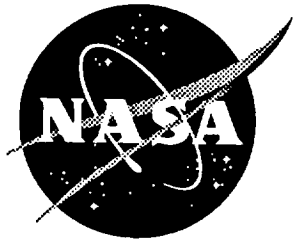
NASA Contractor Report 191606



Laser Velocimeter Data Acquisition System for the Langley 14- by 22-Foot Subsonic Tunnel

Software Reference Guide Version 3.3

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1.0 Introduction

The Laser Velocimeter Data Acquisition System (LVDAS) in the 14-x 22-Foot Tunnel is controlled by a comprehensive software package designed to control the data acquisition process during wind tunnel tests which employ a laser velocimeter measurement system.

The HP-UX Operating System is a multi-user, multiprogramming operating system based on AT&T's UNIX-System V Interface Definition. In addition, HP-UX includes real-time enhancements, high performance file access, and device I/O libraries.

2.0 Command Syntax

The Laser Velocimeter Data Acquisition System is used by entering commands in response to input prompts. Each command begins with a keyword followed by one or more parameters needed to complete the specified command. Four of the commands (**bif, kif, sif,** and **fdp**) are used to enter subsystems which are controlled by their own individual set of commands. In describing the LVDAS commands, the following conventions are used:

subsystem	name of an LVDAS subsystem
filename	name of a file including path if needed
lvpname	laser velocimeter data acquisition parameter name
wtpname	wind tunnel parameter name
value,value1,value2	numeric values
string	ASCII character string

Many of the commands in LVDAS have optional parts. These optional parts are enclosed in square brackets.

[this is optional]

Some keywords in the commands are selected from a list of acceptable keywords. These keywords are in a vertical list with the first choice enclosed in braces.

{ choose }
one
of
these

LVDAS command keywords may be abbreviated. Most keywords and commands can be abbreviated with three or more characters. For example, the following are equivalent:

- acquire, acqui, acq
- display 1 vel, disp 1 vel, dis 1 vel
- tape rewind, tap rewin, tap rew

All commands are entered in lower case and in free-field format using blanks as separators. LVDAS will check the command syntax. If a command is entered using improper syntax an error message will be displayed.

On-line help is always available should the user need the correct syntax for a particular command. Several frequently used commands have been assigned to function keys appearing along the lower portion of the user console. The use of these function keys can significantly simplify and minimize user inputs.

2.1 List of Command Keywords

Command	Description
acquire	start data acquisition
align	move scan positioning system for alignment
bif	buffer interface
boot	soft restart of program
display	display a static wind tunnel parameter
echo	enables/disables command echoing
execute	direct input from an alternate command file
exit	terminate program
fdp	frequency domain processors interface
graphics	assign axes limits for graphics frames
grid	specify acquisition grid table file name
help	get command assistance
home	move scan positioning system to home location
info	place a comment in header record on magnetic tape
kif	klinger scan positioning interface
mode	select an acquisition mode (i.e. auto, manual)
move	move scan positioning system
park	move scan positioning system out of tunnel flow
plot	make hardcopy plots
print	print selected system files
quicklook	designate LVABI channels to be quicklook data channels
record	write data to magnetic tape
reference	provide geometric reference point for measurement locations
rewind	reposition system files
scanmode	change operational mode of the scan positioning system
sdas	issue commands to static data acquisition system
sif	unidex scan positioning interface
set	assign new values to LVDAS parameter values
show	display stored LVDAS parameter values
summary	specify output location for data summaries
tape	control magnetic tape unit
track	monitor static wind tunnel parameter

2.2 List of LVDAS Parameter Keywords

LVDAS Parameter	Description
time	acquisition time
minpts	minimum number of acquired data points to automatically accept measurement and write to magnetic tape
acqpts	maximum number of acquired data points
serial	measurement position magnetic tape identifier
uaperture	u-component aperture time
vaperture	v-component aperture time
waperture	w-component aperture time
uangle	u-component cross beam angle
vangle	v-component cross beam angle

wangle	w-component cross beam angle
ubragg	u-component bragg shift frequency
vbragg	v-component bragg shift frequency
wbragg	w-component bragg shift frequency
uwavelen	u-component wave length
vwavelen	v-component wave length
wwavelen	w-component wave length
xmax	x-axis maximum limit
xmin	x-axis minimum limit
xfeed	x-axis controller feed rate
xref1	reference location 1 x-value
xref2	reference location 2 x-value
xalign	x-axis alignment position
ymax	y-axis maximum limit
ymin	y-axis minimum limit
yfeed	y-axis controller feed rate
yref1	referencelocation 1 y-value
yref2	reference location 2 y-value
zalign	z-axis alignment position
zmax	z-axis maximum limit
zmin	z-axis minimum limit
zfeed	z-axis controller feed rate
zref1	reference location 1 z-value
zref2	reference location 2 z-value
zalign	z-axis alignment position
pmax	p-axis maximum limit
pmin	p-axis minimum limit
phome	p-axis home position
pfeed	p-axis contorller feed rate
ppark	p-axis park position
pref1	reference location 1 p-value
pref2	reference location 2 p-value
palign	p-axis alignment position
tmax	t-axis maximum limit
tmin	t-axis minimum limit
thome	t-axis home position
tfeed	t-axis contoller feed rate
tpark	t-axis park location
tref1	reference location 1 t-value
tref2	reference location 2 t-value
talign	t-axis alignment position
amax	azimuth maximum limit
amin	azimuth minimum limit
rmax	radial position maximum limit
rmin	radial position minimum limit
dmax	height above/below tip-path-plane maximum limit
dmin	height above/below tip-path-plane minimum limit
pzero	initial offset to zero degrees pan
tzero	initial offset to zero degrees tilt
zzero	initial offset to zero position along z-axis (centerline of model)
radius	blade radius length(feet)

2.3 List of Wind Tunnel Parameter Keywords

Wind Tunnel

Parameter	Description
test	test number
run	run number
point	point number
id	identification number
yrmoda	year-month-day of measurement
hrmnsc	hour-minute-seconds of measurement

2.4 List of LVDAS Subsystem Keywords

LVDAS

Subsystem	Description
acquisition	acquisition parameters
buffer	LVABI parameters and channel setup
optics	laser velocimeter optics parameters
scan	scan positioning system parameters
unidex	scan positioning system hardware status
fdp	frequency domain processors parameters
tracked	monitored wind tunnel parameters

3.0 Getting Started

This section will describe the procedures to start the LVDAS from a powered-on state. It will also acquaint the user with the various window areas of the console and present some commands that are fundamental to the operation of the LVDAS.

3.1 Logging In to HP-UX

Press **Return** to bring up the login prompt. The user must repond with a username and a password. A special username has been established to log in to the LVDAS as follows:

login: lvops **Return**

password: xxxxxx **Return** See System Manager for current password.

If the log-on has been successful, HP-UX should grant access to the system. What appears next is a greeting and a prompt to enter the terminal type.

TERM = (98736)

Respond by entering **Return** to accept **98736** as the terminal type. When the login process is complete, the C shell prompt **fetch[1]%** will be displayed. The C shell is a program that executes under the HP-UX operating system. It is a command interpreter - the gateway to other programs and utilities running under HP-UX.

3.2 Starting the LVDAS Software

At the C shell prompt, enter:

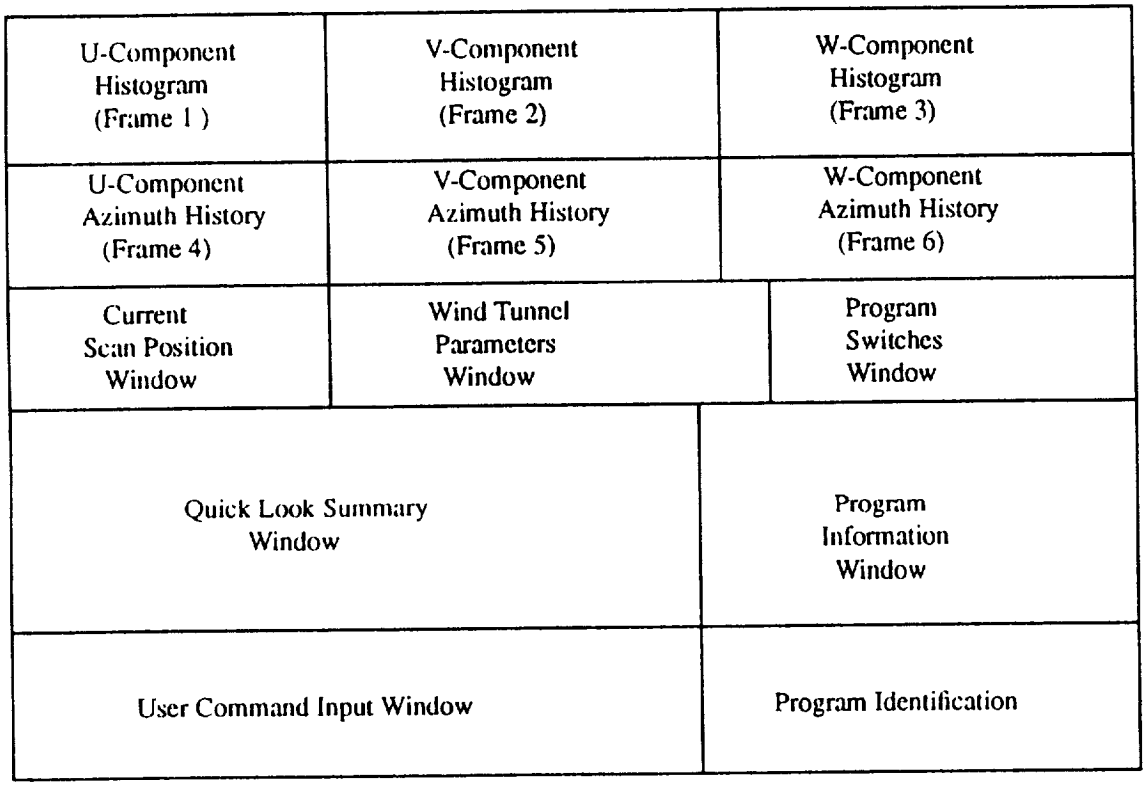
lvdas **Return**

which will start the LVDAS software. The following tasks are performed during the startup cycle:

- Global variables are initialized.
- Console windows and graphics frames are initialized.
- Configuration information is read for:
  a. device assignments from **conf/.devices**
  b. software setup parameters from **conf/.parameters**
- Calibration information is read for:
  a. z-axis (zoom) positions from **cals/zoomcals.dat**
  b. crossbeam angles from **cals/bluecals.dat** and **cals/greencals.dat** respectively.
- Opens device files associated with:
  a. Laser Velocimeter Autocovariance Buffer Interface (LVABI)
  b. Unidex controller for the Scan Positioning System
  c. Frequency Domain Processors
  d. 9-Track Magnetic Tape Drive
  e. Line printer/Laser printer
  f. Klinger controller for the 3rd component Scan Positioning System
- Starts a server process with client(s) to access the Static Data Acquisition System (SDAS) and/or other connected systems.
- Automatically executes the command input files **conf/.setup**, **conf/.lvabi**, **conf/.fdp**, if found.

3.3 The User Console

The following figure identifies the various windows and graphics frames contained on the user's console screen.



3.3.1 Description of Windows

1. **Current Scan Position.** This window displays the current position of the measurement sample volume and is updated after every move.

    a. X-value is the longitudinal axis, in inches, measured positive downstream.
    b. Y-value is the vertical axis, in inches, measured positive up.
    c. Z-value is the latitudinal axis, in inches, measured positive away from the scan positioning system.
    d. P-value is the pan axis, in degrees, measured positive downstream.
    e. T-value is the tilt axis, in degrees, measured positive up.
    f. User coordinate system values from the acquisition grid table are also displayed.

2. **Wind Tunnel Parameters.** This window displays the user selected wind tunnel parameters and the values are updated after each acquisition cycle.

3. **Program Switches.** This window displays the current status of the following program switches:

    a. Track - indicates whether parameter tracking is ON of OFF.
    b. Scan - indicates the operational mode of the scan positioning system as either REMote or LOCal.
    c. Plotter - indicates whether plotter output is ON or OFF.
    d. SDAS - indicates whether parameters from the tunnel Static Data Acquisition system will be requested and transferred to the LVDAS. The status ON indicates that the parameters will be

requested and passed; **OFF** indicates that parameters will not be requested.
e. Summary - indicates whether summary output is **ON** or **OFF**.
f. Tape - indicates whether tape writes are **ON** or **OFF**.

4. **QuickLook Summary.** This window displays quicklook statistics for each selected LVABI channel. The following statistical parameters are calculated and displayed:

   a. Measurements - number of measurement points acquired.
   b. Mean - the mean value.
   c. Error-mean - calculated error in the mean value.
   d. Sigma - the standard deviation.
   e. Error-sigma - calculated error in the standard deviation.
   f. Skew - skewnesss (3rd Moment).
   g. Excess - kurtosis (4th Moment).
   h. Turb Int - calculation of turbulence intensity relative to a component's mean value.

5. **Program Information.** This window displays help and status screens.

6. **User Command Input.** This window is used to enter commands.

3.3.2 Graphics Frames

1. **LV Component Histograms.** These frames display a velocity hisogram for each measured laser velocimeter velocity component.

2. **Azimuth History Plots.** These frames display rotor azimuth versus mean velocity.

3.4 The HELP Command

This command provides the capability to obtain on-line reference information about available LVDAS commands, parameters, and subsystems.
The syntax of the command is:

help [{command}|
lvpname
wtpname
subsysname

where:

command is the LVDAS command to be described. If no command is specified, a list of LVDAS commands is given in the Program Information Window.
lvpname displays a list of laser velocimeter data acquisition parameters (LVP) in the Program Information Window.
wtpname displays a list of wind tunnel parameters (WTP) in the Program Information Window.
subsysname displays a list of LVDAS subsystems.

If an invalid command or subsystem keyword (such as **what**) is given, the LVDAS will respond with the message:

what: Help NOT available.

Examples:

```
M> help                 Displays a list of LVDAS commands
M> help display         Displays help about the command display
M> help buffer          Displays help about the LVABI subsystem
M> help lvpname         Displays a list of LVP names
M> help wtpname         Displays a list of WTP names
M>
```

3.5 The EXECUTE Command

This command is used to specify the name of an ASCII file which contains LVDAS commands. Alternate command files may be executed as often as required.
The syntax of the command is:

execute filename

where:

filename is the name of an alternate command file.

This command allows the user to create customized or repetitive command procedures on a file and then have LVDAS execute the set of commands without user interaction. When LVDAS detects an end-of-file on the indicated file, LVDAS will return control to the user's console and wait for the next command.

A more general application of this command is possible by causing a second alternate command file to be used from the first alternate command file by use of the **execute** command as the last command to appear in the first alternate file. Alternate command files cannot be nested.

Example:

```
M> execute conf/.lvabi      Execute the buffer setup command file
M>
```

3.6 The ECHO Command

This command is used to cause all LVDAS commands from an alternate command file to be displayed at the user's console as they are executed.
The syntax of the command is :

echo { on }
off

where:

on displays all commands from an alternate command file at the user's console.
off surpresses the display of LVDAS commands.

Example:

```
M> echo on              Causes echoing of commands
M>
```

3.7 The BOOT Command

This command is used to perform a controlled restart of the LVDAS and return the system to a known state.

The syntax of the command is:

boot [filename]

where:

filename is the name of an alternate command file. If no command file is specified, the LVDAS will look for the file **conf/lvdas.setup.**

The following tasks are performed during the restart cycle:

- Configuration information is read for:
  a. device assignments from **conf/.devices**
  b. parameter identification from **conf/.parameters**

- Calibration information is read for:
  a. z-axis (zoom) positions from **cals/zoomcals.dat**
  b. crossbeam angles from **cals/bluecals.dat** and **cals/greencals.dat** respectively.

- Re-opens device files associated with:
  a. Laser Velocimeter Autocovariance Buffer Interface (LVABI)
  b. Unidex controllers for the Scan Positioning System
  c. Frequency Domain Processors
  d. 9-Track Magnetic Tape Drive
  e. Klinger controller for the 3rd component

- Executes the specified command file, if given.

Examples:

M> **boot**	Executes default file **conf/.setup**
M> **boot myboofile**	Executes file **mybootfile**
M>	

3.8 The EXIT Command

This command is used to return control to the operating system. To prevent any unintentional exits, the program will ask the user for confirmation before executing the command.
The syntax of the command is:

exit

The following tasks are done during the exit cycle:

- Closes device files associated with:
  a. Laser Velocimeter Autocovariance Buffer Interface (LVABI)
  b. Unidex controllers for the Scan Positioning System
  c. Frequency Domain Processors
  d. 9-Track Magnetic Tape Drive (after rewind of tape)
  e. Line/Laser printer
  f. Klinger controller for the 3rd component scan system

- Terminates the server process for the Static Data Acquisition system (SDAS)

- Clears windows and graphics frames from the user's console

If the user is operating within the scan position or buffer subsystems, this command will cause a return to the acquisition prompt and not exit to the operation system.

Examples:

M> **exit**	*Exit command entered*
Are you sure (Y/N) ?y	*user is asked for confirmation*

4.0 Controlling What You See at the Console

4.1 The DISPLAY Command

This command is used to control the display of wind tunnel parameters (WTP) at the user's console. The value of each displayed WTP will be updated at the completion of every acquisition cycle.
The syntax of the command is :

display value { wtpname }
off

where:

value is the number of the display position within the Wind Tunnel Parameters window of the user's console where the specified WTP will appear.
wtpname is the name of a WTP.
off will turn off the display of a WTP at the specified display position.

The following figure identifies the display positions within the Wind Tunnels Parameters window:

[1]	[4]	[7]
[2]	[5]	[8]
[3]	[6]	[9]

Examples:

M> **display 1 vel**	*Displays tunnel free stream velocity in position 1*
M> **display 4 alpha**	*Displays angle of attack in position 4*
M> **display 1 off**	*Turns off display of tunnel free stream velocity*
M>	

4.2 The QUICKLOOK Command

This command is used to designate an LVABI channel as a quicklook data channel. At the completion of each acquisition cycle, the LVDAS will calculate and display statistics for all quicklook data channels. The statistics for the quicklook data channels are saved in the header record and written to magnetic tape with the raw data.
The syntax for the command is:

quicklook value1 { value2 }
off

where:

value1 is the number of the display column within the QuickLook Summary window of the user's console where the designated quicklook data channel will appear.
value2 is the address number of the LVABI channel to be designated a quicklook data channel.
off will turn off the display of the quicklook data channel at the specified column and removes that channel as a quicklook data channel.

Examples:

M> **quicklook 1 0**	*Designates LVABI channel 0 to be a quicklook data channel and displays*

it in column 1

M> **quicklook 4 2**
M> **quicklook 4 off** *Removes quicklook data channel currently being displayed in column 4*
M>

4.3 The GRAHPICS Command

This is used to enter/change the plotting limits for the horizontal and vertical axes within a graphics frame. The command also controls the display of a specified graphics frame.
The syntax of the command is:

graphics value [{ on }]
off

where:

value is the number of the graphics frame where the plotting limit values are to be changed. Refer to the figure in Section 3.3 for the positions of the frames at the user's console
off will turn off the display of the specified graphics frame.
on will turn on the display of the specified graphics frame.

The following table identifies which plotting limit values can be changed for each graphics frame.

Frame	Changeable Plotting Limits
1,2,3	Vertical maximum, horizontal minimum and maximum
4,5,6	Vertical minimum and maximum

After entering the **graphics** command, the user will be prompted for new plotting limit values appropriate for the specified frame. If data was being displayed within the frame, it will be re-plotted using the new limits.

Example:

M> **graphics 1** *Change plotting limits in frame 1*
Enter vertical max value > 500 *User enters value 500*
Enter horizontal min value > -35 *User enters value -35*
Enter horizontal max value > 50 *User enters value 50*
M> **graphics 2 off** *Turn off display of graphics frame 2*
M>

5.0 Setting and Displaying Program Parameters

5.1 The SHOW Command

This command is used to display the current value of laser velocimeter data acquisition parameters (LVP) or wind tunnel parameters (WTP) and also to display information about one of the LVDAS subsystems. The syntax of the command is:

show { lvpname }
wtpname
subsystem

where:

lvpname is the name of an LVP. The current value of the specified parameter will be displayed in the User Input Window.
wtpname is the name of a WTP. The current value of the specified parameter will be displayed in the User Input Window.
subsystem is the name of an LVDAS subsystem. The current values for all parameters associated with the specified subsystem will be displayed in the Program Information Window.

LVDAS parameters displayed with the show command may be changed using the set command.

Examples:

M> show ubragg
UBRAGG set to 5.0
M> show acquisition *Display appears in Program Information window*
M> show time
TIME set to 2:00
M>

5.2 The SET Command

This command is used to change the value of a laser velocimeter data acquisition parameter (LVP) or wind tunnel parameter (WTP). The LVDAS will respond by displayed the new value and the previously wind tunnel parameter (WTP). The LVDAS will respond by displayed the new value and the previously assigned value.
The syntax of the command is:

set { lvpname } value
wtpname

where:

lvpname is the name of an LVP.
wtpname is the name of a WTP.
value is the new value to be assigned.

LVDAS parameters assigned with the **set** command may be displayed using the **show** command.

Examples:

```
M> set ubragg 5.0
UBRAGG set to 5.0 was 0.0        New and old values are displayed
M.> set acqpts 2048
ACQPTS set to 2048 was 4096
M> set time 2:45
TIME set to 2:45 was 1:00
M>
```

5.3 The TRACK Command

This command is used to specify a wind tunnel parameter (WTP) for monitoring expected values versus transferred values during subsequent data acquisition cycles.
The syntax of the command is:

track { on }
off

where:

wtpname is the name of an WTP to add to the list of monitored parameters. A maximum of nine parameters can be specified at any one time.
value1 is the minimum allowed value of the parameter.
value2 is the maximum allowed value of the parameter.
off removes the specified WTP from the list of monitored parameters

The **track** command can check the measured value of a WTP against the range of acceptable values determined from the specified minimum and maximum values. During each data acquisition cycle the LVDAS checks the value received from the Static Data Acquisition System (SDAS) against the value range established with the **track** command. When the value received does not fall within the expected range the user will be notified and given the option of accepting or rejecting the current data point measurement.

A list of current **tracked** values can be displayed using the **show tracked** command.

Examples:

```
M> track vel 205.0 215.0     Turns tracking on for vel. Acceptible range is 205 fps to 215fps
M> track q 73.5 74.5
M> track amumr off           Turns tracking off for amumr
M> track off                 Turns tracking off for all parameters
M>
```

5.4 The INFO Command

This command is used to place a 62-character ASCII comment into the header record for each acquired data point.
The syntax of the command is:

info string

where:

string is a 62-character ASCII string containing the comment for subsequent acquired data points.

Example:

M> **info Test 213 Rectangular Blades mu=0.38 alpha=-6.8**
M>

5.5 The TEST Command

This command is used to specify a 62-character ASCII test description to be used on summary output produced by the LVDAS.
The syntax of the command is:

test string

where:

string is a 62-character ASCII string containing the test description.

Example:

M> **test Test 388 Rotor Inflow No. 5**
M>

6.0 Controlling the Scan Positioning System

6.1 The GRID Command

This command is used to specify an acquisition grid table to be used to control the movement of the scan positioning system through a predetermined sequence of measurement locations.
The syntax of the command is:

grid [filename]

where:

filename is the name of the file containing the acquisition grid table. If no file name is specified, the LVDAS will display the name of the current acquisition grid table.

An acquisition grid table must be specified before operating in auto acquisition mode. The acquisition grid tables are usually located in subdirectory **lvdas/grid** but can be placed anywhere if the full path name is supplied. The format for an acquisition grid table is described in Section 12.

Examples:

M> grid
No specified grid table *Acquisition grid table has not been specified*
M> grid agt38 *Specify an acquisition grid table*
Grid table is grid/agt38
M> mode auto *A grid table must be specified before entering auto acquisition mode*
A> grid
Current grid table is grid/agt38
A>

6.2 The MOVE Command

This command is used to change the measurement location of the scan positioning system. The action of the LVDAS will depend upon which acquisition mode is active when the command is entered.
The syntax of the command is:

move [value]

where:

value is an optional grid table pointer which indicates a specific measurement location within that grid table. A pointer should only be specified in **auto** acquisition mode.

In **manual** acquisition mode the user will be prompted to supply the values for each of the five axes of motion. Confirmation is required before initiating the change in measurement location.

In **auto** acquisition mode the user can provide a grid table pointer to move to a specific measurement location contained within the acquisition grid table. If a pointer is not provided, the scan positioning system moves to the next sequential measurement location in the acquisition grid table.

Examples:

M> move *Move in manual mode, LVDAS prompts for values*
Enter scan X-pos > -3.88

```
Enter scan Y-pos > 2.0                          User enters values
Enter scan Z-pos > 8.25
Enter scan Pan > 0.0
Enter scan Tilt > 0.0                           User give confirmation below
Move scan to X: -3.880 Y: 2.000 Z: 8.250 P: 0.000 T: 0.000 (y/n) ?? y
M> grid agt38                                   Specify acquisition grid table for normal mode
M> mode auto                                    Changes acquisition mode from manual to auto, see
                                                Section 7.1
A> move 15                                      Move to table location 15 in auto mode
A> move                                         Move to table location 16, the next sequential location
A>
```

6.3 The REFERENCE Command

This command is used to set coordinates of the sample volume measurement location to a known physical location within the tunnel test section.
The syntax of the command is:

ref value

where:

value is the number of the reference point whose set of coordinates will define the sample volume measurement location.

Two reference point locations are available in the LVDAS and are labelled as **1** and **2**. Each reference point location consists of five axes values set by the user. These five values are identified in the following table.

Axes	Axes	Description
xref1	xref2	the x-axis position value (inches)
yref1	yref2	the y-axis position value (inches)
zref1	zref2	the z-axis position value (inches)
pref1	pref2	the pan-axis position value (degrees)
tref1	tref2	the tilt-axis position value (degrees)

Examples:

To set the reference 1 location to (2.5, -3.0, -1.0, 0.0, 0.0) use the following sequence of commands:

```
M> set xref1 2.5
XREF1 set to  2.500  was 0.000
M> set yref1 -3.0
YREF1 set to -3.000 was 0.000
M> set zref1 -1.0
ZREF1 set to -1.000 was 0.000
M> ref 1                    Directs LVDAS to load stored coordinates designated as Reference 1
M>
```

6.4 The ALIGN Command

This command is used to direct the scan positioning system to move the measurement location to a pre

assigned reference point used for alignment of the laser velocimeter system.
The syntax of the command is:

align

The alignment location consists of five axes values set by the user and stored by the LVDAS. These five values are identified in the following table.

Axes	Description
xalign	the x-axis position value (inches)
yalign	the y-axis position value (inches)
zalign	the z-axis position value (inches)
palign	the pan-axis position value (degrees)
talign	the tilt-axis position value (degrees)

Example:

To set the align location to (12.5, -38.0, -24.0, 0.0, 0.0) use the following sequence of commands:

M> set xalign 12.5
XALIGN set to 12.500 was 0.000
M> set yalign -38.0
YALIGN set to -38.000 was 0.000
M> set zalign -24.0
ZALIGN set to -24.000 was 0.000
M> set palign 0.0
PALIGN set to 0.000 was 0.000
M> set talign 0.0
TALIGN set to 0.000 was 0.000
M> align *Moves scan position to align location*
M>

6.5 The HOME Command

This command is used to direct the scan positioning system to move the measurement location to a pre-assigned reference point in the direction of the scan positioning system. The movement is along the z-axis only; the x- and y-axis values remain fixed in making the movement.
The syntax of the command is:

home

The home location consists of three axes values set by the user and stored by the LVDAS. These three values are identified in the following table.

Axes	Description
zhome	the z-axis position value (inches)
phome	the pan-axis position value (inches)
thome	the tilt-axis position value (degrees)

Example:

To set the home location to (?.?, ?.?, -72.0, 0.0, 0.0) use the following sequence of commands:

```
M> set zhome -72.0
ZHOME set to  -72.000 was 0.000
M> set phome 0.0
PHOME set to  0.000 was 0.000
M> set thome 0.0
THOME set to 0.000 was 0.000
M> home                          Moves scan position to home location
M>
```

6.6 The PARK Command

This command is used to direct the scan positioning system to move the measurement location to a pre-assigned reference point usually above the model. The movement is along the y-axis only; the x- and z-axis values remain fixed in making the movement.
The syntax of the command is:

park

The park location consists of three axes values set by the user and stored by the LVDAS. These three values are identified in the following table.

Axes	Description
ypark	the y-axis position value (inches)
ppark	the pan-axis position value (degrees)
tpark	the tilt-axis position value (degrees)

Example:

To set the park location to (?.?, 8.0, ?.?, 0.0, 0.0) use the following sequence of commands:

```
M> set ypark  8.0
YPARK set to  8.000 was 0.000
M> set ppark 0.0
PPARK set to 0.000 was 0.000
M> tpark 0.0
TPARK set to  0.000 was 0.000
M> park                          Moves scan position to park location
M>
```

6.7 The SCANMODE Command

This command is used to change the operational mode of the scan positioning system controller.
The syntax of the command is:

scanmode { local }
remote

where:

local allows the scan positioning system to be operated from within the tunnel test section.
remote returns the control of the scan positioning system to the LVDAS.

Examples:

M> **scanmode local**
M> **scanmode remote** *Status updates in Program Switches Window*
M>

7.0 Acquiring Data

7.1 The MODE Command

This command is used to specify one of four acquisition modes in which the LVDAS can operate. The syntax of the command is:

mode { manual }
auto
check

The input prompt will change to reflect which mode is active. **Auto** acquisition mode requires an acquisition grid table be specified before entering this mode for the first time. The following table identifies the LVDAS prompts and the modes they indicate.

Prompt	Acquisition Mode
A>	auto
M>	manual
C>	check
B>	LVABI buffer interface
S>	UNIDEX scan interface
F>	Frequency Domain Processor interface
K>	Klinger scan interface

Examples:

A> **mode manual** *Changes acquisition mode from auto to manual*
M> **check** *Abbreviated form of mode check command*
C> **auto**
A>

7.2 The ACQUIRE Command

This command is used to direct the LVDAS to initiate the acquisition of data at the current measurement location. The specific actions of the system will depend upon which acquisition mode is active when the command is entered.
The syntax of the command is:

acquire

An acquisition cycle consists of the following actions:

- Quicklook statistics tables are cleared.
- LVABI initialized for current data point.
  a. Memory addresses set
  b. Memory contents set to *zero* conditions
- Initiate request for Static Data Acquisition System (SDAS) to begin acquiring wind tunnel parameters (WTP)

- Initiate request to LVABI to start data acquisition and wait for acquisition to complete.
- Place Frequency Domain Processors in RUN mode.
- If tracking is on, transfer all selected WTPs from the tunnel SDAS. Check the values of the wind tunnel parameters contained in the tracking list.
- Read and process each data channel
- Calculate quicklook statistics for each selected channel
- If tracking is off, transfer all selected WTPs from the tunnel SDAS
- Update magnetic tape header record with:
  a. measurement location using user defined axis system values
  b. laser velocimeter parameters (i.e. bragg, angles)
  c. perform special calculations, if needed
- Write raw data channels to magnetic tape
- Update displays
  a. quicklook statistics
  b. WTP window values
- Output statistics summary to printer or specified file
- Plot data, if selected.

In **manual** acquisition mode the movement of the scan positioning system is controlled by the user who enters each measurement location at the user's console. When the scan positioning system is at the desired measurement location, the user then enters the acquire command to start an acquisition cycle. At the completion of the acquisition cycle, control returns to the user's console and the procedure is repeated for another measurement location.

In **auto** acquisition mode an acquisition grid table is specifed and provides the measurement locations that control the movement of the scan positioning system. Using the move command, the user can select any of the locations in the table at random or follow the sequence of locations given by the table. When the scan positioning system is at the desired measurement location, the user can enter the acquire command to start an acquisition cycle. Control returns to the user's console at the completion of the acquisition cycle and the procedure is repeated for additional measurement locations.

In **check** mode the system will bypass the transfer of static data, disable printing a summary to the selected summary device (usually the line printer), and disable writing the data to magnetic tape. This mode is useful for verifying input signal to the counters and that other system parameters have been correctly set. When leaving check mode, the system is returned to the program state that existed prior to entering check mode.

8.0 Controlling Peripheral Devices

8.1 The PLOT Command

This command is used to direct the LVDAS to output the current graphics frames to a hardcopy plotter. The syntax of the command is:

plot { on }
off
current

where:

on enables graphics output to the plotter.
off disables graphics output to the plotter.
current directs the LVDAS to output the data currently displayed in the graphics frames to the plotter.

Examples:

M> **plot on**
M> **plot off**
M> **plot current**
M>

8.2 The PRINT Command

This command is used to print hardcopy listings of either the acquisition grid table or a statistical summary. The syntax of the command is:

print { summary }
grid

where:

summary will print the contents of the current summary file on the line printer.
grid will print the contents of the current acquisition grid table on the line printer.

Examples:

M> **print summary**	*Prints current summary file on line printer*
M> **grid agt38**	*Specify an acquisition grid table to be printed*
M> **print grid**	*Print contents of acquisition grid table on line printer*
M>	

8.3 The RECORD Command

This command is used to direct the LVDAS to write data to magnetic tape containing the current acquired data point in system memory.
The syntax of the command is:

record

The data point is the last measurement made. This command can be used to write a modified serial to tape or to

correct some error while acquiring the last data point.

Example:

```
M> record
M>
```

8.4 The REWIND Command

This command is used to rewind a LVDAS file.
The syntax of the command is:

```
rewind { summary }
       grid
```

where:

summary rewinds the statistical summary file.
grid rewinds the acquisition grid table file.

Examples:

```
M> rewind summary        Rewind current summary file
M> mode auto
A> rewind grid           Rewind current acquisition grid table
A> move 1                Same result as previous command
A>
```

8.5 The SUMMARY Command

This command is used to designate where the statistical summary for each data point location will be written.
The syntax of the command is:

```
summary [{ filename }]
        printer
```

where:

filename is the name of the file where the statistical summaries will be redirected. If no file name is specified, the LVDAS will display the name of the current summary file.
printer directs the statistical summary to be written to the line printer.

Examples:

```
M> summary                  Default destination is printer
Current destination is printer
M> summary myoutput         Redirect output to a file
Summary output directed to sum/myoutput
M> summary
Current destination is sum/myoutput
M>
```

8.6 The TAPE Command

This command is used to control the magnetic tape drive during the data acquisition process without returning to the operating system.
The syntax of the command is:

```
tape {  on              }
        off
        rewind
        new
        old
        serial  value
        label   string
```

where:

on enables output to magnetic tape.
off disables output to magnetic tape.
rewind repositions the magnetic tape to BOT.
new indicates the magnetic tape does not contain LV data.
old indicates the magnetic tape contains LV data and you wish to append LV data after that data.
value is a tape serial number.
serial indicates the magnetic tape contains LV data and you wish to append LV data after the specified serial number.
label causes the specified string to be used as a tape label.

Examples:

```
M> tape on
M> tape label LVI006        Tape is identified as LVI006 on summaries, etc
M> tape old                 Tape is positioned at EOT
M> tape serial 135          Tape is positioned to write LV data after serial number 135
                            Tape positioning status is displayed in the Program Information Window
M>
```

8.7 The SDAS Command

This command is used to access the 14-x 22-Foot tunnel Static Data Acquisition (SDAS) from within the LVDAS.
The syntax of the command is:

```
sdas { on       }
       off
       transfer
       acquire
       break
       status
       ready
```

where:

on enables transfer of wind tunnel parameters (WTP) from the SDAS.
off disables transfer of WTPs from the SDAS.

transfer directs the server to request current set of wind tunnel parameter values from the SDAS.
acquire directs the server to request a new set of wind tunnel parameters be acquired by the SDAS.
break terminates communication link between the LVDAS (and server) with the SDAS.
status requests server status words be displayed at the user's console.
ready requests check if SDAS is communicating.

These commands do not need to be entered during a typical data acquisition cycle because the LVDAS performs the necessary communications between the SDAS and LVDAS automatically.

Examples:

M> sdas on
M> sdas transfer
Transferring data from ModComp ... DONE
M> sdas acquire
Acquiring data from ModComp ... DONE
M> sdas status
SN: 123 RN: 208 PN: 15 STATUS: 0
M> sdas break *Terminates communication with SDAS*
M>

9.0 The LVABI Interface

The Laser Velocimeter Autocovariance Buffer Interface (LVABI) can be accessed through the use of the bif command.
The syntax of the command is:

bif [command]

where:

command is an optional buffer interface command. If no command is entered, the LVDAS places you in the LVABI subsystem.

The input prompt will change to B>.

9.1 No Operation

This command is used to direct the LVABI to perform no operation.
The syntax of the command is:

no

9.2 Reset

This command is used to set the LVABI to the power-on condition.
The syntax of the command is:

rs

All control lines are set to their inactive states, control flip-flops are initialized, the data acquisition elapse time controller is initialized, the front panel display is cleared, active channels are displayed on LCD, the front panel definition software is cleared, and zeroes are written into the memory of all active data acquisition channels.

9.3 Channel Active

This command is used to request the LVABI to return the status of the specified channel.
The syntax of the command is:

ca value

where:

value is the address of the channel. The LVABI returns a data word indicating either active or inactive.

Examples:

B> ca 0 *Request status of data channel 0*
Channel: 0 is ACTIVE
B> ca 15
Channel: 15 is INACTIVE
B>

9.4 Channel Definition

This command is used to set up the LVABI to recognize the printed circuit card addressed as a unique type of card.
The syntax of the command is:

cd value { lv } { up dt dn ax a1-a7 sp dt fa ff fu fd } string

where:

value is the address of the channel being defined.
lv laser velocimeter component channel.
dt delta time channel
ax auxilliary channel
sp spare channel
up up-shifted bragg cell conversions for lv channels using counters
dn down-shifted bragg cell conversions for lv channels using counters
fu up-shifted bragg cell conversions for lv channels using fdp's, bragg - freq
fd down-shifted bragg cell conversions for lv channels using fdp's, freq - bragg
ff frequency-generating conversion for lv channels using fdp
fa auxilliary channel conversions for frequency domain processors that includes phase shifting.
string is a description of the data channel to display on quicklook summaries.
cf frequency-generating conversion for lv channels using counters.
a1-a3 auxilliary channel conversions for frequency domain processors and/or counters which will handle the use of the azimuth daughter cards. No phase shifting will occur.
a4-a7 are routines that perform no conversion on the data.

Examples:

B> **cd 0 lv dn U-COMP**	*Typical velocity component definition*
B> **cd 3 dt dt V-TIME**	*Inter-arrival times channel*
B> **cd 6 ax a1 U-AZIM**	*U component azimuth auxilliary channel*
B>	

9.5 Front Panel Definition

This command is used to link a front panel display location with a specific channel address.
The syntax of the command is:

fp value1 value2

where:

value1 is the display position on the front panel of the LVABI.
value2 is the address of the channel to be displayed.

Examples:

```
B> fp 1 0          Display channel 0 in upper left display position
B> fp 2 2          Display channel 2 in upper middle display position
B>
```

9.6 Set First Memory Address

This command is used to specify the memory location where the first data point will be stored for the selected data channel.
The syntax of the command is:

```
fa { value1 } value2
   all
```

where:

value1 is the channel number to set the first address.
all specifies to set the first address for all active channels.
value2 is the value of the first address.

Examples:

```
B> fa 0 0          Sets first address of channel 0 to 0
B> fa 2 1024
B> fa all 100      Sets first address of all active channels to 100
B>
```

9.7 Set Last Memory Address

This command is used to specify the memory location where the last data point will be stored for the selected data channel.
The syntax of the command is:

```
la { value1 } value2
   all
```

where:

value1 is the channel number to set the last address.
all specifies to set the last address for all active channels.
value2 is the value of the last address.

Examples:

```
B> la 0 4095
B> la 2 1024       Sets last address for channel 2 to 1024
B> la all 8192     Sets last address for all active channels to 8192
B>
```

9.8 Set Data Acquisition Elapse Time

This command is used to set the maximum length of time that the LVABI will acquire data.

ti value

where:

value is the time in minutes and seconds. A maximum time of 9:59 can be entered.

Examples:

B> ti 1:30	*Set a maximum acquisition time of 1 minute 30 seconds*
B> ti 3:00	
B> ti 9:59	*Set maximum acquisition time to the maximum value*
B>	

9.9 Coincidence

This command is used to enable/inhibit the selected channel to operate in the coincidence mode. The syntax of the command is:

cn value { ena }
inh

where:

value is the selected channel number.
ena indicates the channel is to operate in coincidence mode.
inh indicates the channel is not to operate in coincidence mode.

Examples:

B> cn 2 ena	*Enable channel 2 for coincidence*
B> cn 0 inh	*Disable channel 0 for coincidence*
B>	

9.10 Set Coincidence Aperture

This command is used to set the coincidence aperture of the selected channel. The syntax of the command is:

ap { value1 } value2
all

where:

value1 is the channel number to set the aperture.
all specifies to set the aperture for all active channels.
value2 is the aperture time in 100 nanoseconds.

Examples:

B> ap 0 5	*Sets coincidence aperture time of 500 nanoseconds for channel 0*
B> ap all 3	*Sets coincidence aperture time of 300 nanoseconds for all active data channels*

```
B>ap 2 4          Sets coincidence aperture time of 400 nanoseconds for channel 2
B>
```

9.11 Write Single Value Data to Memory

This command is used to write a specific data value to all memory locations between the set first address and the last address of a selected channel.
The syntax of the command is:

ws { value1 } value2
all

where:

value1 is the LVABI channel number to write the data value.
all specifies to write the data value to all active channels.
value2 is the data value.

Examples:

```
B> ws 0 255       Write a value of 255 into all memory locations of channel 0
B> ws all 0       Write a value of 0 into all memory locations of all active data channels
B>
```

9.12 Write Data to Memory DMA

This command is used to write a block of data from the LVDAS to the specified channel's memory via direct-memory-access(DMA).
The syntax of the command is:

wd value

where:

value is the specified channel to write data to memory.

Example:

```
B> wd 2           Write data block to channel 2
B>
```

9.13 Read Data from Memory DMA

This command is used to read a block of data from the selected channel's memory and routes the data to the LVDAS via direct-memory-access (DMA).
The syntax of the command is:

rd value

where:

value is the specified channel to read data from memory.

Examples:

```
B> fa 0 0          Set first address of channel 0 before reading it
B> rd 0
B> fa all 0        Set first address of all active data channels
B> rd 6
B>
```

Displayed in the Program Information Window will be 64 16-bit data words from the LVABI Memory. At the **Enter address >>** prompt, the user can supply the starting address of the next 64 word block. To stop view ing memory, enter **done** in response to the prompt.

9.14 Read Memory Address

This command is used to read the current memory address of the selected LV or DT channel. The syntax of the command is:

ra value

where:

value is specified channel to read address.

Examples:

```
B> ra 0            Read current address value of channel 0
Address: 3817      System displays current address
B> ra 7
Address: 4095
B>
```

9.15 Read Status

This command is used to read the status of the LVABI. The syntax of the command is:

st

Examples:

```
B> st
Status: 00000
B>
```

9.16 Auxiliary Channel Clock Control

This command is used to select the clock input to the auxiliary channel that will initiate data acquistion. The syntax of the command is:

```
ac value { g1 }
         g2
         r1-
```

r6
ex
in

where:

value is the auxilliary channel number.
g1 -g2 coincidence groups
r1 - r6 lv channel data ready
ex external clock selected.
in internal clock selected.

Examples:

```
B> ac 6 r1          Set channel 6 to trigger from lv channel with data ready 1 set
B> ac 7 r2          Set channel 7 trigger from lv channel with data ready 2 set
B>
```

9.17 Start Data Acquisition

This command is used to start data acquisition with the LVABI.
The syntax of the command is:

sr [{ con }]
unc

where:

con indicates start data acquisition upon receipt of an external enable signal.
unc indicates start data acquisition immediately.

Examples:

```
B> sr unc           Starts acquisition unconditionally
B> sr               This also starts acquisition unconditionally
B> sr con
B>
```

10.0 The Frequency Domain Processor Interface

The Frequency Domain Processor Interface can be accessed through the use of the fdp command. The syntax of the command is:

fdp [command]

where:

command is an optional frequency domain processor interface command. If no command is entered, the LVDAS places you in the FDP subsystem.

The input prompt will change to F>.

10.1 Reset

This command performs the same function as the front panel reset push button. All parameters are set to default and control is passed to local.
The syntax of the command is:

reset unit

where:

unit is the unit number being addressed.

Example:

F> **reset 0** *Resets unit 0 to powerup state*
F>

10.2 Output Firmware Revision

This command is used to access the current firmware revision number of the FDP3100 software. This command is currently not implemented in Version 3.3.
The syntax of the command is:

rev unit

where:

unit is the unit number being addressed.

10.3 Down Load Firmware

This command is used to upgrade the current firmware of the FDP3100. This command is currently not implemented in Version 3.3.
The syntax of the command is:

dlfirm unit

where:

unit is the unit number being addressed.

10.4 Down Load Parameters

This command allows remote entry of all selectable functions of the Frequency Domain Processor. The FDP3100 is placed in **REMOTE** mode.
The syntax of the command is:

dnload unit

where:

unit is the unit number being addressed.

Example:

F> **dnload 0** *Transfers setup parameters to unit 0*
F>

10.5 Change to Run Mode

This command is used to place the FDP in the **RUN** mode awaiting a trigger to capture a time signal.
The syntax of the command is:

run unit

where:

unit is the unit number being addressed.

Example:

F> **run 1** *Places unit 1 in* **RUN** *mode, waiting for trigger*
F>

10.6 Change to Command Mode

This command is used to place the FDP in the **COMMAND** mode preventing further triggering.
The syntax of the command is:

cmd unit

where:

F> **cmd 2** *Places unit 2 in* **COMMAND** *mode, preventing triggers*
F>

10.7 Up Load Parameters

This command allows access of all selectable functions of the Frequency Domain Processor by returning the values of the internal variables. The FDP is placed in **REMOTE** mode.
The syntax of the command is:

upload unit

where:

unit is the unit number being addressed.

Example:

F> **upload 0** *Transfers parameters from unit 0 to the host computer*
F>

10.8 Change to Local Mode

This command is used to place the FDP in the **LOCAL** mode enabling front panel controls. The syntax of the command is:

local unit

where:

unit is the unit number being addressed.

Example:

F> **local 0** *Places unit 0 in* **LOCAL** *mode*
F>

10.9 Output Model Number

This command is used to access the current model number of the FDP3100. This command is currently not implemented in Version 3.3.
The syntax of the command is:

model unit

where:

unit is the unit number being addressed.

10.10 Runtime Parameters

This command is used to update gain, trigger level and validation percentage during runtime. The use of this command provides quick updates of these three parameters at runtime.
The syntax of the command is:

quick unit

where:

unit is the unit number being addressed.

Example:

F> **quick 0** *Transfers runtime parameters to unit 0*
F>

10.11 Processes Start and Stop

These commands are used to set ranges on the incoming data.
The syntax of the command is:

start unit { ped }
min
value

stop unit value

where:

unit is the unit number being addressed.
ped is the short menu level.
min is the long menu level.
value is

Example:

F> start 0 *Requests full menu be displayed on unit 0*
Menu Level (Unit 0) is FULL
F>

10.12 Bandwidth

This command is used to select the bandwidth in MHz to accomodate the particular flow condition.
The syntax of the command is:

bw unit { 0.2 }
1.0
5.0
20.0

where:

unit is the unit number being addressed.

Example:

F> **bw 1 0.2** *Selects bandwidth of 0.2 MHz for unit 1*
BandWidth (Unit 1) is 0.2
F> **bw 0 20** *Selects bandwidth of 20 MHz for unit 0*
BandWidth (Unit 0) is 20.0
F>

10.13 Trigger Source

This command is used to select the triggering source.

The syntax of the command is:

tgrsrc unit { digital }
external
analog

where:

unit is the unit number being addressed.

Example:

F> tgrsrc 2 digital *Selects digital trigger source for unit 2*
Trigger Source (Unit 2) is DIGITAL
F> tgrsrc 1 analog *Selects analog trigger source for unit 1*
Trigger Source (Unit 1) is ANALOG
F>

10.14 Trigger Level

This command is used to set the value at which time domain data points of a burst must exceed or be equal to for time domain qualification.
The syntax of the command is:

tgrlvl unit value

where:

unit is the unit number being addressed.
value is the level value. Valid level values range between -100 and 100.

Examples:

F> tgrlvl 0 10 *Selects trigger level for unit 0*
Trigger Level (Unit 0) is 10
F> tgrlvl 1 1
Trigger Level (Unit 1) is 1 *Selects trigger level for unit 1.*
F>

10.15 Trigger Count

This command is used to set the count that the digital integrator must attain in order to capture the burst.
The syntax of the command is:

tgrcnt unit value

where:

unit is the unit number being addressed.
value is the count value. Valid count values range between 1 and 127.

Examples:

```
F> tgrcnt 2 1                    Selects trigger count for unit 2
Trigger Count (Unit 2) is 1
F> tgrcnt 0 20                   Selects trigger count for unit 0
Trigger Count (Unit 0) is 20
F>
```

10.16 Trigger Delay Offset

This command is used to adjust the trigger point over the record length window.
The syntax of the command is:

tgrdoff unit value

where:

unit is the unit number being addressed.
value is the percentage adjustment/movement of the trigger point. A positive value shifts the trigger point to the left and a negative value shifts to the right. Valid percentage values range between -50 and 999, but the specified record length will reduce this overall range.

Examples:

```
F> tgrdoff 0 0                   Selects no adjustment for unit 0
Trigger Delay (Unit 0) is 0
F> tgrdoff 1 25                  Selects movement of trigger point to left for unit 1
Trigger Delay (Unit 1) is 25
F>
```

10.17 Display Select

This command is used to select the display type. The selection of **off** maximizes the number of samples that are processed.
The syntax of the command is:

```
distyp unit { rate }
            lin
            log
            off
```

where:

unit is the unit number being addressed.

Example:

```
F> distyp 2 log                  Selects logarithmic display on RUN page (local mode) of unit 2
Display Type (Unit 2) is LOGARITHMIC
F>
```

10.18 Record Length

This command is used to specify the number of data points in a record interval with selections in powers of two.

The syntax of the command is:

rcl unit value

where:

unit is the unit number being addressed.
value is the selected record length in powers of two. Valid record length values range from 32 to 4096.

Examples:

F> rcl 0 512 *Selects record length of 512 data points for unit 0*
Record Length (Unit 0) is 512
F> rcl 1 1024 *Selects record length of 1024 data points for unit 1*
Record Length (Unit 1) is 1024
F>

10.19 Transform Length

This command is used to specify the FFT length with selections in powers of two. It must be greater than, or equal to the record length.
The syntax of the command is:

fftlen unit value

where:

unit is the unit number being addressed.
value is the select transform length in powers of two. Valid FFT length values range from 32 to 4096.

Examples:

F> fftlen 2 512 *Selects transform length of 512 data points for unit 2*
FFT Length (Unit 0) is 512
F> fftlen 0 1024 *Selects transform length of 1024 data points for unit 0*
FFT Length (Unit 1) is 1024
F>

10.20 Validation Technique

This command is used to select the frequency domain validation technique.
The syntax of the command is:

valtyp unit { peak }
energy

where:

unit is the unit number being addressed.

Example:

F> valtyp 2 peak *Selects peak validation technique for unit 2*

SNR Validation (Unit 2) is PEAK
F>

10.21 Process Range

This command is used to select the range of the spectra that is being processed relative to the full bandwidth. The syntax of the command is:

midbin unit value

where:

unit is the unit number being addressed.
value is the percentage of range to process. Valid values range between 0 to 100.

Example:

F> **midbin 0 10** *Selects process range for unit 0*
MidBin (Unit 0) is 10
F>

10.22 Analog Output

This command is used to select the type of analog output.
The syntax of the command is:

anaout unit { off }
on

where:

unit is the unit number being addressed.
off selects the output to be a voltage based on the last frequency measured.
on selects the output to be reconstructed time domain and spectrum data for monitoring on an oscilloscope.

Example:

F> **anaout 1 off** *Selects analog output OFF for unit 1*
Analog Output (Unit 1) is OFF
F>

10.23 Digital Output

This command is used to select the type of digital output.
The syntax of the command is:

digout unit { off }
on

where:

unit is the unit number being addressed.

off selects the output to be turned off
on selects the output to be turned on.

Example:

```
F> digout 1 on              Selects digital output ON for unit 1
Digital Output (Unit 1) is ON
F>
```

10.24 Process Mode

This command is used to select the processing and data transfer modes.
The syntax of the command is:

```
prcmde unit { standby  }
            time
            frequency
            doppler
```

where:

unit is the unit number being addressed.
standby transfers no data back to the host computer. This is the default setting used for local control.
time transfers time data to the host computer.
doppler transfers frequency data to the host computer.
frequency transfers frequency, time and doppler estimate data to the host computer.

Examples:

```
F> prcmde 0 standby         Selects standby process mode for unit 0
Process Mode (Unit 0) is STANDBY
F> prcmde 2 doppler         Selects doppler process mode for unit 2
Process Mode (Unit 2) is DOPPLER
F>
```

10.25 Full Scale Input (Gain)

This command is used to select the full peak range of the input in mV.
The syntax of the command is:

```
gainval unit value
```

where:

unit is the unit number being addressed.
value is the gain value in mV. Valid gain values range between 50 and 1062 mV.

Examples:

```
F> gainval 0 300            Selects 300 mV gain value for unit 0
Input Range (Unit 0) is 303.6
F> gainval 1 1000           Selects 1V gain value for unit 1
Input Range (Unit 1) is 1062.5
```

F>

The full scale input voltage range is expressed as:

$$InputRange_{mv} = 12750/GainValue$$

where:

GainValue is a coded value in the range 12 (1062 mV) to 255 (50 mV).

10.26 Validation Level

This command is used to select the validation level peak ratio. This percentage sets the rejection level and acceptance level of the transformed signal information.
The syntax of the command is:

snrval unit value

where:

unit is the unit number being addressed.
value is the peak ratio value. Valid ratio values range between 0 and 100.

Example:

F> **srnval 1 90** *Selects validation peak ratio for unit 1*
SNR Validation Level (Unit 1) is 90
F>

10.27 Debug Mode

This command is used to select debug mode.
The syntax of the command is:

debug unit (off)
on

where:

unit is the unit number being addressed.

Example:

F> **debug 0 off** *Selects debug mode off for unit 0*
Debug Mode (Unit 0) is OFF
F>

11.0 The Scan Positioning System Interface

The Aerotech Unidex IX Scan Positioning Controller Interface can be accessed through the use of the sif command.
The syntax of the command is:

sif

The input prompt will change to S>.

11.1 Absolute Mode

This command is used to place the scan positioning controller in absolute mode. In this mode a distance command tells the scan positioning controller an absolute position to move.
The syntax of the command is:

absolute

Examples:

S> **chassis 1**	*Selects chassis 1*
S> **absolute**	*Places scan positioning controller in absolute mode*
S> **umoveaxis 5000**	*Moves u-axis to 5000 units*
S> **umoveaxis 5000**	*No additional motion, u-axis is at 5000 units*
S>	

11.2 Attention

This command is used to direct the scan positioning controller to listen for commands and activates communications via RS-232 mode.
The syntax of the command is:

attention

Example:

S> **attention**	*Get the attention of the scan positioning controller and activate RS-232 communications mode*
S>	

11.3 Beeper

This command is used to turn on/off an audio beeper on the current chasis.
The syntax of the command is:

beeper { on }
off

where:

on turns the beeper on.
off turns the beeper off.

Examples:

S>**chassis 0**	*Select chassis 0*
S> **beeper on**	*Turns beeper on for chassis 0*
S> **beeper off**	*Turns beeper off for chassis 0*
S>	

11.4 Select Chassis

This command is used to specify which scan positioning controller chassis is active for receiving commands.
The syntax of the command is:

chassis value

where:

value is the chassis number.

Examples:

S> **chassis 0**	*Open communications for chassis 0*
Chassis 0 communications opened	
S> **chassis 1**	*Open communications for chassis 1 and disables communications for chassis 0*
Chassis 1 communications opened	
S>	

11.5 Setting Axis Feed Rate

These commands are used to specify the feed rate for an axis of the current active chassis.
The syntax of the commands are:

{ xfeedrate } value
yfeedrate
ufeedrate
vfeedrate

where:

xfeedrate changes the feedrate of the x-axis.
yfeedrate changes the feedrate of the y-axis.
ufeedrate changes the feedrate of the u-axis.
vfeedrate changes the feedrate of the v-axis.
value specifies the speed at which the axis is to travel in units per second.

Examples:

S> **chassis 1**	*Select chassis 1*
S> **xfeedrate 500**	*Change feed rate to 500 units/second for x-axis*
S> **ufeedrate 100**	*Change feed rate to 100 units/second for u-axis*
S>	

11.6 Reset Scan Controller

These commands are used to set the scan positioning controller to the power-up condition. The syntax of the command is:

{ hardreset }
reset

where:

reset returns the scan controller to the power on state from remote mode.
hardreset returns the scan controller to the power on state when communications are out of sync.

Examples:

S> **reset**
S> **hardreset**
S>

11.7 Home Axis

These commands are used to direct an axis to move to its physical home limit. The syntax of the command is:

{ xhomeaxis }
yhomeaxis
uhomeaxis
vhomeaxis
homeall

where:

xhomeaxis moves the x-axis of the current chassis to the home position.
yhomeaxis moves the y-axis of the current chassis to the home position.
uhomeaxis moves the u-axis of the current chassis to the home position.
vhomeaxis moves the v-axis of the current chassis to the home position.
homeall moves all axes of the current chassis to their home position.

Examples:

S> **chassis 1** *Select chassis 1*
S> **xhomeaxis** *Direct x-axis to home position*
S> **yhomeaxis** *Direct y-axis home position*
S> **chassis 0**
S> **homeall** *Direct all axes of chassis 0 to their home position*
S>

11.8 Incremental Mode

This command is used to place the scan positioning controller in incremental mode. In incremental mode a distance command tells the scan positioning controller how much further to move the axis.

The syntax of the command is:

incremental

Examples:

```
S> chassis 0              Select chassis 0 for motion commands
S> incremental
S> xmoveaxis 100          Moves the x-axis 100 units from current position
S> xmoveaxis 100          Moves the x-axis 100 additional units from current position
S>
```

11.9 Joystick Mode

This command is used to turn on/off the joystick. The display changes to the joystick mode tracking display.
The syntax of the command is:

joystick { on }
off

where:

on enables use of the joystick.
off disables use of the joystick and returns control to LVDAS.

The initially active axes will be X and Y.

Examples:

```
S> joystick on
S> joystick off
S>
```

11.10 Load Axis Position Registers

These commands are used to load the scan position controller register for the indicated axis with a specified value which establishes an absolute reference position.
The syntax of the command is:

{ xloadreg } value
yloadreg
uloadreg
vloadreg

where:

xloadreg loads the position register of the x-axis with the specified value.
yloadreg loads the position register of the y-axis with the specified value.
uloadreg loads the position register of the u-axis with the specified value.
vloadreg loads the position register of the v-axis with the specified value.
value is the number to be loaded into the specified axis register.

Examples:

S> **chassis 1**	*Select chassis 1*
S> **xloadreg 102390**	*Load x-axis position register with 102390 units*
S> **chassis 0**	*Select chassis 0*
S> **uloadreg -230**	*Load u-axis position register with -230 units*
S>	

11.11 Local Mode

This command is used to place the scan positioning controller into the local with communications enabled mode. This is the state that was enabled upon power-up.
The syntax of the command is:

local

Example:

S> **local**	*Place scan positioning controller in local mode*
S> **attention**	*Return scan positioning controller to LVDAS control*
S>	

11.12 Move Axis Position

These commands are used to direct the scan positioning controller to move a specified axis.
The syntax of the command is:

{ xmoveaxis } value
ymoveaxis
umoveaxis
vmoveaxis

where:

xmoveaxis moves the x-axis of the current chassis to its move position.
ymoveaxis moves the y-axis of the current chassis to its move position.
umoveaxis moves the u-axis of the current chassis to its move position.
vmoveaxis moves the v-axis of the current chassis to its move position.
value is the number of units to move.

Examples:

S> **chassis 0**	*Select chassis 0*
S> **ymoveaxis 2000**	*Move y-axis of chassis to an absolute position of 2000 units*
S> **incremental**	
S> **ymoveaxis 1000**	*Move y-axis to an absolute position of 3000 units. 2000+1000=3000*
S> **xmoveaxis 100**	*Move x-axis 100 units from its current position*
S> **absolute**	
S> **xmoveaxis 100**	*Move x-axis to an absolute position of 100 units*
S>	

11.13 Print Axis Position

These commands are used to display the current values of the specified axis position register for the current active chassis.
The syntax of the command is:

{ xprint }
yprint
uprint
vprint

where:

xprint displays the contents of the x-axis position register.
yprint displays the contents of the y-axis position register.
uprint displays the contents of the u-axis position register.
vprint displays the contents of the v-axis position register.

Examples:

```
S> chassis 0                    Select chassis 0
S> xprint                       Print x-axis position register contents
X-POSITION is 23866
S> uprint                       Print u-axis position register contents
U-POSITION is -13366
S>
```

11.14 Ramp Time

This command is used to specify the accel/decel ramp time in milliseconds for the current active chassis.
The syntax of the command is:

ramp value

where:

value is the ramp time in milliseconds.

Examples:

```
S> chassis 0                    Selects chassis 0
S> ramp 300                     Set ramp time of 300 milliseconds
S>
```

11.15 Service Request

This command is used to enable/disable service request mode for the scan positioning controller.
The syntax of the command is:

srq { on }
off

where:

on establishes services request mode.
off cancels service request mode.

Examples:

```
S> srq on
SERVICE REQUEST is ON
S>
```

11.16 Scan Positioning System Status

This command is used to display the status words for the scan positioning controller. The syntax of the command is:

status

Example:

```
S> status
--- UNIDEX IX Status ---
Chassis:    -0-        -1-
Byte  1: 00000061 000000041
Byte  3: 00000000 000000000
Byte  5: 00000103 000000103
Byte  6: 00000000 000000000
Byte  7: 00000007 000000003

ABSOLUTE MODE
SRQ MODE:  ON
JOYSTICK:  OFF
S>
```

12.0 The 3rd Component Scan Positioning System Interface

The Klinger Scan Positioning Interface can be accessed through the use of the **kif** command. The syntax of the command is:

kif

The input prompt will change to K>.

12.1 Help

This command is used to provide the operator with additional help with issuing commands to the Klinger motor controller.
The syntax of the command is:

helpkif

Example:

K> **helpkif**
K>

12.2 Absolute Mode

This command is used to place the Klinger scan positioning controller in absolute mode. In this mode a distance command tells the scan positioning controller an absolute position to move. Absolute mode is the default mode.
The syntax of the command is:

absolute

Examples:

K> **abs**	*Places Klinger scan positioning controller in absolute mode*
K> **ymove +1.5**	*Moves the y-axis a positive 1.5 inches*
K> **ymove +1.5**	*No additional motion, y-axis is at 1.5 inches*
K>	

12.3 Incremental Mode

This command is used to place the Klinger scan positioning controller in incremental mode. In this mode a distance command tells the scan positioning controller how much further to move the axis.
The syntax of the command is:

incremental

Examples:

K> **incremental**	*Places Klinger scan positioning controller in incremental mode*
K> **ymove +1.5**	*Moves the y-axis a positive 1.5 inches*
K> **ymove +1.5**	*Moves the y-axis 1.5 additional inches in the positive direction from the current position*
K>	

12.4 Move Axis Position

These commands are used to direct the Klinger scan positioning controller to move a specified axis. The syntax of the commands are:

{ wmove } value
xmove
ymove
zmove

where:

wmove moves the w-axis to its move position.
xmove moves the x-axis to its move position.
ymove moves the y-axis to its move position.
zmove moves the z-axis to its move position.
value is the distance in inches or degrees the axis is to move. (The w-axis moves in degrees)

Examples:

K> ymove +1.5 *Moves the y-axis a positive 1.5 inches*
K> xmove -10.0 *Moves the x-axis a negative 10.0 inches*
K>

12.5 Ramp Time

These commands are used to specify the accel/decl ramp time in seconds for the axis specified. The syntax of the commands are:

{ wramp } value
xramp
yramp
zramp

where:

wramp sets the ramp time for the w-axis.
xramp sets the ramp time for the x-axis.
yramp sets the ramp time for the y-axis.
zramp sets the ramp time for the z-axis.
value is the ramp time in seconds for the individual axis to accelerate from 50Hz to 4000Hz. The time range is .1 second to 2.0 seconds. (Default acceleration rate is .4)

Example:

K> wramp .6 *The ramp rate for the w-axis is set to.6 seconds*
K>

12.6 Setting Axis Feed Rate

These commands are used to specify the feed rate for individual axes. The syntax of the commands are:

{ wrate } value
yrate
zrate
xrate

where:

wrate specifies the stepping rate for the w-axis.
yrate specifies the stepping rate for the y-axis.
zrate specifies the stepping rate for the z-axis.
xrate specifies the stepping rate for the x-axis.
value is the number of full steps/second that are to be specified for a given axis. Stepping rates range from 32 to 4000.

Example:

K> **wrate 2000** *Sets the fulls steps/second rate to 2000 for the w-axis*
K>

12.7 Home Axis

These commands are used to direct an axis to move to its physical home limit.
The syntax of the commands are:

whome
yhome
zhome
xhome

where

whome moves the w-axis to its home position.
yhome moves the y-axis to its home position.
zhome moves the z-axis to its home position.
xhome moves the x-axis to its home position.

Examples:

K> **whome** *Direct w-axis to home position*
K> **yhome** *Direct y-axis to home position*
K>

12.8 Reference Points

These commands are used to set reference points for individual or all axes. When reference points are set the displays are zeroed, the current position is set as the floating point origin point, and, this preset position will be used as a reference point for the move command when the mode is set to absolute.
The syntax of these commands are:

wref
yref
zref

xref
ref_all

where:

wref sets the reference point for the w-axis.
yref sets the reference point for the y-axis.
zref sets the reference point for the z-axis.
xref sets the reference point for the x-axis.
ref_all sets the reference points for all the active axes.

Examples:

K> **xref** *Establishes a new reference point for the x-axis*
K>

12.9 Attention

This command is used to set/reset the modem control lines and the status information format. The syntax of the command is:

att

where

att sets/resets the modem control lines and the return status format.

Example:

K> **att**
K>

12.10 Printing Axes Information

These commands are used to provide information concerning the current positioning and modes of axes. The syntax of these commands are:

stats
read_all

where:

stats displays the current positions of the 4 axes, their current modes, and their encoder counts in a tabular format in the Program Information Window.
read_all displays the current positions of the 4 axes in either inches or degrees depending on the axis configuration into the User Command Input Window.

Examples

K> **stats**
K> **read_all**
K>

12.11 Exiting the Kif Interface

This command is used to exit the Klinger interface.
The syntax of the command is:

exitkif

where:

exitkif terminates the klinger interface and returns the user to the previous interface.

Example:

K> **exitkif**
K>

13 .0 Raw Data Tape Format

The LVDAS raw data tape is a sequential access tape file. The file is composed of two different record types: the data point header record and the LVABI data channel record. The record lengths are given in the table below.

Record Type	Length (bytes)
Data Point Header	1024
Data Channel	2*number of acquired data points

The first record in the file is the data point header record. This record identifies the data point and contains system and data channel setup parameters. It also contains identification data, equipment settings which will affect conversion to engineering units, and wind tunnel parameters from the STATIC Data Acquisition System. Following the data point header record is the channel data for that data point. For each LVABI channel that was acquired there is a record containing the unconverted data. These are in 16-bit two's complement integer format and can be converted using the following formulae:

1) For lv channels using counters:

$$\mathbf{EU}_{\text{upshift}} = \left(bragg - \frac{32000 \times 10^6}{mantissa \times 2^{exponent}}\right)\left(\frac{\lambda}{2\sin\frac{\theta}{2}}\right)(3.28084)$$

$$\mathbf{EU}_{\text{downshift}} = \left(\frac{32000 \times 10^6}{mantissa \times 2^{exponent}} - bragg\right)\left(\frac{\lambda}{2\sin\frac{\theta}{2}}\right)(3.28084)$$

For example :

λ = 488 x 10-9 m
θ = 2.769 deg
Bragg = 2 Mhz. ; downshift

raw counter data = 155414

1 5 5 4 1 4
6 2 2 3 6 3 (two's complement)

1 1 0 0 1 0 0 1 0 0 1 1 1 1 0 0 1 1 (binary representation)

exponent = 1st 4 LSB's
mantisssa = next 10 bits

exponent = 0 0 1 1 = 3
mantissa = 1 0 0 1 0 0 1 1 1 1 = (1 + 2 + 4 + 8 + 64 + 512) = 591

$$\mathbf{EU, fps} = \left(\frac{32000 \times 10^6}{591 \times 2^3} - 2 \times 10^6\right)\left(\frac{488 \times 10^{-9}}{2\sin\frac{\theta}{2}}\right)(3.28084) = 157.979$$

2) For lv channels using frequency domain processors:

$$\text{EU,fps} = (mantissa \times 2^{exponent}) \left(\frac{\lambda}{2\sin\frac{\theta}{2}} \right) (3.28084)$$

For example:

λ = 488 x 10-9
θ = 2.744
Bragg = 2 Mhz.

raw **FDP** data = 143201

001 100 011 010 000 001 (binary representation)

mantissa = 1st 11 LSB's
skip 1 bit
exponent = next 4 bits

mantissa = 1 1 0 1 0 0 0 0 0 0 1 = 1 + 128 + 512 + 1024 = 1665
exponent = 1 1 0 0 = 4 + 8 = 12

mantissa x 2exponent = 6819840

$$\text{EU, fps} = (6,819,840 - 2,000,000) \left(\frac{488 \times 10^{-9}}{2\sin\frac{\theta}{2}} \right) (3.28084) = 161.145$$

3) For dt (interarrival time) data channels:

$$\text{EU, sec} = (10^{-7})\ (mantissa \times 10^{exponent})$$

where

mantissa = 1st 14 LSB's
exponent = next 2 bits

For example:

raw dt interarrival time data = 115120

00100110100101 0000 (binary representation)

mantissa = 16 + 64 + 512 + 2048 + 4096 = 6736
exponent = 2

dt = 6736 x 102 x 10-7 = 67.36 ms

4) For azimuth channels using the auxiliary card equipped with position encoder daughter cards:

EU, deg. = shifted dataword / (1024/360)

for example: raw value = 31540

0 1 1 0 0 1 1 0 1 0 0 0 (binary representation)

drop the 1st 4 bits then ; shifted dataword = 0 1 1 0 0 1 1 0 1 1 0 = 822

EU, deg = 822/2.84444 = 288.98

The header record data are stored in real, integer, or ASCII format, depending on the parameter in question.

The raw data tape file is marked with an End-of-File (EOF) mark after the final raw data channel record in the file. The End-of-Tape (EOT) is indicated by two consecutive EOF marks.

13.1 Tape Data Record Sequence

Beginning of Tape.
- Data Point Header Record
- LVABI Data Channel 1 Record
- LVABI Data Channel 2 Record
- ...
- LVABI Data Channel n Record
- End-of-File mark — End of data point

- Data Point Header Record
- LVABI Data Channel 1 Record
- LVABI Data Channel 2 Record
- ...
- LVABI Data Channel n Record
- End-of-File mark — End of data point
- End-of-File mark — End of data on tape

End of LVDAS data on tape

13.2 Data Point Header Record Format

Byte Offset	Parameter Description	Length (Bytes)
0	HP-UX Flag 0 = RTE created tape 1 = HP-UX created tape 3 = HP-UX corrected data point 4 = Invalid Static data 5 = Invalid operating condition	2
2	Data Point Information	62
64	Number of data points acquired	2
66	Number of LV data points acquired	2
68	Number of AX data channels	2
70	Number of QuickLook data channels	2
72	Number of data channels coincidence group 1	2
74	Number of data channels coincidence group 2	2
76	Number of wind tunnel parameters recorded	2
78	Unused	2
80	Channel configuration	32
112	Channel names	128
240	Data Point Serial number	2
242	Month of acquisition	2
244	Day of acquisition	2
246	Hour of acqusition	2
248	Minute of acquisition	2
250	X Position (inches)	4
254	Y Position (inches)	4
258	Z Position (inches)	4
262	Pan Position (degrees)	4
266	Tilt Position (degrees)	4
270	Zoom Position (inches)	4
274	User defined axis number 1	4
278	User defined axis number 2	4

Data Point Header Record Format (continued)

Byte Offset	Parameter Description	Length (Bytes)
282	User defined axis number 3	4
286	U-component cross beam angle (degrees)	4
290	V-component cross beam angle (degrees)	4
294	W-component cross beam angle (degrees)	4
298	U-component bragg frequency (Hz)	4
302	V-component bragg frequency (Hz)	4
306	W-component bragg frequency (Hz)	4
310	U-component wavelength	4
314	V-component wavelength	4
318	W-component wavelength	4
322	Selected Quicklook data channels	14
336	Quicklook data for each selected channel Number of measurements Mean value Error in the mean Standard deviation Error in standard deviation Skewness Kurtosis Turbulence Intensity	224
560	Unused	52
612	RPM	4
616	Coincidence group 1 table	28
644	Coincidence group 2 table	28
672	U-component BAND WIDTH	2
674	U-component TRIGGER SOURCE	2
676	U-component TRIGGER LEVEL PERCENT	2
678	U-component TRIGGER COUNT	2
680	U-component TRIGGER PERCENT DELAY	2
682	U-component DISPLAY SELECT	2
684	U-component RECORD LENGTH	2
686	U-component TRANSFORM LENGTH	2
688	U-component VALIDATION	2
690	U-component STOP	2
692	U-component ANALOG OUT	2
694	U-component FS INPUT	2
696	U-component VAL RATIO	2
698	V-component BAND WIDTH	2
700	V-component TRIGGER SOURCE	2
702	V-component TRIGGER LEVEL PERCENT	2
704	V-component TRIGGER COUNT	2
706	V-component TRIGGER PERCENT DELAY	2
708	V-component DISPLAY SELECT	2
710	V-component RECORD LENGTH	2
712	V-component TRANSFORM LENGTH	2
714	V-component VALIDATION	2
716	V-component STOP	2
718	V-component ANALOG OUT	2
720	V-component FS INPUT	2

Data Point Header Record Format (continued)

Byte Offset	Parameter Description	Length (Bytes)
722	V-component VAL RATIO	2
724	W-component BAND WIDTH	2
726	W-component TRIGGER SOURCE	2
728	W-component TRIGGER LEVEL PERCENT	2
730	W-component TRIGGER COUNT	2
732	W-component TRIGGER PERCENT DELAY	2
734	W-component DISPLAY SELECT	2
736	W-component RECORD LENGTH	2
738	W-component TRANSFORM LENGTH	2
740	W-component VALIDATION	2
742	W-component STOP	2
744	W-component ANALOG OUT	2
746	W-component FS INPUT	2
748	W-component VAL RATIO	2
750	U-component PROCESS START	2
752	V-component PROCESS START	2
754	W-component PROCESS START	2
756	Unused	12
768	Test number - Start of Wind Tunnel Parameters	4
772	Run number	4
776	Point number	4
780	ID number	4
784	Year-Month-Day	4
788	Hour-Minute-Seconds	4
792	Additional Wind Tunnel Parameters (4-bytes each)	232
1024		

14.0 Disk File Formats

The LVDAS files are sequential access disk files. Each column must be separated by at least one space.

14.1 Device File Record Format

Column	Parameter Description	Format
1	Device Name, one of the following: tape lvabi scan0 scan1 klinger sdas plotter printer console fdp0 fdp1 fdp2	ASCII
2	Path name to Device Column 1	ASCII

14.2 Configuration File Record Descriptions

Record	Description
1	Name of User defined axis 1
2	Name of User defined axis 2
3	Name of User defined axis 3
4-61	Names of Wind Tunnel Parameters in the order passed from the SDAS. The parameters TEST, RUN, POINT, ID, YRMODA(date), HRMNSC(time) are always available.

14.3 Acquisition Grid Table Record Format

Column	Parameter Description	Format (w.d)
1	User Defined Axis 1	8.3
2	User Defined Axis 2	8.3
3	User Defined Axis 3	8.3
4	X Position (inches)	8.3
5	Y Position (inches)	8.3
6	Z Position (inches)	8.3
7	Pan Position (degrees)	8.3
8	Tilt Position (degrees)	8.3

14.4 Zoom Calibration File Record Format

Column	Parameter Description	Format (w.d)
1	Zoom Encoder Counts	8.0
2	Z Position value (inches)	8.3

14.5 Crossbeam Angle Calibration File Record Format

Column	Parameter Description	Format (w.d)
1	Zoom Encoder Counts	8.0
2	Cross Beam Angle (degrees)	8.3

15.0 Examples of LVDAS Files

15.1 Device File (conf/.devices)

tape	**/dev/rmt/3h**
scan0	**/dev/scan0**
scan1	**/dev/scan1**
console	**/dev/console**
sdas	**/dev/modcomp**
plotter	**/dev/plt7550**
printer	**/dev/line**
lvabi	**/dev/gpio**
fdp0	**/dev/hpib/0a10**
fdp1	**/dev/hpib/0a11**
fdp2	**/dev/hpib/0a12**

15.2 Parameters Selection File (conf/.parameters)

Azi	*User Axis#1 (Azimuth Location)*
RoR	*User Axis#2 (Radial Location)*
Tpp	*User Axis#3 (Tip-Path_Plane Location)*
Psi	*Rotor Azimuth Position*
r/R	*Radial Position on Blade*
Htp	*Height of tip-path-plane*
q	*dynamic pressure*
vel	*free stream velocity*
rn	*Reynold's number*
rho	*air density*
alpha	*model angle of attack*
beta	*model sideslip angle*
theta	*Euler pitch angle*
psi	*Euler yaw angle*
phi	*Euler roll angle*
hgt	*height of model ref. pt. above floor*
pa	*ambient pressure*
ta	*ambient temperature*
tdew	*dew point temperature*
elev	*model support mast elevation*
groll	*gimbal roll angle from gimbal q-flex*
alphah	*rotor shaft angle of attack*
alftpp	*alpha of tip-path-plane*
sa0	*rotor coning angle (degrees)*
sa1	*rotor longitudinal flapping*
sb1	*rotor lateral flapping*
ba1	*rotor lateral cyclic*
bb1	*rotor longitudinal cyclic*
coll	*rotor collective*
flap	*blade flapping*
lag	*blade lead-lag*
hp	*horsepower*
tc	*rotor thrust from NF1 alone*
rf3	*resultant force*
tmach	*advancing tip mach number*

vtip *advancing tip speed*
amumr *advance ratio*
tmhov *hover tip mach number*
rlift *rotor lift (lbs)*
rdrag *rotor drag (lbs)*
ctr *rotor thrust coefficient*
cqr *rotor torque coefficient*
ctmr *rotor thrust coefficient / sigma*
cqmr *rotor torque coefficient / sigma*
crlift *rotor lift coefficient*
crdrag *rotor drag coefficient*
crf3 *rotor thrust coefficient (3 components)*
figm *figure of merit*
rqmr *rotor torque (lbs)*
ba1c *corrected ba1 for phase*
bb1c *corrected bb1 for phase*
velk *velocity in knots*
rpm *rotor revolutions per minute*

15.3 LVDAS Setup Command File (conf/.setup)

```
echo on                 Display commands at user's console
set minpts 2000
set radius 4.0
quick 1 0               Set up quicklook data channels
quick 2 2
quick 3 6
quick 4 7
dis 1 q                 Select wind tunnel parameters to be displayed
dis 2 vel
dis 3 ta
dis 4 rho
dis 5 tdew
dis 6 alphah
dis 7 rlift
dis 8 ctr
dis 9 amumr
set ubragg 2.0          Configure parameters for optics subsystem
set vbragg 5.0
set uwavelen 488.0
set vwavelen 514.5
set uangle 2.4
set vangle 2.4
set xmax 72.02          Set scan positioning system limits
set xmin -7.69
set ymax 12.0
set ymin -45.0
set zmax 60.0
set zmin -60.0
set pmax 0.2
set pmin -0.2
set tmax 0.2
set tmin -0.2
set xref1 -1.88         Set absolute reference point#1
```

```
set yref1 0.74
set zref1 -1.42
set xref2 -1.88        Set absolute reference point#2
set yref2 0.74
set zref2 -1.42
set xalign -18.0       Set alignment location
set yalign -39.0
set zalign -24.0
set ypark 6.0          Set park location
gra 1                  Set graphic frames plotting limits
400 250 300
gra 2
400 -25 25
gra 4
250 300
gra 5
-25 25
grid standard.dat      Specify acquisition grid table
exec conf/.lvabi       Execute another command file
```

15.4 LVABI Setup Command File (conf/.lvabi)

```
bif                    Enter LVABI interface
cd 0 lv dn U-COMP      Define data channels
cd 1 dt dt U-TIME
cd 2 lv dn V-COMP
cd 3 dt dt V-TIME
cd 6 ax al U-AZIM
cd 7 ax al V-AZIM
ac 0 r1                Configure auxillary channels to trigger
ac 2 r2                on corresponding lv channels
ac 6 r1
ac 7 r2
fp 0 1                 Front panel setup
fp 2 2
ti 2:00                Set acquisition time
fa al 0                Set first and last memory addresses for active channels
la al 4096
exitbif                Exit LVABI interface
set acqpts 4096
echo off
exec conf/.fdp         Execute another command file
```

15.5 UNIDEX Setup Parameters File (conf/.unidex)

```
306.945        Scan Zero Offset in inches
-2.53181       Pan Zero Offset in degrees
3.88762        Tilt Zero Offset in degrees
-25.0000       Z-axis home position in inches
0.000          Pan-axis home position in degrees
0.000          Tilt-axis home position in degrees
500.00         X-axis feed rate in units/second
2000.00        Y-axis feed rate in units/second
3000.00        Z-axis feed rate in units/second
```

5000.00	*P-axis feed rate in units/second*
5000.00	*T-axis feed rate in units/second*
500.00	*Ramp time for unit 0*
500.00	*Ramp time for unit 1*
0.00	*Unused*
0.00	*Unused*
0.00	*Unused*

15.6 Frequency Domain Processor Setup File (conf/.fdp)

```
fdp
bw 0 20.0              Setup for FDP unit 0
tgrsrc 0 dig
tgrlvl 0 100
tgrcnt 0 1
tgrdoff 0 0
rcl 0 512
fftlen 0 512
valtyp 0 peak
midbin 0 0
anaout 0 0ff
digout 0 on
prcmde 0 standby
gainval 0 1062.0
srnval 0 50
dnload 0
exitfdp                Transfer setup from host to FDP unit 0
```

Acquisition Computer System
(sab64.larc.nasa.gov)

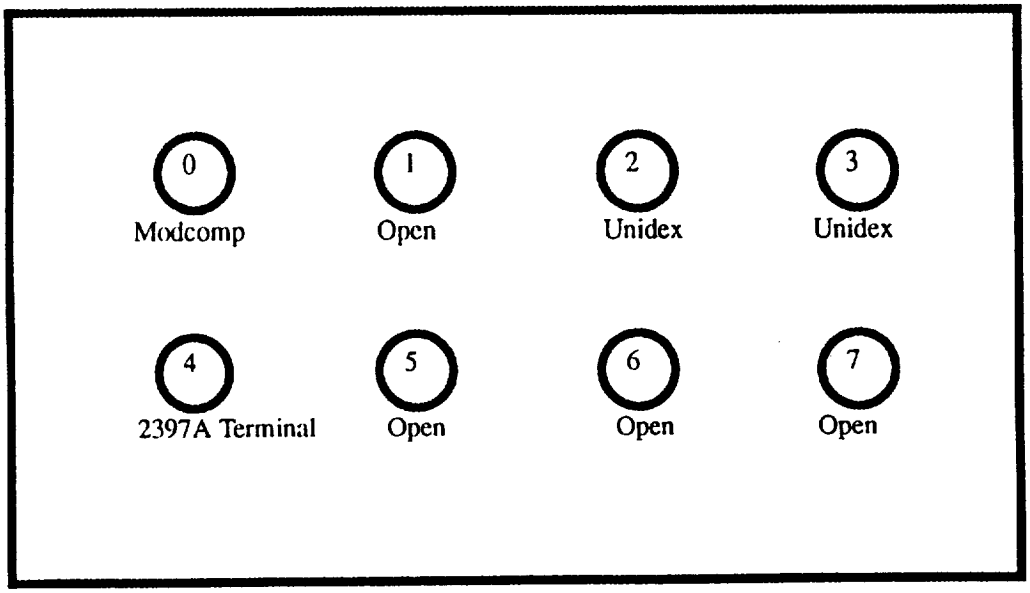
The acquisition computer is a Hewlett Packard 9000 series 433s that is running the HP-UX version of the Unix operating system. The computer has a MC68040 processor, 32 MB RAM, and an HP 2213A 663 MegaByte Hard Drive of which 100 MB is used as swap space. Some important device configuration information about this system is listed below.

The backplane contains:

3	8 port RS-232C multiplexer card(HP 98642) at Select Codes 28 & 29	
2	GPIO card(HP 98622) at Select Code 13	DIO-1 Adapter Card(HP A1401A)
1	OPEN	DIO-1 Adapter Card(HP A1401A)

where 1, 2, and 3 represent the I/O slots in the backplane.

The eight port multiplexer is used to communicate with a variety devices as shown below:



Where 0, 1, 2, 3, 4, 5, 6, and 7 represent the eight multiplexer ports. The device files and their addresses for the corresponding ports are described next.

Port	Major Number	Minor Number	Device	Device File
0	1	0x1c0004	Modcomp	/dev/modcomp
1	1	0x1c0104	OPEN	N/A
2	1	0x1c0204	Unidex motor controller	/dev/scan0
3	1	0x1c0304	Unidex motor controller	/dev/scan1
4	1	0x1d0004	HP 2937A terminal	/dev/term
5	1	0x1d0104	OPEN	N/A
6	1	0x1d0204	OPEN	N/A
7	1	0x1d0304	OPEN	N/A

Note: the Klinger motor controller will not work with the 8 port multiplexer because line 5 does not return a signal. The Klinger motor contoller must be used with the internal RS-232C port on the core I/O board.

Other devices:

Device	Device File	Major Number	Minor Number
HP 7980A 9 Track Tape Drive	/dev/rmt/3h	9	0x070342
DDS Tape Drive	/dev/dds->/dev/rmt/0m	54	0x0e0342
Klinger Stepping Motor Controller	/dev/klinger	1	0x090004
Frequency Domain Processors	/dev/hpib/0a10 /dev/hpib/0a11 /dev/hpib/0a12	21 21 21	0x070a00 0x070b00 0x070c00
HPIB Interface	/dev/hpib/hpib_raw	21	0x071f00
General Purpose I/0 card	/dev/gpio	22	0x0d0000
Cartridge Tape Drive	/dev/ct -> /dev/mt/update.src	4	0x070300
HP 2564B Line Printer	/dev/lp_line2	26	0x070100
HP LaserJet III	/dev/lp_ljiii	21	0x0c0000
Console HP 98736 VDMA Bit Mapped Display	/dev/crt	12	0x840200

Note: the cartridge tape drive and the 9 track tape drive can not be connected simultaneously.

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The Laser Velocimeter Data Acquisition System (LVDAS) in the Langley 14- by 22-Foot Tunnel is controlled by a comprehensive software package designed to control the data acquisition process during wind tunnel tests which employ a laser velocimeter measurement system. This report provides detailed explanations on how to configure and operate the LVDAS system to acquire laser velocimeter and static wind tunnel data.

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