INSTALLATION
&
OPERATION MANUAL

Model SMB9675-1A-1

FADAL REPLACEMENT

SENSORED VECTOR DRIVE &

SENSORLESS INVERTER DRIVE

GLENTEK

"Solutions for Motion Control"

MANUAL#: 9675-1040-000
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CHAPTER ONE: GENERAL

1.1. Overview

The Glentek Inc. SMB9675-1A-1 vector drive uses flux vector technology to close a torque (current) feedback loop. When applied to a three phase induction motor, the result is servo motor like performance from a standard three phase induction motor. The Digital Signal Processor (DSP) based vector drive uses it's high speed math processing capability to continuously calculate flux and torque vectors and to maintain a constant 90 degree phase difference between the vectors. This technique allows torque control from zero speed to base speed and above. Encoder feedback provides the shaft position data needed to calculate the vectors and velocity data, thus, Vector Control allows precise speed control down to and including zero speed of an induction motor.

The SMB9675-1A-1 vector drive can operate in sensorless mode (no feedback is needed). This mode of operation is usually referred to as inverter mode or VFD (Variable Frequency Drive) mode. With advanced mathematic algorithms and latest DSP technology, Glentek SMB9675-1A-1 VFD is optimized to produce a steady starting torque from standstill right up to full speed with high efficiency. The applied frequency and voltage are increased at a controlled rate and ramped up to accelerate the load without drawing excessive current.

1.2. Intended Application

The SMB9675-1A-1 is a drop-in replacement vector drive or VFD drive on FADAL ENGINEERING VMC's having the part numbers listed in Table 1 (vector drive) and Table 2 (VFD drive). Specify equivalent GTK P/N when ordering.

1.3 Fadal Engineering VMC and Equivalent GTK Vector Drive Replacement

Table 1:

FADAL P/N	Description	Spindle RPM	Motor HP	GTK Replacement P/N
INV-0015	VECTOR,BALDOR; 10HP 10K CL	10000	10	SMB9675-1A-1-6889
INV-0016	VECTOR,BALDOR; 10HP VMC15 CL	7500	10	SMB9675-1A-1-7090
INV-0020	VECTOR,BALDOR; 15HT 10K CL	10000	15	SMB9675-1A-1-6889
INV-0039	VECTOR,BALDOR; 15HT 10K CE	10000	15	SMB9675-1A-1-6889
INV-0040	VECTOR,BALDOR; 15HT 10K	10K/7.5K	15	SMB9675-1A-1-7090
INV-0041	VECTOR,BALDOR; 10HP 10K CL	10K/7.5K	10	SMB9675-1A-1-7090
INV-0042	VECTOR,BALDOR; 10HP 10K CE	10000	10	SMB9675-1A-1-6889
INV-0043	VECTOR,BALDOR; 15HT 7.5K YD	7500	15	SMB9675-1A-1-7090
INV-0044	VECTOR,BALDOR; 10HP 7.5K YD CE	7500	10	SMB9675-1A-1-7090
INV-0045	VECTOR,BALDOR; 10HP 7.5K YD	10K/7.5K	10	SMB9675-1A-1-7090
INV-0046	VECTOR,BALDOR; 15HT 7.5K YD CE	7500	15	SMB9675-1A-1-7090
INV-0049	VECTOR,BALDOR; 10HP 7.5K/10K	10K/7.5K	10	SMB9675-1A-1-7090
INV-0055	VECTOR,BALDOR; 10HP 6.5K CL	6500	10	SMB9675-1A-1-7090
INV-0056	VECTOR,AMC; 10 or 15HP 10K/7.5K	10K/7.5K	15	SMB9675-1A-1-7090
INV-0058	VECTOR,BALDOR; 20HPVHT 10K CL	10000	20	SMB9675-1A-1-6889
INV-0059	VECTOR,BALDOR; 20HPVHT 10K CE	10000	20	SMB9675-1A-1-6889
INV-0070	VECTOR,BALDOR; 20HPVHT 10K CE	10000	20	SMB9675-1A-1-6889
INV-0077	VECTOR DRIVE,YASKAWA; 15HT 10K CE 104D	10000	15	SMB9675-1A-1-6889
INV-0083	VECTOR DRIVE,YASKAWA; 10HP CE 7.5/10L	10K/7.5K	10	SMB9675-1A-1-7090
INV-0086	VECTOR DRIVE, YASKAWA; 20VHT 10K CE CNC88	10000	20	SMB9675-1A-1-6889
INV-0093	VECTOR DRIVE,YASKAWA; 15HT 10K CE CNC88	10K/7.5K	15	SMB9675-1A-1-7090
INV-0095	VECTOR, AMC; 10 or 15HP 10K/7.5K CE PWR SUPPLY	10K/7.5K	15	SMB9675-1A-1-7090
INV-0096	VECTOR, AMC; 10 or 15HP 10K/7.5K	10K.7.5K	15	SMB9675-1A-1-7090
INV-0097	VECTOR DRIVE, YASKAWA; 10HP CE 104D	10K/7.5K	10	SMB9675-1A-1-7090

Note: Glentek Vector drives SMB9675-1A-1-6889 and SMB9675-1A-1-7090 are shipped with parameters tuned and optimized for 15HP motors. Please contact one of Glentek's sales engineers for help in tuning and optimizing vector drives for motors that have different horsepower rating.

1.4 Fadal Engineering VMC and Equivalent GTK VFD Drive Replacement

Table 2:

FADAL P/N	Description	Spindle RPM	Motor HP	GTK Replacement P/N
INV-0085	INVERT/CBL,YASKAWA G7 7.5HP CL CE 104D	7500	10	SMB9675-1A-1-7091
INV-0076	INVERTER,.CBL,YASKAWA; 7.5HP 7500RPM NON-RT	7500	7.5	SMB9675-1A-1-7091
INV-0075	INVERTER,/CBL,YASKAWA; 7.5HP 7500RPM RT	7500	7.5	SMB9675-1A-1-7091
INV-0052	INVERTER,BALDOR; 10HP 10K NCL- NON RT	10000	10	SMB9675-1A-1-7091
INV-0054	INVERTER,BALDOR; 15HT 10K NCL- NON RT	10000	20	SMB9675-1A-1-7091
INV-0057	INVERTER,BALDOR; 5HP 6500RPM 6POLE	6500	5	SMB9675-1A-1-7091
INV-0032	INVERTER,BALDOR; 5HP 7.5K NCL- NON RT YD	7500	5	SMB9675-1A-1-7091
INV-0037	INVERTER,MITS; 10HP 10K CL 10000	10000	10	SMB9675-1A-1-7091
INV-0036	INVERTER,MITS; 10HP 10K CL YD	10000	10	SMB9675-1A-1-7091
INV-0026	INVERTER,MITS; 10HP 15K CL	10000	10	SMB9675-1A-1-7091
INV-0025	INVERTER,MITS; 10HP 15K NCL- NON RT	10000	10	SMB9675-1A-1-7091
INV-0038	INVERTER,MITS; 15HP 10K CL YD	10000	15	SMB9675-1A-1-7091
INV-0034	INVERTER,MITS; 15HT 10K CL	10000	15	SMB9675-1A-1-7091
INV-0006	INVERTER,MITS; 20HP 10K W/BRAKE	10000	20	SMB9675-1A-1-7091
INV-0035	INVERTER,MITS; 20HP NCL- NON RT	10000	20	SMB9675-1A-1-7091
INV-0027	INVERTER,MITS; 5HP 10K NCL- NON RT	10000	5	SMB9675-1A-1-7091
INV-0031	INVERTER,MITS; 5HP 10K NCL- NON RT	10000	5	SMB9675-1A-1-7091

Note: Glentek VFD drives SMB9675-1A-1-7091 are shipped with parameters tuned and optimized for 15HP motors. Please contact one of Glentek's sales engineers for help in tuning and optimizing VFD drives for motors that have different horsepower rating.

CHAPTER TWO: APPLICATION SOFTWARE

2.1. MotionMaestro©

MotionMaestro© is Glentek's Windows based application software that you will need to setup and tune the vector drive. MotionMaestro© has many features that allow users to easily configure and tune the entire Glentek digital product line. However, for the Fadal VMC replacement vector drive and VFD drive most of the setup has been done at the factory. The installer only needs go through a quick tuning procedure to get the vector drive or the VFD drive up and running. But first MotionMaestro needs to be installed.

2.2. Installing MotionMaestro©

2.2.1. Requirements

MotionMaestro© requires Windows95, Windows 98 SE, Windows ME, Windows 7, Windows NT 4.0, Windows 2000 or Windows XP operating system running on a laptop with a serial port or a USB port. It is suggested that you have a minimum of 3 mega bytes of application program disk space available prior to installation.

2.2.2. MotionMaestro© v1.37

Only MotionMaestro© v1.37 or later will work with Glentek Inc. vector or VFD drives, earlier versions are not compatible.

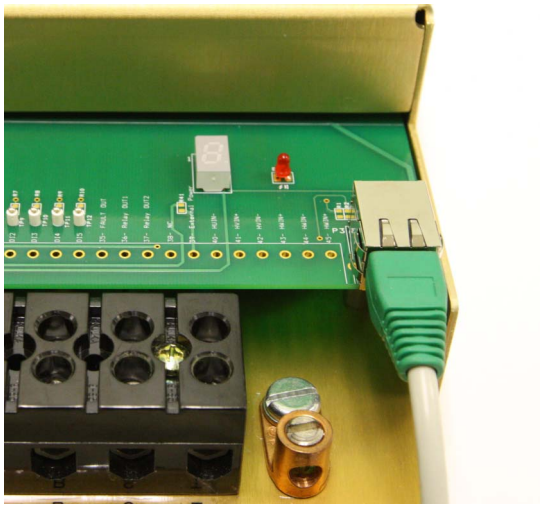
2.2.3. Installation

The MotionMaestro© install disk is set up 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 complete, you will find a MotionMaestro© icon on the Windows Start\Programs menu. The MotionMaestro© installation program is named Setup.exe. It is found in the MotionMaestro© \disk1 directory of the distribution CD, included with the vector drive. The installation will create a Glentek folder in the Program Files folder. A MotionMaestro© 1.37 folder is created when 1.37 installed. You can have multiple versions of MotionMaestro© installed, if you wish, and they will be placed into their own directories. 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.

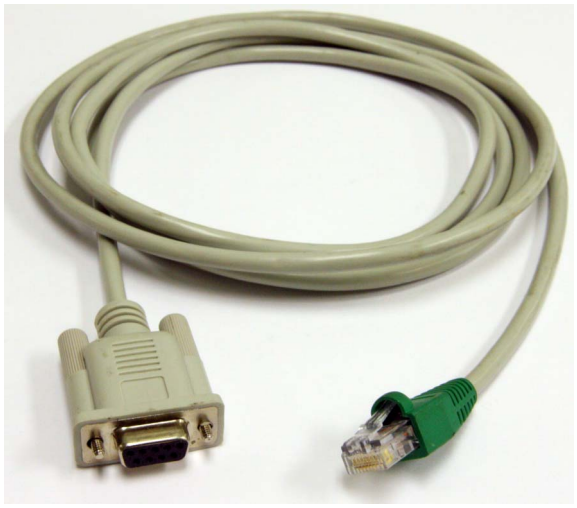
2.3. Communicating With The Vector Drive or VFD Drive

2.3.1. Serial Port

If your PC has a serial port (RS-232) you can connect to the vector drive or the VFD drive with Glentek cable (GTK # GC2400-AL005AM-000). This cable has a female DB-9 (computer) on one end and an RJ-45 (vector drive) on the other.



SERIAL PORT ON THE VECTOR DRIVE



GC2400-AL005AM-000

2.3.2. USB Port

If your PC has a USB port, a USB to serial port (RS-232) adapter (GTK # GC2410-001). is necessary in addition to the cable above. Two known tested adapters are available: USBG-232 from USBGEAR and US232R-10 from FUTURE TECHNOLOGY DEVICES INTERNATIONAL Ltd.

USBG-232

CHAPTER THREE:
INSTALLING THE GLENTEK VECTOR/VFD DRIVE INTO A FADAL VMC

3.1. Removing the old drive

Turn off the power to the VMC and wait 5 minutes before beginning removal. Disconnect all the wires and cables. If any wires are not labeled take note of their location. Of the cables, only the Control cable and the Delta/Wye cable can be confused, both are 6 terminal connectors. The control cable has 6 sockets in the connector and Delta/Wye cable has 3 sockets in the connector. Unbolt the old drive and remove.

3.2. Mechanical Installation

Install the new drive (slots down) by first resting the drive on the lower mounting studs in the panel and positioning the drive over the studs at the top. Hold the drive against the panel and loosely install four nuts, top two first. Tighten all four nuts.

3.3. Electrical Installation

3.3.1. Power Terminal Block Connections
Begin the wiring by connecting the AC, regenerative braking, motor and green ground wires. Match the wire labels to the terminal block labels. Check connections for tightness. See the Appendix A for more details.

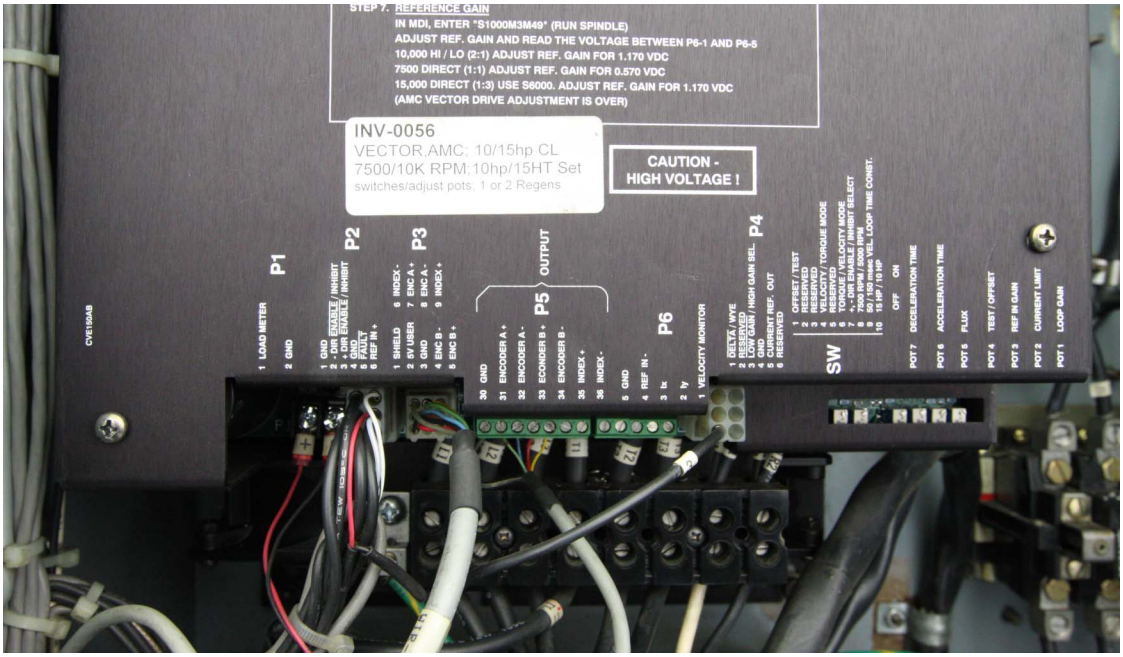
3.3.2. Load Meter Cable
Connect the load meter cable by connecting the black wire to P1-1 screw terminal and the red wire to P1-2.

3.3.3. Control Cable
Connect the control cable to P5, the Control cable has 6 sockets installed, do not mistake the Wye/Delta connector with only 3 sockets.

3.3.4. Wye/Delta Cable
Connect the Wye/Delta cable to P6 (Wye/Delta is an option for 7500 RPM spindle, your VMC may not have this cable).

3.3.5. Encoder Feedback Cable
Connect the encoder feedback from the motor (9 terminal connector) to P4 (VFD drive does not need this cable).

3.3.6. Rigid Tap Cable (Encoder Output To CNC Control)
For VMC's with the Rigid Tap option, connect the rigid tap cable from the CNC to P2 of the vector drive. Use installation drawing 6889-6 (Appendix) to match the wires by color to the correct terminal.



Before and after photos of a typical installation

CHAPTER FOUR: SETUP AND TUNING

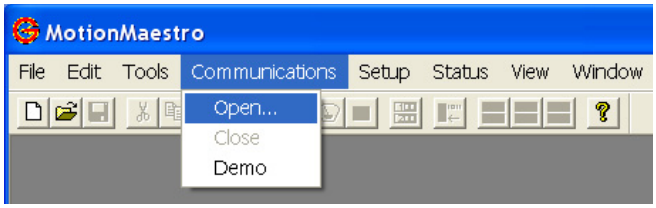
Note: There is no setup or tuning required by the end user. All the setup and tuning are pre-set at the factory. Should the customer must make any major change (such as using different motor and/or feedback), please contact one of Glentek's sale engineers for help in setup and tuning the amplifier for optimum performance. If minor change (such as adjusting input command offsets, etc.) to the amplifier, use the procedures as follow for reference.

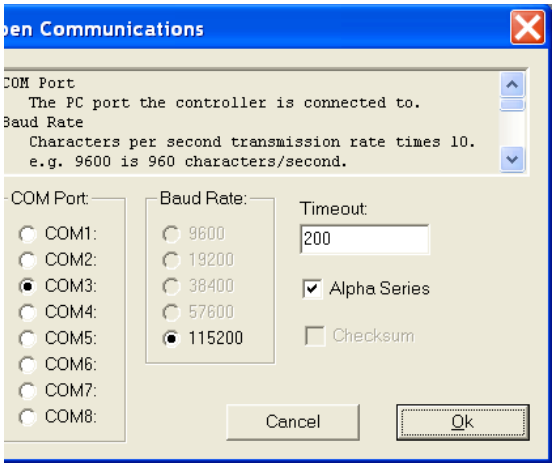
4.1. Turning the Power On.

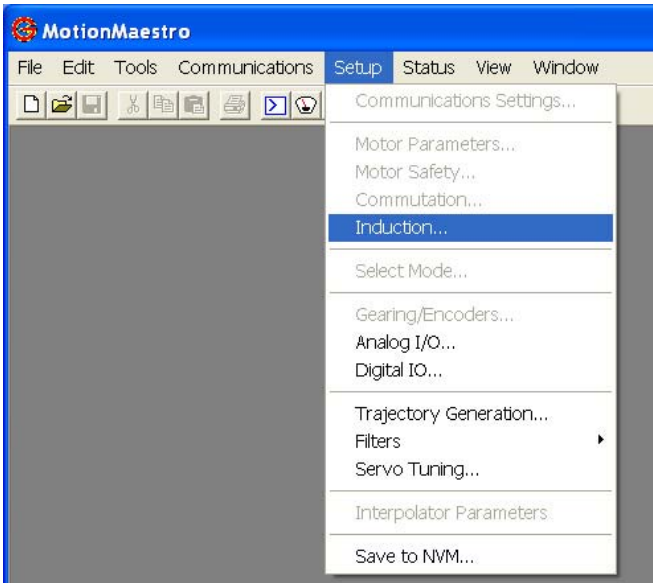
Carefully recheck the wiring. Restore power to the VMC. After the VMC is finished initializing, check the vector drive status 7 segment display. One segment may be lighted or if the spindle is rotating slowly you will see a rotating pattern of segments lighting.

4.2. Establishing Communications

Connect your laptop to the vector drive at P3.
Open MotionMaestro 1.37 or later version and go to the communication menu drop down and select *OPEN*.
The *Open Communications* dialog box will appear.
Press the OK button and the COM status box to the right will turn green.







4.3. Motor Parameters

Note: These parameters are preset at the factory and do not normally need to be changed.

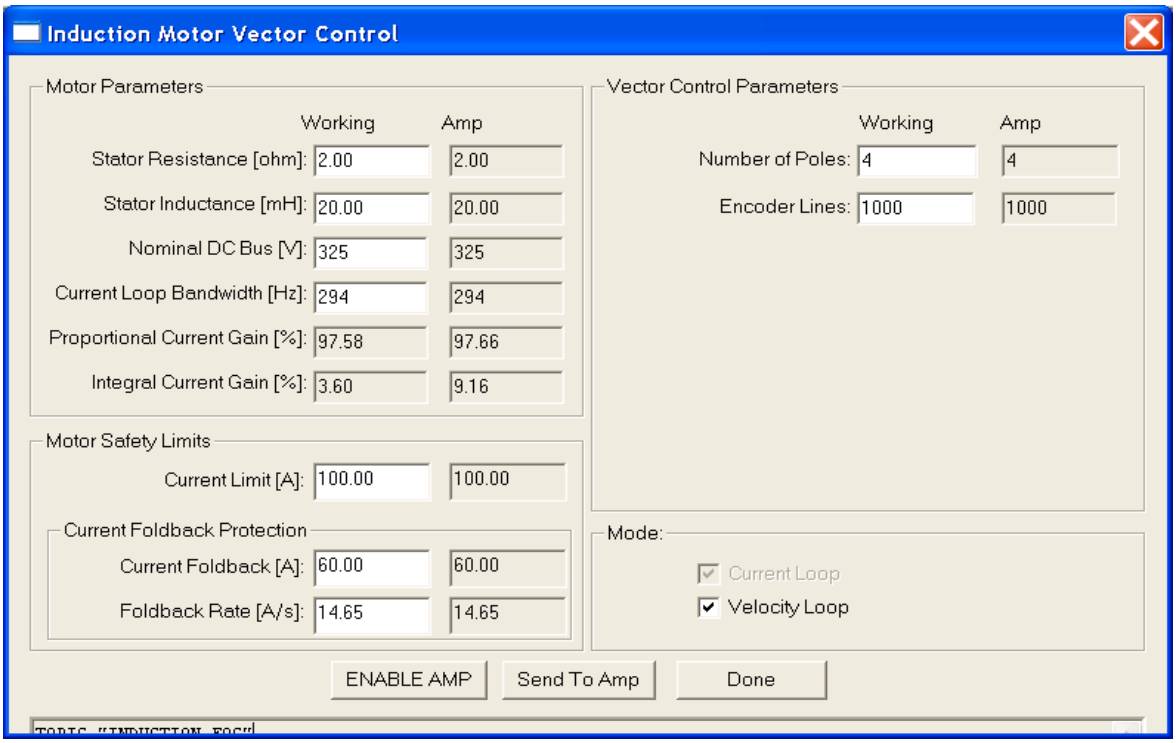
From the Setup menu drop down, open the Induction Motor Vector Control dialog box as seen below.

Motor Parameters Section;
In the working column verify the Stator Resistance (phase to phase) and the Stator Inductance are correct and match the motor to be used. The Nominal DC Bus is preset to 325VDC.

Motor Safety Limits;
Verify that the value is same as motor rating.

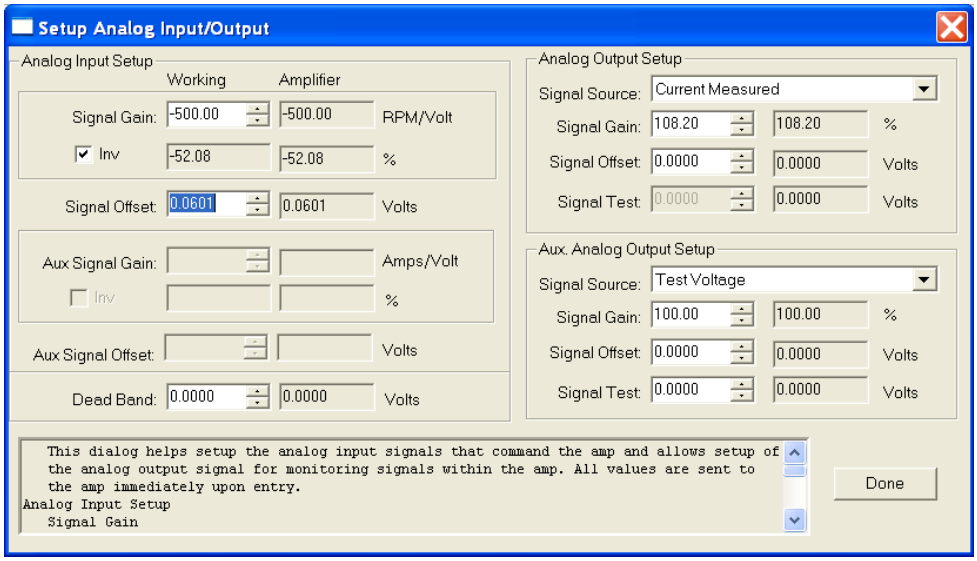
Vector Control Parameters;
Verify that the parameters are correct and match the motor to be used.

If new parameters are entered, check that your parameters are correct and push the Send to Amp button (make sure to disable the amp, otherwise amplifier will prohibit new parameters to be sent). The parameters in the working column will appear in the Amp column, next push the Enable Amp button, then the Done button. Close the box.



4.4. Tuning & Offset

From the Tools menu drop down select the Control Panel dialog box. From the Setup menu drop down select the Analog I/O dialog box. Arrange the boxes side by side. Observe any small rotation in the Actual Velocity box in the control panel dialog. Adjust that rotation to zero by changing the value in the Signal Offset box in the Analog I/O dialog (only if slightly signal adjustment is needed).



4.5. Saving your setup

You are almost done setting up. In order for the newly set parameters to permanently store on the amplifier, the parameters need to be saved to NVM (Non Volatile Memory). The saving sequence is amplifier model/part number dependent. Refer to the appropriate amplifier model/part number below for the necessary steps for saving parameters to NVM.

SMB9675-1A-1-6889:
When using SMB9675-1A-1-6889, type “sc6” at the “Terminal” window, and press the “Enter” key. Repeat the same steps for “sc7”, “sc8”, and “sc9”.

SMB9675-1A-1-7090:
When using SMB9675-1A-1-7090, and the amplifier is operated in “Wye” mode, type “sc7” at the “Terminal” window, and press the “Enter” key. Repeat the same steps for “sc8”.

When using SMB9675-1A-1-7090, and the amplifier is operated in “Delta” mode, type “sc6” at the “Terminal” window, and press the “Enter” key. Repeat the same steps for “sc9”.

SMB9675-1A-1-7091:
When using SMB9675-1A-1-7091, type “sc6” at the “Terminal” window, and press the “Enter” key. Repeat the same steps for “sc7”, “sc8”, and “sc9”.

Setup is completed.

4.6 Rigid Tap Test (Optional)

If desired you can test the rigid tap mode of your VMC by performing the following procedure. This procedure is drawn from the FADAL maintenance manual.

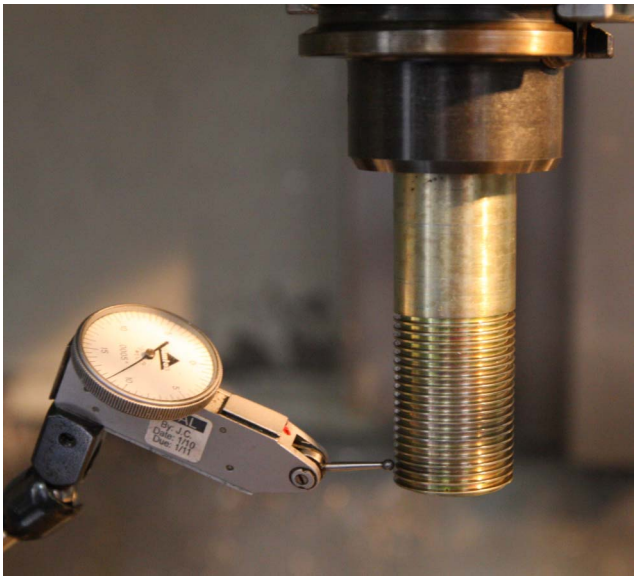
Install test screw (SVT-0077). The screw can be fabricated from 1.000” round stock, by threading a 14 TPI Acme thread.

Program is for Format 1. Use test program #6000 or the following program:

```
%
N1O6000(RIGID TAP CYCLE
N2G80
N3S750
N4G91
N5X0.1Y0.1G1F10.
N6M5
N7G4P2000
N8G84.1Z-1.R+0F500.Q0.0714
N9M45
N10X-0.1Y-0.1G1F10.
N11M45
N12M45
N13M45
N14M45
N15G80
N16G4P2000
N17M99P5
N18(!
N19( NOTE: O5827 CNC88 TEST WAS MOVED TO TA,5!!!
%
3801
```

Once the program is loaded jog the z axis down so the screw can be indicated.
Type “SETZ” and press ENTER. Start the test program and observe
the program is running correctly. Depress the SINGLE STEP key. Be sure the test screw returns to its original position.
Set the indicator as shown below, the tip must be touching the lower thread halfway into the thread, the second thread from the bottom.

Run the test and observe the indicator. The reading should not deviate from zero More than .002” on either side of zero.
If necessary consult the FADAL maintenance manual for your machine.



TEST SCREW IN SETUP WITH DIAL INDICATOR

TEST SCREW

TEST SCREW W/ TOOL HOLDER

CHAPTER FIVE: TROUBLESHOOTING AND MAINTENANCE

5.1 Status Display Codes

Display	Name	Description	Possible Cause
1	EEPROM Fault	Parameter EEPROM checksum fault	Internal problem
8	Reset	External reset	Improper configuration setting
8.	Reset	Drive processor is in reset	Internal problem
A	Overspeed	Motor RPM is over speed limit	Mechanical linkage problem
b	Bus Over Voltage	DC bus exceeded 450VDC	Regenerative braking circuit not working, regen resistor does not match spindle, check fuse in regen circuit
C	Clamp (Disabled)	Vector drive disabled	Control is disabling the drive
E	Encoder Fault	Encoder fault detected	Encoder faulty or encoder wiring broken
F	Foldback	Motor current draw exceeded set point	Mechanical binding in motor or spindle
H	Heatsink Over Temperature	Heatsink exceeded 65ºC	Fan(s) failed
L	LS/ECB	Motor RMS over current	Mechanical binding in motor or spindle
0	Normal Operation	Amp enabled	Normal when rotating
S	HS/ECB	Output short circuit detected	Motor windings shorting
U	Bus Under Voltage	DC bus below 50VDC nominal	AC input voltage to drive is low or off
Single segment	Normal Operation	Amp enabled	Normal @ zero speed

5.2. Maintenance

The only maintenance required is to periodically inspect the fans. The blades should be free turning and built up dirt should be removed from the blades.

CHAPTER SIX: WARRANTY, FACTORY REPAIR AND SAFETY

6.1. Warranty

Any product, or part thereof, manufactured by Glentek, Inc., described in this manual, 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 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.

Any product or part manufactured by others and merely installed by us, such as an electric motor, 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 claim

6.2. Factory Repair

Should it become necessary to return a vector 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.

5. Return the unit by the best means possible. The method of freight chosen will directly affect the timeliness of its return.

6.3. Safety

- Serious or fatal injury can result from failure to work safely on this equipment.
- Only qualified personnel should install and maintain this vector drive.
- The drive has capacitors that remain charged after the power is shutoff. Wait 5 minutes to allow the capacitors to discharge before removing the cover or working on the drive.
- Be sure the system is properly grounded before applying power.
- Regenerative braking resistors can generate temperatures that ignite combustible materials or vapors. Keep all combustible materials way from braking resistors.
- Braking resistors should be shielded to prevent burn injuries.
- The motor will rotate when autotuning, take precautions to prevent injury and damage to equipment.

APPENDIX A - SERVO DRIVE CONNECTIONS

A - 1. Power, Regen, and Motor Connector

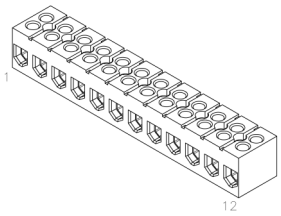


Table A - 1.1. Power/Regen/Motor Designations

Designations Pin#	I/O	Name	Function
1	Input	L1	AC LINE 1, three phase AC input
2	Input	L2	AC LINE 2, three phase AC input
3	Input	L3	AC LINE 3, three phase AC input
4	Rsvd	Reserved	Reserved
5	Rsvd	Reserved	Reserved
6	Output	B-	DC BUS Return output
7	Input	R1	Brake/Regen resistor output
8	Input	R2	Brake/Regen resistor output
9	Output	B+	DC BUS + output
10	Output	T1	Motor Output Phase T1
11	Output	T2	Motor Output Phase T2
12	Output	T3	Motor Output Phase T3

Table A - 1.2. Power/Regen/Motor Connectors

Connector Description/Type	12-Pin Terminal Block
Terminal Block, Barrier, 12 Position, 10-4 AWG	Marathon 985-GP-12

A - 2. Controller I/O Connectors

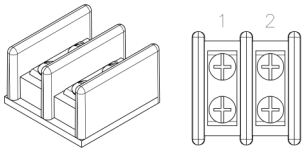


Table A - 2.1. Load Meter Designations: Labeled as P1 on servo drive

Designations Pin#	I/O	Name	Function
1	Output	Black -	GND
2	Output	Red +	Current Monitor Output

Table A - 2.2. Load Meter Connector

Connector Description/Type	2-Pin Terminal Block
Terminal Block, Single Row, 2 Position, 22-12 AWG	Magnum A202202NL

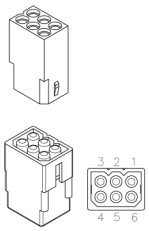


Table A - 2.3. Control Designations: Labeled as P5 on servo drive

Designations Pin#	I/O	Name	Function
1	Input	Spindle Common	Spindle Common (for Forward & Reverse)
2	Input	*Spindle Reverse	Spindle Reverse
3	Input	*Spindle Forward	Spindle Forward
4	Input	CMD Common	CMD Common (for Fault & Speed)
5	Input/ Output	*ESTOP/ *Spindle Fault	Emergency Stop/Spindle Fault
6	Output	Spindle Speed	Spindle Speed Command

Table A - 2.4. Wye/Delta Designations: Labeled as P6 on servo drive

Designations Pin#	I/O	Name	Function
1	Input	Wye/*Delta	Wye or Delta modes
2	N/C	Reserved	Reserved
3	Input	Hi Gain/*Lo Gain	High Gain or Low Gain modes
4	Input	Common	Common for Wye/Delta and High Gain/Low Gain modes
5	N/C	Reserved	Reserved
6	N/C	Reserved	Reserved

Table A - 2.5. Control and Wye/Delta Connectors

Connector Description/Type	6-Pin Male Mating Connector Housing	Female Crimp Terminal
Receptacle, 6 Position, 22-18 AWG	Molex 03-09-1064	Molex 02-09-1119

A - 3. Encoder Input Connector

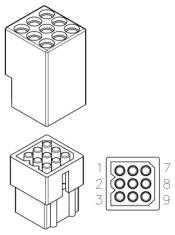


Table A - 3.1. Encoder Input Designations: Labeled as P4 on servo drive.

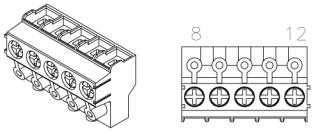
Designations Pin#	I/O	Name	Function
1	Input	Shield	Cable Shield
2	Power	+5V	Encoder +5VDC out, 150mA max
3	Power	GND	Encoder Power Return
4	Input	B -	Encoder Channel B - (not)
5	Input	B +	Encoder Channel B +
6	Input	Index +	Encoder Index + (Channel Z +)
7	Input	A +	Encoder Channel A +
8	Input	A -	Encoder Channel A - (not)
9	Input	Index -	Encoder Index - (Channel Z -)

Table A - 3.2. Encoder Input Connector

Connector Description/Type	9-Pin Male Mating Connector Housing	Female Crimp Terminal
Receptacle, 9 Position, 22-18 AWG	Molex 03-06-1092	Molex 02-06-1103

A - 4. Encoder Output Connector

Table A - 4.1. Encoder Output Designations: Labeled as P2 on servo drive.



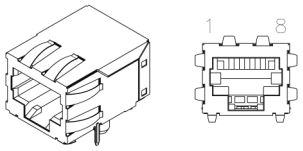
Designations Pin#	I/O	Name	Function
8	Power	GND	Encoder Power Return
9	Output	EOA +	Encoder Channel A +
10	Output	EOA -	Encoder Channel A - (not)
11	Output	EOB +	Encoder Channel B +
12	Output	EOB -	Encoder Channel B - (not)

Table A - 4.2. Encoder Output Connector

Connector Description/Type	5-Pin Terminal Block
Terminal Block, 5 Position, 22-12 AWG	Phoenix Contact 1934890

A - 5. Serial Communication Connector

Table A - 5.1. Serial Communication Designations: Labeled as P3 on servo drive.



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

Table A - 5.2. Encoder Output Connector

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

A - 6. Power and Signal Wiring

6.1. Recommend 3-phase input, 3-phase output, and chassis GND power wiring, 8 AWG (8.36 mm^2) or larger, 105°C rated PVC or better.

6.2. Recommend BUS+, BUS Return, and brake power wiring, 10 AWG (5.26 mm^2) or larger, 105°C rated PVC or better.

6.3. Recommend all signal wiring, 22 AWG (0.326 mm^2) or larger, 105°C rated PVC or better.

APPENDIX B - AMPLIFIER CONNECTION INTERFACE

This section describes the amplifier connections and how they are used in the typical application. Refer to the amplifier's installation drawing in Appendix K. 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 7-segment LED display is provided for determining the general operating condition of the amplifier.

When the amp is operating normally, one of the outer six segments is lit. Each of the six outer segments represents one of the six commutation states in a commutation cycle of a motor. A commutation cycle consists of two poles. In an 4-pole motor the LED will cycle through its six outer segments 2 times for one revolution of a rotary motor. When the motors current is clamped, (i.e. held to zero), or the amplifier is in a fault condition, one of the fault characters will be displayed as is appropriate to the fault or state.

Note: See Chapter 5 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, the Forward/Reverse, the Wye/Delta, the Hi Gain/Lo Gain, Estop/Fault, load meter, an encoder output signal, and common.

Signal	Description
SPINDLE SPEED	Command signal analog input, reference to CMD Common.
*SPINDLE FORWARD	Enable the motor in the CCW direction.
*SPINDLE REVERSE	Enable the motor in the CW direction.
WYE/*DELTA	Enable the motor either in WYE or DELTA mode.
HI GAIN/*LO GAIN	Enable the motor either in HI or LO gain mode.
*ESTOP/*FAULT	Bi-directional, functions as Emergency Stop input or Fault output.
LOAD METER	Analog output, indication of the load current on the motor.
ENCODER A	Encoder A channel Output.
ENCODER B	Encoder B channel Output.
ENCODER Z	Encoder Z index Output (not used).

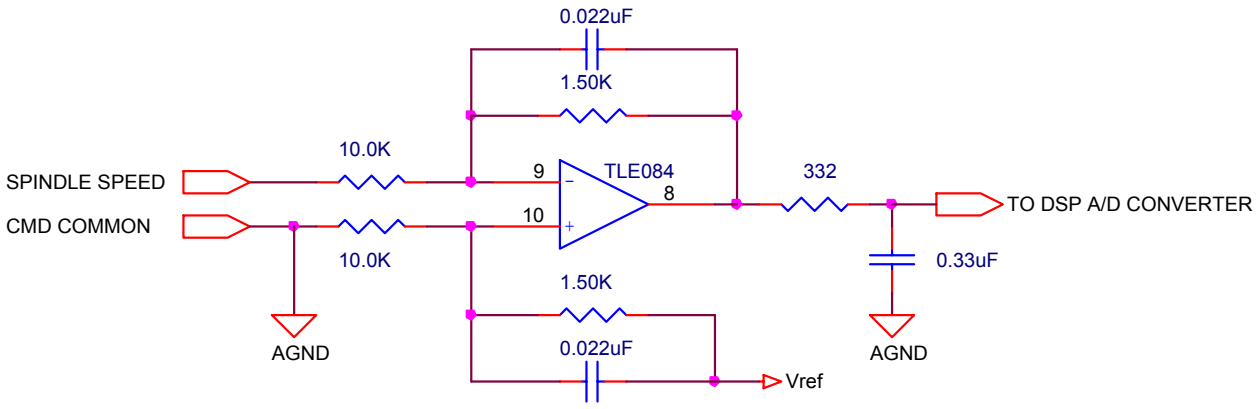
For the actual pin out of above signals, see Appendix A - Controller I/O Connector section

Analog Input, Command Signal

Pins SPINDLE SPEED and CMD COMMON are the command input pins. The command input takes a differential analog signal as referenced to the amplifier's ground. Input voltage is expected to range from -10 volts to +10 volts (typical).

The velocity command signal will be 0 to +10 VDC in unipolar control (non-rigid tap mode), ±10 VDC for bipolar control (rigid tap mode).

Note: CMD COMMON (AGND) is connected to Logic Common (Digital GND) inside the amplifier.



Command Signal Analog Input Schematic

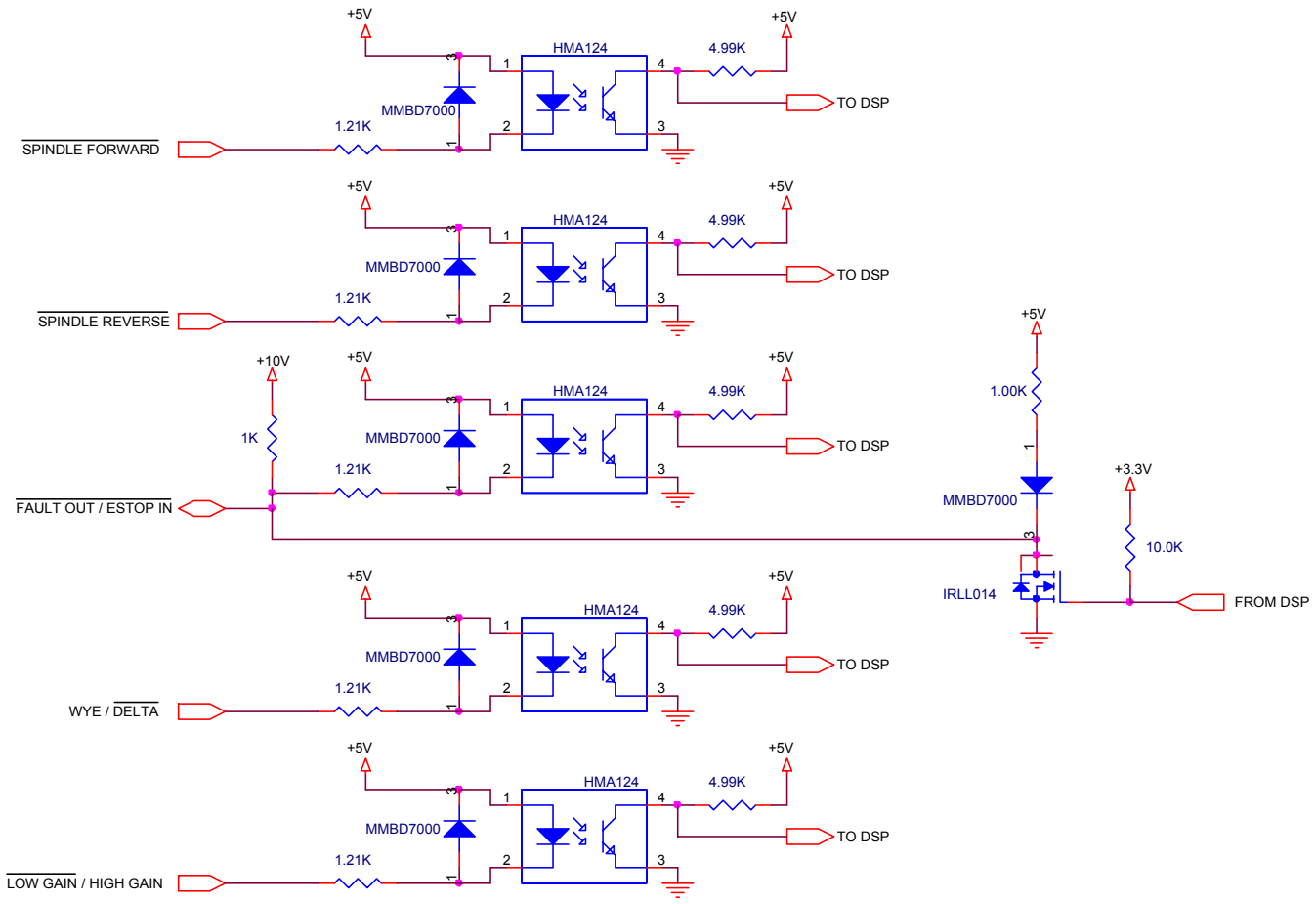
Controller Inputs/Outputs - Direction Control, Wye/*Delta, *Lo Gain/Hi Gain Inputs, *Estop Input, and *Fault Output

The amplifier accepts *SPINDLE FORWARD and *SPINDLE REVERSE signals for operating four rotation commands.

*FORWARD	*REVERSE	ACTION
closed	open	drive on, CCW rotation, unipolar speed control
open	closed	drive on, CW rotation, unipolar speed control
closed	closed	drive on, bipolar speed and direction control
open	open	drive off, no voltage or flux to the motor

*SPINDLE FORWARD and *SPINDLE REVERSE are enable and direction control signals. That is, each signal enables motor movement in one direction. If both signals are on (the signals are pulled low), motor movement in both directions is enabled. When only one enable is closed (*FORWARD or *REVERSE on), the velocity command is unipolar, and when both enables are closed (*FORWARD and *REVERSE on), the velocity command is bipolar.

When both *FORWARD and *REVERSE are closed, the amplifier is in rigid tap mode. When only *FORWARD or *REVERSE is closed, the amplifier is in non-rigid tap mode (sometimes called "inverter" mode). Both rigid tap mode and non-rigid tap ("inverter") mode are used with vector drives. Inverters or VFD drives use non-rigid tap mode only.



Controller I/O Schematic

When *FORWARD and *REVERSE are both open (signals are left floating) the spindle is off and spins freely. However, the change from enabled (*FORWARD and/or *REVERSE on to both off) is also a signal to stop (just like Emergency Stop); the drive is never supposed to coast to a stop.

The change from WYE to DELTA or vice versa occurs only when the drive is off (*FORWARD and *REVERSE open) and the motor is stopped or below 50 rpm. When the CNC wants DELTA mode, the signal WYE/*DELTA is pulled low.

When the CNC wants LOW GAIN, the signal *LO GAIN/HIGH GAIN is pulled low.

*EMERGENCY STOP and *FAULT share the same I/O pin at the amplifier. A spindle FAULT is declared by the spindle drive. Status good is 10 VDC thru a 1K pull-up resistor. 0 VDC indicates a fault condition to the CNC. The Fault output is open collector that can sink 500 mA max. When *ESTOP is asserted (signal is pulled low), drive is to totally ignore FORWARD, REVERSE, and velocity command, and ramp down to in stop.

Encoder Feedback

The following pin description defines the main encoder feedback 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 (not used)

The amplifier can supply 5 volts of encoder power. The source is rated at 150 mA.

The encoder input uses a DS26LV32 differential line receivers. By default, the encoder feedback is configured for receiving differential signals (single-ended configuration is available upon request). The amplifier accepts nominal encoder frequency of 5 MHz (maximum frequency of up to 10 MHz is possible, but is system dependent). The Z channel is edge sensitive such that swapping Z and Z* does not change the behavior of the amplifier.

Encoder Output

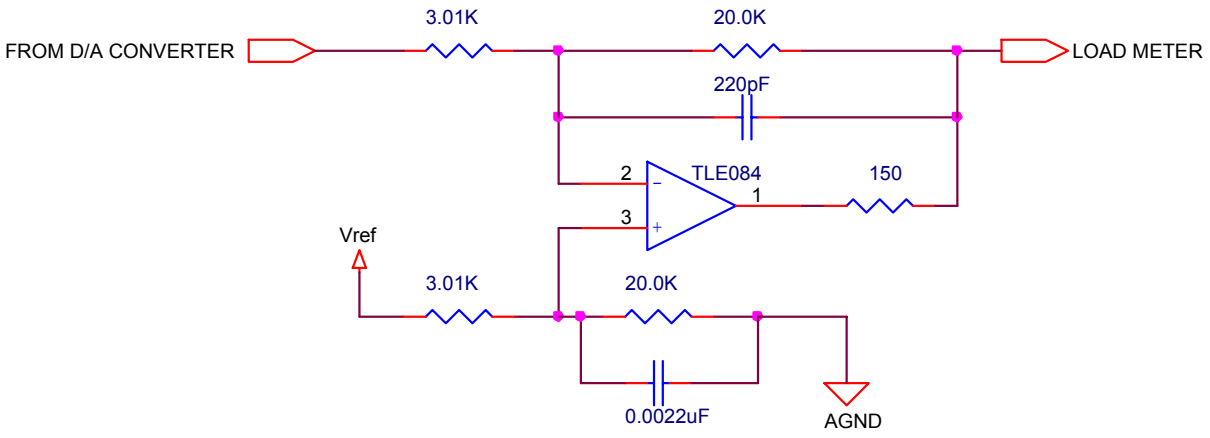
The encoder out signals are differential output signals. The encoder output pins are buffered representation of the motor encoder feedback. The encoder output uses a 26C31 differential line driver.

Encoder channels A, and B are available as pins EOA+, EOA-, EOB+, EOB- of P2.

Load Meter Output

This is an indication of the load on the motor. The output ranges from -10 volts to +10 volts and has 12-bit resolution.

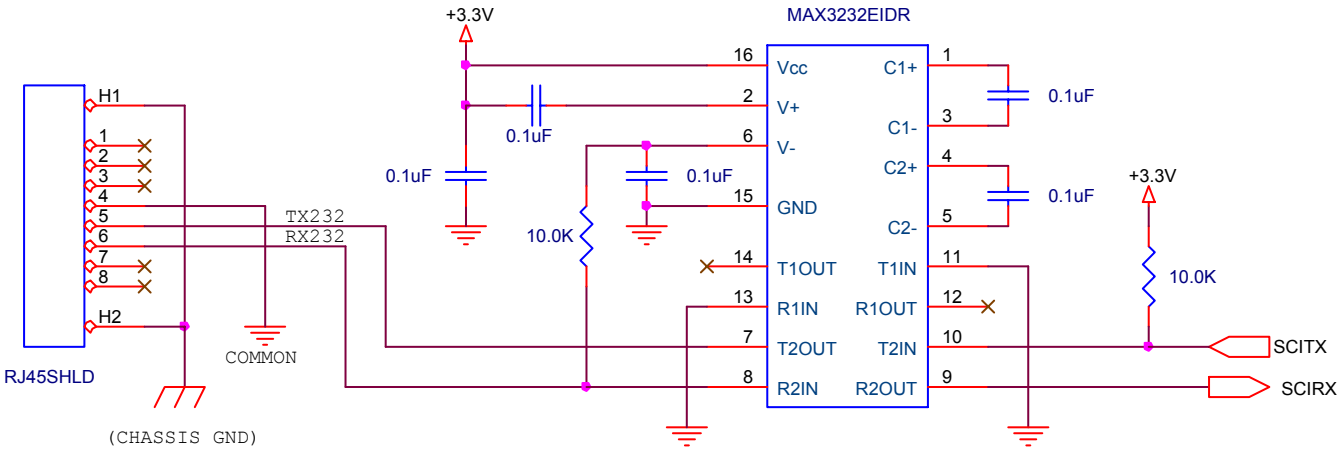
2.5 VDC = 100% absolute motor current (100% of continuous current)
3.75 VDC = 150% absolute motor current (150% of continuous current)



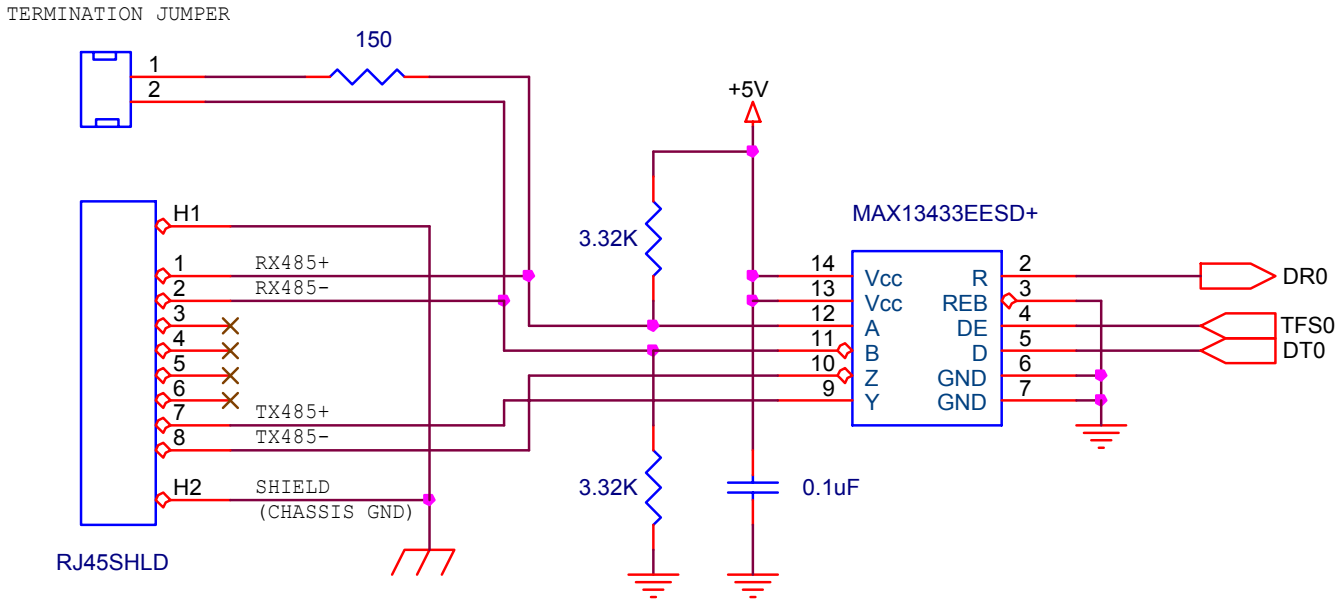
Load Meter Output Schematic

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 an RJ-45 type connector.



RS-232 Input Schematic



RS-485 Input Schematic

The serial cable can be made or purchased for communicating with a PC by configuring a cable with one end being a male RJ-45 plug and the other end being a DB-9 female connector. Remember that there is no standard for an RS-485 connector

Note: 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.

Power Input and Motor Output

The signal names for power are listed below:

Pin Name	Description
L1,L2,L3	Input - AC voltage (line 1, line 2, and line 3, respectively).
PE	Protective Earthing, Chassis GND.
B+	Output - DC BUS +.
B-	Output - DC BUS Return.
R1	Input - Brake/Regen resistor.
R2	Input - Brake/Regen resistor.
PHASE T1	Output - Motor phase T1.
PHASE T2	Output - Motor phase T2.
PHASE T3	Output - Motor phase T3.

L1, L2, and L3 are 3-phase, 208-240 VAC, 50/60 Hz AC inputs. The maximum inrush current at power up is 510 A @ 240 VAC.

B+ and B- are unregulated DC BUS output (derived from 3-phase inputs). Total DC BUS capacitance is 4,080 uF. BUS undervoltage trips nominally at 50 VDC ± 5%. BUS overvoltage trips nominally at 450 VDC ± 5%.

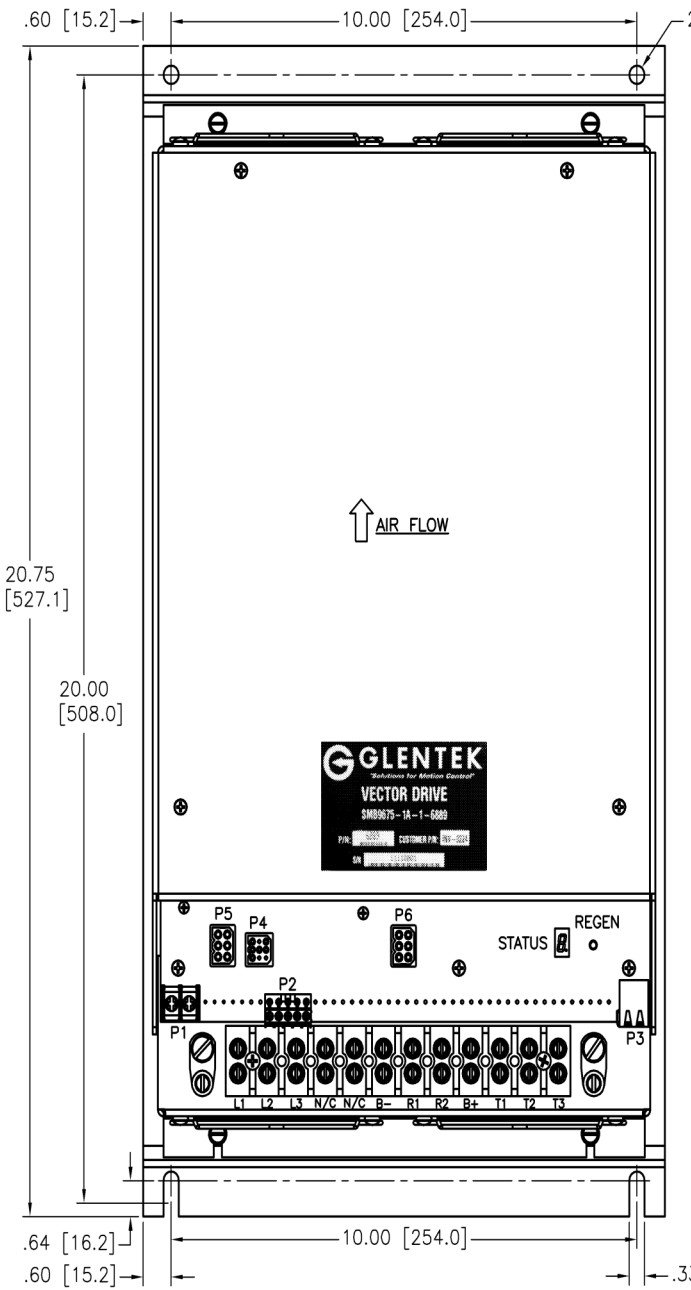
R1 and R2 are external Regen resistor (brake) inputs. Acceptable resistance range is 12 - 30 Ohms. Regen turns on at 430 VDC ± 5%. Regen circuit uses a Ferraz Shawmut TRS10R time delay fuse.

Motor power is delivered at pins PHASE T1, T2 and T3. The motor power is Pulse Width Modulated signals used to drive the motor.

It is recommended that the wire size for 3-phase AC inputs and motor outputs is 8 AWG (8.36 mm^2) or larger, 105°C rated PVC or better.

It is recommended that the wire size for DC BUS, and Brake/Regen resistor inputs is 10 AWG (5.26 mm2) or larger, 105°C rated PVC or better.

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 AC input pins connected, one should be able to communicate with the amplifier via a serial cable and the motor encoder feedback should be functioning properly.



REVISION HISTORY						
ZONE	REV	DESCRIPTION	ECO	DATE	CHANGED	APPD
-	A	INITIAL DRAWING RELEASE	3227	07SEP11	M. TAGUPA	J.A.M.

P1 Load Meter Connector	
PIN	SIGNAL NAME
1	BLACK -
2	RED +

P2 Encoder Output Connector	
PIN	SIGNAL NAME
8	GND
9	EAOUT +
10	EAOUT -
11	EBOUT +
12	EBOUT -

P3 Host Connector	
PIN	SIGNAL NAME
1	RS485 RX +
2	RS485 RX -
3	N/C
4	COM232
5	TX232
6	RX232
7	RS485 TX +
8	RS485 TX -

Status Display	
DISPLAY	FAULT DESCRIPTION
1	EEPROM FAULT
8	EXTERNAL RESET
8.	DRIVE PROCESSOR IS IN RESET
A	OVERSPEED
b	BUS OVERVOLTAGE
C	CLAMP
E	ENCODER FAULT
F	FOLDBACK
H	HEATSINK OVERTEMP
L	LS/ECB
O	NORMAL OPERATION
S	HS/ECB
U	UNDER VOLTAGE

P4 Encoder Input Connector	
PIN	SIGNAL NAME
1	SHIELD
2	+5V
3	GND
4	B -
5	B +
6	INDEX +
7	A +
8	A -
9	INDEX -

P5 Control Connector	
PIN	SIGNAL NAME
1	SPINDLE COMMON
2	*SPINDLE REVERSE
3	*SPINDLE FORWARD
4	CMD COMMON
5	*ESTOP/*SPINDLE FAULT
6	SPINDLE SPEED

P6 Wye/Delta Connector	
PIN	SIGNAL NAME
1	WYE/*DELTA
2	N/C
3	HI GAIN/*LOW GAIN
4	COMMON (WYE/*DELTA & HI GAIN/*LOW GAIN)
5	N/C
6	N/C

Motor Power Connector	
PIN	SIGNAL NAME
L1	3 PHASE AC INPUT
L2	3 PHASE AC INPUT
L3	3 PHASE AC INPUT
N/C	NOT AVAILABLE
N/C	NOT AVAILABLE
B-	B- OUTPUT
R1	REGEN RESISTOR
R2	REGEN RESISTOR
B+	B+ OUTPUT
T1	MOTOR OUTPUT PHASE
T2	MOTOR OUTPUT PHASE
T3	MOTOR OUTPUT PHASE

Specifications and Features	
AC Input Voltage	240 VAC 3-phase, 50/60 Hz
Inrush Current at Power Up	510A max @ 240VAC
Logic Power	Logic power is derived from input BUS Voltage. Powers all amplifier logic and encoders (250 mA max.)
Peak Current Output	125 A @ 25°C Ambient (with forced air cooling)
Continuous Current Output	75 A @ 25°C Ambient (with forced air cooling)
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. Encoder broken wire. Invalid Hall/comm track state. Overspeed fault.
Amplifier Status Indication	See Table
Low Speed Electronic Circuit Breaker (LS/ECB)	Latches when programmable current (75 A max.), and time (10 sec max.) exceed limit.
Bus Overvoltage	Trips nominally at 450VDC ± 5%
Bus Undervoltage	Trips nominally at 50VDC ± 5%
External Regen	Acceptable Resistance Range: 12 - 30 Ohms. Regen turns on at 430VDC ± 5%.
Amplifier Type	Sensored Vector Drive or Sensorless VFD Drive
Analog Command Input	±10V for analog velocity command
Encoder Feedback	Accepts TTL level encoder signals
Dedicated Inputs	Wye/Delta, Hi Gain/Lo Gain, Spindle Forward/Spindle Reverse
Bi-directional Input/Output	Emergency Stop input or Fault output
Analog Output/Load Meter	±10V Analog output for monitoring the load on the motor
RS-232 Host Port	High speed serial communication interface for set-up and tuning. 115.2 Kbaud, 8 bits, no parity, 1 stop bit
Software Configurable	All parameters are downloaded using the RS232 port / Glentek's Windows™ based MotionMaestro™ software.
Digitally Tuned	All parameters set digitally. No potentiometers to adjust. RS-232 high speed serial communication interface for all gain and PID tuning parameters.
Non-Volatile Memory	All parameters are stored in non-volatile memory
PWM Switching Frequency	5 KHz Standard
Amplifier Isolation	Logic completely isolated from high voltage output stage
Operating Temperature	0 °C to +60 °C
Storage Temperature	-40 °C to +80 °C
Humidity	5% to 95% non-condensing
Mounting Hardware	5/16 x .75
Dimension (L x H x W - inches)	L. 20.75, H. 8.02 W. 11.20
Backup File	Factory Preloaded

Mating Connectors	
P5 / P6 Controller I/O 6-Pin Molex	Glentek P/N: EJ588M06; Molex P/N: 03-09-1064
P5 / P6 Controller I/O Pins	Glentek P/N: EJD21F09; Molex P/N: 02-09-1119
P4 Encoder Feedback 9-Pin Molex	Glentek P/N: EJ761M09; Molex P/N: 03-06-1092
P4 Encoder Feedback Pins	Glentek P/N: EJD21F06; Molex P/N: 02-06-1103
P3 Host RJ45	Glentek P/N: EJ018083; Molex P/N: 87522-8012

NOTES:

1. MAX HEIGHT 8.02 INCHES.
2. FADAL VECTOR CONFIGURATION SHOWN.
3. RECOMMENDED WIRE SIZE:
   L1, L2, L3, – 8 AWG [6.63 mm²]
   R1, R2, – 10 AWG [5.26 mm²]
   T1,T2,T3, – 8 AWG [6.63 mm²]
   CONTROL SIGNALS – 22 AWG [0.326 mm²]
4. REGEN FUSE IS FERRAZ SHAWMUT TRS10R. REMOVE COVER TO CHANGE THIS FUSE.
5. MAINTAIN MINIMUM OF 2"–3" SPACE AT BOTH ENDS TO ENSURE PROPER VENTILATION.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES ARE AS FOLLOWS: DECIMAL: XX ± ±0.01, XXX ± ±0.005; ANGULAR: < ± ±0.5°; FINISH: 125 MAXIMUM

APPROVAL	DATE
DWN BY: M.TAGUPA	07SEP11
CHK BY: J.A.M.	07SEP11
APP BY: J.A.M.	07SEP11

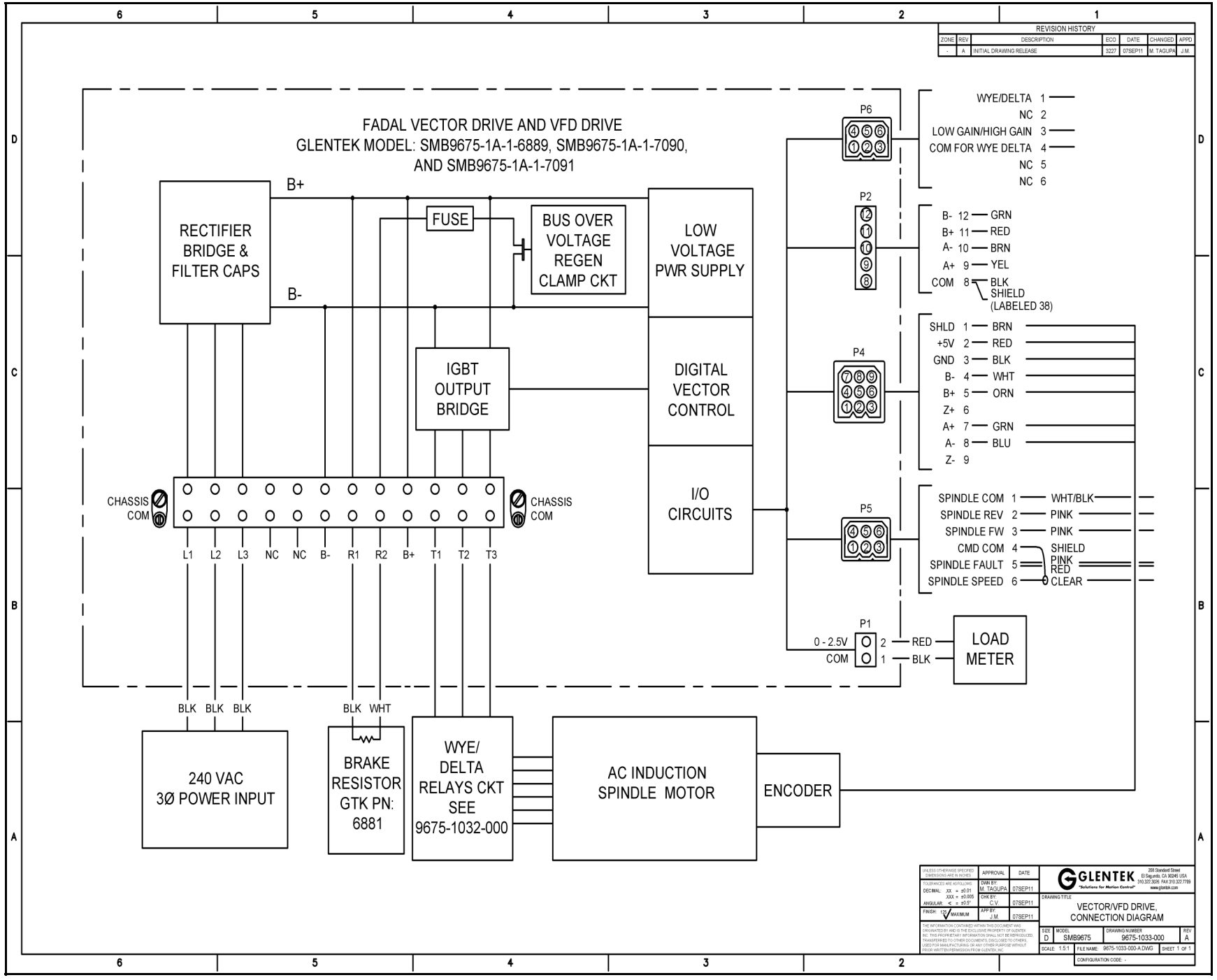
GLENTEK "Solutions for Motion Control"
208 Standard Street
El Segundo, CA 90245 USA
310.322.3026 FAX 310.322.7719
www.glentek.com

DRAWING TITLE: INSTALLATION, FADAL VECTOR DRIVE AND VFD DRIVE, SMB9675-1A-1

SIZE	MODEL	DRAWING NUMBER	REV
D	SMB9675-1A-1	9675-1030-000	A

SCALE: 1:1.25 | FILE NAME: 9675-1030-000-A.DWG | SHEET 1 OF 1

CONFIGURATION CODE:


REVISION HISTORY
ZONE REV DESCRIPTION ECO DATE CHANGED APPD
- A INITIAL DRAWING RELEASE 3227 07SEP11 M. TAGUPA J.M.
FADAL VECTOR DRIVE AND VFD DRIVE
GLENTEK MODEL: SMB9675-1A-1-6889, SMB9675-1A-1-7090,
AND SMB9675-1A-1-7091
RECTIFIER BRIDGE & FILTER CAPS
B+
B-
FUSE
BUS OVER VOLTAGE REGEN CLAMP CKT
LOW VOLTAGE PWR SUPPLY
IGBT OUTPUT BRIDGE
DIGITAL VECTOR CONTROL
I/O CIRCUITS
CHASSIS COM
CHASSIS COM
L1 L2 L3 NC NC B- R1 R2 B+ T1 T2 T3
P6
WYE/DELTA 1
NC 2
LOW GAIN/HIGH GAIN 3
COM FOR WYE DELTA 4
NC 5
NC 6
P2
B- 12 GRN
B+ 11 RED
A- 10 BRN
A+ 9 YEL
COM 8 BLK
SHIELD
(LABELED 38)
P4
SHLD 1 BRN
+5V 2 RED
GND 3 BLK
B- 4 WHT
B+ 5 ORN
Z+ 6
A+ 7 GRN
A- 8 BLU
Z- 9
P5
SPINDLE COM 1 WHT/BLK
SPINDLE REV 2 PINK
SPINDLE FW 3 PINK
CMD COM 4 SHIELD
SPINDLE FAULT 5 PINK
RED
SPINDLE SPEED 6 CLEAR
P1
0 - 2.5V 2 RED
COM 1 BLK
LOAD METER
BLK BLK BLK
BLK WHT
240 VAC 3Ø POWER INPUT
BRAKE RESISTOR GTK PN: 6881
WYE/ DELTA RELAYS CKT SEE 9675-1032-000
AC INDUCTION SPINDLE MOTOR
ENCODER
GLENTEK
"Solutions for Motion Control"
208 Standard Street
El Segundo, CA 90245 USA
310.322.3026 FAX 310.322.7799
www.glentek.com
DRAWING TITLE
VECTOR/VFD DRIVE,
CONNECTION DIAGRAM
SIZE D MODEL SMB9675 DRAWING NUMBER 9675-1033-000 REV A
SCALE: 1.5:1 FILE NAME: 9675-1033-000-A.DWG SHEET 1 OF 1
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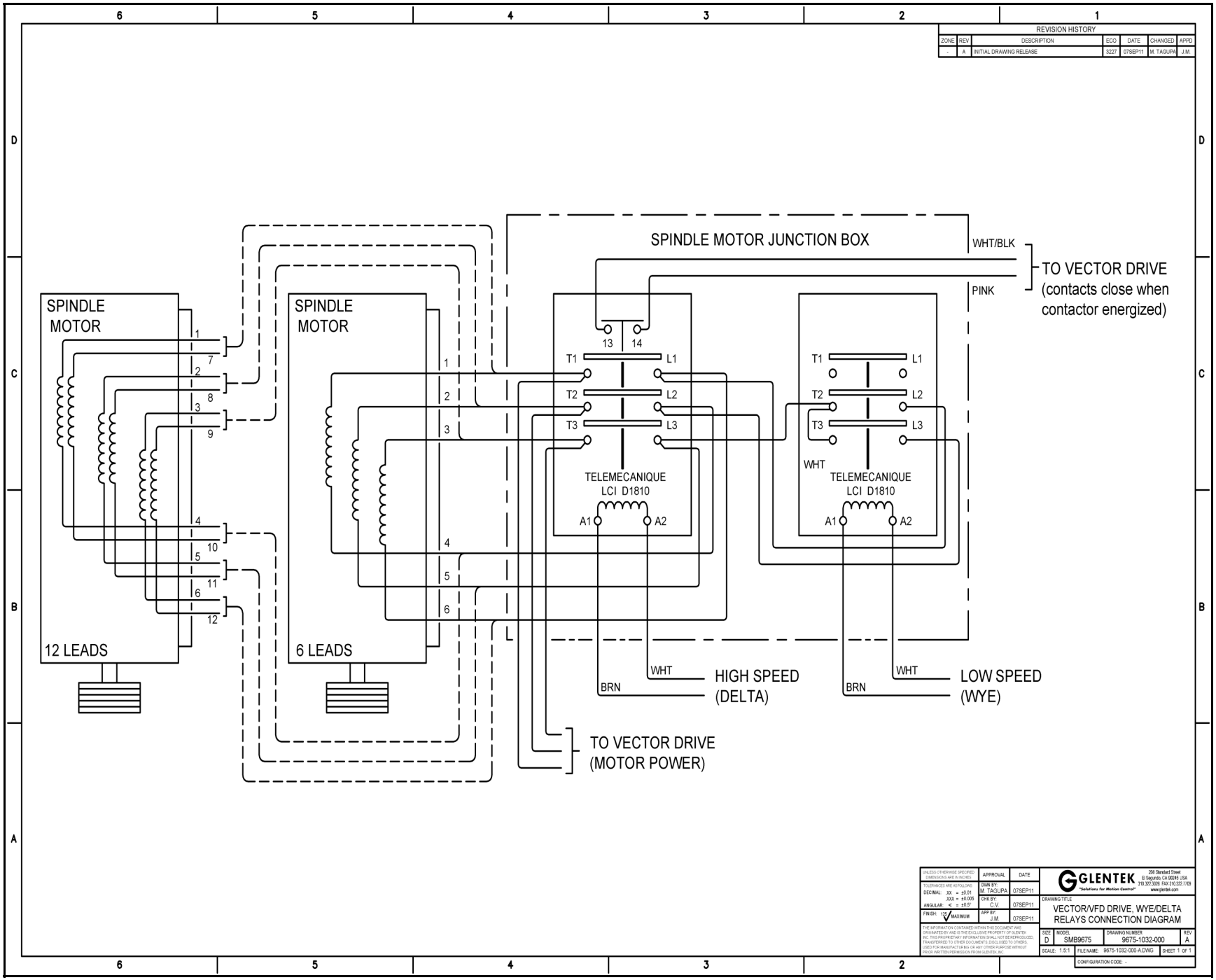
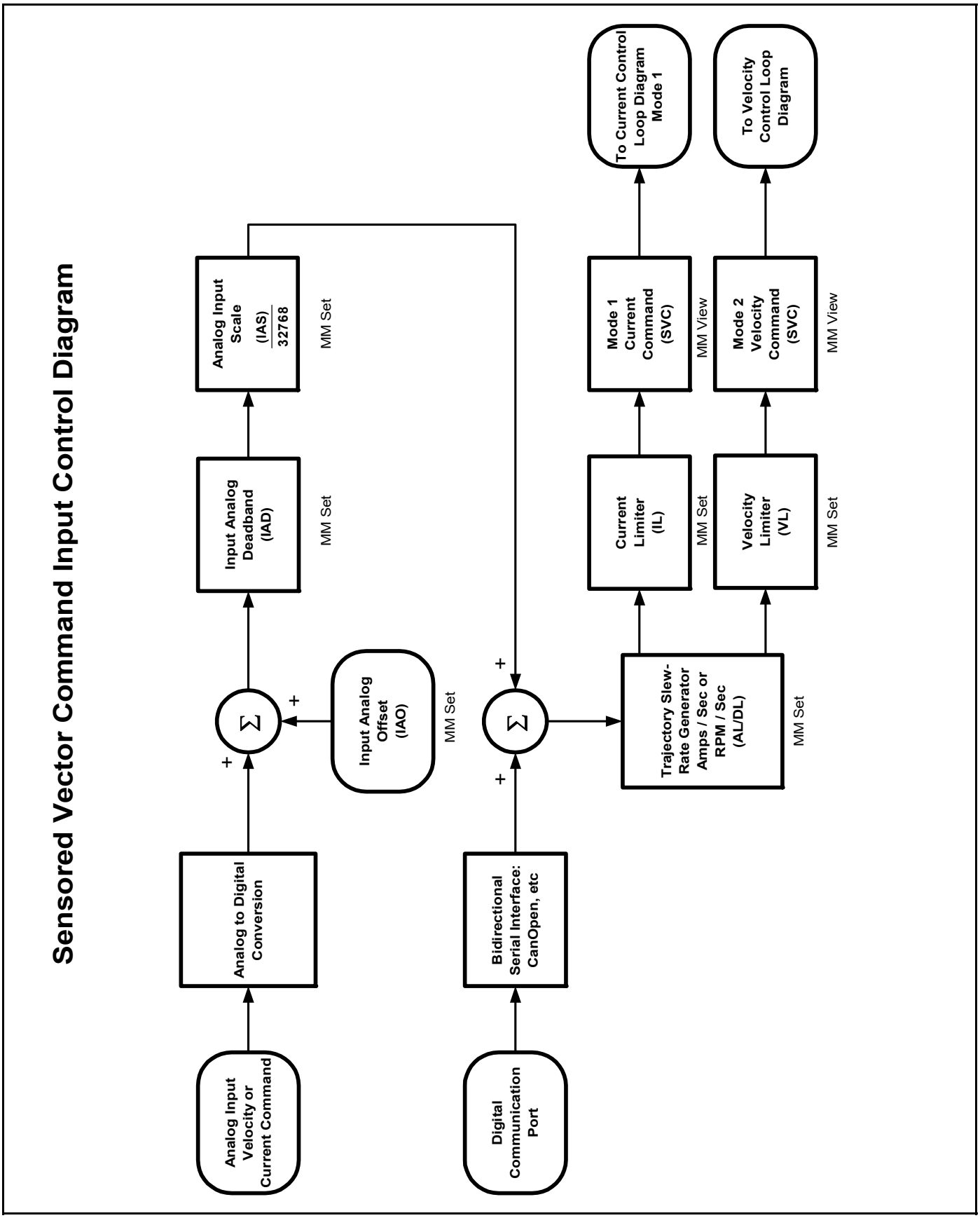
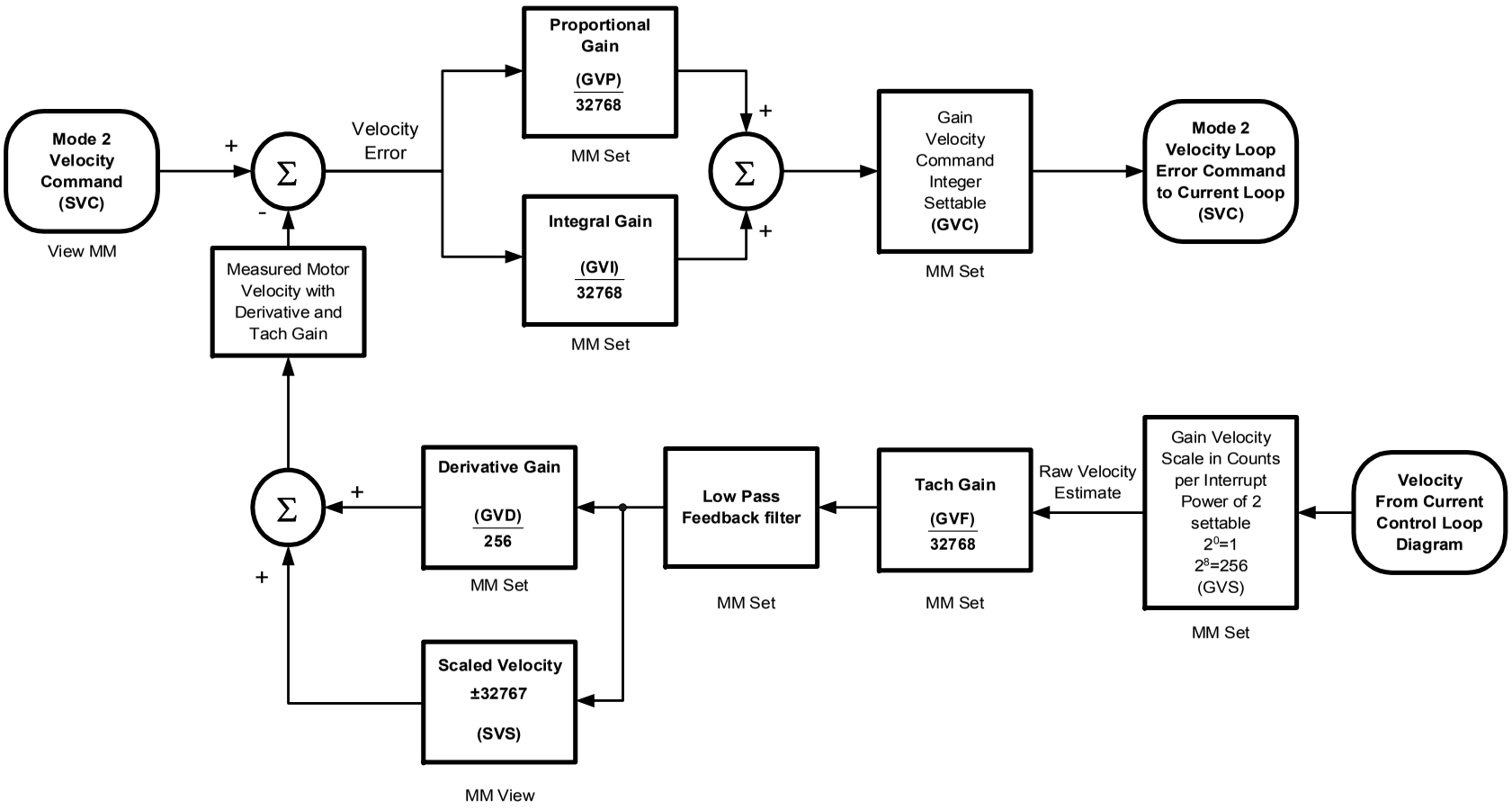
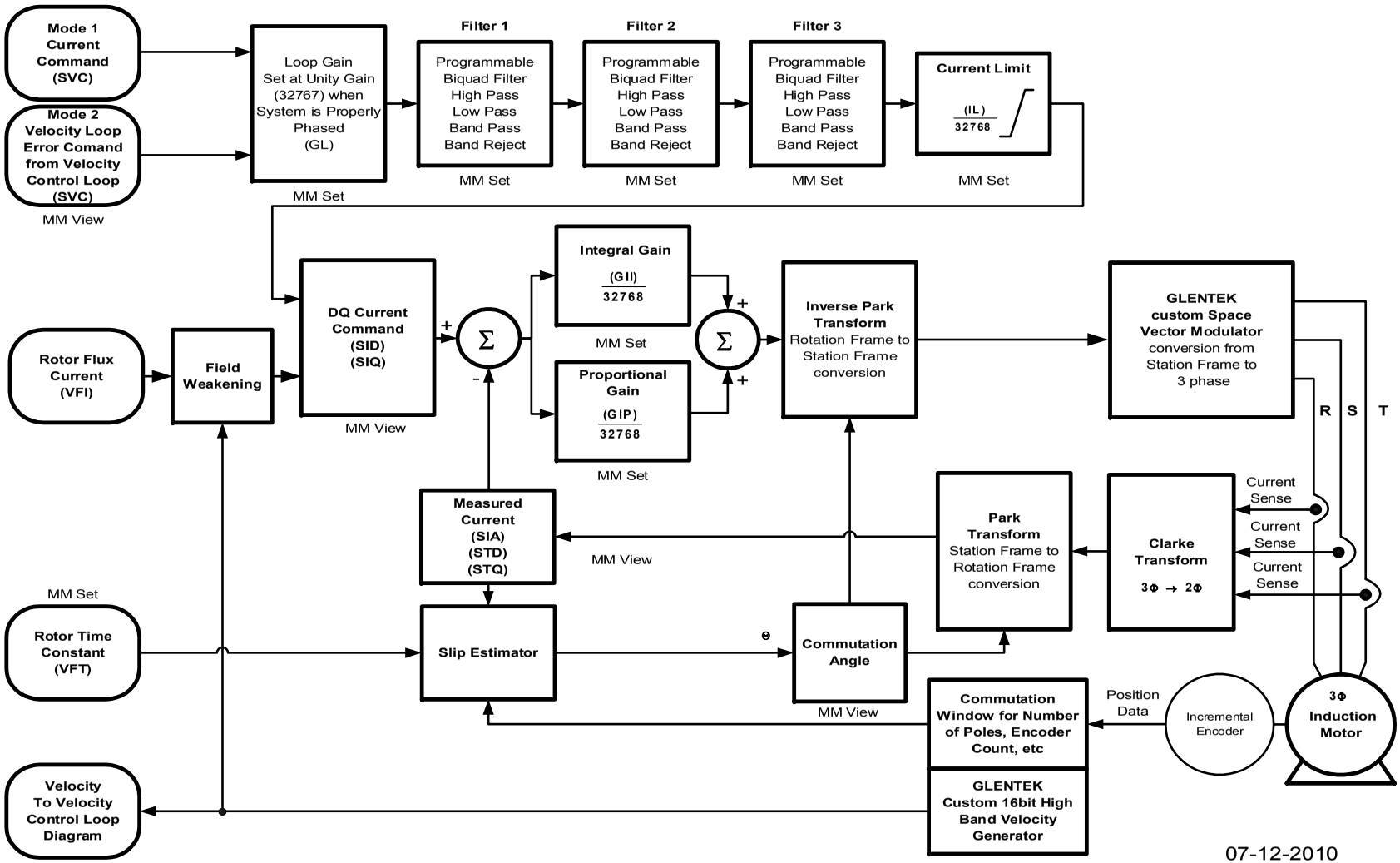

REVISION HISTORY
ZONE REV DESCRIPTION ECO DATE CHANGED APPD
- A INITIAL DRAWING RELEASE 3227 07SEP11 M. TAGUPA J.M.
SPINDLE MOTOR JUNCTION BOX
WHT/BLK
PINK
TO VECTOR DRIVE
(contacts close when
contactor energized)
SPINDLE MOTOR
12 LEADS
SPINDLE MOTOR
6 LEADS
TELEMECANIQUE
LCI D1810
TELEMECANIQUE
LCI D1810
WHT
BRN
HIGH SPEED
(DELTA)
WHT
BRN
LOW SPEED
(WYE)
TO VECTOR DRIVE
(MOTOR POWER)
GLENTEK
"Solutions for Motion Control"
VECTOR/VFD DRIVE, WYE/DELTA
RELAYS CONNECTION DIAGRAM
SMB9675
9675-1032-000
A
9675-1032-000-A.DWG


Sensored Vector Command Input Control Diagram
Analog Input Velocity or Current Command
Analog to Digital Conversion
Digital Communication Port
Bidirectional Serial Interface: CanOpen, etc
Input Analog Offset (IAO)
MM Set
Input Analog Deadband (IAD)
MM Set
Analog Input Scale (IAS) / 32768
MM Set
Trajectory Slew-Rate Generator Amps / Sec or RPM / Sec (AL/DL)
MM Set
Current Limiter (IL)
MM Set
Velocity Limiter (VL)
MM Set
Mode 1 Current Command (SVC)
MM View
Mode 2 Velocity Command (SVC)
MM View
To Current Control Loop Diagram Mode 1
To Velocity Control Loop Diagram

Sensored Vector Velocity Control Loop Diagram



Sensored Vector Current Control Loop Diagram



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