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230005-252 B00

Model 1270VS

Rate of Turn Test Table

230005-252 B00

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I. PURPOSE AND DESCRIPTION

1.1 PURPOSE

This manual covers the general operating, installation and service instructions necessary for the operation and maintenance of the Ideal Aerosmith, Inc., Model 1270VS Rate Table. The unit is designed for applying angular velocity to gyrostatic devices for calibration in a horizontal, rotating plane. The velocity may be set from 1 degree/minute to 21600 degrees/minute (1 rev/second). The table will handle instruments of any cube suitable to the surface area of the table and of a weight not in excess of 50 pounds.

1.2 DESCRIPTION

The closed-loop motion control system consists of a DC servo gearmotor, a controller, and an optical encoder. The encoder is located on the high speed shaft of the gearmotor to provide high resolution feedback for precise speed regulation. A gear train with electric clutches is used to select four different ranges. A dedicated microcontroller running application specific software developed by Ideal Aerosmith provides the crystal-based accuracy for the close loop control. The closed loop control coupled with the selective gear trains allows the Model 1270VS to have a speed range of 21,600:1.The rate table can turn in both clockwise and counterclockwise directions. Clutches protect the gear train if large forces are applied to the tabletop. A four-point contact bearing is used to resist axial, radial, and moment loads while providing smooth rotation. Slip rings and a vacuum line are also standard features of the test table.

The microcontroller provides the user interface which is available from the keypad on the front panel and the host communications port (RS-232 or IEEE-488) on the rear. The front panel consists of four push-button switches, a backlit LCD display, and a power switch. The back panel contains the pneumatic connection, input power, fuses, user connector (slip ring), remote communications port, and the calibration port. While the table is rotating, the LCD display shows the current rate. The keypad can be disabled to prevent an operator from interrupting a test routine.

All mechanical components are mounted on an aluminum base plate having a precision ground mounting surface and incorporating four leveling screws to accurately level the unit. The twelve-inch diameter aluminum table has a precision ground surface for instrument mounting. *(See **Figure 5***) The table rim

is machined and engraved from 0 degrees to 360 degrees in one degree increments.

1.3 SPECIFICATIONS

SPECIFICATIONS	
Table Surface Characteristics	
• Diameter	12 Inches (305mm)
• Hole Pattern	Square pattern 10-32 UNF threaded on 3 inch centers
• Face Flatness	.003 inch TIR
• Face Runout	.003 inch @ 6 inch Radius
• Material	Aluminum
• Surface Finish	32 RMS
Overall Dimensions (inches)	14.5 x 16.6 x 10.5H in. (368 x 422 x 267 mm)
Test Load Capacity	50 lbs. (23 kg) Centered
Drive Type	DC Servo Motor
Power requirements	115 or 230V, 50/60 Hz (Specify at time of order)
Shipping Weight	59 lbs. (27 kg)
Leveling	
• Range	± 1 Degrees
• Resolution	Continuous
Rotational Limits	Unlimited
Operating Environment	
• Temperature	32° to 130° F (0° to 54° C)
• Relative Humidity	20% to 85% noncondensing
Finish	Machine blue paint on base Black anodizing on table top
Vacuum Line	Pneumatic air line for testing vacuum instruments 1/4 NPT Male on Base, 1/8 NPT Female on Tabletop
Slip Ring	
• Connector	37 pin D-Sub with a female connector on table top and a male connector on the base
• Ring	16 Circuits 2 Amp Max
Communication Interface	RS-232 (IEEE-488 optional)
• Speed	9600 BAUD (RS-232)
• Connector	9-Pin D-Sub Female (RS-232) 24-Pin Female (IEEE-488)
Rate	
• Speed Range	1-21600 Deg/Min, bi-directional
• Accuracy	± 0.1%
• Units (Selectable)	Deg/Sec or Deg/Min

II. PREPARATION FOR USE

2.1 INITIAL SET-UP

The unit should be placed on a rigid bench and carefully leveled with the four leveling screws. Plug one end of the line cord into the line connector on the back of the table and the other to a power source that matches the rating indicated on the back of the table. Consult the factory if you desire a different voltage rating.

> WARNING: Warranty does not cover improper voltages applied to the unit.

Fuses

The fuses are located on the rear panel of the table. (***Figure 2***). The table has one of the following configurations depending on the voltage indicated on the back of the table.

115V Tables

F1	.75 AMPS
F2	2 AMPS

230V Tables

F1	.375 AMPS
F2	1 AMPS

Rotational Limits

The model 1270VS is equipped with a slip ring which allows unlimited rotation of the axis. See Appendix A for pinout configuration.

2.2 LEVELING THE TABLE

To level the table, place a level on the tabletop or on the fixture in any orientation. A level with 30 arc-sec/division or better is recommended. If a mounting bracket or fixture will be used, it should be installed at this time. Adjust the leveling feet until the level indicates the surface is level. Rotate the tabletop 180°. Readjust the leveling feet until the level gives the same reading (with

respect to the level, i.e. if the level reads 1 division to the right, it should read 1 division to the left after rotating the tabletop 180°) at the current position and the position 180° away. Rotate the tabletop 90° and repeat the procedure. After this is complete the bubble on the level should stay in the same position as the tabletop is slowly rotated. This ensures that the axis of rotation is vertical.

2.3 PREPARATION

Mount the instrument to be tested to the tabletop using the mounting holes provided. Mounting brackets and fixtures are also available from Ideal Aerosmith. The vacuum line and/or electrical leads from the instrument to be tested should also be connected.

III. OPERATION INSTRUCTIONS

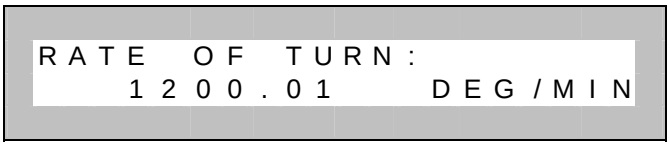
EMERGENCY PROCEDURES

In the event that the table must be shut down quickly the best procedure is to press the power switch located on the control panel. (See ***Figure 6***) This will cause the axis to stop quickly. For a decelerated stop, simply press the Run/menu key or issue the STO command through the communications link.

3.1 INTRODUCTION

When the power switch is turned on, the LCD will display the Model number of the table and the Firmware number. After the initial screen, the Run Display will be shown. This menu will be shown whenever the table is rotating. The initial rate at start-up will always be zero.

Run Display



The Run Display must be active in order for the remote communications port to be active. The communications port cannot be used while an operator is inputting information on the front panel. The keypad can be disabled to prevent the operator from interrupting a test. (See KPE Command, Section 3.4)

The actual speed is obtained by controlling the speed of the DC servo motor and by selecting the proper clutch. Listed below is the rate capabilities of the table in each range. Clutch selection is automatic when the desired rate is input. If the table must switch ranges, it will come to a complete stop before switching clutches.

Range	Min Speed °/min	Max Speed °/min	Min Speed °/sec	Max Speed °/sec
1	1	9.999	0.0167	0.1666
2	10	99.99	0.167	1.666
3	100	999.9	1.667	16.66
4	1000	21600	16.7	360.0

3.2 FRONT PANEL CONTROL

The four keys located directly below the LCD are the only keys required to operate the table.

Key Functions

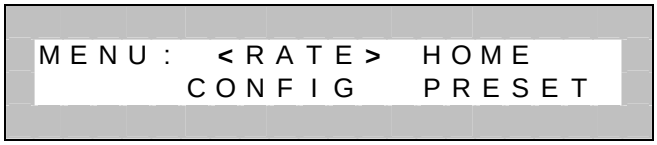
Run/Menu: The Run/Menu key has three functions depending on which menu is active. The main function of the key is to toggle the table between the run mode and the menu mode. The second function of the Run/Menu key is to add another digit when entering rates. The third function of the Run/Menu key is a cancel. The Run/Menu key takes you back one menu except in the rate menu where it has the digit function.

Increase & Decrease: The increase & decrease keys are used to toggle brackets or to scroll through numbers in the rate menu.

Enter: The enter key is used to select the current value or menu.

To activate the main menu, press the Run/Menu key once.

Main Menu



Pressing the increase or decrease key will toggle the <> among the four menu choices. Press the enter key after the selection has been made. If you wish to return to running the last rate at this time, press the Run/Menu key. If the Run/Menu key is not pressed, the table will return to the run display (zero rate) after approximately 10 seconds of inactivity. After this ten second period, the remote communications will be enabled.

Listed below is a summary of the functions found under each menu selection. Each function will be discussed in more detail later in this manual.

Rate Menu

The rate menu is used for entering a desired rate of turn and the direction. After entering the new rate, simply press the Run/Menu key once to put the table in motion. This menu is also used for setting the rate to program the presets.

Home Menu

The home menu is used to home the table. This puts the tabletop in a known configuration for loading.

Config Menu

The configuration menu is used for setting both the preset values and the units.

Preset Menu

The preset menu is used to run the table at the predetermined speed presets.

3.3 OPERATION

First, configure the table for the desired units (°/sec or °/min). The ability to change the units eliminates the need to convert between the two. Information entered in a different unit system will be converted when the units system is switched.

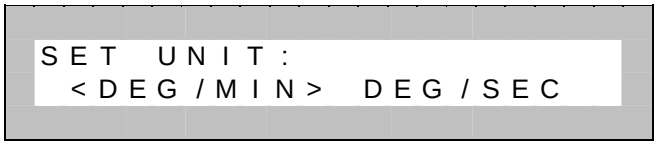
Note: There is not always an exact conversion between the units system.

Changing the units: Press the increase (decrease) key until "CONFIG" is enclosed in <>. Press enter and the config menu will be displayed.

Config Menu

Press increase (decrease) key until "UNIT" is enclosed in <> and press enter. The Set unit menu is now displayed.

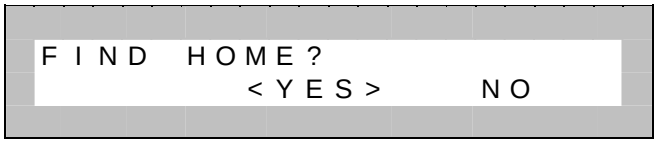
Set Unit Menu



Press increase (decrease) key until desired unit is enclosed in <> and press enter. The desired units will now be set and the main menu will be displayed. The current unit system is always shown in the run display.

Homing the Table: From the main menu, press increase (decrease) until "HOME" is enclosed in <> and press enter. The home menu is now displayed.

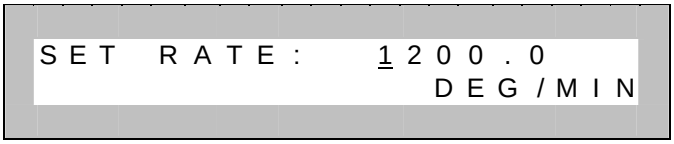
Home Menu



Press enter when "YES" is enclosed in <> and the table will find the home position. The home position can be adjusted by using the home offset command through the Remote communications port.

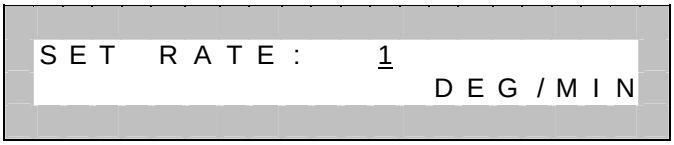
Moving the Table at a Specified Rate:
From the main menu, press increase (decrease) until "RATE" is enclosed in <> and press enter. The rate menu is now displayed.

Rate Menu



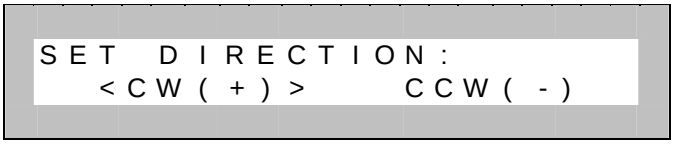
The number displayed will be the absolute value of the last rate commanded. If this is the number you wish to select, press enter to select displayed rate, increase (decrease) to select the desired number, or run/menu to return to the main menu. If the increase key is pressed, it will be the start of a new rate value.

Rate Menu



Press increase or decrease until the desired digit is displayed. The order of the numbers is "0,1,2,3,4,5,6,7,8,9,.". After the digit is correct, press run/menu to go to the next digit or press enter if that is the last digit. After pressing enter, the direction menu will be displayed.

Direction Menu



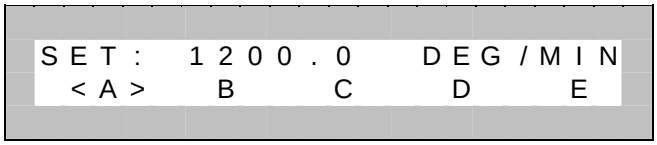
Press increase (decrease) key until desired direction is enclosed in <> and press enter. The desired rate and direction will now be set and the main menu will be displayed. Press Run/Menu to operate the table at the new rate.

Setting the Presets: Before entering the config menu, enter the Rate Menu to select the rate that you would like stored in one of the presets.

Config Menu

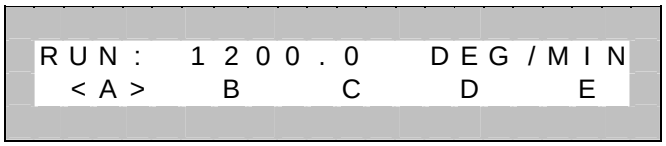
Press increase (decrease) key until "PRESET" is enclosed in <> and press enter. The Set preset menu is now displayed.

Set Preset Menu



The top line shows the value that will be entered into the desired preset. In this example, the value is 1200.0 deg/min. Press the increase (decrease) key until the desired preset is enclosed in <>, and press the enter key. If the letter "D" was the preset enclosed in <>, then 1200.0 deg/min would be stored in D.
Note: The sign is also saved as a part of the preset.

Running Presets: Presets are designed to reduce the number of keystrokes required to perform certain operations. From the main menu, Press increase (decrease) key until "PRESET" is enclosed in <> and press enter. The run preset menu is now displayed.



As you toggle through each of the presets with your increase(decrease) keys, the first line shows the rate that will be selected if Enter is pressed. After pressing enter, the table returns to the main menu, and will begin operating.

3.4 REMOTE COMMUNICATION (RS-232 or IEEE-488)

The Ideal Aerosmith Table Language (ATL) is designed to simplify the task of programming the rate table. The basic functions of the table are also located on the keypad, but some advanced functions are only available through the remote link.

RS-232 Communication Parameters

Host communication is established with the controller through the RS-232 port. It is a three wire asynchronous serial interface with hard wired Clear To Send (CTS) and Data Terminal Ready (DTR). The controller is configured as DCE. Listed below are the communication parameters.

Baud Rate	9600
Stop Bits	1
Parity	None
Data Bits	8

See Appendix A for connector pinouts.

IEEE-488 Communication Parameters (optional)

Host communication is established with the controller through the IEEE-488 port. The IEEE-488 connector is a standard IEEE-488 24-pin female connector. The GPIB Address is selected using DIP switches inside the table. See Section 4.6.

The table is shipped from the factory configured as Address 2.

See Appendix A for connector pinouts.

Host Computer Interface

The host computer must use all upper case characters and terminate each command with a carriage return (ASCII 13). The space character (ASCII 32), linefeed (ASCII 10) and the backspace character (ASCII 8) are not accepted in a command string. After a command is sent to the table, some action is taken and a response is sent to the host computer. One of the following responses must be received by the host computer before the next command is issued.

1. Response of valid commands when no data is requested: [CR, LF, “>”, CR, LF]
2. Response of valid command when data is requested: [DATA STRING, CR, LF, “>”, CR, LF]
3. Response of invalid command, syntax, or range: [“?”, CR, LF, “>”, CR, LF]

The ASCII codes for carriage return (CR) and linefeed (LF) are 13 and 10, respectively.

Summary of ATL Commands:

Command	Syntax	Description
ACL	ACL100	Sets the acceleration and deceleration in user units.
ANG	ANG3072	Angular Interval in encoder edges used in calibration
CAL	CAL1536	Calibration constant to calibrate rates.
CLU	CLU2	Manually selects clutch setting.
HOF	HOF3000	The home offset is set to 3000 encoder edges.
HOM	HOM	The table will search for the home position and stop there.
KPE	KPE1	The keyboard is disabled on 0, enabled on 1.
JGA	JGA	Table rotates at Preset A setting
JGB	JGB	Table rotates at Preset B setting
JGC	JGC	Table rotates at Preset C setting
JGD	JGD	Table rotates at Preset D setting
JGE	JGE	Table rotates at Preset E setting
JOG	JOG1.023	Table rotates at specified speed
REX	REX	Returns count from incremental optical shaft encoder
RTV	RTV	Returns actual velocity of table top
SPA	SPA4.5	Sets Preset A to 4.500 units
SPB	SPB4.5	Sets Preset B to 4.500 units
SPC	SPC4.5	Sets Preset C to 4.500 units
SPD	SPD4.5	Sets Preset D to 4.500 units
SPE	SPE4.5	Sets Preset E to 4.500 units
SRV	SRV0	Shuts off motor drive
	SRV1	Turns on motor drive
STO	STO	Stops the table in a decelerated fashion.
UNI	UNI0	Sets units to deg/min
	UNI1	Sets units to deg/sec

Outlined below are the various ATL commands. The actual three letter commands are in bold, while the parameters are in italics. No spaces should be issued in any command.

Query Parameter Settings

The following ATL commands may be interrogated for their current value by adding a "?" after the three character command: ACL, ANG, CAL, CLU, HOF, KPE, JOG, SPA, SPB, SPC, SPD, SPE, SRV, and UNI. The syntax is shown in the following example:

ACL?

Note: JOG? will return the current set rate, not the actual rate. Use the RTV command to return the actual rate.

Description of ATL Commands

Acceleration
ACL *acceleration*

The acceleration command is used to enter the acceleration parameter. All subsequent motion will be completed using this acceleration. The acceleration command is formatted as follows:

ACL50

The command sets the default acceleration to 50 deg/s² provided the current unit system is deg/sec.

Range: 50-500 deg/sec² (180,000-1,800,000 deg/min²)
Resolution: 50 deg/sec² (180,000 deg/min²)

The power up default setting is 100 deg/sec^2.

Encoder Pulse Angle
ANG *edges*

The encoder pulse angle command is used to set the interval between pulses on the calibration port. See Appendix B for converting encoder edges to table angle in degrees. The acceleration command is formatted as follows:

ANG1152000

The previous command sets the encoder pulse angle to 1,152,000 edges

Range: 1-16,777,215
Resolution: 1

The power up default is 3200.

Calibration Constant
CAL *constant*

The calibration constant is used to compensate for any crystal error. The default value (no correction) is 1536. The calibration constant command is formatted as follows:

CAL1536

The previous command sets the calibration constant to 1536 (no correction)
Range: 1000-2000
Resolution: 1

See section 4.5 for calibration procedures

This value is stored in the microcontroller EEPROM.

Clutch Select
CLU *clutch*

The clutch command manually selects the speed range. The software sets the clutch automatically. This command is typically used for diagnostic purposes. The CLU0 command can be used so that the table is free to rotate. The clutch command is formatted as follows:

CLU2

The previous command sets the clutch in the 10-99.99 deg/min speed range
Range: 0-4
Resolution: 1

Home Offset
HOF *edges*

The home offset command is used to define the zero position of the table. Changing the value of the home offset changes where the table stops after the home sequence is executed. See Appendix B for converting encoder edges to table angle in degrees. The home offset command is formatted as follows:

HOF3000

The previous command sets the home offset angle to 3000 edges
Range: 1-10,000
Resolution: 1

This value is stored in the microcontroller EEPROM.

Home Table
HOM

The home table command causes the table to search for the home position, The table will always execute the sequence even if it is currently at the home position. The home command is issued without any arguments:

HOM

Jog at Preset
JGA
JGB
JGC
JGD
JGE

The Jog at Preset A (JGA) through the Jog at Preset E (JGE) command causes the table to rotate at their respective Preset settings. The Presets are set using the Set Preset command. The jog at preset commands are issued without any arguments

JGA
JGD

The first command jogs the table at the preset A settings while the second jogs the table at the preset D settings.

Jog Table
JOG *velocity*

The jog command rotates the axis at a specified velocity.

JOG-100
JOG50

The first command rotates the axis in the negative direction at 100 units. The second rotates the axis at a velocity of 50 units. To set the units, see the UNI command.

KeyPad Enable
KPE *value*

The keypad enable is used to disable or enable the keypad. A value of 1 allows the keypad to be used and a value of 0 will disable it. The keypad is always enabled when the table is turned on. The keypad can be disabled to prevent an operator from interrupting a test sequence.

KPE0

Return Encoder Count
REX

The return encoder count returns the current value of the counter which represents the incremental 4X quadrature decoding of the optical shaft encoder. The value returned will be between 0 and 16,777,215. The command is issued without any arguments:

REX

Return Actual Velocity
RTV

The return actual velocity command returns the velocity of the table, When the command is issued, the table measures the number of encoder edges passing in the next .32 seconds and computes the velocity. The value returned will be in the current units. The command is issued without any arguments:

RTV

Set Preset
SPA *velocity*
SPB *velocity*
SPC *velocity*
SPD *velocity*
SPE *velocity*

The set preset command associates a velocity (with direction) with a Preset. The presets can also be set from the keypad. The presets are generally used with the keypad to reduce the number of keystrokes required to command a rate. If the units are changed, the value of the presets will be converted to the new units (40 deg/sec becomes 2400 deg/min). The set preset commands are issued as shown below.

SPA4.5
SPD-100

The first command sets preset A to 4.5 units in the CW direction while the second sets preset D to 100 units in the CCW direction. The set preset command stores it's values in the microcontroller EEPROM.

Servo On/Off
SRV *value*

The servo command can either shut off the servo drive or turn on the servo drive to begin closed loop control of the axis. A value of 1 turns the servo drive on and a value of 0 turns the servo drive off. The following command will turn off the servo drive. *This command should not be used to halt motion.* Use the STO command to stop motion.

SRV0

Stop
STO

The stop command is used to stop the axis in a decelerated motion. No parameters are needed.

STO

Set Unit
UNI *value*

The set unit command is used to switch the table between Degrees/Minute and Degrees/Second. A value of 1 will command the table to display in degrees/second and a value of ∅ will command the table to display in degrees/minute. The units can also be switched from the keypad. The units can be switched while the table is rotating.

UNI0

The above command sets the units to degrees/minute.

The set unit command stores it's value in the microcontroller EEPROM.

IV. MAINTENANCE

4.1 INSPECTION

Inspection should be performed in accordance with accepted standards and practices. Inspection should be performed at regular intervals and include such items as:

A. Proper Lubrication of Parts
B. Cleaning of Parts
C. Calibration

4.2 OPENING THE UNIT FOR SERVICE

To service the table, first remove the power cord from the connector on the back of the table.

DANGER:	THE TABLE CONTAINS POTENTIALLY LETHAL VOLTAGES. DO NOT REMOVE COVERS WITH POWER CORD CONNECTED.

Remove the four black truss-head screws on each cover. (8 screws indicated by “A” in figures 1 and 2). Access to most of the parts can now be gained through the front or the rear. At this point, troubleshooting can be accomplished and the gears lubricated.

If further maintenance is required, it may be necessary to tilt the main assembly away from the base. Remove the following items:-two jack screws mounting the DB37 user connector and the pneumatic line from the bulk-head connector. Loosen approximately one turn the two screws marked “B” in Figures 1 and 2. Remove the two screws marked “C” and “D. Lift up on the side plates and the table will tilt away from the base. (See ***Figure 7***)

Make sure side plates are properly supported before attempting maintenance.

DANGER:	FAILURE TO SUPPORT THE TABLE MAY RESULT IN SERIOUS INJURY.

4.3 LUBRICATION

Very little lubrication is required under normal operating conditions. The bull gear and the pinions should be kept lightly coated with grease per MIL-G-23827 or an equivalent. This should be performed on six month intervals. The selective gear trains may also be lightly coated with grease if desired (especially the first three sets) as they will run quieter.

4.4 CLEANING

Maintain the instrument free of dust and lint. When lubricating gear teeth, remove any excess grease.

4.5 CALIBRATION

In order to compensate for crystal drift, the unit can be software calibrated. Hook up a frequency counter to the calibration port on the back of the table (J3) to measure the time interval between pulses. J3 is a BNC female connector. The rate pulse is driven with a 74HC14 Schmitt trigger with the voltage rail at 5VDC. To determine the accuracy of the unit set the ANG parameter to 1152000. Set the table to rotate at 21600°/min or 360°/sec. The theoretical time is 10 seconds. Issue the CAL? to determine the current value of the calibration constant. By increasing the calibration constant by one count speeds up the table .0016%.

$$CORRECTION = \frac{100 - (10 * TIME)}{0.0016}$$

TIME IN SECONDS

Subtract the correction from the current calibration constant. If the actual time is less than 10 seconds, the calibration number should be smaller. If the actual time is greater than 10 seconds, the calibration number should be larger. For example, if the current calibration constant is 1523 and the measured time is 9.9998 seconds, the correction would be 1.25 counts. Since the calibration constant must be an integer the new calibration constant should be 1522. Enter CAL1522 to change this parameter. Measure the interval to verify that the value is 10.0000±.0016 seconds.

4.6 CHANGING THE IEEE-488 ADDRESS

In order to change the IEEE-488 address, it is necessary to remove the rear panel. To change the address set SW1 on A9. (See Figure 8 for location of A9). SW1 is located on the top of A9 and is the dip switch closest to the IEEE-488 connector. Switches 4 through 8 affect the IEEE-488 address. The settings are shown in the table below.

Switches					Indication
8	7	6	5	4	
OFF	OFF	OFF	OFF	OFF	Address 0
ON	OFF	OFF	OFF	OFF	Address 1
OFF	ON	OFF	OFF	OFF	Address 2
ON	ON	OFF	OFF	OFF	Address 3
OFF	OFF	ON	OFF	OFF	Address 4
ON	OFF	ON	OFF	OFF	Address 5
OFF	ON	ON	OFF	OFF	Address 6
ON	ON	ON	OFF	OFF	Address 7
OFF	OFF	OFF	ON	OFF	Address 8
ON	OFF	OFF	ON	OFF	Address 9
OFF	ON	OFF	ON	OFF	Address 10
ON	ON	OFF	ON	OFF	Address 11
OFF	OFF	ON	ON	OFF	Address 12
ON	OFF	ON	ON	OFF	Address 13
OFF	ON	ON	ON	OFF	Address 14
ON	ON	ON	ON	OFF	Address 15
OFF	OFF	OFF	OFF	ON	Address 16
ON	OFF	OFF	OFF	ON	Address 17
OFF	ON	OFF	OFF	ON	Address 18
ON	ON	OFF	OFF	ON	Address 19
OFF	OFF	ON	OFF	ON	Address 20
ON	OFF	ON	OFF	ON	Address 21
OFF	ON	ON	OFF	ON	Address 22
ON	ON	ON	OFF	ON	Address 23
OFF	OFF	OFF	ON	ON	Address 24
ON	OFF	OFF	ON	ON	Address 25
OFF	ON	OFF	ON	ON	Address 26
ON	ON	OFF	ON	ON	Address 27
OFF	OFF	ON	ON	ON	Address 28
ON	OFF	ON	ON	ON	Address 29
OFF	ON	ON	ON	ON	Address 30

The 1270VS rate table has an RS232 to IEEE-488 converter card. One can configure it to use the SRQ feature which is detailed below:

Using the SRQ Feature

The GPIB bus performance might slow down if the Controller is constantly waiting for the rate table GPIB card to send or receive data. With SRQ enabled, the bus can be

used by other devices until the GPIB card requests service (asserts SRQ*). When the GPIB card asserts SRQ*, the Controller serial polls the GPIB card to determine what type of service it needs. After it is serial polled, the GPIB card unasserts SRQ*. You can enable the SRQ feature by setting switch 3 of SW1 to the ON position. **The factory default setting for switch 3 of SW1 is OFF.**

Conditions That Cause SRQ to be Asserted

If SRQ is enabled, the GPIB card asserts the SRQ* signal on two conditions:

- when the GPIB card receives serial data that it needs to pass on to the GPIB port
- when the GPIB card input buffer becomes empty

When the GPIB card's input buffer is empty and the GPIB card receives a serial character to be sent along to the GPIB, the SRQ* signal is asserted. This alerts the GPIB Controller that the GPIB card has data to send to a GPIB Listener. The Controller can then address the GPIB card to talk so that the data can be read out of the GPIB card's serial buffer. When the serial buffer is empty, the Controller can unaddress the GPIB card to talk and address other devices to transfer data on the bus.

SRQ* is also asserted when the GPIB input buffer becomes empty. When the GPIB card has emptied out the buffer, it requests service, indicating it is ready for more data. The Controller can then readdress the GPIB card to listen and continue sending data until all the data is sent.

GPIB Card Serial Poll Responses

If the GPIB card is serial polled, its response byte depends on the status of the internal data buffers.

- If the serial input buffer is empty, bit 1 of the status byte is set to 1.
- If the serial input buffer is not empty, bit 1 is set to 0.
- If the GPIB card input buffer is empty, bit 0 of the status byte is set to 1.
- If the GPIB input buffer is not empty, bit 0 is set to 0.

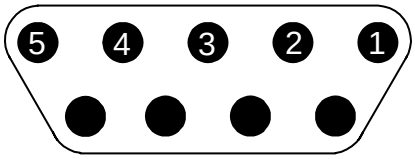
In all cases, bit 6 is set to 1 if the GPIB card is requesting service; otherwise it is set to 0.

Appendix A
Pinout Configuration

J1 User Connector DCMAE-37P on base, DCMAE-37S on table top:

WIRE TABLE	
SLIP RING COLOR	TO PIN
BRN	1
RED	2
ORG	3
YEL	4
GRN	5
BLU	6
VIO	7
GRY	8
WHT	9
BLK	10
WHT/BRN	11
WHT/RED	12
WHT/ORG	13
WHT/YEL	14
WHT/GRN	15
WHT/BLU	16
WHT/VIO	-

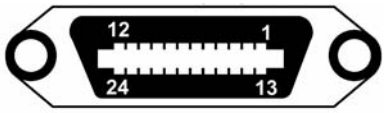
J2 RS 232 Connector (DB9S Style Connector)



PIN NUMBER	DESCRIPTION
1	
2	TXD
3	RXD
4	
5	GROUND

Permanent Jumpers from 4 to 1, 6
Permanent Jumper from 7 to 8

J2 IEEE-488 Connector



IEEE-488 Host Port
24 Pin Centronics
Located on Rear Panel

Pin	Signal	Abbr.	Source
1	Data Bit 1	DIO1	Talker
2	Data Bit 2	DIO2	Talker
3	Data Bit 3	DIO3	Talker
4	Data Bit 4	DIO4	Talker
5	End Or Identity	EOI	Talker/Controller
6	Data Valid	DAV	Controller
7	Not Ready For Data	NRFD	Listener
8	No Data Accepted	NDAC	Listener
9	Interface Clear	IFC	Controller
10	Service Request	SRQ	Talker
11	Attention	ATN	Controller
12	Shield		-
13	Data Bit 5	DIO5	Talker
14	Data Bit 6	DIO6	Talker
15	Data Bit 7	DIO7	Talker
16	Data Bit 8	DIO8	Talker
17	Remote Enabled	REN	Controller
18	Ground DAV		-
19	Ground NRFD		-
20	Ground NDAC		-
21	Ground IFC		-
22	Ground SRQ		-
23	Ground ATN		-
24	Logical Ground		-

Appendix B
Converting Table Angle in Degrees to Encoder Edges

Use the table below to calculate the range based on the current rate.

Range	Min Speed °/min	Max Speed °/min	Min Speed °/sec	Max Speed °/sec
1	1	9.999	0.0167	0.1666
2	10	99.99	0.167	1.666
3	100	999.9	1.667	16.66
4	1000	21600	16.7	360.0

$$ENCODER\_EDGES = TABLE\_ANGLE * 10^{(4-RANGE)} * 320$$

TABLE ANGLE IN DEGREES

The number of encoder edges in 10° when rotating at 1500°/min is 3200 edges.

Computing rate from the calibration pulse-

This calculation is used to determine the value of the ANG command to obtain a calibration pulse at a desired interval.

The following calculation is used to determine the speed when the value of the ANG command is known and the time between pulses.

$$SPEED = \frac{ANGLE}{10^{(4-RANGE)} * TIME * 320}$$

SPEED IN DEGREES/ SECOND
TIME IN SECONDS
ANGLE IN ENCODER EDGES