UNIDEX® 21
MOTION CONTROLLER
USER'S MANUAL

PN: EDU 116

AEROTECH®

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Manual Update (3.0 to 4.0)

Aerotech's Unidex 21 User's Manual has been updated as of **February 10, 1993** to include the following changes:

Reorganization of Chapter 6 "The Parameter Mode" which includes a break up of the following sections, as well as each change for that section:

INTRODUCTION

GETTING STARTED

GENERAL PARAMETERS

General Parameter #3 – Added additional Segment Calculation Rates
"4" for a 8ms rate
"5" for a 16ms rate

General Parameter #11 – Added reference to the maximum setting for the parameter (1999 bytes).

General Parameter #30 – Deleted sentence re: The appropriateness of the Axes Ramp time setting may be verified by application of certain parameters derived from application of the Auto-tune function.

General Parameter #45 – Added note re: Perpendicularity error compensation will not be enabled until the axes are sent home.

General Parameter #52 – Added sentence re: Although there is no operational difference between the master and slave controller, typically the master is set to Yes, and the Slave is set to No.

General Parameter #57 – "NEW" - Master Trajectory Linear?

General Parameter #58 – "NEW" - Fast FeedHold Ramp Time (ms)

General Parameter #59 – "NEW" - Master Parabolic Coefficient

General Parameter #60 – "NEW" - Exp Filter Level (0-7)

General Parameter #61 – Ramping During G23 Operation?

AXIS PARAMETERS

Axis Parameter #21 – Added note re: Setting this parameter to zero for all axes will disable this feature.

Axis Parameter #23 – Added sentence re: The minimum setting for the parameter is 1000.

Axis Parameter #33 – Added sentence re: A value of zero will disable max velocity error checking.

AXIS PARAMETERS (CON'T)

Axis Parameter #34	– Added sentence re: A value of zero will disable max velocity error checking.
Axis Parameter #35	– Added sentence re: A value of zero will disable max velocity error checking.
Axis Parameter #38	– Added sentence re: A coefficient of zero represents a linear ramp. Higher values result in a steeper curve.
Axis Parameter #45	– Added note re: Backlash compensation will not be enabled unless the axis is sent home.

AXES AUTO-TUNE

FRONT PANEL FUNCTION KEYS

LOAD/SAVE PARAMETER

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CHAPTER 1: INTRODUCTION

SECTION 1-1: OVERVIEW OF THE UNIDEX 21

The Unidex 21 Motion Controller is a multi-microprocessor based motion controller capable of producing linear, circular, helical, spherical and elliptical interpolation as well as velocity profiling and cubic spline contouring.

Some of the available package configurations are shown below:

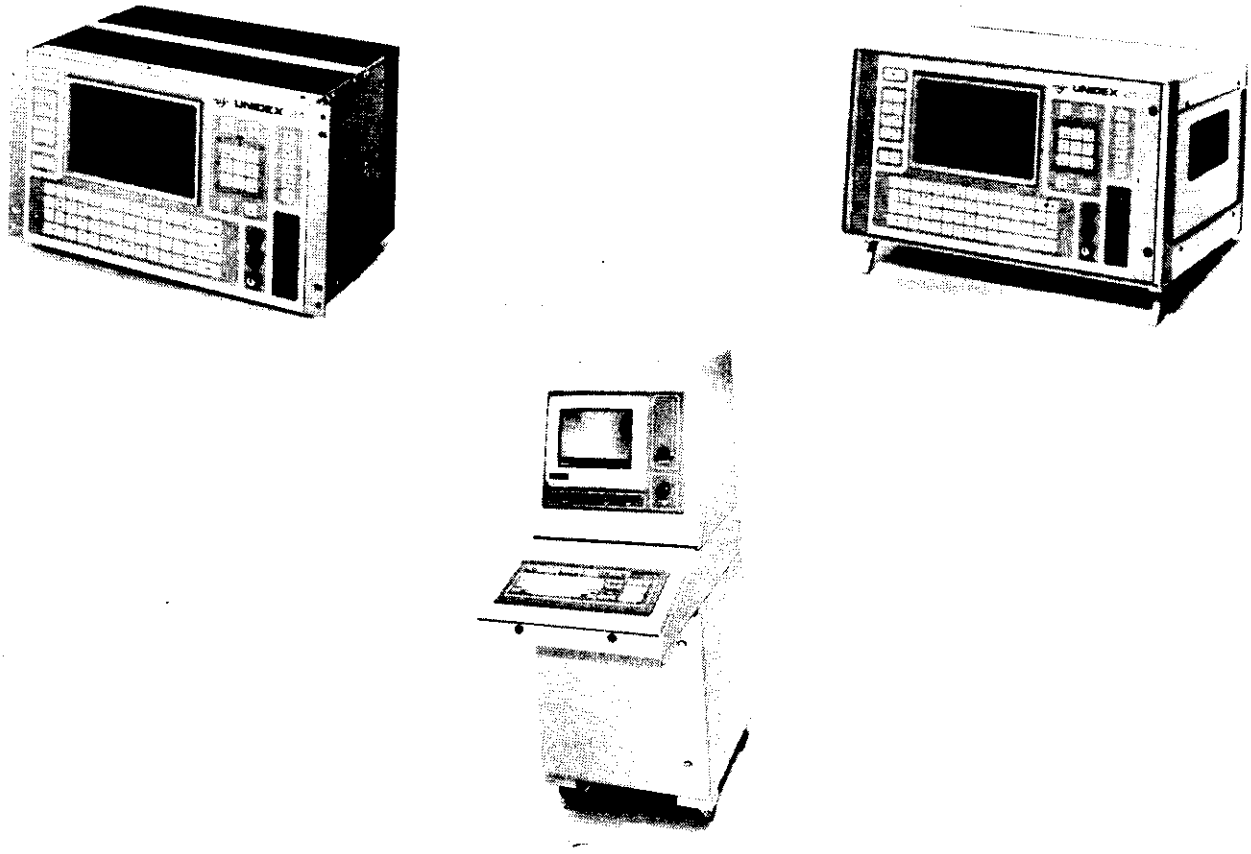


Figure 1-1: The: Unidex 21 Motion Controller Family

SECTION 1-2: UNIDEX 21 COMPONENTS

The basic components of Unidex 21 are illustrated below:

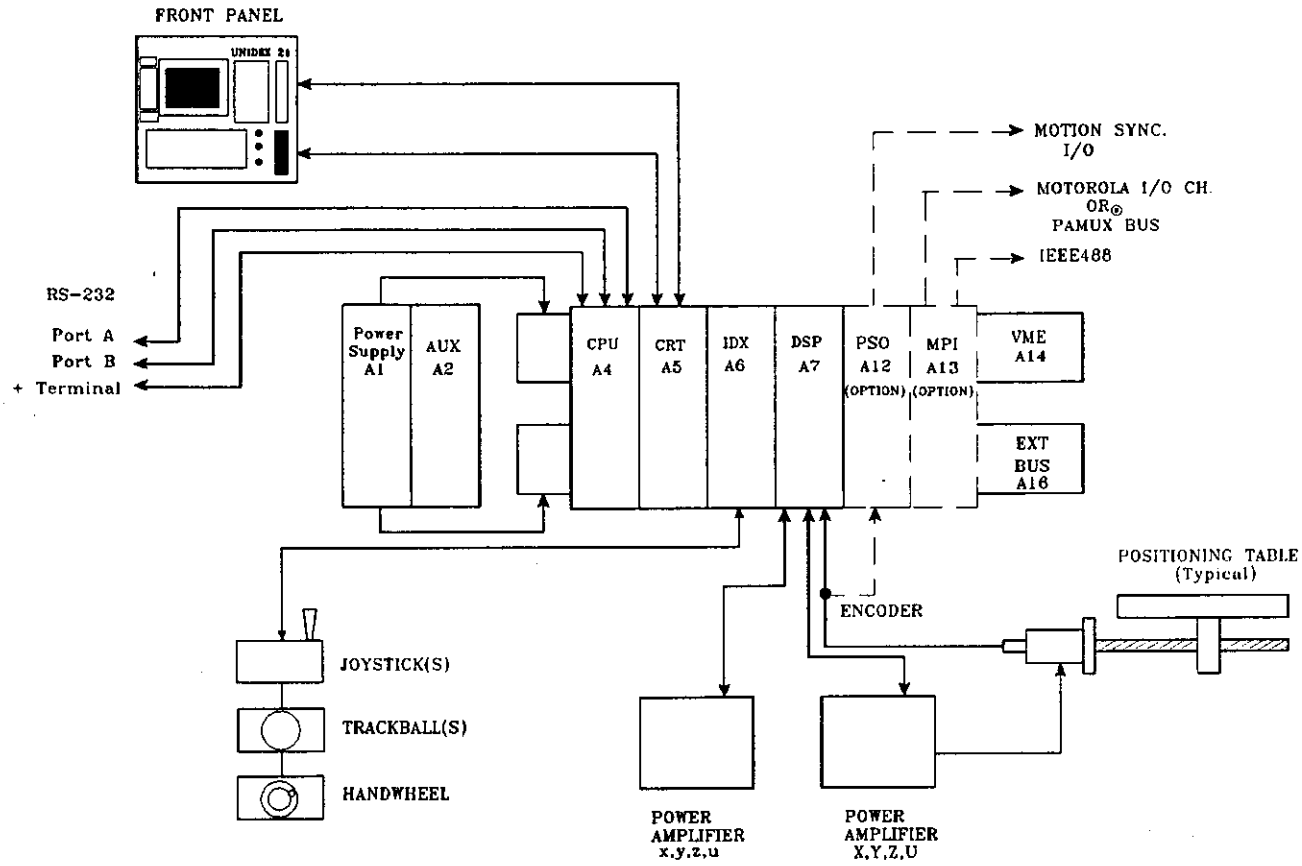


Figure 1-2: Unidex 21 Component Block Diagram

CHAPTER 2: GETTING ACQUAINTED WITH UNIDEX 21

This Chapter provides the User with general Unidex 21 operating information. (See Section 2-5 for Model variations.)

SECTION 2-1: INTERFACE CONNECTIONS

Prior to Unidex 21 operation, make certain all applicable interface connections have been correctly made. The following is a list of the connectors available on the Unidex 21 Rear Interface Panel (refer to Figure 2-1 for connector locations):

NOTE: Throughout this manual, Axes 1, 2, 3, 4, 5, 6, 7, and 8 will be referred to Axes X, Y, Z, U, x, y, z, and u respectively.

Reference	Name	Description
P6/P6A*	Y LINEAR ENC	Y Axis Linear Encoder (15 pin, Male "D" type)
P6B *	y LINEAR ENC	y Axis Linear Encoder (15 pin, Male "D" type)
P7/P7A*	Y ENC/LMTS	Y Axis Encoder Limit Switch, Hall Effect (25 pin, Female "D" type)
P7B *	y ENC/LMTS	y Axis Encoder Limit Switch, Hall Effect (25 pin, Female "D" type)
P8/P8A*	U LINEAR ENC	U Axis Linear Encoder (15 pin, Male "D" type)
P8B *	u LINEAR ENC	u Axis Linear Encoder (15 pin, Male "D" type)
P9/P9A*	U ENC/LMTS	U Axis Encoder Limit Switch,Hall Effect (25 pin, Female "D" type)
P9B *	u ENC/LMTS	u Axis Encoder Limit Switch,Hall Effect (25 pin, Female "D" type)
P10	PAMUX or I/O CHANNEL	(50 pin, Champ)
P11	IEEE-488	(24 pin, Champ)
P12/P12A*	X LINEAR ENC	X Axis Linear Encoder (15 pin, Male "D" type)

Reference	Name	Description
P12B *	x LINEAR ENC	X Axis Linear Encoder (15 pin, Male "D" type)
P13/P13A*	X ENC/LMTS	X Axis Encoder Limit Switch, Hall effect (25 pin, Female "D" type)
P13B *	x ENC/LMTS	x Axis Encoder Limit Switch, Hall effect (25 pin, Female "D" type)
P14/P14A*	Z LINEAR ENC	Z Axis Linear Encoder (15 pin, Male "D" type)
P14B *	z LINEAR ENC	z Axis Linear Encoder (15 pin, Male "D" type)
P15/P15A*	Z ENC/LMTS	Z Axis Encoder Limit Switch (25 pin, Female "D" type)
P15B*	z ENC/LMTS	z Axis Encoder Limit Switch (25 pin, Female "D" type)
P16	EGA OUTPUT	EGA Monitor (9 pin, Female "D" type)
P21	TERMINAL	TeleVideo 905 Video Display Terminal (9 pin, Male "D" type)
P22	CPU OPTO 22 PB24	Eight OPTO Isolated Outputs, Sixteen Opto Isolated Inputs, Interfaces directly to CPU, PB24 (50 pin, Champ)
P23	MISC I/O	(25 pin, Female "D" type)
P23A *	MISC I/O1	(25 pin, Female "D" type)
P23B *	MISC I/O2	(25 pin, Female "D" type)
P24	IDX PORT B	Indexing Board , RS-232 (9 pin, Male "D" type)
P25	JOY 2	Joystick # 2 Input (15 pin, Female "D" type)
P26	I/O PWR	Power Output to Motorola I/O Channel Card (14 pin, Champ)
P27	KEY BD	AT-Style Keyboard Interface (5 pin, Female DIN , Type Mab55V)
P29	PORT B	RS-232 Port B (9 pin, Male "D" type)

Reference	Name	Description
P30	PORT A	RS-232 Port A (9 pin, Male "D" type)
P31	SSI	Serial Synchronous (DSP) Interface (15 pin, Female "D" type)
P31A *	SSI1	Serial Synchronous (DSP) Interface (15 pin, Female "D" type)
P31B *	SSI2	Serial Synchronous (DSP) Interface (15 pin, Female "D" type)
P32	SCI	Serial Communication (DSP) Interface (9 pin, Male "D" type)
P32A *	SCI1	Serial Communication (DSP) Interface (9 pin, Male "D" type)
P32B *	SCI2	Serial Communication (DSP) Interface (9 pin, Male "D" type)
P33	TRACKBALL	Trackball Input Interface (9 pin, Male "D" type)
P34	JOY 1	Joystick # 1 Input (15 pin, Female "D" type)
P35	IDX MST BUS	Misc., Spindle Tool Changer Interface to Indexing Board (50 pin, Champ)
P40	IDX INP1	Handwheel /Auto-Focus Interface (9 pin, Female "D" type)
P41	IDX INP2	Handwheel /Auto-Focus Interface (9 pin, Female "D" type)
P42/P42A *	U RESOLVER	U Axis Resolver (9 pin, Female "D" type)
P42B *	u RESOLVER	u Axis Resolver (9 pin, Female "D" type)
P43/P43A *	Z RESOLVER	Z Axis Resolver (9 pin, Female "D" type)
P43B *	z RESOLVER	z Axis Resolver (9 pin, Female "D" type)
P44/P44A *	Y RESOLVER	Y Axis Resolver (9 pin, Female "D" type)
P44B *	y RESOLVER	y Axis Resolver (9 pin, Female "D" type)

Reference	Name	Description
P45/P45A *	X RESOLVER	X Axis Resolver (9 pin, Female "D" type)
P45B *	x RESOLVER	x Axis Resolver (9 pin, Female "D" type)
P48A *	DRIVE INT 1	Current Command and Shutdown Interface to Power Rack (9 pin, Female "D" type)
P48B *	DRIVE INT 2	Current Command and Shutdown Interface to Power Rack (9 pin, Female "D" type)
P51	(Optional)	(50 pin, Champ)
P52	(Optional)	(50 pin, Champ)

"*" denotes connectors available on Model U21C only.

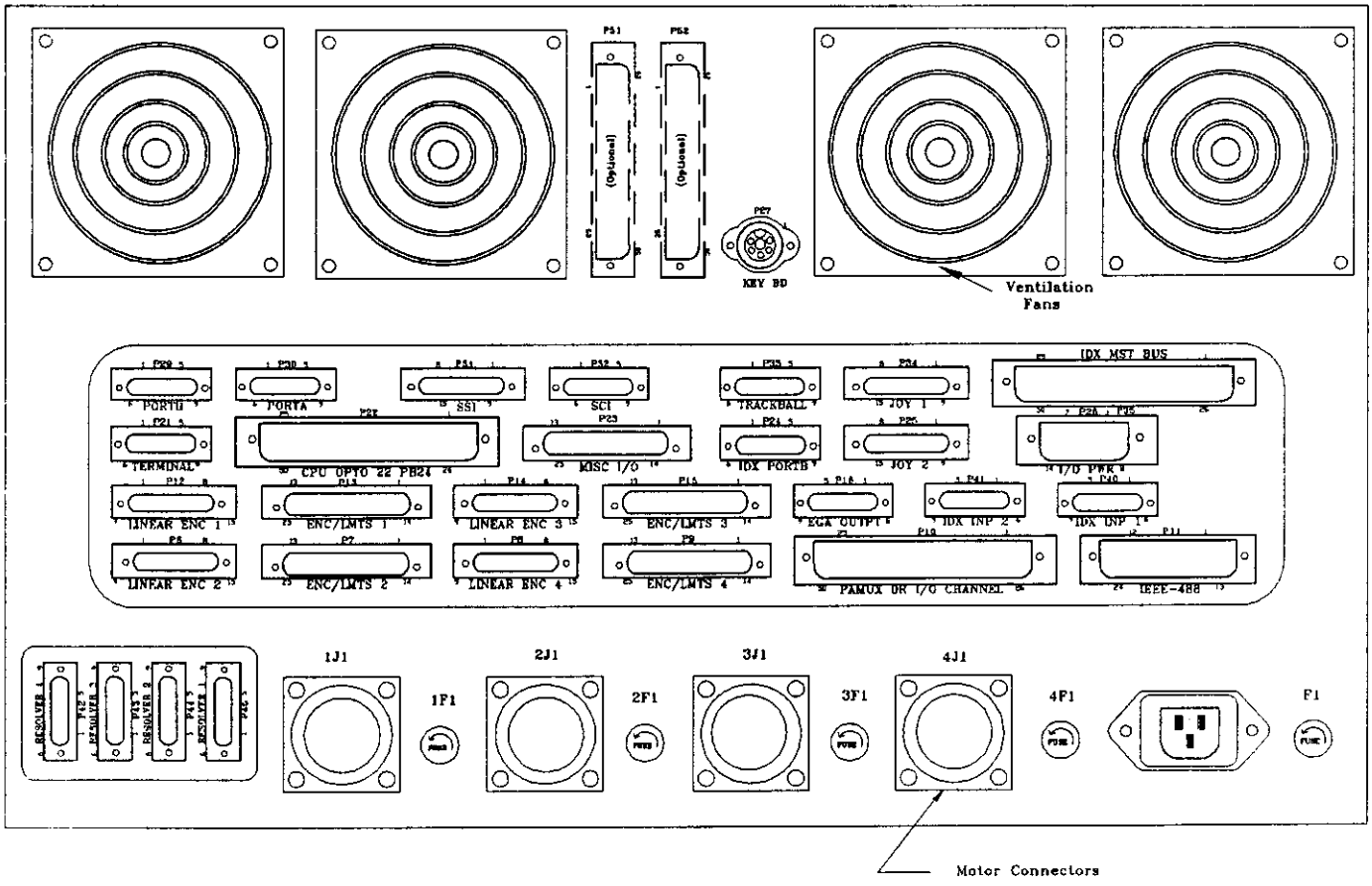
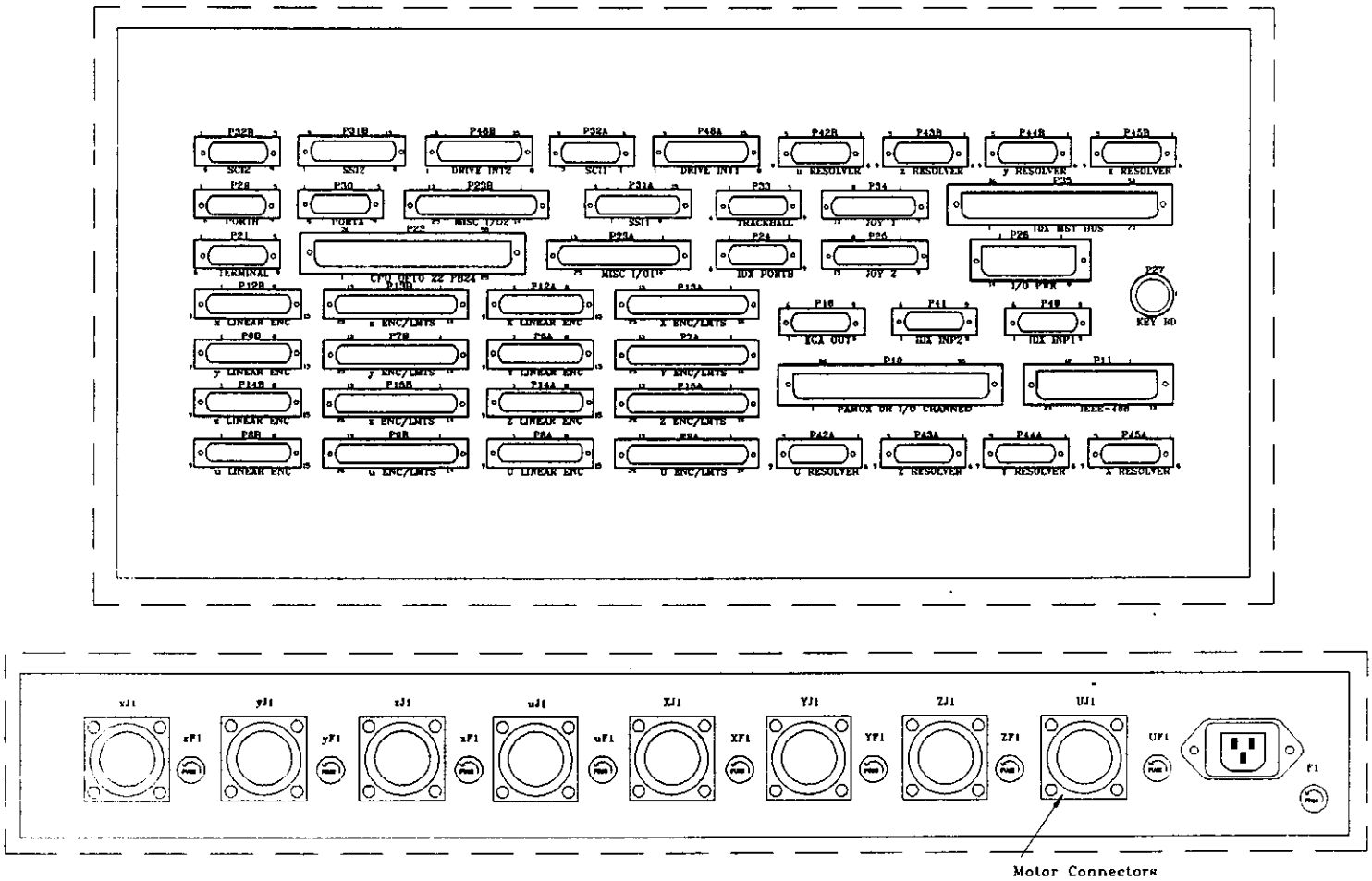


Figure 2-1: Unidex 21, Model U21B and U21R Rear Panel



NOTE: The relative location of the 8 Axis Rear Connector Panel and Motor Connector Panel is dependent upon packaging configurations.

Figure 2-2: Unidex 21, Model U21C Rear Panel

SECTION 2-2: POWER UP

WARNING: **Prior to Power Up of the Unidex 21, make certain that all Interface connections are correct and securely fastened. See the Unidex 21 Hardware Manual for connection details.**

Move the POWER Switch of the Unidex 21 to the ON position.
The following Power Up Initial Selection menu screen will be displayed:

```
UNIDEX 21       Version xx


EPROM OK        PARAMETER OK        RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug

Active axes: .....Alt-Z     clear message
```

The version number displayed in this Initial Selection screen, refers to the Unidex 21 Software version currently installed.

Upon Power Up the Unidex 21 tests three data storage areas.

2-2-1: EPROM VERIFICATION

A checksum is done on all data contained in the EPROM. "OK" is displayed if the integrity of the data is verified. If an error is detected, the following message is displayed:

```
EPROM checksum error ; Select function:
```

If an error exists in the System EPROM the User must contact the Customer Service Department of Aerotech, Inc. for appropriate action. Make certain the Unidex 21's serial number is available at the time of the call.

2-2-2: PARAMETER VERIFICATION

A checksum is done on all parameter settings. If an error exists between the last saved set of parameters and the currently active set of parameters the following message is displayed:

Parameter error ; Press space bar to use default data, any other key to ignore it.

To return to default parameters press the space bar/key. The User may then enter the Parameter Mode and load an error-free copy of the file containing the desired parameter settings. (See Chapter 6: Parameter Mode.)

2-2-3: RAM VERIFICATION

RAM verification is internally divided into two sections:

1) System RAM
2) User RAM

The Read and Write capability is checked in both sections of RAM.

If a Read/Write error is detected, one of the following messages is displayed:

RAM (0) fail @ (address location) = (fail data)
RAM (F) fail @ (address location) = (fail data)
RAM (5) fail @ (address location) = (fail data)
RAM (A) fail @ (address location) = (fail data)

A checksum is also done on the User's RAM to verify file integrity. Detection of a checksum error prompts the display of the following message:

RAM checksum error (filename.type)

The "filename.type" identified, is the file containing the error. To eliminate the file error, the User must enter the File Mode, delete the file containing the error, then reload a previous error-free copy of the file.

2-2-4: USER'S RAM

The number of bytes of available User's RAM is displayed.

2-2-5: MESSAGE LINE

Upon Power Up the axes that are active and clear for movement will be listed in the message line near the botttom of the screen. If the User does not desire this display, pressing the "Alt" and "Z" keys will clear the message from the display.

One of the following Error messages may appear within this display line:

Active axes: ..... Doesn't Match This error message is displayed upon a System Power Up or Reset if an inconsistancy is noted between the Axis Parameter, Existance Checking setting, and the Hard - ware configuration.

Axis in Limit: (axis name) (direction) Alt-Z to move out

The indicated axis is positioned at a directional limit. Press the "Alt" and "Z" keys to move the axis from the limit. This message may occur at any time during operation.

Axis in Trap (axis name) (position/velocity/integral)

The indicated axis cannot be activated because the Integral position exceeds the specified limits.

Typical reasons are:

Position feedback is interrupted
Gain settings are too low

SECTION 2-3: ON-SCREEN HELP MENU

The Unidex 21 contains an extensive HELP file that is accessible from any function mode or screen. To enter the HELP file press the "Alt" and "H" keys. The HELP file displayed will be that of the HELP file last used.

An example of a typical HELP menu is as follows:

Press the "Alt" and "H" keys to enter the HELP menu.

Press the "1" key. The display will be as follows:

```
..... (HELP message)

Abort     Block#   Copy       Down       Erase
Find      Get File H-home     I - CI     Joystick digitizing
K         LI       M          Next page  Optional-edit
Prev page Quit     Replace    Set & run  T-reTrieve
Up        V        Write & end

0-Main 1-Edit 2-File 3-Machine 4-P(general) 5-P(axes) 6-Test 7-System 8-Others
```

NOTE: The Help Menu currently active will be highlighted at the bottom of the display.

Press the capitalized letter of the sub-function for which HELP information is requested. A brief explanation of the sub-function will be displayed.

Press the number of the desired main function. The HELP menu of the selected main function will be displayed.

NOTE: The HELP menu displayed for both Parameter functions (4P (general) and 5P (axes)) provides only the Parameter number as identification. Refer to Chapter 6: Parameter Mode, for a listing of the Parameter numbers and functions.

SECTION 2-4: PRINT SCREEN

If the Unidex 21 is equipped with a front panel display, the User has the ability to print the current display. The printer must be connected to the Unidex 21 through the RS-232 , Port A or Port B as selected in the Parameter Mode (refer to Chapter 6 of this manual for Parameter Mode details).

To print the current display press the "Alt" and "P" keys The display screen will be sent to the printer

NOTE: When printing a display screen containing a graphic, such as Step Response and Velocity curves, a bit mapped pattern of the screen, will be sent to the printer.

SECTION 2-5: FRONT PANEL OPERATION

2-5-1 FUNCTION

Unidex 21 Models U21R and U21C have several system functions available directly through use of specific Front Panel keys. A brief explanation of some of these functions follows:

2-5-1-1 RESET

The RESET key is used to re-initialize the system without a complete Power Down.

2-5-1-2 OPTIONAL STOP

The OPTIONAL STOP key is used in conjunction with the M1 command. When the M1 command is decoded, if the OPTIONAL STOP key has been toggled to the ON position, program execution will stop. If the OPTIONAL STOP key is deactivated, the M1 command will be ignored. The OPTIONAL STOP status is visible at the Status Line at the bottom of the display. If the OPTIONAL STOP function is active, "Opt-Stop" will be highlighted.

Refer to the *Unidex 21 Programming Manual* for additional information.

2-5-1-3 BLOCK DELETE

The BLOCK DELETE key is used in conjunction with the / command. When the / command is decoded, if the BLOCK DELETE key has been toggled to the ON position, the program block following the / will not be processed. If the BLOCK DELETE key is deactivated, the / will be ignored. The BLOCK DELETE status is visible at the Status Line at the bottom of the display. If the BLOCK DELETE is active, "Block-delete" will be highlighted.

Refer to the *Unidex 21 Programming Manual* for additional information concerning BLOCK DELETE.

2-5-1-4 FEEDHOLD

The FEEDHOLD key is used interchangably with the "Feedhold" function that is initiated through the Machine Mode.

Refer to Chapter 5 of this Manual for detailed information concerning Feedhold.

2-5-1-5 RETRACE

The RETRACE key is used to stop a program run and reverse program processing, one block at a time.

Refer to the *Unidex 21 Programming Manual* for a detailed explanation of the RETRACE function.

2-5-1-6 CYCLE START

The CYCLE START key is used interchangably with the "C-start" function that is initiated through the Machine Mode.

Refer to Chapter 5 of this Manual for detailed information concerning Cycle Start.

2-5-1-7 MFO

The Manual Feedrate Override keys provide the User the capability to change the programmed feedrate by a designated percentage. The increment of change is determined by Parameter22 (see Chapter 6 of this Manual). Pressing the MFO + key will increase the feedrate, the MFO - key will decrease the feedrate.

In Unidex 21 Controllers containing Software Version 2.10 or greater, MFO may also be input to the Unidex 21 through a potentiometer connected to the Rear Panel's JOY 2 (P25) connector. Refer to the *Unidex 21 Hardware Manual* for connection details.

2-5-2 FRONT PANEL CONFIGURATIONS

The Unidex 21 Controller's front panel is available in three basic configurations:

Model U21B - blank

Model U21R - sealed membrane front panel keyboard with EL (electroluminescent) display

Model U21C - sealed Qwerty keyboard and color EGA monitor

Operating procedures, though similar, vary somewhat between models. The following paragraphs provide a summary of the differences and the effects of these differences on the general operating procedures as provided in the remaining sections of this manual.

2-5-2-1: Model U21B

The Unidex 21 Model U21B is a full featured version of the Unidex 21 with the exception of the Operator's front panel. (See Figure 2-1.)

The User has the option of using one of several devices to communicate with the Unidex 21, Model U21B.

TeleVideo 905 Video Display Terminal

A TeleVideo 905 Video Display terminal may be used to communicate with the Unidex 21, Model U21B. (See the *Unidex 21 Hardware Manual* for interface details.) The following functional and operational exceptions apply :

Functional

1) The SYSTEM LOCK switch located on the blank front panel is not active.

2) The RESET pushbutton located on the blank front panel is not active. System reset is accomplished by depressing the "CTRL" key and then pressing the "DEL" key two times.

NOTE: At times it may be necessary to power down the Unidex 21 to accomplish a complete reset.

3) Power ON/OFF is controlled by the ON/OFF pushbutton on the blank front panel.

Operational

1) MFO control is accomplished by pressing the "PAGE ERASE" key to incrementally decrease the MFO value, or by pressing the "BACK TAB" key to incrementally increase the MFO value. (The MFO increment size is established in the Parameter Mode, refer to Chapter 6 of this manual for Parameter Mode details .) The MFO value may be changed in one step increments by pressing the "SHIFT" key in conjunction with the "PAGE ERASE" or "BACK TAB" key. (Refer to the *Unidex 21 Hardware Manual* for external MFO potentiometer connection details.)

2) The RETRACE function is enabled from the VT905 terminal by pressing the "CTRL" and "R" keys.

3) The FEEDHOLD and CYCLE START functions are not available directly from the VT905 terminal. They are available to the terminal User through the Machine Mode display only.

4) The OPTIONAL STOP and BLOCK DELETE enable/disable functions are not available to the VT905 terminal User.

IBM AT Keyboard and EGA Monitor

An IBM AT keyboard (84 or 101 key) and EGA monitor may be used to communicate with a U21B that is equipped with the optional front panel and CRT display function cards. (See the *Unidex 21 Hardware Manual* for interface details.) The following functional and operational exceptions apply:

Functional

1) The SYSTEM LOCK switch located on the blank front panel is active. The SYS LOCK key must be "in" for the keyboard to be active.

2) The RESET pushbutton located on the blank front panel is active. System reset may be accomplished by pressing either the RESET pushbutton on the blank front panel or by depressing the "CTRL", "ALT" and "DEL" keys on the keyboard.

3) Power ON/OFF is controlled by the ON/OFF pushbutton on the blank front panel.

Operational

1) MFO control is accomplished by pressing the "F9" key to incrementally decrease the MFO value, or by pressing the "F10" key to incrementally increase the MFO value. (The MFO increment size is established in the Parameter Mode, refer to Chapter 6 of this manual for Parameter Mode details.) The MFO value is changed in one step increments by pressing the "SHIFT" key in conjunction with the "F9" or "F10" key. (Refer to the *Unidex 21 Hardware Manual* for external MFO potentiometer connection details.)

2) The RETRACE function is enabled from the IBM keyboard by pressing the "-" key, located on the Calculator keypad.

3) The FEEDHOLD function is enabled from the IBM keyboard by pressing the "*/Prt Sc" key , of the IBM 84 key keyboard, or by pressing the "*" key on the Calculator keypad of the IBM 101 key keyboard.

4) The CYCLE START function is enabled from the either IBM keyboard by pressing the "+" key, located on the Calculator keypad.

5) The OPTIONAL STOP function is enabled from the IBM keyboard by pressing the "Scroll-Lock/Break" key of the IBM 84 key keyboard, or by pressing the "Scroll-Lock" key of the IBM 101 key keyboard.

6) The BLOCK DELETE function is enabled from the IBM keyboard by pressing the "Sys Req" key of the IBM 84 key keyboard, or by pressing the "Scroll-Lock" key of the IBM 101 key keyboard.

Remote Front Panel

The Unidex 21 Model U21B equipped with the optional CRT display function card, may be controlled by a Aerotech supplied Remote Front Panel. (See the *Unidex 21 Hardware Manual* for interface details.) The Remote Front Panel provides operation as described throughout this manual with the following functional exceptions:

1) The SYSTEM LOCK switch located on the blank front panel is active. The SYS LOCK key must be "in" for the sealed membrane keyboard to be active.

2) The RESET pushbutton located on the blank front panel is not active. System reset is accomplished by depressing the RESET pushbutton on the Remote Front Panel

3) Power ON/OFF is controlled by the ON/OFF pushbutton on the blank front panel.

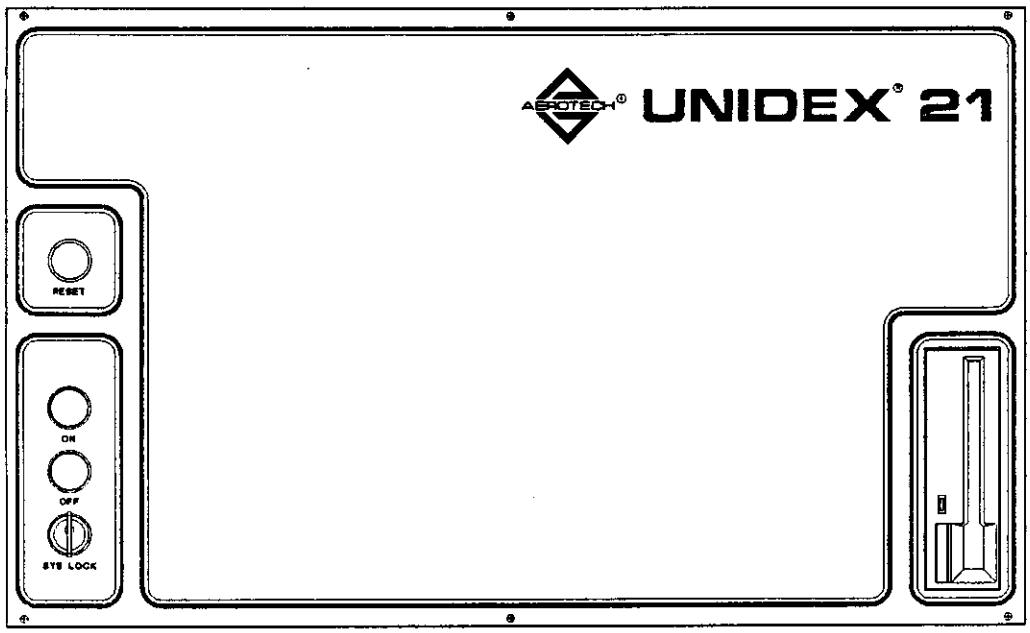


Figure 2-3: Unidex 21, Model U21B Front Panel (Shown with optional Disc Drive)

2-5-2-2: Model U21R

The Unidex 21 Model U21R is a rugged full featured rack or panel mounted version of the Unidex 21 containing a sealed membrane front panel and EL (electroluminescent) display. (See Figure 2-4.)

Operation of the Unidex 21, Model U21R is as described in the following sections of this manual.

(See the *Unidex 21 Hardware Manual* for interface details.)

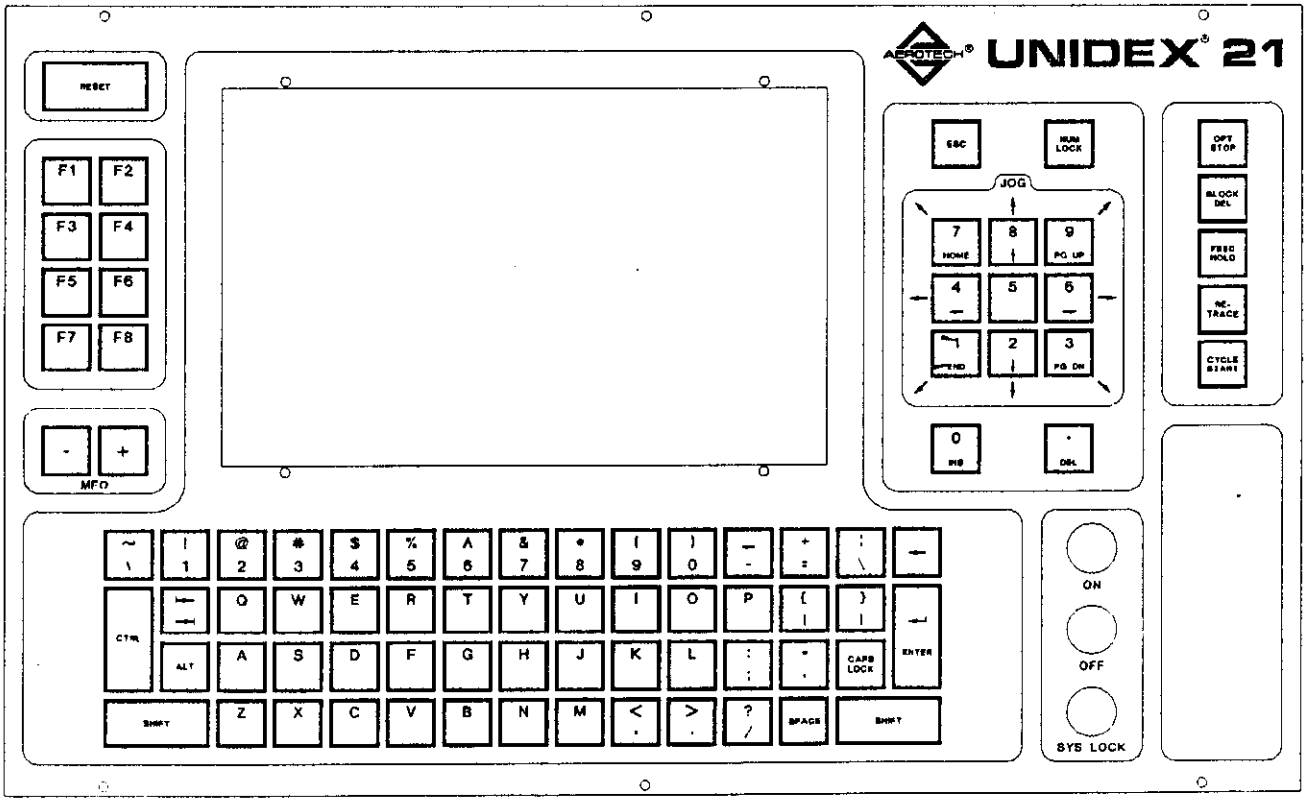


Figure 2-4: Unidex 21, Model U21R Front Panel (Shown with optional Disc Drive)

2-5-2-3: Model U21C

The Unidex 21 Model U21C is a complete multi-axis turnkey system enclosed in a NEMA 12 rated free-standing floor console. A qwerty keyboard and EGA color monitor are standard (see Figure 2-5). (See the *Unidex 21 Hardware Manual* for interface details.)

Though the keyboard has a slightly different configuration than the Unidex 21, Model U21R, operation of the Unidex 21, Model U21C is as described in this manual with the following functional exceptions.

1) The EMERGENCY STOP pushbutton located on the Model U21C console, is used to de-activate the motor drivers, stopping all axes motion. Depressing the EMERGENCY STOP pushbutton does not de-activate the Unidex 21 controller.

2) A Remote Keyboard connector is included on the front of the Model U21C Console for increased accessability. Functionally it is the same as the Rear panel connector of the other two models. (See the *Unidex 21 Hardware Manual* for interface details.)

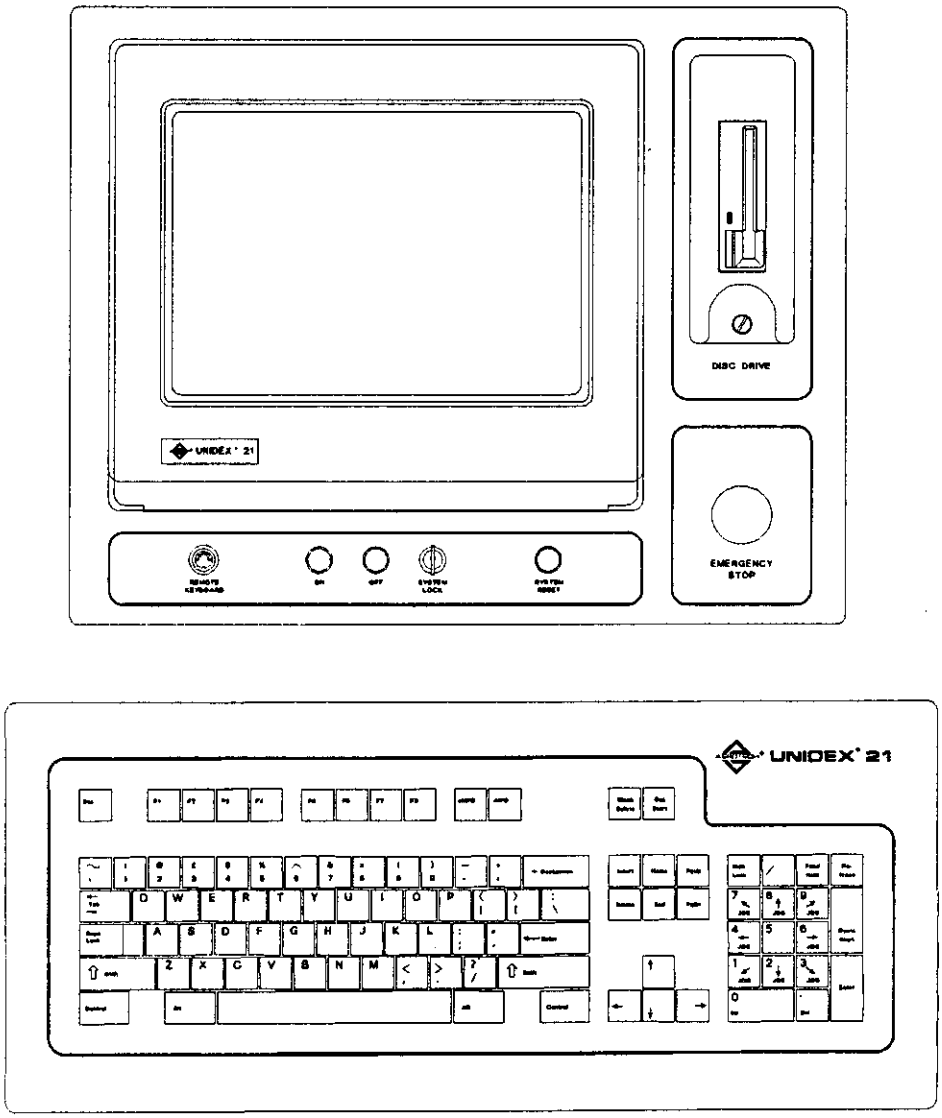


Figure 2-5: Unidex 21, Model U21C Front Panel (Shown with optional Disc Drive)

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CHAPTER 3 : EDIT MODE

SECTION 3-1: INTRODUCTION

Unidex 21 contains a versatile editor enabling the User to edit programs by two methods; "On Screen Editing" and "Menu Driven Editing".

"On Screen Editing" is done directly by entering the desired machine code into the program block. This editing function provides a "what-you-see-is-what you-get" type of editing . The entire program is visible and is altered character-by-character.

"Menu Driven Editing" is an edit function available through an Edit sub-screen. It provides menu selections from which the Unidex 21 writes the program in machine code. Menu selections affecting the entire program as well as those creating or editing a specific program block are available.

This Chapter provides a detailed description of each of the editing methods.

SECTION 3-2: GETTING STARTED

Following Power-up the Initial Selection screen shown below will be displayed:

```
UNIDEX 21      Version xx


EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter. Test, System, Batch, Console, Debug
```

Enter the Edit Mode by pressing "E" from the Initial Selection screen.

The following message will be displayed:

```
Editing mode
> Ctrl (Quit, Abs, Inc digitizing) Filename.type
```

Ctrl Quit - Press "Control Q" to return to the Initial selection screen.

Filename.type - A filename may consist of up to 20 characters (numbers or letters) if it is to be stored in RAM or 18 characters if disk storage is used. It is suggested that the file extension be used to identify a file type, however no restrictions exist except that it be no more than 3 characters in length. Pressing the "Control" and "Q" keys will abandon the Edit mode and return to the Initial selection screen.

Ctrl A Pressing the "Control" and "A" keys enables editing with joystick digitizing in the Absolute mode. (Refer to the *Unidex 21 Option Manual* for Joystick information)

Ctrl I Pressing the "Control" and "I" keys enables editing with joystick digitizing in the Incremental mode. (Refer to the *Unidex 21 Options Manual* for Joystick information.)

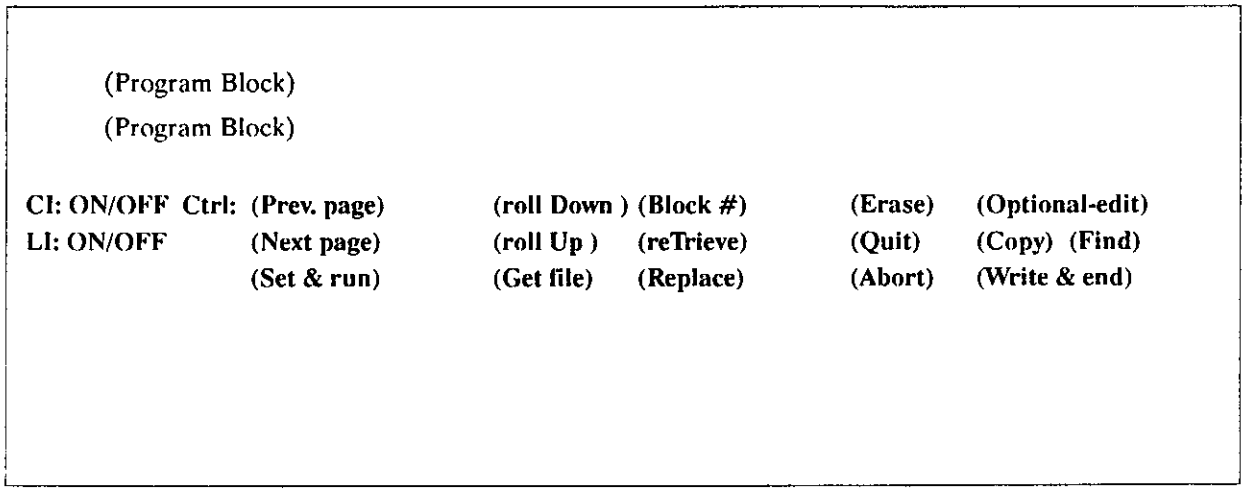
SECTION 3-3: MAIN EDIT SCREEN

Enter the filename to edit or the name of a file to be created.

If the attributes for an existing file have been established as "Read Only" (see Chapter 4; File Mode) an applicable message will appear.

NOTE: If a File attribute is "Read Only", it is not possible to save any on-screen editing that is performed on the file.

The following Edit screen will be displayed:



The following is a description of the "On Screen" Edit mode functions:

(Program Blocks) - Program Blocks may be entered or edited from this listing. Use of the "arrow" keys provides cursor placement.

CI: ON/OFF - The "Insert" key is used to toggle this function (Character Insert) ON or OFF. When ON, characters are inserted without overwriting existing text.

LI: ON/OFF - The "Control" and "Insert" keys are used to toggle the Line Insert Function ON or OFF. When ON, a new line is inserted with each carriage return.

Ctrl Prev page - Press the "Control" and "P" keys to move the cursor to the previous page. The PG UP key performs the same function.

Ctrl Next page - Press the "Control" and "N" keys to move the cursor to the next page. The PG DN key performs the same function.

Ctrl Set & run - The Set & Run function provides the ability to start the run of a program at a selected block. This selection is used in conjunction with the Machine Mode.

Use the "arrow" keys to move the cursor to the program block where the run is to start. Press the "Control" and the "S" keys to initiate the function. The Machine Mode main screen will be displayed and the program segment may be run. (See Chapter 5: Machine Mode)

Ctrl roll Down - Press the "Control" and "D" keys to scroll the program display towards the display's bottom.

Ctrl roll Up - Press the "Control" and "U" keys to scroll the program display towards the display's top.

Ctrl Get file - The **Get file** function provides the ability to retrieve and display another existing file without leaving the Edit mode.

Press the "Control" and "G" keys. The following message will appear: **Get Filename.type from, to.** Enter the filename to be retrieved. Perform a <cr> if the file is to be inserted in it's entirety. If only certain blocks of a file are to be inserted, enter the block numbers in place of **from, to**. The new file will be merged with the existing file at the cursor location.

Ctrl Block # - The Block # function provides the option of displaying block numbers before each program block. Press the "Control" and "B" keys to see: **Number Program Blocks (Yes/No).** Depress "Y" if numbers are desired.

Ctrl reTrieve - The reTreive function is used to establish the location within a program to which previously erased or copied block(s) are to be inserted. Move the cursor to the block number which will precede the inserted block(s). Press the "Control" and "T" keys, the block(s) will be inserted within the program.

Ctrl Replace - The Replace function enables the user to change character strings throughout the file without locating and changing each string individually.

Press the "Control" and "R" keys to see: **FROM string (1 to 30 char.).** Enter the character string to be replaced. The next message will be: **TO string (1 to 30 characters).** Enter the replacement character string. The last message will be: **ALL files/# of blocks.** If the replacement is to occur in all blocks, enter "A". If the replacement is to occur in a specified number of blocks only, enter this number.

Ctrl Erase - To erase blocks from a file, position the cursor at the first block to be erased. Press the "Control" and "E" keys. The display will indicate: **How many blocks to buffer?** Enter the number of blocks to be erased (start with the block containing the cursor).

NOTE: **Erased blocks remain in the system buffer and may be recalled by the "reTrieve" function.**

Ctrl Quit - Press the "Control" and "Q" keys to abandon the Edit function and return to the Initial selection screen. All changes made to the file are discarded.

Ctrl Abort - Press the "Control" and "A" keys to abort a requested function while in the Get file, Find, Replace, Erase and Copy editing functions. You will then be returned to the program being edited.

Ctrl Optional-edit - **Optional Menu Driven** editing is an alternative method of creating or editing program blocks. It provides an easy method of program editing, allowing the user to select a desired menu function which in turn inserts the proper Machine code into a program block. **Menu Driven Editing** may be used to program many common machine moves.

Press the "Control" and "O" keys to enter the **Menu Driven** Edit mode. Refer to Section 3-4 for a detailed description of the **Optional Menu Driven** Edit mode.

Ctrl Copy - Press the "Control" and "C" keys to copy program blocks. The display will indicate: **How many blocks to buffer?** Enter the number of blocks to copy (start with the block containing the cursor.)

Ctrl Write & end - Press the "Control" and "W"" keys to save any changes and return to the Main Selection screen.

Ctrl Find - The **Find** function searches a program, from the cursor block to the end, for a specified string of characters. Press the "Control" and "F" keys to activate the **Find** function. The display will indicate: **FIND string (1 to 30 char.) <CR>.** Enter the character string for the search. The cursor will move to the first occurrence of the specified string. Any editing function may then be performed. Press the "Control" and "F" keys to resume the **Find** function.

SECTION 3-4: OPTIONAL MENU DRIVEN EDITING

Optional Menu Editing may be used to edit an existing program or to create a new program.

When in the Main Edit screen, press the "Control" and the "O" keys to enter the Optional Menu Driven Editing Mode.

The following screen will appear:

```
                    ***MENU DRIVEN EDITING***
M  > program flow                    1  > increment/absolute
2  > english/metric                  3  > corner rounding
4  > ac/deceleration                 5  > cutter compensation
6  > contour/point                   7  > 2nd plane contour
^  > 3rd plane contour               &  > 4th plane contour
8  > 1-2 plane select                *  > 3-4 plane select
9  > dwell in 100 ms  =              F  > contour feedrate =
]  > Axes hardware home  =
[  > load axes position =

---- 1st & 2nd plane axes ----      ---- 3rd & 4th plane axes ----
X =        I =                      x =        i =
Y =        J =                      y =        j =
Z =        K =                      z =        k =
U =        P =                      u =        p =

0  > advance  =
;  > comment  =
CTRL - Quit, @erase, TAB (new), SPACE (next), BACKSPACE (previous) ?
```

The Optional Edit screen indicates the status of the program block at the cursor location where the Optional Edit mode was initiated. If the block contains data not available through any of the Menu Driven Editing functions it will be displayed at **0 > advance = .**

Menu Driven Editing functions are selected by entering the symbol preceding the desired function. Pressing the symbol key repeatedly will display the selections available as a part of that function.

A description of the elements of the Optional Edit Mode follows:

M > program flow Press the "M" key to establish **program flow** code. The selections are; **program stop, optional stop, end of program, end of data** and **return to start.**

Continue to press the "M" key until the desired **program flow** condition is displayed. Press the "Enter" key, the machine code (M0, M1, M2, M32, or M47) for the desired **program flow** condition is entered into the program block at the cursor location where the Optional Edit mode was initiated.

1 > increment/absolute Press the "1" key to establish **incremental** or **absolute** program mode.

Continue to Press the "1" key until the desired positioning mode is displayed. Press the "Enter" key, the machine code (G90/G91) for the desired positioning mode condition is entered into the program block at the cursor location where the Optional Edit mode was initiated.

If no selection of position mode is made, all moves will be done incrementally.

2 > english/metric Press the "2" key to establish units in either **English** or **Metric.** When the desired unit is displayed, press the "Enter" key. The machine code (G70/G71) for the desired unit condition is entered into the program block at the cursor location where the Optional Edit mode was initiated.

If no unit is selected the program will be written in the units established in the Parameter mode.

3 > corner rounding Press the "3" key to activate the **corner rounding** mode. Continue to press the "3" key until **yes** or **no** is displayed. When the desired condition is displayed, press the "Enter" key. The machine code (G23, G24) is entered into the program block at the cursor location where the Optional Edit mode was initiated.

If no condition is selected the non-corner rounding mode will be in effect.

4 > ac/deceleration

Press the "4" key to change **acceleration/deceleration** conditions. Selections are **ac only** and **de only.** When the desired condition is displayed, press the "Enter" key. The machine code (G8, or G9) is entered into the program block at the cursor location where the Optional Edit mode was initiated.

If no condition is selected both acceleration and deceleration will be active.

5 > cutter compensation

Press the "5" key to establish **cutter compensation** position. Selections are **cancel, left** or **right**. When the desired condition is displayed, press the "Enter" key. The machine code (G40, G41, or G42) is entered into the program block at the cursor location where the Optional Edit mode was initiated.

If no condition is selected, **cancel** (no cutter compensation) will be in effect.

6 > contour/point

Press the "6" key to specify the move type. Selections are **point-to-point, linear, CW circular,** and **CCW circular.** When the desired move type is displayed, press the "Enter" key. The machine code (G0, G1, G2, or G3) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is specified, **linear** movement will be in effect.

7 > 2nd plane contour

Press the "7" key to specify the move type of the 2nd plane. The selections are **linear, CW circular** and **CCW circular.**

When the desired move type is displayed, press the "Enter" key. The machine code (G11, G12, or G13) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is selected, **linear** movement will be in effect.

^ >3rd plane contour Press the "^" key to specify the move type of the 3rd plane. The selections are **linear, CW circular** and **CCW circular.**

When the desired move type is displayed, press the "Enter" key. The machine code (H1, H2, or H3) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is selected, **linear** movement will be in effect.

& >4th plane contour Press the "&" key to specify the move type of the 3rd plane. The selections are **linear, CW circular** and **CCW circular.**

When the desired move type is displayed, Press the "Enter" key. The machine code (H11, H12, or H13) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is selected, **linear** movement will be in effect.

8 > 1-2 plane select Press the "8" key to specify the axis plane designations for the 1st and 2nd plane. The selections are **XY/ZU, ZX/YU**, and **YZ/XU**.

When the desired axes designations are displayed, press the "Enter" key. The machine code (G17, G18, or G19) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is selected, **XY/ZU** will be the designated as the 1st and 2nd axes planes.

*** >3-4 plane select** Press the "*" key to specify the axis plane designations for the 3rd and 4th plane. The selections are **xy/zu, zx/yu**, and **yz/xu**. When the desired axes designations are displayed, press the "Enter" key. The machine code (H17, H18, or H19) is entered into the program block at the cursor position where the Optional Edit mode was initiated.

If no condition is selected, **xy/zu** will be the designated as the 3rd and 4th axes planes.

9 > dwell in 100ms = Press the "9" key to specify a dwell within the program. Key in the desired dwell time in 100ms blocks (7 digits maximum). The machine code (G4) will be entered into the program block at the cursor position where the Optional Edit mode was initiated.

F > contour feedrate = Press the "F" key to specify the contour feedrate (inches/minute). Key in the desired feedrate (9 digits maximum). The feedrate will be incorporated into the program at the cursor position where the Optional Edit mode was initiated.

] > Axis hardware home = Press the "]" key to specify an axis home within the program. Key in the home reference position. The home reference position will be entered into the program block at the cursor position where the Optional Edit mode was initiated.

[> load axis position = Press the "[" key to load in new axes references for the present axis position. The machine code (G92) is entered into the program at the cursor position where the Optional Edit mode was initiated.

0 > advance = A block of machine program to be edited that is not recognized by the Menu Driven Edit Menu is displayed at the **0 > advance =**. Press the "0" key to edit the displayed 0 program block. When editing is complete press the "Enter" key.

; > comment = Press the ";" key to enter comments or notes to follow a program block. Comments or notes are visible from within the program but have no effect on the intent of the program.

CTRL - Quit Press the "Control" and "Q" keys to return to the Main Edit screen.

@ erase Press the "Shift" and "@" keys to erase the currently displayed program block and associated comments.

TAB (new) Press the "TAB" key to insert a new program block into an existing program.

SPACE Press the "SPACE" bar/key to bring the next program block into the Optional Edit screen.

BACKSPACE (previous) Depress the "BACKSPACE" key to bring the previous program block into the Optional Edit screen.

When Optional Menu Driven Editing is complete, press the "Control" and "Q" keys to return to the Main Edit Menu. To save program changes that were made in the Optional Menu Driven Edit Mode, depress the "Control" and "W" keys.

OPTIONAL MENU EDITING PROGRAM EXAMPLE

Optional Edit Menu Entry	Resulting Program
] X,Y,Z	(REF, X,Y,Z)
2 Enter English	G70
1 Enter Absolute	G90
F 1000	F1000
X 10.	
Y5.	X10.,Y5.
9 2	G4 F0.5.
X 20.	
Y10.	X20.,Y10.
M Enter program stop	M0

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CHAPTER 4: FILE MODE

SECTION 4-1: INTRODUCTION

The Unidex 21 provides a full range of file management capabilities. Through the keyboard, files which are retained in the Unidex 21's internal memory as well as files accessable through the optional floppy disk drive, may be listed, verified, transferred, etc.

This chapter provides a detailed description of each of the Unidex 21 file management functions.

SECTION 4-2: GETTING STARTED

Following Power-Up the initial selection screen below is displayed:

```
UNIDEX 21      Version xx

EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Press the "F" key to enter the File Mode. The following message will be displayed:

```
Attrib, Backup, Copy, Dir, Erase, Input, Output, PLC, Load-from-pointer,
Rename, Sumcheck, Transfer, Verify, aXiscal, Ctrl Quit

> Select function
```

SECTION 4-3: FILE MANAGEMENT FUNCTIONS

4-3-1: ATTRIBUTES

The File Attribute function permits the user to establish conditions to limit the accessibility of a particular file.

Press the "A" key to establish the access attributes of a file.

The Display will be:

```
Memory file attribute function
> Ctrl - Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the name of the file to set attributes.

The display will be:

```
> Read only?    Write - read?    No change?
```

Read Only - Press the "R" key to prevent any alterations from being made to the file. While Attribute is set to **Read only**, an attempt to alter the file, will result in the following message:

```
File Attribute Read Only. Hit "Enter" to continue
```

Write-Read - Press the "W" key to allow editing of the designated file.

No change - Press the "N" key to retain a previously established attribute. No change is most often used when the Attribute function has been entered inadvertedly and no status change is desired.

4-3-2: BACKUP

The File Backup function provides file management utilities for the optional Floppy Disk Backup system. Press the "B" key to see the following Backup sub-menu:

```
Floppy disk utility

Attrib, Dir, Erase, Format, Output, Rename, Verify, Ctrl Quit,
Load-to-Memory, Save-to-disk

> Select function:
```

4-3-2-1: BACKUP ATTRIBUTES

Press the "A" key to establish the access attributes of a floppy disk file.
The Display will be:

```
Disk file attribute function
> Ctrl - Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Enter the name of the file to set the attributes.
The Display will be:

```
> Read only?    Write - read?    No change?
```

Read Only - Press the "R" key to prevent alterations from being made to the file. While Attribute is set to **Read only**, any attempt to alter the file, will result in the following message:

```
File Attribute Read Only. Hit "Enter" to continue
```

Write-Read - Press the "W" key to allow editing of the designated file.

No change - Press the "N" key to retain a previously established attribute. No change is most often used when the Attribute function has been entered inadvertently and no status change is desired.

4-3-2-2: BACKUP DIRECTORY

Press the "D" key for a directory of the files available from the floppy disk drive. The display will be:

Disk file name	Type	Status	Length	Last edit date
.....	.....	.....	.....	.....

More, others Quit
> press any key to Quit, Mem.left (bytes) = xxxxx

Disk file name - The name of all files contained on the floppy disk will be listed below.

Type - The file name extension is listed below.

Status - The file Status column indicates the Attribute setting of a file. A file having a "R" in this column has been set for "Read only" through the Attribute function. This file cannot be altered in any way. A file having a "B" in this column indicates the file consists of binary data. A file with no entry in this column is set for "Write - Read" and may be altered by the User.

Length - The file Length column indicates the number of bytes a file occupies on the disk.

Last Edit Date - The Last Edit Date column indicates the date a file was last copied.

Memory.left (bytes) - "Memory left" indicates the number of bytes still available on the floppy disk.

Press any key to return to the Backup file menu.

4-3-2-3: BACKUP ERASE

Press the "E" key, the display will be:

```
> Ctrl Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the Backup file menu.

Enter the filename.type to be erased. The file will be erased from the disk.

4-3-2-4: BACKUP FORMAT

The Format function is used to format a floppy disk within the Unidex 21's disk drive. Prior to formatting a disk, the disk configuration, single or double sided, must be selected in the Parameter Mode (Chapter 6).

From the Backup file menu, press the "F" key. The display will be:

```
WARNING!! Format will erase all data on disk.

> Press <CR> to continue, any other key to quit.
```

When format of the disk is complete the following message will be displayed:

```
***Format complete, Format another? (Yes/No)
```

4-3-2-5: BACKUP OUTPUT

The Output function permits the user to send files from the floppy disk to the RS-232 Output.

Press the "O" key to initiate the RS-232 output function.

The display will be:

```
Output files from disk to RS-232/IEEE488
> Ctrl - Quit, Ctrl - All <CR>, filename.type =
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Press the "Control" and "A" keys to send all files on the floppy disk through one of the RS-232 ports or the IEEE-488 Port.

Enter the filename.type to be sent through the RS-232 or IEEE-488 Port.

The display will be:

```
> port-A, port-B, Ieee488, Ctrl-Quit
```

Press the "A" key to send the file through RS-232 Port-A. Press the "B" key to send the file through RS-232 Port-B.

Press the "I" key to send the file through the IEEE-488 Port.

The file output format will be:

(header)
%
file text
(end-of-file)

Press the "Control" and "Q" keys to return to the main Backup File menu.

4-3-2-6: BACKUP RENAME

Press the "R" key to change the name of a file on the floppy disk.

The display will be:

```
Rename file in disk
> Ctrl-Quit, filename.type=
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Enter the filename.type to be renamed.

The display will be:

```
> Ctrl-Quit, filename.type
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Enter the new filename.type.

4-3-2-7: BACKUP VERIFY

The Verify function provides the user with a method of checking files and or recorded data that has been copied onto the floppy disk, against the original file that remains in system memory.

Press the "V" key to initiate file or data verification. The display will be:

```
Verify file or recorded data from disk to memory
> Ctrl-Quit, Ctrl-All <CR> filename.type =
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Press the "Control", "A" and "Enter" keys to Verify all the files on the floppy disk against the corresponding files in the system memory.

NOTE: Recorded (Binary) data files must be verified individually.

Enter the filename.type from the disk, which is to be verified.
The display will be:

```
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main Backup file menu.

Enter the memory filename.type to be used to verify the disk file.

Following file verification, one of two messages will be displayed:

```
Verify OK, press any key to continue
```

```
Verify fail, press any key to continue.
```

Press any key to return to the main Backup file menu.

4-3-2-8: BACKUP QUIT

Press the "Control" and "Q" keys to return to the main File menu.

4-3-2-9: BACKUP LOAD-TO-MEMORY

The Load-to-Memory function is used to transfer files from the disk drive to the Unidex 21 memory. Depress the "L" key to initiate the Load-to-memory function.

The display will be:

```
Load file(s) or recorded data from disk to memory
> Ctrl-Quit, Ctrl-All <cr>, filename.type =
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Press the "Control" and "A" keys to load all of the files contained on the floppy disk into the Unidex 21 memory.

NOTE: Recorded (Binary) data files must be loaded individually

Enter the disk filename.type which is to be loaded into the Unit's memory.

The display will be:

```
> Ctrl-Quit, filename.type =
```

Enter the filename.type of the file which will reside in the Unidex 21's memory.

NOTE: The Load-to-memory function will not over-write an existing file. To update a file in memory from the floppy disk, it is necessary to first erase/rename the file from the Unidex 21 memory, then load the file from the disk to memory.

4-3-2-10: BACKUP SAVE-TO-DISK

The Save-to-disk function allows the User to copy files from the Unidex 21's memory onto the Floppy disk. Depress the "S" key to initiate the Save-to-disk function.

The display will be:

```
Save file(s) or recorded data from memory to disk
> Ctrl-Quit, All, Recorded <cr>, file =
```

Press the "Control" and "Q" keys to return to the main Backup File menu.

Press the "Control", "A" and "Enter" keys to copy all files from the Unidex 21's memory to the Floppy disk.

Press the "Control" and "R" keys to copy Recorded (Binary) files from the Unidex 21's memory to the Floppy disk.

NOTE: Recorded (Binary) data files must be backed up individually.

Enter the filename.type of the file to be saved.

The display will be:

```
> Ctrl-Quit, filename.type =
```

Enter the disk filename.type which will receive the file being saved.

NOTE: The Save-to-disk function will not over-write an existing file. To update a file onto floppy disk from memory, it is necessary to first erase/rename the file from the disk, then save the file from memory to disk.

4-3-3: COPY

The File Copy function permits the user to duplicate files within the Unidex 21's memory. Press the "C" key from the main File menu to see:

```
Copy file from memory to memory
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the File main menu.

Enter the filename.type of the origin file.

The display will be:

```
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the new filename.type. The file will be copied to this name.

4-3-4: DIRECTORY

To initiate a Directory listing of the Unidex 21's memory, press the "D" key. The display will be:

```
memory file name    type    status    length    sumchk    last edit date


> More, others  Quit
> Press any key to quit, memory left (bytes) = xxxxxxx    allocated memory = xxxxxxxx
```

Memory File name - The names of all of the files contained in memory will be listed below.

Type - The file name extension is listed below.

Status - The file status column indicates a file's Attribute setting. A file having an "R" in this column has been set for "Read only" through the Attribute function. This file cannot be altered in any way. A file with no entry in this column is set for "Write-read" and may be edited by the User.

A file with an "A" in this column is set "Active" to run and cannot be altered. This is established in the Machine mode.

Length - The file Length column indicates the number of bytes a file occupies in memory.

Sumchk - The alpha-numeric number listed in the Sumchk column is derived from an internal summation of the bytes in a file. It is used for file integrity verification.

Last edit date - The last edit date column indicates the most recent date a file was created or copied.

Memory left - "Memory left" indicates the number of bytes still available in the Unidex 21's memory.

Allocated memory - The number of memory bytes, allocated by the **MALC** command to run backround functions.

Press any key to return to the File menu.

4-3-5: ERASE

The Erase function permits the user to delete entire files from the Unit's memory. Press the "E" key to see:

```
> Ctrl Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type to be deleted. The file will be deleted from the Unidex 12's memory.

4-3-6: INPUT

The Input function is used to import files through one of the RS- 232 ports or the IEEE-488 port into the Unidex 21's memory.

Press the "I" key to initiate the Input function.
The display will be:

```
> Input file from RS-232 /IEEE488 to memory
> port-A, port-B, IEEE488, Ctrl-Quit
```

Press the "A" key to receive the file through the RS-232, Port A.
Press the "B" key to receive the file through the RS-232, Port B.
Press the "I" key to receive the file through the IEEE-488 Port.
The display will be:

```
> Port-A/B, IEEE488 to
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type to be received through the RS-232 or IEEE488 Ports. The file will be input into the Unidex 21's memory. The source file must contain a "%" at the beginning of valid data and an "end-of-file" code at the end.

4-3-7: OUTPUT

The Output function is used to send files from the Unidex 21's memory through one of the RS-232 ports or the IEEE488 port.

Press the "O" key to initiate the Output function.
The display will be:

```
> Output files from memory to RS-232/IEEE488
> Ctrl-Quit, Ctrl-All <cr>, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Press the "Control", "A" and Enter keys to output all files from the Unidex 21's memory, through the RS-232 or IEEE488 ports.

Enter the filename.type to be output through the RS-232 orIEEE488 ports.
The display will be:

```
> port-A, port-B, IEEE488 .Ctrl-Quit
```

Press the "A" key to send the file through the RS-232, Port A.
Press the "B" key to send the file through the RS-232, Port B.
Press the "I" key to send the file through the IEEE-488 Port.

The file output format for a single file is:

(header)
%
file text
(end-of-file)

The file output format for multi-files is:

(header)
%
file text
(end-of-file)
(header)
%
file text
(end-of-file)
.....
.....
(end-of-all-file)

NOTE: **The Unidex 21 is equipped with an RS-232/IEEE-488 Time-out feature. When sending or receiving data, if the external device does not respond to input/output in a predetermined length of time (see Chapter 6: Parameter Mode) an error message will be displayed.**

Press the "Control" and "Q" keys to return to the main File menu.

4-3-8: RENAME

The Rename function permits the renaming of any file in the Unidex 21's memory. Press the "R" key, the display will be:

```
Rename file in memory
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type of the file to be renamed.
The display will be:

```
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.
Enter the new filename.type. The File will be renamed.

4-3-9: PLC

The Programmable Logic Controller Option. (Refer to the *Unidex 21 Option Manual* for a description of the PLC option.)

4-3-10: LOAD-FROM-POINTER

The Load-from-pointer function provides access to files stored in a User's auxiliary memory board. Press the "L" key, the display will be:

```
Load file from address pointer to user's memory
> Ctrl-Quit, Address pointer (Hexadecimal) = xxxx
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the Hexadecimal file location. The display will be:

```
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type for the file being loaded. The source files being loaded must contain a "%" at the beginning of valid data and an "end-of-file" code at the end. (See Chapter 6: Parameter Mode.) The file will now appear in the system directory.

4-3-11: SUMCHECK

The Sumcheck function is used to compare a file contained in the systems memory against a file which has been output through an RS- 232 or IEEE-488 port. Press the "S" key to initiate the Sumcheck function.

The display will be:

```
Output memory file sum-check to RS-232/IEEE488
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main file menu.

Enter the filename.type. The display will be:

```
> port-A, port-B, IEEE488, Ctrl-Quit
```

Press the "A" key to send the sumcheck to RS-232 Port A.
Press the "B" key to send the sumcheck to RS-232 Port B.
Press the "I" key to send the sumcheck to the IEEE-488 Port.
Press the "Control" and "Q" keys to return to the main File menu.

4-3-12: TRANSFER

The Transfer function establishes communication with another AEROTECH device.

NOTE: A file must have been previously developed to initialize the peripheral AEROTECH device.

Press the "T" key to initiate the Transfer function. The following series of displays are applicable when establishing communication with another AEROTECH device.

```
Transfer data to another AEROTECH system
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type of the initialization file to activate the Transfer function. The display will be:

```
Ctrl-Quit, Input-file, Output-file, Transfer-only:
```

Press the "Control" and "Q" keys to return to the main File menu.

Press the "I" key to Input a file from another AEROTECH device. The display will be:

```
> Input file after transfer complete
> port-A, port-B, IEEE488, Ctrl-Quit
```

Press the "A" key to input the file through RS-232 Port A.
Press the "B" key to input the file through RS-232 Port B.
Press the "I"key to input thr file through the IEEE-488 Port
Press the "Control" and "Q" keys to return to the main File menu.

The display will be:

```
> port-A/B , IEEE488,to
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.
Enter the filename.type to which the the file being input will be written.

To Output a file to another AEROTECH device following initialization of the Transfer mode, press the "O" key. The display will be:

```
> Output file after transfer complete
> Ctrl-Quit, Ctrl All, filename.type
```

Press the "Control" and "Q" keys to return to the main File menu.

Press the "Control" and "A" keys to Output all files from the User's Unidex 21 memory to another AEROTECH device.

Enter the filename.type of the file which is to be Output from the User's Unidex 21.

The display will be:

```
> port-A, port-B, IEEE488, Ctrl-Quit
```

Press the "A" key to Output the file through RS-232 Port A.
Press the "B" key to Output the file through RS-232 Port B.
Press the "I" key to Output thr file through the IEEE-488 Port.
Press the "Control" and "Q" keys to return to the main File menu.

"Transfer-only" sends only the initialization file from the User's Unidex 21 to the peripheral AEROTECH device. When the "Transfer- only" function is complete, communication is possible between the AEROTECH device and the User's Unidex 21.

Press the "T" key, the display will be:

```
Transfer data to another AEROTECH system
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type of the initialization file.
The display will be:

```
> Transfer data only
> port-A, port-B, IEEE488, Ctrl-Quit
```

Press the "A" key to transfer data through RS-232, Port A.
Press the "B" key to transfer data through RS-232, Port B.
Press the "I" key to transfer the data through the IEEE-488 Port.
Press the "Control" and "Q" keys to return to the main File menu.

4-3-13: VERIFY

The Verify function provides the User with a method of assuring that file manipulations have not affected the integrity of a file.

Press the "V" key from the main File menu . The display will be:

```
Verify file from memory to memory:
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.
Enter the filename.type of the the file to be verified.

The display will be:

```
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the filename.type of the file to which the file to be verified should be compared.

4-3-14: AXISCAL

The aXiscal function provides the User with alternatives for storing Axis Calibration data. Calibration data may either be saved from the Indexing Board to RAM in the form of a file, or loaded as a file from RAM to the Indexing Board for processing.

Press the "X" key from the main File menu. The display will be:

```
Axis calibration data, Save to RAM or Load to INDEXING

> ctrl - Quit, S1 to S8, L1 to L8
```

Press the "Control" and "Q" keys to return to the main File menu.

Press S1 through S8 to transfer Axis Calibration data from the Indexing Board to a file to be stored in RAM. The display will be:

```
> ctrl - Quit, filename.type
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the Filename.type of the file to which the Axis Calibration data will be saved in RAM.

Press L1 through L8 to load an Axis Calibration file to the Indexing Board for processing. The display will be:

```
> ctrl - Quit, filename.type
```

Press the "Control" and "Q" keys to return to the main File menu.

Enter the Filename.type of the Axis Calibration file that is to be loaded to the Indexing Board for processing.

NOTE: Comments may be added to a File containing Axis Calibration data by preceeding the text with a ";". (See the *Unidex 21 Programming Manual* for details on the use of the ";".) All data located between the ";" and the block's end is ignored by the Unidex 21.

4-3-15: CTRL-QUIT

Press the "Control" and "Q" keys to return to the initial selection menu.

CHAPTER 5: THE MACHINE MODE

5-1: INTRODUCTION

The Machine Mode is the mode in which programs are run and axis motion will occur. Prior to entering the Machine Mode, make certain that the appropriate Parameters have been established. (See Chapter 6: The Parameter Mode)

WARNING: **Prior to entering the Machine Mode, make certain all hardware is configured such that no injury to personnel or damage to equipment will occur.**

The following sections provide detailed information concerning Machine Mode programming and operation.

SECTION 5-2: GETTING STARTED

Following Power-Up, the initial selection screen is displayed:

```
UNIDEX 21      Version xx


EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter. Test, System, Batch, Console, Debug
```

Press the "M" key to enter the Machine Mode. The following screen will be displayed:

```
        X     0.000        x     0.000
        Y     0.000        y     0.000
        Z     0.000        z     0.000
        U     0.000        u     0.000


H1 H11 H17 G1 G11 ..... (system codes)        Feedrate =  0.00      0.00

.....(program)


Ctrl (Auto/Single [S]) (C-start) (Error ack) (Feedhold) (Track) (D-Scope)(Quit)

> Home, Jog, Mdi, Run, Slew, Wheel, Ctrl-^ Abort    select :
```

SECTION 5-3: MACHINE MODE SCREEN DESCRIPTION

A description of the display follows:

5-3-1:
```
X  0.000    x  0.000
Y  0.000    y  0.000
.....       .....
```

Relative tracking position is displayed for each axis as the program is run. Position is displayed either in machine or program steps (See Chapter 6: Parameter Mode).

5-3-2: (system codes)

These codes indicate the status of the following parameters:

Contour Type (G1,G2,G3,G5,H1,H2,H3,H5)
Contour Plane ((G17,G18,G19,H17,H18,H19)
Corner/Non-Corner Rounding (G23,G24)
ICRC (G40,G41,G42)
Metric/English (G71/G70)
Absolute/Incremental (G90/G91)

5-3-3: Feedrate

Feedrate is the speed at which the axes execute a programmed move. The left display indicates the Feedrate as programmed. The right display indicates the programmed Feedrate multiplied by the MFO% value.

5-3-4: (Program display)

Each block of the program is displayed as it is being executed. If Block numbers have been established in the Edit Mode they will be displayed before each block.

5-3-5: Ctrl (Auto/Single [S/A]

A program may be run one block at a time or continuously from start to finish. The default setting runs the program one block at a time. Press the "Control" and "C" keys, or the Front Panel's CYCLE START button to step through the program.

Press the "Control" and "A" keys to run the program automatically.

5-3-6: Cycle Start

Press the "Control" and "C" keys or the Front Panel's CYCLE START key to step through a program that is to be run, one block at a time.

The Cycle Start function may be factory set to respond to continuous key depression in one of two ways; either continuous key depression will have no effect on the single program block run, and each key depression will run only one block, or continuous key depression will result in program blocks being run one after another as long as the key continues to be depressed.

This function may also be used to continue a program following a Program Stop (M0) or Optional Program Stop (M1).

5-3-7: Error ack

At times, during the run of a program, an error message may appear. If instructions are not provided to alleviate the error condition, the message may be cleared to permit further action, by depressing the "Control" and "E" keys, acknowledging the error message and continuing with the requested function..

5-3-8: Feedhold

Press the "Control" and "F" keys to halt all axis motion. The Front Panel FEEDHOLD key may also be used for this function. Press the "Control" and "F" keys a second time to resume axis motion.

Several conditions exist concerning the Feedhold operation :

1) Use of the Abort function while in the Machine Mode will cancel a previously established Feedhold.

2) If a Feedhold is initiated while using the Mdi function of the Machine Mode, in order to quit the function, either the Feedhold must be released to allow completion of the move or the move must be aborted ("Control" "^").

3) If a Feedhold is initiated while in the Machine Mode's Jog function, in order to quit the function, either the Feedhold must be released to allow completion of the move, or the system must be Reset. Aborting the move ("Control"" ^ ") will not permit exit from the Jog function.

4) If a Feedhold is initiated when a program is in the Machine Run Mode the following message will be displayed:

> **> < release feedhold > , Jog, Wheel, Ctrl- ^ abort select:**

Press the "Control" and "F" keys or the Front Panel FEEDHOLD key to cancel the Feedhold and continue running the program.

Press the "J" key to enter the Jog mode. (See Section 5-3-13 for a description of the Jog function.)

Press the "W" key to enter the Handwheel mode. (See Section5-3-17 for a description of the Handwheel function.)

Press the "Control" and "^" keys to abort this function and return to the Machine Mode menu.

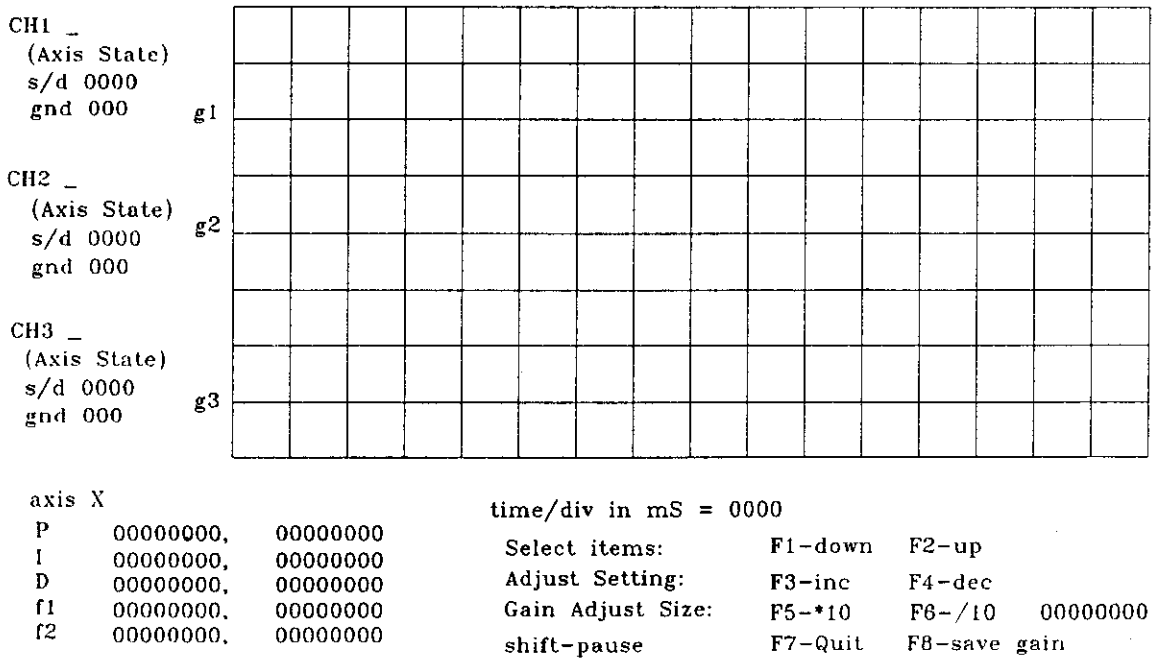
5-3-9: Track

The Unidex 21 automatically updates the Machine Mode tracking display unless instructed otherwise from within the program (TRAK,0) or through an MDI entry. When the automatic tracking has been disabled in one of these ways, current information may be displayed by depressing the "Control" and "T" keys.

5-3-10: D-Scope

The Digital Scope function permits the User to view positioning functions while a program is being run.

Press the "Control" and "D" keys to enter the D-Scope Mode.
The display will be:



The following is a description of the Digital Scope functions:

CH1_/CH2_/CH3_ The axis to be profiled is entered at this location. Three axes profiles may be viewed simultaneously.

Axis State The User selects the Axis State to be profiled. The Axis States available for profiling are;

mS Command - displays the motion profile that is currently executing.

Position Error - displays an indication of the difference between the requested position and the actual position.

Integral Error - displays the accumulation of the position error.

Velocity Error - displays an indication of the difference between the requested velocity and the actual velocity.

s/d The desired number of machine steps per vertical division is entered at this location.

gnd Indicates the relative location of the ground to the baseline.

Axis_ Designates the name of the axis for which the gain and feedforward settings are displayed.

The following group of settings are the PID and Feedforward Gains for a designated axis. The first number is the default setting or the setting that has been established within the Auto-Tune procedure. (Refer to Chapter 6 : Parameter Mode, of the *Unidex 21 User's Manual.*) The second number may be established by the User as a proposed PID or Feedforward setting. These settings may be modified by the User and the effect upon the motion profile can be monitored on the display. When the desired system response is obtained, these settings may then be saved and will become the new default parameters.

P	00000000,	00000000	Proportional Gain Setting.
I	00000000,	00000000	Integral Gain Setting
D	00000000,	00000000	Derivative Gain Setting
f1	00000000,	00000000	Velocity Feedforward Setting
f2	00000000,	00000000	Acceleration Feedforward Setting

time/div in mS — Provides the User the ability to establish the number of milli-Seconds each division will represent.

Select Items — The F1 key moves the cursor down through the list of options. The F2 key moves the cursor up through the list of options. The cursor must be located at the setting to be altered.

Adjust Settings — When the cursor is located at the setting to be changed, the F3 key may be used to increment through the setting variables. The F4 key may be used to decrement through the setting variables.

Gain Adjust Size — Increments (F5) or decrements (F6) by a power of 10 the constant that is located to the far right of F6. This constant is used to modify PID and Feedforward Gains (i.e. when the constant is set at 1000, pressing F4 or F3 will cause the selected Gain value to increment or decrement by 1000).

Shift — Causes the display to pause.

Quit Press the F7 key to quit the D-Scope Mode and return to the Machine Mode.

Save Gain Press the F8 key to save the Gain and Feedforward settings that were established while in the D-Scope Mode.

5-3-11: Quit

Press the "Control" and "Q" keys to return to the previous selection screen.

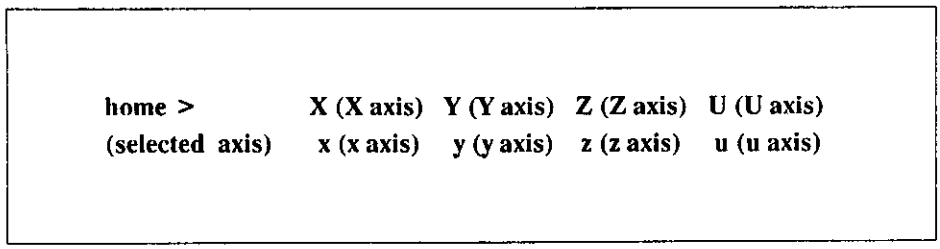
5-3-12: Home

The Home function of the Machine Mode is used to send any axis to it's Home position. If it is requested within a program, all axis movement is stopped and the selected axis is returned to it's Home position.

The Feedrate and direction of the Home move is established within the Parameter Mode (Chapter 6 of this manual).

Following a Home function the Auto-Single run mode returns to the default of Single block movement.

Press the "H" key from the main Machine menu to select the axis to send Home. The display will be:



Press the key(s) of the axes to be sent Home. If the Tracking display is ON, the axis position display for the appropriate axis should go to zero. When axes selection is complete, press the "Control" and "Q" keys to return to the main Machine Mode menu.

5-3-13: Jog

The Jog function enables the User to move one axis at a time with the use of the Keyboard's arrow keys.

The assignment of arrow key/axis and direction is done in the Parameter Mode's Axis settings (Chapter 6). The default setting for positive direction is CW. The default settings for arrow/axis assignment are as follows:

Press the "Control" and "G" keys to toggle between arrow/axis keys 1-4 and 5-8.

Axis 1-4	Axis 5-8
X axis = 6-4 keys	x axis = 6-4 keys
Y axis = 9-1 keys	y axis = 9-1 keys
Z axis = 8-2 keys	z axis = 8-2 keys
U axis = 3-7 keys	u axis = 3-7 keys

Press the "J" key to enter the Jog function. The following menu will be displayed:

```
jog> Top, High, Medium, Low, Step, Velocity, Ctrl-(Return), (Preset) (Group 1)
<speed = (T/H/M/L/S)    increment = (10000/1000/100/10/1) steps
```

NOTE: If a Feedhold is initiated while in the Machine Mode's Jog function, in order to quit the function, either the Feedhold must be released to allow completion of the move, or the system must be Reset. Aborting the move ("Control"" ^ ") will not permit exit from the Jog function.

5-3-13-1: Speed/Increment

Press the "T", "H" "M" "L" or "S" keys to set the axis speed or incremental distance of a jog move.

The Jog/Velocity function permits the User to jog an axis at a set speed but with no set incremental distance. The axis will continue to move as long as the arrow key is depressed. (The Jog/Velocity function is not valid forUnidex 21, Model U21B used in conjunction with a TeleVideo 905 Video Display Terminal.)

5-3-13-2: Return

The Return function permits the User to send the axis to the position established by the Preset function. (See next Section)

5-3-13-3: Preset

The Preset function is used to establish a temporary point to which the User desires to return. Use the Preset function as follows:

Jog the axis to a desired location. Press the "Control" and "P" keys to temporarily store this point.

The axis may now be jogged to another location, pressing the "Control" and "R" keys will return the axis to the Preset location.

The Preset location remains until overwritten.

5-3-13-4: Group 1/2

Group 1 consists of axes 1-4 (X, Y, Z,U). Group 2 consists of axes 5-8 (x, y, z,u). Press the "Control" and "G" keys to toggle between Group 1 or Group 2.

5-3-14: Mdi (Manual Data Input)

Mdi (Manual Data Input) allows the user to stop a program run, enter a move or change a status, then return to the program run. A status change by the Mdi function overrides those previously established in the program. The "up arrow" and "down arrow" keys may be used to recall previously entered Mdi data. (See Chapter 6 of this manual for Parameter Mode information, and the *Unidex 21 Programming Manual* for programming information.)

NOTE: If a Feedhold is initiated while using the Mdi function of the Machine Mode, in order to quit the function, either the Feedhold must be released to allow completion of the move or the move must be aborted ("Control" "^").

5-3-15: Run

The Run function provides the User with the ability to execute a complete program. Press the "R" key to begin a program run, the following message will be displayed:

```
run > Filename.type =
```

The Filename.type of the program to be run may be entered or the "up arrow" and/or "down arrow" keys may be used to recall previously run filenames. Press Enter when the desired filename is displayed. If the "Single/Auto" function is set to "A" the program will soon begin to run. If the "Single/Auto" function is set to "S" only the first block of the program will run. Subsequent blocks must be run by pressing the "Control" and "C" keys or the CYCLE START key of the Front Panel. If the program was initially set to run Single and is switched to Auto the "Control" and "C" keys and or the Front Panel CYCLE START key must be pressed to start program run.

NOTE: Some Unidex 21 systems may be factory configured such that the program will not begin to run until the "Control" and "C" keys or the Front Panel CYCLE START key is depressed.

The "Control" and "Quit" keys may be pressed to exit the Machine Mode during the running of the program. The program will continue to run although other Unidex 21 functions are available to the User.

NOTE: If a Feedhold is initiated when a program is in the Machine Run Mode the User is given the option of entering the Jog or Handwheel Mode then returning to the program run. (See Item 5-3-8 for details concerning Machine Mode Feedhold.)

5-3-16: Slew

The Slew function is used in conjunction with the Joystick or Trackball option. It provides a function similar to Jog in that it permits manual axis movement. In addition to being accessable from the main Machine Mode it may also be activated from the "Mdi" mode or from the User's program.

When activated from the Machine Mode **all** axes are enabled and under Joystick/Trackball control.

The following Joystick/Trackball settings are available from the Parameter Mode (Chapter 6):

Joystick/Trackball Axis pairings for Slew operation.
Assignment of positive direction. The default setting for positive direction is CW.
An absolute window may be established governing axis movement while under Joystick/Trackball control.
The Joystick/Trackball Hi/Lo speed (steps/sec).

Press the "S" key from the Machine Mode main menu to activate the Slew function. The display will be:

```
Slew > Joystick, Trackball
```

Press the "J" key if a Joystick is being used, Press the "T" key if a Trackball is being used.

Refer to the *Unidex 21 Options Manual* for detailed instructions concerning Joystick/Trackball use.

5-3-17: Wheel

Press the "W" key from the Machine Mode main menu to activate the Unidex 21 for Handwheel use. The display will be:

```
Handwheel      X (X  ) Y(Y  ) Z(Z  ) U(U  )
(selected axis) x (x  ) y(y  ) z(z  ) u(u  )
                Disarm (D/A)  Input (1/2)  High (XXX)  Low
```

Press the key of the axis to be active for Handwheel use. The selected axes name will be displayed at the lower left corner of the display.

Upon axis selection the Disarm status will change to Armed (A).

NOTE: During Handwheel operation the Handwheel may be disarmed at any time by pressing the "D" key.

Input is available from one of two ports. Press the "I" key to toggle between Input ports 1 and 2.

The ratio of Handwheel increments to machine steps is established by the High/Low settings of this display.

Press the "H" key to increase the number of machine steps equal to each Handwheel increment. (Pressing the "H" key increases the machine steps in increments as established in the Parameter Mode (see Chapter 6 of this Manual for Parameter information). Press the "L" key to decrease the number of machine steps equal to each Handwheel increment. (Pressing the "L" key decreases the machine steps in increments as established in the Parameter Mode (see Chapter 6 of this Manual for Parameter information). (Refer to the *Unidex 21 Options Manual* for detailed Handwheel operating instructions.)

NOTE: If the Handwheel has been previously enabled by an Mdi entry or program command, entering the Handwheel function through the Machine Mode allows the User to establish different parameters and use the Handwheel. At the conclusion of Machine Mode Handwheel use the Machine Mode Handwheel function may be "quit" and the Handwheel settings will return to those established through the Mdi or Program.

5-3-18: Ctrl-^Abort

A program being run or Mdi data being entered, may be aborted by pressing the "Control" and "^" keys. The program run will stop and the files set to an inactive status. Mdi data will be abandoned. If a Home or Slew move is in progress, the current move will be completed before the files are set to an inactive status.

This is the only function that will abort a program run once it has been initiated.

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CHAPTER 6: THE PARAMETER MODE

SECTION 6-1: INTRODUCTION

Program parameters are established within this mode. Default parameters are factory set and applicable for most program applications. Before entering the Parameter mode, the User must have established a thorough understanding of the Unidex 21 as well as a high degree of familiarity with this manual and the Unidex 21 Hardware and Unidex 21 Programming manuals.

WARNING: PRIOR TO CHANGING ANY DEFAULT PARAMETER SETTINGS, SAVE THE DEFAULT SETTINGS TO A FILE.

Prior to establishing any User parameters, save the default parameters to a file to facilitate a return to default settings. (See Section 6-7 for "Load/Save Parameter" details.) After User parameters are established, it is suggested that these parameters are also saved to a file.

Initialize User established parameters to the Unidex 21 by pressing RESET or the Power OFF push-button. Parameter settings remain in memory until changed or another parameter file is loaded.

Once User parameters have been established, save these Parameters to a file for future reference.

Current default parameters appear in brackets [ ] after entering a particular parameter. To return to the factory default setting, press the "Control", "D", and <cr> keys.

The following sections provide an explanation of each of the parameters as well as suggestions for use.

SECTION 6-2: GETTING STARTED

Following Power-Up, the initial selection screen is displayed:

```
UNIDEX 21       Version xx

EPROM OK        PARAMETER OK        RAM checksum


User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Press the "P" key to enter the Parameter mode.

SECTION 6-3: GENERAL PARAMETERS

If the instructions in "Getting Started" have been completed, the following General Parameters screen (PAGE 1) will be displayed:

```
0 : System Password                          1 : Skip Auto-Boot Function ?
2 : IDX Buffer 1 block only ?                3 : IDX seg. calculate base (1/2/3)
4 : COMM input feedback ?                    5 : System default at metric ?
6 : RS232 protocol Port-A                    7 : Additional RAM in 1024 bytes
8 : RS232 protocol Port-B                    9 : Debug display is at front panel ?
10 : RS232/IEEE488 time out (sec)            11 : Parts Program stack size in bytes
12 : Edit block buffer (1 to 40)             13 : Edit default Char-insert ?
14 : Edit default Line-insert ?              15 : Edit TAB space
16 : End of All File Code CHR$(n)            17 : End of File Code CHR$(n)
18 : Beeper Duration (1 to 280) ms           19 : Double sided floppy disk ?
20 : Beeper Frequency  (2 to 20K)            21 : Display Blank-Out (minutes)
22 : MFO inc./step (-100 to 100)             23 : Tracking Display program step ?
24 : Y pixel size reduce to (%)              25 : Print screen to port-A ?
26 : Joystick axis pair                      27 : Digitize with Joystick ?

200 : 2ND PAGE          201 : Axes Auto-Tune          202: 3RD PAGE

300 : Load/save parameter                    301 : Front panel function keys

401 : 1st axis   402 : 2nd axis   403 : 3rd axis   404 : 4th axis
405 : 5th axis   406 : 6th axis   407 : 7th axis   408 : 8th axis

ctrl-Quit, number <cr>to each parameter =
```

Enter "200", the screen will display the following General Parameters (PAGE 2).

```
28 : Input 1 is 0-CW/CCW, 1-CLK/DIR, 2-QUAD x 1, 3-QUAD x 2
29 : Input 2 is 0-CW/CCW, 1-CLK/DIR, 2-QUAD x 1, 3 -QUAD x 2
30 : Axis Ramp Time (1-32767) ms          31 : Power on remote control 0/1/2/3/4
32 : M Strobe Delay (0-65535) ms          33 : M Ack Delay to 65535 ms, 0 no
34 : S Strobe Delay (0-65535) ms          35 : S Ack Delay to 65535 ms, 0 no
36 : T Strobe Delay to (0-65535)          37 : T Ack Delay to 65535 ms, 0 no
38 : Quick Stop Hi-Lo trigger ?           39 : Quick Stop at trigger point ?
40 : IDX does checksum ?                  41 : GANTRY (msmsmsms) m,s = 1,8
42 : Input 1 Handwheel Scale 0-254        43 : Input 2 Handwheel Scale 0-254
44 : Roll over max # 99999999             45 : H-V pairs (hvhvhvhv)h,v=1,8
46 : 1 perpendicular error arc sec        47 : 2 perpendicular error arc sec
48 : 3 perpendicular error arc sec        49 : 4 perpendicular error arc sec
50 : Reset MALC memory 0/1/2              51 : Default at Front Panel Interface?
52 : SYNC code 0?                         53 : IEEE488 Setup
54 : Keep position during reset?          55 : MFO adjust Handwheel Scale?
56 : Axis Trap negate Output (0-8)        57 : Master Trajectory Linear
58 : Fast Feedhold Ramp Time (ms)         59 : Master Parabolic Coefficient

200 : PREVIOUS PAGE
>Ctrl-Quit, number <cr>to each parameter =
```

Enter "202", the screen will display the following General Parameters (PAGE3).

```
60 : G23 Exp Filter Level (1-7)           61 : Ramping During G23 Operation
62 :                                      63 :
64 :                                      65 :
66 :                                      67 :
68 :                                      69 :
70 :                                      71 :
72 :                                      73 :
74 :                                      75 :
76 :                                      45 :
46 :                                      77 :
78 :                                      79 :
80 :                                      81 :
82 :                                      83 :
84 :                                      85 :
86 :                                      87 :
```

A description of each of the General Parameters follows:

6-3-1 0 : SYSTEM PASSWORD

Enter "0" to establish password parameters. The display will be:

```
# password    EFMPT
1. ----------
2. ----------

Ctrl-Quit, Ctrl-Erase <nn> <cr>; Ctrl-Add <1 to 8 char>/option <cr>
```

Press the "Control" and "Q" keys to return to the Main Parameter Menu.

To erase a password, press the "Control" and "E" keys. Enter the password number which is to be erased.

To add a password, press the "Control" and "A" keys. Enter the password name (1 to 8 characters) an "/" and the letter(s) of the option(s) that the password User is to have access. The option letters are: **E** - Edit mode, **F** - File mode, **M** - Machine mode, **P** - Parameter mode, and **T** - Test mode.

> NOTE: **To avoid password "lock-out" it is suggested that the primary User of this system establish a password which is active in all options.**

6-3-2 1 : SKIP AUTO BOOT

An Auto-Boot program is a User defined program which may be configured to automatically run upon a system Power-Up or Reset. The Unidex 21 treats this file as a batch file, although the program data is variable, the program name must be "AUTOBOOT.$$$". This parameter is used to turn the automatic execution of this program On/Off. The default setting skips the Auto-Boot program.

Enter "1" to change the status of the Auto-Boot program. Press the "Control" and "N" keys to toggle between Yes (the Auto-Boot program is not executed) or No (the Auto-Boot program is executed).

6-3-3 2 : IDX BUFFER 1 BLOCK ONLY

Program blocks may be sent to the Indexing Buffer in two ways. Blocks may be sent one at a time or in a continuous flow, replacing blocks in all four indexing buffers as soon as they are completed.

The default setting is to send blocks one block at a time.

Enter "2" to change the status of the Index Buffer. Press the "Control" and "N" keys to toggle between Yes (one block at a time) or No (four blocks at a time).

6-3-4 3 : IDX SEGMENT CALCULATE BASE (1/2/3/4/5)

The Segment Calculation Base Rate for the Indexing Board may be changed from the standard 1 msec rate to a rate of up to 16 msec. The default setting is 1msec.

Enter "3" to change the Segment Calculation Rate. Enter one of the following:

"1" for a 1ms rate
"2" for a 2ms rate
"3" for a 4ms rate
"4" for a 8ms rate
"5" for a 16ms rate

6-3-5 4 : COMM INPUT FEEDBACK

The Communication Input Feedback parameter determines whether the Unidex 21 requires "echo" characters for RS232 and IEEE488 input.

The default setting requires "echo" characters.

Refer to the *Unidex 21 Programming Manual* for further definition of the "COMM" command.

Refer to the *Unidex 21 Options Manual* for IEEE-488 information.

Enter "4" to change the feedback status. Press the "Control" and "N" keys to toggle between Yes (feedback echoes are required) or No (no echo characters required).

6-3-6 5 : SYSTEM DEFAULT AT METRIC

The System may be configured to use either English or Metric units as a default.

The default setting is Metric.

Enter "5" to change the units from the default of Metric (yes) to English (no).

6-3-7 6 : RS232 PROTOCOL PORT-A

The characteristics of RS232 Port-A, may be established within this parameter setting.

The default settings are; **Char** - 8, **Stop** - 1, **Parity** - No and **Baud** - 9600.

Enter "6" the following display will appear:

```
(Ctrl-Default) Char [8] Stop [1] Parity [N] Baud [9600]
```

Press the "C" key to toggle between 5, 6, 7, or 8 character bytes.

Press the "S" key to set the Stop Bit to 1 or 2.

Press the "P" key to set the Parity as None, Odd, or Even.

Press the "B" key to set the Baud Rate. Continue to press the "B" key until the desired rate appears, then press Enter.

6-3-8 7 : ADDITIONAL RAM IN 1024 BYTES

The amount of on board memory may be varied. The speed of file management is directly proportional to the amount of RAM being used.

The default setting is 320.

Enter "7" to change the amount of RAM. Enter the desired number of bytes of RAM to be used (0 = the minimum amount, 147,456 bytes) (320 = the maximum amount, 475,136 bytes). If more than 475,136 bytes of memory is required, an additional memory board must be installed.

6-3-9 8 : RS232 PROTOCOL PORT-B

The characteristics of RS-232 Port-B may be established within this parameter setting.

The default settings are; **Char** - 8, **Stop** - 1, **Parity** - No and **Baud** - 9600.

Enter "6", the following display will appear:

```
(Ctrl-Default) Char [8] Stop [1] Parity [N] Baud [9600]
```

Press the "C" key to toggle between 5, 6, 7, or 8 character bytes.

Press the "S" key to set the Stop Bit to 1 or 2.

Press the "P" key to set the Parity as None, Odd, or Even.

Press the "B" key to set the Baud Rate. Continue to press the "B" key until the desired rate appears, then press Enter.

6-3-10 9 : DEBUG DISPLAY IS AT FRONT PANEL

If the Unidex 21 being used is not equipped with a display screen, this parameter configures the system to send the Debug Display to an IBM PC/AT (equipped with the AEROTECH Display Software package).

The default setting is for the Debug Display located on the Unidex 21's front panel.

Enter "9" to change the Debug Display. Press the "Control" and "N" keys to toggle between Yes (Unidex 21's front panel will be used for the Debug Display) or No (Debug Display sent to a remote screen).

6-3-11 10 : RS232/IEEE488 TIME-OUT (SECONDS)

The Unidex 21 contains a Time-Out feature for file Input/Output through the RS232 or the IEEE488 ports. When RS232 or IEEE488 mode file transmission is initiated, the Unidex 21 will "look" for the data for a predetermined amount of time before producing an error message.

The default setting is 600 seconds.

Enter "10" to set the length of time the Unidex 21 waits for a return signal following an RS-232 or IEEE-488 transmission. Enter the new time (in seconds).

Refer to the *Unidex 21 Options Manual* for IEEE-488 information.

6-3-12 11 : PARTS PROGRAM STACK SIZE IN BYTES

This parameter is used to change the amount of RAM reserved for program stacks. (Refer to the *Unidex 21 Programming Manual* for additional information.) The maximum setting for this parameter is 1999 bytes.

The default setting is 300 bytes.

Enter "11" to change the amount of memory reserved for stacking. Enter the new number of bytes.

6-3-13 12 : EDIT BLOCK BUFFER (1 TO 40)

The amount of memory reserved for an Edit function buffer may be changed within this parameter. The Edit function buffer is used to store program blocks which are copied or erased while in the Edit mode.

The default setting is 8 blocks. Each block of program equals 256 bytes of memory.

Enter "12" to change the Edit buffer size. Enter the new buffer size (1 to 40 blocks).

6-3-14 13 : EDIT DEFAULT CHARACTER INSERT

While in the Edit mode, the User may insert characters in two ways. Characters may be inserted at the cursor, displacing existing text, or characters may be inserted such that existing text is over-written.

The default setting is that text will be inserted at the cursor, displacing existing text.

Enter "13" to change the Character Insert status. Press the "Control" and "N" keys to toggle between Yes (text inserted at cursor) or No (inserted text over-writes existing text).

6-3-15 14 : EDIT DEFAULT LINE INSERT

While in the Edit mode, a carriage return may be set to insert a new line in a program or to move to the next line of text.

The default setting is to insert a new line at each carriage return.

Enter "14" to change the Line Insert status. Press the "Control" and "N" keys to toggle between Yes (carriage return inserts new line) or No (carriage return moves to next line of text).

6-3-16 15 : EDIT TAB SPACE

While in the Edit mode, the number of spaces advanced by a TAB is set by this parameter.

The default setting is 10.

Enter "15" to change the TAB spacing. Enter the desired TAB spacing.

6-3-17 16 : END OF ALL FILE CODE CHR$(n)

When sending multiple files through an RS-232 or IEEE-488 port, a character is necessary to signal when data transmission has been completed. This parameter permits the User to change the End of All File character(s) for a particular system.

The default setting is 17.

Enter "16" to change the End of All File character(s). Enter the new End of File character(s).

Refer to the *Unidex 21 Option Manual* for IEEE-488 information.

6-3-18 17 : END OF FILE CODE CHR$(n)

When sending a file through an RS-232 or IEEE-488 port, it is necessary to indicate when file data transmission is complete. This parameter permits the User to change the End of File character(s) for a particular system.

The default setting is 9.

Enter "17" to change the End of File character. Enter the new End of File character(s).

Refer to the *Unidex 21 Options Manual* for IEEE-488 information.

6-3-19 18 : BEEPER DURATION (1 TO 280) ms

The length of time (ms) the Unidex 21's beeper stays On may be changed through this parameter.

The default setting is 50 ms.

Enter "18" to change the Beeper Duration. Enter the new time (in ms).

6-3-20 19 : DOUBLE SIDED FLOPPY DISK

Prior to formatting disks through the Unidex 21's Floppy Disk Drive, this parameter must be configured (single or double sided) the same as the floppy disk being formatted.

The default setting is Double Sided.

Enter "19" to change the Floppy Disk Configuration. Press the "Control" and "N" keys to toggle between Yes (format double-sided disks) or No (format single-sided disks).

6-3-21 20 : BEEPER FREQUENCY (2 TO 20K)

The sound frequency of the beeper is varied by this parameter. The frequency can be changed to between 2 and 20,000 hertz.

The default setting is 2000 hertz.

Enter "20" to change the Beeper Frequency. Enter the desired Beeper Frequency.

6-3-22 21 : DISPLAY BLANK-OUT (MINUTES)

The Unidex 21 is equipped with a "screen saving" technique which blanks-out the display screen if no entry has been made within a certain number of minutes. The time elapsing between the last key entry and screen Blank-Out is set by this parameter.

The default setting is 60 minutes.

Enter "21" to set the time to elapse (minutes) before screen Blank-Out. Enter the new time.

6-3-23 22 : MFO INC./STEP (-100 TO 100)

This parameter is used to change the increments/decrements of the MFO keys (+,- /F9, F10) or initialize and provide the zero offset for an external MFO adjustment.

Enter "22" to set the increments available through the MFO keys. Enter the desired MFO increment (-100 to 100).

If an external MFO adjustment is being used, this parameter must be set with a negative number. The negative sign indicates to the Unidex 21 that an external MFO adjustment is being used, the number entered provides the amount of zero offset. The amount of zero offset required is determined as follows:

Enter a negative number (-100 to 100) into this parameter.
Power down or reset the system to load the parameter.
Turn the MFO potentiometer fully CCW.
The MFO indication should go to approximately zero.

If the MFO% indication does not go to approximately zero, re-enter the Parameter mode and adjust this parameter setting as necessary. The default setting is 10.

6-3-24 23 : TRACKING DISPLAY PROGRAM STEP

While in the Machine mode, tracking may be displayed in Machine or Program steps.

The default setting is Program steps.

In the Debug mode, tracking is displayed in Program steps only.

Enter "23" to change the Tracking Display. Press the "Control" and "N" keys to toggle between Yes (tracking displayed in Program steps) or No (tracking displayed in Machine steps).

6-3-25 24 : Y PIXEL SIZE REDUCE TO (%)

Variance in monitors require that the pixel size of the Y axis be reduced for optimum viewing during the Debug Display mode.

The default setting is 100 %.

Enter "24" to change the Y pixel size. Enter the percentage of the desired reduction.

6-3-26 25 : PRINT SCREEN TO PORT-A

The User may choose to do a "Print Screen" through either RS232 Port-A or Port-B.

The default setting is Port-A.

NOTE: The "Print Screen" function is valid only in conjunction with the Unidex 21's Front Panel. (Key in "Alt P")

Enter "25" to change the "Print Screen" RS232 port. Press the "Control" and "N" keys to toggle between Yes ("Print Screen" goes through RS232 Port-A) or No ("Print Screen" goes through RS232 Port-B).

6-3-27 26 : JOYSTICK AXIS PAIR

This parameter is used to set the axes configurations for Joystick or Trackball use.

The default settings are as shown in the display below.

Enter "26" to change the Joystick axes configurations.

The display will be:

	-horizontal-		-vertical-		- 3rd move-	
	code	XYZU/xyzu	code	XYZU/xyzu	code	XYZU/xyzu
1st						
	00	10001000	01	01000100	02	00100010
	03	00100010	04	00010001	05	00000000
	06	00000000	07	00000000	08	00000000
	09	00000000	10	00000000	11	00000000
	12	00000000	13	00000000	14	00000000
	15	00000000	16	00000000	17	00000000
	18	00000000	19	00000000	20	00000000
	21	00000000	22	00000000	23	00000000
	24	10001000	25	01000100	26	00100010
	27	00100010	28	00010001	29	00000000
	30	00000000	31	00000000	32	00000000
	33	00000000	34	00000000	35	00000000
	36	00000000	37	00000000	38	00000000
	39	00000000	40	00000000	41	00000000
	42	00000000	43	00000000	44	00000000
	45	00000000	46	00000000	47	00000000

>Ctrl-Quit, Ctrl-Defaut <cr>, code/nnnnnnnn <cr> =

Press the "Control" and "Q" keys to return to the Main Parameter Menu.

Press the "Control" and "D" keys to load default axes configurations.

To change the status of an axis, enter the code number, then enter a "0" to turn that axis OFF or a "1" to turn that axis ON.

6-3-28 27 : DIGITIZE WITH JOYSTICK

Prior to use, Joystick or Trackball digitizing must be delineated from this parameter.

The default setting is for Joystick digitizing.

Enter "27" to change the digitizing status. Press the "Control" and "N" keys to toggle between Yes (digitizing done by Joystick) or No (digitizing done by Trackball).

Refer to the *Unidex 21 Options Manual* for Joystick and Trackball information.

6-3-29 28 : INPUT 1 IS 0-CW/CCW, 1-CLK/DIR, 2-QUAD x 1, 3-QUAD x 2

The first auxiliary input must be configured so as to be in conjunction with the signal requirements of the input device.

Enter "28" to change the configuration of Input 1. Press the number associated with the desired configuration.

"0" for a CW/CCW input signal type
"1" for a CLK/DIR input signal type
"2" for a QUAD x 1 input signal type
"3" for a QUAD x 2 input signal type

The default setting is 0-CW/CCW input signal type.

6-3-30 29 : INPUT 2 IS 0-CW/CCW, 1-CLK/DIR, 2-QUAD x 1, 3-QUAD x 2

The second auxiliary input must be configured so as to be in conjunction with the signal requirements of the input device.

Enter "29" to change the configuration of Input 2. Press the number associated with the desired configuration.

"0" for a CW/CCW input signal type
"1" for a CLK/DIR input signal type
"2" for a QUAD x 1 input signal type
"3" for a QUAD x 2 input signal type

The default setting is 0-CW/CCW input signal type.

6-3-31 30 : AXES RAMP TIME (1-32767) ms

While contouring, acceleration and deceleration times may be optimized by adapting the time to reflect equipment limitations.

The default setting is 100 msec.

Enter "30" to change the Axes Ramping Time. Enter the new time (in msec).

6-3-32 31 : POWER ON REMOTE CONTROL 0/1/2/3/4

This parameter must be configured prior to putting the Unidex 21 under remote control. The default setting is for no remote control.

Enter "31" to change the remote power status.

Enter a "0" for no remote control.

Enter a "1" for Unidex 21 to be under RS-232 remote control following a Power-Up or Reset. There will be no Main Display on the Unidex 21 screen.

Enter a "2" for Unidex 21 to be under RS-232 remote control following a Power-Up or Reset. There will be a Main Display on the Unidex 21 screen.

Enter a "3" for Unidex 21 to be under IEEE-488 remote control following a Power-Up or Reset. There will be no Main Display on the Unidex 21 screen.

Enter a "4" for Unidex 21 to be under IEEE-488 remote control following a Power-Up or Reset. There will be a Main Display on the Unidex 21 screen.

6-3-33 32 : M STROBE DELAY (0-65535) ms

The M function Strobe Delay parameter provides the User the ability to change the length of time that the system output signal stays ON, allowing a slow device time to respond.

The default setting is for zero msec (no Strobe Delay).

Enter "32" to change the M function Strobe Delay time. Enter the new M Strobe Delay time (in msec).

6-3-34 33 : M ACK DELAY TO 65535 ms, 0 no

The **M** function Acknowledge Delay parameter provides the User the ability to establish a time that the Unidex 21 will wait for an acknowledgment signal from a slow device.

The default setting is zero (0) for no acknowledgment needed. Setting a **M** function Acknowledge Delay time of 65535 msec causes the Unidex 21 to scan indefinitely and check every 1msec for an acknowledge signal.

Enter "33" to change the **M** function Acknowledge Delay time. Enter the new **M** function Acknowledge Delay time (in msec).

6-3-35 34 : S STROBE DELAY (0-65535) ms

The **S** function Strobe Delay parameter provides the User the ability to change the length of time that the system output signal stays ON, allowing a slow device time to respond.

The default setting is zero (0) msec **S** function Strobe Delay time.

Enter "34" to change the **S** function Strobe Delay time. Enter the new **S** function Strobe Delay time (in msec).

6-3-36 35 : S ACK DELAY TO 65535 ms, 0 no

The **S** function Acknowledge Delay parameter provides the User the ability to establish a time that the Unidex 21 will wait for an acknowledgment signal from a slow device. The default setting is zero (0) for no acknowledgment needed. Setting a **S** function Acknowledge Delay time of 65535 msec causes the Unidex 21 to scan indefinitely and check every 1msec for an acknowledge signal.

Enter "35" to change the **S** function Acknowledge Delay time. Enter the new **S** function Acknowledge Delay time.

6-3-37 36 : T STROBE DELAY (0-65535) ms

The **T** function Strobe Delay parameter provides the User the ability to change the length of time that the system output signal stays ON, allowing a slow device time to respond. The default setting is for zero (0) msec **T** function Strobe Delay time.

Enter "36" to change the **T** function Strobe Delay time. Enter the new **T** function Strobe Delay time (in msec).

6-3-38 37 : T ACK DELAY TO 65535 ms, 0 no

The T function Acknowledge Delay parameter provides the User the ability to establish a time that the Unidex 21 will wait for an acknowledgment signal from a slow device. This time must include the time of the strobe signal.

The default setting is zero (0) for no acknowledgment needed. Setting a T function Acknowledge Delay time of 65535 msec causes the Unidex 21 to scan indefinitely and check every 1msec for an acknowledge signal.

Enter "37" to change the T function Acknowledge Delay time. Enter the new T function Acknowledge Delay time (in msec).

6-3-39 38 : QUICK STOP HI-LO TRIGGER

A Quick Stop is an interrupt signal to feedhold the Unidex 21 as quickly as possible. Quick Stop may be initiated by either a High/Low or a Low/High trigger signal. The interrupt signal is externally supplied, by the User, through an I/O connector on the rear panel of the Unidex 21.

The default setting is for a Quick Stop to occur at an input signal with a High to Low edge trigger.

NOTE: All User supplied Interrupt signals must be debounced.

Enter "38" to change the Quick Stop trigger signal. Press the "Control" and "N" keys to toggle between Yes (High/Low signal trigger) or No (Low/High signal trigger).

6-3-40 39 : QUICK STOP AT TRIGGER POINT

When a standard Quick Stop is initiated, deceleration occurs and axis movement halts at the conclusion of the deceleration ramp. If this parameter is activated (Yes) then the Unidex 21 moves the axis back to the point at which the trigger occurred, thus eliminating the ramp time distance.

The default setting is Yes.

Enter "39" to change the Quick Stop Trigger Point status. Press the "Control" and "N" keys to toggle between Yes (the axes will return to the point of the trigger) or No (the axes remain at the position following a deceleration ramp).

6-3-43 40 : IDX DOES CHECKSUM ?

This parameter configures the Indexing Board either to do a Checksum on each program block or to skip the Checksum feature. Skipping the Checksum operation provides faster processing time (3.6 +3.4N msec, N = no. of bytes in a block).

The default setting is for the Indexing Board to do a Checksum on each block.

Enter "40" to change the Indexing Board Checksum status. Press the "Control" and "N" keys to toggle between Yes (Checksum performed) and No (Checksum not performed).

6-3-44 41 : GANTRY (msmsmsms) m,s = 1,8

The Gantry parameter establishes the Master/Slave relationship of multiple axes motors being used in pairs. A maximum of four Master/Slave groups (8 axes) may exist.

Enter "41" to activate, deactivate, or change the Gantry Master/Slave status of one or more axes groups.

Enter the motor numbers to be paired as Master/Slave. For example, entering "18" will pair up the axis motors that have been designated 1 and 8. Motor 1 is designated as the Master and motor 8 is designated as the Slave. All programming for these axes must be input through axis motor 1.

NOTE: If the system is not being used in a Gantry configuration, all axis motor designations must be 0 (ms = 00).

6-3-43 42 : INPUT 1 HANDWHEEL SCALE (0-254)

If Input 1 is being used for the Handwheel option, the relationship between Handwheel increments and the number of Machine steps to be moved is established with this parameter.

The default is 10 Machine steps moved for each Handwheel increment.

Enter "42" to change the Handwheel increment/Machine step ratio of Input 1.

Enter the desired Scaling Factor (0-254). For example, If "10" is entered, the axes will move 10 Machine steps for each increment of the Handwheel.

Refer to the *Unidex 21 Options Manual* for Handwheel information.

6-3-44 43 : INPUT 2 HANDWHEEL SCALE (0-254)

If Input 2 is being used for the Handwheel option, the relationship between Handwheel increments and the number of Machine steps to be moved is established with this parameter.

The default is 10 Machine steps moved for each Handwheel increment.

Enter "43" to change the Handwheel increment/Machine step ratio of Input 2.

Enter the desired Scaling Factor (0-254). For example, If "10" is entered, the axes will move 10 Machine steps for each increment of the Handwheel.

Refer to the *Unidex 21 Options Manual* for Handwheel information.

6-3-45 44 : ROLL OVER MAX # 99999999

The Tracking Display is capable of indicating up to 99999999 Machine steps. If further Tracking Display is necessary, this parameter is used to instruct the system to automatically roll the display over to 00000000 and continue counting.

The default is "Yes" providing display roll over.

Enter "44" to activate/deactivate the Tracking Display roll over feature. Press the "Control" and "N" keys to toggle between Yes (Tracking Display will roll over) and No (Tracking Display will not roll over).

6-3-46 45 : H-V PAIRS (hvhvhvhv)h,v = 1,8

The H-V Pairs parameter identifies, to the system, the horizontal and vertical relationship of axes pairs. The pair identification is used for Perpendicularity Error Compensation. Eight axes may be identified for a total of four pairs.

The default setting is for no axis pairing, i.e., no Perpendicularity Error Compensation.

Enter "45" to identify horizontal and vertical axes pairs. Enter a horizontal axis number and a vertical axis number to be paired for Perpendicularity Error Compensation. For example, entering "13" will pair the horizontal axis number "1" with the vertical axis number "3". A total of four pairs may be entered.

NOTE: **Perpendicularity Error Compensation will not be enabled until the axes are sent Home.**

6-3-47 46 : 1 PERPENDICULAR ERROR ARC SEC

Positioning Accuracy is directly related to the perpendicularity of the paired axes. This parameter permits the User to enter into the system the amount of the error, in arc seconds, that has been calculated for the first axis pair (as established in Parameter 45: H-V Pairs). Perpendicularity Error is defined as the positive or negative deviation of the two paired stages from 90 degrees. An error factor in the CW direction is entered as a negative value. An error in the CCW direction is entered as a positive value.

The default setting is for zero (0) error.

Enter "46" to permit entry of the Perpendicularity Error for axis pair number 1. Enter the amount of error (in arc seconds).

6-3-48 47 : 2 PERPENDICULAR ERROR ARC SEC

Positioning Accuracy is directly related to the perpendicularity of the paired axes. This parameter permits the User to enter into the system the amount of the error, in arc seconds, that has been calculated for the second axis pair (as established in Parameter 45: H-V Pairs). Perpendicularity Error is defined as the positive or negative deviation of the two paired stages from 90 degrees. An error factor in the CW direction is entered as a negative value. An error in the CCW direction is entered as a positive value.

The default setting is for zero (0) error.

Enter "47" to permit entry of the Perpendicularity Error for axis pair number 2. Enter the amount of error (in arc seconds).

6-3-49 48 : 3 PERPENDICULAR ERROR ARC SEC

Positioning Accuracy is directly related to the perpendicularity of the paired axes. This parameter permits the User to enter into the system the amount of the error, in arc seconds, that has been calculated for the third axis pair (as established in Parameter 45: H-V Pairs). Perpendicularity Error is defined as the positive or negative deviation of the two paired stages from 90 degrees. An error factor in the CW direction is entered as a negative value. An error in the CCW direction is entered as a positive value.

The default setting is for zero (0) error.

Enter "48" to permit entry of the Perpendicularity Error for axis pair number 3. Enter the amount of error (in arc seconds).

6-3-50 49 : 4 PERPENDICULAR ERROR ARC SEC

Positioning Accuracy is directly related to the perpendicularity of the paired axes. This parameter permits the User to enter into the system the amount of the error, in arc seconds, that has been calculated for the fourth axis pair (as established in Parameter 45: H-V Pairs). Perpendicularity Error is defined as the positive or negative deviation of the two paired stages from 90 degrees. An error factor in the CW direction is entered as a negative value. An error in the CCW direction is entered as a positive value.

The default setting is for zero (0) error.

Enter "49" to permit entry of the Perpendicularity Error for axis pair number 4. Enter the amount of error (in arc seconds).

6-3-51 50 : RESET MALC MEMORY 0/1/2

The **MALC** command is used to allocate memory to be used for background functions. This parameter provides the User the ability to select the status of the Memory Allocation, following a Power-Down or Reset.

Enter "50" to change the Memory Allocation status.

The following options are available to set Memory Allocation status following a Power-up or Reset. Press the number of the desired status.

"0" Configures the system such that it will wait for the User to determine Memory Allocation status.

"1" Configures the system such that all previously allocated memory is cleared and returned to memory pool.

"2" Configures the system to retain the previously established amount of allocated memory.

6-3-52 51 : DEFAULT AT FRONT PANEL INTERFACE?

If the Unidex 21 Front Panel and a TeleVideo 905 terminal are being used in conjunction, this parameter may be used to designate which is to be considered the Main Interface.

The default setting is for the Unidex 21's Front Panel to be the Main Interface.

Enter "51" to change the Quick Stop Trigger Point status. Press the "Control" and "N" keys to toggle between Yes (the Unidex 21's Front Panel will be the Main Interface) or No (the TeleVideo 905 terminal will be the Main Interface).

6-3-53 52 : SYNC CODE 0?

If two Unidex 21's are being used together, each unit must be given a distinct code. This parameter permits the User to establish this code for Handshaking.

Although there is no operational difference between the Master and Salve controller, typically the Master is set to "Yes", and the Slave is set to "No".

Enter "52" to establish the SYNC code for this unit. Press the"Control" and "N" keys to toggle between Yes (the SYNC code for this unit is 0) or No (the SYNC code for this unit will be 1).

6-3-54 53 : IEEE-488 SETUP

The Unidex 21 may be controlled by a host computer through an IEEE-488 bus. Prior to IEEE-488 use, the settings of this parameter must be appropriately configured.

Enter "53" to establish IEEE-488 parameters. The display will be:

```
IEEE-488 SET UP

0: address mode (0 talk only) (1 listen only) (2 major only) (3 major/minor)
   (4 primary/secondary) (5 primary/primary) = 2
1: 1st address (0 to 31) = 2
2: 2nd address (0 to 31) = 3
3: PPR (0 no) (1 to 8 - in phase) (9 to 16 - reverse phase) = 1
4: EOS data (0 to FF) = 0A
5: EOS bits (0-7) (1-8) = 1
6: set EOI with last byte of write? (0 - yes) (1 - no) = 0
7: terminate read on EOS? (0 - yes) (1 - no) = 0
8: set EOI with last byte of write? (0 - yes) (1 - no) = 0

NOTE: EOS will not affect EOI during File mode Input/Output case
      Input - Unidex 21 will wait for EOI or end-of-file code
      Output - Unidex 21 will set EOI with end-of-file code

Qtrl-Quit, Ctrl Default , code/nnnnnnnn =
```

Refer to the *Unidex 21 Options Manual* for a detailed explanation of the IEEE-488 Parameter settings.

6-3-55 54 : KEEP POSITION DURING RESET?

This parameter allows the User to configure the Unidex 21 such that following a System Reset, the axes position is retained on the Tracking Display.

The default setting is for the position information to be retained on the Tracking Display following a System Reset.

Enter "54" to change the Reset Tracking Display status. Press the "Control" and "N" keys to toggle between Yes (the Tracking Display will retain position information following a System Reset) or No (the Tracking Display will clear to zero following a System Reset).

6-3-56 55 : MFO ADJUST HANDWHEEL SCALE?

This parameter is used to link the MFO increment/decrement setting (Parameter 22) to the Handwheel scale factor (Parameters 42 and/or 43). If the link is established, the Handwheel scale factor will be adjusted by the MFO increment/decrement setting. This provides the User with the ability to change the Handwheel increment/Machine step relationship without returning to the Parameter mode.

The default setting is for the MFO setting to adjust the Handwheel scale factor.

Enter "55" to change the MFO/Handwheel scale status. Press the "Control" and "N" keys to toggle between Yes (Handwheel scale factor will be adjusted by the MFO setting) or No (Handwheel scale factor will not be adjusted by the MFO setting).

Refer to the *Unidex 21 Options Manual* for Handwheel information.

6-3-57 56 : AXES TRAP NEGATE OUTPUT (0-8)

When an Axis Trap occurs, the User may select an output line (0-8) in which the signal will go low. This signal may then be used by an auxiliary device to initiate some function.

The default setting is for no change in the output signal when an axis is in a trap condition.

Enter "56" to assign an output line to signal an Axis Trap condition.

Enter a "0" for no function to occur when an axis encounters a trap condition.

Enter a "1 thru 8" to assign an output line to go low when an axis encounters a fault (programming error, limit, trap, etc.) condition.

Enter a "1 thru 8" to assign an output line to go Low when an axis encounters a trap condition only.

6-3-58 57 : MASTER TRAJECTORY LINEAR?

For all contoured moves, each individual axis is synchronized with a "virtual" master axis. Therefore, the Acceleration/Deceleration Ramping Trajectory for each axis follows the Acceleration/Deceleration Ramping Trajectory for the Master Axis. This ramping trajectory may be defined as either Linear or Parabolic. A Parabolic Ramping Trajectory is derived by applying a "Parabolic Coefficient" (see Parameter #59) to the maximum slope. (See Chapter 5: Machine Mode for additional information.)

The default setting is for a Linear Type Trajectory.

Enter "57" to change the trajectory type. Press the "Control" and "N" keys to toggle between Yes (Linear Trajectory) and No (Parabolic Trajectory).

6-3-59 58 : FAST FEEDHOLD RAMP TIME (ms)

This parameter is used to specify the amount of time in which to decelerate all axes to a stop when the Quick Stop interrupt signal is detected. (Refer to parameters 38 and 39.)

Enter "58" to change deceleration time during a Quick Stop. Enter the new time (in msec).

6-3-60 59 : MASTER PARABOLIC COEFFICIENT

The Parabolic Coefficient is the factor used to convert the linear velocity/time slope into a Parabolic Trajectory. It is suggested that coefficient selections be made in steps of 10,000. The following formula is applied to the coefficient value selected.

$$\frac{\text{Parabolic Coefficient}}{65535} + 1 = \text{Maximum Slope}$$

A coefficient of zero represents a Linear Ramp. Higher coefficient values result in a steeper curve.

The default setting is 24576.

Enter "59" to change the Master Parabolic Coefficient. Enter the new number (0-65535).

6-3-61 60 : EXP FILTER LEVEL (0-7)

During G23 (Corner Rounding) operation, the Unidex 21 applies an Exponential Filter on the millisecond Position/Velocity Trajectory command being sent to the DSP Servo Control Card. This filter permits the Unidex 21's PIDF Servo Loop to digitally replicate the traditional error based type of Servo Loop Closure.

The digital filter works under the following relationships:

Filter Total = Filter Total + Command In

$$\text{Command Out} = \frac{\text{Filter Total}}{2^n} \quad \text{where n is the Filter Level}$$

Filter Total = Filter Total - Command Out

Therefore, higher filter values result in more Corner Rounding.

Enter "60" to change the G23 Exponential Filter Level. Enter the new number (0-7).

6-3-62 61 : RAMPING DURING G23 OPERATION?

The G23 (Corner Rounding) mode is used to permit the User to program moves which are not necessarily tangent, and have the controller provide relatively continuous Velocity Contouring. Some applications utilize this feature to smooth out step velocities resulting from non-tangent moves while contouring. However, in other applications such as Raster Scanning, it is desirable to permit the User to program a set of linear moves at right angles to each other, and have the controller round the corners. That is, as soon as the first axis begins its deceleration ramp, the second axis is to begin its acceleration ramp. This could be achieved by setting the Ramp Time (RAMP) command to one millisecond each time the User enters Corner Rounding (G23) mode, and restoring it when in Non-Corner Rounding (G24) mode. This implementation was deemed unnecessarily cumbersome.

If this parameter is set to "Yes", the normal Ramp Time will be in effect for both Corner Rounding (G23) mode and Non-Corner Rounding (G24) mode. If this parameter is set to "No", a Ramp Time of one (1) millisecond will be used while operating in Corner Rounding mode, and the normal Ramp Time parameter will be used in Non-Corner Rounding mode.

Enter "61" to change the ramping during G23 operation parameter. Press "Control" and "N" keys to toggle between Yes (G23 normal ramping) and No (G23 1ms ramping).

SECTION 6-4: AXIS PARAMETERS

A description of each of the Axis Parameters follows:

6-4-1 401 : 1ST AXIS

NOTE: Since the parameters are the same for 401 : 1st Axis through 408 : 8th Axis, one set will be described as being representative of the rest.

Enter "401" to configure the parameters for the 1st Axis. The display will be:

```
1st axis

 0: Metric Constant                    1: English Constant
 2: Digits after "." (1 to 6)          3: Digits after "." (1 to 6)
 4: Home direction is CCW ?            5: Home Limit to Marker Steps 0
 6: Home Feedrate  steps/sec           7: Home Offset steps 0
 8: Top Feedrate steps/sec             9: ac/de steps/sec/sec
10: Symbol (1 to 4 char)              11: Kp  (0-16777215) =
12: Ki  (0-16777215) =                13: Kd  (0-16777215) =
14: Kf1 (0-16777215) =                15: Kf2 (0-16777215) =
16: Jog control key (3,6,8,9)         17: + move is CW ?
18: Jog/Slew + direction is CW ?      19: Feedhold enabled in Free Run ?
20: Axis Calibration on ?             21: Joystick abs. window
22: Joystick high (steps/sec)         23: Joystick low (steps/sec)
24: Start/Stop speed (steps/sec)      25: Modulo Machine step
26: Power-on Home Feedrate (s/s)      27: Home Switch is at end ?
28: Home Switch is normal open ?      29: Position Lag factor (0-65535)
30: Limit Switch is normal open ?     31: Switch-Mechanical limit steps
32: Max Overshoot % (n/128)           33: Max Velocity Error (0-65535)
34: Max Position Error (0-65535)      35: Max Integral Error n*100  0-65535
36: MFO enabled in Free Run ?         37: Trajectory is Linear type ?
38: Parabolic Coefficient (0-65535)   39:  Machine Origin steps

200: NEXT PAGE
>Ctrl-Quit, number <cr> to each parameter =
```

Enter "200" to go to the Next Page for more Axis Parameters.

The display will be:

```
1st axis

  40: Input 1 Auto-Focus convert factor (n/65535) 0 to 8388607
  41: Input 2 auto-focus convert factor (n/65535) 0 to 8388607
  42: Feedback Device?                          43: Driver Type?
  44: Brushless Commutation factor              45: Backlash Machine steps (0-65535)
  46: Existance Checking  0/1/2/3               47: CCW Software Limit, mach-steps
  48: CW Software Limit, mach-steps             49: Step Size for Step Response
  50:                                           51:
  52:                                           53:
  54:                                           55:
  56:                                           57:
  58:                                           59:
  60:                                           61:


200: PREVIOUS PAGE
  <Ctrl-Quit,number<cr> to each parameter =
```

A description of each of the Axis Parameters follows:

6-4-1-1 0 : METRIC CONSTANT

The Metric Constant parameter defines the Metric program (G71) mode's Machine step and Program step conversion factor. The number selected is incorporated into the following calculation:

$$\text{Machine steps} = \frac{(\text{this number}) * (\text{Program steps})}{1000000}$$

The default setting is 1000000.

Press the "0" key to change the Metric value constant for this axis. Enter the new Metric value constant.

6-4-1-2 1 : ENGLISH CONSTANT

The English Constant parameter defines the English program (G70) mode's Machine step and Program step conversion factor. The number selected is incorporated into the following calculation:

$$\text{Machine steps} = \frac{(\text{this number}) * (\text{program steps})}{1000000}$$

The default setting is 2540000.

Press the "1" key to change the English value constant for this axis. Enter the new English value constant.

6-4-1-3 2 : DIGITS AFTER "." (1 TO 6)

This parameter delineates the number of digits to be programmed after a decimal point in the Metric program (G71) mode.

The default setting is 3.

Press the "2" key to set the number of digits that will follow a decimal point. Enter the desired number of digits.

6-4-1-4 3 : DIGITS AFTER "." (1 TO 6)

This parameter delineates the number of digits to be programmed after a decimal point in the English program (G70) mode.

The default setting is 4.

Press the "3" key to set the number of digits that will follow a decimal point. Enter the desired number of digits.

6-4-1-5 4 : HOME DIRECTION IS CCW ?

The Hardware Home position may be established from either a CW or CCW motor direction.

The default setting is CCW.

Press the "4" key to establish motor direction for a Hardware Home. Press the "Control" and "N" keys to toggle between Yes (motor direction is counterclockwise) or No (motor direction is clockwise).

6-4-1-6 5 : HOME LIMIT TO MARKER STEPS

A distance (in Machine steps) that the axes may move at maximum speed before slowing to search for a Marker is established in this parameter. (See the *Unidex 21 Programming Manual* for a detailed description of the HOME command.) This distance is dependent upon system configuration and hardware variances.

The default setting is 1000 steps.

Press the "5" key to establish a distance from the Home Limit to the Marker. Enter the approximate distance in Machine steps.

6-4-1-7 6 : HOME FEEDRATE STEPS/SEC

The feedrate of a normal Home cycle is determined by the setting of this parameter. (See the *Unidex 21 Programming Manual* for a detailed description of the HOME command.)

The default setting is 2000 steps per second.

Press the "6" key to establish the feedrate of a Home cycle. Enter the new feedrate.

6-4-1-8 7 : HOME OFFSET STEPS

This parameter is used to establish offsets to provide for a Home position which is not at the Home Marker. (See the *Unidex 21 Programming Manual* for a detailed description of the HOME command.) The distance from the Home Marker to the desired Home Offset must be measured and then converted to steps.

The default setting is zero (the Home position is at the Home Marker).

Press the "7" key to establish the offset required for the desired Home position. Enter the offset (in steps).

6-4-1-9 8 : TOP FEEDRATE STEPS/SEC

The Top Feedrate is the highest speed for which this axis is mechanically configured. It will be used for all "G0" commands and as a basis for the Jog Feedrate.

The default setting is 128000 steps per second.

Press the "8" key to set the Top Feedrate. Enter the desired Top Feedrate (steps per second).

6-4-1-10 9 : AC/DE STEPS/SEC/SEC

This parameter is used to set the maximum acceleration/deceleration rate. The system uses this setting to verify all acceleration rates which are input for "G0" ramping.

The default setting is 1,000,000 steps per second per second.

Press the "9" key to establish the axis' maximum acceleration/deceleration rate. Enter the new rate (in steps/sec/sec).

6-4-1-11 10 : SYMBOL (1 TO 4 CHAR.)

This parameter permits the User to designate a new name for an axis. All system references will change to the new name, however, the system will continue to recognize the default name.

The default name of this axis is X.

Press the "10" key to change the axis name. Enter the new axis name (1 to 4 characters). Make certain name conflicts do not exist.

6-4-1-12 11 : Kp

The "P" (Proportional) gain parameter sets the "P" gain value within the PIDF loop. The "P" gain produces an output directly proportional to the Position Error and thus produces a constant counteracting force to the error.

The default setting is 102400.

Prior to changing the "Kp" value, see Section 6.5 "Axis Auto-Tune"for further information.

Press the "11" key to change the system's Proportional gain. Enter the new amount of "P" gain.

6-4-1-13 12 : Ki

The "I" (Integral) gain parameter sets the "I" gain value within the PIDF loop. The "I" gain produces an output which is a summation of the position errors, producing an increasing counter-acting force for a constant or increasing Position Error.

The default setting is 20.

Prior to changing the "Ki" value, see Section 6-5 (Axis Auto-Tune) for further information.

Press the "12" key to change the amount of Integral gain.

Enter the new amount of "I" gain.

6-4-1-14 13 : Kd

The "D" (Derivative) gain parameter sets the "D" gain in the PIDF loop. The "D" gain serves to dampen system response by producing a restraint, as long as the system is progressing toward error reduction.

The default setting is 896000.

Prior to changing the "Kd" value, see Section 6-5 (Axis Auto Tune) for further information.

Press the "13" key to change the amount of Derivative gain. Enter the new amount of "D" gain.

6-4-1-15 14 : Kf1

The "Kf1" (Velocity Feedforward) parameter optimizes the gain settings of the PIDF loop. The Velocity Feedforward value is a function of the System inertia and torque constant. Since it is not strictly error driven, it complements the PID gain by reducing the PID compensation effort required and by reducing system lag.

Prior to changing the "Kf1" value, see Sections 6-5 (Axis Auto-Tune) for further information.

Press the "14" key to change the "Kf1" parameter. Enter the new "Kf1" value.

6-4-1-16 15 : Kf2

The "Kf2" (Acceleration Feedforward) parameter optimizes the gain settings of the PIDF loop. The Acceleration Feedforward value is a function of the System inertia and torque constant. Since it is not strictly error driven, it complements the PID gain by reducing the PID compensation effort required and by reducing system lag.

Prior to changing the "Kf2" value, see Sections 6-5 (Axis Auto-Tune) for further information.

Press the "15" key to change the "Kf2" parameter. Enter the new "Kf2" value.

6-4-1-17 16 : JOG CONTROL KEY (3, 6, 8, 9)

The user may designate the arrow keys (3-7, 6-4, 8-2, 9-1) to be used to control this axis while in the Jog mode.

The default setting for this axis is 6.

Press the "16" key to change the arrow keys controlling this axis. Enter the key number of the desired arrow key. Press the "Control" and "G" keys to set axes 5-8.

6-4-1-18 17 : + MOVE IS CW ?

For a programmed + (positive) move, the motor may be set for CW or CCW direction.

The default setting is for CW motor direction for any programmed + move.

Press the "17" key to change the motor direction for a programmed + move. Press the "Control" and "N" keys to toggle between Yes (CW motor direction) or No (CCW motor direction).

6-4-1-19 18 : JOG/SLEW + DIRECTION IS CW ?

Motor direction may be set for CW or CCW movement when a + (positive) move is requested while in the Jog/Slew mode.

The default setting is for CW direction motor movement when a + move is requested in the Jog/Slew mode.

Press the "18" key to change the motor direction for a Jog/Slew + move. Press the "Control" and "N" keys to toggle between Yes (CW motor direction) or No (CCW motor direction).

6-4-1-20 19 : FEEDHOLD ENABLED IN FREE RUN

This parameter determines whether the Feedhold key may be used to control Free Run motion for this axis.

The default setting enables the Feedhold key for Free Run control.

Press the "19" key to change the status of the Feedhold key during a Free Run of this axis. Press the "Control" and "N" keys to toggle between Yes (Feedhold key active for a Free Run of this axis) or No (Feedhold key not active for a Free Run of this axis).

6-4-1-21 20 : AXIS CALIBRATION ON ?

If the Unidex 21 is equipped with the Axis Calibration option, this parameter must be configured appropriately.

The default setting is Yes, axis calibration ON for this axis.

Press the "20" key to change the status of Axis Calibration. Press the "Control" and "N" keys to toggle between Yes (Axis Calibration - ON) or No (Axis Calibration - OFF).

Refer to the *Unidex 21 Options Manual* for Axis Calibration information.

6-4-1-22 21 : JOYSTICK ABS. WINDOW

While in the Joystick Mode an "Absolute Window" may be created to provide an area of movement where extremely fine positioning capabilities exist. The number selected in this parameter represents the increment factor that will be used for the Joystick handle deflection/Position movement relationship.

NOTE: Setting this parameter to zero (0) for all axes will disable this feature.

The default setting is for 10 steps.

Press the "21" key to change the Joystick window size. Enter the new window size.

Refer to the *Unidex 21 Options Manual* for Joystick information.

6-4-1-23 22 : JOYSTICK HIGH (STEPS/SEC)

Resolution ratio's vary between axes. When a Joystick move is requested, the speed/distance ratio for each affected axis must be compatible. This parameter establishes the speed at which the axis will move when a Joystick move is requested at the "High" speed setting. To derive the Joystick "High" speed setting for this axis, proceed as follows:

Determine the distance (mm/in) that this axis will move per second at maximum speed.

Multiply this value by the axis resolution ratio (number of Machine steps that equal 1 (mm/in)).

The resulting number (steps/sec) is the Joystick-High value to be entered for this parameter.

The default setting is 50000 steps per second.

Press the "22" key to change the Joystick's "High" speed setting. Enter the new speed setting (in steps/sec).

Refer to the *Unidex 21 Options Manual* for additional Joystick information.

6-4-1-24 23 : JOYSTICK LOW (STEPS/SEC)

Resolution ratio's vary between axes. When a Joystick move is requested, the speed/distance ratio for each affected axis must be compatible. This parameter establishes the speed at which the axis will move when a Joystick move is requested at the "Low" speed setting. To derive the Joystick "Low" speed setting for this axis, proceed as follows:

Determine the distance (mm/in) that this axis will move per second at the low speed.

Multiply this value by the axis resolution ratio (number of Machine steps that equal 1 (mm/in)).

The resulting number (steps/sec) is the Joystick-Low value to be entered for this parameter.

The minimum setting for this parameter is 1000.

The default setting is 10000 steps per second.

Press the "23" key to change the Joystick's "Low" speed setting.

Enter the new speed setting (in steps/sec).

Refer to the *Unidex 21 Options Manual* for additional Joystick information.

6-4-1-25 24 : START/STOP SPEED (STEPS/SEC)

The Start/Stop Speed parameter establishes the maximum speed this axis may be started or stopped without initiating an error condition.

The default setting is 2000 steps/sec.

Press the "24" key to change the Start/Stop speed. Enter the new speed.

6-4-1-26 25 : MODULO MACHINE STEP

This parameter is used to establish the step number which will signal the Unidex 21 to return its axis position counters to zero and begin another count of steps, starting with 1. The default setting is 0 (no counter reset).

Press the "25" key to change the number of steps after which the Unidex 21's counters return to zero. Enter the new step number.

6-4-1-27 26 : POWER-ON HOME FEEDRATE (S/S)

This parameter provides the User the ability to set a Home Feedrate specifically for a Home move following a Power-Up. To avoid possible equipment damage, it is suggested that this Home Feedrate be considerably slower than the programmed Home Feedrate since axis disorientation is likely.

The default setting is 2000 steps per second.

Press the "26" key to change the Home feedrate following a Power-Up. Enter the new feedrate.

6-4-1-28 27 : HOME SWITCH IS AT END ?

This parameter setting delineates for the Unidex 21 whether the Home Limit Switch is located at the end of axis travel or is a selected position as that of a Home Limit Switch on a Rotary Table.

The default setting specifies the Home Limit Switch to be at the end of axis travel.

Press the "27" key to change the Home Limit Switch status. Press the "Control" and "N" keys to toggle between Yes (the Home Limit Switch is located at the end of axis travel) or No (the Home Limit Switch is a selected point).

6-4-1-29 28 : HOME SWITCH IS NORMAL OPEN ?

This parameter must be configured to reflect the type of Home Limit Switch being used.

The default is that the Home Limit Switch is a normally open type switch.

Press the "28" key to change the Home Limit Switch status. Press the "Control" and "N" keys to toggle between Yes (the Home Limit Switch is a normally open switch) or No (the Home Limit Switch is a normally closed switch).

6-4-1-30 29 : POSITION LAG FACTOR (0-65535)

(Description not available at this time.)

6-4-1-31 30 : LIMIT SWITCH IS NORMAL OPEN ?

This parameter must be configured to reflect the type of CW and CCW Limit Switches being used.

The default is that the Limit Switches are a normally open type switch.

Press the "30" key to change the CW and CCW Limit Switch status. Press the "Control" and "N" keys to toggle between Yes (the Limit Switches are a normally open switch) or No (the Limit Switches are a normally closed switch).

6-4-1-32 31 : SWITCH-MECHANICAL LIMIT STEPS

The User must enter the number of Machine steps separating the Limit Switch from the Mechanical Stop.

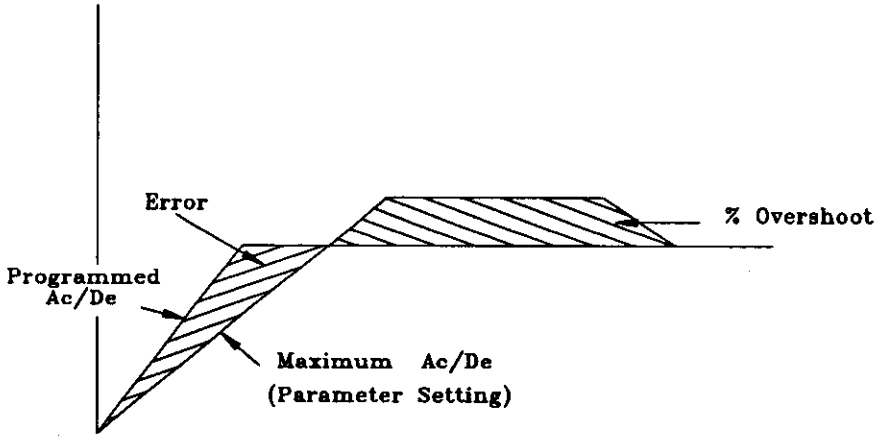
The default setting is 1000 Machine steps.

Press the "31" key to change the number of Machine steps designated as separating the Limit switches from the Mechanical stops. Enter the number of Machine steps.

6-4-1-33 32 : MAX OVERSHOOT % (n/128)

The maximum percentage of allowable Axis Overshoot must be entered for this parameter, 128 = 100%. The Unidex 21 uses this parameter to determine the amount of overshoot permissible when dissipating errors resulting from acceleration at a rate greater than the parameter setting of the Ac/De rate (see Item 6-4-1-10).

The default setting is 1.



Press the "32" key to change the maximum percentage of Axis Overshoot. Enter the percentage of the allowable overshoot.

6-4-1-34 33 : MAX VELOCITY ERROR (0-65535)

The maximum amount of allowable Velocity Error must be input at this parameter. The Unidex 21 presents an Error message if this parameter is exceeded during operation. A value of zero (0) will disable Maximum Velocity Error checking.

The default setting is 1000.

Press the "33" key to change the maximum allowable amount of Velocity Error. Enter the new amount (0-65535).

6-4-1-35 34 : MAXIMUM POSITION ERROR (0-65535)

The maximum amount of allowable Position Error must be input at this parameter. The Unidex 21 presents an Error message if this parameter is exceeded during operation. A value of zero (0) will disable Maximum Position Error checking.

The default setting is 1000.

Press the "34" key to change the maximum allowable amount of Position Error. Enter the new amount (0-65535).

6-4-1-36 35 : MAXIMUM INTEGRAL ERROR (0-65535)

The maximum amount of allowable Integral Error must be input at this parameter. The Unidex 21 presents an Error message if this parameter is exceeded during operation. The desired Integral Error value must be divided by 100 before it is entered. Example: If an Integral Error value of 20,000 is desired, enter 200 into this parameter. A value of zero (0) will disable maximum Integral Error checking.

The default setting is 1000.

Press the "35" key to change the maximum allowable amount of Integral Error. Enter the new amount (0-65535) +100.

6-4-1-37 36 : MFO ENABLED IN FREE RUN

This parameter permits the Manual Feedrate Override (MFO) function to be active in the Free Run mode.

The default setting is for MFO to be active during Free Run.

Press the "36" key to change the status of the MFO during Free Run. Press the "Control" and "N" keys to toggle between Yes (MFO enabled during Free Run) or No (MFO disabled during Free Run).

6-4-1-38 37 : TRAJECTORY IS LINEAR TYPE ?

Acceleration/ Deceleration (G0) Ramping Trajectory may be defined as either Linear or Parabolic. A Parabolic Ramping Trajectory is derived by applying a "Parabolic Coefficient" (see Parameter 38) to the maximum slope. (See Chapter 5: Machine Mode for more information.)

The default setting is for a Linear type trajectory.

Press the "37" key to change the trajectory type. Press "Control" and "N" keys to toggle between Yes (Linear Trajectory) or No (Parabolic Trajectory).

6-4-1-39 38 : PARABOLIC COEFFICIENT (0 - 65535)

The Parabolic Coefficient is the factor used to convert the linear velocity/time slope into a Parabolic Trajectory. It is suggested that coefficient selections may be made in steps of 10,000. The following formula is applied to the coefficient value selected:

$$\frac{\text{Parabolic Coefficient}}{65535}$$

The default setting is 24576.

A coefficient of zero (0) represents a Linear Ramp. Higher values result in a steeper curve.

Press the "38" key to change the Parabolic Coefficient. Enter the new number (0-65535).

6-4-1-40 39 : MACHINE ORIGIN STEPS

The Machine Origin parameter permits the User to establish a location, in Machine steps, to which the designated axes will return when the **MORG** command is used.

The default setting is zero.

Press the "39" key to enter the Machine Origin (in Machine steps) for this axis.

6-4-1-41 40 : INPUT 1 AUTO-FOCUS CONVERT FACTOR (n/65535) 0 TO 8388607

This parameter provides the User with the ability to establish the default value of the Conversion Factor used in conjunction with the **AFCO** command. This Conversion Factor is used to convert the Input Clock to Machine steps. The following formula applies:

$$\text{Machine steps} = \text{Input Clock} * \frac{n}{65535}$$

The default conversion factor is zero (0), indicating Input 1 is not used for Auto-Focus.

6-4-1-42 41 : INPUT 2 AUTO-FOCUS CONVERT FACTOR (n/65535) 0 TO 8388607

This parameter provides the User with the ability to establish the default value of the Conversion Factor used in conjunction with the **AFCO** command. This Conversion Factor is used to convert the Input Clock to Machine steps. The following formula applies:

$$\text{Machine steps} = \text{Input Clock} * \frac{n}{65535}$$

The default Conversion Factor is zero (0), indicating Input 2 is not used for Auto-Focus.

6-4-1-43 42 : FEEDBACK DEVICE?

This parameter configures the System for the type of position Feedback Device being used. The Unidex 21 may be configured to recognize any of the following Feedback Devices:

Enter a "0" if a Square Wave Encoder is providing position feedback.

Enter a "1" if a Resolver is providing position feedback.

Enter a "2" if the optional Resolution Multiplier Board with Sine Wave Encoder is providing position feedback.

Enter a "3" if an Open Loop Stepper Motor is being used.

The default setting is for a Square Wave Encoder as the Feedback Device.

6-4-1-44 43 : DRIVER TYPE?

This parameter configures the System for the type of Drive system being used. The Unidex 21 may be configured to recognize any of the following Driver types:

Enter a "0" if a DC Servo Brush Drive system is being used.

Enter a "1" if a AC Brushless Drive system is being used.

Enter a "2" if a Stepping Drive system is being used.

The default is for the use of a DC Servo Brush type Drive.

NOTE: If a Brushless Drive System is established by this parameter, the next parameter, "Brushless Commutation Factor", must be configured appropriately.

6-4-1-45 44 : BRUSHLESS COMMUTATION FACTOR

This parameter is valid only when a Brushless type motor is being used. The Brushless Commutation Factor is established as follows:

If the axis position feedback device is an Encoder, the Commutation Factor is the number of Machine steps per electric cycle (1 to 65535).

If the axis position feedback device is a Resolver, the Commutation Factor is the number of electric cycles per revolution (2, 3, 4).

The default setting is 2 (indicating a Brushless motor with Resolver position feedback).

Press the "44" key to change the Brushless motor Commutation Factor. Enter the new Commutation Factor.

6-4-1-46 45 : BACKLASH MACHINE STEPS, 0 TO 65535

To provide greater Positioning Accuracy, this parameter allows the User to enter a number of Machine steps (0 to 65535) to compensate for any backlash present in the system.

NOTE: Backlash compensation will not be enabled unless the axis is sent Home.

The default value is zero.

Press the "45" key to change the number of Machine steps that is necessary to compensate for System Backlash. Enter the compensation number (in Machine steps).

6-4-1-47 46 : EXISTENCE CHECKING 0/1/2/3

This parameter provides the User the ability to establish active axis status conditions that will be monitored by the Unidex 21 upon Power-Up or Reset. The use of this parameter gives added awareness to the User of the current configuration of the hardware.

The default setting is zero.

Press the "46" key to change the active status for this axis. The following options are available to set axis status:

0 - the status of this axis is irrelevant
1 - this axis **must** exist
2 - this axis **must not** exist
3 - this axis **always** exists regardless of status - No Auto-Tune procedure possible for this axis

Results of system monitoring are displayed in the Active Axis line of each display.

6-4-1-48 47 : CCW SOFTWARE LIMIT, MACHINE STEPS

This parameter permits the User to establish a CCW Software Travel Limit (in Machine steps) that is in reference to the Hardware Home.

The default setting is zero, indicating that a CCW Software Limit has not been established.

Press the "47" key to change the CCW Software Limit. Enter the new limit.

6-4-1-49 48 : CW SOFTWARE LIMIT, MACHINE STEPS

This parameter permits the User to establish a CW Software Travel Limit (in Machine steps) that is in reference to the Hardware Home.

The default setting is zero, indicating that a CW Software Limit has not been established.

Press the "48" key to change the CW Software Limit. Enter the new limit.

6-4-1-50 49 : STEP SIZE FOR STEP RESPONSE

This parameter permits the User to establish an optimum Step Size to produce a desired Step Response. Typically, the Step Size is 1/4 of the motor's resolution, i.e., a Step Size of 500 steps per revolution would be used for a 2000 line Encoder.

If AEROTECH, Inc. motors are being used in the system, the appropriate Step Size has been established as a default parameter setting (500 steps).

Press the "49" key to change the Step Size. Enter the new Step Size.

SECTION 6-5: AXES AUTO-TUNE

The Unidex 21 Auto-Tune function provides two tuning methods to optimize the Step Response output. The PIDF gains and the Step Size may either be individually adjusted for specific Step Response outputs, or the Unidex 21 may be requested to automatically adjust the PIDF gains. If the Unidex 21 is equipped with a Front Panel or EGA monitor, a graphic display of the Step Response and Velocity Curves is available to illustrate new or existing settings.

Enter "201" to change the PIDF gains or Step Size settings.

The display will be:

Axes		Parameter Setting					Auto/Manual Tune					Step
#	Name	Kp	Ki	Kd	f1	f2	Kp	Ki	Kd	f1	f2	Size
1	X	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
2	Y	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
3	Z	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
4	U	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
5	x	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
6	y	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
7	z	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500
8	u	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00500

A1 to A8 : Auto tune, Ad/cm, cm is current command % (1-100) default 30
S1 to S8 : Save to Parameter
P1 to P8 : Positive step response with auto/manual tune gain
N1 to N8 : Negative step response
M1 to M8 : Manual input gain or step size, format --Md/item/data
d = 1 - 8, item = P,I,D,F1,F2,S data = 0 - 16777215

ctrl-Quit, select =

A description of each of the axes for changing the PIDF gains or Step Size settings follows:

6-5-1: AXES # NAME

Each axes is assigned an **Axes #** (number), this number is used to specify the axis for all display functions.

The axes **Name** is the name assigned in the Axis Parameter, Symbol Setting. The default settings are X,Y,Z,U,x,y,z, and u.

6-5-2: PARAMETER SETTINGS

The Parameter Setting values indicate settings established at the factory, by the User from the Axis Parameter mode, through previously saved Manual settings or through previously saved Auto-Tune settings. An explanation of each of the Parameter settings follows:

6-5-2-1: Kp

The Kp parameter sets the Proportional gain within the PIDF loop. The "P" gain produces an output directly proportional to the position error, thus producing a constant counteracting force to the error.

6-5-2-2: Ki

The Ki parameter sets the Integral gain in the PIDF loop. The "I" gain produces an output which is a summation of the position errors, producing an increasing counteracting force for a constant or increasing position error.

6-5-2-3: Kd

The Kd parameter sets the Derivative gain in the PIDF loop. The "D" gain serves to dampen system response by producing a restraint as the system progresses toward error reduction.

6-5-2-4: Kf1

The Kf1 parameter sets Velocity Feedforward in the PIDF loop. The Velocity Feedforward value is a function of the system friction and torque constant. Since it is not strictly error driven, it complements the PID gain by reducing the compensation effort required, thus reducing system lag.

6-5-2-5: Kf2

The Kf2 parameter sets the Acceleration Feedforward in the PIDF loop. The Acceleration Feedforward value is a function of the system inertia and torque constant. Since it is not strictly error driven, it complements the PID gain by reducing the compensation effort required, thus reducing system lag.

6-5-2-6: Step Size

The optimum Step Size setting is dependent upon system configurations. Typically, the Step Size is 1/4 of the motor revolution, i.e., the Step Size of 500 steps per revolution would be used for a 2000 line encoder.

6-5-3: AUTO/MANUAL TUNE

The Auto/Manual Tune function permits the User to establish new settings for the gain values listed in the Parameter Setting section of this display. These values may be set manually or automatically by using the following options:

WARNING: USE OF THE AUTO-TUNE PROCEDURE MAY CAUSE SUDDEN MECHANICAL MOVEMENT.

6-5-3-1: A1 TO A8: AUTO TUNE, Ad/cm IS CURRENT COMMAND % (1- 100) DEFAULT 30

Selecting **A1** through **A8** initiates the Auto-Tune procedure for the designated axis (1-8). The generated values appear on the display when Auto-Tune is complete.

NOTE: The Auto-Tune procedure cannot take place on axes under gantry control (see the GANTRY Parameter setting). If an axis is selected that is under gantry control, an error message (Can't tune gantry axes! Ctrl-Quit, select =) will be displayed.

NOTE: The Auto-Tune procedure should not be done on the vertical (Z) axis.

A graphic display of the Step Response and Velocity Curves produced from these values is available by depressing **P1** through **P8** for a Positive Step Response display or **N1** through **N8** for a Negative Step Response display. A typical positive Step Response and Velocity Curve graphic is shown in Figure 6-1. The Step Response procedure may be performed while in the graphic mode by depressing "**P (1-8)**" or "**N (1-8)**". Press the "**Q**" key to return to the main Auto-Tune display.

NOTE: The graphic display retains all previous data. Newly generated curves are superimposed upon existing curves. The display may be cleared by depressing the "R" key.

NOTE: For optimum system performance, the Step Response display should exhibit some overshoot (approx. 25%). Systems that are overdamped (almost no indication of overshoot during Step Response) will have long settling times during Velocity Profiling.

It is recommended that the Step Response procedure be repeated a minimum of four times for each axis prior to saving these values to the Parameter Settings. Following each performance of the Step Response, the graphic should be examined for consistency. If inconsistency in "Overshoot" and/or "Settling Time" is evident, the current command may be increased or decreased, in steps of 5%, to achieve stabilization. Following each current command change, the Step Response should again be run a minimum of four times, and checked for consistency.

To increase or decrease the current command, proceed as follows:

Press the "A" key, the axis number **(1-8)** "/" and the new current command percentage **(1-100)**. The default current command percentage is 30.

If the output displayed by the Step Response curve is satisfactory, press "**S (1-8)**" to save the Auto-Tune gain values. The saved values will replace the previously established gain values in all Parameter Settings.

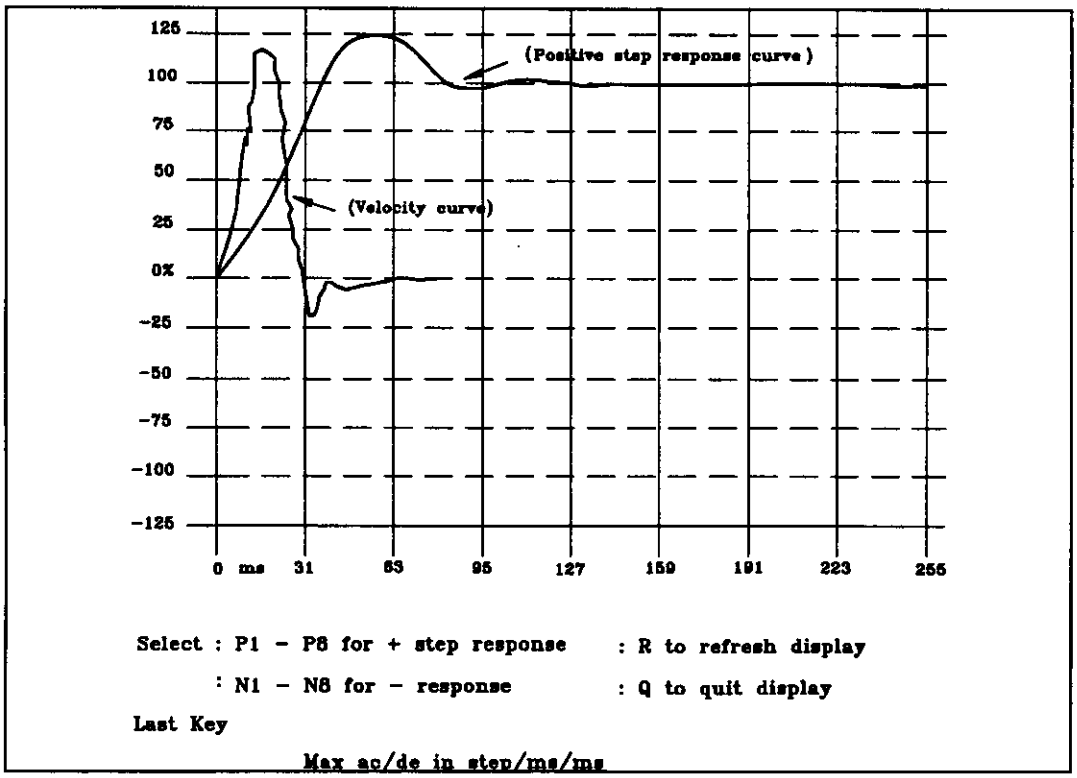


Figure 6-1: Typical Step Response and Velocity Curve Graphic

6-5-3-2: S1 TO S8 : SAVE TO PARAMETER

Selecting **S1** through **S8** saves the settings that have been established manually or by the Auto-Tune. Previous values in the Parameter Settings are replaced by the new values.

6-5-3-3: P1 TO P8 : POSITIVE STEP RESPONSE, WITH AUTO/MANUAL TUNE GAIN

Selecting **P1** through **P8** displays the graphic of the Positive Step Response for the Step Size and gain values that have been either automatically or manually derived.

6-5-3-4: N1 TO N8 : NEGATIVE STEP RESPONSE

Selecting **N1** through **N8** displays the graphic of the Negative Step/Response for the Step Size and gain values either automatically or manually derived.

6-5-3-5: M1 TO M8 : MANUAL INPUT GAIN OR STEP SIZE, FORMAT-- Md/item/data

d = 1-8, item = P,I,D,F1,F2,S data = 0-16777215

Selections through this function provide the User with the ability to manually configure the gain values and/or Step Size to achieve specific Step Response reaction. See Figures 6-2 and 6-3 for a summary of the affects of gain variation.

NOTE: The Velocity Feedforward Parameter Setting, should not, under most circumstances be manually set. Use the Unidex 21's Auto-Tuning function to select new Velocity Feedforward values.

NOTE: The Acceleration Feedforward Parameter Setting, should not, under most circumstances be manually set. Use the Unidex 21's Auto- Tuning function to select new Acceleration Feedforward values.

6-5-3-5-1: MANUAL GAIN SETTING

To manually alter a gain value and/or Step Size, use the following format:

Md/item/data
- d = Axes numbers 1-8
- item = Parameter Settings, P,I,D,F1,F2, or Step Size, S
- data = 0 -167772155

Press **P1** through **P8** for the Graphic display of the Positive Step/Response output.
Press **N1** through **N8** for the Graphic display of the Negative Step/Response output.

In addition to the Step Response curve, a Velocity Curve is shown. From this curve, the maximum acceleration value is derived by calculating the time required to reach the maximum velocity from zero. Use this value to establish "Acceleration/Deceleration steps/sec/sec" setting otherwise referred to as Axis Parameter #9.

NOTE: **Prior to entering the "Max ac/de/in step/ms/ms" value into the Axis Parameter setting, msec must be changed to sec. (Multiply the Max ac/de/in step/ms/ms value by 1,000,000.)**

6-5-3-5-2: MANUAL STEP SIZE SETTING

Typically, the Step Size is 1/4 of the motor's resolution, i.e., a Step Size of 500 steps per revolution would be used for a 2000 line Encoder. The Step Size is not automatically generated by the Auto-Tune procedure. If AEROTECH, Inc. motors are being used in the system, the appropriate Step Size has been established as a default parameter setting (500 steps). If AEROTECH, Inc. motors are not being used , the Step Size may be established as follows:

Press "**M1**" through "**M8**", "/", "**S**", "/", then the desired Step Size.

Press **P1** through **P8** for the Graphic display of the Positive Step/Response output.

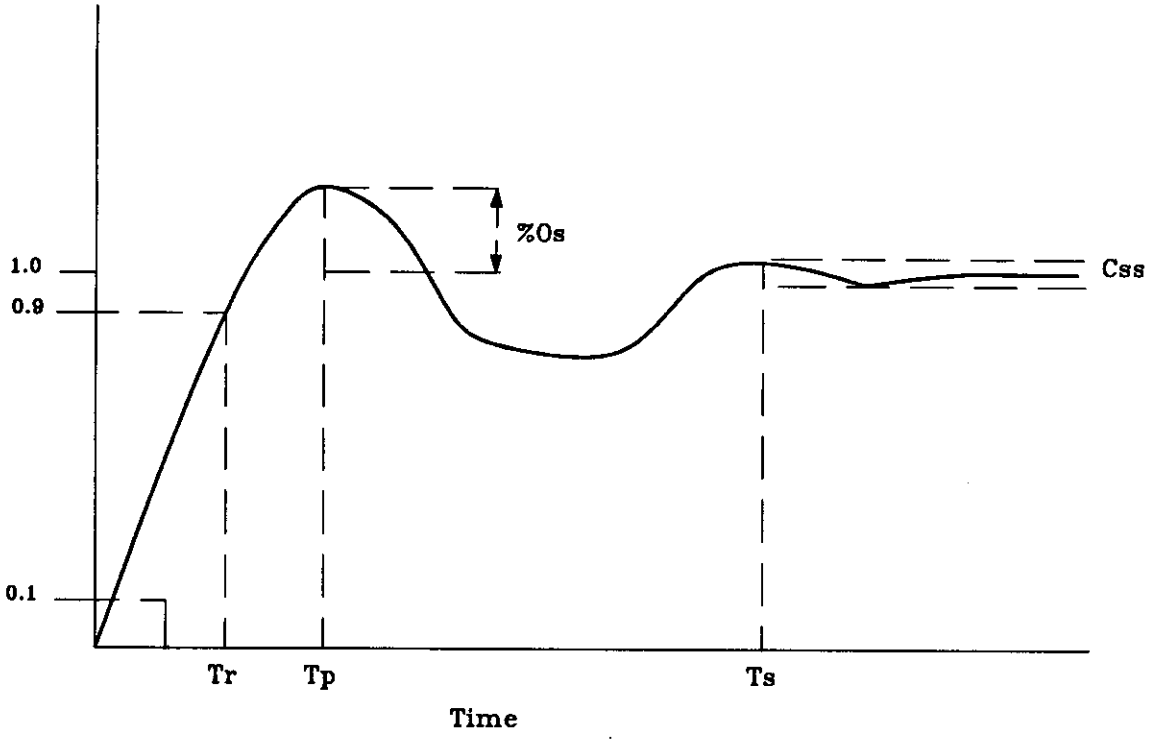
Press **N1** through **N8** for the Graphic display of the Negative Step/Response output.

NOTE: **If a Step Size value has been selected that is too large, Response Overshoot will consistently occur regardless of gain variations.**

NOTE **Selecting S1 through S8 saves the new Step Size as well as gain value settings. Upon Power Up or Reset, the previous values in the Parameter Settings are replaced by the new values.**

When the desired Step/Response output has been established, press **S (1-8)** to save these values.

Press the "Control" and "Q" keys to return to the main Parameter menu.



Tr — Rise Time of the Step Response is defined as the time that is required for the response to rise from 10 percent of the final value to 90 percent of the final value.

Tp — Peak Time is the time that the response takes to reach its peak value.

Ts — Settling Time is the time required for the output to stabilze to within 5 percent of its final value.

Css — Steady State is the final value of the Step Response.

%Os — Percent Overshoot is derived by the following formula:

$$\text{Percent Overshoot} = \frac{\text{Peak Value} - \text{Steady State Value}}{\text{Steady State Value}} \times 100$$

Figure 6-2: Typical Step Response

PARAMETER	Kp ↑	Ki ↑	Kd ↑
Rise Time	↓	↓	↑
Overshoot	↑	↑	↓
Settling Time	↑	↑	↓
Steady State Error	↓	↓	—
Damping Factor	↓	↓	↑

Figure 6-3: Gain Adjustment Affects on System Response

6-6: FRONT PANEL FUNCTION KEYS

Function keys F1 through F8 may be configured to initiate various program functions.

Enter "301", the display will be:

```
        Key              Mode      Title              bytes
F1
F2
F3
F4
F5
F6
F7
F8

Key definition buffer left (bytes) = xxx  (total of 512 bytes)
```

Press the "Control" and "Q" keys to return to the Main Parameter Menu.

Press the number of the Function key to be configured.

The following display will appear:

```
Select      :  Alt-Abort, Alt-Backspace, mode code/title/key-data <Alt-End>
mode code   :  all = 0, general =1, edit = 2, file = 3, machine = 4,
               p-meter = 5, test = 6, system = 7, INT 1/2 = 8
title       :  1 to 15 characters
Key-data    :  ASCII, Ctrl Keys are represented by πA to πZ.
Status F-   :  (mode code)/(title)/Key-data
New data    :
```

A description of the "on screen" Function key menu follows:

Select : Select provides a menu of options available in the Function key mode. The options are:

Alt-Abort Press the "ALT" and "A" keys to cancel any changes that have been made and return to the main Function key display.

Alt-Backpace Press the "ALT" and "B" keys to backspace and delete entered characters.

Alt-End Press the "Alt" and "E" keys at the completion of data entry to save the new Function key configuration and return to the main Function key menu.

mode code : The mode code delineates the mode from which the Function key is to be active.

all =	0 - the Function key is active from any mode at any display.
general =	1 - the Function key is active from the Main Display Menu only.
edit =	2 - the Function key is active in the Edit mode only.
file =	3 - the Function key is active in the File mode only.
machine =	4 - the Function key is active in the Machine mode only.
p-meter =	5 - the Function key is active in the Parameter mode only.
system =	7 - the Function key is active in the System mode only.
INT 1/2 =	8 - the Function key is activated to initiate Interrupt 1 or 2.

Key in the appropriate mode code number followed by "/".

title : The title is the Function key label which will be displayed at all selection screens. The title (1 to 15 characters in length) may be the same as the program name.

Key in the desired title immediately following the "mode code/".

Key-data : The Key-data line contains an explanation of the ASCII code displayed during entry of the Key data. Key-data entry consists of the actual keystrokes necessary to initiate a function.

For example, DRFILENAME.TYP π A π M π D is the Key-data entry for Debug, Run, Filename.typ, Ctrl-Automatic, Enter, Ctrl-Display.

Status F - The Status line provides the User with the data to which the Function key is currently configured.

New data : The New data line is the location where the User reconfigures the Function key. Data must be entered as described in "Select".

When the data is entered in this manner, use of the Function key will initiate all entered data.

SECTION 6-7: LOAD/SAVE PARAMETER

Parameter settings may be saved to a file and reloaded as desired.

Enter "300" to Load or Save parameter settings.

The following screen will be displayed:

```
Ctrl-Quit; Load-from (filename.typ) ; Save-to (filename.typ)

Select =
```

Press the "Control" and "Q" keys to return to the Main Parameter Menu.

Key in "S", the Filename.type and then "carriage return" to save the current parameter display to a file. Any file saved through the Parameter mode receives an attribute setting of "Read only".

Key in "L," the Filename.type and then "carriage return" to load an existing parameter file into the current parameter display.

NOTE: Loading a Parameter file over- writes all existing Parameter settings.

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CHAPTER 7: TEST MODE

SECTION 7-1: INTRODUCTION

The Unidex 21 contains a self-test mode initiated through the main selection menu. It is not necessary to do a system Power Down or Reset prior to performing the test.

The Test mode provides the ability to test three storage locations, EPROM, RAM and the Parameters. In addition to the testing function this mode provides the ability to clear all User files from memory.

SECTION 7-2: GETTING STARTED

Following Power-Up the Initial Selection screen below will be displayed:

```
UNIDEX 21      Version xx

EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Enter the Test Mode by pressing the "T" key from the Initial Selection screen.

The following message will be displayed:

```
Ram, Eprom, Parameter, Ctrl-Clear memory, Ctrl-Quit
```

SECTION 7-3: RAM CHECK

Depress the "R" key to perform a RAM check. The RAM check is internally divided into two subsections:

1) System RAM
2) User RAM

The Read and Write capability is checked in both subsections of RAM.

The User RAM, in addition checking Read and Write, also checks the User's file checksum to verify file integrity.

If the both sections of the RAM check are verified, the following message will appear:

RAM OK ; Select function :

If a Read/Write error is detected one of the following is displayed:

RAM (0) fail @ (address location) = (fail data)
RAM (F) fail @ (address location) = (fail data)
RAM (5) fail @ (address location) = (fail data)
RAM (A)fail @ (address location) = (fail data)

If a checksum error is detected the following will be displayed:

RAM checksum error (filename.type)

SECTION 7-4: EPROM

Depress the "E" key to perform an EPROM test. The Unidex 21 performs a checksum on all data contained on EPROM.

If the check is verified the following screen will be displayed:

> **EPROM OK ; Select function :**

If the EPROM check is not verified the following will be displayed:

> **EPROM checksum error ; Select function :**

If an EPROM error is detected, contact a AEROTECH, Inc. Service Representative for assistance.

SECTION 7-5: PARAMETER

Press the "P" key to perform a checksum on the Unidex 21's parameters. Verification is performed between the last previously saved parameters and the currently active parameters.

If the Parameter check is verified the following screen will be displayed:

> **Parameter OK ; Select function :**

If the Parameter check is not verified the following will be displayed:

Parameter error ; Select function :

SECTION 7-6: CTRL- CLEAR MEMORY

Press the "Control" and "C" keys to clear RAM memory.

SECTION 7-7: CTRL-QUIT

Press the "Contol" and "Quit" keys to return to the main selection menu.

CHAPTER 8: SYSTEM MODE

SECTION 8-1: INTRODUCTION

The Unidex 21 contains a System Mode initiated through the main selection menu.

SECTION 8-2: GETTING STARTED

Following Power-Up the Initial Selection screen will be displayed:

```
UNIDEX 21      Version xx

EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Enter the System Mode by pressing the "S" key from the Initial Selection screen.

The following message will be displayed:

```
Date, Time, Version, Standard, Password, Ctrl-Quit
> Select function:
```

SECTION 8-3 : DATE

Depress the "D" key to verify or change the System's date. The following will be displayed:

```
"Current Date"        (dd-mmm-yyyy)  Ctrl-Quit < = >
```

If the "Current Date" is to be changed, enter the desired date in the format illustrated below:

dd;	must be entered as digits 01 to 31	
mmm;	JAN	JUL
	FEB	AUG
	MAR	SEP
	APR	OCT
	MAY	NOV
	JUN	DEC
yyyy;	1990	

If the "Current Date" is not to be changed, press the "Control" and "Q" keys to return to the main System menu.

SECTION 8-4: TIME

Depress the "T" key to verify or change the System's Time setting, The following will be displayed:

```
"Current Time"        (hh-mm-ss)  Ctrl-Quit < = >
```

If the "Current Time" is to be changed, enter the desired time in the format illustrated below:

hh;	00 to 23
mm;	00 to 59
ss;	00 to 59

If the "Current Time" is not to be changed, press the "Control" and "Q" keys to return to the main System menu.

SECTION 8-5: VERSION

Depress the "V" key to display the Version number of the software installed in the Unidex 21.

The following will be displayed:

```
Version X.X ; Select function :
```

SECTION 8-6: STANDARD

Press the "S" key to display the Standard syntax being used by the system. The display below shows the system default standard:

```
>XYZU IJKP LCD OAB xyzu ijkp lcd oab NGHFMST ; Select function
```

XYZU -	represents axes 1-4
IJKP -	represents circular interpolation parameters of axes 1-4
LCD/OAB -	represent polar cordinate commands for circular interpolation of axes 1-4
xyzu -	represents axes 5-8
ijkp -	represents circular interpolation parameters of axes 5-8
lcd/oab -	represents polar coordinate commands for circular interpolation of axes 5-8
NGHFMST -	RS274-D Commands

SECTION 8-7: PASSWORD

Applicable passwords and their active functions may be established within the Parameter Mode (see Chapter 6 of this manual). Thereafter, upon Power-Up a Password will be required to operate the System. Any established password may be used, however, it may be that all modes are not available for all passwords.

The System Password function permits the User to initialize the system to another previously established password without enacting a complete Power Down.

Press the "P" key to initialize a different System password..
The following will be displayed:

```
> Select function
  Password:
```

Enter the Password and Reset the System. The System will now be active to the functions established in the Parameter Mode for this password.

CHAPTER 9: BATCH MODE

SECTION 9-1: INTRODUCTION

Batch files may be created in the Edit Mode to simplify and accelerate a frequently used series of events. Batch files typically contain one or more command functions that are to be executed one at a time (see Figure 9-1 for an example of Batch File creation).

The Unidex 21's Batch Mode function provides the User with the ability to process Batch files that have been previously created and reside in User memory.

SECTION 9-2: GETTING STARTED

Following Power-Up the Initial Selection screen will be displayed:

```
UNIDEX 21       Version xx


EPROM OK        PARAMETER OK        RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter. Test, System, Batch, Console, Debug
```

Enter the Batch Mode by pressing the "B" key from the Initial Selection screen. The following message will be displayed:

```
Batch function mode
> Ctrl-Quit, filename.type =
```

Press the "Control" and "Q" keys to return to the Initial Selection menu.

Enter the filename.type of the Batch file to be executed.

UNIDEX 21 BATCH FILE EXAMPLE

A Batch File is created in the Edit Mode in the same way as a standard program file, with the following exceptions:

1) The "Control" character is represented by the "^" key.

2) Any function requiring an "Enter" or <CR> must be followed by a "^M".

EXAMPLE FILE:

```
M                   ; from the Power-Up Initial selection screen, entry is made
                      into the Machine Mode. (No <CR> required)
M                   ; from the Machine Mode entry is made into Mdi. (No <CR>
                      required)
(REF,U) ^M          ; U axis is sent Home (<CR> required to activate)
G11 F100. U1. ^M    ; U axis moves 1 (in./mm) with Linear contouring at a Feedrate
                      of 100 steps/sec. (<CR> required to activate)
^Q                  ; Quits Mdi Mode (No <CR> required)
^Q                  ; Quits Machine Mode (No <CR> required)
F                   ; from the Power-Up Initial selection screen, entry is made
                      into the File Mode. (No <CR> required)
```

Figure 9-1: Batch File Example

CHAPTER 10: CONSOLE MODE

SECTION 10-1: INTRODUCTION

The Console mode provides the User the ability to establish monitor characteristics for the Unidex 21's console or front panel display.

SECTION 10-2: GETTING STARTED

Following Power-Up the Initial Selection screen will be displayed:

```
UNIDEX 21      Version xx


EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Enter the Console Mode by pressing the "C" key from the Initial Selection screen.

The following will be displayed:

```
Last key in =

Alt - Activate console #1  Alt - Backround color  Alt - Quit console mode
Alt - Interface PLC  Unidex 21  Terminal  Monitor  Alt - Through Port A  B
```

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CHAPTER 11: THE DEBUG MODE

SECTION 11-1: INTRODUCTION

The Debug Mode provides the User with the ability to simulate program runs, to aide in the elimination of programming errors.

All applicable Machine Mode functions are duplicated in the Debug mode and are accessed in the same manner asdetailed in the Machine Mode. A Display function is added to provide the User with a visual verification of the program prior to entering the Machine Mode. Make certain that all appropriate Parameters have been properly established. (See Chapter 6: The Parameter Mode)

The following sections provide information concerning the Setup andDisplay functions of the Debug Mode. For information regarding any other Debug Mode functions, refer to Chapter 5: Machine Mode.

SECTION 11-2: GETTING STARTED

Following Power-Up the initial selection screen is displayed:

```
UNIDEX 21      Version xx

EPROM OK       PARAMETER OK       RAM checksum
User's RAM (bytes) = xxxxxxx

Edit, File, Machine, Parameter, Test, System, Batch, Console, Debug
```

Depress the "D" key to enter the Debug Mode. The following screen will be displayed:

```
        X    0.000        x    0.000
        Y    0.000        y    0.000
        Z    0.000        z    0.000
        U    0.000        u    0.000


H1 H11 H17 G1 G11 ..... (system codes)        Feedrate =  0.00      0.00

.....(program)


Ctrl (Auto/Single [S]) (C-start) (Error ack) (Feedhold) (Track) (Display) (Quit)

  > Home, Jog, Mdi, Run, Setup,  Ctrl- ^ Abort      select :
```

SECTION 11-3: DEBUG MODE SCREEN DESCRIPTION

See Chapter 5: Machine Mode for an explanation of all of the Debug functions except "Display" and "Setup".

NOTE: The Tracking display in the Debug Mode indicates Program steps only.

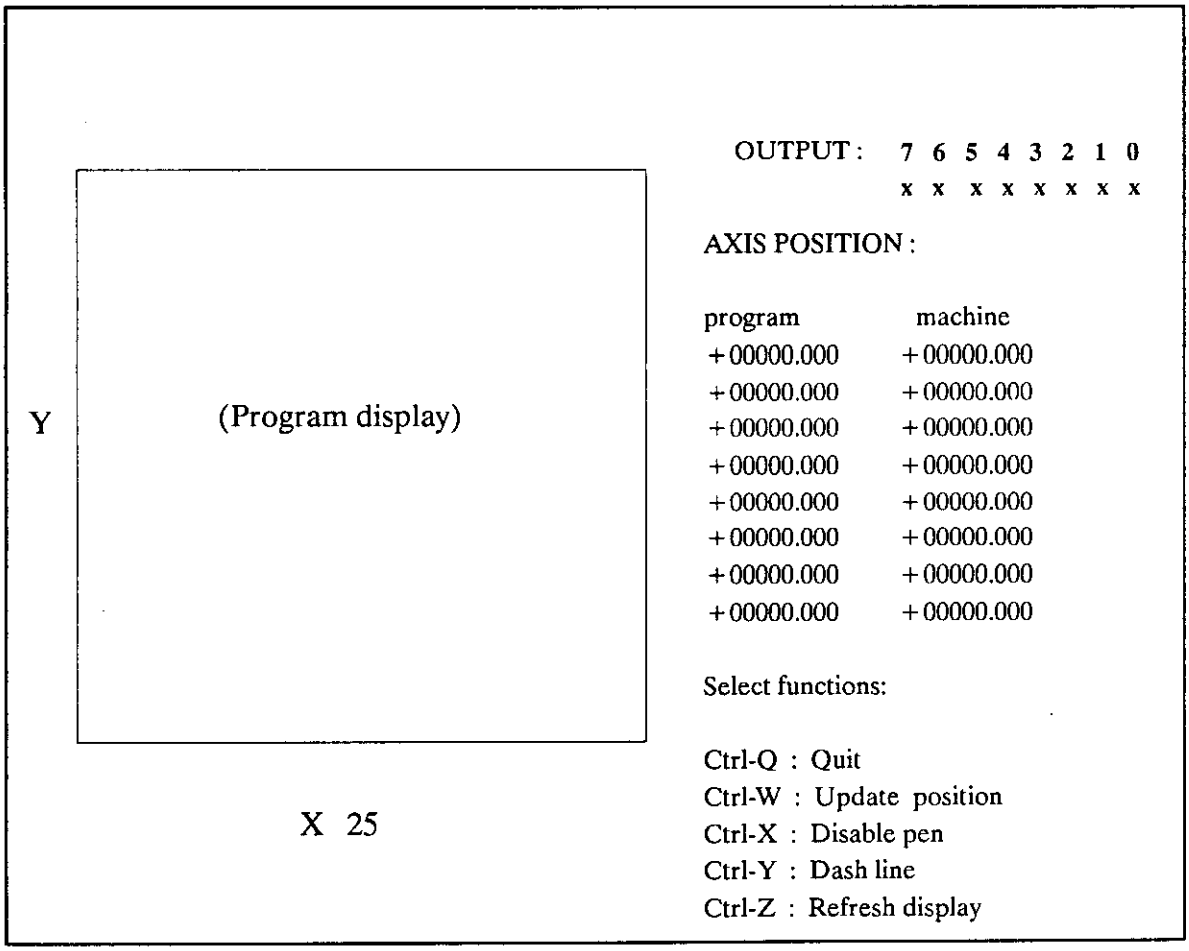
11-3-1: DISPLAY

The Display function provides the User the ability to change the screen from the main Debug display, to a simulated result of the program run.

To use the Display screen to debug a program, proceed as follows:

Enter the Filename.type of the program to be run. If the "Single/Auto" function is set to "A", the program will soon begin to run. If the "Single/Auto" function is set to "S", only the first block of the program will run. Subsequent blocks must be run by pressing the "Control" and "C" keys, the Numeric "+" or the CYCLE START key of the Front Panel. If the program was initially set to run Single and is switched to Auto the "Control" and "C" keys and or the Front Panel CYCLE START key must be pressed to start program run.

Press the "Control" and "D" keys to change the screen to the program display screen. The following will be displayed:



11-3-1-1: (Program Display)

This is the area used to provide a program simulation. The axes names, as defined in Debug Setup (See next Section) are labeled. In addition to the axis name, the "Display Window" size is also indicated (established in Debug Setup).

11-3-1-2: OUTPUT

The Unidex 21 contains eight Output pins (addressed by system variables; $OTP0 through $OTP7). This display is included to indicate to the User which Output Pins are active.

An "X" indicates a non active output, a "1" indicates an active high output, a 0 indicates an active low output.

11-3-1-3: AXIS POSITION

The Axis Position indication of the Debug Display supply the User with a numerical axis position in conjunction with the simulated program run. The axes position is displayed in both program and machine steps.

11-3-1-4: CTRL-Q

Press the "Control" and "Q" keys to quit the Display mode and return to the main Debug screen.

11-3-1-5: CTRL-W

Press the "Control" and "W" keys to activate or deactivate the Axis position display.

11-3-1-6: CTRL-X

Press the "Control" and "X" key to Disable or Enable the pen. If a simulation of the actual workpiece is desired the pen should be disabled at times when the tool would not be touching the workpiece. If axis movement is to be simulated, the pen should be enabled for entire program run.

11-3-1-7: CTRL-Y

Press the "Control" and "Y" keys to toggle between solid and dash lines. It may be desirable to specify different line types when a program requires overlapping lines such as in program comparisons.

11-3-1-8: CTRL-Z:

Press the "Control" and "Z" keys to provide a clean program display screen.

11-3-2: SETUP

From the main Debug screen press the "S" key to establish the Debug Display parameters. The following will be displayed:

```
Ctrl - (First ) (Second) (Reference) (Window) (Down) (up) (Abort) (Quit)

Setup >
   Plane = ( X,Y) Reference = (1/2/3/4) Window (XX)
   Down = (XXXX = 1/0)   Up = (XXXX = 1/0)
```

11-3-2-1: CTRL-FIRST

Press the "Control" and "F" keys to change the first axis designation in the Debug Display's Plane setting. (Axis symbols are established in the Axis Parameter Mode, Chapter 6).

11-3-2-2: CTRL-SECOND

Press the "Control" and "S" keys to change the second axis designation in the Debug Display's Plane setting. (Axis symbols are established in the Axis Parameter Mode, Chapter 6).

11-3-2-3: CTRL-REFERENCE

Press the "Control" and "R" keys to change the Home Reference location. The following selections are possible:

1 = display of the program will be referenced from the lower left corner of the display

2 = display of the program will be referenced from the lower right corner of the display

3 = display of the program will be referenced from the upper right corner of the display

4 = display of the program will be referenced from the upper left corner of the display

11-3-2-4: CTRL-WINDOW

Press the "Control" and "W" keys to establish the window size in the Debug Display. The window size may be in either Metric or English and is referenced to workpiece size. For example, if a window size of 25 inches is entered, the Debug Display will show the segment of the workpiece which is encompassed within a 25 inch window. Additional segments may be viewed by changing the reference point as explained above.

11-3-2-5: CTRL-DOWN

Press the "Control" and "D" keys to specify a function for "pen down" activate the Ouputs (1-8).

For example if; DOWN = ($OT7 = 1); each time ($OT7 = 1) is decoded the Debug Display will respond with a pen down.

11-3-2-6: CTRL-UP

Press the "Control" and "U" keys to specify the output function which will activate a Debug Display pen up.

For example if; UP = (M90 = 0); each time (M90 = 0) is decoded the Debug Display will respond with a pen up.

NOTE: Both the pen down and pen up functions may be activated or deactivated by the Ctrl-X keys

11-3-2-7: CTRL- QUIT

Press the "Control" and "Q" keys to return to the previous selection screen.

SERVICE AND REPAIR

Customer repair of the equipment is limited. Control Board(s) may be removed and replaced if necessary, however, component level repair must not be attempted.

On-site service should be performed by an experienced electronic technician, preferably one trained by Aerotech.

SHIPMENT

The procedure for shipping equipment to Aerotech, described below, pertains to warranty as well as non-warranty repairs.

1. Before returning any equipment a "Return Authorization Number" must be obtained from Aerotech. (Be prepared to give the serial number of the equipment being returned.)

2. The equipment being returned must be encased in a proper cushioning material and enclosed in a cardboard box.

Call for a "Return Authorization Number" if it is necessary to ship any equipment to the factory.

WARNING: DAMAGE TO THE EQUIPMENT DUE TO IMPROPER PACKAGING MAY VOID WARRANTY!

Aerotech Sales and Service offices are listed below. For service and information, contact the office servicing your area.

AEROTECH, INC. SALES OFFICES

WORLD HEADQUARTERS
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West Germany

Phone (0911) 521031
TLX 622474
FAX (0911) 521235

Warranty and Field Service Policy

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products which are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Laser Product Warranty

Aerotech, Inc. warrants its laser products to the original purchaser for a minimum period of one year from date of shipment. This warranty covers defects in workmanship and material and is voided for all laser power supplies, plasma tubes and laser systems subject to electrical or physical abuse, tampering (such as opening the housing or removal of the serial tag) or improper operation as determined by Aerotech. This warranty is also voided for failure to comply with Aerotech's return procedures.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within (30) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. Any returned product(s) must be accompanied by a return authorization number. The return authorization number may be obtained by calling an Aerotech service center. Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than (30) days after the issuance of a return authorization number will be subject to review.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warrantied defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an air freight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Returned Product Non-Warranty Determination

After Aerotech's examination, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within (30) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-Site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty- related, then the following policy applies.

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special service rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-Site Non-Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies.

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

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