiers Installed

F	Fan Power
1	115VAC
2	230VAC

SMB9815 Amplifier Module Numbering Key

SMB9815 - XXX - YYY - 1

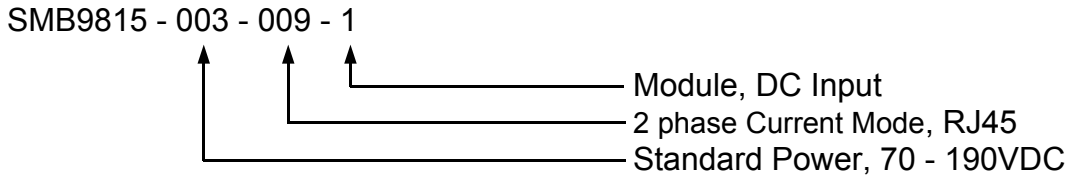
Model number key:

SMB9815 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

YYY Logic board Configuration Code.

Example:



SMB9815 Stand Alone Amplifier

SMB9815 - XXX - YYY - 1A - 1

Model number key:

SMB9815 Designates an Omega Series fully digital Surface Mount Amplifier.

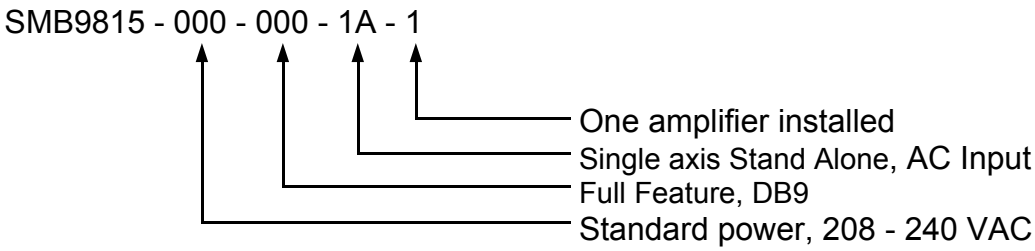
XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1A Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example:



SMB9815 Multi - Axis Amplifier

SMB9815 - XXX - YYY - MM - N - F

Model number key:

SMB9815 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

YYY Logic board Configuration Code.

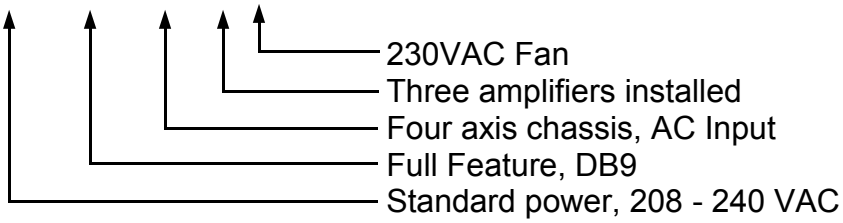
MM Mounting Configuration Code.

N Number of amplifiers installed.

F Fan Power..

Example:

SMB9815 - 000 - 000 - 4A - 3 - 2



SMC9815 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when

XXX	Power	Power Input Voltage		Continuous Current (Amps)	Peak Current (Amps)
		Module (VDC)	Stand Alone / Chassis (VAC)		
100	Standard	190 - 370	208 - 240	15	30
101	High	190 - 370	208 - 240	20	40
102	Low	190 - 370	208 - 240	10	20
103	Standard	70 - 190	110 - 130	15	30
104	High	70 - 190	110 - 130	20	40
105	Low	70 - 190	110 - 130	10	20
106	Standard	30 - 70	Not Available	15	30
107	High	30 - 70	Not Available	20	40
108	Low	30 - 70	Not Available	10	20

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

MM	Mounting
Omit	1 - axis Module
1A	1 - axis Stand Alone
2A	2 - axis Chassis
4A	4 - axis Chassis

N	Number of Amplifiers Installed
1	1 Amplifier Installed
2	2 Amplifiers Installed
3	3 Amplifiers Installed
4	4 Amplifiers Installed

F	Fan Power
1	115VAC
2	230VAC

SMC9815 Amplifier Module Numbering Key

SMC9815 - XXX - YYY - 1

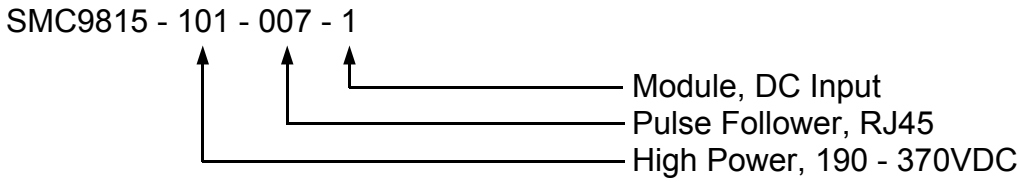
Model number key:

SMC9815 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

YYY Logic board Configuration Code.

Example:



SMC9815 Stand Alone Amplifier

SMC9815 - XXX - YYY - 1A - 1

Model number key:

SMC9815 Designates an Omega Series fully digital Surface Mount Amplifier.

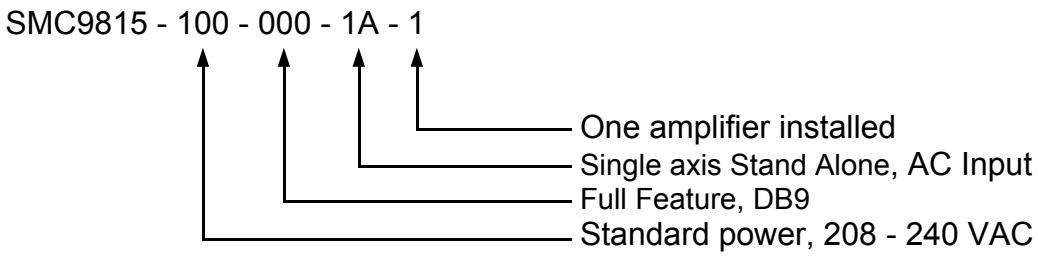
XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1A Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example:



SMC9815 Multi - Axis Amplifier

SMC9815 - XXX - YYY - MM - N - F

Model number key:

SMC9815 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX Power board Configuration Code.

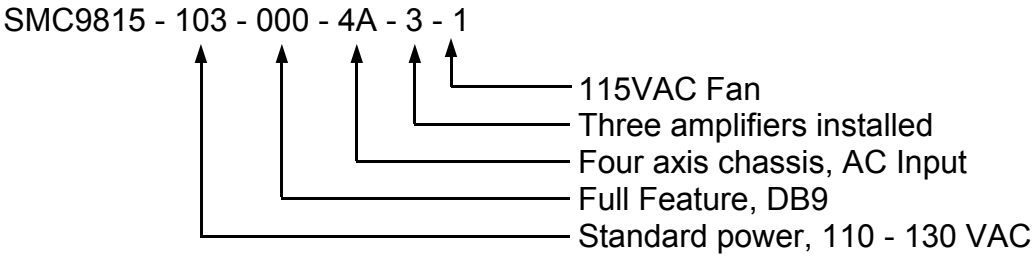
YYY Logic board Configuration Code.

MM Mounting Configuration Code.

N Number of amplifiers installed.

F Fan Power..

Example:



SMB9830 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

XXX	Power	Power Input Voltage	Continuous Current (Amps)	Peak Current (Amps)
		Stand Alone / Chassis 3 phase (VAC) Input		
000	Standard	208 - 240	30	60
003	Standard	110 - 130	30	60

SMB9830 Stand Alone Amplifier

SMB9830 - XXX - YYY - 1B - 1

Model number key:

SMB9830 Designates an Omega Series fully digital Surface Mount Amplifier.

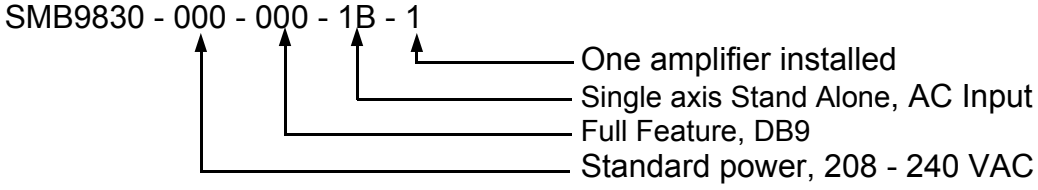
XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1B Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example:



SMC9830 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

XXX	Power	Power Input Voltage Stand Alone / Chassis 3 phase (VAC) input	Continuous Current (Amps)	Peak Current (Amps)	Keep Alive/ Logic Power
100	Standard	208 - 240	30	60	24VDC
103	Standard	110 - 130	30	60	24VDC
200	Standard	208-240	30	60	110VAC
203	Standard	110-130	30	60	110VAC

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

SMC9830 Stand Alone Amplifier

SMC9830 - XXX - YYY - 1B - 1

Model number key:

SMC9830 Designates an Omega Series fully digital Surface Mount Amplifier.

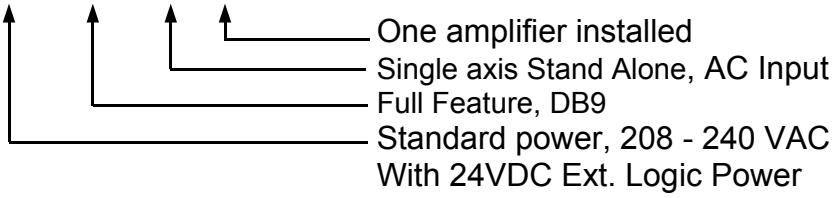
XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1B Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example: SMC9830 - 100 - 000 - 1B - 1



SMB9845 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

Notes: 90 Amp peak is available upon special request.

XXX	Power	Power Input Voltage	Continuous Current (Amps)	Peak Current (Amps)
		Stand Alone / Chassis 3 phase (VAC) Input		
000	Standard	208 - 240	45	80
003	Standard	110 - 130	45	80

SMB9845 Stand Alone Amplifier

SMB9845 - XXX - YYY - 1B - 1

Model number key:

SMB9845 Designates an Omega Series fully digital Surface Mount Amplifier.

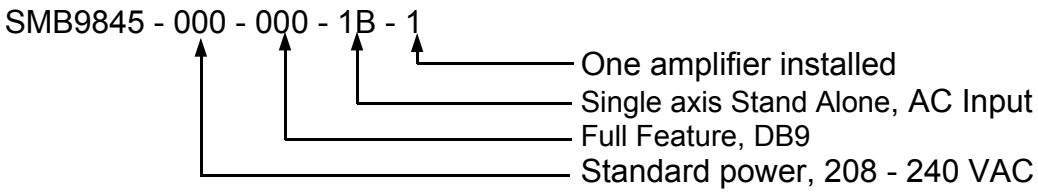
XXX-Power board Configuration Code.

YYY-Logic board Configuration Code.

1B-Mounting Configuration code, Single axis Stand Alone

1– Single amplifier module.

Example:



SMC9845 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

Notes:
90 Amp peak is available upon special request.

XXX	Power	Power Input Voltage Stand Alone / Chassis 3 phase (VAC) input	Continuous Current (Amps)	Peak Current (Amps)	Keep Alive/ Logic Power (VAC)
100	Standard	208 - 240	45	80	24VDC
103	Standard	110 - 130	45	80	24VDC
200	Standard	208-240	45	80	110VAC
203	Standard	110-130	45	80	110VAC

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

SMC9845 Stand Alone Amplifier

SMC9845 - XXX - YYY - 1B - 1

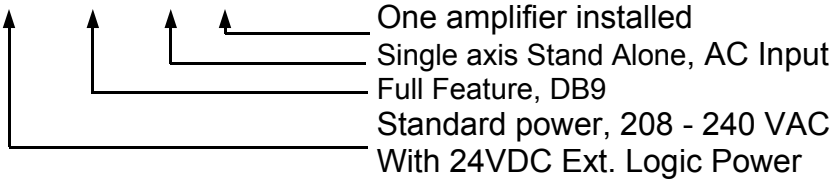
Model number key:

SMC9845 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX-Power board Configuration Code. **1B-**Mounting Configuration code, Single axis Stand Alone

YYY-Logic board Configuration Code. **1**– Single amplifier module.

Example: SMC9845 - 100 - 000 - 1B - 1



SMB9875 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

XXX	Power	Power Input Voltage	Continuous Current (Amps)	Peak Current (Amps)
		Stand Alone / Chassis 3 phase (VAC) Input		
000	Standard	208 - 240	75	120
003	Standard	110 - 130	75	120

SMB9875 Stand Alone Amplifier

SMB9875 - XXX - YYY - 1B - 1

Model number key:

SMB9875 Designates an Omega Series fully digital Surface Mount Amplifier.

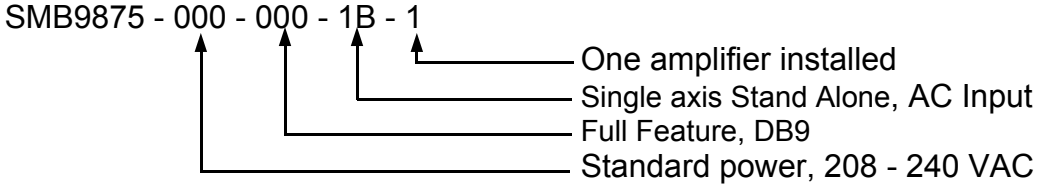
XXX Power board Configuration Code.

YYY Logic board Configuration Code.

1B Mounting Configuration Code, Single axis Stand Alone.

1 Single amplifier module.

Example:



SMC9875 Amplifier Model Numbering

The following tables are used to fill in the different parts of the model number. Refer to these when constructing a model number for your requirements.

XXX	Power	Power Input Voltage Stand Alone / Chassis 3 phase (VAC) input	Continuous Current (Amps)	Peak Current (Amps)	Keep Alive/ Logic Power
100	Standard	208 - 240	75	120	24VDC
103	Standard	110 - 130	75	120	24VDC
200	Standard	208-240	75	120	110VAC
203	Standard	110-130	75	120	110VAC

YYY	Logic Board Description	Connector
000	Full Feature	DB9
001	Full Feature	RJ45
002	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	DB9
003	Reduced Wire Encoder (Sanyo Denki and Tamagawa)	RJ45
004	Yaskawa Encoder	DB9
005	Yaskawa Encoder	RJ45
006	Pulse Follower	DB9
007	Pulse Follower	RJ45
008	2 phase Current Mode	DB9
009	2 phase Current Mode	RJ45

SMC9875 Stand Alone Amplifier

SMC9875 - XXX - YYY - 1B - 1

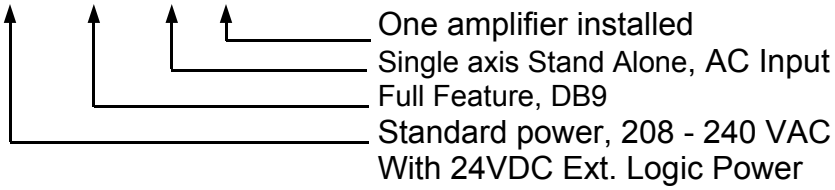
Model number key:

SMC9875 Designates an Omega Series fully digital Surface Mount Amplifier.

XXX-Power board Configuration Code. **1B**-Mounting Configuration code, Single axis Stand Alone

YYY-Logic board Configuration Code. **1**– Single amplifier module.

Example: SMC9875 - 100 - 000 - 1B - 1



Appendix J
Factory Repair, Maintenance and Warranty

Factory Repair

Should it become necessary to return an servo drive to Glentek for repair, please follow the procedure described below:

1. Reassemble the unit, if necessary, making certain that all the hardware is in place.
2. Tag the unit with the following information:
    A. Serial number and model number.
    B. Company name, phone number, and name of representative returning the unit.
    C. A brief notation explaining the malfunction.
    D. Date the unit is being returned.
3. Repackage the unit with the same care and fashion in which it was received. Label the container with the appropriate stickers (e.g.: FRAGILE: HANDLE WITH CARE).
4. Contact a Glentek representative, confirm that the unit is being returned to the factory and obtain an RMA (Return Material Authorization) number. The RMA number must accompany the unit upon return to Glentek. Do not ship unit with RMA number. Show RMA number on outside of package.
5. Return the unit by the best means possible. The method of freight chosen will directly affect the timeliness of its return.

Glentek may offer a 24-48 hr. expedited repair service, in the unlikely event that your system is down and you do not have a replacement.

Maintenance

There are no field-serviceable or replaceable parts or components in the SMB9715/ SMC9715, and SMB98XX/ SMC98XX amplifiers. Should the amplifier require a service, please contact Glentek about repairs.

Warranty:

Any product, or part thereof, manufactured by Glentek, Inc., which, under normal operating conditions in the plant of the original purchaser thereof, proves defective in material or workmanship within one year from the date of shipment by us, as determined by an inspection by us, will be repaired or replaced, at our discretion, free of charge, FOB our factory, El Segundo, California, U.S.A. Provided that you promptly send to us notice of the defect and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage, and that no factory sealed adjustments have been tampered with. Glentek's liability is limited to repair or replacement of defective parts. Repaired items will carry a 90-day warranty.

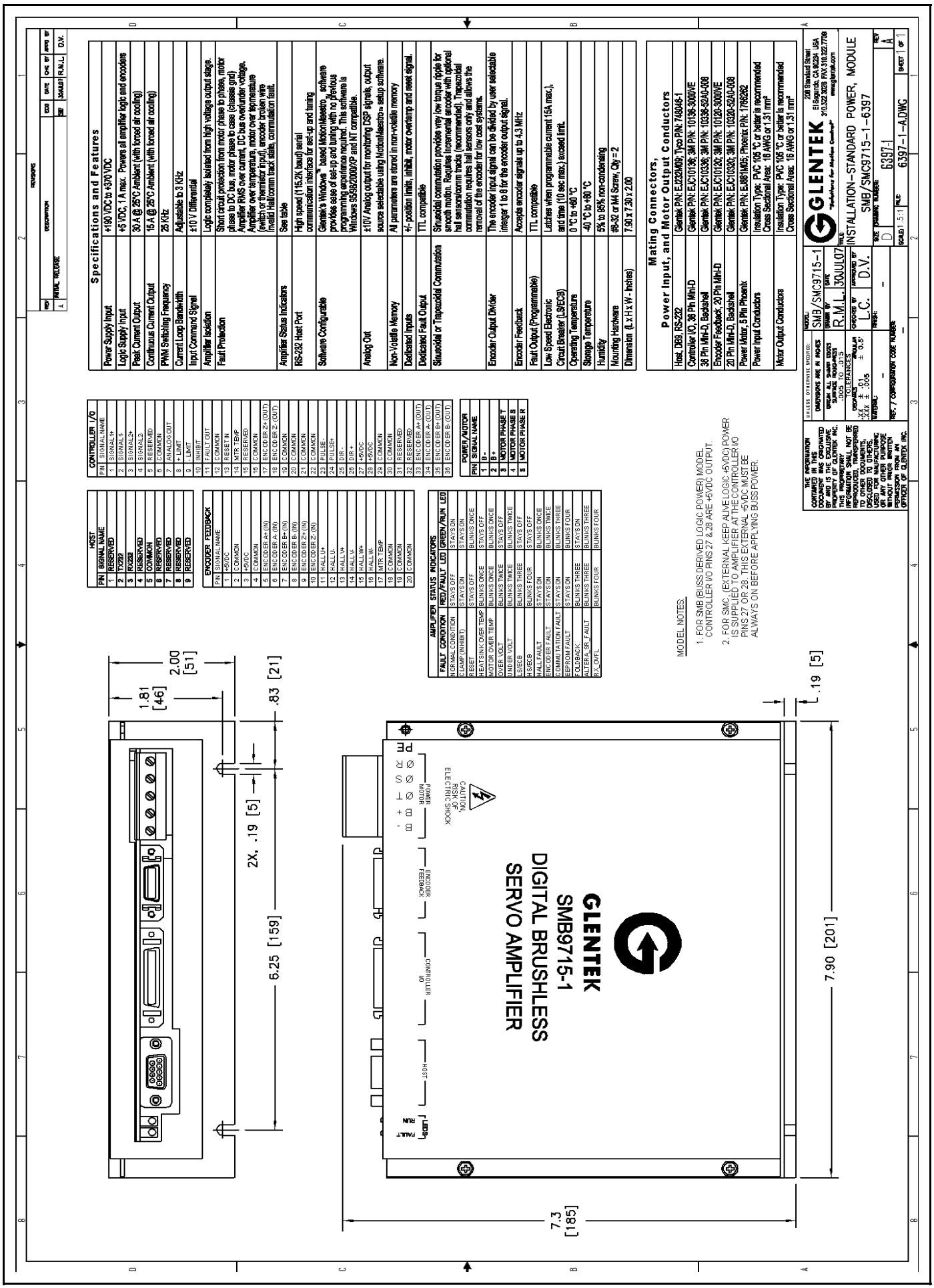
Any product or part manufactured by others and merely installed by us, such as an encoder, etc., is specifically not warranted by us and it is agreed that such product or part shall only carry the warranty, if any, supplied by the manufacturer of that part. It is also understood that you must look directly to such manufacturer for any defect, failure, claim or damage caused by such product or part.

Under no circumstances shall Glentek, Inc. or any of our affiliates have any liability whatsoever for claims or damages arising out of the loss of use of any product or part sold to you. Nor shall we have any liability to yourself or anyone for any indirect or consequential damages such as injuries to person and property caused directly or indirectly by the product or part sold to you, and you agree in accepting our product or part to save us harmless from any and all such claims or damages that may be initiated against us by third parties.

APPENDIX K

K– Drawings

SMB/SMC9715	Amplifier Module Standard Power
SMB/SMC9715	Amplifier Module High Power
SMB/SMC9715	2 Axis base plate chassis installation Standard Power
SMB/SMC9715	4 Axis base plate chassis installation Standard Power
GP8600	Power Supply
SMB/SMC9808	Amplifier Module Standard Power
SMB/SMC9815	Amplifier, With Built-In DC Power Supply Standard Power (Stand Alone)
SMB/SMC9815	Amplifier Module Standard Power
SMB/SMC9815	Amplifier Module High Power
SMB/SMC9815	2 Axis base plate chassis installation Standard Power
SMB/SMC9815	4 Axis base plate chassis installation Standard Power
SMB/SMC9830	Amplifier, With Built-In DC Power Supply (Stand Alone)
SMB/SMC9845	Amplifier, With Built-In DC Power Supply (Stand Alone)
SMB/SMC9875	Amplifier, With Built-In DC Power Supply (Stand Alone)


GLENTEK
SMB9715-1
DIGITAL BRUSHLESS
SERVO AMPLIFIER
HOST
CONTROLLER I/O
FEEDBACK
POWER
MOTOR
CAUTION
RISK OF
ELECTRIC SHOCK
6.25 [159]
2X, .19 [5]
.83 [21]
1.81 [46]
2.00 [51]
7.90 [201]
7.3 [185]
.19 [5]
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL CONTROLLER I/O PINS 27 & 28 ARE +5VDC OUTPUT.
2. FOR SMC, (EXTERNAL KEEP ALIVE LOGIC +5VDC) POWER IS SUPPLIED TO AMPLIFIER AT THE CONTROLLER I/O PINS 27 OR 28. THIS EXTERNAL +5VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
Specifications and Features
Power Supply Input
+190 VDC to +370 VDC
Logic Supply Input
+5 VDC, 1 A max. Powers all amplifier logic and encoders
Peak Current Output
30 A @ 25°C Ambient (with forced air cooling)
Continuous Current Output
15 A @ 25°C Ambient (with forced air cooling)
PWM Switching Frequency
25 kHz
Current Loop Bandwidth
Adjustable to 3 kHz
Input Command Signal
±10 V Differential
Amplifier Isolation
Logic completely isolated from high voltage output stage.
Fault Protection
Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd). Amplifier RMS over current, DC bus overvoltage, Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire invalid Hall/comm track states, commutation fault.
Amplifier Status Indicators
See table
RS-232 Host Port
High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable
Glentek's Windows™ based MotionMeastro_ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 95/98/2000/XP and NT compatible.
Analog Out
±10V Analog output for monitoring DSP signals, output source selectable using MotionMeastro software.
Non-Volatile Memory
All parameters are stored in non-volatile memory
Dedicated Inputs
+/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output
TTL compatible
Sinusoidal or Trapezoidal Commutation
Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider
The encoder input signal can be divided by user selectable integer 1 to 8 for the encoder output signal.
Encoder Feedback
Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable)
TTL compatible
Low Speed Electronic Circuit Breaker (LSECB)
Latches when programmable current (5A max.), and time (10 sec max.) exceed limit.
Operating Temperature
0 °C to +60 °C
Storage Temperature
-40 °C to +80 °C
Humidity
5% to 95% non-condensing
Mounting Hardware
#8-32 or M4 Screw, Qty = 2
Dimension (L x H x W - Inches)
7.90 x 7.30 x 2.00
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232
Glentek P/N: EJ2320M09; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D
Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell
Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D
Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell
Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Power Motor, 5 Pin Phoenix
Glentek P/N: EJ5811M05; Phoenix P/N: 1766282
Power Input Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
Motor Output Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
HOST
PIN | SIGNAL NAME
1 | RESERVED
2 | TX232
3 | RX232
4 | RESERVED
5 | COMMON
6 | RESERVED
7 | RESERVED
8 | RESERVED
9 | RESERVED
ENCODER FEEDBACK
PIN | SIGNAL NAME
1 | +5VDC
2 | COMMON
3 | +5VDC
4 | COMMON
5 | ENCODER A+ (IN)
6 | ENCODER A- (IN)
7 | ENCODER B+ (IN)
8 | ENCODER B- (IN)
9 | ENCODER Z+ (IN)
10 | ENCODER Z- (IN)
11 | HALL U+
12 | HALL U-
13 | HALL V+
14 | HALL V-
15 | HALL W+
16 | HALL W-
17 | MTR TEMP
18 | COMMON
19 | COMMON
20 | COMMON
CONTROLLER I/O
PIN | SIGNAL NAME
1 | SIGNAL1+
2 | SIGNAL1-
3 | SIGNAL2+
4 | SIGNAL2-
5 | RESERVED
6 | COMMON
7 | ANALOG OUT
8 | + LIMIT
9 | - LIMIT
10 | INHIBIT
11 | FAULT OUT
12 | COMMON
13 | RESETIN
14 | MTR TEMP
15 | RESERVED
16 | COMMON
17 | ENCODER Z+ (OUT)
18 | ENCODER Z- (OUT)
19 | COMMON
20 | COMMON
21 | COMMON
22 | COMMON
23 | PULSE+
24 | PULSE-
25 | DIR-
26 | DIR+
27 | +5VDC
28 | +5VDC
29 | COMMON
30 | COMMON
31 | RESERVED
32 | RESERVED
33 | ENCODER A+ (OUT)
34 | ENCODER A- (OUT)
35 | ENCODER B+ (OUT)
36 | ENCODER B- (OUT)
POWER / MOTOR
PIN | SIGNAL NAME
1 | B-
2 | B+
3 | MOTOR PHASE T
4 | MOTOR PHASE S
5 | MOTOR PHASE R
AMPLIFIER STATUS INDICATORS
FAULT CONDITION | RED/FAULT LED | GREEN/RUN LED
NORMAL CONDITION | STAYS OFF | STAYS ON
CLAMP (INHIBIT) | STAYS ON | STAYS ON
RESET | STAYS OFF | BLINKS ONCE
HEATSINK OVER TEMP | BLINKS ONCE | STAYS OFF
MOTOR OVER TEMP | BLINKS ONCE | BLINKS ONCE
OVER VOLT | BLINKS TWICE | STAYS OFF
UNDER VOLT | BLINKS TWICE | BLINKS TWICE
I2T/ECB | BLINKS THREE | STAYS OFF
HSECB | BLINKS FOUR | STAYS OFF
HALL FAULT | STAYS ON | BLINKS ONCE
ENCODER FAULT | STAYS ON | BLINKS TWICE
COMMUTATION FAULT | STAYS ON | BLINKS THREE
EEPROM FAULT | STAYS ON | BLINKS FOUR
FOLDBACK | BLINKS THREE | STAYS ON
ALTERA_SR_FAULT | BLINKS THREE | BLINKS THREE
RX_OVFL | BLINKS FOUR | BLINKS FOUR
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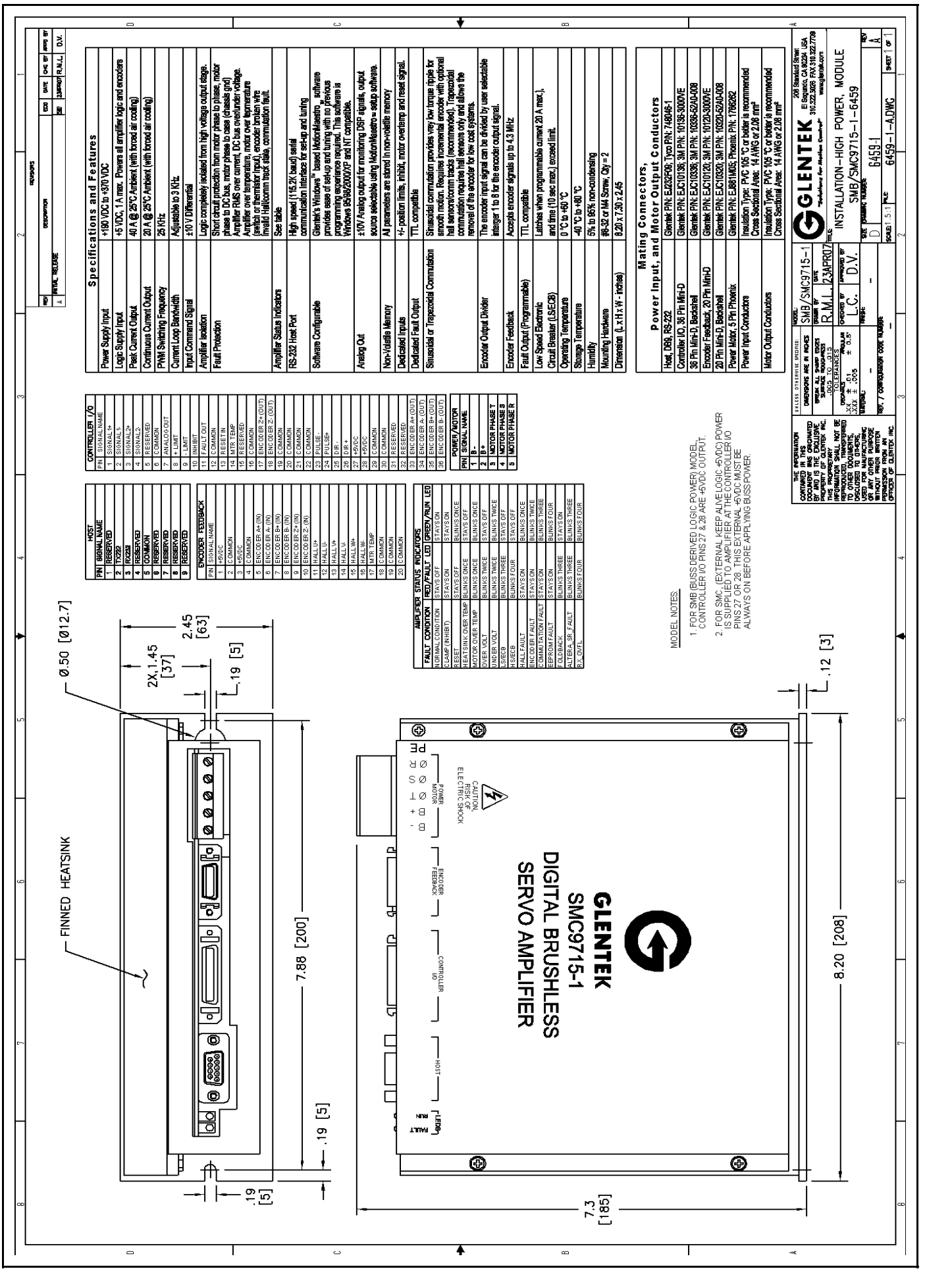
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES .010 MAX. SURFACE ROUGHNESS 125 MAX. TOLERANCES: DECIMALS .XX ± .01 .XXX ± .005 FRACTIONS ± 0.5° TURNS/ROLL: - FINISH: - REF. / CONFIGURATION CODE NUMBERS: -
MODEL: SMB/SMC97715-1
DRAWN BY: R.M.L. DATE: 30JUL07
CHECKED BY: L.C.
APPROVED BY: D.V.
SIZE: D DRAWING NUMBER: 6397-1
SCALE: 1.5:1 FILE: 6397-1-A.DWG
REV: A
SHEET 1 OF 1
GLENTEK 208 Standard Street El Segundo, CA 90245 USA 310.322.3026 FAX 310.322.7709 www.glentek.com
TITLE: INSTALLATION-STANDARD POWER, MODULE SMB/SMC97715-1-6397
REVISIONS
REV | DESCRIPTION | ECO | DATE | CHK BY | APPD BY
A | INITIAL RELEASE | 397 | 30AUG07 | R.M.L. | D.V.


GLENTEK
SMC9715-1
DIGITAL BRUSHLESS
SERVO AMPLIFIER
FINNED HEATSINK
Ø.50 [Ø12.7]
2X,1.45 [37]
2.45 [63]
.19 [5]
7.88 [200]
8.20 [208]
7.3 [185]
.12 [3]
HOST
CONTROLLER I/O
ENCODER FEEDBACK
MOTOR POWER
FAULT
RUN
Specifications and Features
Power Supply Input +180 VDC to +370 VDC
Logic Supply Input +5 VDC, 1 A max. Powers all amplifier logic and encoders
Peak Current Output 40 A @ 25°C Ambient (with forced air cooling)
Continuous Current Output 20 A @ 25°C Ambient (with forced air cooling)
PWM Switching Frequency 25 KHz
Current Loop Bandwidth Adjustable to 3 KHz
Input Command Signal ±10 V Differential
Amplifier Isolation Logic completely isolated from high voltage output stage.
Fault Protection Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd). Amplifier I²t over current, DC bus overvoltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire. Invalid Hall/comm track state, commutation fault.
Amplifier Status Indications See table
RS-232 Host Port High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable Glentek's Windows™ based MotionMaestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 95/98/2000/XP and NT compatible.
Analog Out ±10V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory All parameters are stored in non-volatile memory
Dedicated Inputs +/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output TTL compatible
Sinusoidal or Trapezoidal Commutation Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider The encoder input signal can be divided by user selectable integer 1 to 8 for the encoder output signal.
Encoder Feedback Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable) TTL compatible
Low Speed Electronic Circuit Breaker (LSECB) Latches when programmable current 20 A max.), and time (10 sec max.) exceed limit.
Operating Temperature 0 °C to +60 °C
Storage Temperature -40 °C to +80 °C
Humidity 0% to 95% non-condensing
Mounting Hardware #8-32 or M4 Screw, Qty = 2
Dimension (L x H x W - inches) 8.20 x 7.30 x 2.45
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232 Glentek P/N: Ea232P9B; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D Glentek P/N: EAC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell Glentek P/N: EAC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D Glentek P/N: EAC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell Glentek P/N: EAC10320; 3M P/N: 10320-52A0-008
Power Motor, 5 Pin Phoenix Glentek P/N: EA8611M05; Phoenix P/N: 1788682
Power Input Conductors Insulation Type: PVC 105 °C or better is recommended. Cross Sectional Area: 14 AWG or 2.08 mm²
Motor Output Conductors Insulation Type: PVC 105 °C or better is recommended. Cross Sectional Area: 14 AWG or 2.08 mm²
HOST
PIN SIGNAL NAME
1 RESERVED
2 TX232
3 RX232
4 RESERVED
5 COMMON
6 RESERVED
7 RESERVED
8 RESERVED
9 RESERVED
ENCODER FEEDBACK
PIN SIGNAL NAME
1 +5VDC
2 COMMON
3 +5VDC
4 COMMON
5 ENCODER A+ (IN)
6 ENCODER A- (IN)
7 ENCODER B+ (IN)
8 ENCODER B- (IN)
9 ENCODER Z+ (IN)
10 ENCODER Z- (IN)
11 HALL U+
12 HALL U-
13 HALL V+
14 HALL V-
15 HALL W+
16 HALL W-
17 MTR_TEMP
18 COMMON
19 COMMON
20 COMMON
CONTROLLER I/O
PIN SIGNAL NAME
1 +5VDC
2 SIGNAL1+
3 SIGNAL2+
4 SIGNAL2-
5 RESERVED
6 COMMON
7 ANALOG OUT
8 + LIMIT
9 - LIMIT
10 INHIBIT
11 FAULT OUT
12 COMMON
13 RESET IN
14 MTR TEMP
15 RESERVED
16 COMMON
17 ENCODER Z+ (OUT)
18 ENCODER Z- (OUT)
19 COMMON
20 COMMON
21 COMMON
22 COMMON
23 PULSE+
24 PULSE-
25 DIR+
26 DIR-
27 +5VDC
28 +5VDC
29 COMMON
30 COMMON
31 RESERVED
32 RESERVED
33 ENCODER A+ (OUT)
34 ENCODER A- (OUT)
35 ENCODER B+ (OUT)
36 ENCODER B- (OUT)
POWER/MOTOR
PIN SIGNAL NAME
1 B-
2 B+
3 MOTOR PHASE T
4 MOTOR PHASE S
5 MOTOR PHASE R
AMPLIFIER STATUS INDICATORS
FAULT CONDITION RED/FAULT LED GREEN/RUN LED
NORMAL CONDITION STAYS OFF STAYS ON
CLAMP (INHIBIT) STAYS ON STAYS ON
RESET STAYS OFF BLINKS ONCE
HEATSINK OVER TEMP BLINKS ONCE STAYS OFF
MOTOR OVER TEMP BLINKS ONCE BLINKS ONCE
OVER VOLT BLINKS TWICE STAYS OFF
UNDER VOLT BLINKS TWICE BLINKS TWICE
LSECB BLINKS THREE STAYS OFF
HSECB BLINKS THREE BLINKS ONCE
HALL FAULT BLINKS FOUR STAYS OFF
ENCODER FAULT STAYS ON BLINKS ONCE
COMMUTATION FAULT STAYS ON BLINKS TWICE
EEPROM FAULT STAYS ON BLINKS THREE
FOLDBACK BLINKS THREE STAYS ON
ALTERA_SR_FAULT BLINKS THREE BLINKS FOUR
EX_OVFL BLINKS FOUR BLINKS FOUR
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL CONTROLLER I/O PINS 27 & 28 ARE +5VDC OUTPUT.
2. FOR SMC, (EXTERNAL KEEP ALIVE LOGIC +5VDC) POWER IS SUPPLIED TO AMPLIFIER AT THE CONTROLLER I/O PINS 27 OR 28. THIS EXTERNAL +5VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
REVISIONS
REV DESCRIPTION ECO DATE CHK BY APPD BY
A INITIAL RELEASE SB 2APR07 R.M.L. D.V.
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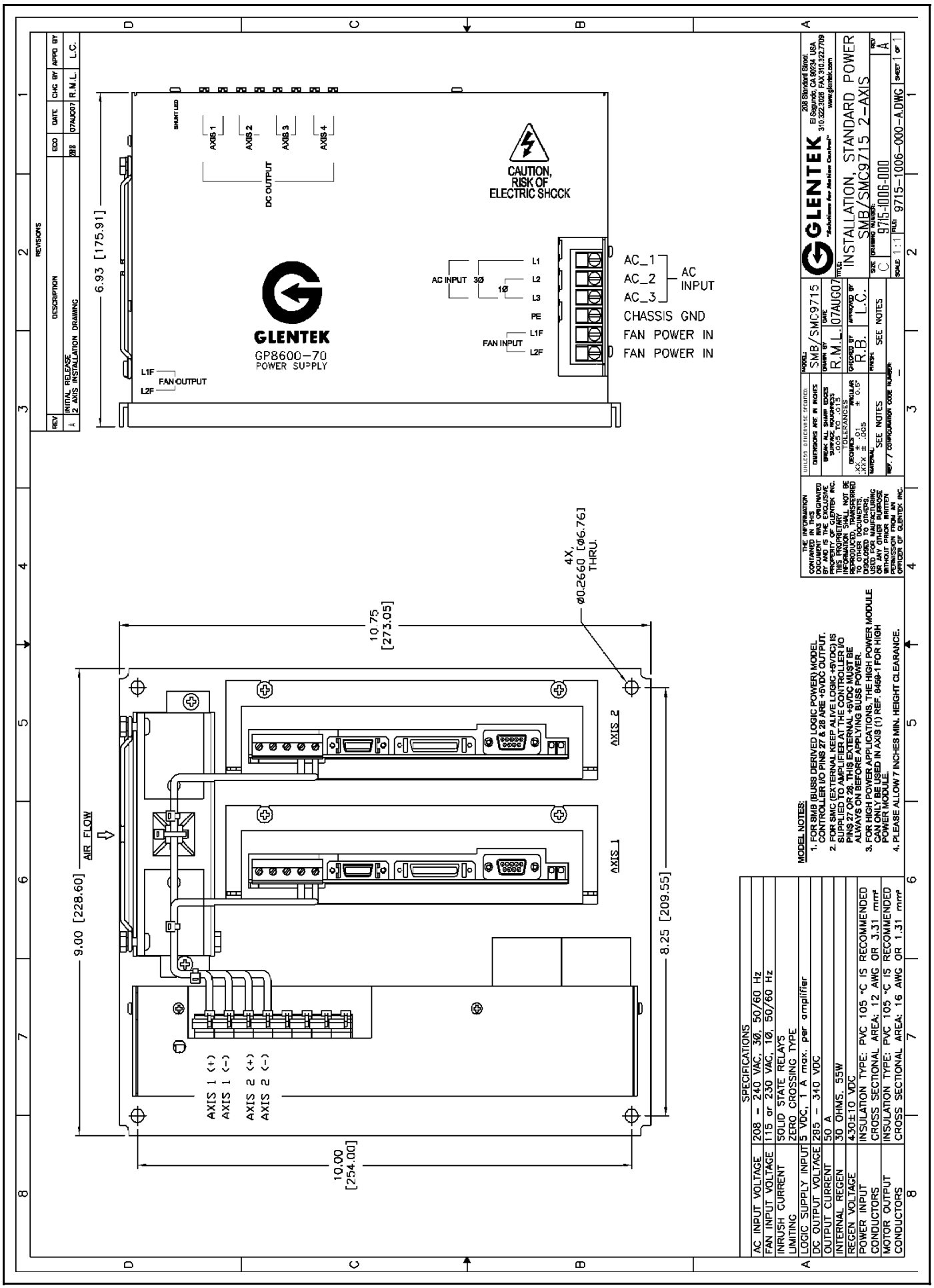
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES .005 TO .015. TOLERANCES: .XX ± .01, .XXX ± .005, ANGLES ± 0.5°
MATERIAL: -
FINISH: -
MODEL: SMB/SMC9715-1
DRAWN BY: R.M.L. 23APR07
CHECKED BY: L.C.
APPROVED BY: D.V.
GLENTEK 208 Standard Street El Segundo, CA 90245 USA 310.322.3026 FAX 310.322.7709 www.glentek.com
TITLE: INSTALLATION-HIGH POWER, MODULE SMB/SMC9715-1-6459
SIZE: D DRAWING NUMBER: 6459-1 REV: A
SCALE: 1.5:1 FILE: 6459-1-A.DWG SHEET 1 OF 1


GLENTEK
GP8600-70
POWER SUPPLY
CAUTION, RISK OF ELECTRIC SHOCK
AXIS 1
AXIS 2
AXIS 3
AXIS 4
DC OUTPUT
AC INPUT 3Ø
1Ø
L1
L2
L3
PE
L1F
L2F
FAN INPUT
FAN OUTPUT
AC_1
AC_2
AC_3
AC INPUT
CHASSIS GND
FAN POWER IN
FAN POWER IN
6.93 [175.91]
10.75 [273.05]
4X, Ø0.2660 [Ø6.76] THRU.
AIR FLOW
9.00 [228.60]
8.25 [209.55]
10.00 [254.00]
AXIS 1 (+)
AXIS 1 (-)
AXIS 2 (+)
AXIS 2 (-)
AXIS 1
AXIS 2
REVISIONS
REV
DESCRIPTION
ECO
DATE
CHG BY
APPD BY
A
INITIAL RELEASE
2 AXIS INSTALLATION DRAWING
07AUG07
R.M.L.
L.C.
GLENTEK
"Solutions for Motion Control"
208 Standard Street
El Segundo, CA 90234 USA
310.322.3026 FAX 310.322.7709
www.glentek.com
INSTALLATION, STANDARD POWER
SMB/SMC9715 2-AXIS
SIZE C
DRAWING NUMBER: 9715-1006-000
REV A
SCALE: 1:1
FILE: 9715-1006-000-A.DWG
SHEET 1 OF 1
MODEL: SMB/SMC9715
DRAWN BY R.M.L.
DATE 07AUG07
CHECKED BY R.B.
APPROVED BY L.C.
FINISH: SEE NOTES
MATERIAL: SEE NOTES
REF. / CONFIGURATION CODE NUMBER: -
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
SURFACE ROUGHNESS .005 TO .015
TOLERANCES
DECIMALS .XX ± .01 .XXX ± .005
ANGULAR ± 0.5°
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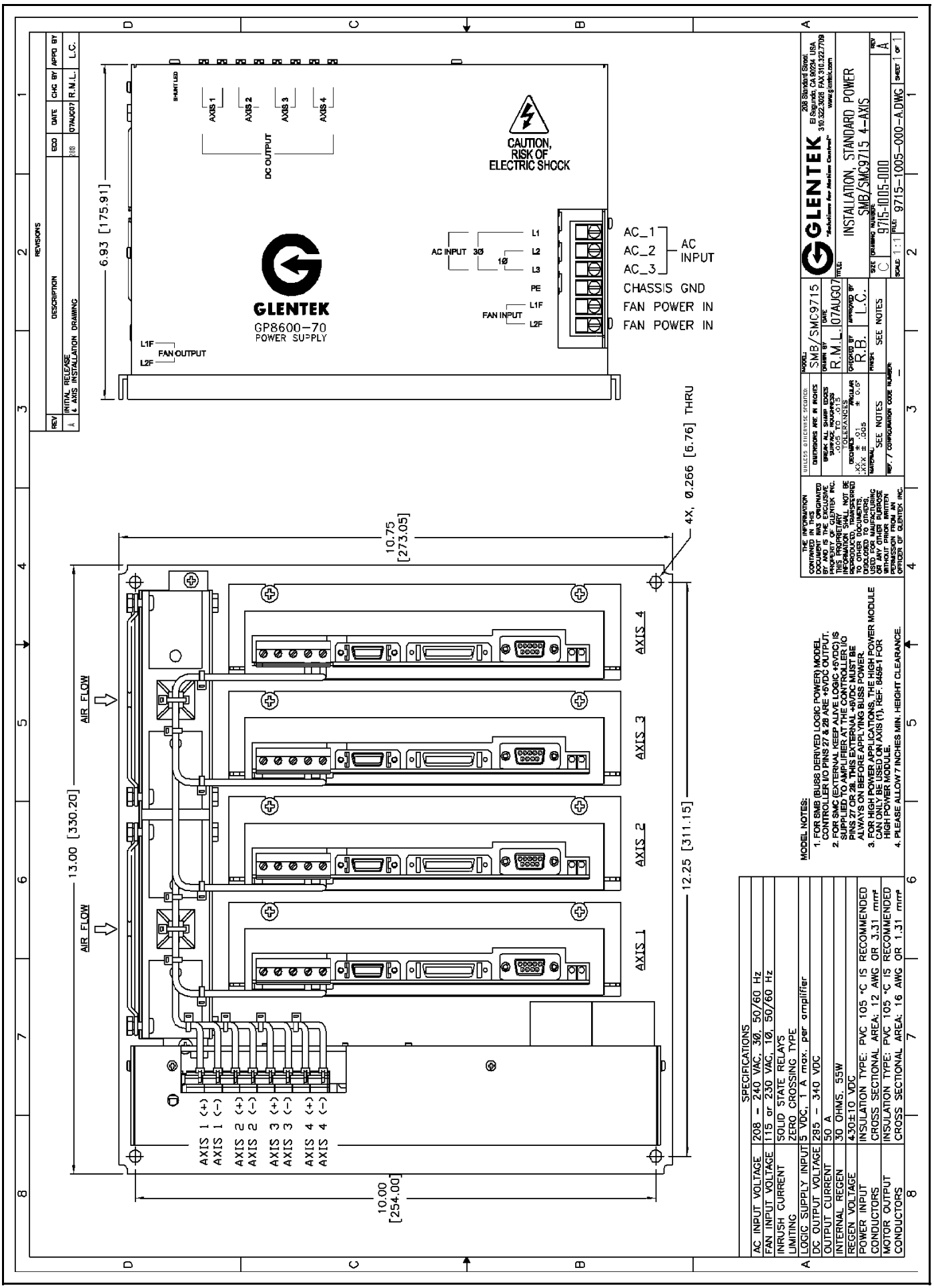
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL CONTROLLER I/O PINS 27 & 28 ARE +5VDC OUTPUT.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +5VDC) IS SUPPLIED TO AMPLIFIER AT THE CONTROLLER I/O PINS 27 OR 28. THIS EXTERNAL +5VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. FOR HIGH POWER APPLICATIONS, THE HIGH POWER MODULE CAN ONLY BE USED IN AXIS (1) REF. 8459-1 FOR HIGH POWER MODULE.
4. PLEASE ALLOW 7 INCHES MIN. HEIGHT CLEARANCE.
SPECIFICATIONS
AC INPUT VOLTAGE 208 - 240 VAC, 3Ø, 50/60 Hz
FAN INPUT VOLTAGE 115 or 230 VAC, 1Ø, 50/60 Hz
INRUSH CURRENT LIMITING SOLID STATE RELAYS ZERO CROSSING TYPE
LOGIC SUPPLY INPUT 5 VDC, 1 A max. per amplifier
DC OUTPUT VOLTAGE 295 - 340 VDC
OUTPUT CURRENT 50 A
INTERNAL REGEN 30 OHMS, 55W
REGEN VOLTAGE 430±10 VDC
POWER INPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED CROSS SECTIONAL AREA: 12 AWG OR 3.31 mm²
MOTOR OUTPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED CROSS SECTIONAL AREA: 16 AWG OR 1.31 mm²


GLENTEK
GP8600-70
POWER SUPPLY
CAUTION, RISK OF ELECTRIC SHOCK
AXIS 1
AXIS 2
AXIS 3
AXIS 4
DC OUTPUT
AC INPUT 3Ø
1Ø
L1
L2
L3
PE
L1F
L2F
FAN INPUT
AC_1
AC_2
AC_3
AC INPUT
CHASSIS GND
FAN POWER IN
FAN POWER IN
FAN OUTPUT
6.93 [175.91]
10.75 [273.05]
4X, Ø.266 [6.76] THRU
13.00 [330.20]
12.25 [311.15]
10.00 [254.00]
AIR FLOW
AIR FLOW
AXIS 4
AXIS 3
AXIS 2
AXIS 1
AXIS 1 (+)
AXIS 1 (-)
AXIS 2 (+)
AXIS 2 (-)
AXIS 3 (+)
AXIS 3 (-)
AXIS 4 (+)
AXIS 4 (-)
REVISIONS
REV
DESCRIPTION
ECO
DATE
CHG BY
APPD BY
A
INITIAL RELEASE
4 AXIS INSTALLATION DRAWING
088
07AUG07
R.M.L.
L.C.
MODEL NOTES:
1. FOR SMB (BUS8 DERIVED LOGIC POWER) MODEL CONTROLLER I/O PINS 27 & 28 ARE +5VDC OUTPUT.
2. FOR SMC (EXTERNAL USER ALIVE LOGIC +5VDC) IS SUPPLIED TO CONTROLLER I/O CONNECTOR PINS 27 OR 28. THIS EXTERNAL +5VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. FOR HIGH POWER APPLICATIONS, THE HIGH POWER MODULE CAN ONLY BE USED ON AXIS (1), REF. 8468-1 FOR HIGH POWER MODULE.
4. PLEASE ALLOW 7 INCHES MIN. HEIGHT CLEARANCE.
SPECIFICATIONS
AC INPUT VOLTAGE 208 – 240 VAC, 3Ø, 50/60 Hz
FAN INPUT VOLTAGE 115 or 230 VAC, 1Ø, 50/60 Hz
INRUSH CURRENT LIMITING SOLID STATE RELAYS ZERO CROSSING TYPE
LOGIC SUPPLY INPUT 5 VDC, 1 A max. per amplifier
DC OUTPUT VOLTAGE 285 – 340 VDC
OUTPUT CURRENT 50 A
INTERNAL REGEN 30 OHMS, 55W
REGEN VOLTAGE 430±10 VDC
POWER INPUT INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CONDUCTORS CROSS SECTIONAL AREA: 12 AWG OR 3.31 mm²
MOTOR OUTPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CROSS SECTIONAL AREA: 16 AWG OR 1.31 mm²
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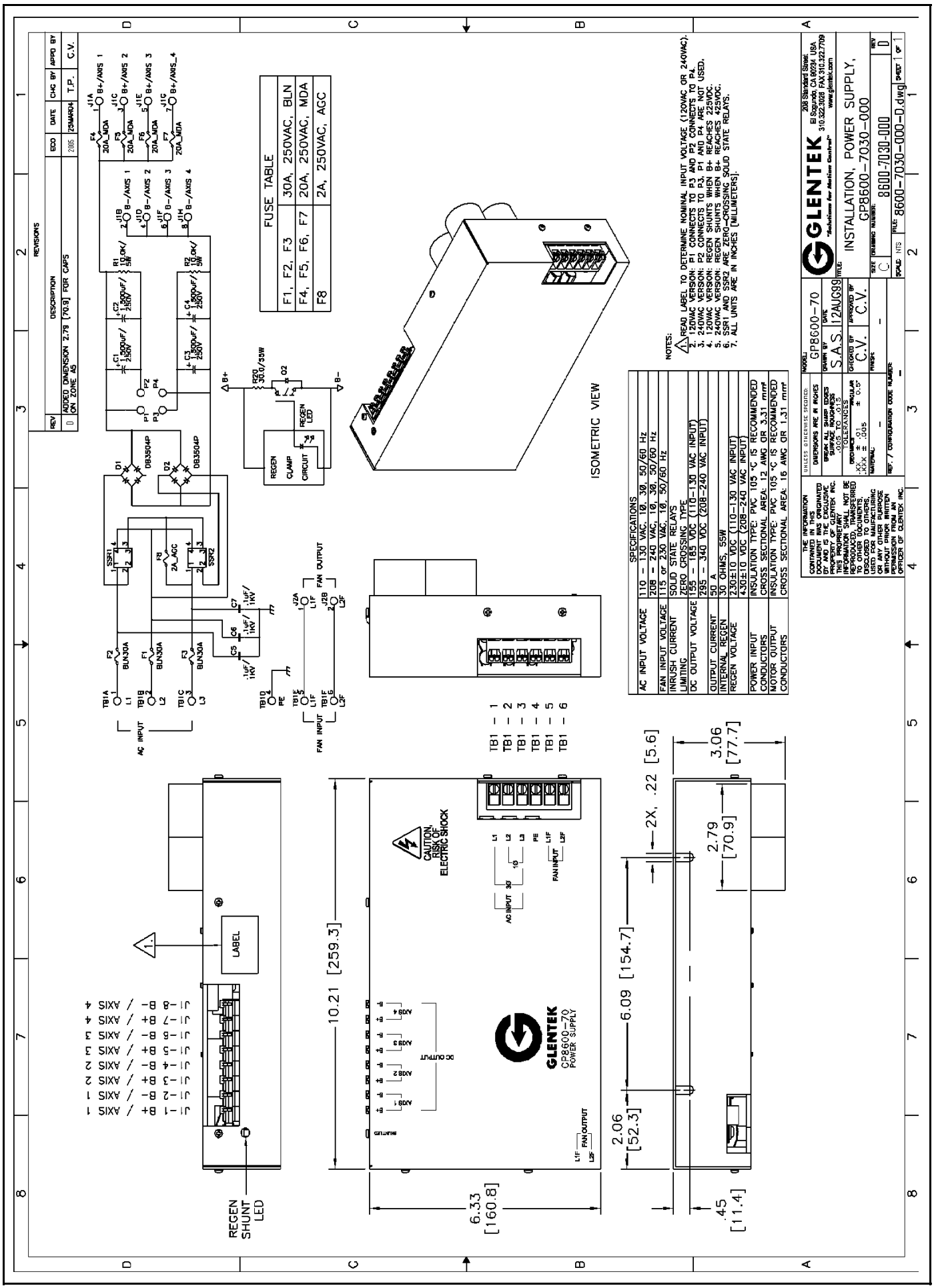
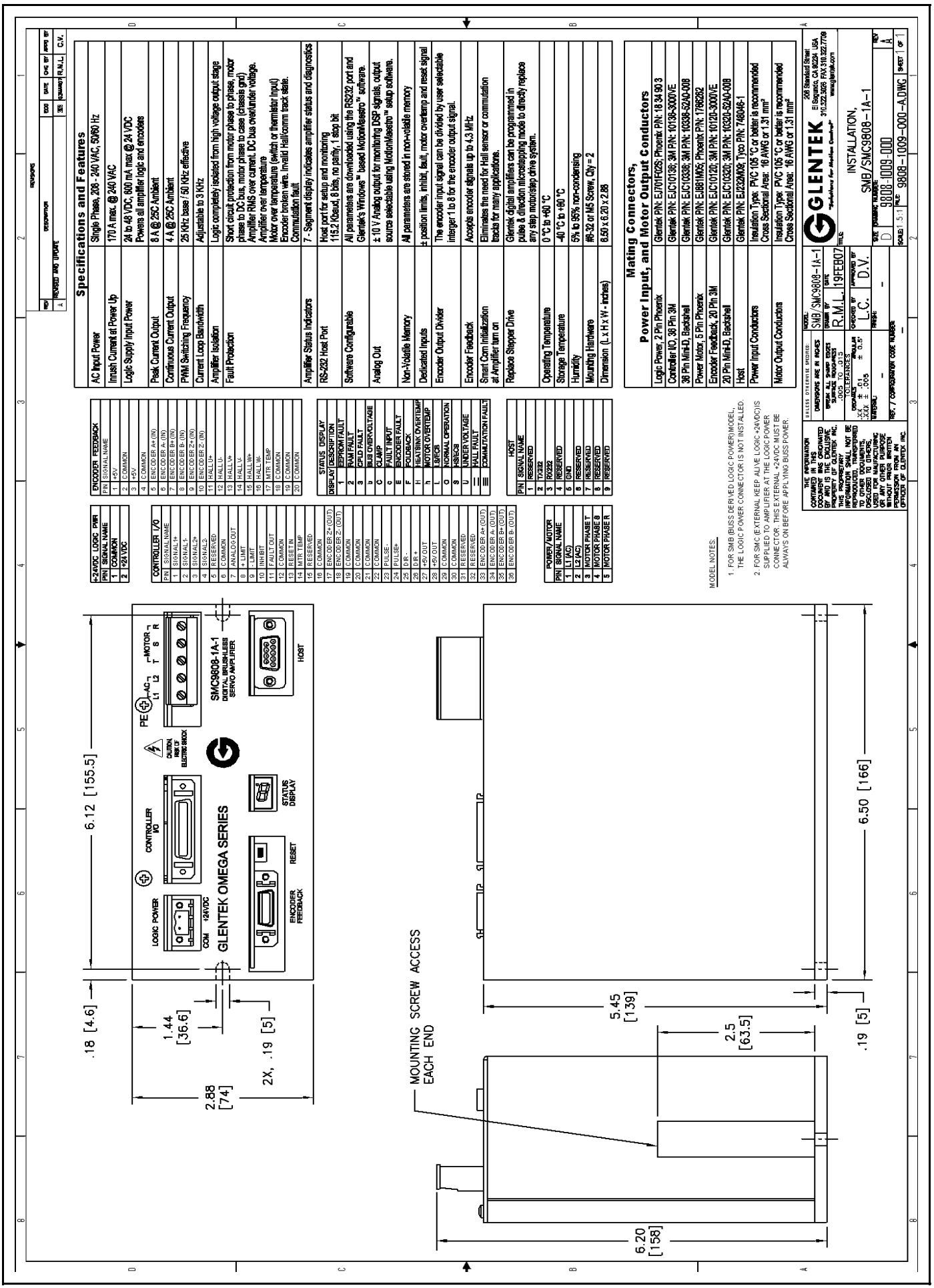
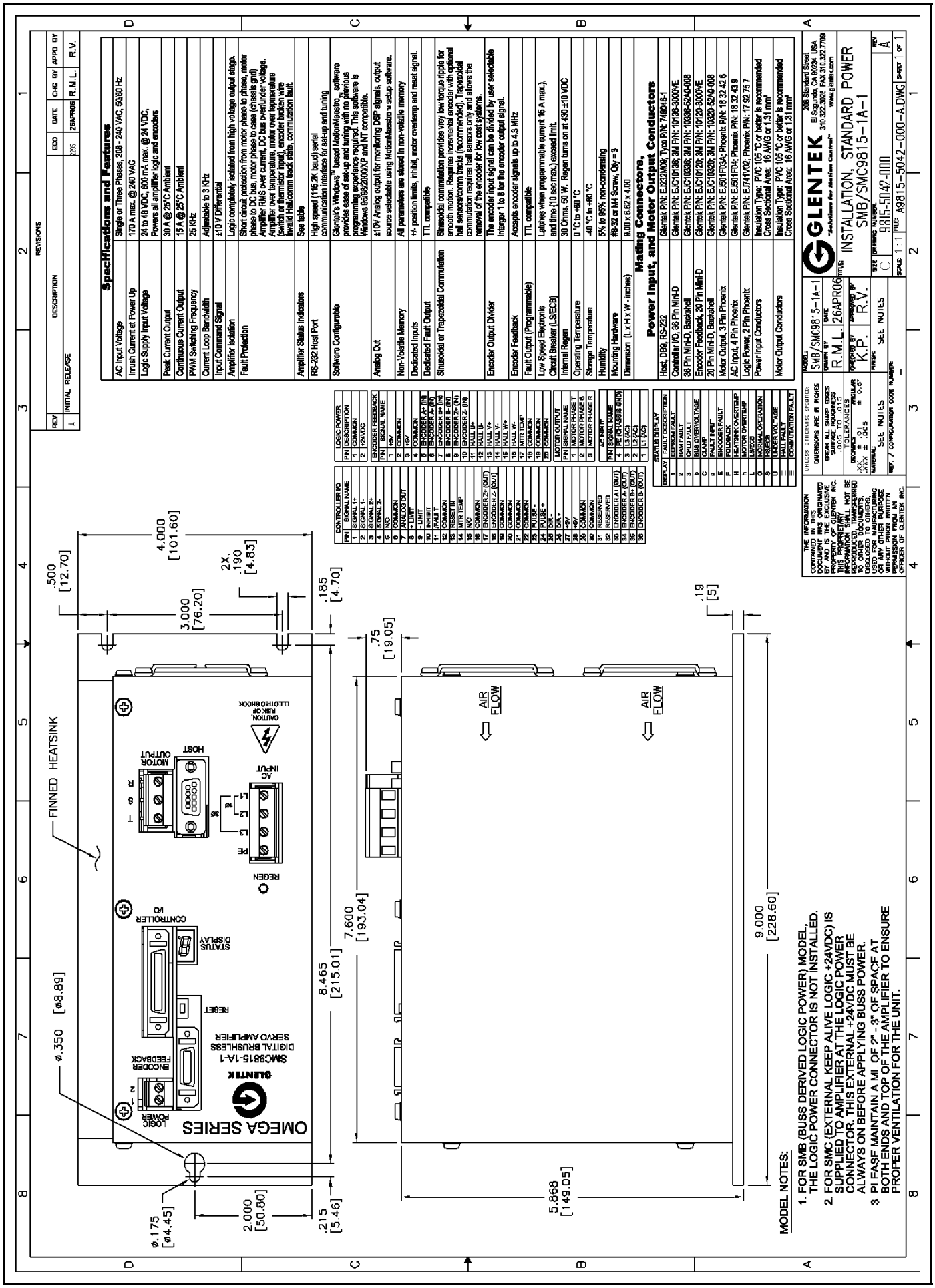
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
SURFACE ROUGHNESS .005 TO .015
DECIMAL TOLERANCES
.XX ± .01
.XXX ± .005
ANGULAR ± 0.5°
MATERIAL SEE NOTES
FINISH SEE NOTES
REF. / CONFIGURATION CODE NUMBER: –
MODEL SMB/SMC9715
DRAWN BY R.M.L.
DATE 07AUG07
CHECKED BY R.B.
APPROVED BY L.C.
GLENTEK
"Solutions for Motion Control"
208 Standard Street El Segundo, CA 90245 USA 310.322.3026 FAX 310.322.7709 www.glentek.com
TITLE: INSTALLATION, STANDARD POWER SMB/SMC9715 4-AXIS
SIZE C
DRAWING NUMBER 9715-1005-000
REV A
SCALE 1:1
FILE: 9715-1005-000-A.DWG
SHEET 1 OF 1


FUSE TABLE
F1, F2, F3 30A, 250VAC, BLN
F4, F5, F6, F7 20A, 250VAC, MDA
F8 2A, 250VAC, AGC
ISOMETRIC VIEW
SPECIFICATIONS
AC INPUT VOLTAGE 110 – 130 VAC, 10, 30, 50/60 Hz
208 – 240 VAC, 10, 30, 50/60 Hz
FAN INPUT VOLTAGE 115 or 230 VAC, 10, 50/60 Hz
INRUSH CURRENT LIMITING SOLID STATE RELAYS
ZERO CROSSING TYPE
DC OUTPUT VOLTAGE 155 – 185 VDC (110–130 VAC INPUT)
295 – 340 VDC (208–240 VAC INPUT)
OUTPUT CURRENT 50 A
INTERNAL REGEN 30 OHMS, 55W
REGEN VOLTAGE 230±10 VDC (110–130 VAC INPUT)
430±10 VDC (208–240 VAC INPUT)
POWER INPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CROSS SECTIONAL AREA: 12 AWG OR 3.31 mm²
MOTOR OUTPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CROSS SECTIONAL AREA: 16 AWG OR 1.31 mm²
NOTES:
1. READ LABEL TO DETERMINE NOMINAL INPUT VOLTAGE (120VAC OR 240VAC).
2. 120VAC VERSION: P1 CONNECTS TO P3 AND P2 CONNECTS TO P4.
3. 240VAC VERSION: P2 CONNECTS TO P3, P1 AND P4 ARE NOT USED.
4. 120VAC VERSION: REGEN SHUNTS WHEN B+ REACHES 225VDC.
5. 240VAC VERSION: REGEN SHUNTS WHEN B+ REACHES 425VDC.
6. SSR1 AND SSR2 ARE ZERO-CROSSING SOLID STATE RELAYS.
7. ALL UNITS ARE IN INCHES [MILLIMETERS].
GLENTEK
INSTALLATION, POWER SUPPLY, GP8600-7030-000
8600-7030-000
GP8600-70
S.A.S. 12AUG99
C.V.
LABEL
REGEN SHUNT LED
CAUTION, RISK OF ELECTRIC SHOCK
GLENTEK CP8600-70 POWER SUPPLY
10.21 [259.3]
6.33 [160.8]
6.09 [154.7]
2.06 [52.3]
2.79 [70.9]
3.06 [77.7]
.45 [11.4]
2X, .22 [5.6]
J1-1 B+ / AXIS 1
J1-2 B- / AXIS 1
J1-3 B+ / AXIS 2
J1-4 B- / AXIS 2
J1-5 B+ / AXIS 3
J1-6 B- / AXIS 3
J1-7 B+ / AXIS 4
J1-8 B- / AXIS 4


Specifications and Features
AC Input Power — Single Phase, 208 - 240 VAC, 50/60 Hz
Inrush Current at Power Up — 170 A max. @ 240 VAC
Logic Supply Input Power — 24 to 48 VDC, 600 mA max @ 24 VDC
Powers all amplifier logic and encoders
Peak Current Output — 8 A @ 25C Ambient
Continuous Current Output — 4 A @ 25C Ambient
PWM Switching Frequency — 25 kHz base / 50 kHz effective
Current Loop Bandwidth — Adjustable to 3 KHz
Amplifier Isolation — Logic completely isolated from high voltage output stage
Fault Protection — Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd)
Amplifier RMS over current, DC bus over/under voltage.
Amplifier over temperature
Motor over temperature (switch or thermistor input)
Encoder broken wire, invalid Hall/comm track states.
Commutation fault
Amplifier Status Indicators — 7 - Segment display indicates amplifier status and diagnostics
RS-232 Host Port — Host port for setup and monitoring
115.2 Kbaud, 8 bits, no parity, 1 stop bit
Software Configurable — All parameters are downloaded using the RS232 port and Glentek's Windows™ based MotionMaestro™ software.
Analog Out — ± 10 V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory — All parameters are stored in non-volatile memory
Dedicated Inputs — ± position limits, inhibit, fault, motor overtemp and reset signal
Encoder Output Divider — The encoder input signal can be divided by user selectable interger 1 to 8 for the encoder output signal.
Encoder Feedback — Accepts encoder signals up to 4.3 MHz
Smart Comm Initialization at Amplifier turn on — Eliminates the need for Hall sensor or commutation tracks for many applications.
Replace Stepper Drive — Glentek digital amplifiers can be programmed in pulse & direction microstepping mode to directly replace any step motor/step drive system.
Operating Temperature — 0 °C to +60 °C
Storage Temperature — -40 °C to +80 °C
Humidity — 5% to 95% non-condensing
Mounting Hardware — #8-32 or M5 Screw, Qty = 2
Dimension (L x H x W - inches) — 6.50 x 6.20 x 2.88
Mating Connectors, Power Input, and Motor Output Conductors
Logic Power, 2 Pin Phoenix — Glentek P/N: EJ701F026; Phoenix P/N: 18 94 90 3
Controller I/O, 36 Pin 3M — Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell — Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Power Motor, 5 Pin Phoenix — Glentek P/N: EJB81M05; Phoenix P/N: 1786262
Encoder Feedback, 20 Pin 3M — Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell — Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Host — Glentek P/N: EJF232M08; Tyco P/N: 746046-1
Power Input Conductors — Insulation Type: PVC 105 °C or better is recommended
Cross Sectional Area: 16 AWG or 1.31 mm²
Motor Output Conductors — Insulation Type: PVC 105 °C or better is recommended
Cross Sectional Area: 16 AWG or 1.31 mm²
+24VDC LOGIC PWR
PIN SIGNAL NAME
1 COMMON
2 +24 VDC
CONTROLLER I/O
PIN SIGNAL NAME
1 SIGNAL1+
2 SIGNAL1-
3 SIGNAL2+
4 SIGNAL2-
5 RESERVED
6 COMMON
7 ANALOG OUT
8 + LIMIT
9 - LIMIT
10 INHIBIT
11 FAULT OUT
12 COMMON
13 RESET IN
14 MTR TEMP
15 RESERVED
16 COMMON
17 ENCODER Z+ (OUT)
18 ENCODER Z- (OUT)
19 COMMON
20 COMMON
21 COMMON
22 COMMON
23 PULSE-
24 PULSE+
25 DIR-
26 DIR+
27 +5V OUT
28 +5V OUT
29 COMMON
30 COMMON
31 RESERVED
32 RESERVED
33 ENCODER A+ (OUT)
34 ENCODER A- (OUT)
35 ENCODER B+ (OUT)
36 ENCODER B- (OUT)
ENCODER FEEDBACK
PIN SIGNAL NAME
1 +5V
2 COMMON
3 +5V
4 COMMON
5 ENCODER A+ (IN)
6 ENCODER A- (IN)
7 ENCODER B+ (IN)
8 ENCODER B- (IN)
9 ENCODER Z+ (IN)
10 ENCODER Z- (IN)
11 HALL U+
12 HALL U-
13 HALL V+
14 HALL V-
15 HALL W+
16 HALL W-
17 MTR TEMP
18 COMMON
19 COMMON
20 COMMON
STATUS DISPLAY
DISPLAY DESCRIPTION
1 EEPROM FAULT
2 RAM FAULT
3 CPLD FAULT
b BUS OVERVOLTAGE
C CLAMP
c FAULT INPUT
E ENCODER FAULT
F FOLDBACK
H HEATSINK OVERTEMP
h MOTOR OVERTEMP
L I2FCR
O NORMAL OPERATION
S H3/EC3
U UNDER VOLTAGE
— HALL FAULT
≡ COMMUTATION FAULT
HOST
PIN SIGNAL NAME
1 RESERVED
2 TX232
3 RX232
4 RESERVED
5 GND
6 RESERVED
7 RESERVED
8 RESERVED
9 RESERVED
POWER/MOTOR
PIN SIGNAL NAME
1 L1 (AC)
2 L2 (AC)
3 MOTOR PHASE T
4 MOTOR PHASE S
5 MOTOR PHASE R
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
LOGIC POWER
COM +24VDC
CONTROLLER I/O
CAUTION, RISK OF ELECTRIC SHOCK
PE
AC L1 L2
MOTOR T S R
SMC9808-1A-1
DIGITAL BRUSHLESS SERVO AMPLIFIER
GLENTEK OMEGA SERIES
ENCODER FEEDBACK
RESET
STATUS DISPLAY
HOST
6.12 [155.5]
.18 [4.6]
1.44 [36.6]
2.88 [74]
2X, .19 [5]
MOUNTING SCREW ACCESS EACH END
5.45 [139]
2.5 [63.5]
6.20 [158]
6.50 [166]
.19 [5]
GLENTEK
208 Standard Street
El Segundo, CA 90245 USA
310.322.3026 FAX 310.322.7709
www.glentek.com
INSTALLATION,
SMB/SMC9808-1A-1
9808-1009-000
9808-1009-000-A.DWG
SMB/SMC9808-1A-1
R.M.L. 19FEB07
L.C.
D.V.
SCALE: 1.5:1
SHEET 1 OF 1


Specifications and Features
AC Input Voltage — Single or Three Phases, 208 - 240 VAC, 50/60 Hz
Inrush Current at Power Up — 170 A max. @ 240 VAC
Logic Supply Input Voltage — 24 to 48 VDC, 600 mA max. @ 24 VDC, Powers all amplifier logic and encoders
Peak Current Output — 30 A @ 25°C Ambient
Continuous Current Output — 15 A @ 25°C Ambient
PWM Switching Frequency — 25 KHz
Current Loop Bandwidth — Adjustable to 3 KHz
Input Command Signal — ±10 V Differential
Amplifier Isolation — Logic completely isolated from high voltage output stage.
Fault Protection — Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd) Amplifier RMS over current, DC bus overtunder voltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire, Invalid Hall comm track state, commutation fault.
Amplifier Status Indications — See table
RS-232 Host Port — High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable — Glentek's Windows™ based MotionMaestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 98/98SE/2000/XP and NT compatible.
Analog Out — ±10V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory — All parameters are stored in non-volatile memory
Dedicated Inputs — +/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output — TTL compatible
Sinusoidal or Trapezoidal Commutation — Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider — The encoder input signal can be divided by user selectable Interger 1 to 8 for this encoder output signal.
Encoder Feedback — Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable) — TTL compatible
Low Speed Electronic Circuit Breaker (LSECB) — Latches when programmable current (5 A max.), and time (10 sec max.) exceed limit.
Internal Regen — 30 Ohms, 50 W. Regen turns on at +30 ±10 VDC
Operating Temperature — 0 °C to +60 °C
Storage Temperature — -40 °C to +80 °C
Humidity — 5% to 95% non-condensing
Mounting Hardware — #8-32 or M4 Screw, Qty = 3
Dimension (L x H x W - inches) — 9.00 x 6.62 x 4.00
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232 — Glentek P/N: E-D23M09; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D — Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell — Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D — Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell — Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Motor Output, 3 Pin Phoenix — Glentek P/N: EJ501F03A; Phoenix P/N: 18 32 42 8
AC Input, 4 Pin Phoenix — Glentek P/N: EJ501F04; Phoenix P/N: 18 32 43 9
Logic Power, 2 Pin Phoenix — Glentek P/N: EJ741V02; Phoenix P/N: 17 92 75 7
Power Input Conductors — Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
Motor Output Conductors — Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
CONTROLLER I/O
LOGIC POWER
ENCODER FEEDBACK
STATUS DISPLAY
AC INPUT
MOTOR OUTPUT
FINNED HEATSINK
OMEGA SERIES
SMC9815-1A-1
DIGITAL BRUSHLESS SERVO AMPLIFIER
GLENTEK
RESET
STATUS DISPLAY
CONTROLLER I/O
ENCODER FEEDBACK
LOGIC POWER
MOTOR OUTPUT
AC INPUT
REGEN
HOST
CAUTION. RISK OF ELECTRIC SHOCK
AIR FLOW
AIR FLOW
.500 [12.70]
4.000 [101.60]
3.000 [76.20]
2X, .190 [4.83]
.185 [4.70]
.75 [19.05]
.19 [5]
8.465 [215.01]
7.600 [193.04]
9.000 [228.60]
5.868 [149.05]
ø.350 [ø8.89]
ø.175 [ø4.45]
2.000 [50.80]
.215 [5.46]
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. PLEASE MAINTAIN A MI. OF 2" - 3" OF SPACE AT BOTH ENDS AND TOP OF THE AMPLIFIER TO ENSURE PROPER VENTILATION FOR THE UNIT.
GLENTEK
208 Standard Street, El Segundo, CA 90245 USA
310.322.3026 FAX:310.322.7709
www.glentek.com
INSTALLATION, STANDARD POWER SMB/SMC9815-1A-1
MODEL: SMB/SMC9815-1A-1
DRAWN BY: R.M.L.
DATE: 26APR06
DRAWING NUMBER: 9815-5047-000
SIZE: C
REV: A
SCALE: 1:1
FILE: A9815-5042-000-A.DWG
SHEET 1 OF 1
REVISIONS
REV A — INITIAL RELEASE — ECO 7295 — DATE 26APR06 — CHG BY R.M.L. — APPD BY R.V.
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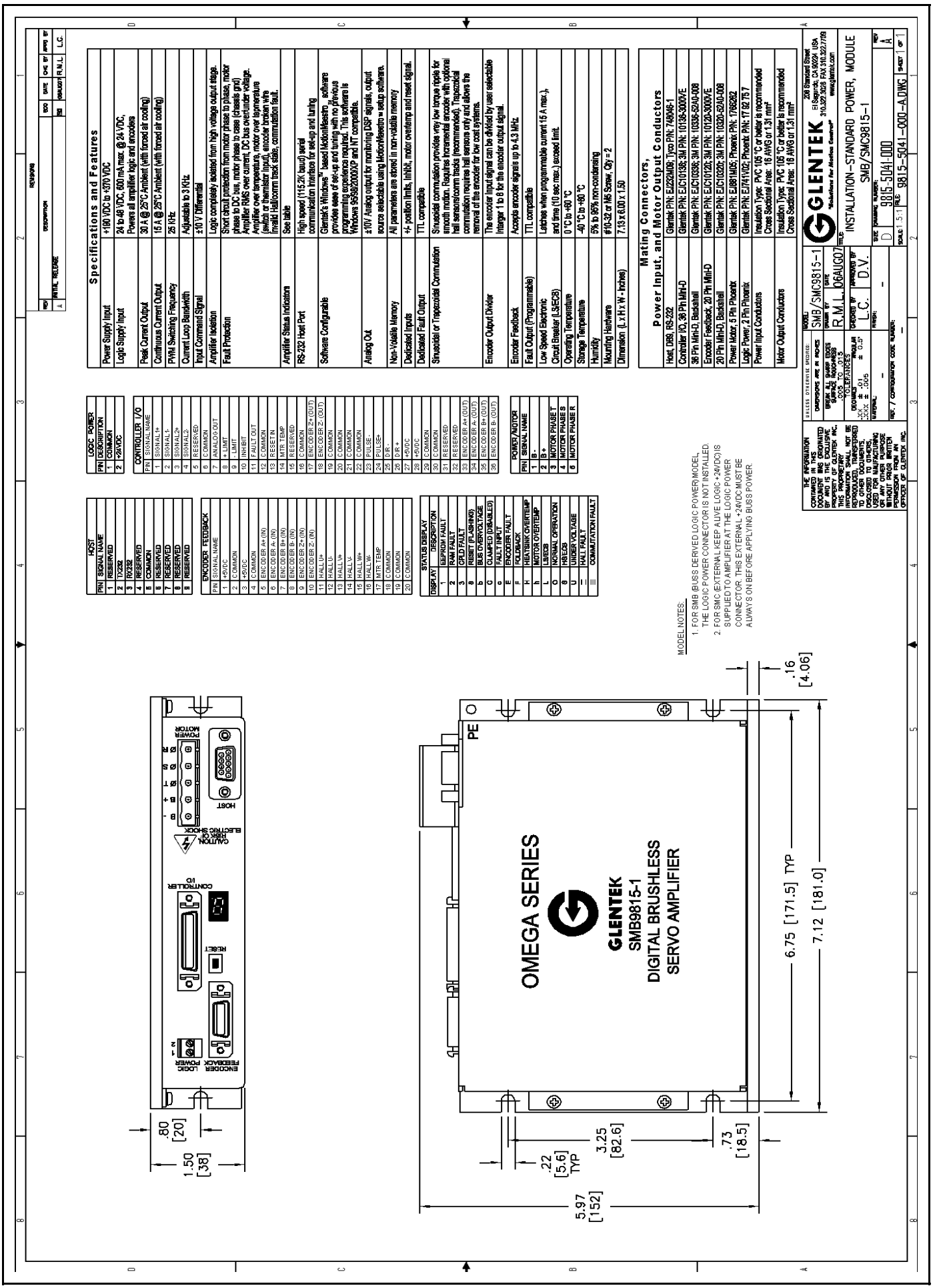
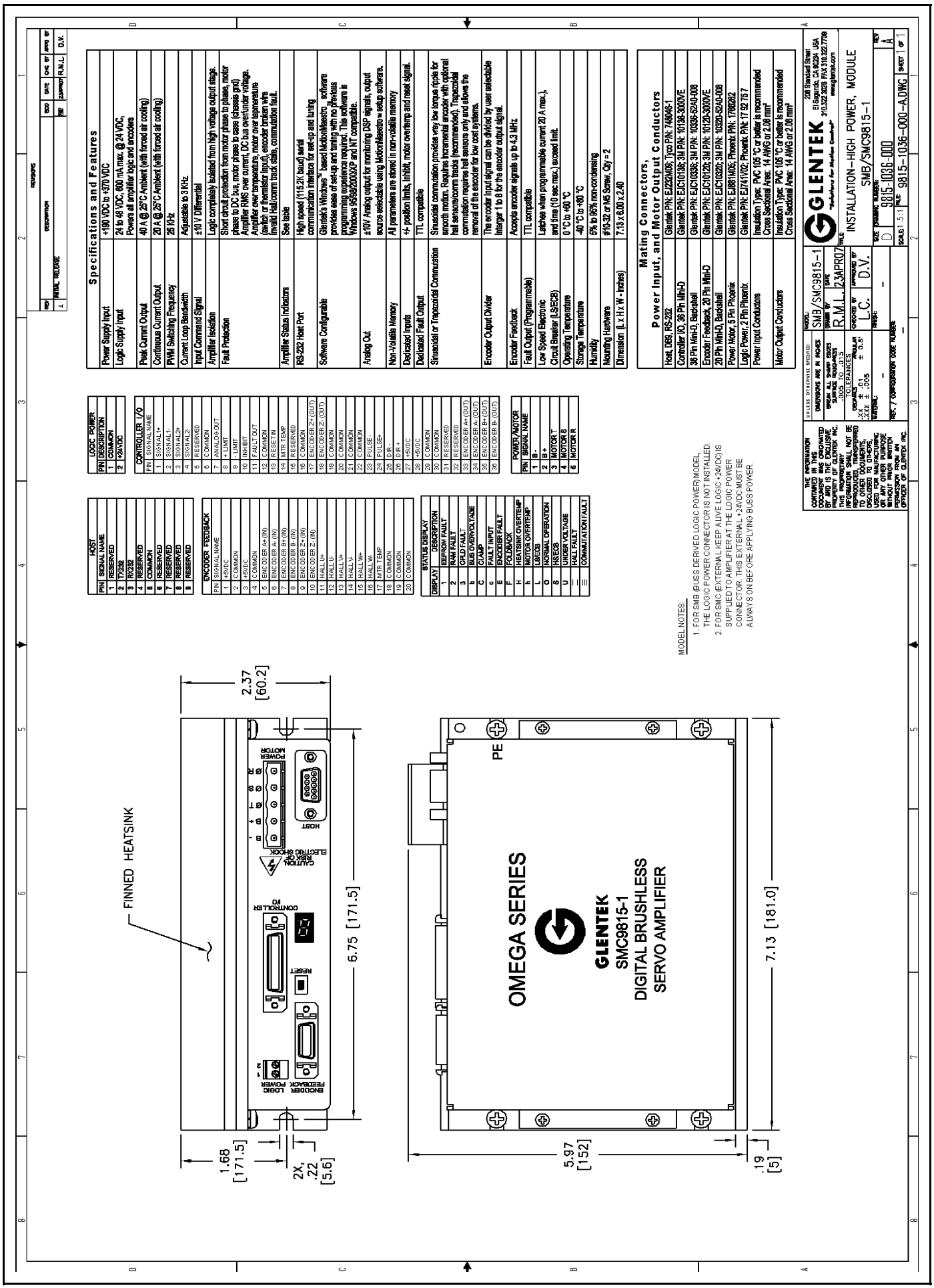

Specifications and Features
Power Supply Input
+180 VDC to +370 VDC
Logic Supply Input
24 to 48 VDC, 600 mA max. @ 24 VDC, Powers all amplifier logic and encoders
Peak Current Output
30 A @ 25°C Ambient (with forced air cooling)
Continuous Current Output
15 A @ 25°C Ambient (with forced air cooling)
PWM Switching Frequency
25 kHz
Current Loop Bandwidth
Adjustable to 3 KHz
Input Command Signal
±10 V Differential
Amplifier Isolation
Logic completely isolated from high voltage output stage.
Fault Protection
Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd). Amplifier RMS over current, DC bus overcurrent, voltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire (invalid Hall/comm state, commutation fault.
Amplifier Status Indications
See table
RS-232 Host Port
High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable
Glentek's Windows™ based MotionMeestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 95/98/2000/XP and NT compatible.
Analog Out
±10V analog output for monitoring DSP signals, output source selectable using MotionMeestro™ setup software.
Non-Volatile Memory
All parameters are stored in non-volatile memory
Dedicated Inputs
+/- position limits, Inhibit, motor overtemp and reset signal.
Dedicated Fault Output
TTL compatible
Sinusoidal or Trapezoidal Commutation
Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider
The encoder input signal can be divided by user selectable Integer 1 to 6 for this encoder output signal.
Encoder Feedback
Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable)
TTL compatible
Low Speed Electronic Circuit Breaker (LSECB)
Latches when programmable current 15 A max.), and time (10 sec max.) exceed limit.
Operating Temperature
0°C to +60 °C
Storage Temperature
-40 °C to +80 °C
Humidity
5% to 95% non-condensing
Mounting Hardware
#10-32 or M5 Screw, Qty = 2
Dimension (L x H x W - Inches)
7.13 x 6.00 x 1.50
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232
Glentek P/N: EJ229/A09; Tyco P/N: 748046-1
Controller I/O, 36 Pin MiniD
Glentek P/N: EJC/C1036; 3M P/N: 10136-3000VE
36 Pin MiniD, Backshell
Glentek P/N: EJC/C1036; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin MiniD
Glentek P/N: EJC/C1020; 3M P/N: 10120-3000VE
20 Pin MiniD, Backshell
Glentek P/N: EJC/C1020; 3M P/N: 10320-52A0-008
Power Motor, 5 Pin Phoenix
Glentek P/N: EJ/881/M05; Phoenix P/N: 1766282
Logic Power, 2 Pin Phoenix
Glentek P/N: EJ/741/V02; Phoenix P/N: 17 92 757
Power Input Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
Motor Output Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 16 AWG or 1.31 mm²
HOST
PIN SIGNAL NAME
1 RESERVED
2 TX232
3 RX232
4 RESERVED
5 COMMON
6 RESERVED
7 RESERVED
8 RESERVED
9 RESERVED
ENCODER FEEDBACK
PIN SIGNAL NAME
1 +5VDC
2 COMMON
3 +5VDC
4 COMMON
5 ENCODER A+ (IN)
6 ENCODER A- (IN)
7 ENCODER B+ (IN)
8 ENCODER B- (IN)
9 ENCODER Z+ (IN)
10 ENCODER Z- (IN)
11 HALL U+
12 HALL U-
13 HALL V+
14 HALL V-
15 HALL W+
16 HALL W-
17 MTR TEMP
18 COMMON
19 COMMON
20 COMMON
LOGIC POWER
PIN DESCRIPTION
1 COMMON
2 +24VDC
CONTROLLER I/O
PIN SIGNAL NAME
1 SIGNAL1+
2 SIGNAL1-
3 SIGNAL2+
4 SIGNAL2-
5 RESERVED
6 COMMON
7 ANALOG OUT
8 + LIMIT
9 - LIMIT
10 INH BIT
11 FAULT OUT
12 COMMON
13 RESET IN
14 MTR TEMP
15 RESERVED
16 COMMON
17 ENCODER Z+ (OUT)
18 ENCODER Z- (OUT)
19 COMMON
20 COMMON
21 COMMON
22 COMMON
23 PULSE+
24 PULSE-
25 DIR -
26 DIR +
27 +5VDC
28 +5VDC
29 COMMON
30 COMMON
31 RESERVED
32 RESERVED
33 ENCODER A+ (OUT)
34 ENCODER A- (OUT)
35 ENCODER B+ (OUT)
36 ENCODER B- (OUT)
STATUS DISPLAY
DISPLAY DESCRIPTION
1 EEPROM FAULT
2 PWM FAULT
3 I2t FAULT
8 RESET (F-48=HW)
b BUS OVERVOLTAGE
C CLAMPED (DISABLED)
d FAULT INPUT
E ENCODER FAULT
F FOLDBACK
H HEATSINK OVERTEMP
h MOTOR OVERTEMP
L LSECB
O NORMAL OPERATION
U UNDERVOLTAGE
= HALL FAULT
≡ COMMUTATION FAULT
POWER/MOTOR
PIN SIGNAL NAME
1 B-
2 B+
3 MOTOR PHASE T
4 MOTOR PHASE S
6 MOTOR PHASE R
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL) KEEP AUX VE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
OMEGA SERIES
GLENTEK
SMB9815-1
DIGITAL BRUSHLESS
SERVO AMPLIFIER
HOST
POWER MOTOR
LOGIC POWER
ENCODER FEEDBACK
CONTROLLER I/O
RESET
PE
.80 [20]
1.50 [38]
.22 [5.6] TYP
3.25 [82.6]
.73 [18.5]
5.97 [152]
6.75 [171.5] TYP
7.12 [181.0]
.16 [4.06]
GLENTEK
208 Standard Street El Segundo, CA 90245 USA
310.322.3026 FAX 310.322.7709
www.glentek.com
INSTALLATION-STANDARD POWER, MODULE
SMB/SMC9815-1
9815-5041-000
9815-5041-000-A.DWG


Specifications and Features
Power Supply Input +180 VDC to +370 VDC
Logic Supply Input 24 to 48 VDC, 600 mA max. @ 24 VDC, Powers all amplifier logic and encoders
Peak Current Output 40 A @ 25°C Ambient (with forced air cooling)
Continuous Current Output 20 A @ 25°C Ambient (with forced air cooling)
PWM Switching Frequency 25 kHz
Current Loop Bandwidth Adjustable to 3 kHz
Input Command Signal ±10 V Differential
Amplifier Isolation Logic completely isolated from high voltages output stage.
Fault Protection Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd) Amplifier RMS over current, DC bus over/under voltage. Amplifier over temperature, motor over temperature (sw/tch or thermistor input), encoder broken wire Invalid Hall/comm track state, commutation fault.
Amplifier Status Indications See table
RS-232 Host Port High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable Glentek's Windows® based MotionMeastro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 95/98/2000/XP and NT compatible.
Analog Out ±10V Analog output for monitoring DSP signals, output source selectable using MotionMeastro™ setup software.
Non-Volatile Memory All parameters are stored in non-volatile memory
Dedicated Inputs +/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output TTL compatible
Sinusoidal or Trapezoidal Commutation Sinusoidal commutation provides very low torque ripple for smooth motion. Requires Incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider The encoder input signal can be divided by user selectable integer 1 to 8 for the encoder output signal.
Encoder Feedback Accepts encoder signals up to 4.3 MHz.
Fault Output (Programmable) TTL compatible
Low Speed Electronic Circuit Breaker (LSECB) Latches when programmable current 20 A max.), and time (10 sec max.) exceed limit.
Operating Temperature 0°C to +60 °C
Storage Temperature -40 °C to +80 °C
Humidity 5% to 95% non-condensing
Mounting Hardware #10-32 or M5 Screw, Qty = 2
Dimension (L x H x W - Inches) 7.13 x 6.00 x 2.40
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232 Glentek P/N: EJ232A009; Tyco P/N: 748046-1
Controller I/O, 36 Pin MiniHD Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin MiniHD, Backshell Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin MiniHD Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin MiniHD, Backshell Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Power Motor, 5 Pin Phoenix Glentek P/N: EJ881M05; Phoenix P/N: 1708262
Logic Power, 2 Pin Phoenix Glentek P/N: EJ741V02; Phoenix P/N: 17 92 767
Power Input Conductors Insulation Types: PVC 105 °C or better is recommended Cross Sectional Area: 14 AWG or 2.08 mm²
Motor Output Conductors Insulation Types: PVC 105 °C or better is recommended Cross Sectional Area: 14 AWG or 2.08 mm²
HOST
PIN SIGNAL NAME
1 RESERVED
2 TX232
3 RX232
4 RESERVED
5 COMMON
6 RESERVED
7 RESERVED
8 RESERVED
9 RESERVED
LOGIC POWER
PIN DESCRIPTION
1 COMMON
2 +24VDC
CONTROLLER I/O
PIN SIGNAL NAME
1 SIGNAL+
2 SIGNAL-
3 SIGNAL2+
4 SIGNAL2-
5 RESERVED
6 COMMON
7 ANALOG OUT
8 + LIMIT
9 - LIMIT
10 INH BIT
11 FAULT OUT
12 COMMON
13 RESET IN
14 MTR TEMP
15 RESERVED
16 COMMON
17 ENCODER Z+ (OUT)
18 ENCODER Z- (OUT)
19 COMMON
20 COMMON
21 COMMON
22 COMMON
23 PULSE-
24 PULSE+
25 DIR-
26 DIR+
27 +5VDC
28 +5VDC
29 COMMON
30 COMMON
31 RESERVED
32 RESERVED
33 ENCODER A+ (OUT)
34 ENCODER A- (OUT)
35 ENCODER B+ (OUT)
36 ENCODER B- (OUT)
ENCODER FEEDBACK
PIN SIGNAL NAME
1 +5VDC
2 COMMON
3 +5VDC
4 COMMON
5 ENCODER A+ (IN)
6 ENCODER A- (IN)
7 ENCODER B+ (IN)
8 ENCODER B- (IN)
9 ENCODER Z+ (IN)
10 ENCODER Z- (IN)
11 HALL U+
12 HALL U-
13 HALL V+
14 HALL V-
15 HALL W+
16 HALL W-
17 MTR TEMP
18 COMMON
19 COMMON
20 COMMON
STATUS DISPLAY
DISPLAY DESCRIPTION
1 EEPROM FAULT
2 RAM FAULT
3 CPLD FAULT
b BUS OVERVOLTAGE
C CLAMP
c FAULT INPUT
E ENCODER FAULT
F FOLDBACK
H HEATSINK OVERTEMP
h MOTOR OVERTEMP
L LSECB3
O NORMAL OPERATION
S HSECB
U UNDER VOLTAGE
= HALL FAULT
≡ COMMUTATION FAULT
POWER/MOTOR
PIN SIGNAL NAME
1 B-
2 B+
3 MOTOR T
4 MOTOR B
6 MOTOR R
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL) KEEP ALIVE LOGIC +24V (VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
FINNED HEATSINK
2.37 [60.2]
6.75 [171.5]
1.68 [171.5]
2X, .22 [5.6]
OMEGA SERIES
GLENTEK
SMC9815-1
DIGITAL BRUSHLESS
SERVO AMPLIFIER
PE
5.97 [152]
7.13 [181.0]
.19 [5]
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
SURFACE ROUGHNESS
FINISH
TOLERANCES
DECIMALS
.XX ± .02
.XXX ± .005
ANGULAR ± 0.5°
MATERIAL
FINISH
DRAWN BY R.M.L. 23APR07
CHECKED BY L.C.
APPROVED BY D.V.
MODEL: SMB/SMC9815-1
TITLE: INSTALLATION-HIGH POWER, MODULE SMB/SMC9815-1
SIZE D
DRAWING NUMBER: 9815-1036-000
REV A
SCALE 1.5:1
WEIGHT
SHEET 1 OF 1
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
REF. / CONFIGURATION CODE NUMBERS: -
GLENTEK 208 Standard Street El Segundo, CA 90245 USA 310.322.3026 FAX 310.322.7709 www.glentek.com
9815-1036-000-A.DWG
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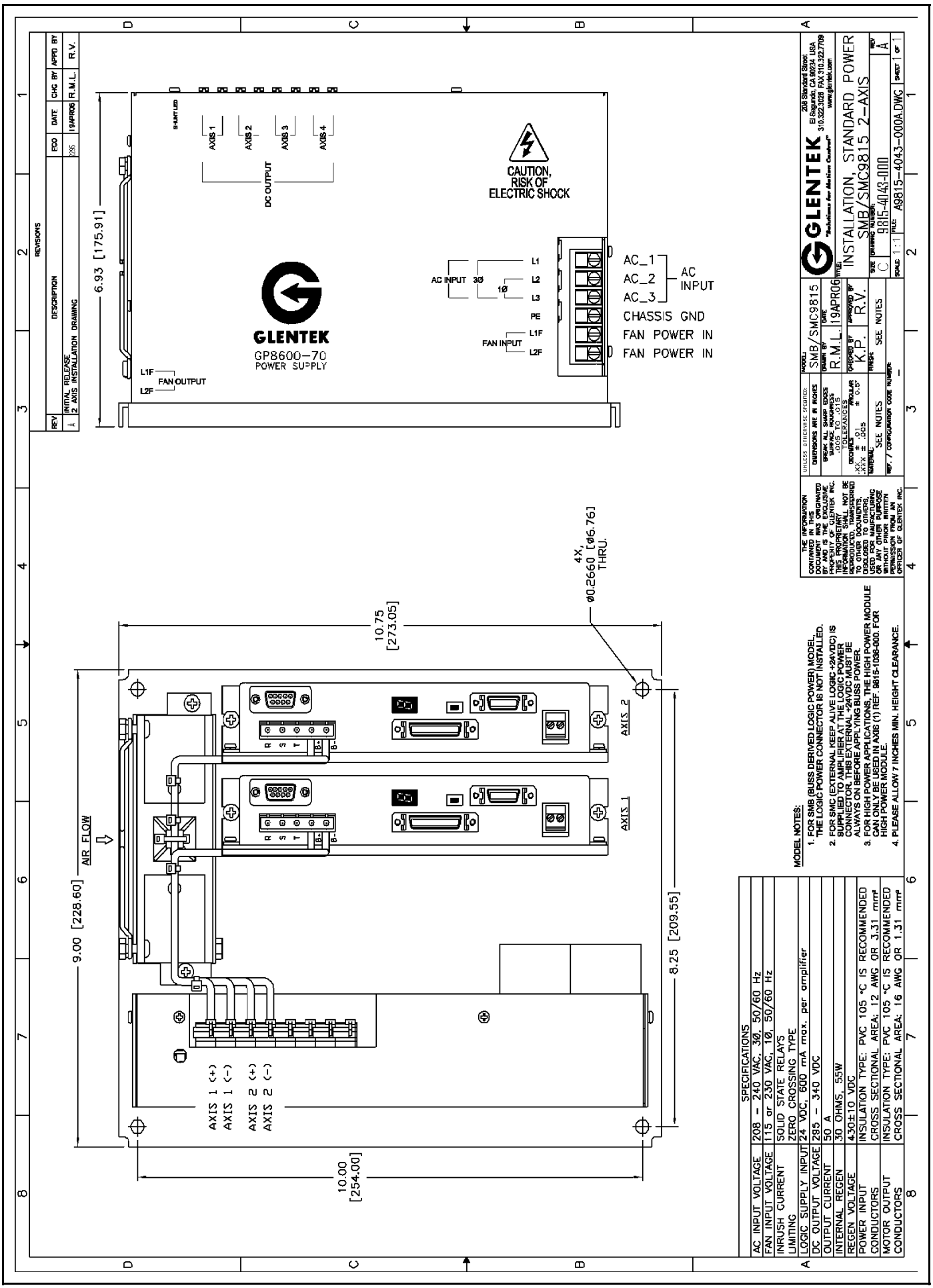
REVISIONS
REV
DESCRIPTION
ECO
DATE
CHG BY
APPD BY
A
INITIAL RELEASE
2 AXIS INSTALLATION DRAWING
19APR06
R.M.L.
R.V.
6.93 [175.91]
SHUNT LED
AXIS 1
AXIS 2
AXIS 3
AXIS 4
DC OUTPUT
CAUTION, RISK OF ELECTRIC SHOCK
GLENTEK
GP8600-70
POWER SUPPLY
L1F
L2F
FAN OUTPUT
AC INPUT 3Ø
1Ø
L1
L2
L3
PE
L1F
L2F
FAN INPUT
AC_1
AC_2
AC_3
AC INPUT
CHASSIS GND
FAN POWER IN
FAN POWER IN
4X, Ø0.2660 [Ø6.76] THRU.
10.75 [273.05]
9.00 [228.60]
AIR FLOW
AXIS 2
AXIS 1
8.25 [209.55]
10.00 [254.00]
AXIS 1 (+)
AXIS 1 (-)
AXIS 2 (+)
AXIS 2 (-)
SPECIFICATIONS
AC INPUT VOLTAGE 208 - 240 VAC, 3Ø, 50/60 Hz
FAN INPUT VOLTAGE 115 or 230 VAC, 1Ø, 50/60 Hz
INRUSH CURRENT LIMITING SOLID STATE RELAYS ZERO CROSSING TYPE
LOGIC SUPPLY INPUT 24 VDC, 600 mA max. per amplifier
DC OUTPUT VOLTAGE 285 - 340 VDC
OUTPUT CURRENT 50 A
INTERNAL REGEN 30 OHMS, 55W
REGEN VOLTAGE 430±10 VDC
POWER INPUT INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CONDUCTORS CROSS SECTIONAL AREA: 12 AWG OR 3.31 mm²
MOTOR OUTPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED
CROSS SECTIONAL AREA: 16 AWG OR 1.31 mm²
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. FOR HIGH POWER APPLICATIONS, THE HIGH POWER MODULE CAN ONLY BE USED IN AXIS (1) REF. 9815-1038-000. FOR HIGH POWER MODULE.
4. PLEASE ALLOW 7 INCHES MIN. HEIGHT CLEARANCE.
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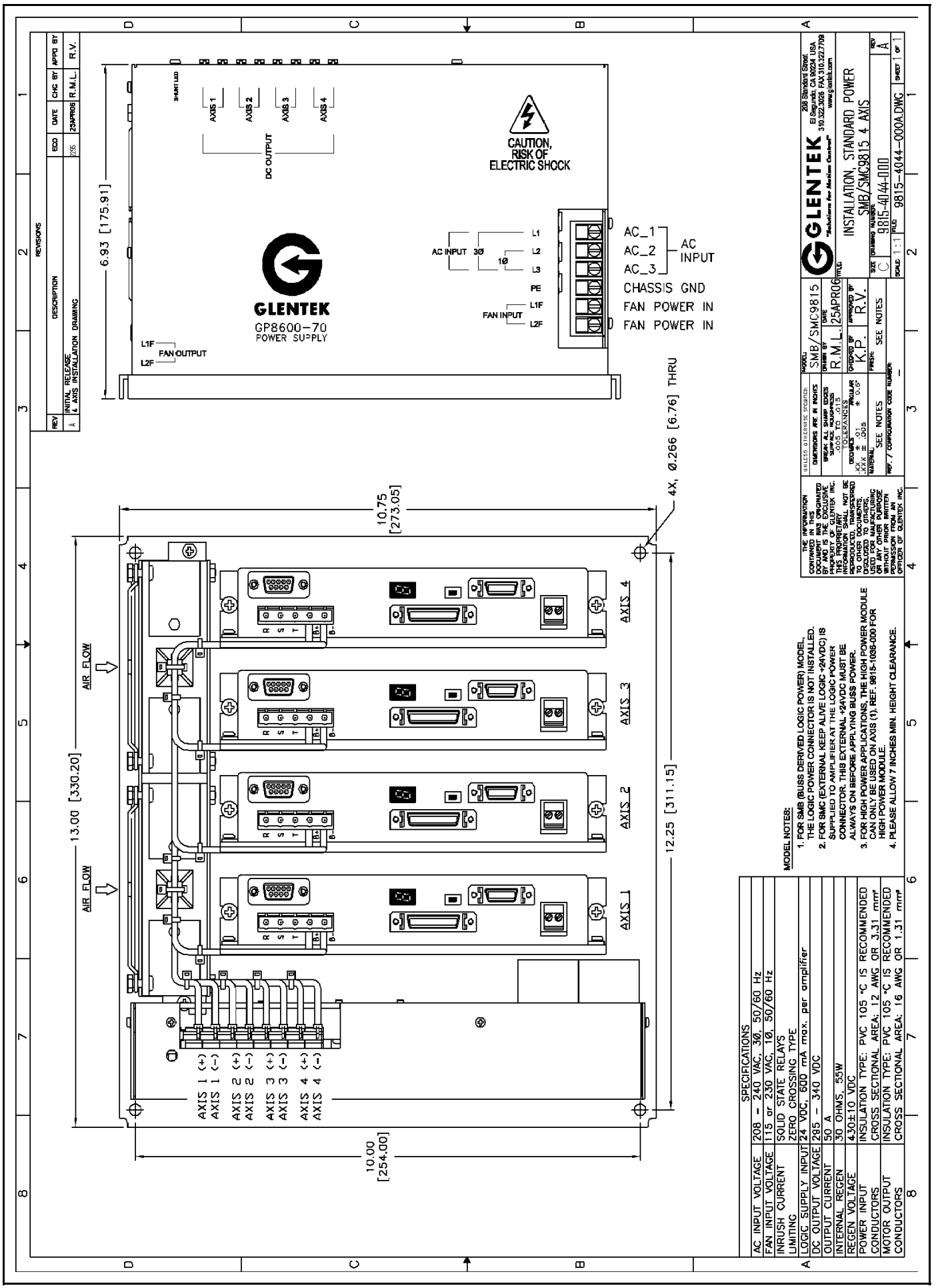
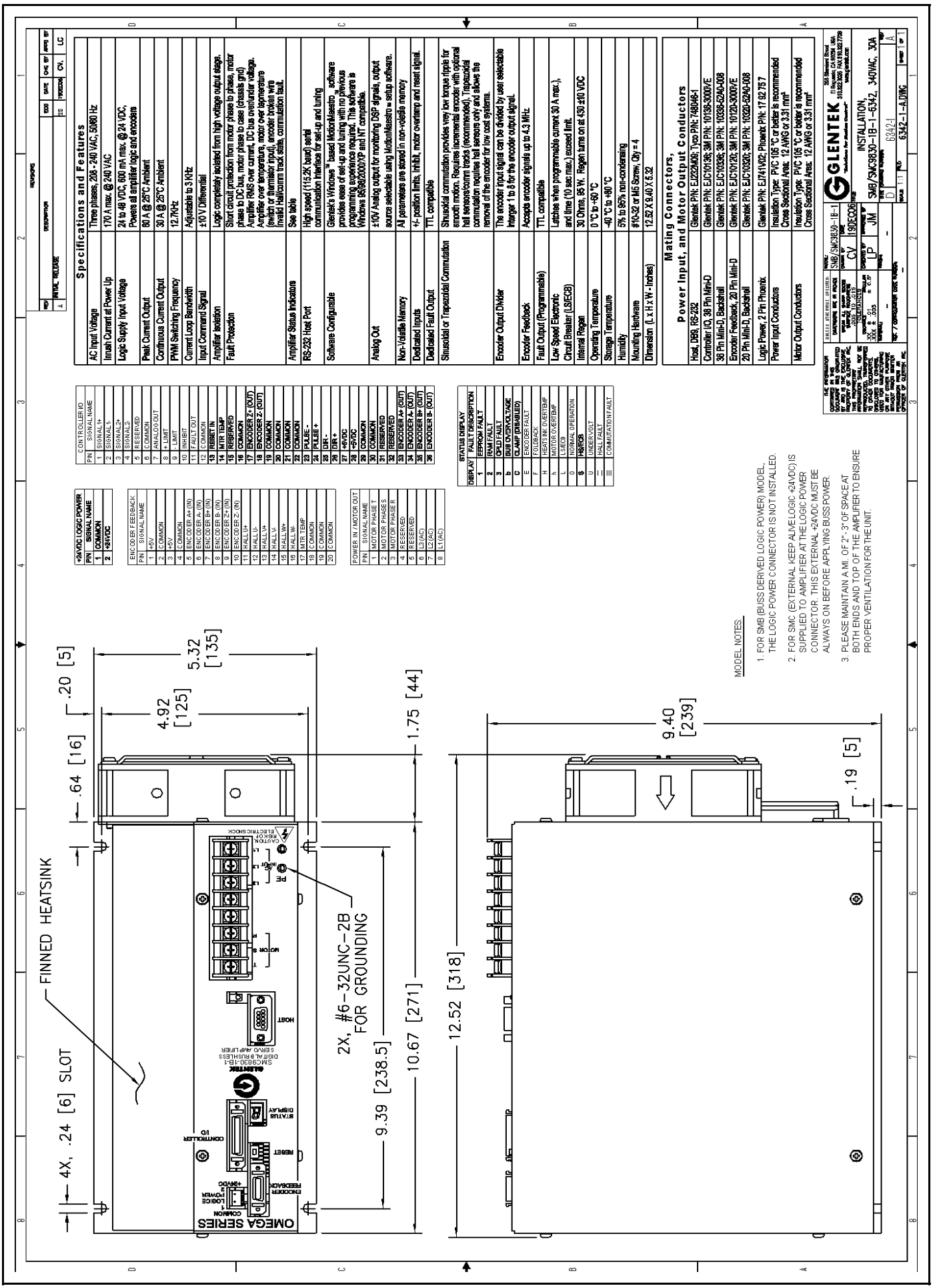
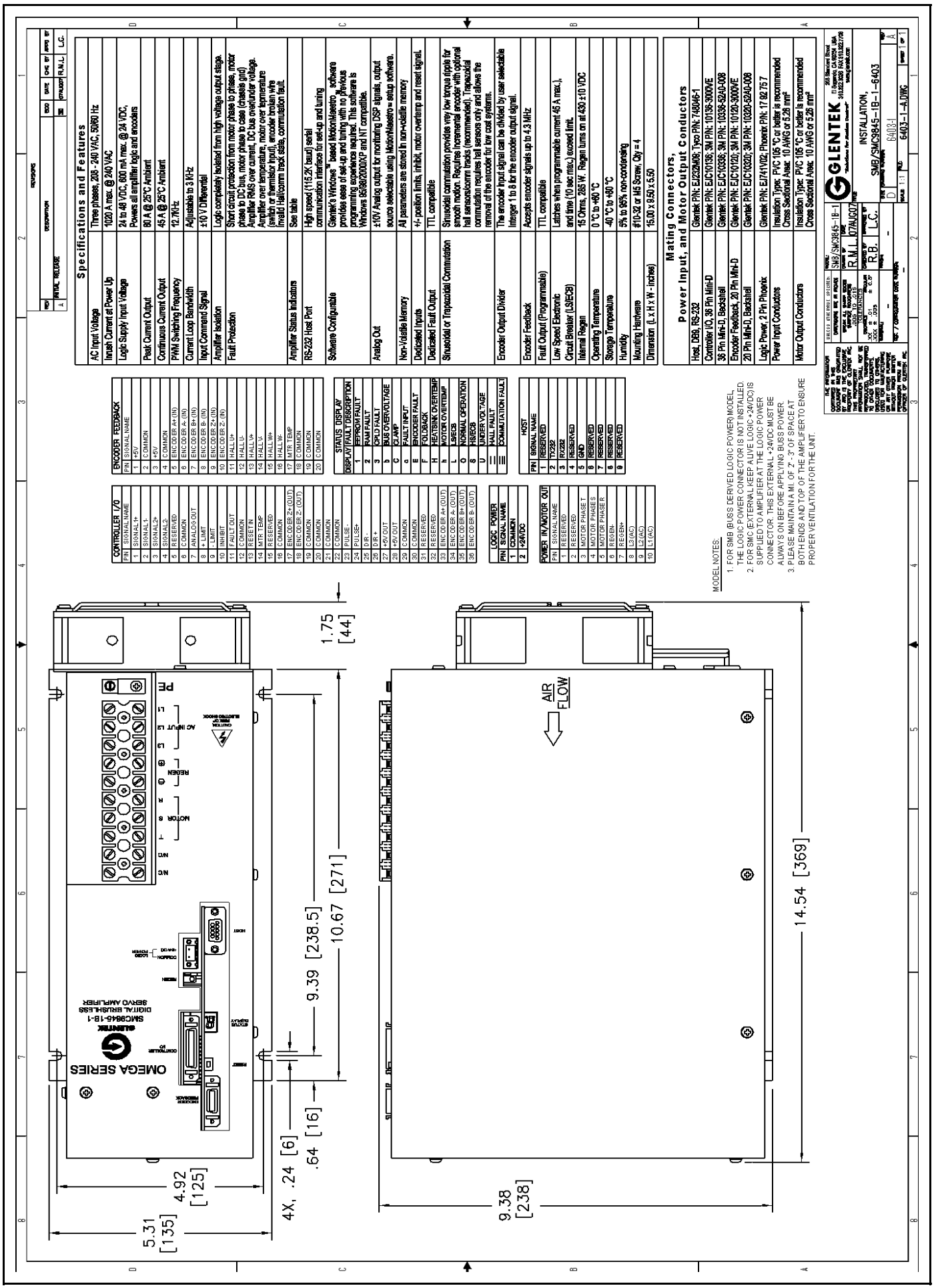
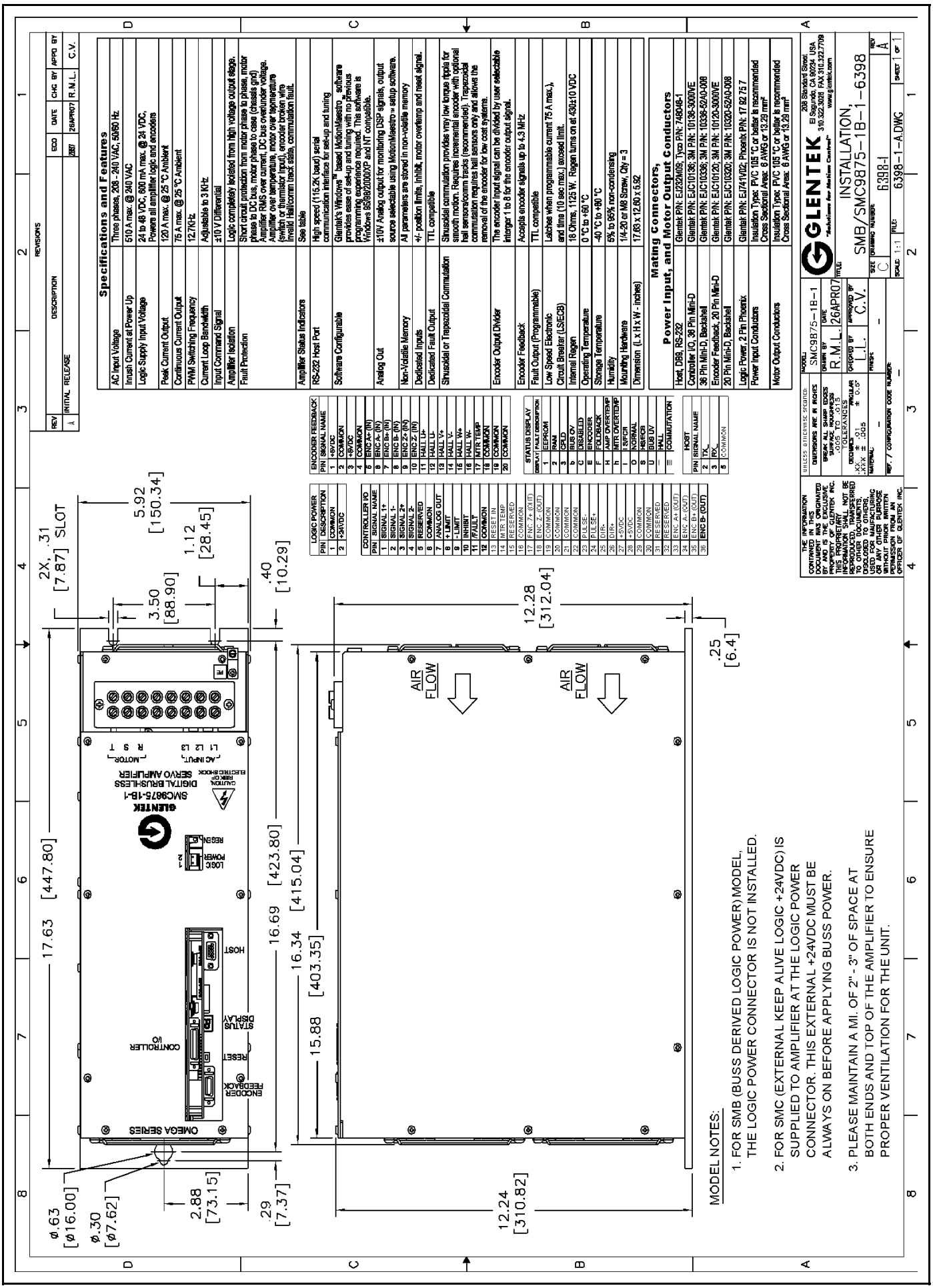
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
SURFACE ROUGHNESS .005 TO .015
TOLERANCES
DECIMALS ANGULAR
.XX ± .01 .XXX ± .005 ± 0.5°
MATERIAL SEE NOTES
FINISH SEE NOTES
REF. / CONFIGURATION CODE NUMBER: -
MODEL SMB/SMC9815
DRAWN BY R.M.L.
DATE 19APR06
APPROVED BY R.V.
DEPOSED BY K.P.
GLENTEK
208 Standard Street El Segundo, CA 90245 USA 310.322.3026 FAX 310.322.7709 www.glentek.com
TITLE: INSTALLATION, STANDARD POWER SMB/SMC9815 2-AXIS
SIZE C
DRAWING NUMBER: 9815-4043-000
REV A
SCALE 1:1
FILE: A9815-4043-000A.DWG
SHEET 1 OF 1


GLENTEK
GP8600-70
POWER SUPPLY
CAUTION, RISK OF ELECTRIC SHOCK
AC_1
AC_2
AC_3
AC INPUT
CHASSIS GND
FAN POWER IN
FAN POWER IN
AC INPUT 3Ø
1Ø
L1
L2
L3
PE
FAN INPUT
L1F
L2F
FAN OUTPUT
DC OUTPUT
AXIS 1
AXIS 2
AXIS 3
AXIS 4
6.93 [175.91]
10.75 [273.05]
4X, Ø.266 [6.76] THRU
13.00 [330.20]
12.25 [311.15]
10.00 [254.00]
AIR FLOW
AXIS 1 (+)
AXIS 1 (-)
AXIS 2 (+)
AXIS 2 (-)
AXIS 3 (+)
AXIS 3 (-)
AXIS 4 (+)
AXIS 4 (-)
REVISIONS
REV
DESCRIPTION
ECO
DATE
CHG BY
APPD BY
A
INITIAL RELEASE
4 AXIS INSTALLATION DRAWING
2295
25APR06
R.M.L.
R.V.
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. FOR HIGH POWER APPLICATIONS, THE HIGH POWER MODULE CAN ONLY BE USED ON AXIS (1). REF. 9815-1036-000 FOR HIGH POWER MODULE.
4. PLEASE ALLOW 7 INCHES MIN. HEIGHT CLEARANCE.
SPECIFICATIONS
AC INPUT VOLTAGE 208 - 240 VAC, 3Ø, 50/60 Hz
FAN INPUT VOLTAGE 115 or 230 VAC, 1Ø, 50/60 Hz
INRUSH CURRENT LIMITING SOLID STATE RELAYS ZERO CROSSING TYPE
LOGIC SUPPLY INPUT 24 VDC, 600 mA max. per amplifier
DC OUTPUT VOLTAGE 295 - 340 VDC
OUTPUT CURRENT 50 A
INTERNAL REGEN 30 OHMS, 55W
REGEN VOLTAGE 430±10 VDC
POWER INPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED CROSS SECTIONAL AREA: 12 AWG OR 3.31 mm²
MOTOR OUTPUT CONDUCTORS INSULATION TYPE: PVC 105 °C IS RECOMMENDED CROSS SECTIONAL AREA: 16 AWG OR 1.31 mm²
GLENTEK
208 Standard Street
El Segundo, CA 90234 USA
310.322.3026 FAX 310.322.7709
www.glentek.com
INSTALLATION, STANDARD POWER
SMB/SMC9815 4 AXIS
SIZE C
DRAWING NUMBER 9815-4044-000
REV A
SCALE 1:1
FILE 9815-4044-000A.DWG
SHEET 1 OF 1
MODEL: SMB/SMC9815
DRAWN BY R.M.L.
DATE 25APR06
CHECKED BY K.P.
APPROVED BY R.V.
FINISH: SEE NOTES
MATERIAL: SEE NOTES
REF. / CONFIGURATION CODE NUMBER: -
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES SURFACE ROUGHNESS .005 TO .015
TOLERANCES
DECIMALS .XX ± .01 .XXX ± .005
ANGULAR ± 0.5°
THE INFORMATION CONTAINED IN THIS DOCUMENT WAS ORIGINATED BY AND IS THE EXCLUSIVE PROPERTY OF GLENTEK INC. THIS PROPRIETARY INFORMATION SHALL NOT BE REPRODUCED, TRANSFERRED TO OTHER DOCUMENTS, DISCLOSED TO OTHERS, USED FOR MANUFACTURING OR ANY OTHER PURPOSE WITHOUT PRIOR WRITTEN PERMISSION FROM AN OFFICER OF GLENTEK INC.


Specifications and Features
AC Input Voltage
Three phases, 208 - 240 VAC, 50/60 Hz
Inrush Current at Power Up
170 A max. @ 240 VAC
Logic Supply Input Voltage
24 to 48 VDC, 600 mA max. @ 24 VDC. Powers all amplifier logic and encoders
Peak Current Output
60 A @ 25°C Ambient
Continuous Current Output
30 A @ 25°C Ambient
PWM Switching Frequency
12.7KHz
Current Loop Bandwidth
Adjustable to 3 KHz
Input Command Signal
±10 V Differential
Amplifier Isolation
Logic completely isolated from high voltage output stage.
Fault Protection
Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd) Amplifier RMS over current, DC bus over/under voltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire Invalid Hallcomm track state, commutation fault.
Amplifier Status Indicators
See table
RS-232 Host Port
High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable
Glentek's Windows™ based MotionMaestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 98/98SE/2000/XP and NT compatible.
Analog Out
±10V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory
All parameters are stored in non-volatile memory
Dedicated Inputs
+/- position limits, Inhibit, motor overtemp and reset signal.
Dedicated Fault Output
TTL compatible
Sinusoidal or Trapezoidal Commutation
Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider
The encoder input signal can be divided by user selectable Interger 1 to 8 for the encoder output signal.
Encoder Feedback
Accepts encoder signals up to 4.3 MHz.
Fault Output (Programmable)
TTL compatible
Low Speed Electronic Circuit Breaker (LSECB)
Latches when programmable current 30 A max.), and time (10 sec max.) exceed limit.
Internal Regen
30 Ohms, 95 W. Regen turns on at 450 ±10 VDC
Operating Temperature
0 °C to +50 °C
Storage Temperature
-40 °C to +90 °C
Humidity
5% to 95% non-condensing
Mounting Hardware
#10-32 or M5 Screw, Qty = 4
Dimension (L x H x W - inches)
12.52 X 9.40 X 5.32
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232
Glentek P/N: EJ222M09; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D
Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell
Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D
Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell
Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Logic Power, 2 Pin Phoenix
Glentek P/N: EJ741V02; Phoenix P/N: 17 92 757
Power Input Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 12 AWG or 3.31 mm²
Motor Output Conductors
Insulation Type: PVC 105 °C or better is recommended Cross Sectional Area: 12 AWG or 3.31 mm²
+24VDC LOGIC POWER
PIN | SIGNAL NAME
1 | COMMON
2 | +24VDC
ENCODER FEEDBACK
PIN | SIGNAL NAME
1 | +5V
2 | COMMON
3 | +5V
4 | COMMON
5 | ENCODER A+ (IN)
6 | ENCODER A- (IN)
7 | ENCODER B+ (IN)
8 | ENCODER B- (IN)
9 | ENCODER Z+ (IN)
10 | ENCODER Z- (IN)
11 | HALL U*
12 | HALL V*
13 | HALL W*
14 | HALL W*
15 | HALL V*
16 | HALL U*
17 | MTR TEMP
18 | COMMON
19 | COMMON
20 | COMMON
POWER IN / MOTOR OUT
PIN | SIGNAL NAME
1 | MOTOR PHASE T
2 | MOTOR PHASE S
3 | MOTOR PHASE R
4 | RESERVED
5 | RESERVED
6 | L3 (AC)
7 | L2 (AC)
8 | L1 (AC)
CONTROLLER I/O
PIN | SIGNAL NAME
1 | SIGNAL+
2 | SIGNAL-
3 | SIGNAL2+
4 | SIGNAL2-
5 | RESERVED
6 | COMMON
7 | ANALOG OUT
8 | + LIMIT
9 | - LIMIT
10 | INHIBIT
11 | FAULT OUT
12 | COMMON
13 | RESET IN
14 | MTR TEMP
15 | RESERVED
16 | COMMON
17 | ENCODER Z+ (OUT)
18 | ENCODER Z- (OUT)
19 | COMMON
20 | COMMON
21 | COMMON
22 | COMMON
23 | PULSE-
24 | PULSE+
25 | DIR-
26 | DIR+
27 | +5VDC
28 | +5VDC
29 | COMMON
30 | COMMON
31 | RESERVED
32 | RESERVED
33 | ENCODER A+ (OUT)
34 | ENCODER A- (OUT)
35 | ENCODER B+ (OUT)
36 | ENCODER B- (OUT)
STATUS DISPLAY
DISPLAY | FAULT DESCRIPTION
1 | EEPROM FAULT
2 | POWER FAULT
3 | I2T FAULT
5 | BUS OVERVOLTAGE
C | CL-AMP (FOLDBACK)
E | ENCODER FAULT
F | HALL FAULT
H | HEATSINK OVERTEMP
L | MOTOR OVERTEMP
O | NORMAL OPERATION
S | INHIBIT
U | UNDERVOLT
— | HALL FAULT
III | COMMUTATION FAULT
FINNED HEATSINK
4X, .24 [6] SLOT
.64 [16]
.20 [5]
4.92 [125]
5.32 [135]
2X, #6-32UNC-2B FOR GROUNDING
9.39 [238.5]
10.67 [271]
1.75 [44]
12.52 [318]
9.40 [239]
.19 [5]
OMEGA SERIES
SMC9830-1B-1
DISTRIBUTED BUS BRUSHLESS SERVO AMPLIFIER
CONTROLLER I/O
STATUS DISPLAY
RESET
ENCODER FEEDBACK
+5VDC
LOGIC POWER
COMMON
HOST
MOTOR
PE
CAUTION RISK OF ELECTRIC SHOCK
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. PLEASE MAINTAIN A MI. OF 2" - 3" OF SPACE AT BOTH ENDS AND TOP OF THE AMPLIFIER TO ENSURE PROPER VENTILATION FOR THE UNIT.
GLENTEK
INSTALLATION, SMB/SMC9830-1B-1-6342, 340VAC, 30A
6342-1-A.DWG


Specifications and Features
AC Input Voltage — Three phases, 208 - 240 VAC, 50/60 Hz
Inrush Current at Power Up — 1020 A max. @ 240 VAC
Logic Supply Input Voltage — 24 to 48 VDC, 600 mA max. @ 24 VDC, Powers all amplifier logic and encoders
Peak Current Output — 80 A @ 25°C Ambient
Continuous Current Output — 45 A @ 25°C Ambient
PWM Switching Frequency — 12.7KHz
Current Loop Bandwidth — Adjustable to 3 Khz
Input Command Signal — ±10 V Differential
Amplifier Isolation — Logic completely isolated from high voltage output stage.
Fault Protection — Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd). Amplifier RMS over current, DC bus over/under voltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire. Invalid Hall/comm track state, commutation fault.
Amplifier Status Indicators — See table
RS-232 Host Port — High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable — Glentek's Windows™ based MotionMaestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 95/98/2000/XP and NT compatible.
Analog Out — ±10V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory — All parameters are stored in non-volatile memory
Dedicated Inputs — +/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output — TTL compatible
Sinusoidal or Trapezoidal Commutation — Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider — The encoder input signal can be divided by user selectable integer 1 to 8 for the encoder output signal.
Encoder Feedback — Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable) — TTL compatible
Low Speed Electronic Circuit Breaker (LSECB) — Latches when programmable current 45 A max.), and time (10 sec max.) exceed limit.
Internal Regen — 15 Ohms, 285 W. Regen turns on at 430 ±10 VDC
Operating Temperature — 0 °C to +60 °C
Storage Temperature — -40 °C to +80 °C
Humidity — 5% to 95% non-condensing
Mounting Hardware — #10-32 or M5 Screw, Qty = 4
Dimension (L x H x W - inches) — 15.00 x 9.50 x 5.50
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232 — Glentek P/N: EJ232M09; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D — Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell — Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D — Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell — Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Logic Power, 2 Pin Phoenix — Glentek P/N: EJ741V02; Phoenix P/N: 17 82 757
Power Input Conductors — Insulation Types: PVC 105 °C or better is recommended. Cross Sectional Area: 10 AWG or 5.26 mm²
Motor Output Conductors — Insulation Types: PVC 105 °C or better is recommended. Cross Sectional Area: 10 AWG or 5.26 mm²
CONTROLLER I/O
ENCODER FEEDBACK
STATUS DISPLAY
LOGIC POWER
HOST
POWER IN/MOTOR OUT
MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL) KEEP ALIVE LOGIC +24VDC IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. PLEASE MAINTAIN A MI. OF 2" - 3" OF SPACE AT BOTH ENDS AND TOP OF THE AMPLIFIER TO ENSURE PROPER VENTILATION FOR THE UNIT.
OMEGA SERIES
DIGITAL BRUSHLESS SERVO AMPLIFIER
SMC9845-1B-1
AIR FLOW
4.92 [125]
5.31 [135]
4X, .24 [6]
.64 [16]
9.39 [238.5]
10.67 [271]
1.75 [44]
9.38 [238]
14.54 [369]
INSTALLATION, SMB/SMC9845-1B-1-6403
GLENTEK


Specifications and Features
AC Input Voltage — Three phases, 208 - 240 VAC, 50/60 Hz
Inrush Current at Power Up — 510 A max. @ 340 VAC
Logic Supply Input Voltage — 24 to 48 VDC, 800 mA max. @ 24 VDC. Powers all amplifier logic and encoders
Peak Current Output — 120 A max. @ 25 °C Ambient
Continuous Current Output — 75 A max. @ 25 °C Ambient
PWM Switching Frequency — 12.7KHz
Current Loop Bandwidth — Adjustable to 3 KHz
Input Command Signal — ±10 V Differential
Amplifier Isolation — Logic completely isolated from high voltage output stage.
Fault Protection — Short circuit protection from motor phase to phase, motor phase to DC bus, motor phase to case (chassis gnd). Amplifier RMS over current, DC bus overt/under voltage. Amplifier over temperature, motor over temperature (switch or thermistor input), encoder broken wire. Invalid Hall/comm (race state, commutation fault.
Amplifier Status Indicators — See table
RS-232 Host Port — High speed (115.2K baud) serial communication interface for set-up and tuning
Software Configurable — Glentek's Windows™ based MotionMaestro™ software provides ease of set-up and tuning with no previous programming experience required. This software is Windows 98/98SE/2000/XP and NT compatible.
Analog Out — ±10V Analog output for monitoring DSP signals, output source selectable using MotionMaestro™ setup software.
Non-Volatile Memory — All parameters are stored in non-volatile memory
Dedicated Inputs — +/- position limits, inhibit, motor overtemp and reset signal.
Dedicated Fault Output — TTL compatible
Sinusoidal or Trapezoidal Commutation — Sinusoidal commutation provides very low torque ripple for smooth motion. Requires incremental encoder with optional hall sensors/comm tracks (recommended). Trapezoidal commutation requires hall sensors only and allows the removal of the encoder for low cost systems.
Encoder Output Divider — The encoder input signal can be divided by user selectable integer 1 to 8 for the encoder output signal.
Encoder Feedback — Accepts encoder signals up to 4.3 MHz
Fault Output (Programmable) — TTL compatible
Low Speed Electronic Circuit Breaker (LSECB) — Latches when programmable current 75 A max.), and time (10 sec max.) exceed limit.
Internal Regen — 18 Ohms, 1125 W. Regen turns on at 430±10 VDC
Operating Temperature — 0°C to +60 °C
Storage Temperature — -40 °C to +80 °C
Humidity — 5% to 95% non-condensing
Mounting Hardware — 1/4-20 or M8 Screw, Qty = 3
Dimension (L x H x W - inches) — 17.63 x 12.80 x 5.92
Mating Connectors, Power Input, and Motor Output Conductors
Host, DB9, RS-232 — Glentek P/N: EJ232M/09; Tyco P/N: 748046-1
Controller I/O, 36 Pin Mini-D — Glentek P/N: EJC10136; 3M P/N: 10136-3000VE
36 Pin Mini-D, Backshell — Glentek P/N: EJC10336; 3M P/N: 10336-52A0-008
Encoder Feedback, 20 Pin Mini-D — Glentek P/N: EJC10120; 3M P/N: 10120-3000VE
20 Pin Mini-D, Backshell — Glentek P/N: EJC10320; 3M P/N: 10320-52A0-008
Logic Power, 2 Pin Phoenix — Glentek P/N: EJ741/02; Phoenix P/N: 17 82 75 7
Power Input Conductors — Insulation Type: PVC 105 °C or better is recommended. Cross Sectional Area: 6 AWG or 13.29 mm²
Motor Output Conductors — Insulation Type: PVC 105 °C or better is recommended. Cross Sectional Area: 6 AWG or 13.29 mm²
ENCODER FEEDBACK
PIN | SIGNAL NAME
1 | +5VDC
2 | COMMON
3 | +5VDC
4 | COMMON
5 | ENC A+ (IN)
6 | ENC A- (IN)
7 | ENC B+ (IN)
8 | ENC B- (IN)
9 | ENC Z+ (IN)
10 | ENC Z- (IN)
11 | HALL U+
12 | HALL U-
13 | HALL V+
14 | HALL V-
15 | HALL W+
16 | HALL W-
17 | MTR TEMP
18 | COMMON
19 | COMMON
20 | COMMON
LOGIC POWER
PIN | DESCRIPTION
1 | COMMON
2 | +24VDC
CONTROLLER I/O
PIN | SIGNAL NAME
1 | SIGNAL 1+
2 | SIGNAL 1-
3 | SIGNAL 2+
4 | SIGNAL 2-
5 | RESERVED
6 | COMMON
7 | ANALOG OUT
8 | + LIMIT
9 | - LIMIT
10 | INHIBIT
11 | /FAULT
12 | COMMON
13 | RESET IN
14 | MTR TEMP
15 | RESERVED
16 | COMMON
17 | ENC. Z+ (OUT)
18 | ENC. Z- (OUT)
19 | COMMON
20 | COMMON
21 | COMMON
22 | COMMON
23 | PULSE-
24 | PULSE+
25 | DIR-
26 | DIR+
27 | +5VDC
28 | +5VDC
29 | COMMON
30 | COMMON
31 | RESERVED
32 | RESERVED
33 | ENC. A+ (OUT)
34 | ENC. A- (OUT)
35 | ENC B+ (OUT)
36 | ENC B- (OUT)
STATUS DISPLAY
DISPLAY | FAULT DESCRIPTION
1 | EEPROM
2 | RAM
3 | CPLD
4 | BUS OV
5 | DISABLED
6 | ENCODER
7 | FOLDBACK
8 | AMP OVERTEMP
9 | MTR OVERTEMP
A | I²SQT
B | NORMAL
C | HS/FOB
D | BUS UV
E | HALL COMMUTATION
HOST
PIN | SIGNAL NAME
2 | TX
3 | RX
5 | COMMON
REVISIONS
REV | DESCRIPTION | ECO | DATE | CHG BY | APPD BY
A | INITIAL RELEASE | 2887 | 26APR07 | R.M.L. | C.V.
GLENTEK
208 Standard Street, El Segundo, CA 90224 USA
310.322.3026 FAX 310.322.7709
www.glentek.com
"Refreshing New Machine Control"
TITLE: INSTALLATION, SMB/SMC9875-1B-1-6398
MODEL: SMC9875-1B-1
DRAWN BY: R.M.L.
DATE: 26APR07
DESIGNED BY: L.L.
APPROVED BY: C.V.
SIZE: C
DRAWING NUMBER: 6398-I
REV: A
SCALE: 1:1
FILE: 6398-1-A.DWG
SHEET 1 OF 1
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES
SURFACE ROUGHNESS .005 TO .015
TOLERANCES: DECIMALS .XX ± .01, .XXX ± .005; FRACTIONS ± 0.5°
MATERIAL: –
FINISH: –
REF. / CONFIGURATION CODE NUMBER: –
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MODEL NOTES:
1. FOR SMB (BUSS DERIVED LOGIC POWER) MODEL, THE LOGIC POWER CONNECTOR IS NOT INSTALLED.
2. FOR SMC (EXTERNAL KEEP ALIVE LOGIC +24VDC) IS SUPPLIED TO AMPLIFIER AT THE LOGIC POWER CONNECTOR. THIS EXTERNAL +24VDC MUST BE ALWAYS ON BEFORE APPLYING BUSS POWER.
3. PLEASE MAINTAIN A MI. OF 2" - 3" OF SPACE AT BOTH ENDS AND TOP OF THE AMPLIFIER TO ENSURE PROPER VENTILATION FOR THE UNIT.
2X, .31 [7.87] SLOT
5.92 [150.34]
1.12 [28.45]
3.50 [88.90]
.40 [10.29]
17.63 [447.80]
16.69 [423.80]
16.34 [415.04]
15.88 [403.35]
12.28 [312.04]
12.24 [310.82]
2.88 [73.15]
.29 [7.37]
Ø.63 [Ø16.00]
Ø.30 [Ø7.62]
.25 [6.4]
AIR FLOW
AIR FLOW
OMEGA SERIES
ENCODER FEEDBACK
CONTROLLER I/O
RESET
STATUS DISPLAY
HOST
LOGIC POWER
RS9SN
SMC9875-1B-1
DIGITAL BRUSHLESS SERVO AMPLIFIER
CAUTION RISK OF ELECTRIC SHOCK
AC INPUT
MOTOR
L1 L2 L3
R S T

Omega Series Digital PWM Brushless Servo Amplifiers

- PWM (Pulse-Width-Modulated) Brushless servo amplifiers to 20KW

Analog Brush Type Servo Amplifiers

- Linear Brush type servo amplifiers to 2.6KW
- PWM (Pulse-Width-Modulated) Brush type servo amplifiers to 28KW

Analog Brushless Servo Amplifiers

- Linear Brushless servo amplifiers to 3.5KW
- PWM (Pulse-Width-Modulated) Brushless servo amplifiers to 51KW

Permanent Magnet DC Brush Type Servo Motors

- Continuous Torques to 335 in. lb.
- Peak Torques to 2100 in. lb.

Permanent Magnet DC Brushless Servo Motors

- Continuous Torques to 1100 in. lb.
- Peak Torques to 2200 in. lb.

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"Solutions for Motion Control"

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