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MOTION CONTROL SYSTEM, VME SERIES

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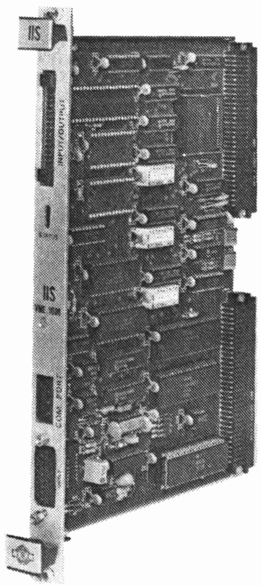

VME-1000 SINGLE AXIS CONTROLLER

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, INC.

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1.0 INTRODUCTION

1.1 About this Instruction Book

This document has been designed to support Industrial Indexing Systems' VME-1000 Single Axis Controller for use in VMEbus applications. It provides product information about the VME-1000 Single Axis Controller including; a product overview, product description, installation, product specifications, description of controls and indicators, functionality tests, connection diagrams, and operation.

1.2 VMEbus Interface

The VME-1000 Single Axis Controller incorporates an industry standard slave chip (PT-VSI) and is functionally compatible with VMEbus Specification Revision C.1. The controller and the VMEbus host communicate through sixteen dual access one byte memory locations configured as mailbox memory. The controller is also equipped with a VMEbus Interrupter with programmable level and vector.

1.3 Product Overview

The VME-1000 Single Axis Controller is a VMEbus compatible motion controller (Figure 1-1) that can be plugged directly into a single slot in a dual height (6U) VMEbus chassis. It provides precision position loop control utilizing feedback data from an encoder on the motion control device (Figure 1-2).

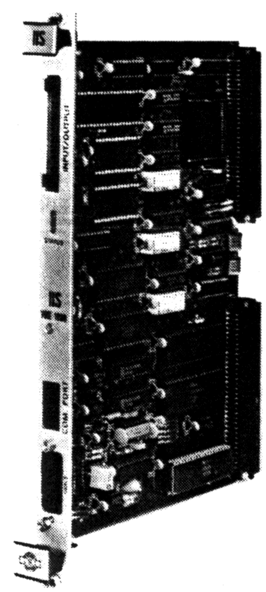

Figure 1-1 VME-1000 Single Axis Controller

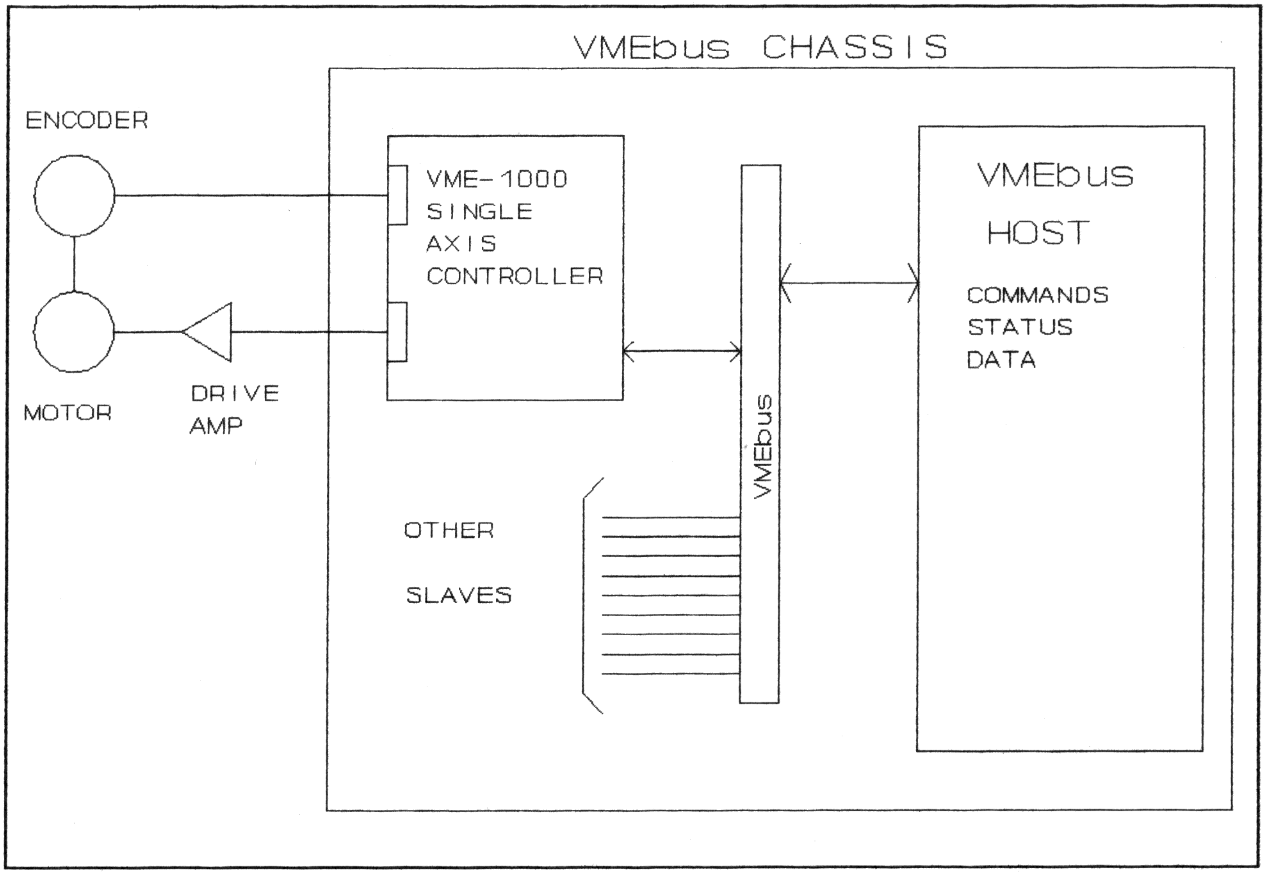

Figure 1-2 Position Loop Overview

2.0 DESCRIPTION

2.1 General

The VME-1000 Single Axis Controller is an intelligent circuit board that works in conjunction with an encoder connected to the motion device. The controller uses the feedback from the encoder to produce a Position Offset Signal OUTput (POS OUT) that causes the motion device to move in relation to the commands from the VMEbus host. The controller is capable of performing indexing, positioning, piecewise profiling, and can also be used as a passive position sensing device.

2.2 VME-1000 Single Axis Controller

The controller (Figure 2-1) is a microprocessor based board running under the control of a unique IIS Operating System. Commands from the VMEbus host are sent over the VMEbus to the controller's mailbox memory. When the controller detects that the VMEbus host has finished writing its data to the mailbox memory the controller begins processing the command. Once processing has begun, the controller sets bit 0 of the status word. The 24-bit wide digitized signals from the encoder and command generator are parallel processed. The controller performs multiple functions of position command generation, comparator, and PID compensation to produce a POS OUT signal.

2.2.1 Active and Passive Modes

The controller is in Active mode when the 'DRIVE_ON' command is executed. While the controller is in active mode, it will accept motion commands. When the 'DRIVE_ON' command is executed, the POS OUT signal is first driven to 0V dc by making the commanded position equal to the actual position then the Drive Enable Control is turned on.

The controller is in Passive mode on power-up or when a 'DRIVE_OFF' command is executed. While the controller is in passive mode, all motion commands will be ignored. When the VME host commands the controller with a 'DRIVE_OFF' command, the drive enable control is turned off and the controller is in passive mode. The POS OUT signal represents the count of the encoder referenced to X.0 degrees home (ie; zero volts is zero degrees). This home position is the encoder position at power up unless the 'INIT_TO_HOME' instructions were executed which changes the home position of the encoder.

As a passive position sensing device, the controller can be used to monitor the motion of machine components. This information can be communicated to the VMEbus host for integration into other functions of the VMEbus system.

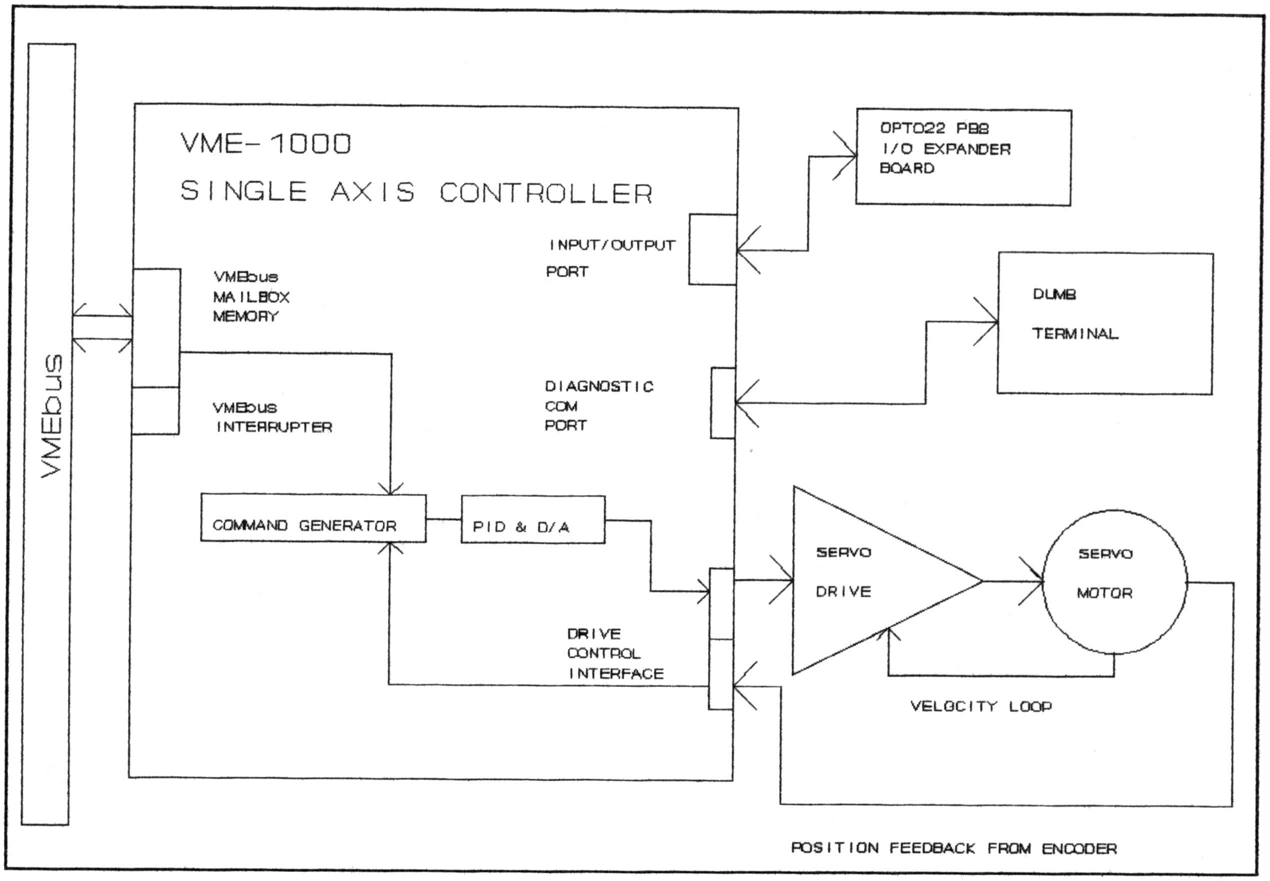

Figure 2-1 VME-1000 Overview Diagram

2.2.2 PID Compensation

The VMEbus host can override the default gain (P) term of 16, integral (I) term of 0, and differential (D) term of 0. These terms can be adjusted to customize system response, stability, and stiffness to perform in particular applications. Figure 2-2 illustrates the integration of PID into the VME-1000 Single Axis Controller.

Some terms used in the following paragraphs are:

Stiffness - the ability of the servo system to keep its position under loaded conditions.

Response - how fast the servo system will respond to changes in the load and/or commands.

Stability - the ability of the servo system to control the load under changing conditions and commands.

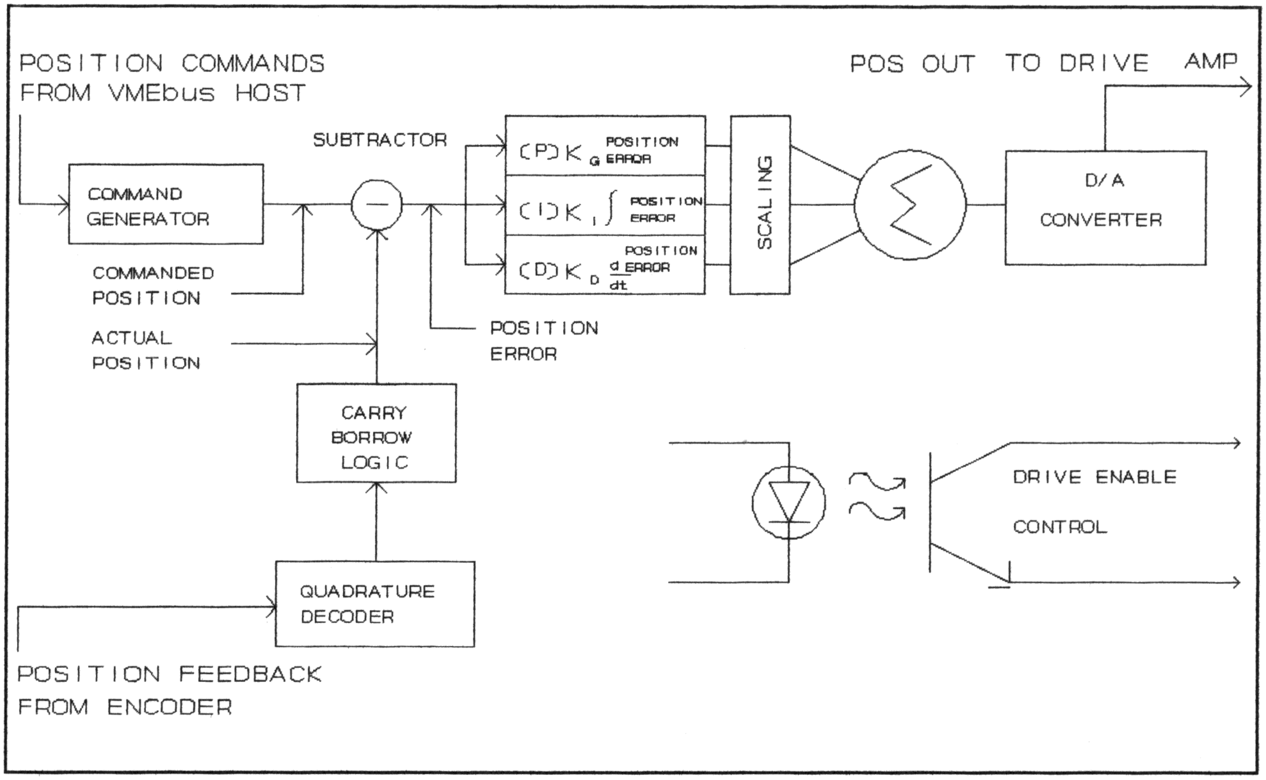

Figure 2-2 PID Block Diagram

2.2.2.1 The P Term (Proportional Gain)

At power up, the controller is configured as a proportional gain controller. The default gain value of 16 provides an overall system gain of one which will produce a POS OUT signal of 20 volts per revolution of the encoder shaft. This relationship can be varied by changing the P term;

> **NOTE**
>
> **The P term has a proportional effect on the operational fault detection discussed in Section 2.7.3.**

P = 256 will produce a POS OUT signal of 20 volts per 1/16 revolution of the encoder shaft.

P = 1 will produce a POS OUT signal of 20 volts per 16 turns of the encoder shaft.

This relationship is used to increase/decrease the servo system's response and stiffness.

2.2.2.2 The I Term (Integral)

The integral term is introduced into a servo control system when the proportional gain cannot compensate for steady-state errors. The actual amount of integral to be added is system dependent. The valid range is +/- 127. At power-up, the integral term is 0.

The I term introduces an anticipated error. During steady-state operation, it reduces the position error providing more accurate position tracking. During acceleration/deceleration ramps, it can increase system responsiveness by tending to overshoot the commanded value.

2.2.2.3 The D Term (Differential)

The differential term is introduced into a servo control system to control the rate of change. The D term has the effect of rounding the acceleration/deceleration ramps and reducing overshoot of the commanded value. The actual amount of D to be added is system dependent. The valid range is +/- 127. At power-up, the differential term is 0.

The D term benefits the system by reducing overshoot and providing more stability and better response by dampening oscillations. Because the D term suppresses oscillations, the proportional gain term can be increased to provide a more responsive system.

2.3 Position Loop

The VME-1000 Single Axis Controller is the heart of the position loop (Figure 2-3). Instructions from the VMEbus host tell the controller what the parameters of the motion are for indexing or positioning. This information is processed by the command generator and the resulting position commands are sent to the comparator along with feedback from the encoder. The command generator produces a commanded position which represents speed, accel/decel rate, direction, and distance that the motion device must move. This difference between the commanded position and the actual position is the POS OUT signal which is sent to the drive amplifier which powers the motion device.

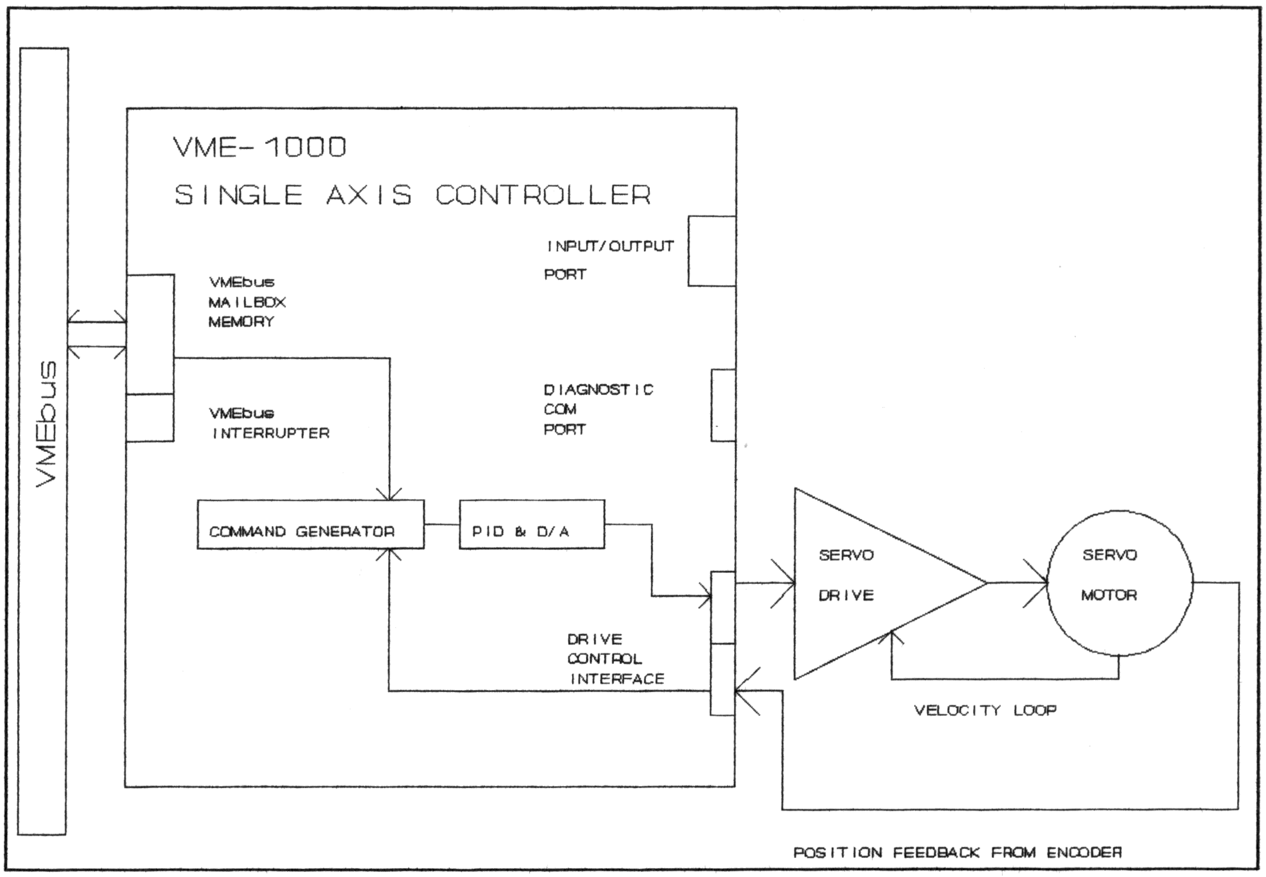

Figure 2-3 Position Loop Diagram

The shaft of the motion device and the shaft of the encoder are mechanically connected. As the encoder turns to a new position, the actual position feedback matches the commanded position thus satisfying the comparator and setting the POS OUT signal to 0.0V dc.

2.3.1 Encoder Functional Description

The encoder produces current loop pulses of approximately 10 ma per channel. There are three channels, two of which are quadrature encoded and the third produces a marker signal. Each of the quadrature channels (Figure 2-4) produce a squarewave signal that is offset by 90 degrees from the other. Each edge of the squarewave is counted by an interface circuit. This technique provides direction sensing capability as well as an increase in resolution that is four times the encoder line count. The marker produced by the third channel is used to mark the 0.0 degree absolute reference point.

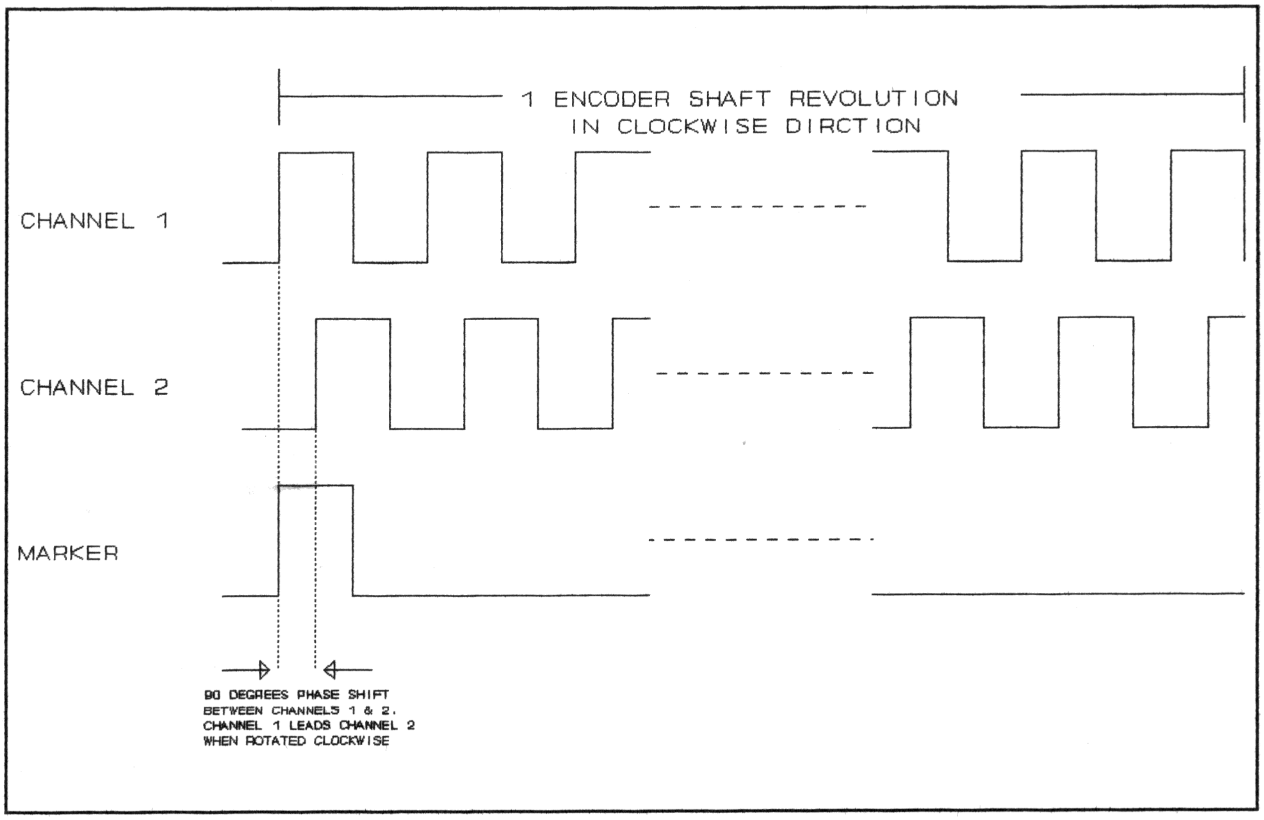

Figure 2-4 Encoder Channel Relationship

2.3.1.1 Encoder Count Channels

The feedback, with a resolution of 1024 line counts from the encoder, is multiplied by a factor of four to produce 4096 bits per revolution. All further descriptions in this instruction book are based on this line count. Encoders having line count other than 1024 lines per revolution can be used but should be compensated for by scaling the distance appropriately and setting the line count via the 'SET_COUNT' instruction.

2.3.1.2 Home Reference Channel

An encoder is not an absolute position sensing device. At power up, the true encoder position is not known. For this reason, the power up location is defined to be 0.0 and is a local home. The encoder has a once per revolution pulse signal called a marker to provide an absolute 0.0 degree reference (Figure 2-4). The controller automatically detects this marker when it passes and sets up the absolute 0.0 reference point and an offset to the startup position to prevent jumps in the signal output. This offset can be cleared via the 'CLR_LOCAL' command and the absolute 0.0 position will be validated.

The VME-1000 Single Axis Controller provides 'INIT_TO_HOME' commands which are used to initialize the system. This is referred to as the absolute mode. These instructions cause the motor to move in the desired direction and position itself at the next marker pulse or moving to the next marker pulse past an input reference from the I/O board. In either case the final resting point is redefined as the absolute zero reference.

The ability to initialize the system is only valid when the controller is being used as an active position sensing device.

2.5 Com Port

The VME-1000 Single Axis Controller has a communication port (Figure 2-5) that accepts a 20 ma current loop ASCII format. The port can be used as a diagnostic tool during system design or integrated into the design as a status monitor. For a list of the diagnostic/command abilities of the communication port, refer to Section 8.2.

2.6 Input/Output Board Functions

2.6.1 General

The optional Input/Output board (Figure 2-6) is an OPTO22 PB8 (or equivalent) that is configured with six inputs and two outputs. The board is interfaced with ribbon cable as illustrated in Section 3.4.3.

2.6.2 Inputs

The VME-1000 Single Axis Controller's Input/Output Board has six inputs that are user definable. At power up, all six inputs are configured as general inputs that can be read by the 'GET_INPUTS' command.

2.6.3 Inputs as Commands

All six inputs can be programmed to perform specific commands when a valid true is detected. For possible commands, refer to the SET_FUNCTION command in the command reference.

2.6.4 Inputs as Sensors

There are three commands that are linked directly to specific input modules. These commands use the inputs as sensors to commence specific tasks. The commands are 'SET_TRAP_POS', 'INIT_TO_HOME', and 'OVER_DRAW'. For or a more detailed description, refer to Paragraph 7.9.3 and the command reference.

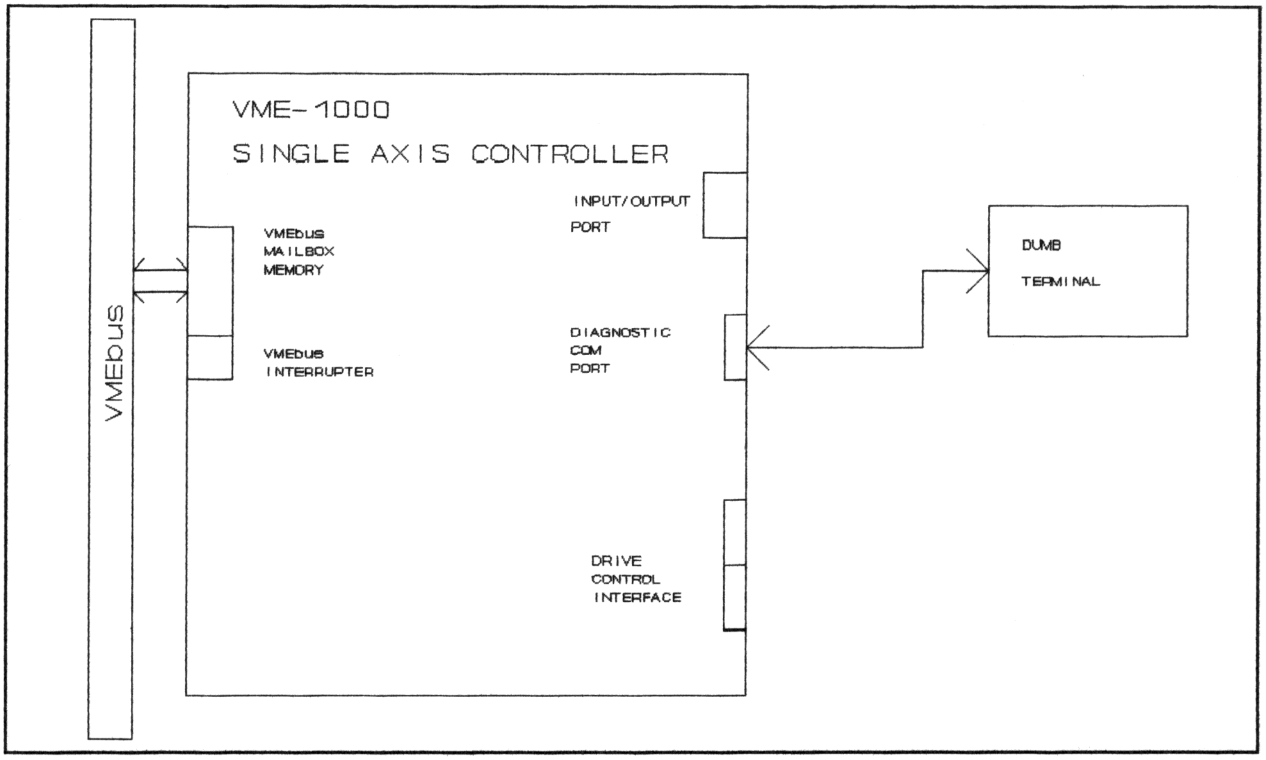

Figure 2-5 COM PORT Block Diagram

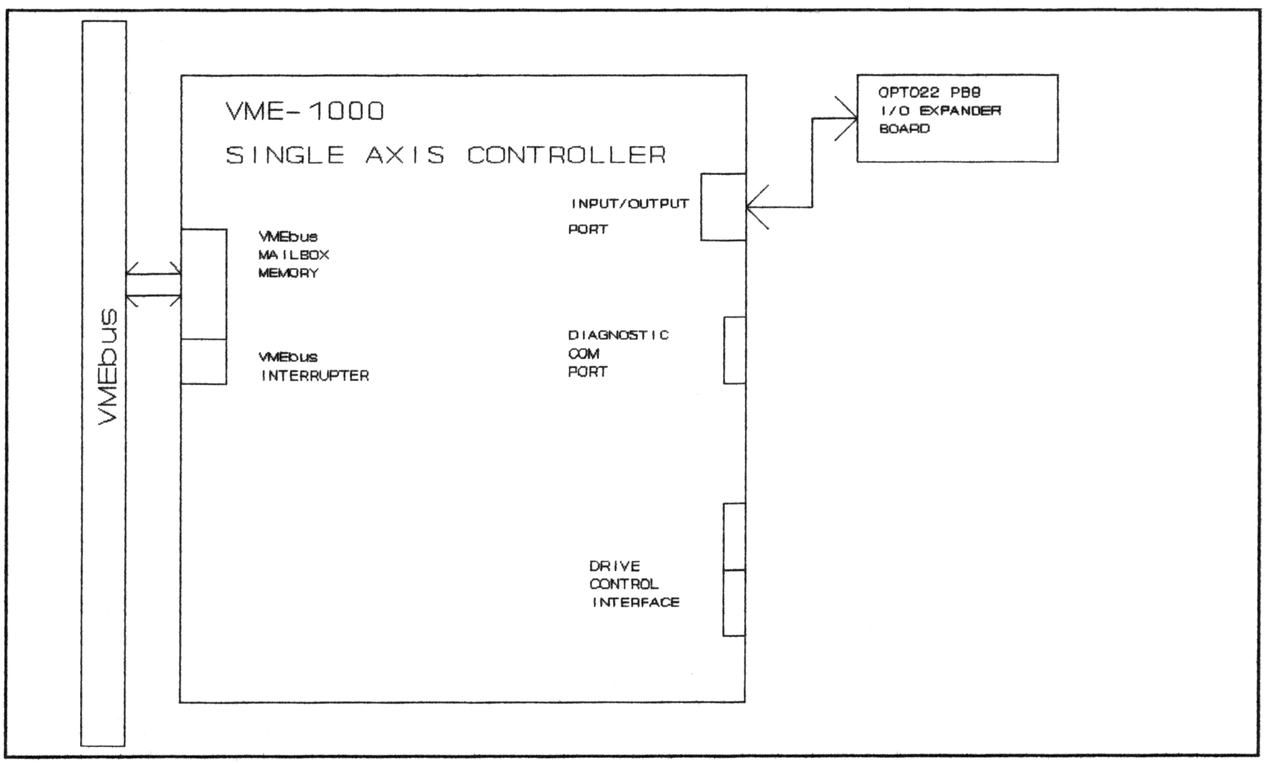

Figure 2-6 Input/Output Block Diagram

2.6.5 Outputs

The VME-1000 Single Axis Controller Input/Output Board has two output modules that are user settable via the 'SET_OUTPUT' command.

2.7 Status and Fault Indicators

2.7.1 General

The controller's status indicators are visible through a cut out in the faceplate (Figure 2-7). Refer to Figure 2-7 during this section to visualize the location and meaning of the indicators.

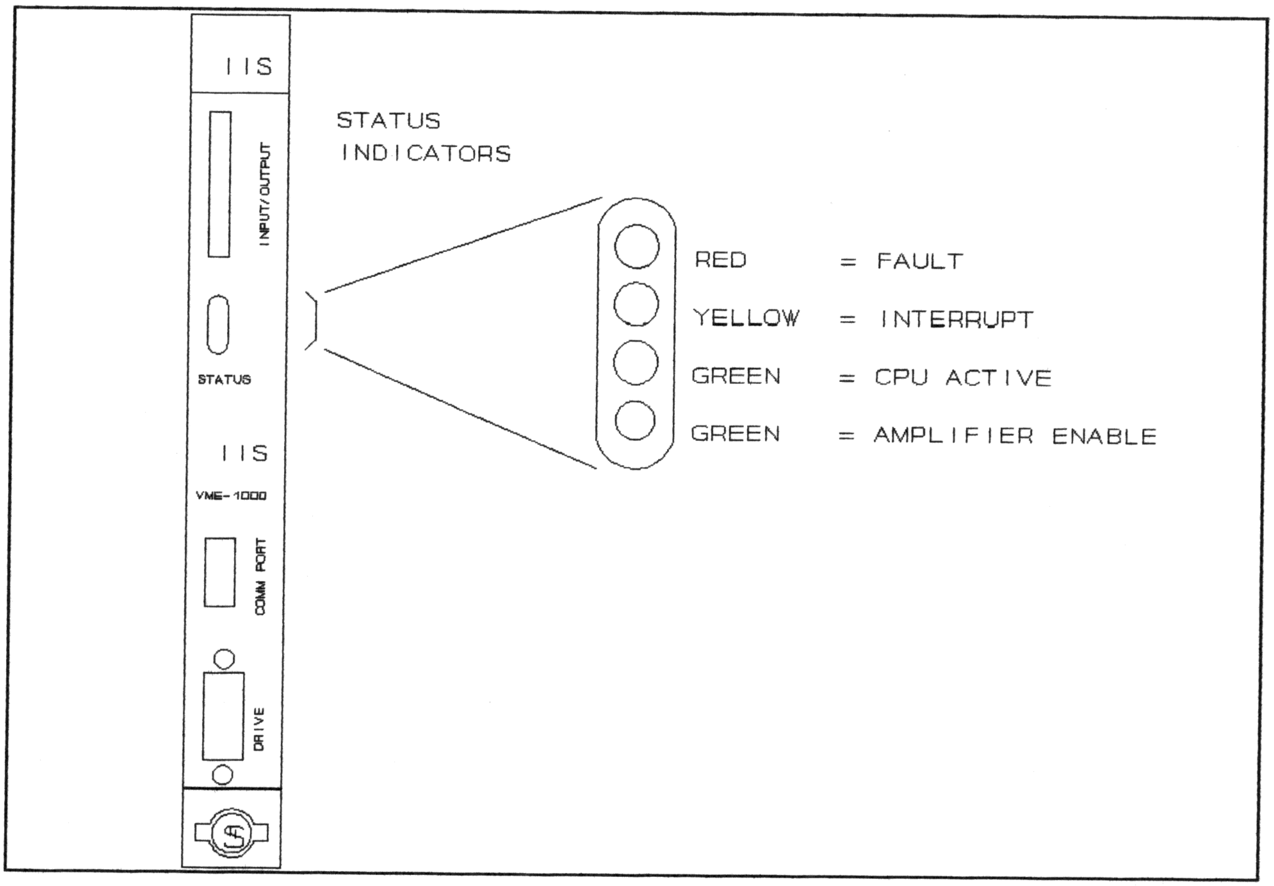

Figure 2-7 Status Indicators

2.7.2 Power-up Fault Detection

On power up, the VME-1000 Single Axis Controller will light the CPU ACTIVE status indicator. If there is a fault on power up, the red SYSTEM FAULT and yellow INTERRUPT indicators will be lighted. If this happens, power down the system and check the seating of the controller and all of its connections. Re-apply power, if the same combination of indicators are lighted, the controller can be suspected of being faulty.

2.7.3 Operational Fault Detection

The VME-1000 Single Axis Controller has built-in fault detection. While the DRIVE ENABLE indicator is lighted, the controller monitors the Position error (see Figure 2-2), immediately sets the signal to 0.00V dc and turns off the drive enable control under the following conditions:

> If no motor motion is commanded, the controller will not allow the encoder to be more than 200 bits off of its commanded position.
>
> If motor motion is commanded, the controller will not allow the encoder to be more than 2000 bits from the commanded position.

2.7.4 Status Indicator Description

During normal operation, the CPU ACTIVE indicator is lighted. As the VMEbus host executes an 'DRIVE_ON' command, the ENABLE OUTPUT indicator comes on to enable the position loop and start the monitoring of the POS OUT signal. As the controller communicates with the VMEbus host and diagnostic monitor, the INTERRUPT indicator will flicker or appear to be steadily on due to rapid flickering. For a more detailed description of the physical and functional characteristics of these indicators, refer to Section 5.1.

3.0 INSTALLATION

3.1 Unpacking and Inspection

CAUTION

The VME-1000 Single Axis Controller contains electrostatic sensitive integrated circuits. Precautions should be taken when handling the controller to minimize the risk of static damage.

The shipping carton should be inspected for damage that may have occurred in transit. If the carton appears damaged, contact a representative of the shipping carrier before proceeding with the unpacking.

Unpack the contents of the carton and verify against the packing list. Inspect the VME-1000 Single Axis Controller for any visible signs of damage. If the controller appears to be damaged, contact Industrial Indexing Systems, Inc. and do not proceed with any further installation.

3.2 Factory Configuration

The VME-1000 Single Axis Controller provides three (3) DIP switches for configuration purposes. The switches determine the VMEbus address and address modifier. At the time of shipment, the controller is configured as an A24 address decode with its starting address at 20000xx hexadecimal, address modifier disabled. Modification of the configuration is explained in Section 5.2.

3.3 Installation Procedure

Before installing the controller, all configuration switches should be set to the desired settings. Refer to Section 5.2 for information on configuration switch set-up.

CAUTION

The VME-1000 Single Axis Controller module should never be inserted or removed from its card-cage slot while power is applied. Such insertion/removal with the power applied could seriously damage the module's components.

The controller may be installed in any slot of a VMEbus backplane. Multiple controller modules may be installed in a common VMEbus backplane.

3.4 Wiring Connections

The following diagrams illustrate all the peripheral connections other than the VMEbus that the VME-1000 Single Axis Controller supports.

3.4.1 Drive Amplifier Connections

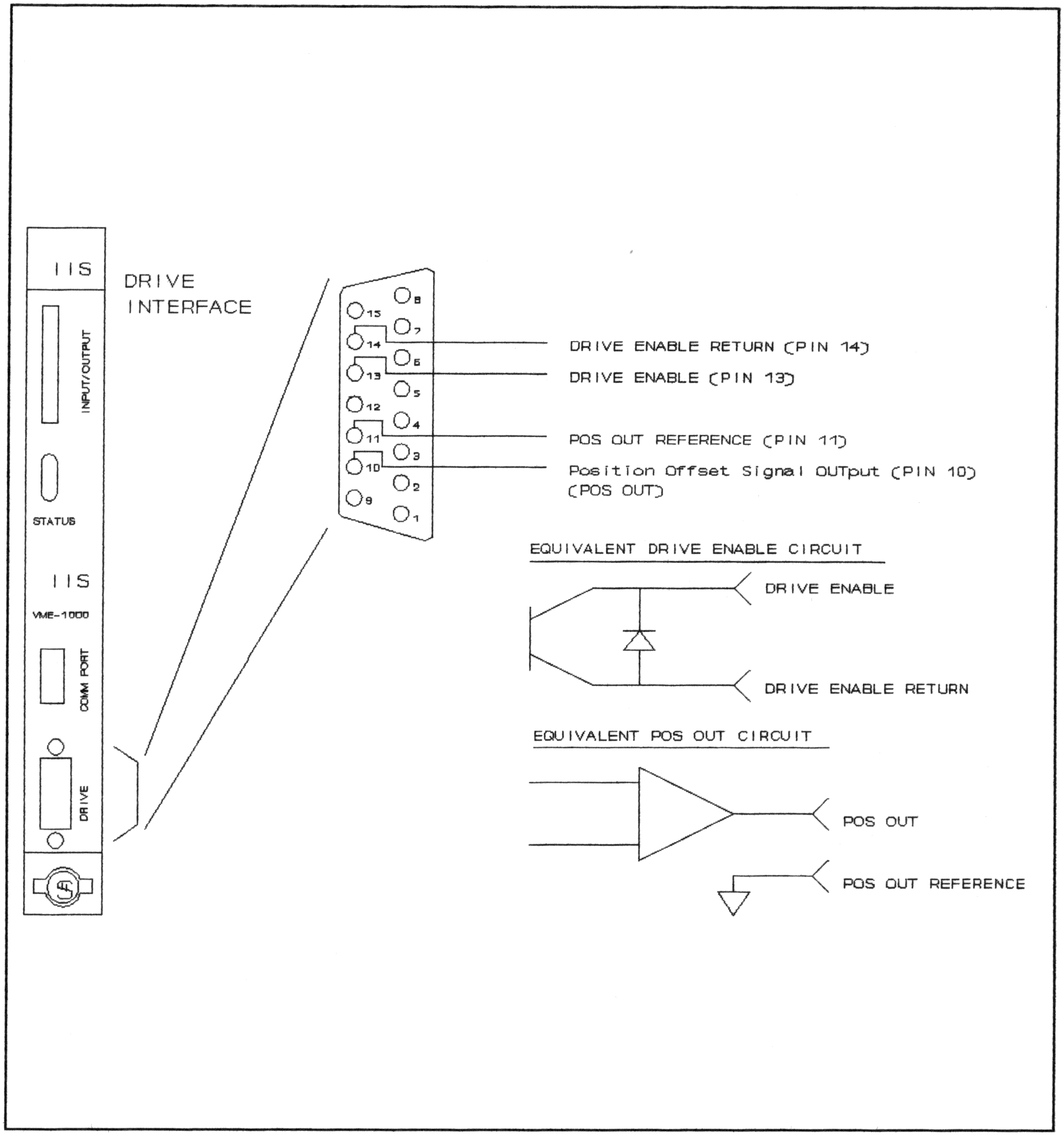

Figure 3-1 Drive Interface Connections

3.4.2 Optical Encoder Connections

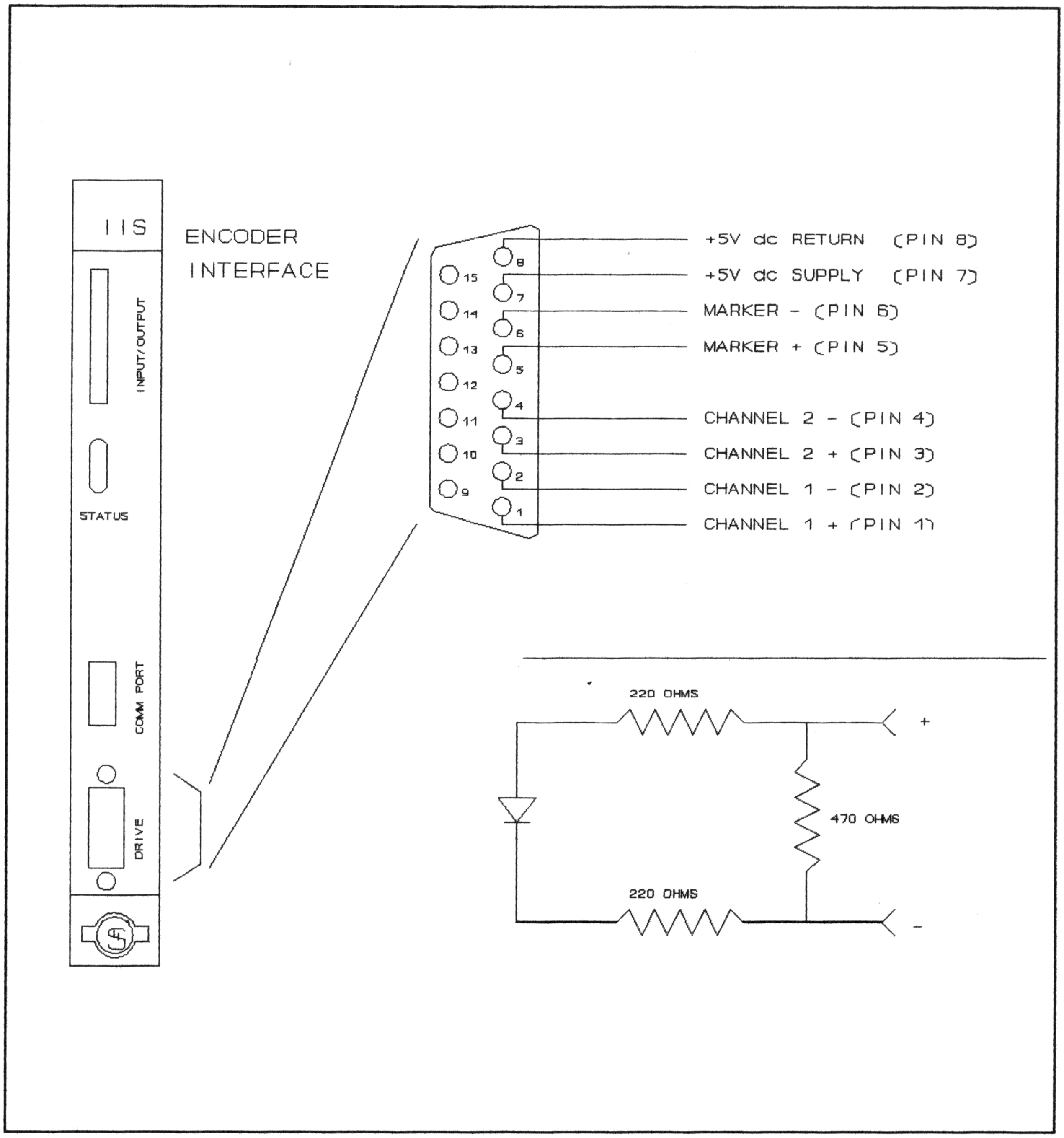

Figure 3-2 Encoder Interface Connections

3.4.3 Input/Output Port Connections

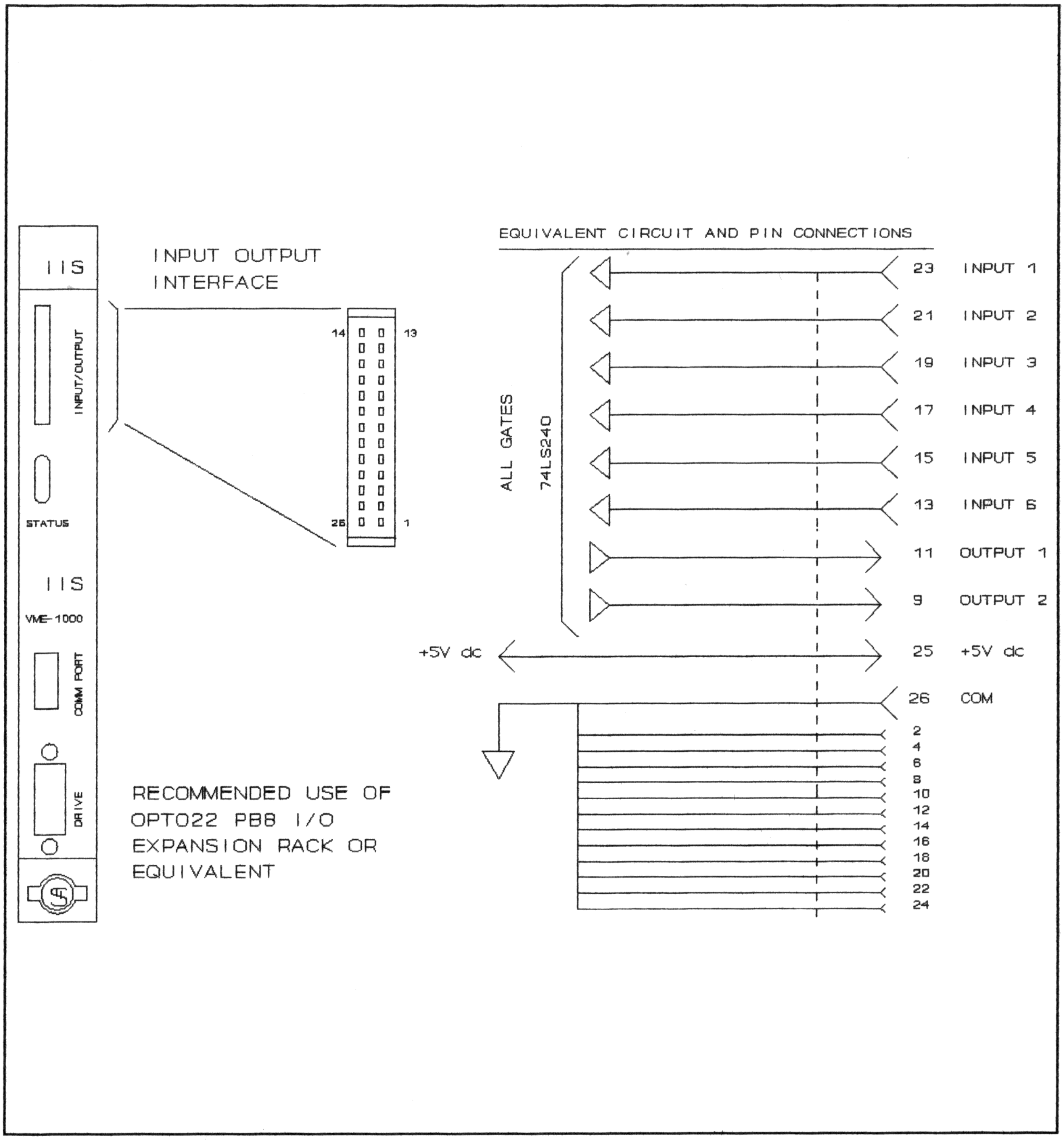

Figure 3-3 Input/Output Interface Connections

3.4.4 Com Port Connection

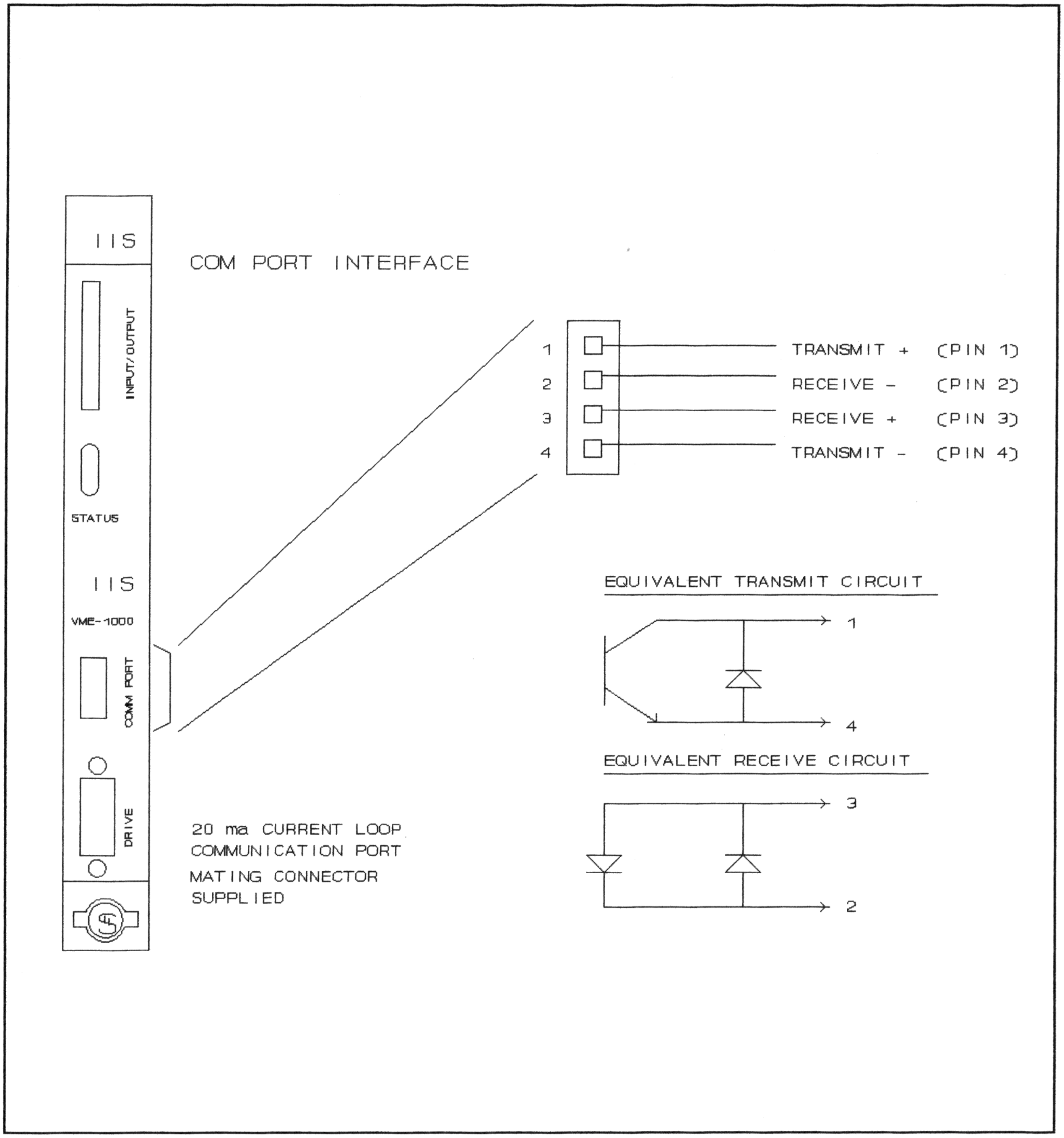

Figure 3-4 Com Port Interface Connections

4.0 SPECIFICATIONS

4.1 Functional Characteristics

Encoder:	Input	Encoder with 1/4 cycle pulse marker.
	Decode	Quadrature @ 800,000 edges per second.
	Electrical	5V dual line receivers, optically isolated. 10 ma drive current required. 5V supply connections provided.
	Mechanical	Standard 15 pin D-type connector houses all encoder interface signals.
Drive Amplifier:	Drive Enable Output	Optically isolated output with status indicator 20 ma @ 30 V dc. Circuit is closed to enable amp.
	Position Offset OUTput (POS OUT)	+/- 10V dc @ 10 ma.
	Mechanical	Standard 15 pin D-type connector houses all drive interface signals.
Com Port:	Serial input/output	4 wire 20 ma current loop. RS232 interface optional.
	Protocol	Standard ASCII with no parity and 1 stop bit.
	Baud rate	Equipped with auto baud feature valid for 300,1200,2400,4800, and 9600 baud. Interfaces with dumb terminal.

Mechanical	4 pin Phoenix type connector supplied.

Input/Output Interface:

Discrete I/O	Ribbon cable to OPTO 22 PB8 card.
Inputs (6)	All user definable as standard inputs or as command initiators. Inputs 4, 5 and 6 can be used as sensors for special commands.
AC Input Module	OPTO22 type IAC5
Voltage range	90 to 140V ac
Off Voltage	30V ac max
On Current	11 ma max
Input impedance	14K Ohms
DC Input Module	OPTO22 type IDC5
Voltage range	10 to 32V dc
Off Voltage	3V
On Current	25 ma
Off Current	1 ma
Outputs (2)	Both user settable.
AC Output Module	OPTO22 type OAC5
Voltage range	12 to 140V ac
Current rating	2 A
Output Voltage drop	1.6V peak
Off-state leakage	5 ma RMS
DC Output Module	OPTO22 type ODC5
Voltage range	5 to 60V dc
Current rating	2.75 A max
Output Voltage drop	1.6V max
Off-state leakage	1 ma

4.2 Performance Characteristics

Processor	Z8002
Instruction speed	1.5 million/second.
Position range	16 bit counter with 32 bit accumulation in firmware.
Position Accuracy	+/- 1 encoder count.
Velocity range	341 to 245,760 counts/second.
Velocity accuracy	1% of set speed.
Accel/decel range	20,480 to 3,276,800 counts/s/s.
Temperature range	0 to 50 degrees Celsius.

4.3 VME Specifications

Compliance	Complies with VME spec Rev C.1.
Interface	Uses industry standard slave interface chip PT-VSI.
Interrupts	Configurable interrupt level and vector for status change interrupts.
Addressing	A32/A24 addressing and AM05, both switch selectable.
Data lines	D08 data (uses 512 byte VME block).
Card	Single slot dual height (6U).

4.4 Power Requirements

+5 Volts	@ 1 A
+12 Volts	@ 200ma
-12 Volts	@ 200ma

5.0 CONTROLS AND INDICATORS

5.1 Status Indicators

The VME-1000 Single Axis Controller is equipped with four status indicators. These are visible through a cut out in the faceplate of the controller. The status reflected by these four indicators is represented in Table 5-1.

Table 5-1 Status Indicator Description

DESCRIPTION	INDICATOR STATE	INDICATOR FUNCTION
ENABLE OUTPUT GREEN LED	STEADY ON	DRIVE ENABLE IS CLOSED
CPU ACTIVE GREEN LED	STEADY ON	CONTROLLER IS OPERATIONAL
INTERRUPT YELLOW LED	FLASHING	CONTROLLER IS COMMUNICATING WITH VMEbus OR COM PORT
FAULT RED LED	STEADY ON FLASHING	START-UP FAULT COMMUNICATION FAULT

5.2 Settable Controls

The only user settable controls on the VME-1000 Single Axis Controller are the VMEbus addressing and addressing modifier selection switches. The controller provides full A32 address decoding capability allowing the mailboxes to be placed anywhere in A24 space under program control. The controller's address scheme is set-up by three 8 position dip-switches (Figure 5-1) that are only read on power up. Any changes made after power up will be ignored.

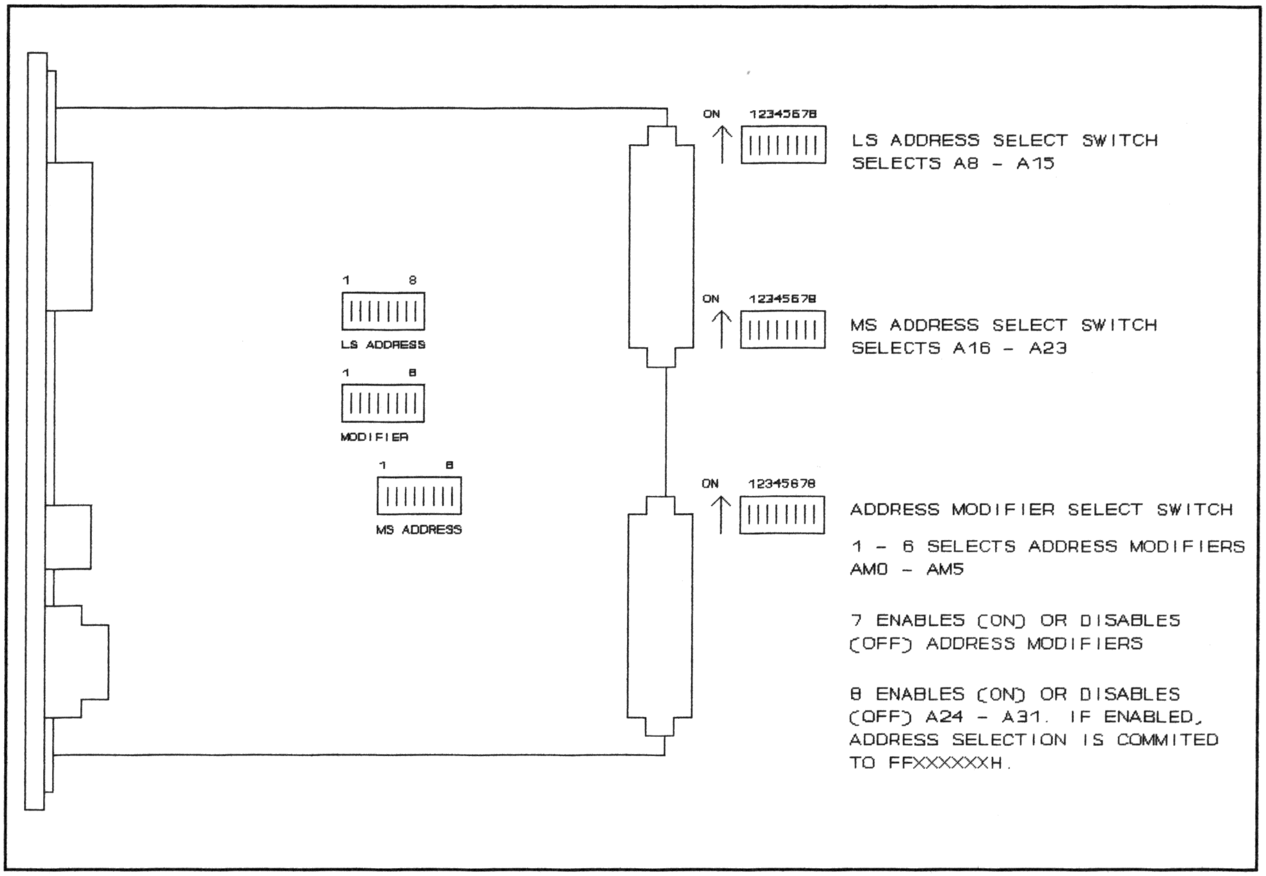

Figure 5-1 VME-1000 Address Selection Switches

5.2.1 VMEbus A16 Address Selection (LS ADDRESS)

The VMEbus LS address is decoded via an 8-position dip-switch (LS ADDRESS) located on the controller's component side (Figure 5-1). It is a representation of address lines A08 thru A15 (A08 is a don't care). The controller uses the address programmed at the switch as its VMEbus address.

5.2.2 VMEbus A24 Address Selection (MS ADDRESS)

The VMEbus MS address is decoded via an 8-position dip-switch (MS ADDRESS) located on the controller's component side (Figure 5-1). It is a representation of address lines A16 thru A23. The controller uses the value programmed at the switch as its VMEbus address.

5.2.3 VMEbus Address Modifier (MODIFIER)

Address modification is accomplished in accordance with VMEbus spec Rev C.1. Address modification is decoded using an 8-position dip-switch (MODIFIER) located on the controller's component side (Figure 5-1). Switch Position 7 enables (on) or disables (off) address modification. Switch Positions 6 thru 1 are AM5 thru AM0 respectively.

5.2.4 VMEbus A32 Address Selection (MODIFIER)

Switch Position 8 on the MODIFIER indicates A24 thru A31 (on) enabled or disabled (off). If A24 thru A31 are enabled, the A32 decode is committed to 0FFxxxxxx hexadecimal.

6.0 OPERATION

6.1 Talking to the Controller

The VME-1000 Single Axis Controller is accessible by a VMEbus master via sixteen dual ported one byte registers configured as mailbox memory (Figure 6-1). Eight of the registers are used for interface to the axis controller, the remaining eight are reserved for future modifications. All sixteen registers are read/write registers by the VMEbus master (8 bit odd addressing) and accessible at any time. The controller will not begin the processing of a command until the least significant (LS) byte of the Command Word is written to its mailbox.

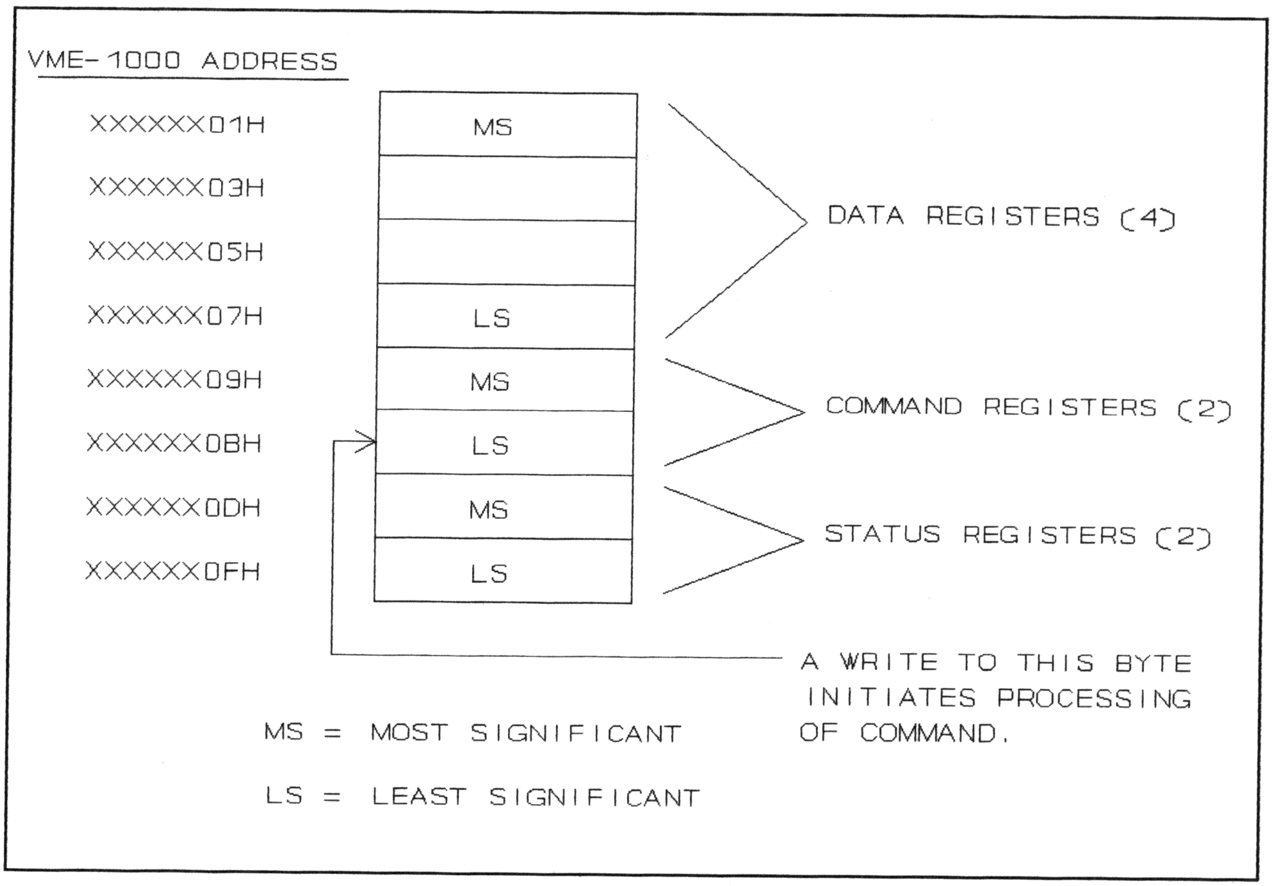

Figure 6-1 Mailbox Memory Configuration

6.2 Data Registers

The data registers are four bytes of VMEbus memory that are used in conjunction with the controller's commands.

When a command requires a data value, it must be set up in the data registers before the command is written to the controller's Command Word.

When a command returns data, the data registers will contain valid data when the appropriate bit is set in the Status Word of the controller.

> **NOTE**
>
> **When the operation does not use the data registers, they can be ignored. The value in them will not affect the operation.**

6.3 Command Registers

The two command registers contain a Command Word. The command is initiated by writing to the Least Significant (LS) byte of the Command Word. All data set up must be completed (including the Most Significant (MS) byte of the Command Word) before the command is initiated.

6.4 Status Registers

The two status registers contain a Status Word, the appropriate bits in the status word will be set and cleared as a command is executing. It will be the responsibility of the VMEbus host to monitor these bits and coordinate the operation of the system.

Status Word Format:

Bit	15	
Bit	14	
Bit	13	high speed op complete
Bit	12	velocity fault
Bit	11	trigger position passed
Bit	10	end limit fault
Bit	09	speed change in progress
Bit	08	
Bit	07	
Bit	06	interrupter enabled
Bit	05	profile calculating
Bit	04	data out of range
Bit	03	axis not ready
Bit	02	axis busy
Bit	01	command not accepted
Bit	00	command accepted

The VME-1000 Single Axis Controller can accept only one command at a time. When the controller has accepted the command, it will respond by toggling (high-low-high) the 'command accepted' bit of the Status Word. Since the VMEbus host may not be available to capture this change, the LS STATUS BYTE should be cleared (by writing a 0) immediatly before the command is written. This will assure that the toggle will be detected by forcing it initially to a low state.

NOTE

Writing data to the STATUS WORD will not affect the controller in any way. It has an internal copy of the STATUS WORD and will write it back into the VMEbus mailboxes on the next status change.

Once the toggle of the 'command accepted' bit has been detected, the controller is executing the previous command and is ready to receive another. A flow chart illustrating this command flow timing is shown in Figure 6-2.

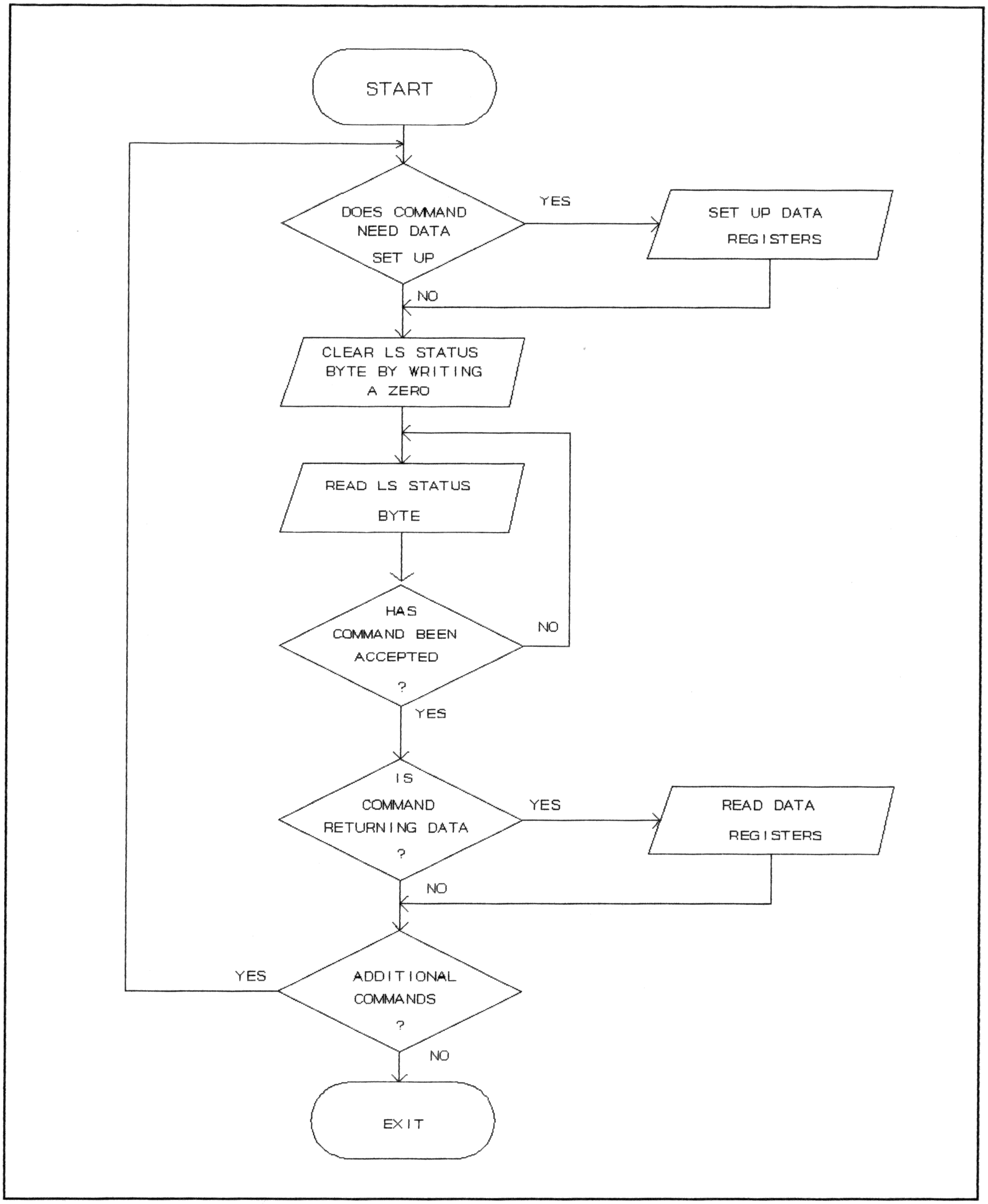

Figure 6-2 VME-1000 Command Flow Timing

7.0 COMMAND OVERVIEW

7.1 Drive Enable Control

The 'DRIVE_ON' command sets the commanded position equal to the current position, sets the POS OUT signal to 0.00V dc, and turns on the drive enable control. The motion device is in active mode and ready to receive motion commands. The 'DRIVE_ON' command will also reset a "velocity fault" condition caused by a drive overload.

The 'DRIVE_OFF' command disables the drive output control. The controller is now in passive mode and will convert the encoder feedback to a proportional voltage at POS OUT.

7.2 Setting Up Parameters

Certain motion commands require that the desired speed and accel/decel rates be set up before the command is issued. These parameters can be set at any time power is applied to the controller. The 'SET_SPEED' command sets the speed for simple motions. The 'SET_AC_DC' command sets the accel/decel rate for simple motions, velocity control, and force deceleration. These parameters will be retained in the controller's memory until they are changed by a new command or by the power being removed. The controller powers up with a speed of 1 RPM and an accel/decel rate of 1 rev/sec/sec.

7.3 Simple Motion

The VME-1000 Single Axis Controller provides two primary operating modes for simple motions: indexing and positioning. Indexing ('INDEX') involves an incremental motion that rotates the shaft a certain distance from its current position. Positioning ('POSITION') involves an absolute motion where the motor shaft rotates from its current position to a new position relative to a zero reference.

When an index/position command is executed, the controller will calculate the time required to reach the set distance allowing for the set acceleration/deceleration ("Ramp") rate and controls the motion device accordingly. Figure 7-1 shows a normal motion device indexing/positioning cycle. Figure 7-2 shows a cycle where there is not enough time to reach the "Index Speed". In this case, the controller only allows the motion device to accelerate and decelerate as much as necessary to reach the desired index/position distance. If possible, the system parameters should be set to achieve the type of curve illustrated in Figure 7-1 with one-third of the cycle for acceleration, one-third at index speed, and one-third for deceleration. This type of curve minimizes the RMS power required by the system.

7.4 Velocity Control

Certain applications require a motion device to operate in a velocity mode. That is, the axis runs continuously, at a precisely controlled speed for indefinite periods of time. The VME-1000 Single Axis Controller can perform this in a command called 'TRACK_SPEED'. This command causes the motion device to accelerate or decelerate to a specific speed at a rate set by the 'SET_AC_DC' command. Direction is determined by the sign of the speed value. Speed, acceleration and direction may be changed while the axis is moving. During the acceleration/deceleration portions, the controller sets the "speed change in process" bit in the Status Word. The only way to terminate a 'TRACK_SPEED' command is to perform a 'FORCE_DECEL' command.

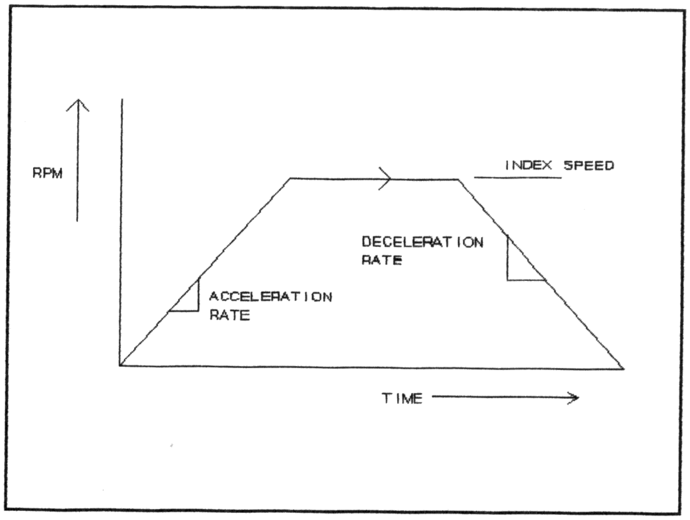

Figure 7-1 Normal Index/Position

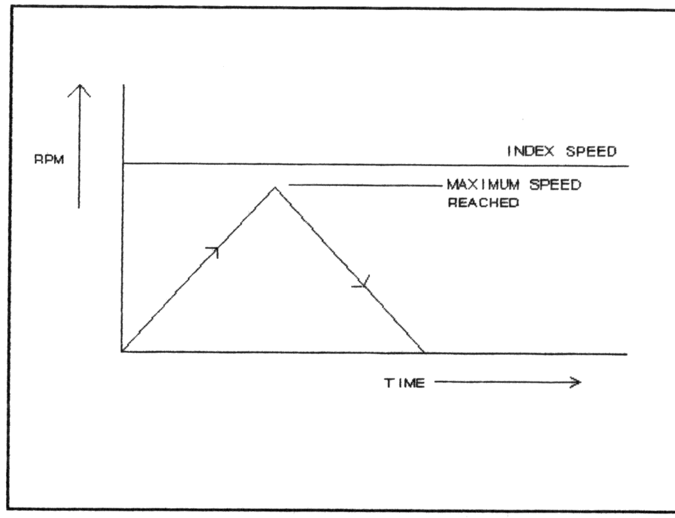

Figure 7-2 Insufficient Distance Index/Position

7.5 Force Deceleration

A 'FORCE_DECEL' command will decelerate any motion command to a full stop at the current defined accel/decel rate.

7.6 Piecewise Profiling

Piecewise profiles provide a simple means of defining complex motion profiles as a series of speeds, accel/decel rates, and distances.

To use piecewise profiles, all that is needed is a table of ending speeds (in RPM), accelerations/decelerations (in rev/sec/sec), and distances (in bits). For example, Table 7-1 contains the values of a simple motion profile illustrated in Figure 7-3.

Profile data tables are organized as a series of profile segments. A profile segment consists of a speed, an accel/decel, and a distance, it will take two 'PROFILE_DATA' commands to complete a profile segment. The MS command byte is incremented from zero for each partial profile segment with the even numbers representing speed and accel and the odd distance.

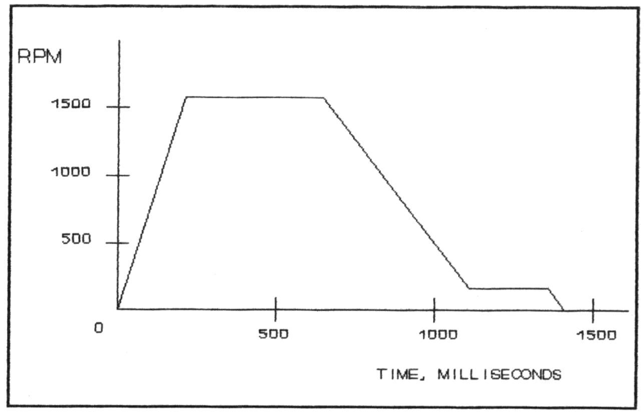

Figure 7-3 Motion Profile

Table 7-1 Motion Profile Values

SEGMENT	TARGET SPEED	ACCEL/DECEL	DISTANCE IN BITS
1	1500	100	10 REVOLUTIONS 40960 BITS
2	100	50	7.5 REVOLUTIONS 30720 BITS
3	0	50	.5 REVOLUTIONS 2048 BITS

After the entire data table has been loaded into the controller, the data must be prepared for execution. Preparation is accomplished using the 'PREP_PROFILE' command. During preparation, the "profile calculating" bit of the Status Word will be set. When the preparation is complete, the results of the preparation checks can be retrieved using the 'GET_PROFILE_STAT' command. If no preparation errors occurred, the profile is ready for execution.

The profile can now be executed with the 'EXEC_PROFILE' command. The profile data will remain calculated and can be executed until power down. If changes are made, the profile must be prepared again. Paragraph 7.6.1 is a mnemonic example of programming a piecewise profile for the data (converted into hexadecimal) in Table 7-1.

7.6.1 Piecewise Profile Example

The following is a mnemonic example of a programming a piecewise profile for the data (converted into hexadecimal) in Table 7-1.

MNEMONIC	COMMENTS	
PROFILE_DATA,05DC0064H	speed & accel ms command byte = 0	segment 1
PROFILE_DATA,0000A000H	distance ms command byte = 1	segment 1
PROFILE_DATA,00640032H	speed & accel/decel ms command byte = 2	segment 2
PROFILE_DATA,00007800H	distance7800H ms command byte = 3	segment 2
PROFILE_DATA,00000032H	speed & accel/decel ms command byte = 4	segment 3
PROFILE_DATA,00000800H	distance ms command byte = 5	segment 3
PREP_PROFILE	ms command byte = 0	

When the "profile calculating" bit in the Status Word is reset, the calculation is complete.

GET_PROFILE_STAT

if status = 0, all ok.

EXEC_PROFILE

the profile will execute

7.6.2 Piecewise Profile Notes

The piecewise profiles perform motion according to the following guidelines.

A piecewise profile must end with a velocity of 0, cannot change direction, and cannot exceed 96 segments.

If the present motor speed is LESS than the speed specified by the NEXT profile segment:

1. Accelerate to the new speed
2. Continue at the new speed until the distance specified has been moved - some of the distance is used during acceleration.

If the present motor speed is GREATER than the speed specified by the NEXT profile segment:

1. Continue at the OLD speed until the specified distance less the distance needed to decelerate has been traveled.
2. Decelerate to the new speed.

7.7 Encoder Initialization

Encoder initialization includes setting the encoder line count using the 'SET_COUNT' command. This command causes the system to automatically scale accel/decel and speed rates accordingly, however, distance must still be scaled by the user. The system defaults to a 1024 line count encoder on power up.

NOTE

Initializing the encoder in the following manner is not required if absolute reference point positioning is not needed.

Initializing the encoder to its 'home' marker point can be accomplished in both a multi-turn and single-turn system using the 'INIT_TO_HOME' commands.

Multi-turn initialization (MS Command byte = 0 or 1), uses a sensor input as a home sensor. The controller will move the motion device (at the set speed and accel/decel) to the first encoder marker signal after the sensor input is activated, setting that point as the absolute zero point.

Single-turn initialization (MS Command byte = 2 or 3) will move the motion device (at the set speed and accel/decel) to the first encoder marker signal in the desired direction, setting that point as the absolute zero point.

7.8 VME Interrupter

The VME-1000 Single Axis Controller provides a full level and vector programmable VME Rev C.1 compliant interrupt on changes in the Status Word. The interrupter vector and level are programmed using the 'SET_INTR_LEVEL' and 'SET_INTR_VECTOR' commands respectively. The interrupter is controlled by the Interrupt Mask and Transition Words.

The 'SET_INTR_MASK' sets both the Transition Word and Mask Word for the controller's interrupter. A value of 0 in the Mask Word will disable the interrupter. The Mask and Transition Word work with the Status Word to determine when to cause a VMEbus interrupt.

The bit positions in the Mask and Transition Words correspond to the bit positions in the Status Word. To monitor a bit position, the corresponding Mask Word bit position must be set to a '1', and to ignore a '0'. After noting the bit positions to be monitored, the Transition Word bit position must be set to a '1' to check for a '0' to '1' transition or '0' for a '1' to '0' transition.

When a monitored bit position makes the specified transition, the controller will issue a VMEbus interrupt at the programmed level and vector.

7.9 Integrated Input/Output Operations

7.9.1 Inputs

The VME-1000 Single Axis Controller's Input/Output Board has six inputs that are user definable. At power up, all six inputs are configured as general inputs that can be read by the 'GET_INPUTS' command.

7.9.2 Inputs as Commands

All six inputs can be programmed to perform specific commands when a valid true is detected. The inputs are programed using the 'SET_FUNCTION' command and are enabled and disabled by the 'ENABLE_FUNCTIONS' and 'DISABLE_FUNCTIONS' commands. For a list of possible commands, refer to the SET_FUNCTION command in Section 8. At power up the functions are disabled and the default programing is:

Input 1 = EXEC_PROFILE
Input 2 = JOG_CW
Input 3 = JOG_CCW
Input 4 = FORCE_DECEL
Input 5 = NULL (no operation)
Input 6 = NULL (no-operation)

7.9.3 Inputs as Sensors

There are three commands that are linked directly to specific input modules. These commands use the inputs as sensors to commence specific tasks.

'SET_TRAP_POS' uses Input 4 as a sensor for a hardware interrupt. Once the command has been executed, the controller will be interrupted on a valid high at the sensor input. The controller will then set the "high speed op complete" bit in the Status Word. During the interrupt the encoder position is captured and can be read using the 'GET_TRAP_POS' command.

'INIT_TO_HOME' has four versions, two are encoder marker only and do not use an external sensor. The remaining two use Input 5 as a sensor. Refer to Section 7.7 for a description of these commands.

'OVERDRAW' works like a regular 'INDEX' command except on the decel curve the controller decels to a preset speed and continues at that speed for a preset distance while looking for a signal on Input 6. If a signal is found, the controller will decel a preset distance past the signal.

7.9.4 Outputs

The VME-1000 Single Axis Controller Input/Output Board has two output modules that are user settable via the 'SET_OUTPUT' command.

7.10 Special Operations

7.10.1 Software Limits

Software limits can be established in both clockwise and counterclockwise directions using the 'SET_CW_LIMIT' and 'SET_CCW_LIMIT' commands. These commands will perform a forced deceleration and set a bit in the status word when the limits have been reached.

7.10.2 Software Position Trigger

A software position trigger can be set up using the 'TRIGGER_ON_POSITION' command. When the trigger position is passed, the controller will set a bit in the Status Word.

7.10.3 Zero Point Manipulation

A floating home position can be set up using the 'SET_LOCAL' and 'CLR_LOCAL' commands.

7.10.4 Position Communication

The current commanded and actual position can be retrieved from the controller at any time using the 'GET_PRESENT_COM' and 'GET_PRESENT_POSITION' commands respectively.

The actual and commanded position can be set to any value using the 'SET_PRESENT_POSITION' command.

7.10.5 Digital Compensation (PID)

The digital compensation values can be changed from their default values to customize the system to perform in particular applications. The effect on system stability, response, and stiffness is discussed in Section 2.2.2.

The proportional gain (P) can be changed from its default value of 16 (gain of 1) to any value in the range of 1 thru 256 using the 'SET_GAIN' command.

The integral (I) can be changed from its default value of 0 to any value in the range of +/- 127 using the 'SET_INTEGRAL' command.

The differential (D) can be changed from its default value of 0 to any value in the range +/- 127 using the 'SET_DAMP' command.

The PID values can be returned to their default values (respectively 16,0,0) at any time using the 'RESET_DIGICOMP' command.

8.0 DIAGNOSTICS AND FUNCTIONALITY TESTS

8.1 General

The VME-1000 Single Axis Controller provides motion control by controlling the position of an encoder type feedback device. The encoder is mechanically connected to the motion device.

The position loop, consisting of the VME-1000 Single Axis Controller and the encoder, controls a velocity loop consisting of the drive amplifier, motor, and power supply. The velocity loop has an input that is proportional to the motion device's velocity. The velocity loop polarity must be configured such that a positive input voltage signal causes the encoder to rotate counterclockwise.

The Overall Trouble Shooting Chart (Figure 8-1) provides a quick reference guide to fault isolation. The specific tests provided in Paragraphs 8.3 and 8.4 are designed to quickly isolate the faulty component.

To determine if the VME-1000 Single Axis Controller is functioning properly, it is first necessary to check whether the problem is in the velocity loop or the position loop. This is accomplished by using the test described in Paragraph 8.3. If the problem is found to be in the position loop, then the tests provided in 8.4 can be used to isolate the faulty component within the position loop. If the problem is in the velocity loop, refer to the specific instruction book for the motor/drive components used in your system.

8.2 Com Port

The VME-1000 Single Axis Controller is equipped with a communication (com) port that will accept 20 ma current loop ASCII communications. It is a very useful tool for diagnostics and during system design.

8.2.1 Baud and protocol

The Com Port is equipped with an auto baud feature that is valid for 300, 600, 1200, 2400, 4800, and 9600 baud. After monitor hook up all that is needed to initialize the baud is two carriage return characters. The protocol is set at 1 stop bit and no parity.

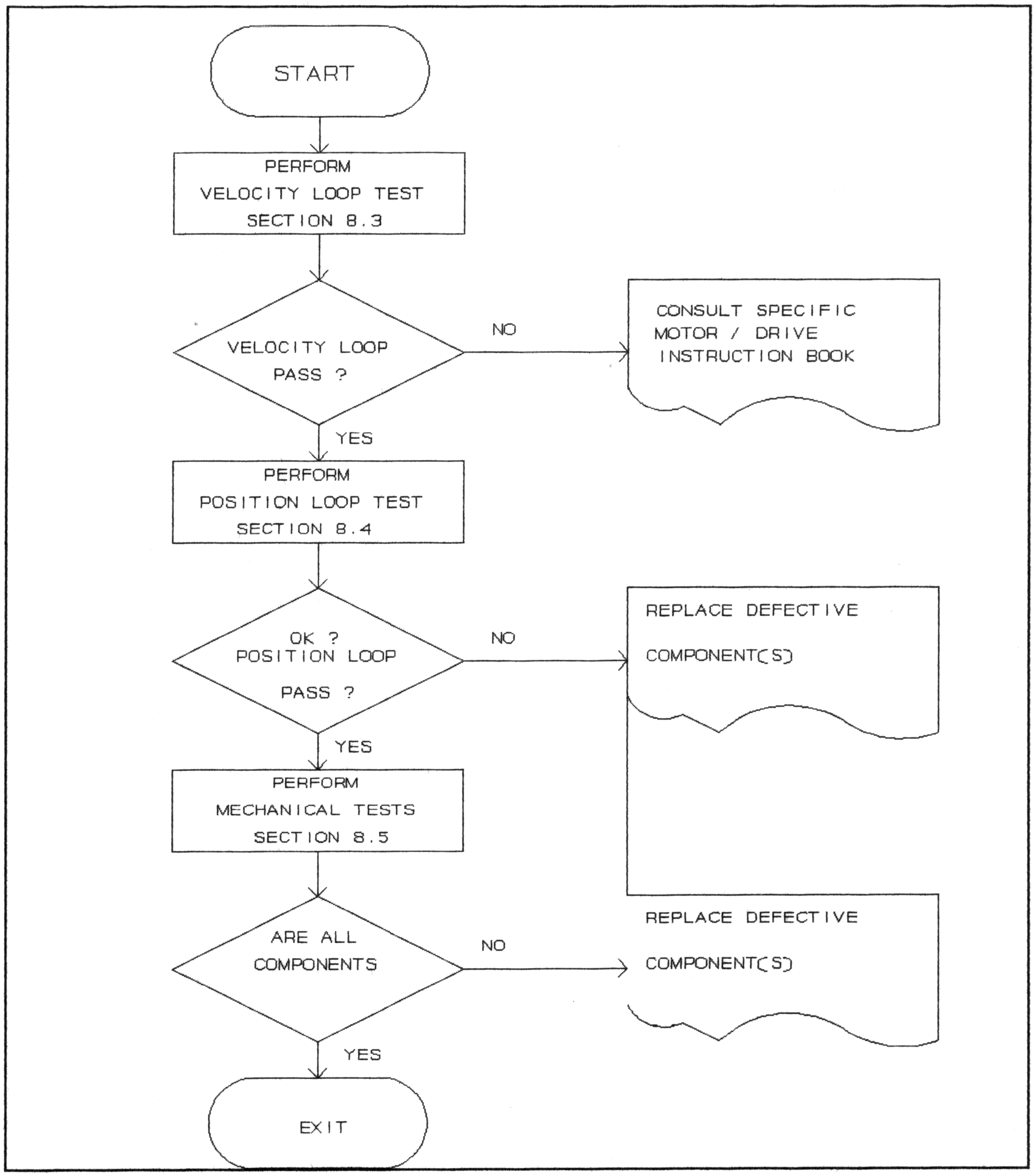

Figure 8-1 Overall Trouble Shooting Chart

8.2.2 Monitor Commands

The following is a list of the valid monitor commands and an explanation of their functions:

The symbols < > are only a representation of where the command data will appear when typed and are not part of the command syntax.

DIS	disable amp control (passive mode).
DMD < >	display mode as <H>ex, <D>ecimal or <B>inary.
DPM	do profile move.
DSC < >	display continuously VME <D>ata, <F>ollowing error, <P>osition, <S>tatus.
ENB	enable amp control (active mode)
GFE	get following error
GPS	get current encoder position
GST	get status word
HLP	on line command listing
IND < >	index <bits>.
INP	view input states
INT < >	initialize to home <0> cw with sensor and marker, <1> ccw with sensor & marker, <2> cw with marker, <3> ccw with marker.
OUT < >	set outputs <0> off, <1> #1 on, <2> #2 on, <3> #1 and #2 on.
POS < >	position to <absolute position>
SAC < >	set accel/decel rate to <accel/decel>
SDP < >	set the dampening factor to <integer>
SGN < >	set the gain factor to <integer>
SIN < >	set the integral factor to <integer>
SSP < >	set target speed to <speed>
STP	force deceleration
TSP < >	track speed to <speed>
VME	dumps the vme registers on the screen

8.3 Velocity Loop Functional Test

This test puts the drive amplifier and motion device in a velocity mode of operation. It is used to determine if the problem is in the velocity loop or the position loop. If all of the following tests pass, then the problem is in the position loop. The position loop can be tested by proceeding with the tests outlined in Paragraph 8.4. If any of the following tests fail, refer to the instruction book on the specific motor/drive package used in your system.

NOTE

This test causes the motion device to move. Be sure that the mechanical load can accept movement in both directions without damaging the equipment.

1. Turn off the power to the system.

2. Remove the DRIVE connector from the VME-1000 Single Axis Controller in the VMEbus chassis.

3. Connect a jumper (Figure 8-2) between pin 13 (green wire) and pin 14 (white wire) of the male 15 pin DRIVE connector.

4. Apply power to the system.

5. The motion device should be at rest and resist movement. A small amount of drift is acceptable.

6. Using the multi-meter as a voltage source, set the multimeter on the x1 Ohms scale.

7. While observing the shaft of the motion device, connect the positive meter lead to pin 10 and the negative or common lead to pin 11 of the male 15 pin DRIVE connector. The shaft should rapidly accelerate in a counterclockwise direction.

8. Now remove either of the meter leads while observing the shaft of the motion device. The shaft should quickly decelerate to a stopped position.

9. Reverse the meter leads in Step 7. The shaft should quickly accelerate in a clockwise direction.

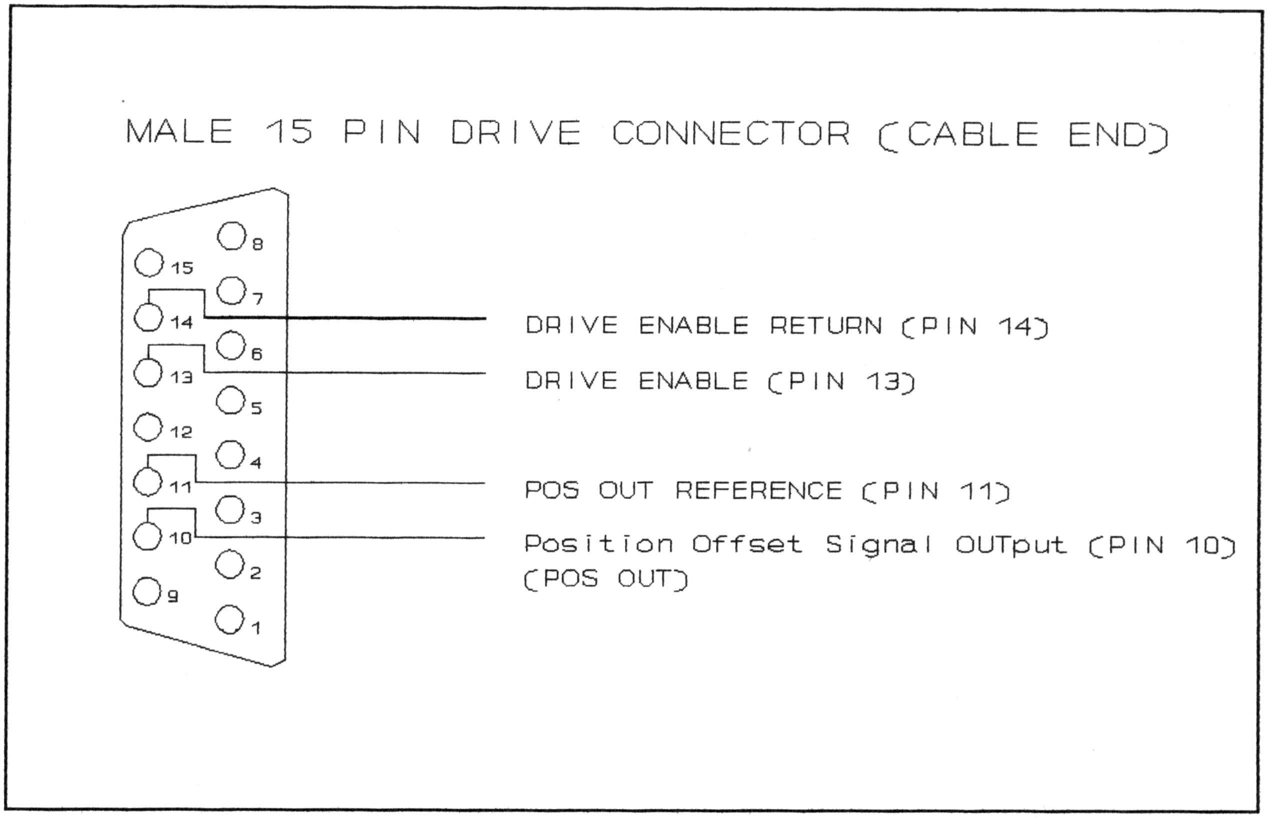

Figure 8-2 DRIVE connector Velocity Loop Pin-Out

10. Now remove either of the meter leads while observing the shaft of the motion device. The shaft should quickly decelerate to a stopped position.

11. Remove the jumper and multi-meter leads.

12. If any of the previous tests fail, refer to the instruction book on the specific motor/drive package used in your system. If all tests pass, refer to Paragraph 8.4.

8.4 Position Loop Functional Tests

The position loop (Figure 8-3) functional tests consist of two parts. The first test checks out the overall position loop. The second test determines whether the problem is in the 5V dc power supply, the interconnecting cable, the encoder, or in the VME-1000 Single Axis Controller.

8.4.1 Position Loop Functionality Tests

This test verifies that the position loop is malfunctioning.

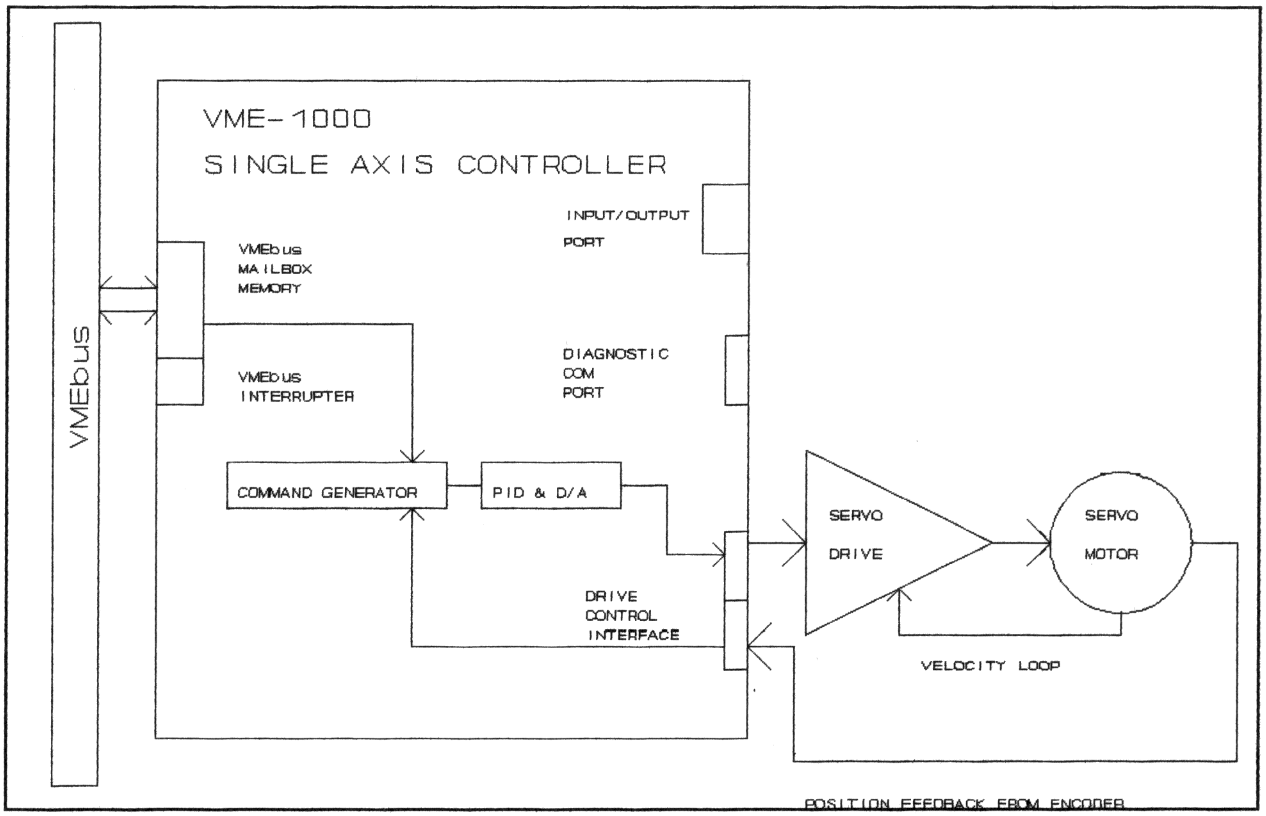

Figure 8-3 Position Loop Components

1. Turn off power to system.
2. Remove connector 15 pin DRIVE connector from the VME-1000 Single Axis Controller in the VMEbus chassis.
3. Apply power to the system. The VME-1000 Single Axis Controller will power up with the drive control disabled. Do not enable the drive control for this test.
4. Set a multi-meter on the 10V dc scale.
5. Connect the positive meter lead to pin 10 and the negative lead to pin 11 on the 15 pin female (on the controller) DRIVE connector.

6. With the encoder in its start-up position, the voltage reading on the meter should be 0.00V dc +/-0.1V dc.

7. Rotate the shaft clockwise 1/4 turn while observing the meter. The meter should smoothly increase to approximately +5V dc (Figure 8-4).

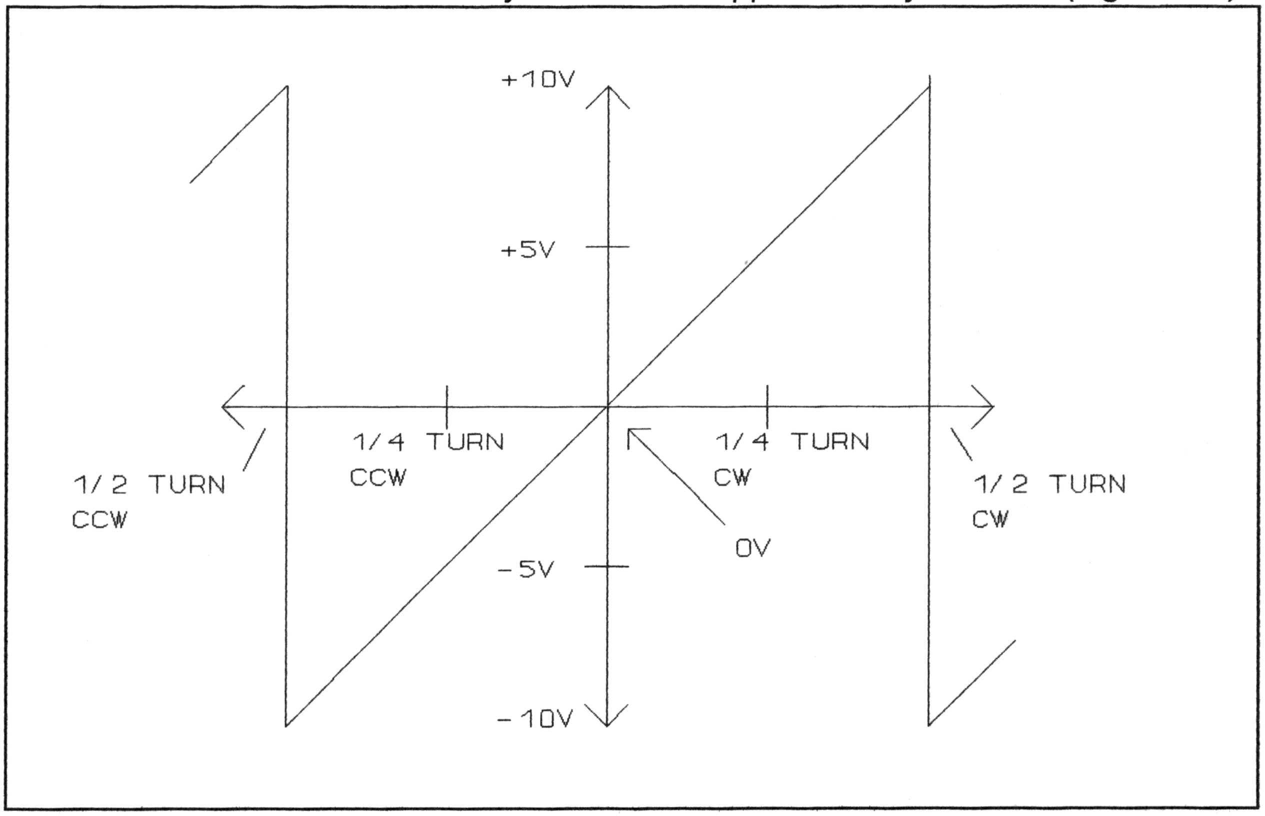

Figure 8-4 POS OUT Voltage versus Encoder Position

8. Rotate the shaft back to its original start up position. The meter should smoothly return to 0.00V dc.

9. Reverse the meter leads at pin 10 and pin 11 on the 15 pin female DRIVE connector.

10. Rotate the shaft counterclockwise 1/4 turn while observing the meter. The meter should smoothly increase to approximately +5V dc.

11. Continue to rotate the shaft in the counterclockwise direction. The voltage should increase smoothly to +10V dc, and as the shaft is rotated beyond the 1/2 turn point, the voltage will abruptly change to -10V dc. As the shaft is continued to be moved, the voltage should return to 0.00V dc upon reaching the 1 full turn position.

NOTE

If the voltage levels are opposite than those shown in Figure 8-4, the encoder channels may be reversed.

12. If the results from the above test did not match the expected results, the position loop is failing. Proceed with Section 8.4.2 to isolate the faulty component within the position loop.

8.4.2 Encoder Tests

1. To perform this test, the encoder must be supplied with its +5v dc power supply.
2. Remove power from the system.

CAUTION

This test makes connections to the cable end only. None of the following connections are made to the controller.

3. Set a multi-meter on the 10V dc scale.
4. Remove the 15 pin DRIVE connector from the controller.
5. Apply the 5V dc source to pin 7 on the MALE (cable end) 15 pin DRIVE connector, and the source ground to pin 8 (Figure 8-5).

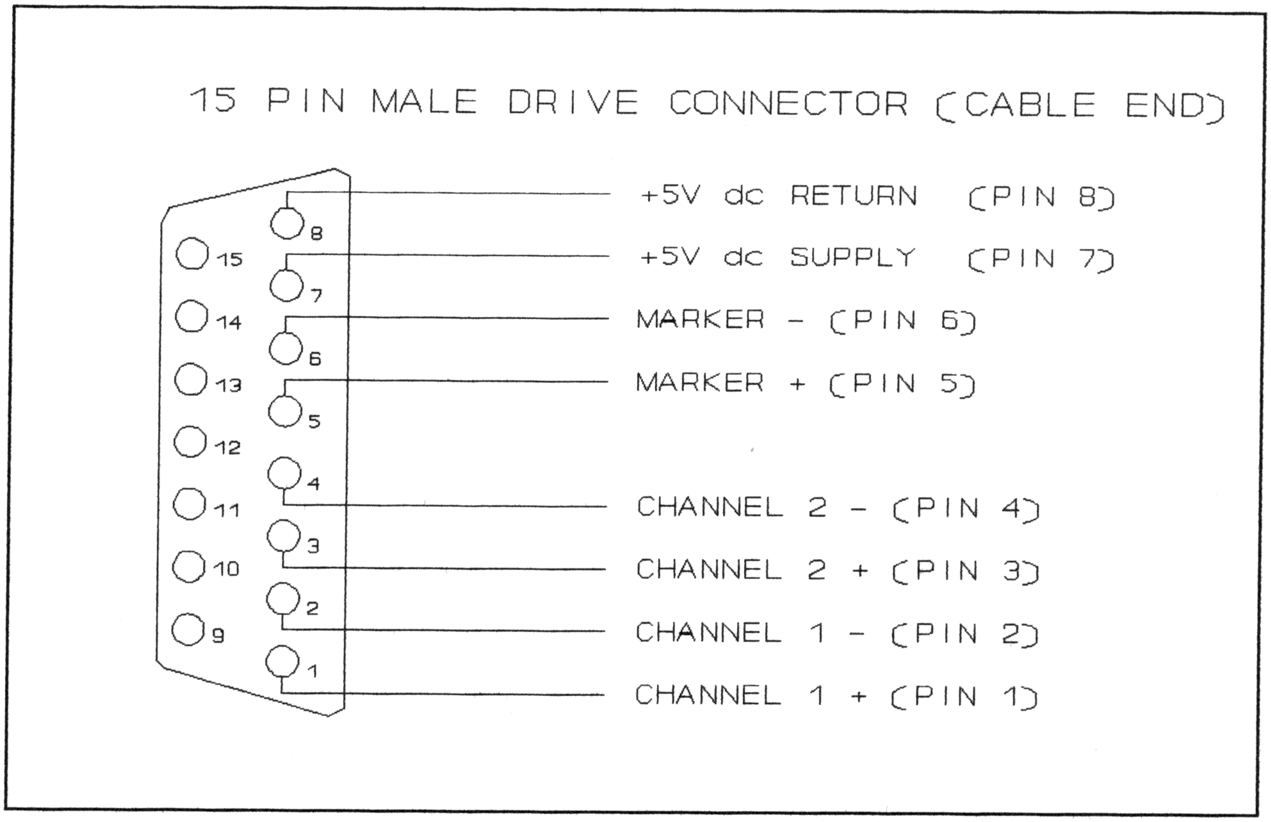

Figure 8-5 DRIVE Connector Encoder Interface Connections

6. Connect the positive meter lead to pin 1 and the negative to pin 2 on the 15 pin DRIVE connector (Figure 8-5).

7. Move the encoder shaft to find two different voltages; one being 0.8V dc or less and the other being 2.5V dc or more. If an out of specification reading is obtained, proceed to Step 12.

8. Connect the positive meter lead to pin 3 and the negative to pin 4 on the 15 pin DRIVE connector (Figure 8-5).

9. Move the encoder shaft to find two different voltages: one being 0.8V dc or less and the other being 2.5V dc or more. If an out of specification reading is obtained, proceed to step 12.

10. Connect the positive meter lead to pin 5 and the negative to pin 6 on the 15 pin DRIVE connector (Figure 8-5).

11. Move the encoder shaft to find two different voltages; one being 0.8V dc or less and the other being 2.5V dc or more.

12. If all readings were in specification, replace the controller, otherwise perform the mechanical test in Section 8.5 to test the DRIVE interface cable.

13. If the cable is functioning properly, replace the encoder.

8.5 Mechanical Components Test

This test checks the mechanical components of the motion control system.

1. Check for intermittent wiring faults.

2. Check for a loose coupling between the motor and positional feedback encoder.

3. Check the motor brushes, if applicable.

4. Make sure that the system's frictional load has not changed.

5. Do the setup procedure in the instruction book on the specific motor/drive package for the system.

9.0 COMMAND REFERENCE

The following pages have descriptions of the valid commands for the VME-1000 Single Axis Controller. Each command shows the status bits that are affected by its execution. Figure 9-1 illustrates the VME-1000 Mailbox memory configuration used to explain the command set-ups.

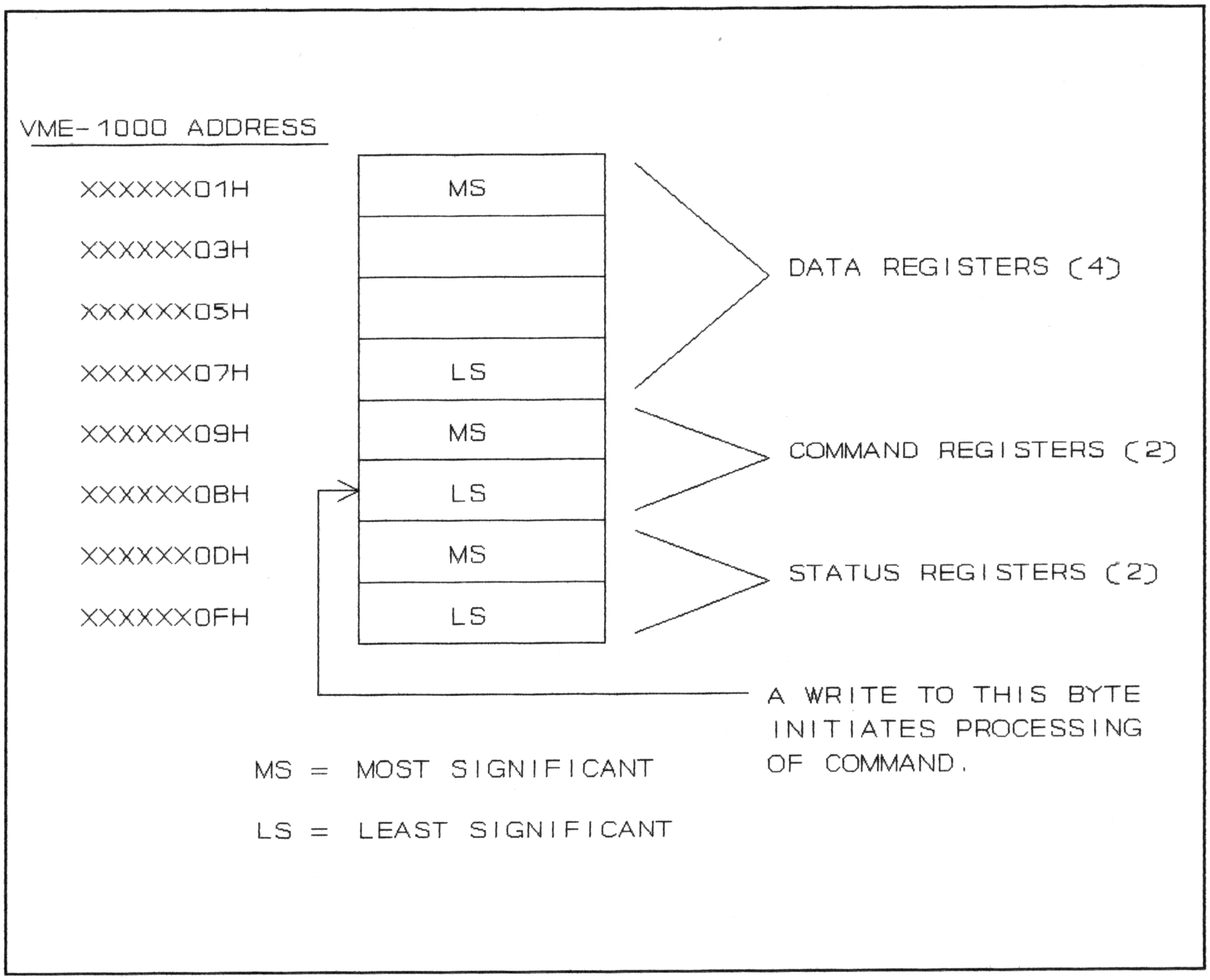

Figure 9-1 Mailbox Memory Configuration

Operation: CLR_LOCAL

Opcode: 10

Clears the current local zero position and causes the VME-1000 to use the current global zero.

RELATED COMMANDS: SET_LOCAL
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	OAH	When the LS COMMAND byte is loaded, the specified operation is performed.

ADDRESS	STATUS	EXPLANATION
xxxxODH	S	Bit 0 set = Command accepted
xxxxOFH	S	

Operation: DISABLE_FUNCTIONS Opcode: 66

This instruction disables the functions set by the SET_FUNCTION command. On power up all functions are disabled and can be used as normal all purpose inputs.

RELATED COMMANDS: ENABLE_FUNCTIONS
SET_FUNCTION

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	42H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: DRIVE_OFF   Opcode: 39

This instruction will set the position output voltage to zero, turn the drive control output off, then produce a voltage proportional to the value of the encoder count.

The proportional voltage produced may be used as a diagnostic tool to check the encoder and digital to analog converter.

RELATED COMMANDS: DRIVE_ON
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	27H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 3 set = Axis not ready
xxxx0FH	S	

Operation: DRIVE_ON Opcode: 38

This instruction will turn the drive control output on, set the position output voltage to zero and then produce a voltage proportional to the difference between the commanded position and the actual position of the motor shaft. This difference (position error) will be monitored and if it exceeds the voltage limit of the position output control then the VME-1000 will turn off the drive control output to shut down the axis.

The DRIVE_ON instruction will also reset a velocity fault condition.

RELATED COMMANDS: DRIVE_OFF
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	26H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 3 reset = Axis not ready
xxxx0FH	S	

Operation: ENABLE_FUNCTIONS Opcode: 65

This instruction enables the functions set by the SET_FUNCTION command.

RELATED COMMANDS: DISABLE_FUNCTIONS
SET_FUNCTION

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	41H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: EXEC_PROFILE Opcode: 72

This instruction executes a profile array that has been loaded and prepared. If a profile array has not been prepared for execution or if it failed any of the preparation checks, it will not execute.

RELATED COMMANDS: PROFILE_DATA
PREP_PROFILE
GET_PROF_STAT

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	48H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	Bit 2 is reset when motion is complete

Operation: FORCE_DECEL Opcode: 06

This command will stop the motor shaft by decelerating it to zero speed at the set accel/decel rate.

RELATED COMMANDS: None

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	06H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	Bit 2 is reset when motor shaft is at rest

Operation: GET_COM Opcode: 49

This instruction will load the present commanded position of the motor shaft as a sign extended 32 bit number into the VME mailbox memory.

RELATED COMMANDS: None

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	31H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Encoder commanded position
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

Operation: GET_INPUTS Opcode: 67

This instruction will return the state of the input modules in the VME mailbox memory when the command is complete.

RELATED COMMANDS: SET_INPUT_MASK

USAGE:

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	43H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = State of input modules, after command is complete
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

Operation: GET_INTR_MASK Opcode: 03

This instruction will return to the VME mailbox data area the current transition and mask words set by the 'SET_INTR_MASK' command.

RELATED COMMANDS: SET_INTR_MASK

USAGE:

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	03H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION
xxxx01H	Y1	Y1 = Transition word
xxxx03H	Y1	
xxxx05H	Y2	Y2 = Mask word
xxxx07H	Y2	

Operation: GET_POS

Opcode: 48

This instruction will load the present position of the motor shaft as a sign extended 32 bit number into the VME mailbox memory. Approximate data set up is 200 micro-seconds.

RELATED COMMANDS: None

USAGE:

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	30H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Motor shaft position at time of command
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

Operation: GET_PROF_STAT Opcode: 73

This instruction returns the profile calculation status that resulted from a PREP_PROFILE command.

RELATED COMMANDS: PROFILE_DATA
PREP_PROFILE
EXEC_PROFILE

USAGE:

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	49H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION
xxxx01H	0	
xxxx03H	0	
xxxx05H	Y1	Y1 = Profile error type*
xxxx07H	Y2	Y2 = Profile segment where error occurred

*Profile error types:
1 = Attempted change of direction.
2 = Commands invalid in this state.
3 = Insufficient distance for specified speed and/or accel/decel.

Operation: GET_TRAP_POS Opcode: 44

This instruction will return to the VME mailbox data area the encoder position trapped during the 'SET_TRAP_POS' interrupt.

RELATED COMMANDS: SET_TRAP_POS

USAGE:

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	2CH	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

ADDRESS	DATA	EXPLANATION

DATA IS VALID WHEN COMMAND IS ACCEPTED

xxxx01H	Y	Y = Encoder shaft position as of interrupt
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

Operation: INDEX,Y Opcode: 25

Where the value of Y represents the number of bits (encoder line count * 4) for the motion device to turn. The direction of the motion device is clockwise if the count value is positive and counterclockwise if the count value is negative.

RELATED COMMANDS: SET_SPEED
SET_AC_DC

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Number of counts (4 * encoder line count)
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	19H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	Bit 2 is reset when motion is complete

Operation: INIT_TO_HOME Opcode: 50

This command will initialize the motion device position (at the set speed and accel/decel rates) in four different ways depending on the value of the MS COMMAND byte:

0 = Initialize to home clockwise with sensor input. The motion device will turn clockwise past the sensor input valid point and position itself at the next encoder marker, setting that point to absolute zero. If the sensor input is on when the command is executed, the motion device will first back off the sensor and then proceed with the initialization.

1 = Same as 0 except in the counterclockwise direction.

2 = Initialize to home clockwise to encoder marker. The motion device will position itself to the first encoder marker in the clockwise direction and make that point absolute zero.

3 = Same as 2 except in the counterclockwise direction.

RELATED COMMANDS: SET_SPEED
SET_AC_DC

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	N	The MS COMMAND byte is loaded with the type of initialization required. N=0,1,2 or 3
xxxx0BH	32H	When the LS COMMAND byte is loaded, the specified operation is performed

(Continued ...)

Operation: INIT_TO_HOME

Opcode: 50

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	

Operation: JOG_CCW Opcode: 23

This instruction will move the motor shaft in a counterclockwise direction at the previously defined accel/decel rate and speed. Motion will continue until a FORCE_DECEL command is executed.

RELATED COMMANDS: SET_SPEED
SET_AC_DC

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	17H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	

Operation: JOG_CW Opcode: 22

This instruction will move the motor shaft in a clockwise direction at the previously defined accel/decel rate and speed. Motion will continue until a FORCE_DECEL command is executed.

RELATED COMMANDS: SET_SPEED
SET_AC_DC

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	16H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	

Operation: OVER_DRAW,Y   Opcode: 51

This instruction will execute an incremental movement at the predefined accel/decel and speed. On the decel portion, the motion device will decel to the speed set by the SET_SEARCH_SPEED command and continue at that speed for the distance set by the SET_SEARCH_DISTANCE command. However, if during the SEARCH_DISTANCE a valid sensor input is found, the motion device will decel the distance set by the SET_SW_DISTANCE command to a full stop.

RELATED COMMANDS: SET_SEARCH_DISTANCE
SET_SEARCH_SPEED
SET_SW_DISTANCE

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Move incremental distance in bits
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	33H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	Bit 2 will be reset when motion is complete

Operation: POSITION,Y   Opcode: 24

Where the value of Y represents the counts relative to the zero position. The motor shaft will then be positioned to the requested count value.

RELATED COMMANDS: SET_SPEED
SET_AC_DC

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Position in bits
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	18H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis busy
xxxx0FH	S	Bit 2 will be reset when motion is complete

Operation: PREP_PROFILE Opcode: 71

This instruction prepares a profile array for execution by calculating the previously loaded data into the needed parameters. During profile calculation, bit 5 of the LS STATUS byte will be set. Profile execution cannot occur until this bit has been reset. A profile array only needs to be prepared once and thereafter only if changes were made to the profile data.

RELATED COMMANDS: PROFILE_DATA
EXEC_PROFILE
GET_PROF_STAT

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	47H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 5 set = Profile calculating
xxxx0FH	S	Bit 5 will reset when calculation is complete

Operation: PROFILE_DATA,Y Opcode: 69

A profile segment consists of speed in RPM, accel/decel in revs/sec/sec and distance in bits to be traveled. This instruction will send over partial profile segments, it will take two instructions to complete a profile segment. A profile array can have 2 to 96 profile segments which can be configured to provide custom servo control for many applications.

RELATED COMMANDS: PREP_PROFILE
GET_PROF_STAT
EXEC_PROFILE

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y1	The data area contents reflect the parity of the MS COMMAND byte
xxxx03H	Y1	If MS COMMAND byte is even: Y1 = speed in RPM
xxxx05H	Y2	Y2 = accel/decel in rev/sec/sec If MS COMMAND byte is odd:
xxxx07H	Y2	Y1Y2 = distance in bits

ADDRESS	COMMAND	EXPLANATION
xxxx09H	N	The MC COMMAND byte is used to address partial profile segments. N=0 thru 191
xxxx0BH	45H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: RESET_DIGICOMP Opcode: 57

This instruction will set the proportional gain to a value of 16, the integral factor to 0 and the damping factor to 0.

RELATED COMMANDS: None

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	47H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_AC_DC,Y Opcode: 41

Where Y is a 32 bit number representing rev/sec/sec to accelerate and decelerate the angular velocity of the motor shaft.

Internal to the VME-1000, the accel/decel value loaded is directly effected by the number of line counts of the encoder. The line count can be set via the SET_COUNT command. The default line count is 1024.

RELATED COMMANDS: SET_COUNT
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = acceleration/deceleration in revs/sec/sec
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	29H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_CCW_LIMIT,Y Opcode: 46

Where the value of Y represents the outer limit of the positional range in the counterclockwise direction. A movement command that travels beyond this limit will cause a forced decel to be performed and the 'end limit fault' bit to be set in the Status Word.

RELATED COMMANDS: None

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = CCW limit in bits relative to zero
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	2EH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 10 set = End limit fault
xxxx0FH	S	

Operation: SET_COUNT,Y Opcode: 68

Where Y is a 32 bit number containing the line count of the encoder being used with the VME-1000. The VME-1000 will calculate the correct speeds and accel/decel rates only if the line count is loaded via this instruction. The default is a 1024 line count encoder. The VME-1000 produces a resolution of four times the encoder line count.

RELATED COMMANDS: NONE
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Encoder line count
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	44H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_CW_LIMIT,Y   Opcode: 45

Where the value of Y represents the outer limit of the positional range in the clockwise direction. A movement command that travels beyond this limit will cause a forced decel to be performed and the 'end limit fault' bit to be set in the Status Word.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = CW limit in bits relative to zero
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	2DH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 10 set = End limit fault
xxxx0FH	S	

Operation: SET_DAMP,Y

Opcode: 59

Set the damping factor. Valid range is +/- 127.

Default value is zero.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Dampening factor
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	3BH	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_FUNCTION,Y Opcode: 64

This instruction is used to program the inputs on the I/O board of the VME-1000 to perform commands. The commands are loaded by loading their opcodes. The valid commands are:

- FORCE_DECEL
- MOVE_INCREMENT (see SET_IN_INDEX)
- MOVE_TO_POSITION (see SET_IN_POSITION)
- DO_PROFILE_MOVE
- JOG_CW
- JOG_CCW
- ENABLE_AXIS
- DISABLE_AXIS
- MOVE_INCR_TO_SENSOR
- NULL (nop) = 0

RELATED COMMANDS: ENABLE_FUNCTIONS
DISABLE_FUNCTIONS

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Command opcode to be programmed
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	The MS COMMAND byte points to the input to be set. N=0,1,2,3,4, or 5
xxxx0BH	40H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_GAIN,Y Opcode: 58

Set the proportional gain value.

The gain value controls the amount of voltage produced at the pos output. A value of 16 (assuming a 1024 line count encoder) will produce a voltage of -10v for a 180 degree counterclockwise rotation and +10v for a 180 degree clockwise rotation.

Default value is sixteen.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Gain value
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	3AH	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_IN_INDEX,Y Opcode: 56

Where Y is a 32 bit number containing an increment value. The increment value is used in conjunction with an input module that can be programmed to perform an INCREMENT command when the input is valid.

RELATED COMMANDS: SET_FUNCTION
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Position in counts relative to zero
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	38H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_IN_POSITION,Y Opcode: 55

Where Y is a 32 bit number containing a position value relative to the motor shaft zero position. The position value is used in conjunction with an input module that can be programmed to perform a POSITION command when the input is valid.

RELATED COMMANDS: SET_FUNCTION
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Position in counts relative to zero
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	37H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_INPUT_MASK,Y Opcode: 61

This instruction is used to turn off and on input signals by masking them with a binary true for on and false for off. The mask is only valid for the GET_INPUTS command.

RELATED COMMANDS: GET_INPUTS
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Mask value 6 lower bits
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	49H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_INTEGRAL,Y   Opcode: 60

Set the integral factor. Valid range is +/- 127.

Default value is zero.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Integral value
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	3CH	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_INTR_LEVEL,Y

Opcode: 01

Where Y is the interrupt level defined by the VMEbus host. The interrupt level must be set before the interrupt mask is written which initiates monitoring of the VME-1000 status word.

RELATED COMMANDS: SET_INTR_VECTOR
SET_INTR_MASK

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Interrupt level
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	01H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_INTR_MASK,Y Opcode: 02

Where Y contains the transitions and mask that will be compared to the VME-1000 status word. The bit positions of the mask and transition words reflect the correspond bit positions in the status word. The VME-1000 will initiate a VMEbus interrupt only when a specified change occurs in a monitored bit position. Setting up the mask and transition words will enable the interrupter, setting the mask and transition words to zero will disable the interrupter.

RELATED COMMANDS: SET_INTR_VECTOR
SET_INTR_LEVEL

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y1	Y1 = Transition word 1 in bit position = low to high
xxxx03H	Y1	0 in bit position = high to low
xxxx05H	Y2	Y2 = Mask word 1 in bit position = monitor
xxxx07H	Y2	0 in bit position = ignore

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	02H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	Bit 6 set = Interrupter enabled*

*Setting the mask and transition words to zero will disable the interrupter and reset bit 6.

Operation: SET_INTR_VECTOR,Y

Opcode: 63

Where Y is the interrupt vector defined by the VMEbus host. The interrupt vector must be set before the interrupt mask is written which initiates monitoring of the VME-1000 status word.

RELATED COMMANDS: SET_INTR_LEVEL
SET_INTR_MASK

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Interrupt vector
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	01H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_LOCAL

Opcode: 09

This command will set the present motor position as the absolute zero position. The global position is not changed and can be re-established using the CLR_LOCAL_ZERO command. This instruction is used to establish a 'floating' home position.

RELATED COMMANDS: CLR_LOCAL
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	When the LS COMMAND byte is loaded, the specified operation is performed
xxxx0BH	09H	

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_OUTPUT Opcode: 62

This command sets and resets the two outputs available on the I/O board of the VME-1000. The outputs are set or resetable via the MS COMMAND byte as follows:

0 = both outputs off.
1 = output #1 on and #2 off.
2 = output #1 off and #2 on.
3 = both outputs on.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Used to set or reset the two outputs. Y = 0, 1, or 2
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	3EH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_PRESENT_POSITION,Y Opcode: 47

Where the value of Y is accepted as motion device position. All other commands will now work from the value of Y as the motor shaft position.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Motor shaft position
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	2FH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_SEARCH_DISTANCE,Y Opcode: 52

This command sets the distance that the motor shaft will travel while 'looking' for a sensor input. If a sensor is not found within the specified distance the motor shaft will decel to zero speed and wait for additional commands.

RELATED COMMANDS: SET_SEARCH_SPEED
SET_SW_DISTANCE
OVER_DRAW

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Search incremental distance in bits
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	34H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_SEARCH_SPEED,Y   Opcode: 53

This instruction will set the speed for the distance specified by the SET_SEARCH_DISTANCE command.

RELATED COMMANDS: SET_SEARCH_DISTANCE
SET_SW_DISTANCE
OVER_DRAW

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Search for sensor speed
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	35H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_SPEED,Y Opcode: 37

Where Y is a 32 bit number representing angular velocity in rpm.

Internal to the VME-1000, the speed value is directly effected by the number of encoder line counts. The encoder line count can be set via the SET_COUNT command. The default line count is 1024 which will provide 4096 counts per revolution of the motor shaft.

RELATED COMMANDS: SET_COUNT
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Speed in RPM
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	25H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_SW_DISTANCE,Y Opcode: 54

This instruction will set the distance that the motion device will travel after sensor detection for a OVER_DRAW command. It is only used when the sensor input is valid during the search distance.

RELATED COMMANDS: SET_SEARCH_DISTANCE
SET_SEARCH_SPEED
OVER_DRAW

USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Decel distance after switch is found
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	36H	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted
xxxx0FH	S	

Operation: SET_TRAP_POS   Opcode: 43

This instruction arms an internal interrupt that will be triggered by a 'high' on sensor input #3. Once triggered, the interrupt will capture the encoder position at that point and set the 'High speed op complete' flag in the status word.

RELATED COMMANDS: GET_TRAP_POS
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Don't care
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	2BH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 13 set = High speed op complete
xxxx0FH	S	Bit 13 will only be set after the trigger input initiates the interrupt

Operation: TRACK_SPEED,Y Opcode: 28

Where Y is the target speed value. This instruction will cause the motor shaft to perform a jog in the clockwise direction if the speed value is positive and counterclockwise if the speed value is negative.

RELATED COMMANDS: SET_AC_DC
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Target speed in RPM
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	1CH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 2 set = Axis Busy
xxxx0FH	S	Bit 9 set = Accel/decel

Operation: TRIGGER_ON_POSITION,Y   Opcode: 42

Where Y is a positional value relative to the absolute zero position. This command will set a flag in the status word if the programmed position has been passed.

RELATED COMMANDS: None
USAGE:

ADDRESS	DATA	EXPLANATION
xxxx01H	Y	Y = Absolute position trigger
xxxx03H	Y	
xxxx05H	Y	
xxxx07H	Y	

ADDRESS	COMMAND	EXPLANATION
xxxx09H	00H	
xxxx0BH	2AH	When the LS COMMAND byte is loaded, the specified operation is performed

ADDRESS	STATUS	EXPLANATION
xxxx0DH	S	Bit 0 set = Command accepted Bit 11 set = Trigger position passed
xxxx0FH	S	Bit 11 is only set after the programmed trigger position is passed. It can only be reset by setting up a new trigger position.

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