ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Aerotech U1B-LM-A-40* at our website: *Click HERE*

UNIDEX® 1
STEPPING MOTOR
MOTION CONTROLLER
USER'S MANUAL

PN: EDU100

AEROTECH, INC., 101 Zeta Drive, Pittsburgh, PA 15238
(412) 963-7470 • TWX 710-795-3125 • FAX(412)963-7459

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Aerotech, Inc.
Release No. 4.1
March, 1991

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DISCLAIMER:

The information contained in this manual is subject to change due to improvements in design. Though this document has been checked for inaccuracies, Aerotech does not assume responsibility for any errors contained herein.

NOTICE:

The information presented in this manual provides a detailed explanation of the Unidex 1 Stepping Motor Motion Controller. Information pertaining to Unidex 1 programming as well as motor, input power, and external control interconnections is provided.

TRADEMARKS:

Unidex is a registered trademark of Aerotech, Inc.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION 1-1
SECTION 1-1 GENERAL DESCRIPTION 1-1
SECTION 1-2 UNIDEX 1 FEATURES 1-2

CHAPTER 2: SYSTEM LAYOUT/EXTTERNAL CONNECTIONS 2-1
SECTION 2-1 INPUT POWER CONNECTION 2-1
SECTION 2-2 INPUT POWER CONNECTION 2-4
SECTION 2-3 INPUT POWER CONNECTIONS 2-7
SECTION 2-4 MOTOR POWER CONNECTIONS 2-9
SECTION 2-5 MOTOR POWER CONNECTIONS 2-11
SECTION 2-6 MOTOR POWER CONNECTIONS 2-13
SECTION 2-7 CONTROL CONNECTIONS, PORT A, B, C 2-15

CHAPTER 3: MOTOR CONNECTIONS 3-1
SECTION 3-1 MOTOR TYPE U1A, U1B, & U1H 3-1
SECTION 3-2 MOTOR TYPE U1AHM, U1B-HM & U1H-HM 3-2
SECTION 3-3 MOTOR TYPE U1C & U1D 3-3
SECTION 3-4 MOTOR TYPE U1C-HM & U1D-HM 3-4
SECTION 3-5 MOTOR TYPE U1E & U1F 3-5
SECTION 3-6 MOTOR TYPE U1E-HM & U1F-HM 3-6

CHAPTER 4: POWER UP 4-1
SECTION 4-1 POWER UP 4-1
SECTION 4-2 INITIALIZATION 4-1
SECTION 4-3 DEACTIVATING UNIDEX 1 4-3
SECTION 4-4 MULTI-AXIS ACTIVATION 4-3
SECTION 4-5 AUTO BOOT PROGRAM OPERATION 4-4

CHAPTER 5: SETUP 5-1
SECTION 5-1 DESCRIPTION 5-1
SECTION 5-2 SETUP MODE SELECTION 5-2
SECTION 5-3 TFX HAND HELD TERMINAL INITIALIZATION 5-3
SECTION 5-4 HAND HELD TERMINAL: DISPLAY/SETUP 5-5
SECTION 5-5 COMPUTER INTERFACE : PRINT SETUP 5-6
SECTION 5-6 COMPUTER INTERFACE: ALTER SETUP 5-6
SECTION 5-7 SETUP CODE DESCRIPTION 5-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 6: UNIDEX 1 OPTIONS 6-1
SECTION 6-1 TFX HAND HELD TERMINAL 6-1
SECTION 6-2 THUMBWHEEL PROGRAMMER (TP) 6-19
SECTION 6-3 THUMBWHEEL INDEXER 6-23

CHAPTER 7: COMPUTER INTERFACE (PORT A) 7-1
SECTION 7-1 REQUIRED HARDWARE 7-1
SECTION 7-2 COMPUTER INTERFACE FORMAT SETUP 7-5
SECTION 7-3 COMMUNICATING THROUGH PORT A 7-6
SECTION 7-4 TYPES OF COMMANDS 7-6
SECTION 7-5 SERVICE REQUEST AND SERIAL POLL 7-10
SECTION 7-6 ERROR CODES 7-13
SECTION 7-7 SYSTEM COMMANDS 7-17
SECTION 7-8 MOTION PROGRAM COMMANDS 7-24
SECTION 7-9 COMPUTER INTERFACE COMMANDS 7-37

CHAPTER 8: PROGRAMMABLE ACEL/DECEL 8-1
SECTION 8-1 MANUAL PROGRAMMING OF RAMP TIME 8-1
SECTION 8-2 START/STOP FEEDRATE PROGRAMMING 8-2
SECTION 8-3 ACCEL/DECEL PROFILE SETUP 8-2
SECTION 8-4 RAMP TIME PROGRAMMING WITHIN PROGRAM 8-2
SECTION 8-5 ACCEL/DECEL IS NOT IMPLEMENTED 8-3
SECTION 8-6 ACCEL/DECEL IN OPERATION 8-3
SECTION 8-7 RAMPING LIMITATIONS 8-7
SECTION 8-8 OTHER LIMITATIONS 8-8

CHAPTER 9: APPLICATION PROGRAM 9-1
SECTION 9-1 SAMPLE PROGRAM DESCRIPTION 9-1

CHAPTER 10: TROUBLESHOOTING 10-1
SECTION 10-1 SOFTWARE MALFUNCTIONS, STATUSES 10-2
SECTION 10-2 HARDWARE MALFUNCTIONS 10-7

SERVICE AND REPAIR

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 1: INTRODUCTION

SECTION 1-1 GENERAL DESCRIPTION

The single axis Unidex 1 Micro-Stepping Driver is a microprocessor-based motion controller most applicable for low and medium power programmable positioning. A variety of models are available providing adaptability to a wide range of applications. The Unidex 1 is packaged in three configurations; 1) Low power panel/desktop mount 2) High power panel mount, and 3) Low power 6U Euro Cardrack mount (Figure 1-1).

The Unidex 1 may recieve control from four sources; 1) User supplied Host Computer (any PC or terminal capable of transmitting ASCII characters) 2) Optional TFX Hand Held Programming Terminal, 3) Optional Thumbwheel Programmer,(TP) and the 4) Optional Thumbwheel Indexer ,(TI).

Unidex 1 Micro-Stepping Motion Controller User specifications are provided in Tables 1-1 and 1-2 and 1-3.

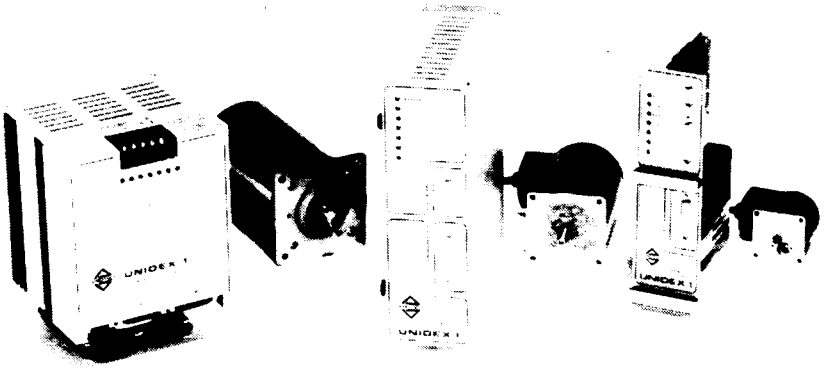


Figure 1-1: Unidex 1 Programmable Motion Control Family of Stepping Motor Control

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 1-2 UNIDEX 1 FEATURES

Program Capacity

- Capacity to store approximately 545 1-axis moves
- Stores up to 99 randomly accessible programs

Programmable Acceleration/Deceleration Parameters

- Accel/decel ramp time = 50 - 9999 milliseconds
- Start/stop feedrate = 1 - 125000 steps/second
- Accel/decel profile = Linear or Parabolic

RS-232 Command Mode Features

- Setup mode for modal parameters
- Immediate command execution
- Downloading for up to 99 programs
- Program run in Auto-run or Block-run mode
- Print - Directory, Axis Position, Single Program, Entire Memory, System Status
- Interactive control capability (Service Request Mode)

Hand-held Terminal (Model TFX) Features (optional)

- Special menu-assist screens
- Setup mode for modal parameters
- Immediate command execution
- Enter and edit up to 99 programs
- Program run in Auto-run or Block-run mode
- Print: Directory, Program, Axis Position, System Status
- Special operations: Home, Index, Stop Axis
- Tracking Display: Continuously displays Mode of Operation, Position, Direction of Travel, and Marker Status while the Motor is running.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Thumbwheel Operation (Optional)

- Immediate command execution.
- Selection of 99 pre-programmed motion sequences.
- No Operator alteration.

Thumbwheel Indexer (Optional)

- Enter and execute single moves as well as complete programs.
- Distance, speed, and acceleration for the move may be set up by the seven digit thumbwheel.
- Selection of up to 99 pre-programmed motion sequences.

Daisy Chain Operation

- Up to 30 Unidex 1s can be connected and accessed at one time
- Address selectable

Auto-Boot Program

- Select any of 99 programs for automatic execution upon power up

Key Program Mode Features

- Conditional program label and subroutine branching via logic input status
- Interrupt program label and subroutine branching via logic input status
- Programmable position boundaries (limits) in program run mode

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SPECIFICATIONS

MEASURES	
Resolution	
Standard	0.09 (4000 steps/rev.)
Optional:	1.8 to 0.0072 (200 to 50,0000 steps/rev.)
Accuracy	+/- 5 arc min. typical unloaded, biodirectional
Repeatability	+/- 5 arc min. typical unloaded, unidirectional
Hysteresis	3 arc min. unloaded, bi-directional
MOTIONS	
Position Range	+/- 1,999,999,999 counts (Range with standard resolution. No limit in free run mode.
Speed Range	0.00025 to 108 rev./sec (0.015 to 6500 rpm)
Acceleration Ramp	50 to 6500 msec
Acceleration Profile	Linear, parabolic (selectable)
Positioning Modes	Absolute, incremental (programmable)
PROGRAMMING	
Programs Storable	99, randomly-accessible Memory (user) 6KB standard, 14KB extended; battery-backed
Modes:	
SET-UP:	Set basic device parameters
AUTO:	Program runs automatically (usual operating mode)
IMMEDIATE:	Block of commands executed immediately on entry
BLOCK RUN:	Permits execution of a motion program one block at a time
EDIT:	Allows new program entry or existing program alteration
REMOTE:	Facilitates clock and direction type control through Unidex 1 from external device
HOLD:	Stop motion; released by trigger or cancel commands
FREE RUN:	Constant speed with infinite position range
Branching	Conditional, interrupt and program initiated GOTO and GOSUB
Subroutine Nesting	Up to 8 levels
Other Features	Auto Boot: Selected program execution upon power-up Software Travel Limits

Table 1-1: Specifications

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INTERFACES

Command (Port A)

Communication	Serial RS-232-C (defaults:9600 baud, 7 data bits, 1 stop bit, even parity)
	Up to 30 Unidex 1's daisy-chainable on one RS-232 line
	+5 VDC @ 30 mA to power remote programming terminal 9 pin, female, type-D
Connector	

Inputs/Output

(Port B)

Discrete Input	4 programmable, optically-isolated
	1 set-up, function select
	2 external clock and direction
	1 feed hold function select, optically isolated
	2 CW, CCW limits, optically-isolated
Discrete Outputs	4 programmable, optically-isolated
	1 fault, optically-isolated
Connector	25 pin, female, type-D
Control (Port C)	Buffered inputs for: CW, CCW limits, Marker (used with H option), encoder
Connect	25 pin, female, type-D
Indicators	7 LEDS, front panel,indicate status and help in diagnosis

ENVIORMENTAL

Ambient Temperature

Operating	0 to 50 C (32 to 122 F)
Storage	- 30 to 85 C (122 to 185 F)
Humidity	0 to 95%, non-condensing

POWER INPUT

AC Power	115 VAC (nom.), 50/60 Hz, 1000 VA (max.), single-phase
	Optional 230 VAC (nom.) 50hz., or 100 VAC (nom.), 50Hz.

Table 1-1: Specifications Con't

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 1-2: Unidex 1 Programmable Stepping Drive Specifications

	LOW POWER PANEL/DESKTOP MOUNT CONFIGURATION			HIGH POWER PANEL MOUNT CONFIGUATION			LOW POWER 6U CARDRACK MOUNT CONFIGURATION		
COMPUTER PACKAGE P/N	U1A	U1B	U1C	U1D	U1E	U1F	U1P	U1R	U1S
Translator P/N	DM4001	DM4005	DM6006	DM8010	DM8010	DM16008	DM4001	DM4005	DM6006
STEPPING MOTOR P/N	50SM	101SM	300SM	310SM	510SM	1010SM	50SM	101SM	300SM
STATIC TORQUE									
OZ-IN	38	90	350	370	520	1050	38	90	350
MOTOR SPEED									
RPM	1000	1875	1500	1875	1500	1500	1000	1875	1500
MAXIMUM MOTOR									
OUTPUT POWER WATTS	12	53	100	250	220	380	12	53	100
MOTOR ROTOR INERTIA									
OZ-IN-SEC^2	$1.66E^{-3}$	$5E^{-3}$	$26.5E^{-3}$	$26.5E^{-3}$	$55E^{-3}$	$114E^{-3}$	$1.66E^{-3}$	$5E^{-3}$	$26.5E^{-3}$
Kg-M^2	$11.8E^{-6}$	$35E^{-6}$	$187E^{-6}$	$187E^{-6}$	$388E^{-6}$	$805E^{-6}$	$11.8E^{-6}$	$35E^{-6}$	$187E^{-6}$
MOTOR FRAME									
NEMA 2	23	23	34	34	42	42	23	23	34
MOTOR TYPE	2-PHASE HYBRID PERMANENT MAGNET, 1.8 DEGREE/FULL STEP								
Translator									
VOLTS (DC)	40	40	60	80	80	160	40	40	60
AMPS	1	5	6	6	8	8	1	5	6
TYPE	UNIPOLAR	UNIPOLAR	BIPOLAR	BIPOLAR	BIPOLAR	BIPOLAR	UNIPOLAR	UNIPOLAR	BIPOLAR
WEIGHTS									
MOTOR (LBS)	2.3	3.6	8.1	8.1	14	20	2.3	3.6	8.1
(KG)	1.05	1.64	3.68	3.68	6.36	9.09	1.05	1.64	3.68
MOTOR/DRIVE (LBS)	12.00	14.00	20.00	34.00	40.00	38.00	12.00	14.00	20.00
(KG)	5.45	6.36	9.09	15.45	18.17	17.26	5.45	6.36	9.09
(Includes all interconnecting cables)									
INPUT POWER									
VOLTS (50/60 HZ)	115/220-240	115/220-240	115/220-240	115/220-240	115/220-240	115 *	115/220-240	115/220-240	115/220-240
AMPS (Allowable voltage tolerance (±10%,Max.)	.5	1	1.5	3	3	4	.5	1	1.5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

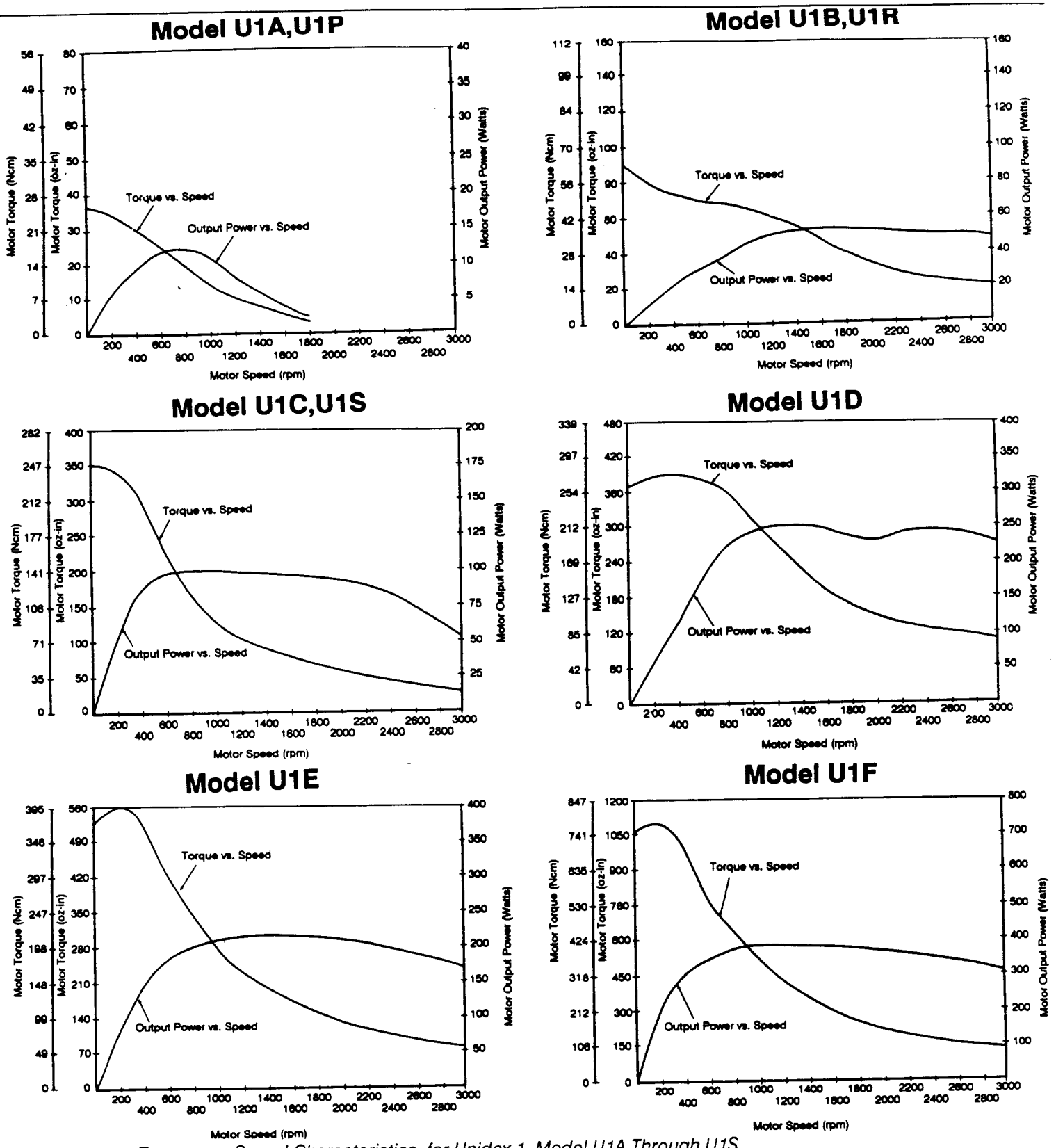


Figure 1-3: Torque vs. Speed Characteristics for Unidex 1 Model U1A Through U1S

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

THIS PAGE INTENTIONALLY LEFT BLANK

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 2: SYSTEM LAYOUT/EXT. CONNECTIONS

Unidex 1 is available in three packaging styles: 1) Unidex 1 Low Power 6U version, 2) Unidex 1 Low Power Panel/Desktop Mount version, and 3) High Power Panel Mount version. The Computer Interface Connector (Port A), I/O Connector (Port B), and Limit Connector (Port C) are the same for all three packaging versions. The AC INPUT POWER connections and motor wiring differ and therefore will be described seperately in this section.

SECTION 2-1 INPUT POWER CONNECTION

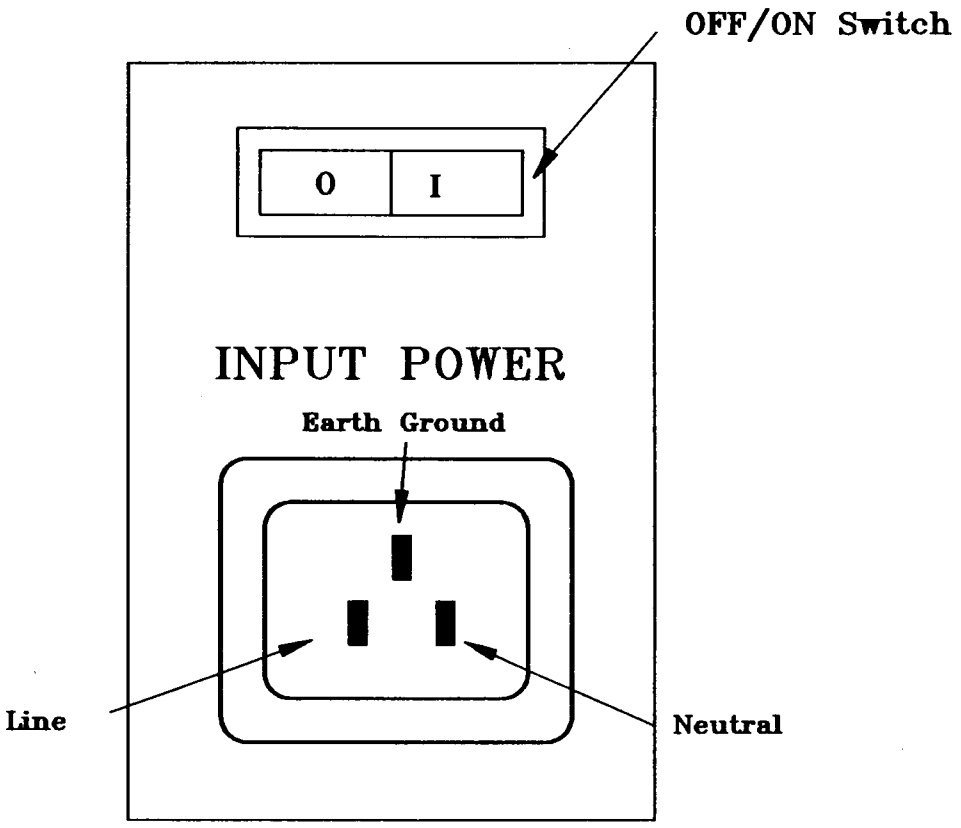
(Low Power Panel/Desktop Mount, Models U1A, U1B, U1C, U1G, U1H, and U1J)

The Unidex 1 U1A, U1B, U1C, U1G, U1H, and U1J Low Power Panel/Desktop packages may be factory wired for either a 115 VAC 60 Hz or 220-240 VAC 50/60 Hz input. Figure 2-1 shows an outline of the INPUT POWER receptacle and ON/OFF switch for the Low Power Panel/Desktop configuration.



WARNING: **Input power specifications are contained on a label located on the bottom of the Unidex 1 chassis. Any deviation from the inputs specified could result in permanent damage to the equipment. Consult your Aerotech representative for further information.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

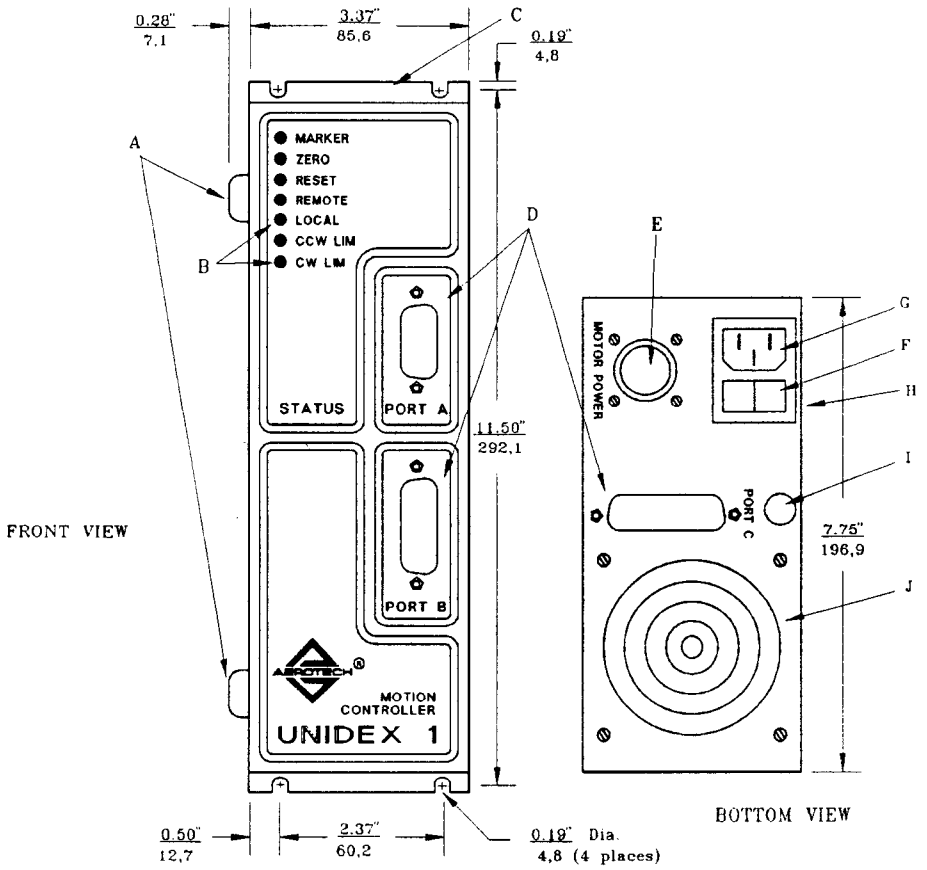


NOTE: Mating cable is supplied with unit.

Refer to Table 1-2 for current ratings.

Figure 2-1: AC INPUT POWER Connector and POWER SWITCH

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



A. Removable rubber bumpers (for desktop mounting)
B. LED indicators
C. Flanges (top and bottom) for panel mounting
D. Control and Limit interface ports
E. Stepping motor connection
F. On/off switch
G. Input power (115 or 230 VAC, depending on lable specification on bottom of unit)
H. Unit specification label (located on bottom of unit)
I. Motor fuse
J. Fan

LED INDICATOR DESCRIPTION

MARKER	LED is on when marker signal is present
ZERO	LED is ON when motor is in low current mode, and OFF when motor is in high current mode.
RESET	LED is on during reset
REMOTE	LED is on when external clock and direction inputs are enabled or during Home cycle.
LOCAL	LED is ON when REMOTE LED is OFF.
CCW LIM	LED is on when in CCW limit
CW LIM	LED is on when in CW limit

Figure 2-2: Unidex 1 Low Power Panel/Desktop Package Outline (Models U1A, U1B, U1C U1G, U1H, U1J)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-2 INPUT POWER CONNECTION

(All Models packaged in the 6U Eurocard Format including U1P, U1R and U1S)

The Unidex 1 6U Eurocard package configuration may be field wired for either 115 VAC 60Hz or 220-240 VAC 50/60Hz. Figure 2-2A shows an outline (as well as motor power connections) of the 6U Eurocard package version of Unidex 1. AC power is connected to the Translator Board Power Connector J3. An outline of the mating connector for J3 (shipped with the unit) is outlined in Figure 2-2B. The pinout connections for both 115 VAC or 220-240 VAC of connector J3 are shown below.

AC Power Wiring

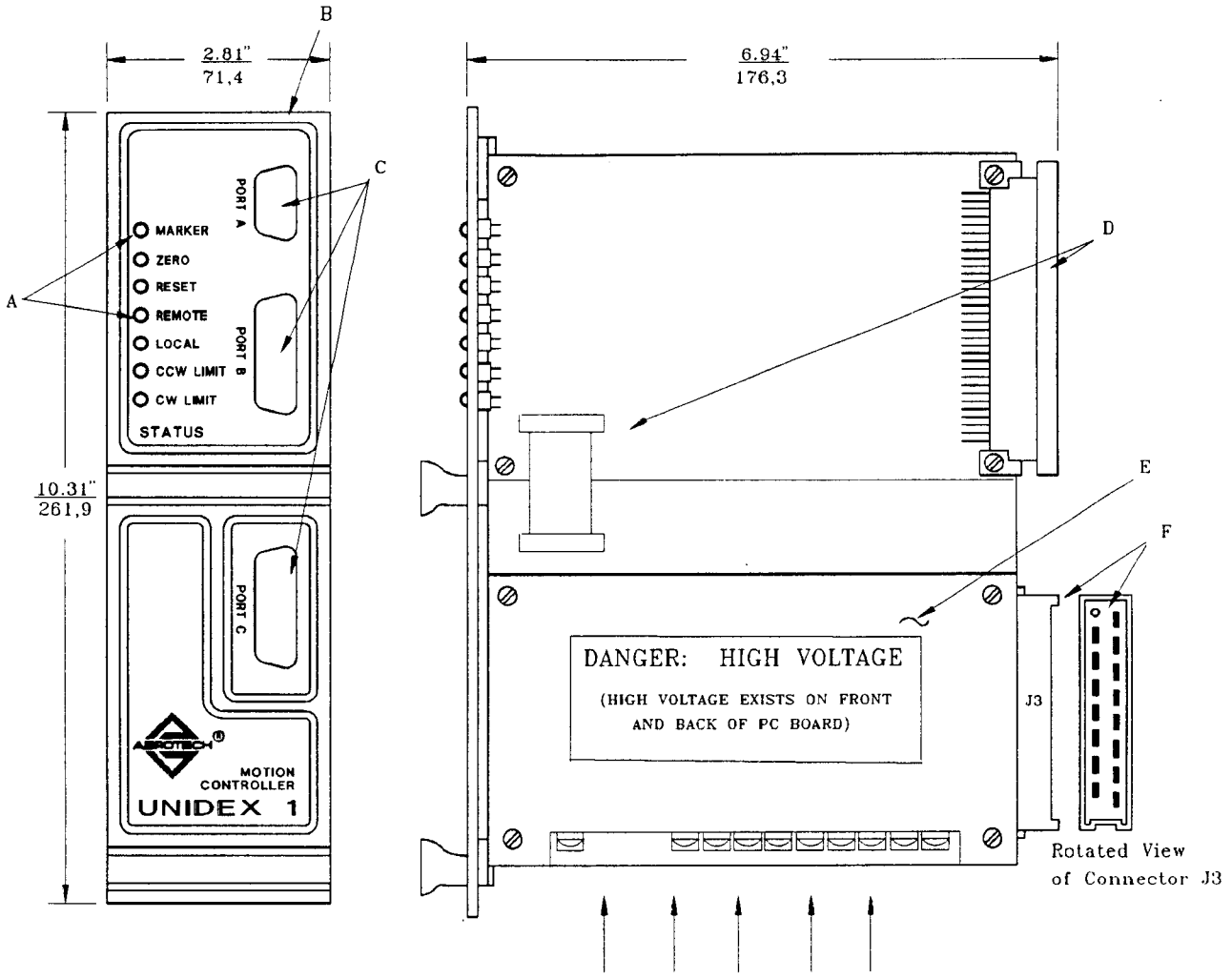
115 VAC	**220-240 VAC**
28 - AC Line	28 - AC Line
32 - (Jumper To 28)	32 - Neutral
24 - Neutral	24 - (no Connection)
22 - Gnd (earth Ground)	22 - Gnd (earth Ground)



DANGER: **The 6U Eurocard package configuration has been designed to be used in a totally enclosed cardrack only. To minimize the possibility of electrical shock and bodily injury, voltage must not be applied to the Unidex 1 Controller prior to cardrack mounting.**

Refer to Table 1-2 for current specifications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE: User supplied fan cooling required here (30CFM minimum)

LED INDICATOR DESCRIPTION

MARKER	LED is on when marker signal is present
ZERO	LED is on when motor is in low current mode, and OFF when motor is in high current mode.
RESET	LED is on during reset
REMOTE	LED is on when external clock and direction inputs are enabled or during Home cycle.
LOCAL	LED is on when REMOTE LED is off.
CCW LIM	LED is on when in CCW limit
CW LIM	LED is on when in CW limit

A. LED indicators
B. 6U, 14 TE front panel
C. Control and limit interface ports
D. Board interconnect cables
E. Unit specification label here
F. Connector J3 for input power (115 OR 230 VAC) and motor output power.

Figure 2-2A: Unidex 1 6U Eurocard Package Outline

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A. Mounting holes as per DIN 41612 specifications
B. .25" quick-connect lugs (typical)

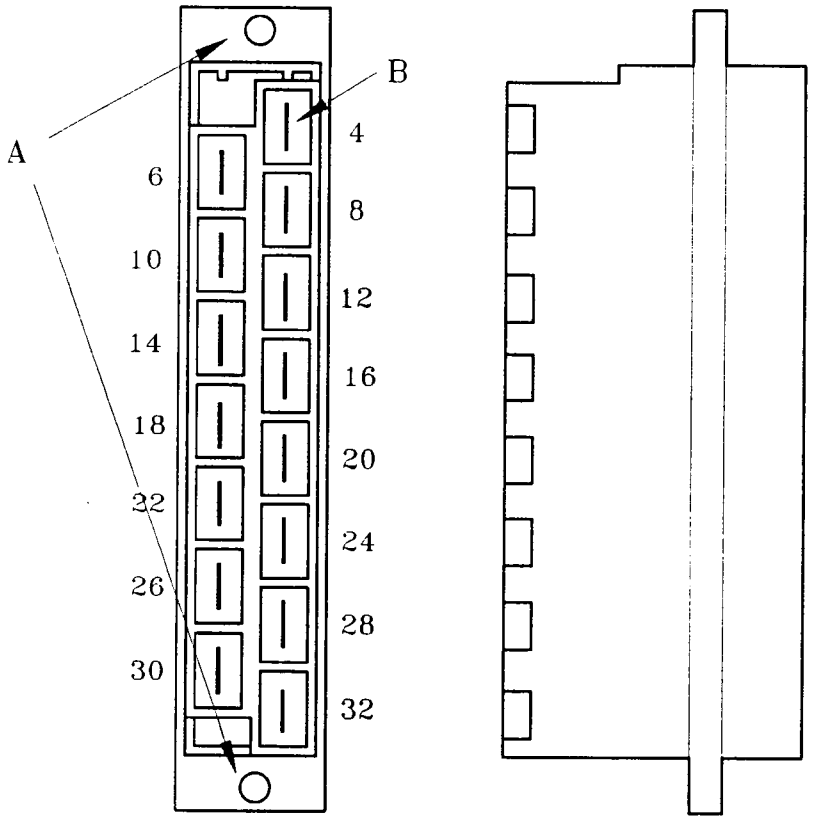


Figure 2-2B: Mating Connector for Connector J3 (Shown In Figure 2-2A)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-3 INPUT POWER CONNECTIONS

(High Power Panel Mount, Models U1D, U1E, U1F)

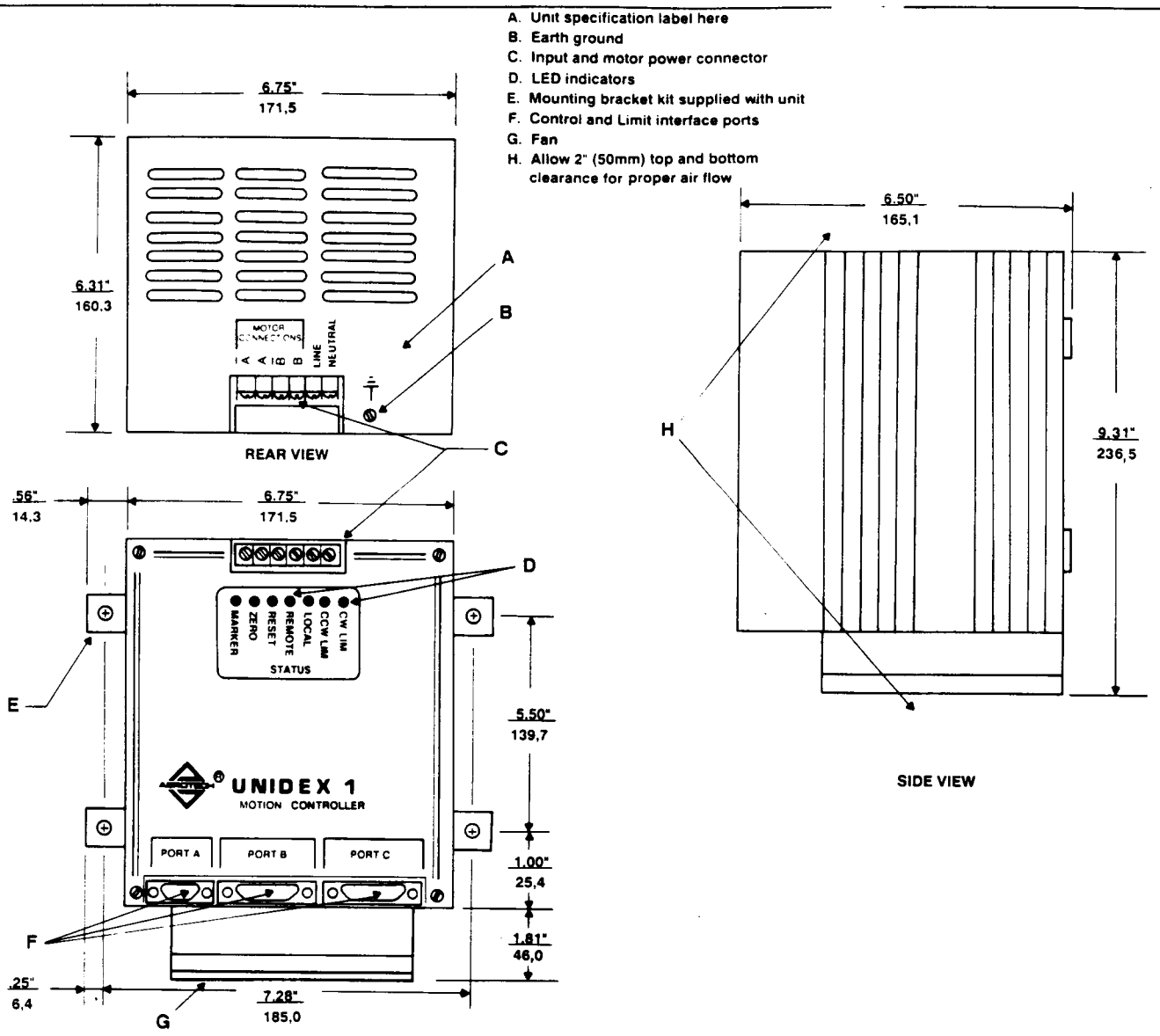
The Unidex 1 High Power Panel Mount Models U1D and U1E (see Figure 2-3) may be factory wired for either 115 VAC or 220-240 VAC 50/60 Hz input power. The High Power Panel Mount Model U1F is available with a 115 VAC 50/60 Hz input power connection only (this unit incorporates off-line isolated drive control). Note the specification label on the side of the unit for appropriate input voltage connections. Input power specifications for this unit are summarized below:

AC Power Wiring

	Unit U1D, U1E	**Unit U1F**
LINE	115 OR 220 THROUGH 240 VAC	115 VAC
NEUTRAL	0 VAC	0 VAC

Refer to Table 1-2 for current specification.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



LED INDICATOR DESCRIPTION

Marker	LED is ON when a marker signal is present.
Zero	LED is ON when motor is in low current mode, and OFF when motor is in high current mode.
Reset	LED is ON during reset.
Remote	LED is ON when external clock and direction inputs are enabled or during home cycle.
Local	LED is ON when REMOTE LED is OFF.
CCW Lim	LED is ON when in CCW Limit.
CW Lim	LED is ON when in CW Limit

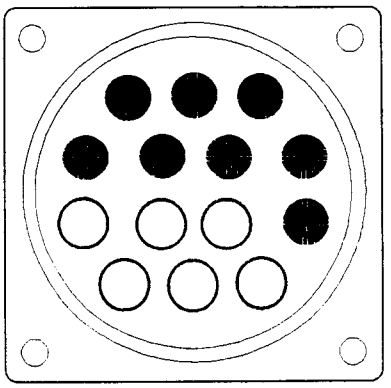
Figure 2-3: Unidex 1 High Power Panel Mount Package Outline

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-4 MOTOR POWER CONNECTIONS

(Low Power Panel/Desktop Mount, Models U1A, U1B, U1C, U1G, U1H, and U1J)

The motor power receptacle outline (see Figure 2-1) is shown below:



NOTE: Pins 9 through 14 are not used.

NOTE: Mating connector (or cable, depending upon application) is supplied with unit.

See Figure 2-4 for the appropriate Stepping Motor connections of the Motor Power connector shown above.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

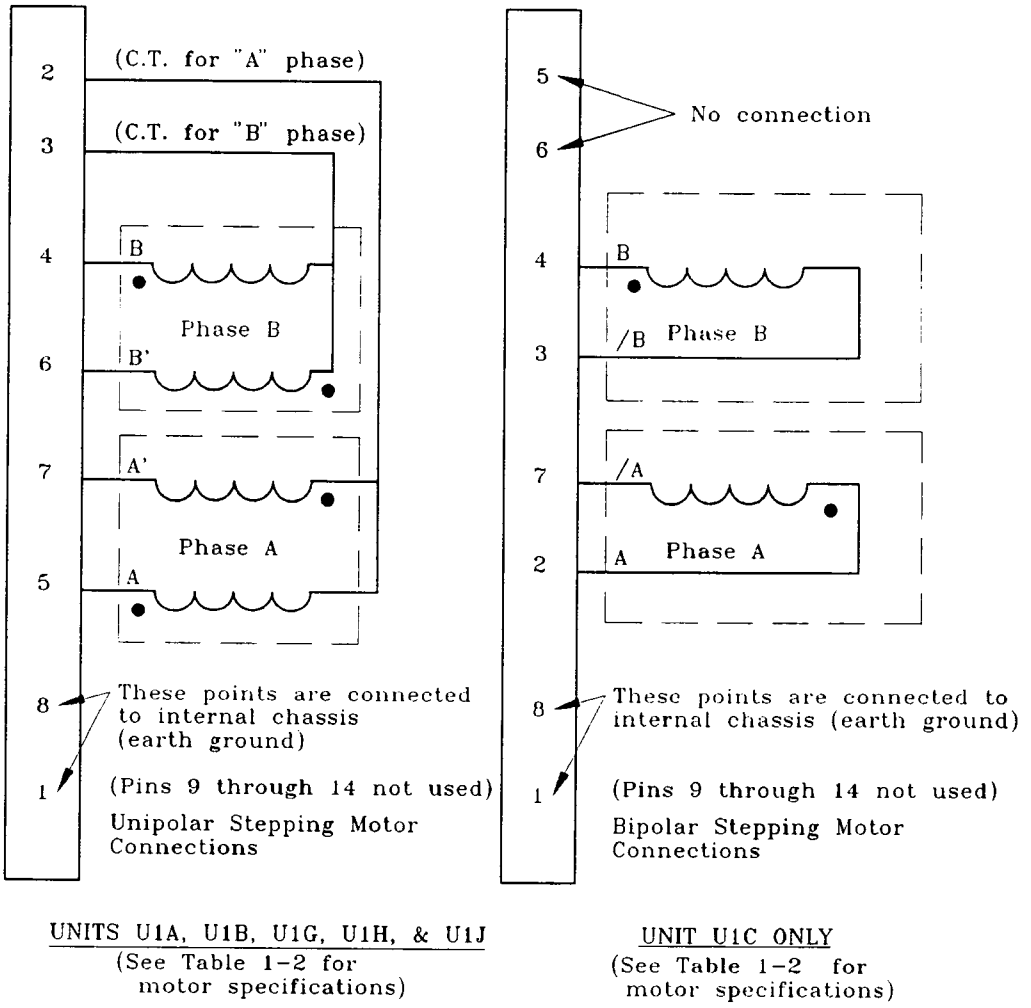


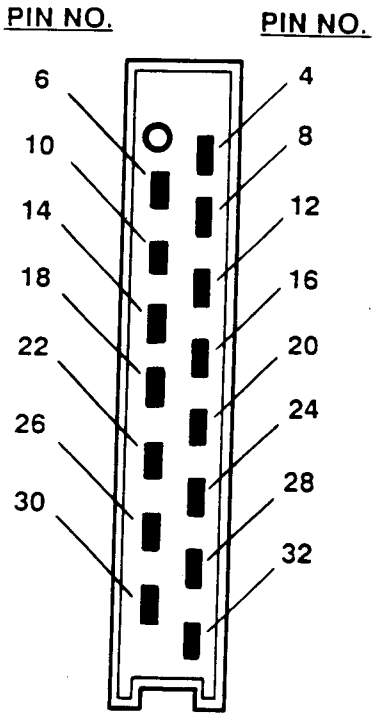
Figure 2-4: Unidex 1 Low Power Panel/Desktop Mount Motor Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-5 MOTOR POWER CONNECTIONS

(Low Power 6U Eurocard Configuration, including Models U1P, U1R, U1S)

Motor Power Receptacle J3 (see Figure 2-2) is shown below (refer to :



Rear View of Connector J3

See Figure 2-5 for an outline of the appropriate Stepping Motor connections for the J3 connector.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

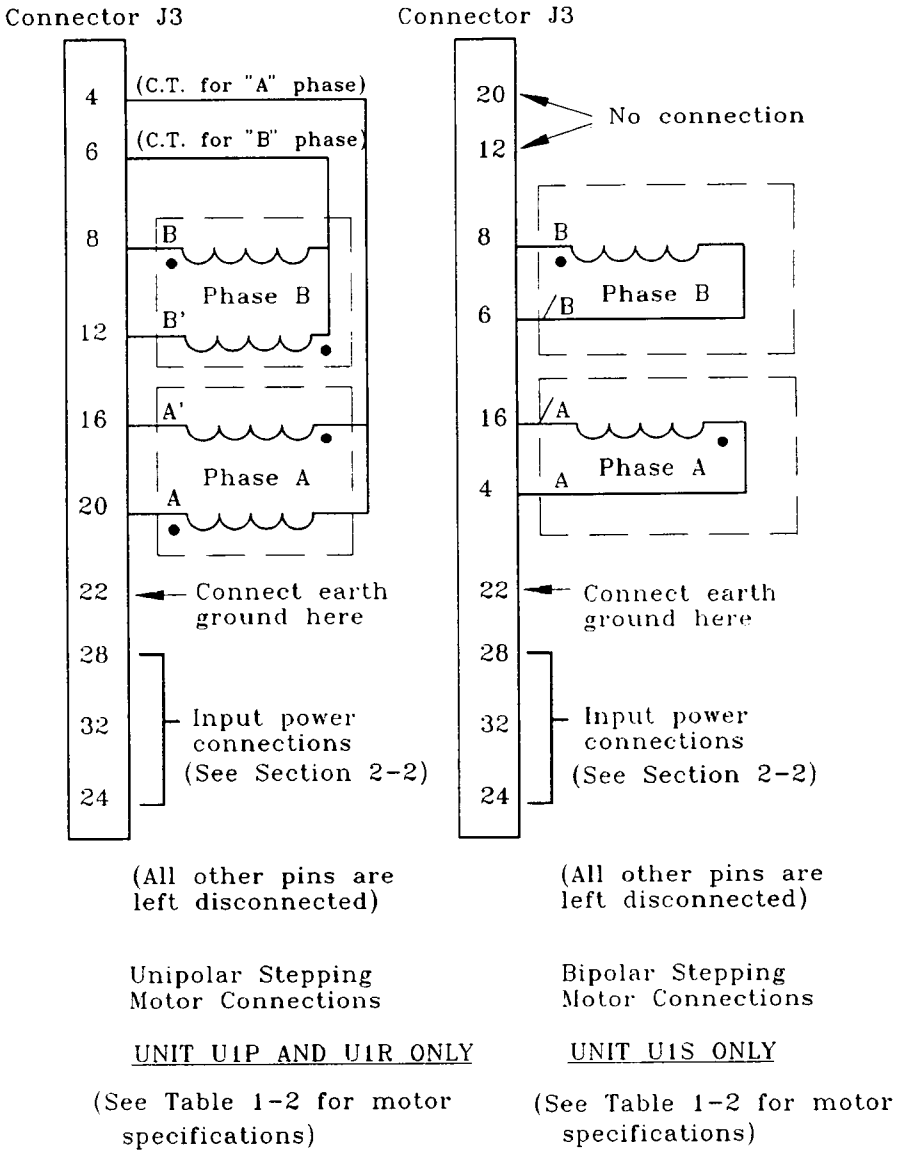


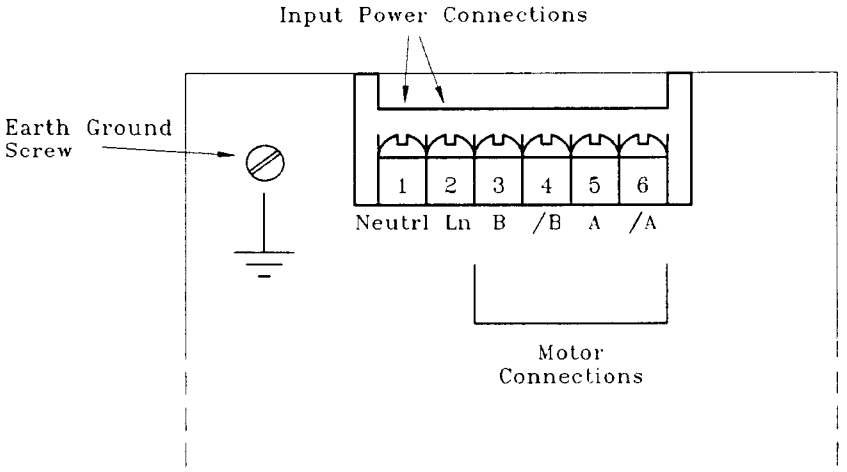
Figure 2-5: Unidex 1 Low Power 6U1 Eurocard configuration Motor Connection Outline

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-6 MOTOR POWER CONNECTIONS

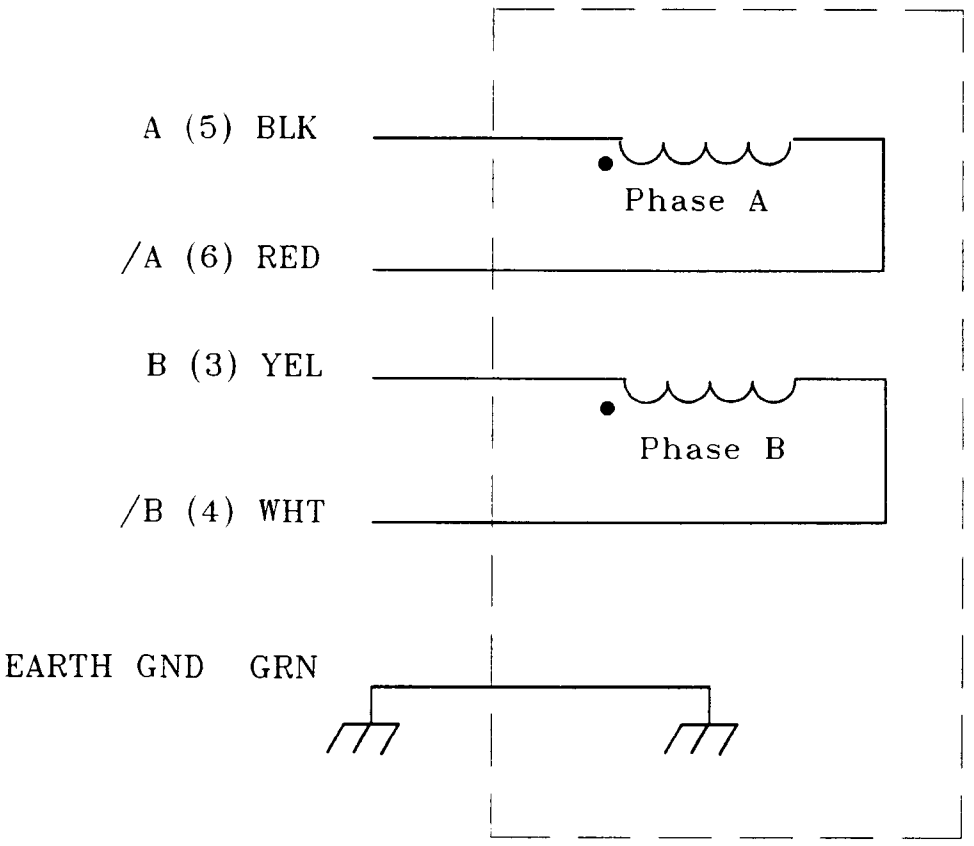
(High Power Panel Mount, Models U1D, U1E, U1F)

The Motor Power receptacle outline (see Figure 2-4) is shown below:



See Figure 2-6 for an outline of the appropriate Stepping Motor connections of the Motor Power connector shown above.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



BIPOLAR STEPPING MOTOR CONNECTIONS MODELS U1D, U1E AND U1F
(See Table 1-2 for Motor specifications)

Figure 2-6: Unidex 1 High Power Panel Mount Motor Connection Outline

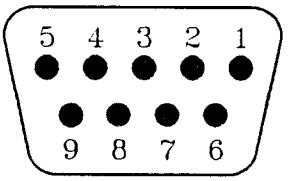
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 2-7 CONTROL CONNECTIONS, PORT A, B, C

(For All Units)

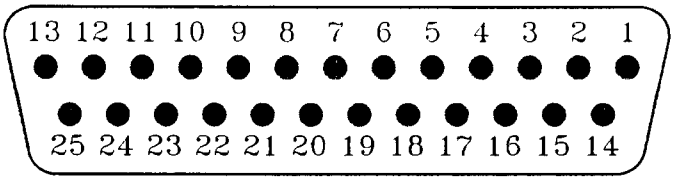
There are three control connectors on Unidex 1 (labeled Port A, Port B and Port C). The location of each of these connectors is shown in Figure 2-1 (Desktop/Panel Mount version), Figure 2-2 (6U Eurocard version), and Figure 2-3 (High Power Panel Mount version). See Figure 2-7 for a description of each connector and its mate.

Port A



(Female, 9 pin "D" type)

Port B and Port C



(Female, 25 pin "D" type)

NOTE: Outline drawings refer to Unidex 1 receptacles only (mate of each is mirror image, as described below).

Mating connector for 9 pin "female" "D-type" connector. (Computer Interface (Port A)	**Molded cable type "male" Belden, No. 49902. Solder pot type "male" TRW-CINCH, No. DEM-9P. Ribbon connector type "male" TRW-CINCH, No. FC-9P.**
Mating connector for 25 pin "female" "D-type" connectors. (Input/Output (Port B) Limits (Port C))	**Molded cable type "male" Belden, No. 49670 Solder pot type "male" TRW-CINCH, No. DBM-25P Ribbon connector type "male" TRW-CINCH, No. FC-25P.**

Figure 2-7: Outline and Mating Connector Description for Unidex 1 Control Connectors (Ports A, B and C)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-1 INTERFACE CONNECTOR (PORT A)

Port A receptacle provides for the termination of the Computer Interface cable. Following is the pinout listing for the RS - 232 receptacle. (See Chapter 7 for details.)

COMPUTER INTERFACE (PORT A)

PIN	DESCRIPTION
1	Shield
2	Received data (RXD)
3	Transmitted data (TXD)
4	Data terminal ready (DTR)
5	Signal common
6	Data set ready (DSR)
7	Request to send (RTS)
8	Clear to send (CTS)
9	+5V (External +5V limited to 30mA max)

2-7-2 INPUT/OUTPUT CONNECTOR (PORT B)

Port B receptacle provides the means of terminating inputs (I1, I2, I3, I4) and outputs (O1, O2, O3, O4) as well as auxiliary control inputs.

The pinouts for the Port B receptacle are as follows (see Figure 2-7 for outline drawing).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INPUT/OUTPUT CONNECTOR (PORT B)

Pin	Description
1	FAULT (Opto Isolated)
2	OUTPUT 03 (Opto Isolated)
3	OUTPUT 01 (Opto Isolated)
4	INPUT I3 (Opto Isolated)
5	INPUT I1 (Opto Isolated)
6	/SETUP
7	EXT CLK
8	COMMON
9	INPUT COMMON
10	CW LIMIT (Opto Isolated)
11	SPARE
12	SPARE
13	SPARE
14	OUTPUT 04 (Opto Isolated)
15	OUTPUT O2 (Opto Isolated)
16	INPUT I4 (Opto Isolated)
17	INPUT I2 (Opto Isolated)
18	/FEEDHOLD (Opto Isolated)
19	EXT DIR
20	+ 5 VDC
21	OUTPUT COMMON
22	CCW LIMIT (Opto Isolated)
23	SPARE
24	SPARE
25	SPARE

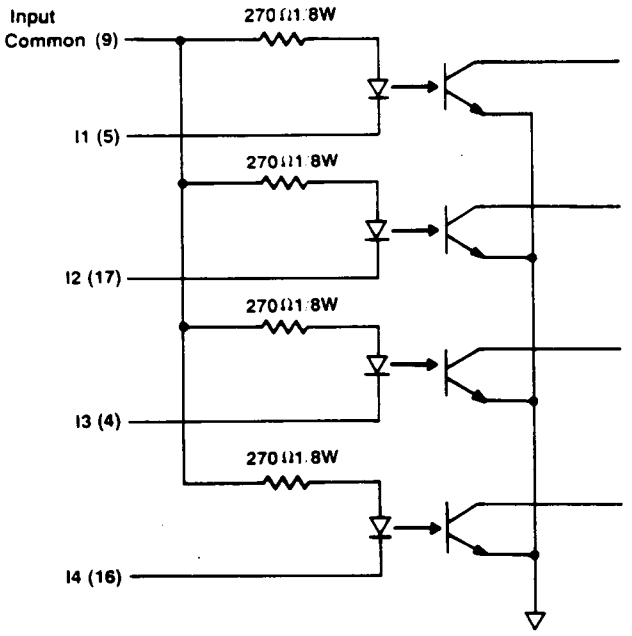
Shield termination is made through the two strain relief screws on the connector.

NOTE: **External use of the +5V is not recommended. Total +5V current must not exceed 30 mA for all Ports.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-2-1 INPUT (I1, I2, I3, I4) CONFIGURATION

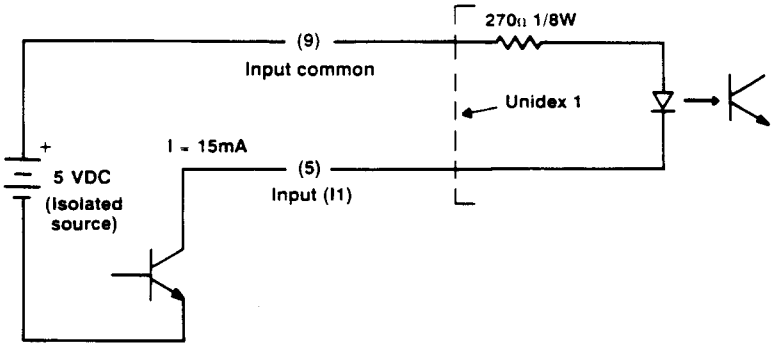
The four condition inputs (see Section 7-8 for conditional input description) are Opto Isolated as shown in the following configuration.



NOTE: **Input common (pin 9) is also used as a common return for the Opto Isolated CW and CCW Limits and Feedhold (described later).**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-2-2 TYPICAL ISOLATION INPUT APPLICATION EXAMPLE



OPTO ISOLATED INPUT SPECIFICATIONS

Maximum input current (I1, I2, I3, I4):	20mA
Maximum voltage (Input common to any input):	6V
Activation voltage range (Input common to any input):	4V - 6V
Maximum reverse voltage (Input common more negative than any input):	6V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The opto isolated inputs may be made to operate at up to 30 volts by adding resistance in series with the input (I1 - I4) lines. To determine the resistance required, use the following formulas:

$$R_{(ohms)} = \frac{[(Voltage) - 5V]}{.015}$$

$$W_{(watts)} = .015 \times (Voltage - 5V)$$

Example: Selecting a resistor value for an operating voltage of 12 volts:

1) $$R = \frac{[(Voltage) - 5V]}{.015}$$

$$R = \frac{(12 - 5)}{.015}$$

$$R = 467 \text{ Ohms (Select nearest value)}$$

(Use 470 Ohm resistor.)

2) $W = .015 \times (Voltage - 5V)$

$W = .015 \times 7$

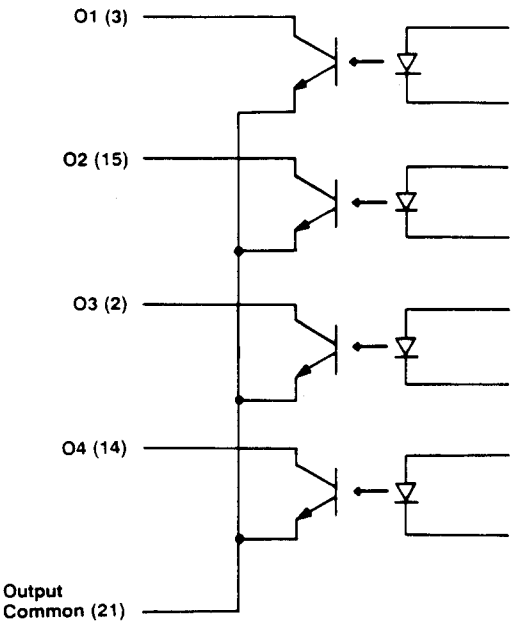
$W = .105$ Watt

(Use 1/4 Watt or 1/2 Watt resistor.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

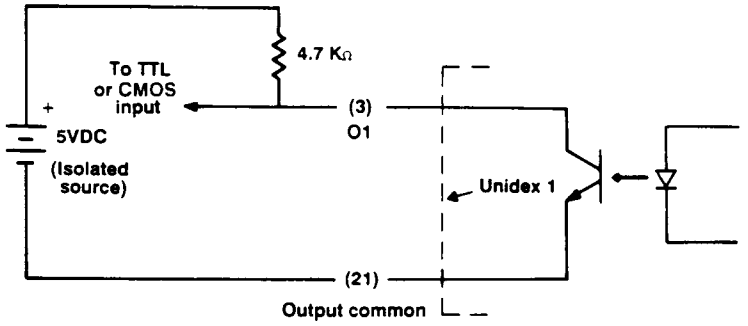
2-7-2-3 OUTPUT (O1, O2, O3, O4) CONFIGURATION

The four programmable outputs (see Section 7-8 for Programmable Output description) are opto isolated with the following configuration:



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Outputs are capable of driving one TTL load. A typical application is shown below:



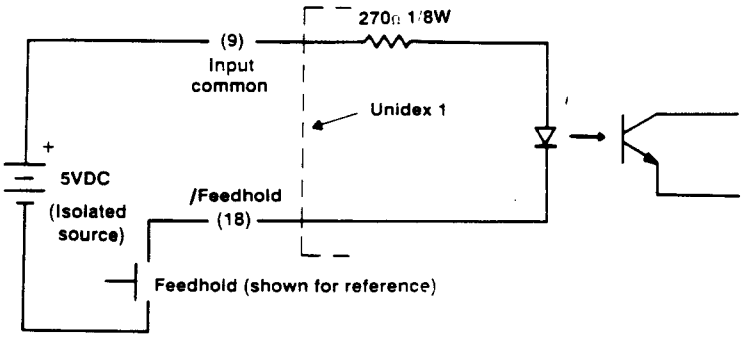
OUTPUT SPECIFICATIONS

Maximum voltage "Off State" (Collector to Emitter):	30V
Maximum reverse voltage:	-7V
Maximum collector saturation voltage (I_C = 2mA):	.5V
Maximum power dissipation:	150mW

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-2-4 FEEDHOLD CONFIGURATION

The feedhold input (see Section 7-8 for commands associated with feedhold) is an opto isolated input with the following configuration:



NOTE: **Input common (Pin 9) is used for all opto isolated inputs.**

The feedhold input specifications are the same as the opto isolated inputs. (See Sub-Section 2-7-2-2 of this section for specifications.)

The feedhold input is designed to bring to a controlled stop, any of the 99 programs executed by the Unidex 1 Indexer. The motion is allowed to continue when the switch is reopened.

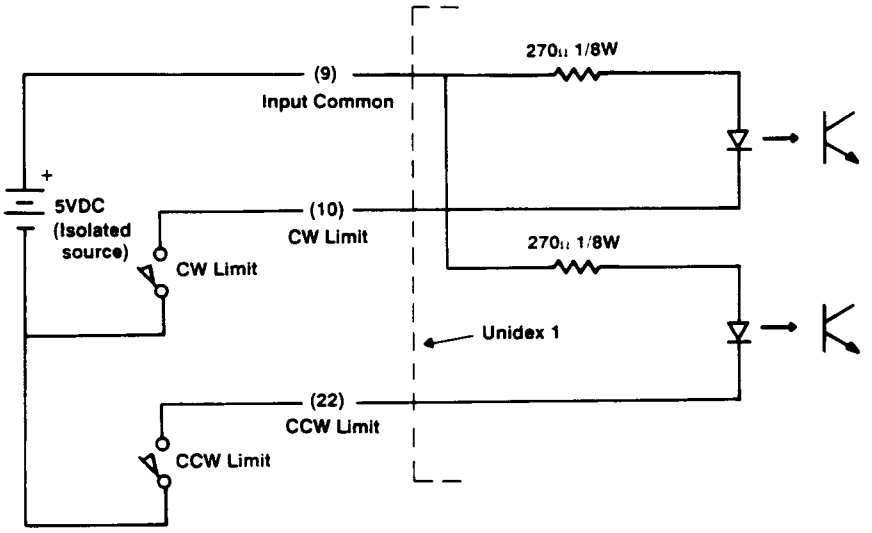
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-2-5 CW/CCW LIMIT CONFIGURATION

The CW/CCW limit connections described in Section 2-7-3 can be provided with opto-isolation. When these isolated limits are used, the Limit Inputs on the Limit connector (Port C) must not be connected.

The opto isolated limit specifications for the CW and CCW Limit Inputs are the same as those for the general purpose opto isolated inputs (I1 through I4) described previously. (See Subsection 2-7-2-2 of this section for specifications.)

Following is a typical opto isolated Limit application:



NOTE: **Input common is used for all opto isolated inputs.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2-7-2-6 EXTERNAL CLOCK AND DIRECTION

The External Clock and Direction inputs allow External Clock and direction commands to be applied to the Translator, when the Unidex 1 is placed in the REMOTE mode (see Section 7-7-4). The Unidex 1 Controller will keep track of these pulses, updating the position register. The External Clock and Direction inputs require +5V (logic 1) and 0V (logic 0) voltage levels. The External Clock and Direction input signal provides the same CMOS buffering as described for the Limit input connections in Section 2-7-2-5.

PORT B	
Pin 7	External Clock
Pin 19	External Direction
Pin 8	Signal Common

2-7-2-7 SETUP INTERFACE CONNECTIONS

The Setup line is used to put Unidex 1 in the Setup Mode (see Chapter 5). For Setup operation, connect the Setup input to Common. *At any other time the Setup line should be left disconnected.*

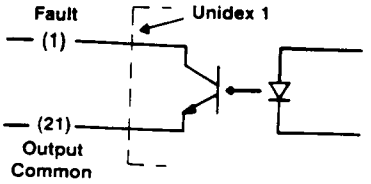
PORT B	
Pin 6	/Setup
Pin 8	Signal Common

2-7-2-8 FAULT INTERFACE CONNECTIONS

The Fault Interface is an optically isolated output used to indicate that Unidex 1 is not ready. The "not ready" state is indicated when the Fault Output Transistor is OFF. When Unidex 1 is in the ready state the Fault Output Transistor will be ON.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications for the Fault interface are the same as the Output specification (see Subsection 2-7-2-3 of this section). The Fault Output configuration is shown below:



2-7-3 LIMITS CONNECTOR (PORT C)

The Port C Limit Connector provides for the termination of the basic control interface signals between the Stepping Motor and the Unidex 1. Connections to this port are *not* optically isolated. Motor travel limits and homing signals are terminated at the Limit Connector. The pinout for the Limits Connector is as follows (see Figure 2-7 for receptacle outline).

LIMITS CONNECTOR (PORT C)

Pin	Description
3,16	+5 VDC
6	/Marker (in)
7	Marker (in)
1,8,9,20,21	Common
12	/CW Limit (in)
22	/Home Limit (in)
24	/CCW Limit (in)

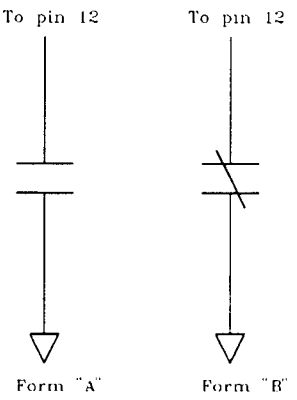
All other pins are spares. Shield termination is made through the two strain relief screws of the connector.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Form "A" connections are shipped standard, and are connected at pins 12, 24 and 22.

Form "B" contacts can be accommodated for all three Limit Inputs (consult your Aerotech Representative). Both configurations are outlined below (CW Limit is used as the example).

The polarity of these limits are normally factory set for Form "A" (normally open). The CW and CCW limits provide Travel Limit protection for the drive system. The Home limit switch is used to reference the "Home" position (see Section 7-8 for Home command). When a Home command is issued, the motor turns CCW until the Home switch closes. When the Home switch closes, the direction of the motor is automatically reversed, and the motor rotates CW. When the Home switch opens, (it was previously closed), the motor stops rotating, ending the Home cycle.



Contact positions are shown when not in limit

Before continuing, it should be noted that the terms CW and CCW rotation are relative to Aerotech Stepping Motors shipped with the Unidex 1. Direction of rotation is directly related to the Stepping Motor phase wiring. Phase wiring on a user-supplied Stepping Motor may require manipulation to provide the correct rotation (CW or CCW) as referred to within this manual.

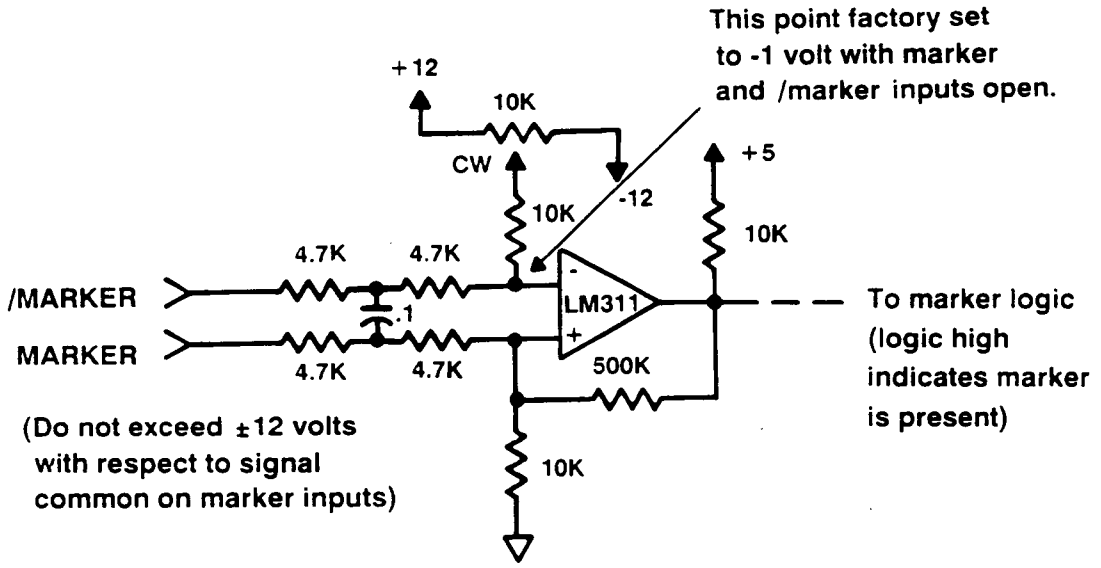
If desired, Homing to a high accuracy marker reference can be achieved by using the Differential Marker Inputs (pin 6 and 7).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The basic Home reference is still in respect to the Home Limit switch as described above. However, if the sum of the polarities of the Marker, /Marker inputs remain negative after the Home switch is closed, the motor will continue to rotate CW after the Home switch is again opened. The motor will stop (Home will complete) when the sum of the polarities of Marker, /Marker becomes positive.

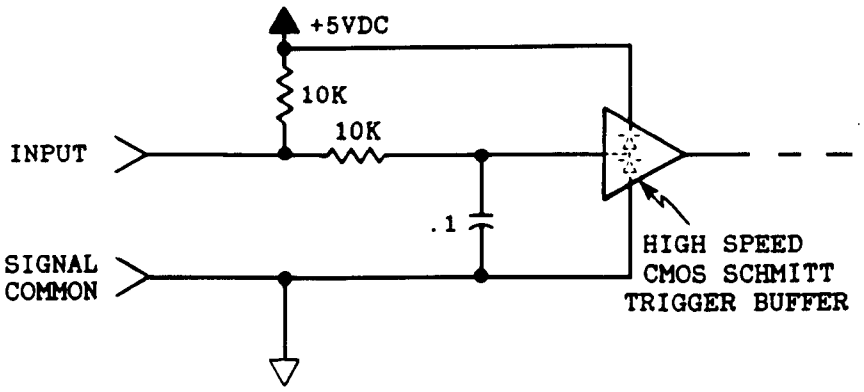
In actuality, there is a -1 volt bias associated with the Marker threshold described above. This is illustrated in the circuit which follows. This bias is used to "force" a marker condition when the user does not require a Marker reference.

It is important to note that the voltage threshold on the Marker and /Marker inputs is *ignored* until the closure of the Home switch during a Home cycle. This allows the use of a "once per Rev" motor shaft Marker pulse to be referenced to the Home Limit switch.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

All Limit Input configurations are internally buffered as shown below:



All Limit Inputs are protected against accidental over voltage of ± 30 volts. All logic inputs such as dry contact, open collector, TTL, or 5 to 15 volt CMOS can be used.

The maximum current draw on the +5 VDC external connection (pin 3 and 16) is limited to 30 mA total for all Ports.

The presence of a visual indication for acknowledge CW Limit, CCW Limit and Marker can be made by viewing the LED indicators on the front panel of the Unidex 1 (see Figures 2-1, 2-2, 2-3). The optional Hand Held Terminal also provides an indication of the presence of a Limit or Marker (see Chapter 6).

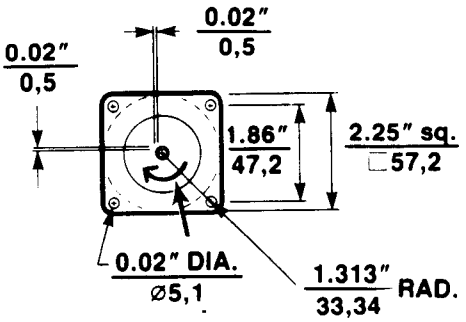
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

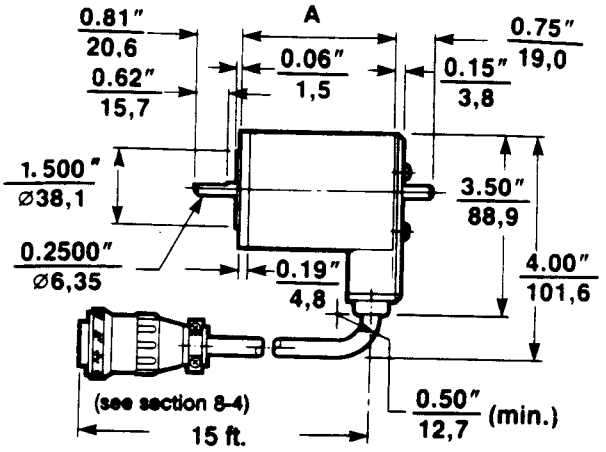
THIS PAGE INTENTIONALLY LEFT BLANK

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 3: MOTOR CONNECTIONS

SECTION 3-1 MOTOR TYPE U1A, U1B & U1H SPECIFICATIONS





Rotational Characteristics

"+" Command CW Rotation

"–" Command CCW Rotation

Home direction is initiated in CCW direction

NOTES:

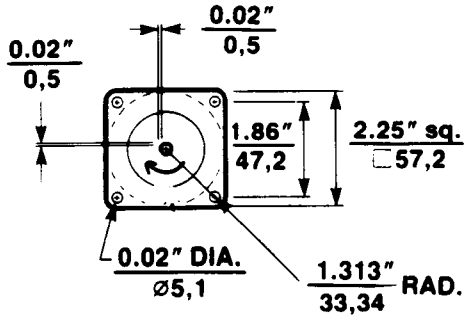
1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load.
   Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max.
   Shaft Tolerance: -0.005" (-0,013)

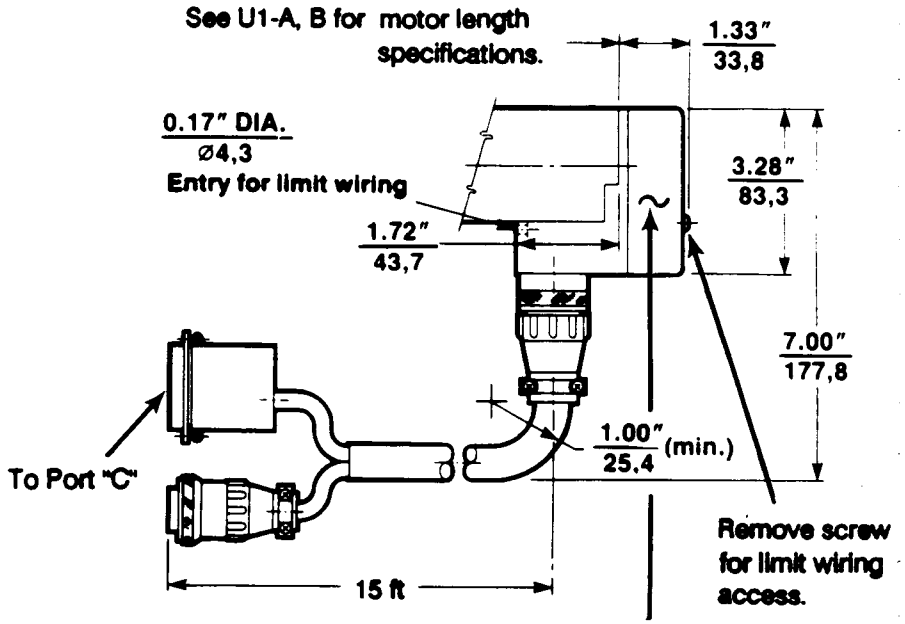
Model	A
U1A	2.00" 50,8
U1B	4.00" 101,6
U1H	2.225" 57,2

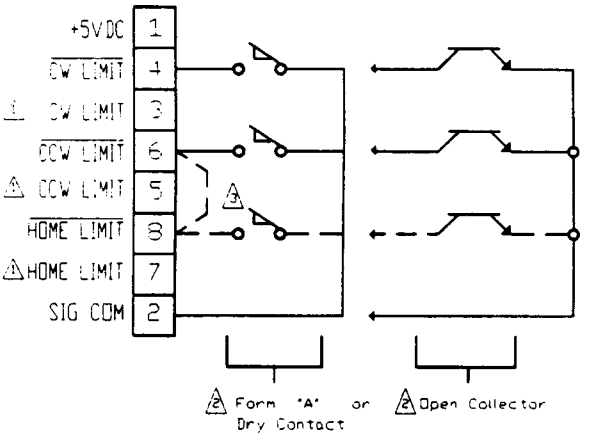
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 3-2 MOTOR TYPE U1A-HM, U1B-HM & U1H-HM SPECIFICATIONS

The following specifications are with reference to Limit Switch interface and Home Marker.







Rotational Characteristics

"+" Command CW Rotation

"–" Command CCW Rotation

Home direction is initiated in CCW direction

NOTES:

1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load. Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max. Shaft Tolerance: -0.005" (-0,013)

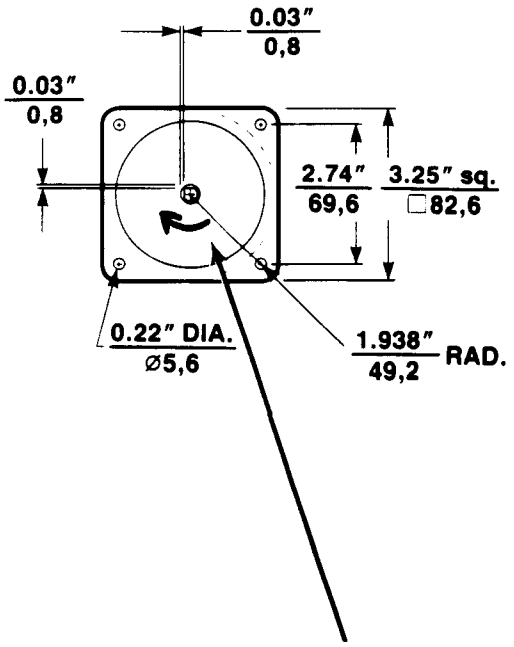
4 Input not applicable to Unidex 1.

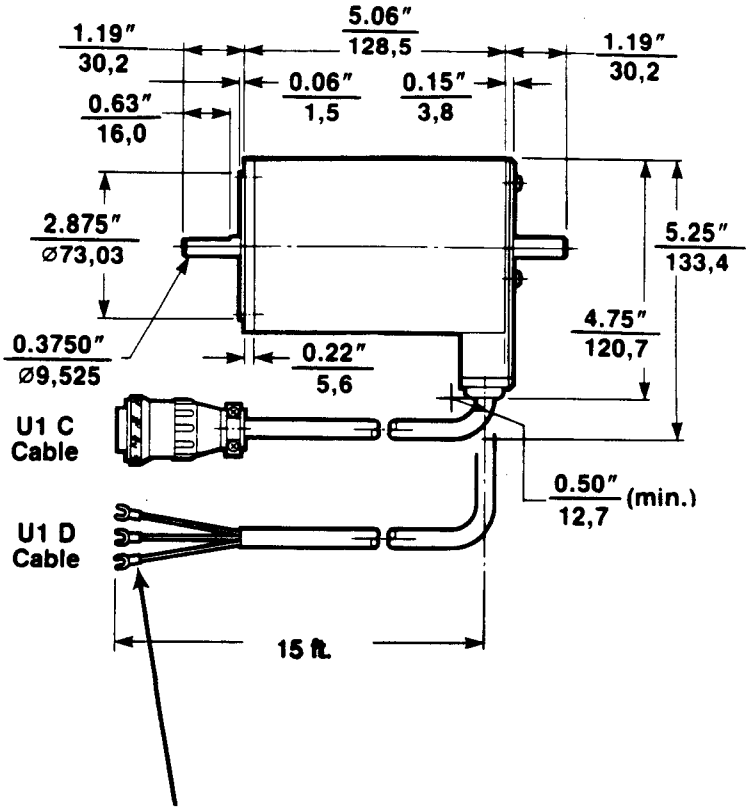
5 Consult factory for normally closed limits.

6 CCW/CW limit signal can be used in place of seperate Home Limit Signals by inserting jumper.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 3-3 MOTOR TYPE U1C & U1D SPECIFICATIONS





Rotational Characteristics

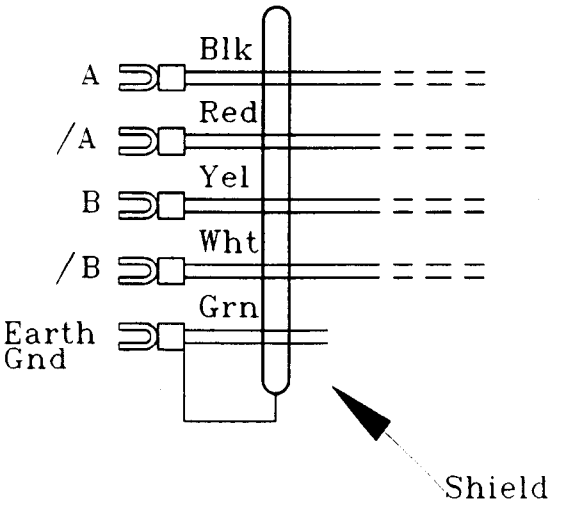
"+" Command CW Rotation

"–" Command CCW Rotation

Home direction is initiated in CCW direc-

NOTES:

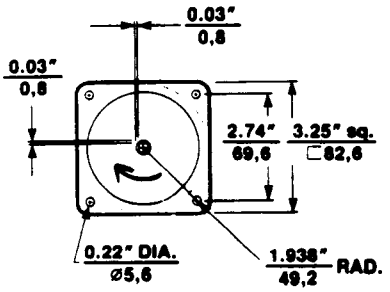
1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load.
   Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max.
   Shaft Tolerance: -0.005" (-0,013)

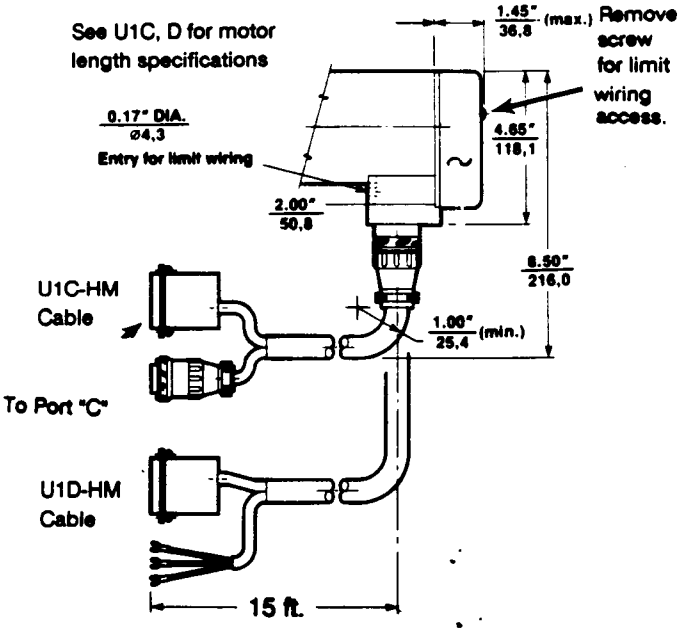


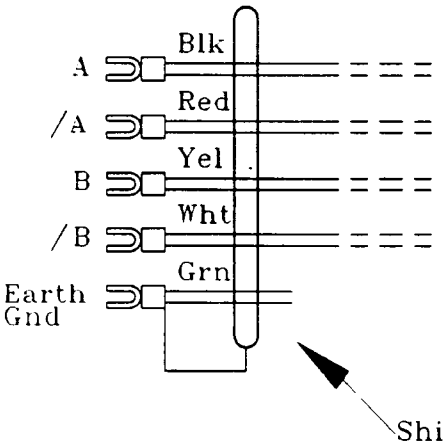
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

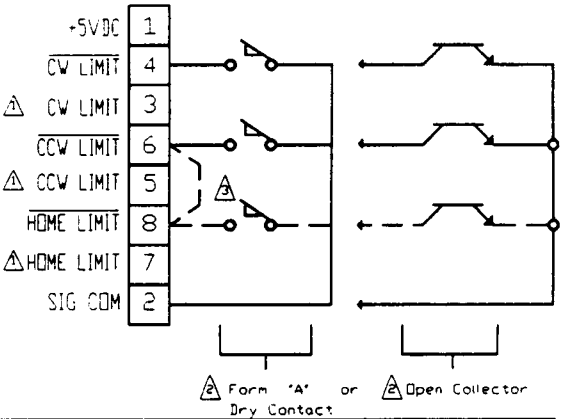
SECTION 3-4 MOTOR TYPE U1C-HM AND U1D-HM SPECIFICATIONS

The following specifications are with reference to the Limit Switch interface and Home Marker.









Rotational Characteristics

"+" Command CW Rotation

"–" Command CCW Rotation

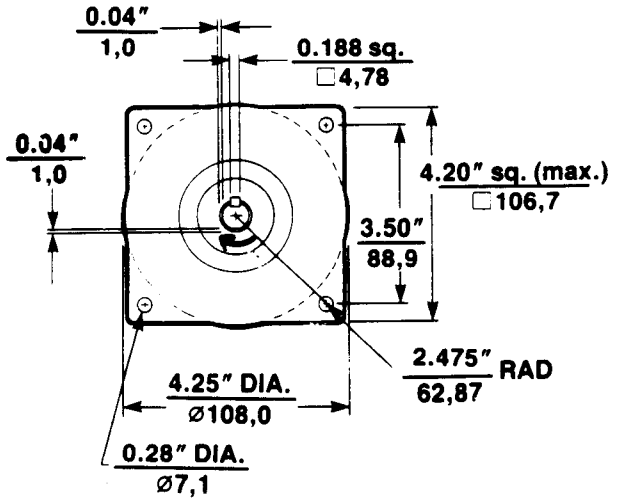
Home direction is initiated in CCW direction

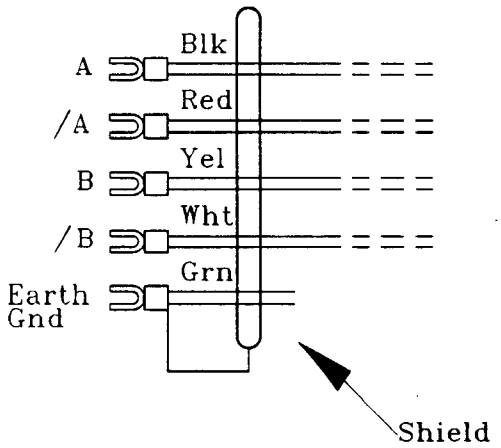
NOTES:

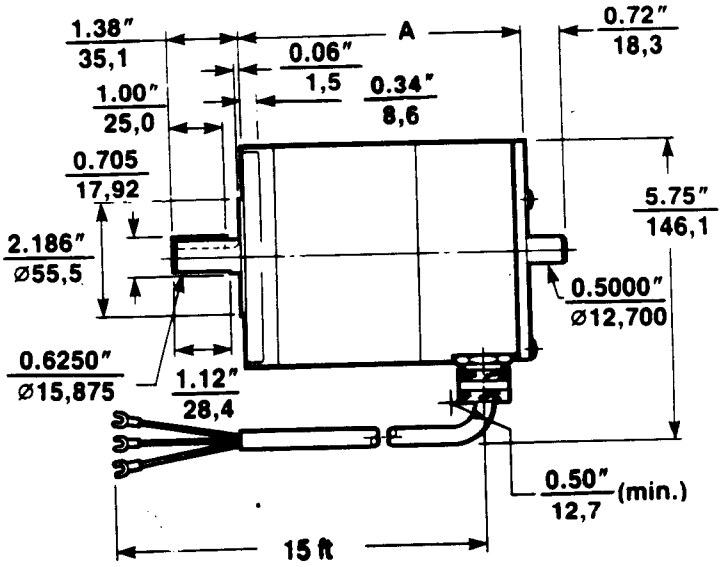
1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load. Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max. Shaft Tolerance: -0.005" (-0,013)
4. Input not applicable to Unidex 1.
5. Consult factory for normally closed limits.
6. CCW/CW limit signal can be used in place of seperate Home Limit Signals by inserting jumper.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 3-5 MOTOR TYPE U1E & U1F SPECIFICATIONS







Rotational Characteristics

"+" Command CW Rotation

"–" Command CCW Rotation

Home direction is initiated in CCW direction

NOTES:

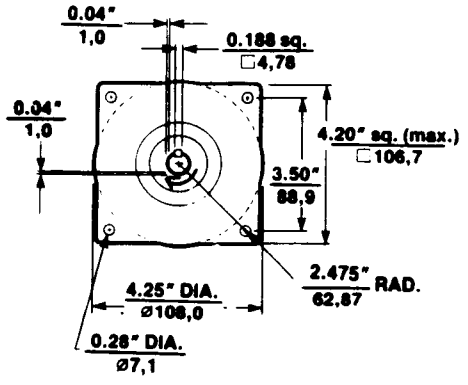
1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load.
   Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max.
   Shaft Tolerance: -0.005" (-0,013)

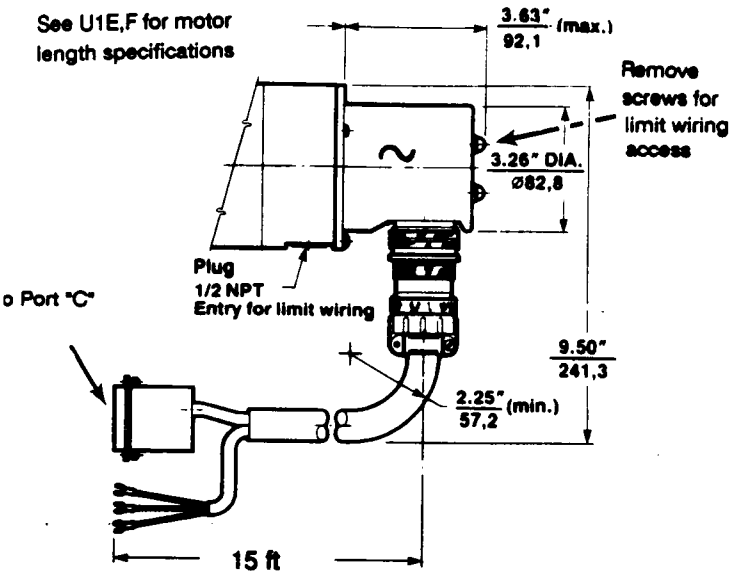
Model	A
U1E	5.44" / 138,2
U1F	7.56" / 192,1

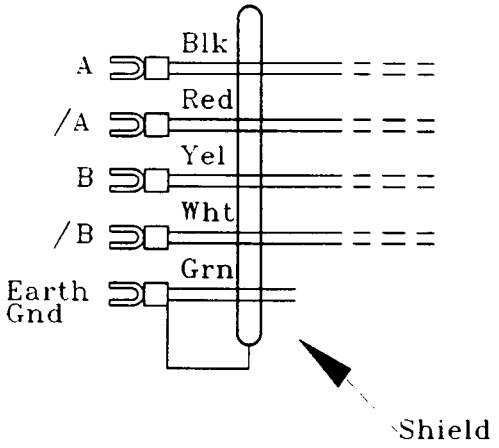
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

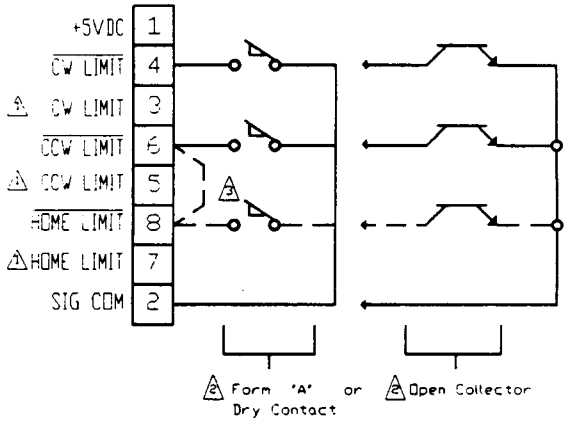
SECTION 3-6 MOTOR TYPE U1E-HM & U1F-HM SPECIFICATIONS

The following specifications are with reference to the Limit Switch interface and Home Marker.









Rotational Characteristics

"+" Command CW Rotation

"–" Command CCW Rotation

Home direction is initiated in CCW direction

NOTES:

1. Dimensions shown in inches over millimeters.
2. End play: 0.005" (0,12) max. with 16 oz (0,45 kg) load. Radial play: 0.001" (0,02) max.
3. Shaft runout: 0.002" (0,05) max. Shaft Tolerance: -0.005" (-0,013)

4 Input not applicable to Unidex 1.

5 Consult factory for normally closed limits.

6 CCW/CW limit signal can be used in place of seperate Home Limit Signals by inserting jumper.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 4: POWER UP

SECTION 4-1 POWER UP

Prior to applying input power to the Unidex 1 Motion Controller the system must be configured in accordance to the specifications of Chapters 1, 2, and 3.



WARNING: **To minimize possible damage to the Controller, make certain that the AC input voltage is in accordance with the Unit Specification Label located on the bottom of the Controllers chassis.**

When the appropriate input voltage has been connected to the Unidex 1, move the POWER ON/OFF Switch into the ON position. One or more LEDs will light. The RESET LED must go out within several seconds. If an Auto-Boot program is present, it will be executed at this time (see Section 4-5).

SECTION 4-2 INITIALIZATION

The Unidex 1 operates in one of two modes; the Computer Interface mode (Chapter 5) or the optional Hand Held Input mode. Both are activated in a similar fashion. This description applies to a single unit. Activating more than one Unidex 1 (daisy-chain mode) is described in a following section. All Unidex 1's must be in the inactive state before an activation command is given. If there are any active units, a deactivation command must be sent first (see Section 4-3).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Mode	Activation Command
Computer Interface	> > nn <CR>
Hand Held Terminal	## nn <ENTER>
Thumbwheel Program Control	<< <CR> *
Thumbwheel Index Control	@ @ <CR> *

***NOTE (1): The TP and TI Controllers generate these codes automatically. No input is required (See Chapter 6 for details).**

NOTE (2): "nn" denotes the device and address number.

NOTE (3): When all Unidex 1's are inactive, all characters sent from a host computer or the optional TFX Hand Held Terminal will be echoed back. These characters will appear as double characters on the screen. For example, "####0011" will appear to activate device #1. Consider the echo character as a check on the communication loop (all Unidex 1's are receiving the command) and not a part of the command.

EXAMPLE:

To activate the Computer Interface, send two "greater than" signs (> >), wait at least two character times, then send the device number of the Unidex 1 (shown above as nn). If the device number is unknown, it can be checked and set (see in Chapter 5, Set Up). (The default address is 01.) Follow the device number with a <CR> (carriage return). Wait at least two character times before sending another character.

NOTE: Digit codes 00 and 01 should not be selected as device numbers for daisy chained Unidex 1s because of the possible interference with the set up of daisy chain operations (00 is used for Setup operations and 01 is the default address).

After the two digit device number has been entered, a <CR> must be sent. Following the <CR>, a short wait is necessary before sending another character. This wait time is needed to allow the Unidex 1 to configure itself as a talker. The wait time is dependent upon the baudrate and can be calculated using the following formula.

Time (seconds) = 24/Baudrate

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

For example, the wait time required for 9600 baudrate would be calculated as follows:

T = 24/9600 = .0025 seconds (or 2.5 milliseconds)

(Wait time must be equal to or greater than .0025 seconds for a 9600 baudrate.)

The Unidex 1 will now be active and ready to receive a command. The Computer Interface will give no immediate response unless requested. A print command (see Section 7-7) can be used to verify activation.

When one Unidex 1 has been activated by the optional Hand Held Terminal, the Hand Held Terminal will respond immediately with a Menu Screen, (Refer to Chapter 6 for details on the TFX, TI and TP Hand Held Terminals, and Chapter 7 for details on Computer Interface.)

SECTION 4-3 DEACTIVATING UNIDEX 1

To deactivate a Unidex 1 Unit, send the <CTRL> B character (hex code 02). This will deactivate all active Unidex 1s and put them in the echo mode. Following the <CTRL>B, a short wait is required before sending another character (see Section 4-2).

SECTION 4-4 MULTI-AXIS ACTIVATION (DAISY CHAIN)

It is recommended that the Computer Interface mode be utilized if commands will be issued simultaneously to more than one Unidex 1.

NOTE: A deactivation command (<CTRL> B) should be sent preceding the activation command, if there is any active Unidex 1 presently on line.

To activate more than one axis at a time, enter a comma or space between each two-digit device code, and enter a <CR> after the last device number. Following the <CR> a short wait is required before sending another character. To activate (in the Computer Interface mode) units 02, 05, 11, 21 and 30, enter the following code:

02,05,21,30,11 <CR>

It is not required that device numbers be entered in numerical sequence.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

It is not recommended that the Hand Held Terminal mode be used if more than one Unidex 1 is active (except for Trigger operation), since the Hand Held Terminal mode does not support interactive control. If more than one Unidex 1 is active at any time, information will not be sent to the Hand Held Terminal from any of the units.

See Section 7-1 for "Daisy Chain" Specifications of Unidex 1.

SECTION 4-5 AUTO BOOT PROGRAM OPERATION

After the Unidex 1 has been powered up, the Auto Boot program will be immediately executed. The Auto Boot program can be any of the 99 possible programs in memory, and may be selected through the Setup mode (Chapter 5). If a program does not exist for the Auto Boot program number, the Unidex 1 will be ready to be activated and receive a command upon being powered up.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 5: SETUP

SECTION 5-1 DESCRIPTION

The Setup mode allows the configuration of certain Unidex 1 system features. These include:

- Device Address
- Baud Rate
- Stop Bits
- Parity
- Word Length
- Accel/Decel Ramp Time
- Start/Stop Frequency
- Ramp Profile
- Output Active Level
- Boot Program #
- Load Default Values
- Hand Held Terminal Initialization
- Enable/Disable Motor Operating Current
- Thumbwheel Indexer Index Speed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 5-2 SETUP MODE SELECTION

To enter the Setup mode, the Unidex 1 must be powered down and a jumper connection must be made between the Setup input (pin 6 of the Input/Output connector, Port B; and Signal Common (pin 8 of the Input/Output connector).



WARNING: **To minimize the possibility of electrical shock and bodily injury, prior to making any electrical connections or disconnections make certain all electrical power switches are in the OFF position.**

The Setup mode requires the TFX Hand Held Terminal or the Computer Interface be set to the following settings (even if previously set up to a different value):

- Baud Rate: 9600
- Stop Bits: 1
- Word Length: 7
- Parity: Even

The Setup mode must always operate in the above configuration.

With the jumper between pin 6 and 8 of Port B, power up and activate Unidex 1 by entering one of the following commands. **(This cannot be done with Port A wired in daisy chain.)**

Hand Held Terminal: ## 00 <ENTER>
Computer Interface: > > 00 <CR>

The Computer Interface mode will give no indication of being in the Setup mode unless the host device sends a print setup command (**PV<CR>**).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The TFX Hand Held terminal should display the following screen when activated:

```
1 DISPLAY SETUP
2 ALTER  SETUP
```

If the TFX display is as above, the TFX does not require initialization. Proceed to Section 5-4 for further setup procedures. If the TFX does not display the above screen, proceed to Section 5-3 for initialization procedures.

SECTION 5-3 TFX HAND HELD TERMINAL INITIALIZATION

The TFX Hand Held Terminal must be initialized to the Setup Communication protocol of the Unidex 1. Once initialized, under normal conditions it should never require re-initialization, however, certain abnormal transient conditions may accidentally alter the internal Hand Held terminal memory requiring the terminal to be re-initialized

Depending on the Model Number of the TFX Hand Held Terminal being used, the re-initialization procedure is done in one of two ways. The following sections provide the procedure for each of the models.

NOTE: The TFX Model Number is located on the lower rear of the terminal.

5-3-1: TFX HAND HELD TERMINAL (MODEL NUMBER ESK 164)

The Unidex 1 provides a special Hand Held terminal Initialization mode to initialize the Hand Held terminal Model ESK - 164.

Power down the Unidex 1. Connect Set Up pin (pin 6 of I/O, Port B connector) to Signal Common pin (pin 8 of I/O, Port B connector) with a removable jumper plug. The Hand Held terminal must be connected to the Port A connector (it cannot be in a daisy chain configuration).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Power up the Unidex 1. After power has been applied for at least 10 seconds, disconnect the Setup to Signal Common jumper. The Hand Held terminal will begin displaying characters while initializing. When the Hand Held terminal has been initialized, it will display the following screen. (Initialization time is less than 30 seconds.)

TERMINAL SET 9600 BAUD, EVEN

NOTE: Power must remain "On" to the Unidex 1 until the "Terminal Set" screen is present on the TFX Hand Held Terminal.

Power down the Unidex 1 to exit the TFX initialization mode.

5-3-2: TFX HAND HELD TERMINAL (MODEL NUMBER ESK 166)

The TFX Hand Held terminal Model ESK - 166 may be initialized as follows:

Power down the Unidex 1. Remove the Setup to Signal jumper (if previously installed) and then power up the Unidex 1.

Press the SHIFT key and then the CTRL and SPACE keys of the TFX Hand Held Terminal. The TFX Setup Menu will appear. The current Baud Rate will be displayed.

Press the F1 key to step through the selections for this setting. Select a Baud Rate of 9600 Baud by pressing the F5 key.

The current Parity setting is displayed. Press the F1 key to step through the selections for this setting. Select Even Parity by pressing the F5 key.

The current Character Display mode is displayed. Press the F1 key to step through the selections for this setting. Select the 32 Character Display mode by pressing the F5 key.

Press F3 to exit the TFX Setup Menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Power down the Unidex 1. Connect Set Up pin (pin 6 of I/O, Port B connector) to Signal Common pin (pin 8 of I/O, Port B connector) with a removable jumper plug. The Hand Held terminmal must be connected to the Port A connector (it cannot be in a daisy chain configuration).

Power up the Unidex 1. After power has been applied for at least 10 seconds, disconnect the Setup to Signal Common jumper. When the Hand Held terminal has been initialized, it will display the following screen.

TERMINAL SET 9600 BAUD, EVEN

NOTE: Power must remain "On" to the Unidex 1 until the "Terminal Set" screen is present on the TFX Hand Held Terminal.

Power down the Unidex 1 to exit the TFX initialization mode.

SECTION 5-4 HAND HELD TERMINAL: DISPLAY /SETUP

After the Hand Held terminal has been placed in the Setup Mode and activated (as described previously in Section 5-2) the Hand Held terminal will display:

1 DISPLAY SETUP 2 ALTER SETUP

To display the Setup, press the F1 key.

Every time the F1 key is pressed, a Setup parameter will be displayed. When the sequence has displayed the last setup code, the display will move back to the first Setup code. If the F5 key is pressed, the display will go back to the Display/Alter select screen. A description of each of the codes can be found in Section 5-7.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To change a setup parameter press F2 .
The following screen will appear:

ENTER SETUP CODE

To change a Setup code, enter the code directly into the keyboard as described in the Setup code description (see Section 5-7). After the code has been entered, *a * (End Of Block) character* must be entered. After the * character has been entered, the Setup code will be updated.

During the process of entering the Setup code, the <BACKSPACE> key will delete one character each time it is pressed, beginning with the last one entered. The changed Setup code can be verified by using the Display command.

To exit the Setup Mode, power down the Unidex 1 and then remove the Setup jumper (6-8 of I/O connector, Port B).

SECTION 5-5 COMPUTER INTERFACE: PRINT SETUP

To print the Setup codes, Unidex 1 must be active and in the Setup mode.

The Computer Interface Print command is PV <CR>. Upon receiving the PV command, Unidex 1 will send Setup codes and their values to the host device. A description of all of the Setup codes is given in Section 5-7.

SECTION 5-6 COMPUTER INTERFACE: ALTER SETUP

To alter the Setup codes in the Computer Interface mode, Unidex 1 must be active and in the Setup mode. To change a Setup code, enter the complete setup code followed by an "*" character. A description of all Setup codes can be found in Section 5-7.
For example:

BR 14 *

This is a baud rate Setup code. The "*" character will cause the Setup code to be updated. However, the given code will not be activated until the Unidex 1 is powered down and the Set-up jumper is removed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 5-7 SET UP CODE DESCRIPTION

This section describes each of the Setup codes. These codes are valid in the Hand Held Terminal and Computer Interface modes.

5-7-1 BAUD RATE

The baud rate setup command is used to set the communication baud rate for normal operating mode. (This does not affect the current Setup mode communication protocol. See Section 5-2.)

For example:

BR 14 *

This command will set the baud rate to 9600 baud (code 14 as shown in the following table). The following codes can be used to set their associated baud rates (Hand Held terminal operation uses 9600 baud rate.)

Baud Rate Codes

CODE	BAUD	CODE	BAUD
01	50	09	1800
02	75	10	2400
03	109.92	11	3600
04	134.58	12	4800
05	150	13	7200
06	300	14	9600
07	600	15	19200
08	1200		

NOTE: **Any code other than those listed above is invalid.**

5-7-2 WORD LENGTH

The communication word length can be either 7 or 8 bits. TFX Hand Held terminal operation requires a word length of 7:

WL 7 *

The above command sets the word length to 7 bits.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7-3 STOP BITS

The communication Stop bit can be selected for either 1 or 2 bits. The Hand Held terminal operation requires 1 stop bit:

SB 1 *

The above command sets the Stop bit to 1.

5-7-4 PARITY

The parity command allows a parity of even (E), odd (O) or no parity (N) to be selected. Even parity is typically used for TFX Hand Held terminal operation.

PY E *

The above command will set the parity to Even.

5-7-5 DEVICE ADDRESS

The device address command sets the address which will activate Unidex 1. The device address must be a number from 0 to 31. (It is recommended, however, that 0 and 1 not be used as addresses, since 0 is used in the Setup mode, and 1 is the default address.)

For example:

DA 24 *

The above example command will set the Unidex 1 to address 24.

5-7-6 BOOT PROGRAM

The boot program command sets the program number (from 1 to 99) to be executed upon power up. (**Enter a boot program number of 00 to disable the boot program feature.**)

BP 49 *

The above example will set program 49 to execute when Unidex 1 is powered up.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7-7 OUTPUT ACTIVE STATE

The output active state command allows the Unidex 1 to be setup for an active high (H) or an active low (L) state.

OT H *

This command sets the output active state to active high.

5-7-8 ACCEL/DECEL

The ramp time command sets the Accel/Decel time in milliseconds. Ramp time must be between 0 and 9999.

AD 250 *

The above command will set the ramp time to 250 milliseconds.

5-7-9 START/STOP

The start/stop code sets the start/stop frequency for ramped moves. The start/stop frequency is entered in steps/sec and must be between 1 and 125000. Once entered into Unidex 1, the start/stop frequency will be converted to the nearest usable frequency.

SS 10000 *

The above example would set the start/stop frequency for 10,000 steps/sec.

Due to the Unidex 1's 1 μS feedrate accuracy, the SS frequency will be automatically rounded to the nearest achievable feedrate. Displaying the Setup commands by typing PV < CR > (computer interface mode only, with Setup mode active) will show the actual value.

5-7-10 RAMP PROFILE

The ramp profile code allows either a linear "L" or Parabolic "P" Accel/Decel ramp curve.

RP P *

This command sets the Accel/Decel ramp profile to parabolic profile.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7-11 ENABLE/DISABLE HIGH MOTOR CURRENT

Motor current control can be automatically configured for High Current When Running/Low Current When Stationary (EH Y Command) or Low Current When Running/Low Current When Stationary (EH N Command). The actual high and low motor current levels are factory set. The high level is analogous to the Continuous Motor Current/Driver Rating (Table 1-2). The low level is analogous to one half (1/2) the continuous motor/driver rating. The command format is as follows:

EH Y* or EH N*

In the high/low level mode, Unidex 1 will switch automatically to the high current level during any type of indexed move (manual or programmed). When the move is finished, Unidex 1 will automatically switch to the low current level. In the low/low level mode, Unidex 1 will stay at the low current level for both an indexed move and a rest (stationary) condition.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7-12 LOAD DEFAULT

The load default command will set the Setup mode to the following. (The commands listed below will not be displayed.)

LD *

Command	Setting
BR 14	Baud rate = 9600
WL 7	Word length = 7
SB 1	Stop bits = 1
PY E	Parity = Even
DA 01	Device Address = 1
BP 00	Boot program = Disabled
OT L	Active low
AD 250	Accel/Decel = 250
SS 8065	Start/Stop = 8065
RP L	Ramp profile = L
EH Y	Enable high current (while running)
TS 10000	Thumbwheel Indexer Index speed = 10000

The LD command offers a fast and easy means of resetting Unidex 1 to the factory default setup parameters.

5-7-13 THUMBWHEEL INDEXER INDEX SPEED

The default Thumbwheel Indexer index speed is selectable to between 2 and 250,000 steps/second.

TS 10000*

The above command will set the Thumbwheel Indexer index speed to 10000 steps/second.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5-7-14 PRINT SETUP VALUES

The print setup command will display all setup parameters currently set. For this command a Carriage Return must follow the command. This command is not applicable to the TFX Hand Held terminal interface.

PV <CR>

DISPLAY FORMAT

BR nn
WL n
SB n
PY n
DA nn
BP nn
OT n
AD nnnn
SS nnnnnnn
RP n
EH n
TS nnnnnnn

This concludes the explanation of the setup.

Make certain that the jumper between pin 6 and 8 of Port B is removed following Setup.

The Setup procedures outlined in this section will not operate if the communication to Port A is configured for the daisy chain mode. The RS-232 terminal, computer or optional TFX Hand Held terminal must be directly linked to Port A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 6: UNIDEX 1 OPTIONS

Aerotech provides three control interface options for the Unidex 1 Controller. These are the TFX Hand Held terminal, the Thumbwheel Programmer (TP) and the Thumbwheel Indexer (TI). These options are outlined in Figures 6-1, 6-2 , 6-3 and 6-4 respectively.

The TFX Hand Held terminal option provides the user with the ability to enter both manual and program command instructions to the Unidex 1 directly, eliminating the need for a bulky data terminal or computer interface.

The Thumbwheel Programmer (TP) option is supplied for applications requiring a very simple means of commanding program execution for the Unidex 1. This option is geared to factory automation, where program motion has already been pre-defined.

The Thumbwheel Indexer (TI) option is supplied for applications involving variable distance/feedrate motion commands under manual control. This option is similar to that of the TFX Hand Held terminal option in the manual indexing mode, except that this option provides for a more simplified user-machine interface.

SECTION 6-1 TFX HAND HELD TERMINAL

6-1-1 INTERFACE CONNECTIONS

The TFX Hand Held terminal (Figures 6-1 and 6-2) is supplied with a cable that is designed to plug into the Communication Interface Connector, Port A, of the Unidex 1 (see Item 2-3-1). No additional interconnect wiring is required. The TFX Hand Held terminal receives its power directly from Unidex 1.



WARNING: **To minimize the possibility of electrical shock and bodily injury, prior to making any electrical connections or disconnections, make certain that all electrical power switches are in the OFF position.**

It should be noted that the TFX Hand Held terminal cable can be altered for "daisy chaining" 2 to 30 Unidex 1 Controllers to one TFX Hand Held terminal (see Figure 6-3). Pin out definitions for the TFX Hand Held terminal are shown in Figure 6-3.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2 OPERATION

Two configurations of the TFX Hand Held terminal are currently being supplied. Functionally the two terminals are identical however slight differences exist on the keypad (see Figures 6-1 and 6-2).

The TFX Hand Held terminal performs a self check upon power up. This process takes approximately 5 seconds, after which the screen will be blank, except for the blinking cursor. If a blinking cursor does not appear, the TFX Hand Held terminal may need to be initialized (see Section 5-3).

NOTE 1: If it is necessary to reset all Unidex 1s ("daisy chain" mode) on the bus through the TFX Hand Held terminal, enter <CTRL> D.

NOTE 2: A Soft Reset is also available and will reset only the active Unidex 1(s). It is initiated by entering "<CTRL> A" through the TFX Hand Held terminal. This reset will stop program execution and/or motion (DECEL to stop) in all active Unidex 1s. All units that have responded to this reset will still be active. The following screen will be displayed:

```
1 EDIT   2 DISPLAY
3 RUN    4 ETC
```

(The above screen is not displayed if more than one axis is active.)

NOTE 3: The escape character, <ESC>, should never be used, since certain Escape sequence codes will lock up the TFX Hand Held terminal and will require that it be re-initialized (Section 5-3).

To activate Unidex 1 through the TFX Hand Held terminal following a power up or a Reset (Note 1 and 2 above), you must enter:

nn <ENTER>

The "nn" designates the appropriate Unidex 1 device number.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

NOTE 1: If TFX Hand Held terminal is used in the "daisy chain" mode, the characters entered will be "echoed" until the given device is activated. (For example: #### nnnn).

NOTE 2: The <SHIFT> key may have to be depressed to make the above entry (dependant on the Serial Number of the TFX terminal being used). Notice the cursor becomes larger when the upper case is active. Function keys are considered upper case. If pressing a Function Key (F1 to F5) gives no result, check the cursor to make certain it is in the upper case mode

After activating the Unidex 1, the following is displayed:

```
1 EDIT   2 DISPLAY
3 RUN    4 ETC
```

Press function key F1 for **EDIT**, F2 for **DISPLAY**, F3 for **RUN** and F4 for **ETC.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

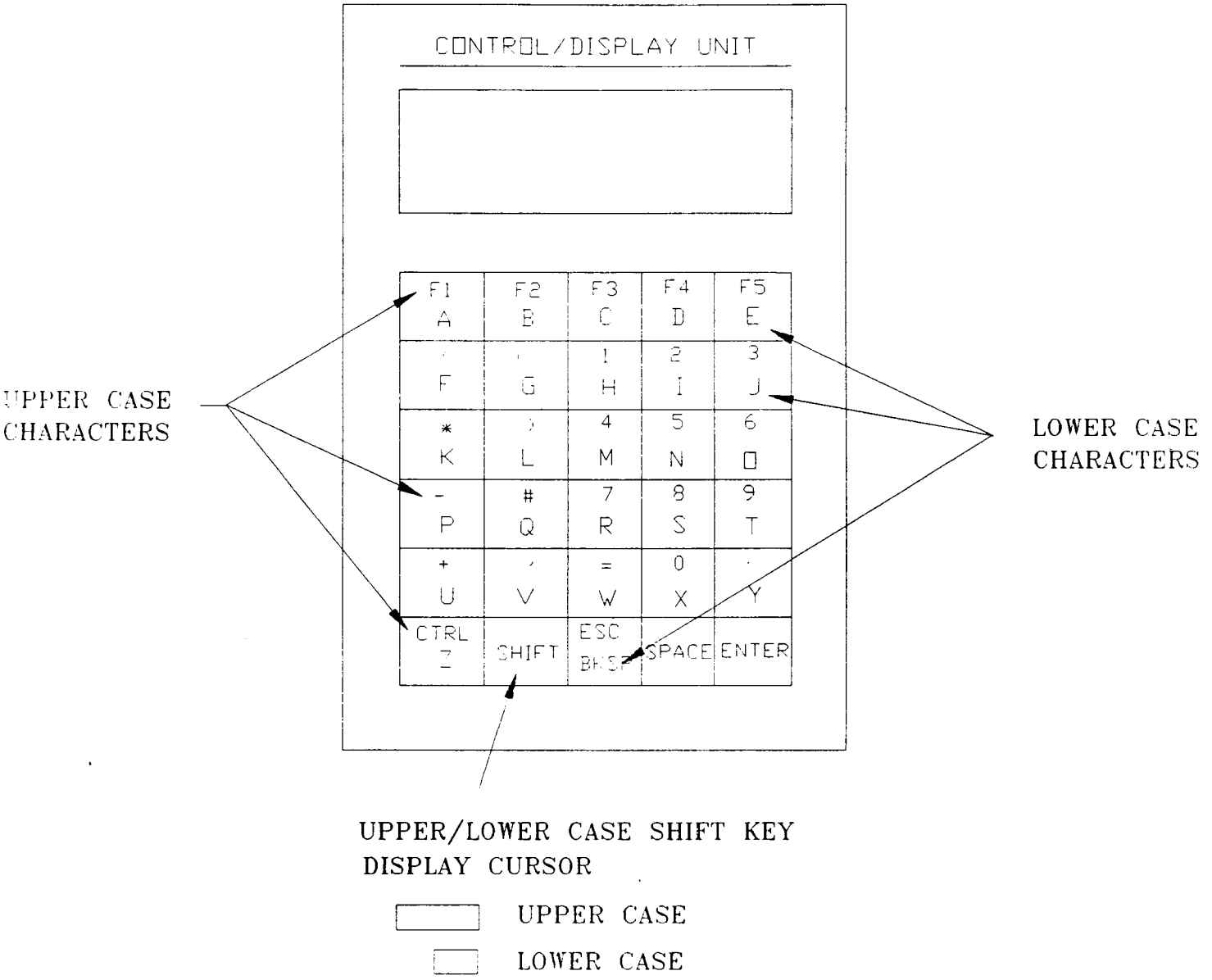


Figure 6-1: Outline of the TFX Hand Held Terminal Option (S/N EFK164) for Unidex 1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

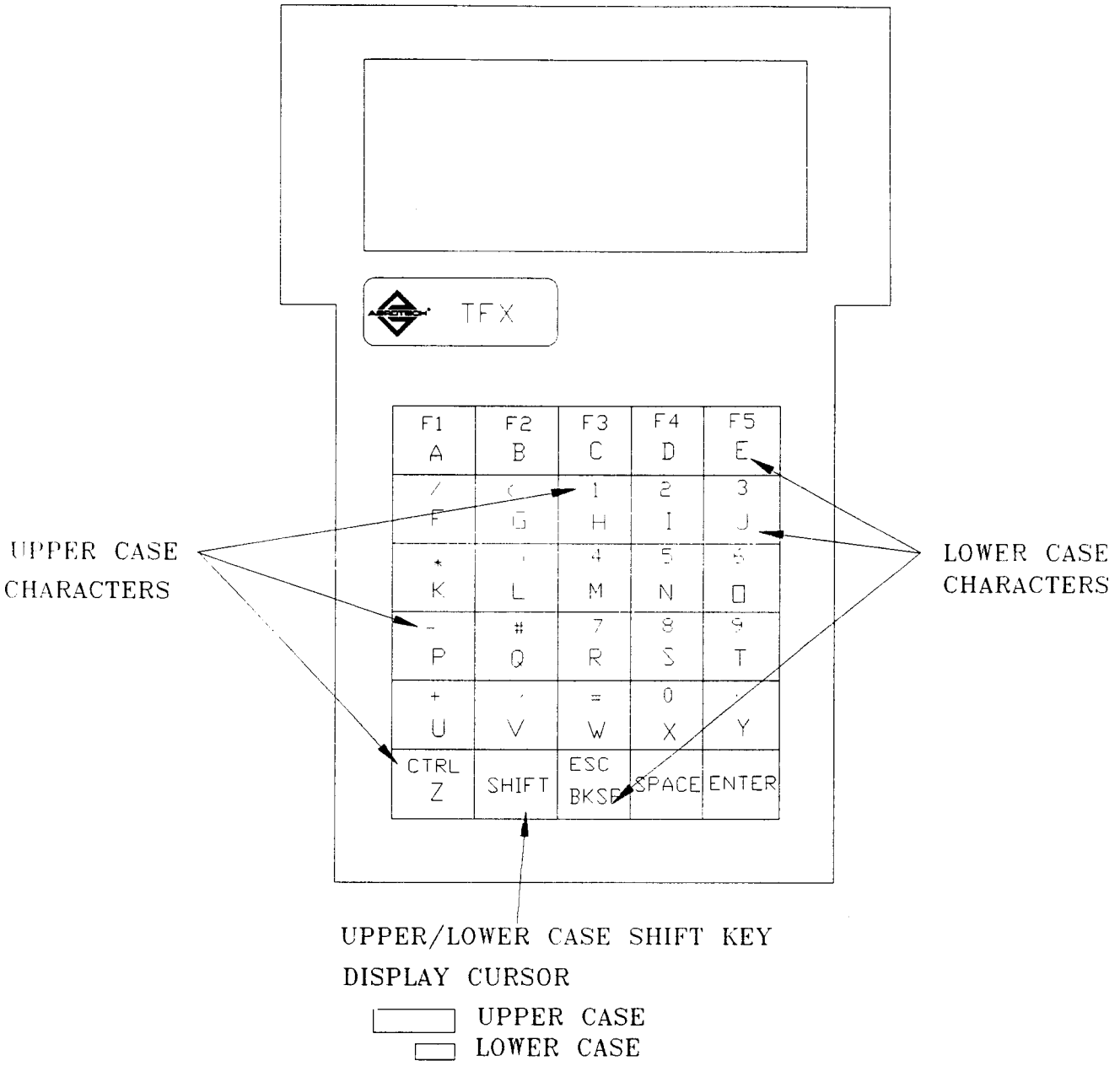


Figure 6-2: Outline of the TFX Hand Held Terminal Option (S/N EFK166) for Unidex 1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following sections will explain each of these modes.

6-1-2-1 EDIT

Press F1, **EDIT**, from the main menu screen, to enter the Edit mode. The display will be:

```
1 PGM  2 ALTER
3 DELETE 5 RTN
```

Press F1 **PRG,** to input a new program, F2 **ALTER**, to edit an existing program, F3 **DELETE**, to delete a program, and F5 **RETURN**, to return to the previous menu.

NOTE: F5 may not always be displayed on the menu screen but still may be used to return to the previous menu.

The following subsections will describe each Edit menu.

6-1-2-1-1 INPUT PROGRAM

Press F1, **PRG**, the display will be:

```
INPUT PROGRAM
00 ENTER
```

Enter the new program number. The display will then be:

```
INPUT BLOCK?
1 CONTINUE  5 END
```

Press F1, **CONTINUE**, the display will be:

```
INPUT BLK CMD
```

Program commands may now be entered. (See Chapter 7 for a summary of Unidex 1 program commands.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Enter the * (End of Block) when the program commands have been entered to return to the EDIT menu.

6-1-2-1-2 ALTER PROGRAM

Once several blocks of commands are entered, it may be necessary to step through the program in order to edit it. Press F5, **END**, of the Input Program mode to get back to the main EDIT menu. Then press F2, **ALTER**, the display will be:

```
INPUT PROGRAM
00 ENTER
```

Enter the program number to be edited, the display will be:

```
1 DSP 2 GET BLK
3 INS 4 DEL 5 BK
```

Press F1 **DSP** to display the program commands. Continue to press F1 to view subsequent command blocks, (F2 to go back over previous blocks). When you get to a point where more commands must be inserted, press F5 to return to the ALTER menu. Then press F3, **INSERT**, to insert a block of commands. It will be inserted **before** the block where F5 was pressed. Press F3, the display will be:

```
INPUT BLK CMD
```

A command block may now be inserted.

NOTE: F5 is not valid at this time. To exit without entering a command, enter an End-Of-Block character (*) to return to the program. If an invalid command is entered, the display will be:

```
FORMAT WARNING
1 CONTINUE
```

Press F1 to re-enter the program then press F5 to exit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Commands may also be inserted by pressing F2, **GET BLK**, from the ALTER Program menu. The display will be:

```
ENTER BLOCK #   0000  ENTER
```

Enter a block number, such as 2. That program block will be displayed, it cannot be directly changed by overwriting it. Instead F5 may be pressed to return to the ALTER Program menu:

```
1 DSP  2 GET BLK
3 INS  4 DEL 5 BK
```

Press F3 **INS** to insert a new block of program commands before the program block just viewed, F4 **DEL**, to delete that program block, F2 **GET BLK**, to go to a certain block, F1 **DSP**, to re-enter the program, or F5 **BK**, to go back to the main EDIT menu.

Once within the program by using any ALTER menu function (except, of course, F5) you may step through the program via **F1 and F2**, even though these functions are not displayed on the screen at the time. Use these functions to check the program while editing.

6-1-2-1-3 DELETE PROGRAM

Press F5, **BK**, to return to the main Edit menu. The main EDIT menu will be displayed:

```
1 PGM  2 ALTER
3 DELETE 5 RTN
```

Press F3, **DELETE**. The display will be:

```
1 CLR MEMORY
2 DEL PGM  5 RTN
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Press F1, **CLR MEMORY**, to clear all programs from memory. **Depressing F1 when in the DELETE Menu deletes ALL programs.**

Press F2, **DEL PRG**, to see:

```
INPUT PROGRAM
00  ENTER
```

Enter a program number. That program will be deleted from Unidex 1 memory and the TFX Hand Held terminal will again display the main EDIT menu.

6-1-2-1-4 RETURN

Pressing F5, **RTN**, from the main EDIT menu returns you to the main menu.

6-1-2-2 DISPLAY

Press F2, **DISPLAY**, of the main menu screen to see:

```
1 PSN  2 PRG
3 DR 4 ETC 5 RTN
```

The above menu provides a display of: Axis Position, a Program, the Directory, Input Status, Output Status and Setup Parameters. Each is described in a following sub-section.

6-1-2-2-1 POSITION DISPLAY

Once in the display mode, the position will constantly update. The display will be:

```
X 0000002000
5 RTN
```

(To maintain consistency with the Aerotech Unidex 11 Series Controllers, the axis label (X) is allocated to this position. Since Unidex 1 is a one-axis system, X will always be displayed.)

Press F5, **RTN**, to return to the main DISPLAY menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-2 PROGRAM DISPLAY

Press F2, **PRG**, the display will be:

```
INPUT PROGRAM
00  ENTER
```

When a program number is entered that exists in memory, the display will be:

```
PRESS F1 TO CONT
PRESS F2 TO EXIT
```

Press F1 to step through the program. Each time F1 is pressed, a subsequent block will appear. (Note that program editing can only be accomplished in the EDIT mode – see Section 6-2.)

Press F5 to return to the main display.

6-1-2-2-3 DIRECTORY DISPLAY

Press F3, **DR**, to see:

```
PRESS F1 TO CONT
PRESS F5 TO EXIT
```

If any program is residing in memory, pressing F1, **CONT**, will give the program number and how many bytes of memory it uses. For example:

Press F1 again to see each subsequent program. When the last program has been displayed, the remaining bytes in memory that are free will be given. For example:

```
PROGRAM # 01   00035  BYTES
05961 FREE BYTES   5 RTN
```

Press F5 to return to the main DISPLAY menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-4 ETC

Press F4, **ETC**, the display will be:

```
1 SETUP  2 STATUS
3 INPUT  5 RTN
```

6-1-2-2-4-1 Setup Display

Press F1, **SETUP**, to see the setup parameters chosen. (For detailed information on the Setup parameters, see Chapter 5, Setup.)

The first setup displayed is the Baud Rate:

```
BR 14
1 CONT   5 RTN
```

Press F1 to continue. The Word Length setup will be displayed:

```
WL 7
1 CONT   5 RTN
```

Press F1 to continue. The Stop Bits setup will be displayed:

```
SB 1
1 CONT   5 RTN
```

Press F1 to establish Odd, Even or No Parity:

```
PY E
1 CONT   5 RTN
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The subsequent screens describe the following:

Device Address (1 through 30):

```
DA 01
1 CONT  5 RTN
```

Boot Program (1 through 99):

```
BP 01
1 CONT  5 RTN
```

Output Active State (high or low):

```
OTL
1 CONT  5RTN
```

Accel/Decel time (0-9999 mS) (see Chapter 8):

```
AD 0250
1 CONT  5 RTN
```

Start/Stop frequency (default speed if move is too short for Accel/Decel rate; see Section 8-2 and 8-5).

```
SS 0000500
1 CONT  5 RTN
```

Accel/decel Ramp Profile (linear or parabolic) (see Chapter 8):

```
RP L
1 CONT  5 RTN
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Enable (Yes) or Disable (No) high motor operating current :

```
EH Y
1 CONT  5 RTN
```

If F1 is pressed again, the display will wrap around to the Baud Rate .

Press F5 at any time to return to the ETC display.

6-1-2-2-4-2 Status Display

Press F2, **STATUS**, to see the present Unidex 1 status. Status codes, described in Chapter 10 (Troubleshooting) will be displayed if valid. Press F1 to continue and F5 to return.

The output status (high or low) is the next to the last status screen and is always displayed:

```
01-04 : ( 1111 )
1 CONT  5 RTN
```

Press F5 to return or F1 for the next screen.

The software version is the last status screen and is always displayed:

(xx represents the software level).

```
SOFTWARE USI xx
5 RTN
```

6-1-2-2-4-3 Input Display

Press F3, **INPUT**, to display the status of the inputs (high or low):

```
I1-I4: (1111)
5 RTN
```

Press F5 once to return to the ETC menu, and again to return to the main DISPLAY menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-5 RUN MODE

Press F3, **RUN**, from the main menu, the display will be:

```
1 IMD  2 AUTO
2 BLOCK  5 RTN
```

The Run mode allows you to execute a program in the AUTO or BLOCK mode, or execute a string of commands in the IMMEDIATE mode.

Each of these modes will be covered the following subsections.

6-1-2-2-5-1 IMMEDIATE MODE

Press F1, **IMD**, the display will be:

```
INPUT BLK CMD
```

Enter a block of commands, such as:

HX*

the display will be:

```
AXIS IN HOME
CYCLE
```

When the Unidex 1 has completed the execution of the command, the main RUN menu is again displayed.

6-1-2-2-5-2 AUTO MODE

Press F2, **AUTO**, of the Run menu, the display will be:

```
INPUT PROGRAM
00  ENTER
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When the program number has been entered, the display will be:

```
WAIT FOR TRIGGER
1 YES  2 NO
```

If execution of the program is to be suspended until the Unidex 1 receives a Trigger, press F1, **YES**. The display will be:

```
WAIT FOR TRIGGER
PRESS  T
```

Press T to begin program execution. The tracking display is displayed as programs are executed. When complete, the main RUN menu will be displayed. The Trigger function may be used with multiple Unidex 1s (daisy chain). The Unidex 1s may be enabled to listen and all begin to execute the same program simutaneously when the T is pressed.

If no Trigger is required, press F2, **NO**, when in the AUTO mode. As soon as F2 is pressed, the program will execute, displaying the tracking display as it runs. When execution is finished, the main RUN mode will be displayed again. At this point, multiple Unidex 1s may be enabled to listen , and all begin to execute the same program simultaneously when T is pressed.

6-1-2-2-5-3 BLOCK MODE

Press F3, **Block**, of the RUN menu, the display will be:

```
INPUT PROGRAM
00  ENTER
```

Enter the program number, the first command block will execute. The display will be:

```
PRESS F1 TO CONT
PRESS F5 TO EXIT
```

Press F1, **CONT**, to execute the next block, or F5, **EXIT**, to exit the program and re-enter the main RUN menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

This message will continue as long as there are blocks to execute. When the end of the program is reached, the main RUN menu will again be displayed.

Press F5, **RTN**, to return to the Main menu.

6-1-2-2-6 ADDITIONAL MODES

Press F4, **ETC**, of the Main menu to see:

The following subsections will describe each of the ETC menus.

6-1-2-2-6-1 STOP

Press F1, **Stop**, to stop axis motion. When this mode is accessed, pressing F1 will halt the axis move. (This command is useful in resetting a "free-run" command.)

```
1 STOP  2 INDEX
3 HM 4 RMT 5 RTN
```

6-1-2-2-6-2 INDEX

Press F2, **Index**, the display will be:

```
1 EXECUTE  2 INC
3 FD 4 DST 5 RTN
```

From within the INDEX mode, the Feedrate (F3) and Distance (F4) at which to Execute (F1) the move may be established. The move may be made in the Incremental or Absolute mode (F2). The details of these modes will be described in the following subsections.

NOTE: Press F2, **INC**, to switch to the ABS mode. These two modes toggle, but the default mode is Incremental. Notice the difference in the Index menu display when the Absolute mode is active. The display will be:

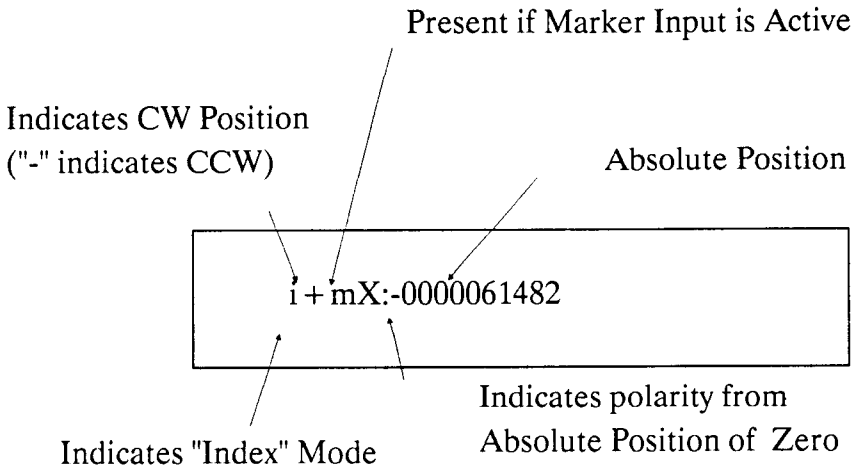
```
1 EXECUTE  2 ABS
3 FD 4 POS 5 RTN
```

The F4 mode changes as a reminder that in the Absolute mode, data entered is not distance, but a *specific position* that the axis is to reach.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-6-2 Execute

Press F1, **EXECUTE**, to make the Axis Index (move a specific distance at a specific feedrate). This distance and feedrate is set via F3, **Feedrate**, and F4, **Distance**. If you do not enter new values, the last ones entered will remain in effect. (They stay the same after a reset, or power down.)



Pressing F1, **EXECUTE**, you will see a display similar to the example shown above.

When execution of the move is complete, a display will appear such as:

```
i  X: 0000065000
1 EXECUTE  5 RTN
```

Press F1, **EXECUTE**, to re-execute the same index. Press F5, **RTN**, to go back to the main ETC menu.

NOTE: **The previous screen is displayed whether you are in the absolute or incremental mode. However, in the absolute mode, once a position is attained (such as 65000 in the above sample screen) pressing F1, EXECUTE, will do nothing (the position has already been reached). To continue indexing, either change the position data in F4, POSITION, or change to the incremental mode by pressing F2.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-6-3 Absolute/Incremental mode

With F2, **INC/ABS**, you may toggle between these two modes. As mentioned above, in the incremental mode, distance (F4) is how many steps the axis is to move from its present position.

Absolute is a specific position. Once it is reached, executing the same distance (position) will do nothing.

6-1-2-2-6-4 Feedrate

Press F3, **FD**, to see a screen similar to:

```
FD = 0010000
ENTER
```

When an index is executed, the axis will move at a feedrate of 10000 steps/second.

6-1-2-2-6-5 Distance or Position

Press F4, **DST**, (when in the Incremental mode), the display will be similar to:

```
DST =0000020000
ENTER
```

When an index is executed in the Incremental mode, the axis will move the distance specified (20000 steps in the above example) from the current position.

Press F4, **POS**, (when in the Absolute mode), the display will be similar to:

```
POS =-0000020000
ENTER
```

When an index is executed in the Absolute mode, the axis will move to the Absolute position (-20000 steps in the previous example).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-1-2-2-6-3 HOME

Pressing F3, **HM**, of the ETC menu, will send the axis home, the display will be:

```
AXIS IN HOME
CYCLE
```

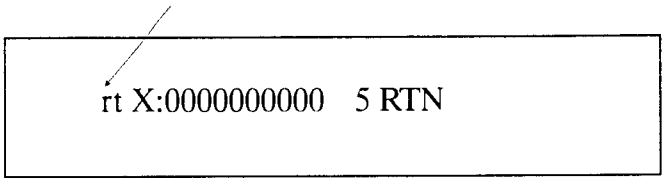
When "Home" is reached, the display will be:

```
AXIS AT HOME
1 HM  5 RTN
```

Press F1 to start another Home cycle. Press F5 to return to the main menu.

6-1-2-2-6-4 REMOTE

Press F4, **RMT**, the display will be similar to:
Indicates REMOTE mode



The REMOTE display monitors any pulses coming in from the Translator (External Clock and Direction Inputs, Input/Output connector; see Section 2-7).

SECTION 6-2 THUMBWHEEL PROGRAMMER(TP)

6-2-1 INTERFACE CONNECTIONS

The Thumbwheel Programmer (TP) (Figure 6-3) is supplied with a molded interconnect cable designed to plug directly into the Communications Interface Connector, Port A of the Unidex 1 (see Section 2-7). No additional interconnect wiring is required by the User. The TP derives its power directly from the Unidex 1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



WARNING: **To minimize the possibility of electrical shock and bodily injury, prior to making any electrical connections or disconnections, make certain that all electrical power switches are in the OFF position.**

Unlike the Hand Held terminal option (Section 6-1), the Thumbwheel Programmer option *cannot* be "Daisy-chained" to other Unidex 1 Controllers.

6-2-2 OPERATION

The Unidex 1 Thumbwheel Programmer Option will call and execute any of 99 possible programs from the Unidex 1 memory. The programs must have previously been entered into the Unidex 1 using the TFX Hand Held terminal or the Users computer interface (as described in this Chapter and in Chapter 7). Upon completion of the program, the Unidex 1 will respond with a READY LED signal. If the program called has not been executed completely or an ERROR has occurred, Unidex 1 will respond with an ERROR LED signal.

The use of the Unidex 1 Thumbwheel Programmer requires that the Unidex 1 be set to the following specifications (see Section 5-7 for a description of these codes):

Baud Rate : 9600
Stop Bits : 1
Word Length : 7
Parity : even

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

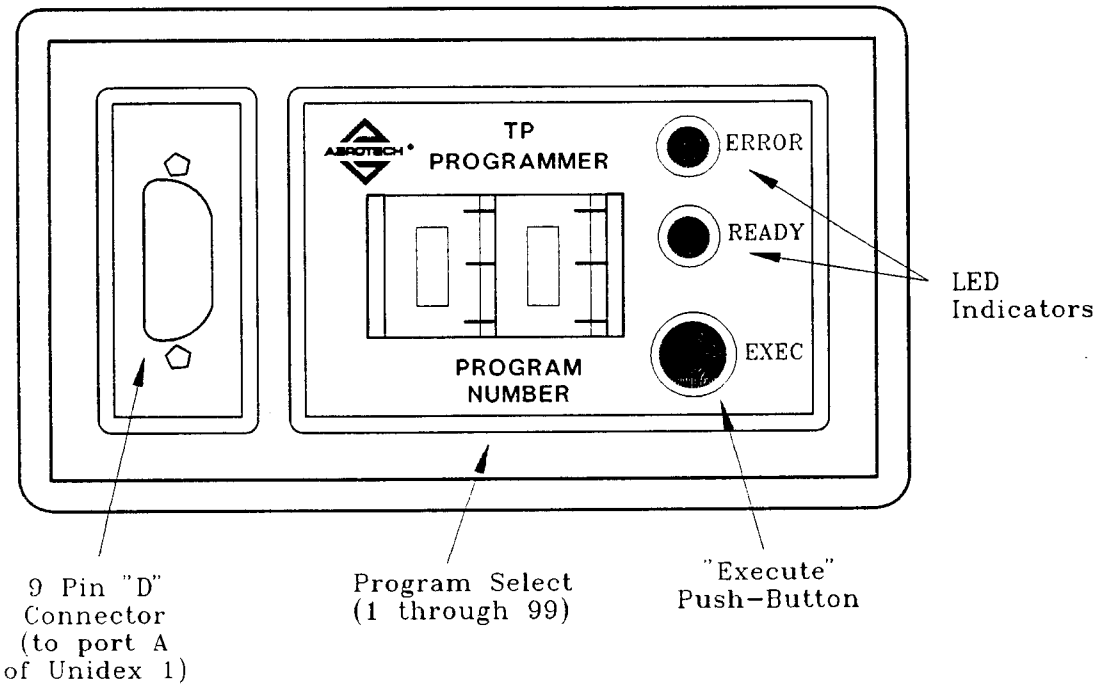


Figure 6-3: Thumbwheel Programmer (TP) Option

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6-2-3 THUMBWHEEL PROGRAMMER POWER UP

The Unidex 1 and Unidex 1 Thumbwheel Programmer must be connected prior to power up to insure that the Thumbwheel Programmer is recognized. When the Unidex 1 is powered up, the READY LED should come ON and the ERROR LED should go OFF.

To verify Thumbwheel Programmer operation, set the Thumbwheels to 00 (Program 00 *cannot* exist) and press the EXECUTE pushbutton. Upon pressing the pushbutton, both the READY and ERROR LEDs must come ON. If both LEDs do not come ON, the problem may be one of the following:

1. Unidex 1 and Unidex 1 Thumbwheel Programmer are not powered up properly.

2 Interface cable between Unidex 1 and Unidex 1 Thumbwheel Programmer is damaged or not connected properly.

3. Communication parameters (see Section 5-7) not as required.

To execute a program using the Unidex 1 Thumbwheel Programmer, move the Thumbwheels to indicate the desired program number, then press the EXECUTE pushbutton. Program execution will begin immediately and will be indicated by both the READY and ERROR LEDs being OFF. When the program has been completed with no errors, a ready signal will be sent and the READY LED signal will re-light. If the program does not exist or an error occurs during execution of the program, the program execution will be terminated and a error signal will be sent. The error signal will cause the READY and ERROR LEDs to be come ON simultaneously.

The EXECUTE pushbutton should not be pressed while both LEDs are OFF, since it may clear the Unidex 1 response signal and result in the ERROR and READY LED status not being set. Pressing the EXECUTE pushbutton while the program is being executed (READY and ERROR LEDs OFF) may also cause brief interruptions in the program execution. If EXECUTE is pressed at the same time that a Unidex 1 response signal is being sent back, the displayed LED status may be cleared or incorrect. *A questionable or missing LED status cannot be recovered.* Commands from the Unidex 1 Thumbwheel Programmer are not accepted during program execution and cannot be used to terminate any programs in progress.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 6-3 THUMBWHEEL INDEXER (TI)

6-3-1 INTERFACE CONNECTIONS

The Thumbwheel Indexer (TI) (Figure 6-4) is supplied with a molded interconnect cable that is designed to plug directly into the Communications Interface Connector, Port A, of the Unidex 1 (see Section 2-7). No additional interconnect wiring is required by the User. The TI derives its power directly from the Unidex 1.



WARNING: **To minimize the possibility of electrical shock and bodily injury, prior to making any electrical connections or disconnections, make certain that all electrical power switches are in the OFF position.**

Like the Thumbwheel Programmer (Section 6-2), the Thumbwheel Indexer *cannot* be "Daisy-chained" to other Unidex 1 Controllers.

6-3-2 OPERATION

The Unidex 1 Thumbwheel Indexer option is similar to the Thumbwheel Programmer option discussed in Section 6-2, except that it provides a much greater level of manual motion control. The TI option allows not only the selection of program execution, as with the TP option, but also the selection of 9 additional levels of motion commands and command modes. These are as follows:

Mode 0/ Home — Send axis to "Home" position. (Similar to RS-232 command "Home"; see Chapter 7.)

Mode 1/ Index — Move the axis the prescribed distance as set by "data" Thumbwheel settings (limited to 7 digits). The Feedrate can be set by Mode 2. The Power-Up Feedrate defaults to the Feedrate set in the Thumbwheel Indexer Index speed command (see Section 5-7). (Similar to RS-232 command "Index"; see Chapter7.)

Mode 2/ Feedrate — Set Axis Feedrate to be used with all subsequent Indexes. (Similar to RS-232 command "Index"; see Chapter 7)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Mode 3/ Accel/Decel	Set Axis Accel/Decel rate to be used with all subsequent Indexes. (Similar to RS-232 command "Accel/Decel"; see Chapter 7.)
Mode 4/ Absolute / Incremental	Set Index mode so that the Index length set in "data" Thumbwheel is relative to preset point (Absolute) or with respect to last move (Incremental). (Similar to RS-232 command "INC/ABS"; see Chapter 7.)
Mode 5/ Load Position	Set Axis position Tracking Register (limited to 7 digits). (Similar to RS-232 command "Load Position Register"; see Chapter 7.)
Mode 6/ Run Program	Execute specific Unidex 1 program (1 through 99). (Similar to RS-232 command "Auto Run"; see Chapter 7.)
Mode 7/ Output	Set the four Output Control signals to 1 (true) or 0 (false) as designated by the first four digit positions of the "data" Thumbwheel. Values 2 through 9 for the given digit specify the "don't care" state. (Similar to RS-232 command "Output State"; see Chapter 7.)
Mode 8/ Slew	Slew (jog) Axis at specified Feedrate (±0 to 250,000 steps/sec) as designated by the Data Thumbwheels. The sign indicates direction (+ for CW, - for CCW). The "Execute" push-button controls the Slew (or jog) process.
Mode 9/ Reset	Reset the Unidex 1 (equivalent to a Ctrl-A "soft reset"). The "EXECUTE" push-button performs the reset. (Similar to RS-232 command "Reset"; see Chapter 7 .)

The above mode definitions, modes 1, 2, 3, 5, 6, and 8 require the respective numerical parameter of the given command be set up in the "data" entry Thumbwheel. Standard numerical limits for the given command apply, i.e., Accel/Decel has a value limitation of between 0 through 6500 mSec, etc.

For modes 0 and 9, data entry on the "data" Thumbwheel are not applicable. Depress the "EXECUTE" push-button to execute these commands.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When using mode 7 (output), the first four (least significant) Data Thumbwheel switches are used (digit 1 for output 1, digit 2 for output 2, etc.). With these four digits, only values 0 (false) and 1 (true) are applicable as set or reset indicators. Digit values 2 through 9 signify "don't care" for the given output.

When using mode 4, the "-" data digit selects the Absolute mode and the "+" data digit selects the Incremental mode. All other data digits are ignored by this mode.

The Unidex 1 Thumbwheel Indexer option requires that Unidex 1 be set to the following specifications (see Section 5-7 for a description of these codes):

Baud Rate	: 9600
Stop Bits	: 1
Word Length	: 7
Parity	: Even

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

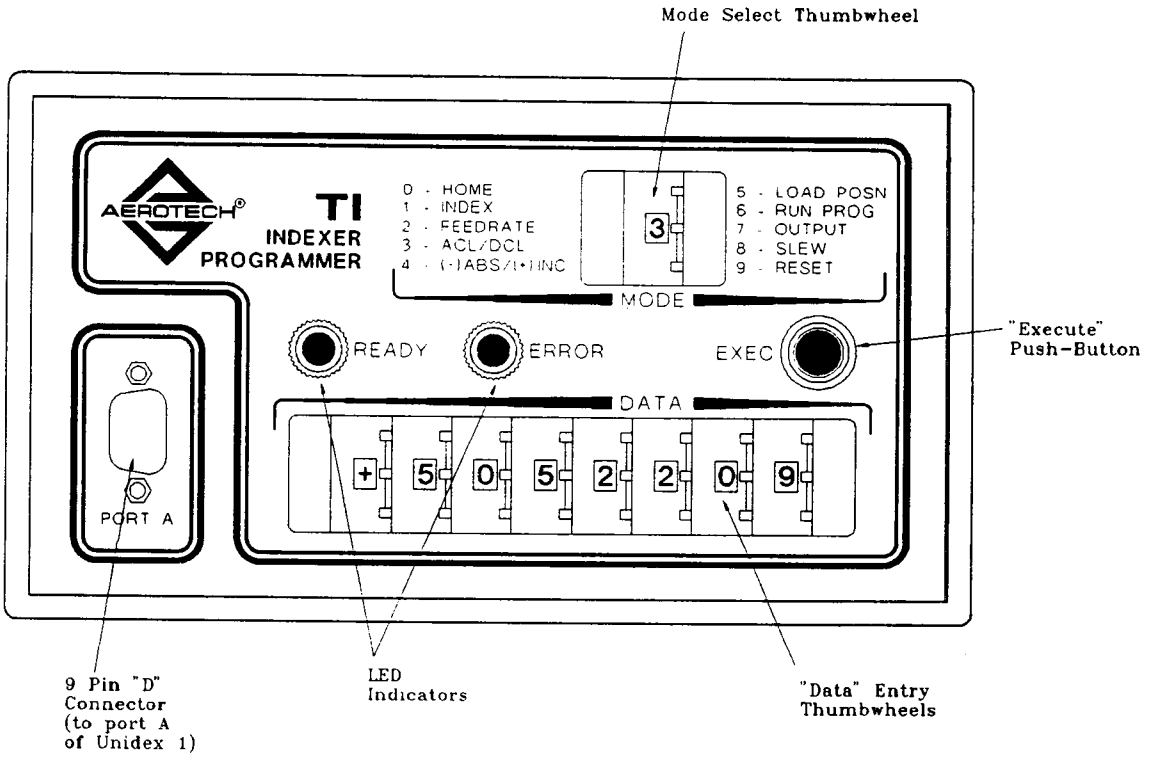


Figure 6-4: Thumbwheel Indexer (TI) Option

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 7: COMPUTER INTERFACE (PORT A)

The Computer Interface (i.e., RS-232C/daisy chain) option for the Unidex 1 makes it possible to control the Unidex 1 from a host device (CRT terminal, Personal Computer, etc.) via serial port A. A simple command sequence to the Computer Interface gains control of the device. The host may, from this point on, perform different tasks using Unidex 1. These tasks include executing command block(s) in the immediate mode, downloading a program into the User memory, running a program from the memory in Auto-run or Block-run mode, and reading the axis position, system statuses, directory, program or the entire memory.

Unidex 1 may also be configured for interactive control. In this mode, Unidex 1 sends a service request after executing a program or a command block, or if there is an error condition. Subsequently, the host device is required to poll Unidex 1 before proceeding further.

SECTION 7-1 REQUIRED HARDWARE

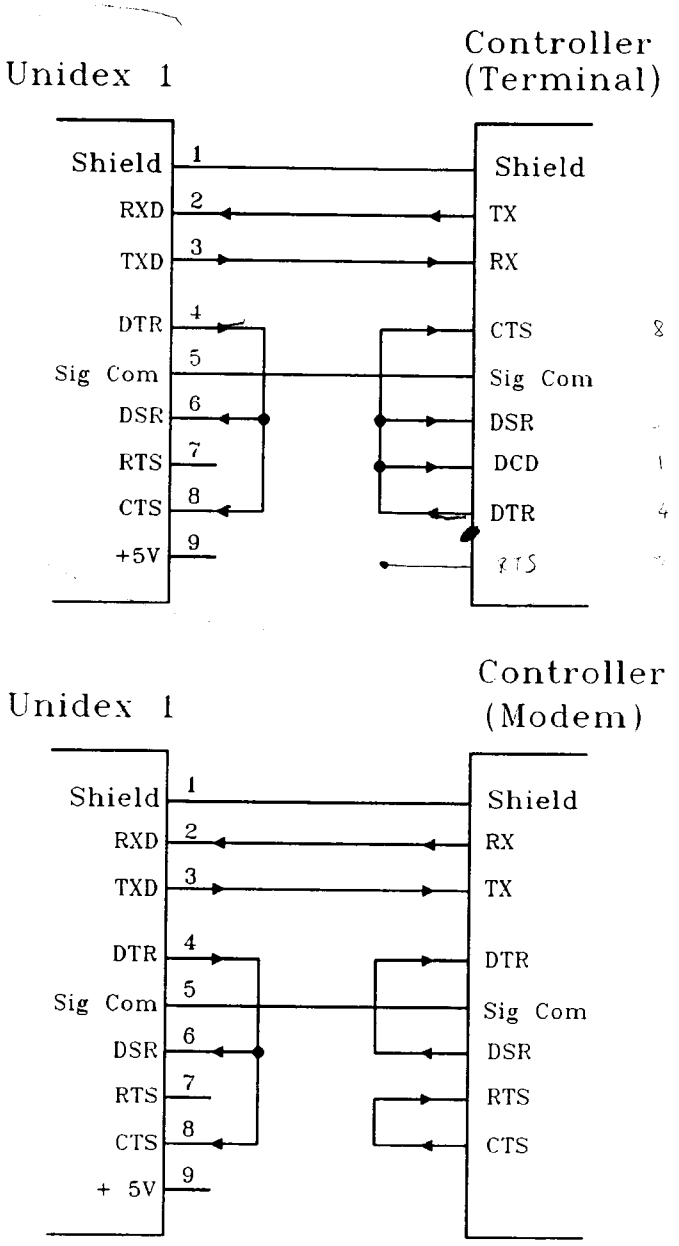
The Port A Computer Interface port (see also Section 7-10) is a 9 pin "D" type female connector implementing the following signal lines:

PIN 1	Not used
PIN 2	Receive Data (RX)
PIN 3	Send Data (TX)
PIN 4	Data Terminal Ready (DTR)
PIN 5	Signal Common (SG)
PIN 6	Data Set Ready (DSR)
PIN 7	Request To Send (RTS)
PIN 8	Clear To Send (CTS)
PIN 9	+5V

Figures 7-1, 7-2 and 7-3 show three examples of Communication Interfaces. The first two show interface connections required for RS-232 devices. Figure 7-3 shows a multi-axis Hand Held Terminal interface example (the Hand Held Terminal is described in Chapter 5).

The daisy chain configuration can be used for up to 30 Unidex 1s. When adding more units, repeat Unidex 1 connections as shown in Figures 7-2 and 7-3.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



NOTE: RS-232C Interface cable must be shielded

Figure 7-1: Single-Axis RS-232C Interface

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

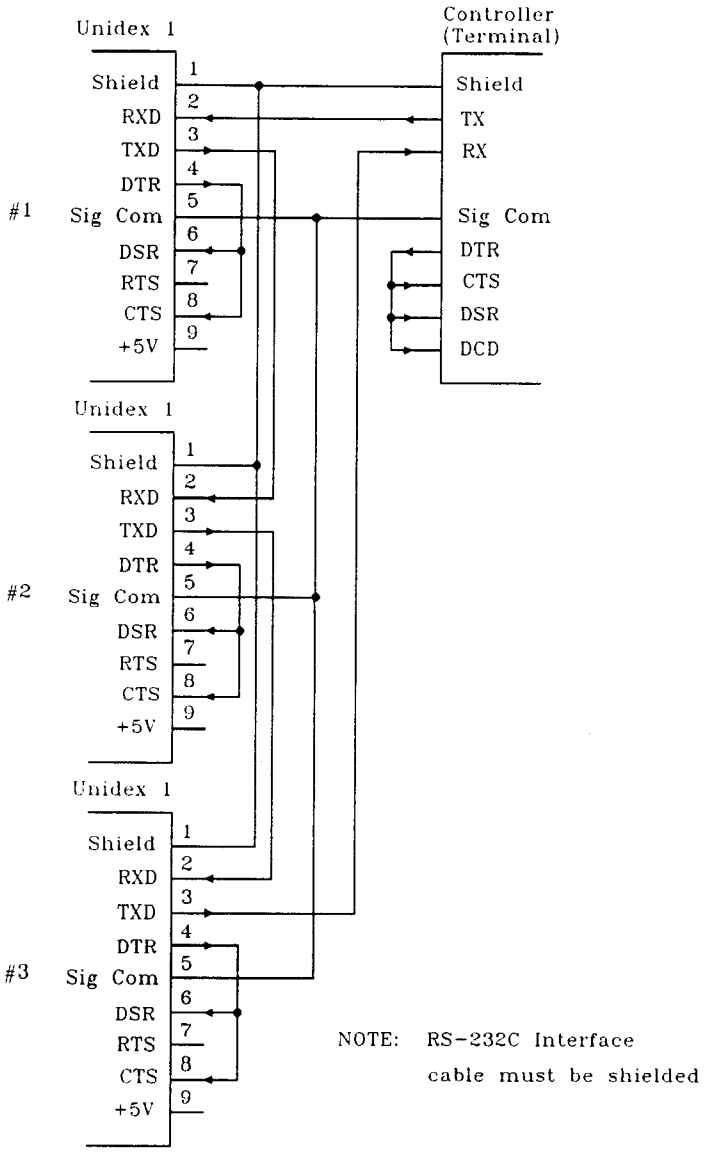


Figure 7-2: Multi-Axis (Daisy Chain) RS-232C Interface

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

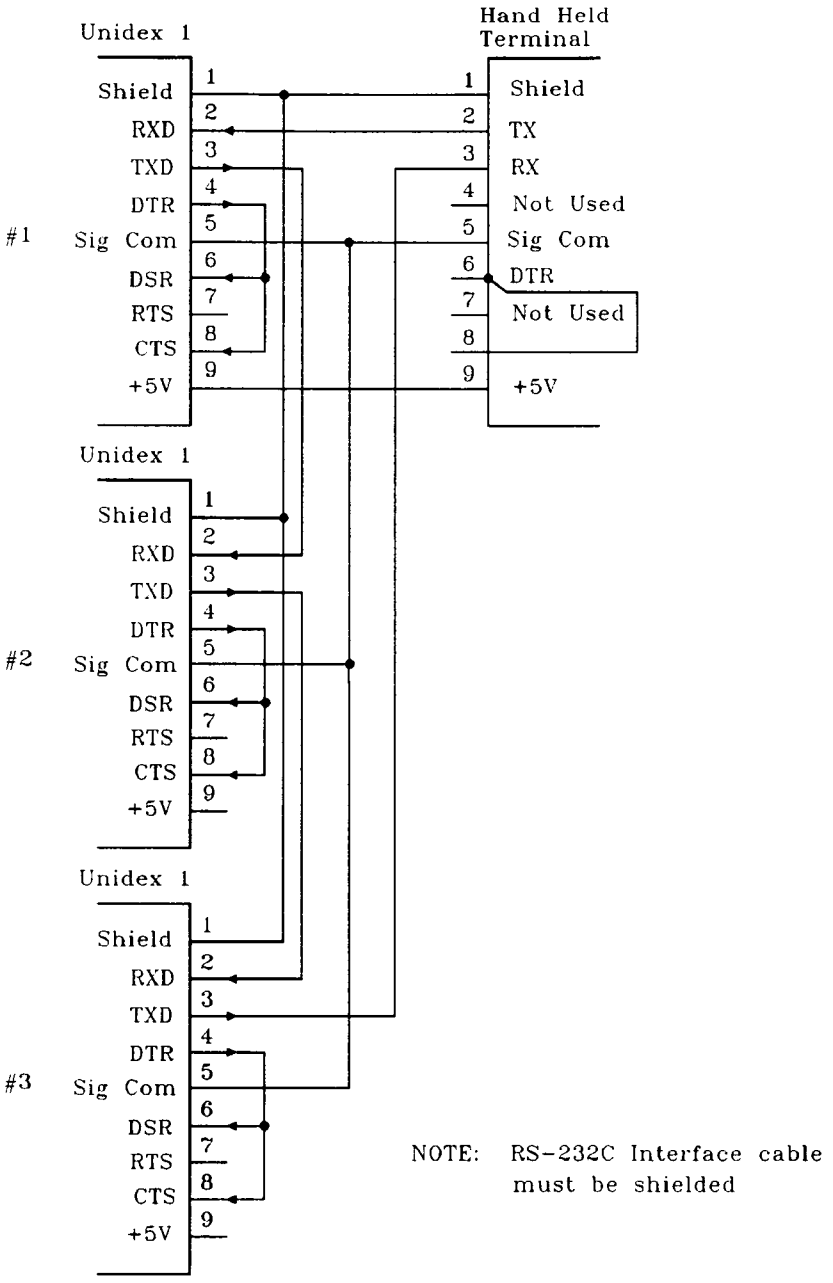


Figure 7-3: Multi-Axis (Daisy Chain) Hand Held Terminal Interface

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7-2 COMPUTER INTERFACE FORMAT SETUP

It is required that certain communication parameters of the sending device match those of the receiving device to enable data to be transferred. These parameters determine the format for communication. There are four parameters that must be set up in the Unidex 1. They are:

Baud Rate — This relates to the rate of transfer of data. The value represents the "number of bits per second" of transfer. Unidex 1 may be set up for a baud rate of from 50 to 19200. (Settings include 50, 75, 109.92, 134.58, 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600 and 19200.)

Character Length — Each byte of data is encoded in either 7 or 8 bit length.

Number of Stop Bits — The end of each byte is indicated by the stop bit sequence. This is also the minimum time required by the receiver to start looking for the next byte after the 7 or 8 bits of the current byte are received. Number of stop bits may be 1 or 2.

Parity — The parity bit is an extra bit added to the character (in addition to the 7 or 8 bits described above) so as to make the number of "1" bits either even or odd, thus adding an extra check for accuracy of data. Parity may also be disabled so that no parity bit is added. Unidex 1 may be set up for ODD or EVEN or DISABLED parity.

Unidex 1 defaults to the following values upon power-up if there is no battery backed user memory or if the "Load Default" operation is performed.

Baud Rate	: 9600
Character Length	: 7 Bits
No. of Stop Bits	: 1
Parity	: Even

To change the above values, Unidex 1 must be put in the Set-up Mode as described in Chapter 5.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7-3 COMMUNICATING THROUGH PORT A

Unidex 1 is ready for communication at power up if the Computer Interface format has been correctly set up or if the default values are the required format.

The host device must now send the "attention" command to Unidex 1. This consists of the character string > > followed by the 2 digit device number and <CR> (see Section 5-2 for more information). The two > > signs must be consecutive. Unidex 1, upon receiving the "attention" command, will accept and execute any valid command.

The attention command for the Hand Held Terminal mode is "## nn", as explained in Chapter 5. (The ## characters should not be used for the operation described in this Chapter.) Unidex 1 will echo back characters which must be cleared from the computer's input buffer.

SECTION 7-4 TYPES OF COMMANDS

Commands sent to Unidex 1 via the Computer Interface may be classified into two types, System commands and Program commands. Subsection 7-4-1 and 7-4-2 provide a summary of these two command sets.

7-4-1 SYSTEM COMMANDS

NOTE: System commands must be entered as UPPER CASE letters.

> > nn <CR>	: Activate RS-232C interface (where "nn" = device address)
A nn <CR>	: Run program #nn in Auto mode (nn = 0 to 99)
B nn <CR>	: Run program #nn in Block mode (subsequent <CR> will execute successive program blocks)
C <CR>	: Reset Unidex 1 (to power up conditions)
D <CR>	: Cancel Remote mode
E nn*	: Begin downloading program #nn. Existing program #nn will be deleted automatically
E $ nn *	: Delete program # nn
E $ 00 *	: Clear program memory (all programs)
F <CR>	: Insert block (line) numbers when printing programs (for editing purposes)
G <CR>	: Cancel block (line) number printing (default)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

H <CR>	: Put Unidex 1 in Hold mode (Trigger required to execute programs). Hold mode cancelled by O <CR>
I (string)* <CR>	: Execute program block (string) in the Immediate mode ("string" is any valid motion program command)
J <CR>	: Set up Unidex 1 to send Service Request after execution
K <CR>	: Cancel set up to send SRQ (default)
M <CR>	: Set up to transmit status in binary format (default)
N <CR>	: Set up to transmit status in Hex-ASCII format
O <CR>	: Cancel Hold mode (default)
PX <CR>	: Print X axis position register value
PD <CR>	: Print directory listing
Pnn <CR>	: Print program #nn
P00 <CR>	: Print all programs in memory
PS <CR>	: Print status bytes
PF <CR>	: Print software level
Q <CR>	: Query (Serial Poll); Unidex 1 returns a byte
R <CR>	: Enable Remote mode from host controller
T <CR>	: Trigger to start program execution
<DEL> (hex 7F) or <CTRL> D(hex 04)	: Hardware reset Unidex 1
<CTRL> A(hex 01)	: Reset (cancel the in-progress motion of Unidex 1)
<CTRL> B(hex 02)	: Deactivate all Unidex 1s
<CTRL> D(hex 04)	: Hardware reset all Unidex 1s
<CTRL> Q (hex 11)	: Start transmission after <CTRL> S is received
<CTRL> S (hex 13)	: Stop transmission until <CTRL> Q is received

NOTE: The line feed <LF> is optional and is not required to execute any command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-4-2 SYSTEM COMMANDS

* or /	: End of block (terminates the block commands listed below)
X F ffffff Dvddddddddddd * (see note 1)	: X axis move at feedrate ffffff steps/sec a distance of ddddddddddd steps, CW (v = "+") or CCW (v = "-")
X F ffffff Rv *	: X axis free run at feedrate ffffff steps/sec, CW (v = "+") or CCW (v = "-")
DW nnn.n *	: Dwell nnn.n seconds
H X *	: X axis home
OT 10XX *	: Output O1, O2, O3, O4 (Opto-coupler outputs) 1: True 0: False X: Don't care
IT X001 *	: Wait until input state I1,I2,I3,I4 (Opto-coupler inputs) matches X001
OS 0011 *	: OUT/STOP state (drive outputs to 0011 on activation of feedhold input)
OR XXXX *	: OUT/RUN state (drive output to XXXX on deactivation of feedhold input)
RS nnnn * (see note 2)	: Repeat loop start nnnn times
RE * (see note 2)	: Repeat loop end
RC 10X0 * (see note 2)	: End Repeat loop on input condition 10X0
RX *	: Start free run axis X after Stop (S X)
SX *	: Stop free run axis X
RP * (see note 2)	: Repeat program
LXvddddddddddd *	: Load position register X with ddddddddddd, v = + or -
IN *	: Set Incremental mode position tracking
AB *	: Set Absolute mode position tracking
LB nn * (see note 2)	: Label # nn (assign block to label #nn)
GT nn * (see note 2)	: GoTo label #nn
GS nn * (see note 2)	: GoSub label #nn
SR * (see note 2)	: Subroutine Return
PS * (see note 2)	: Program Stop (end of program execution)
CT nn I10X0 * (see note 2)	: GoTo label #nn if condition input state is 10X0, else continue

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CS nn I1XXX * (see note 2)
: GoSub label #nn if input state is 1XXX, else continue

RI 0X10 * : Go to remote mode if input conditions match (stay in remote if inputs remain the same)

MT nn * (see note 2) : GoTo label #nn on marker

MS nn * (see note 2) : GoSub label #nn on marker

BI nn I XXX1 * (see note 2)
: Branch to label #nn on interrupt input condition XXX1

SI nn I X1X0 * (see note 2)
: GoSub label #nn on interrupt input condition X1X0

EI * (see note 2) : Enable interrupt

DI * (see note 2) : Disable interrupt

EH * : Enable high/low motor operating current

DH * : Disable high/low motor operating current

AD nnnn * : Accel/Decel ramp time in milliseconds (parabolic or linear ramp profile is selected in Setup Mode)

LP ddddddddd * (see note 2)
: Load positive limit with ddddddddd

LM ddddddddd * (see note 2)
: Load minus limit with ddddddddd

EP * (see note 2) : Enable positive limit

EM * (see note 2) : Enable minus limit

EL * (see note 2) : Enable both limits

DP * (see note 2) : Disable positive limit

DM * (see note 2) : Disable minus limit

DL * (see note 2) : Disable both limits

; : Program comment may begin after ; (comments terminated by <CR>)

% : End edit (downloading)

NOTE 1: "X" axis designated to maintain consistency with the Unidex 11 series Controllers.

NOTE 2: Command not valid in the Immediate mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A brief description of both command types is given below.

SYSTEM COMMANDS

These commands interact with Unidex 1 as a device and perform operations such as resetting the Unidex 1, printing a program, printing position values, running a program, downloading a program, transferring status byte information from Unidex 1, etc. Each system command establishes a mode of operation once it is received by Unidex 1. A detailed description of these commands is given in Section 7-7.

PROGRAM COMMANDS

These are the User program blocks in a motion program that Unidex 1 executes when running a program in the Auto or Block mode. Program commands are valid only if entered in the Immediate or Edit mode. A detailed description of these commands is given in Section 7-8.

SECTION 7-5 SERVICE REQUEST AND SERIAL POLL

Service Request is an important concept in device control when there is a controller (host computer) as the master and the controlled device (such as a printer or Unidex 1) as the slave. The purpose of Service Request is for the slave device to catch the attention of the master controller. Typically, a controller has more than one device being controlled by it and it would be very inefficient for the master controller to continually read the statuses of all the devices to check for error states. The controlled (slave) device therefore has the capacity to send a signal (Service Request) to the master controller whenever it requires the attention of the master. The reason for requesting service may be to signal an error condition or to signal the completion of a task.

Unidex 1 implements a service request by sending a predetermined byte of data followed by a <CR>. The controller (master) may be set up to be interrupted by this data byte whereupon it must take a necessary action. *Service requests are only sent if the Unidex 1 is the only active unit.* Otherwise, it will wait until it is the only active unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The minimum necessary action that the controller must take once Unidex 1 has sent the service request signal is to poll Unidex 1 by sending the query (Serial Poll) command Q <CR>. Unidex 1 waits until the query command is received, and will not respond to any other system command until this is done. The purpose of the query command Q <CR> is to transfer a status byte from Unidex 1 to the controller. The 8 bits of this status byte represent different internal states of Unidex 1. Serial polling may be done any time the Computer Interface is active, not necessarily only after a Service Request.

The status byte may be analyzed by the controller to determine the cause of the Service Request. A description of each of the bits in the status byte follows:

	ZERO	ONE
BIT 0	Incremental mode	Absolute mode
BIT 1	Not running a program	Running a program
BIT 2	Block run mode	Auto run mode
BIT 3	(Not used)	(Not used)
BIT 4	Communication disabled	Communication enabled
BIT 5	Inactive - Not executing a command in immediate mode	Active - Executing a command in immediate mode
BIT 6	No service request signal sent	Service request signal sent, waiting for Q
BIT 7	No errors detected	Error detected

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Unidex 1 may be put into the Service Request Mode by the system command J <CR>. The default Service Request data byte sent by Unidex 1 defaults to %. Unidex 1 sends % **<CR>** as a Service Request signal.

This byte may also be programmed by the User by entering a character immediately after J. This entry becomes the new Service Request character. For example, if **J! <CR>** were entered, the Service Request character would become ! and Unidex 1 would send ! **<CR>** as the Service Request signal.

NOTE: The characters >, < and # should not be used, since they are activation characters.

The Service Request Mode may be cancelled by sending the system command **K <CR>**. In this mode, Unidex 1 will not send a Service Request signal for any reason. This is the default mode. In this mode, to determine if an immediate command or a program has been completed, a Serial Poll (Query) may be done as explained on the previous page and the status byte analyzed (bit 1 and bit 5). When these bits are clear (zero), Unidex 1 is ready to accept the next command.

When in the Service Request Mode , Unidex 1 sends a Service Request (SRQ) character under the following conditions:

1. When an Immediate command execution is complete.
2. When a program is completely executed in the Auto Run mode.
3. When a block is executed in the Block Run mode.
4. When a run time error condition is generated and the program is aborted.
5. When an axis limit is activated.
6. At the end of a program download operation, if an error was generated while downloading. (The SRQ character is sent by Unidex 1 after the "%" that ends the downloading of the program.)
7. When it is requested that a nonexistent program be printed. (If Pnn <CR>, Ann <CR> or Bnn <CR> is sent to Unidex 1 and program number "nn" does not exist, Unidex 1 will send the SRQ character.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7-6 ERROR CODES

An error condition may be detected by the host computer checking the most significant bit (bit 7) of the Serial Poll Status Byte (Section 7-5). If this bit is set to "1", an error has occurred.

To further determine the type of error, the system status may be read by the host by sending the command **PS <CR>**. Unidex 1 will send back 9 bytes followed by <CR><LF>. These 9 bytes represent a complete status report of the Unidex 1. They are described as follows:

BYTE 1 Same as Serial poll status byte described in Section 7-5.

BYTE 2 Editor Error Status

	ZERO	ONE
BIT 0	No illegal character during download	Illegal character during download (illegal command code)
BIT 1	Memory not full during download	Memory full during download
BIT 2	No user memory checksum error	Checksum error during download of program
BIT 3	No command format error	Command format error
BIT 4	No memory repair	Memory repair
BIT 5 - 7	Not used	Not used

NOTE: If one of these errors is generated during download operation, Unidex 1 will send an SRQ (Service Request) character if in the Service Request Mode. It is recommended that the user then edit and correct that program.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

BYTE 3 Run Time Error Status 1

	ZERO	ONE
BIT 0	Axis not in hardware limit	Axis in hardware limit
BIT 1	No axis software limit	Axis software limit
BIT 2	Not used	Not used
BIT 3	No illegal program exit	Illegal program exit
BIT 4	No illegal byte in memory	Illegal byte in memory
BIT 5	Program number valid	Invalid program called out for run (does not exist)
BIT 6	Memory not clear	No programs in memory (memory clear)
BIT 7	No user memory checksum error	User memory checksum error

BYTE 4 Run Time Error Status 2

	ZERO	ONE
BIT 0	Not used	Not used
BIT 1	No "Repeat Loop End Invalid" error	"Repeat Loop End" error (no Repeat Loop Start command)
BIT 2	No "Repeat Loop Incomplete" error	Repeat loop incomplete (no repeat loop end command)
BIT 3	Eight nested repeat loops not exceeded	Eight nested repeat loops exceeded
BIT 4	No "Return from Subroutine Invalid" error	"Return from Subroutine" invalid (no GoSub command)
BIT 5	No "Incomplete subroutine" error	Incomplete subroutine (no Sub Return command)
BIT 6	Eight nested subroutines not exceeded	Eight nested subroutines exceeded
BIT 7	No "Missing Label" error	Missing label

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

BYTE 5 Communication Status 1

	ZERO	ONE
BIT 0	Not used	Not used
BIT 1	Not used	Not used
BIT 2	Not used	Not used
BIT 3	Not used	Not used
BIT 4	Not used	Not used
BIT 5	No Serial Poll initiated	Serial poll initiated by sending Q. Wait
BIT 6	Not in SRQ mode	In SRQ mode
BIT 7	Not in Hold mode	In Hold mode

BYTE 6 Communication Status 2

	ZERO	ONE
BIT 0	Not used	Not used
BIT 1	Not used	Not used
BIT 2	In Hold mode, but no Trigger command received	In Hold mode, and Trigger command received
BIT 3	Unidex 1 "receive buffer" not full	Unidex 1 "receive buffer" full
BIT 4	X on received during transmit	X off received during transmit
BIT 5	Not in program download mode	In program download mode
BIT 6	Status bytes printed in binary format	Status bytes printed in Hex-ASCII format
BIT 7	Not used	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

BYTE 7 Axis Motion Status

	ZERO	ONE
BIT 0	X axis not moving	X axis moving
BIT 1 to BIT 7	Not used	Not used

BYTE 8 Free Run Mode Status

	ZERO	ONE
BIT 0	X axis not in free run mode	X axis in free run mode
BIT 1 to BIT 7	Not used	Not used

BYTE 9 I/O Status

	ZERO	ONE
BIT 0	Input 1 is a 0 (I1)	Input 1 is a 1 (I1)
BIT 1	Input 2 is a 0 (I2)	Input 2 is a 1 (I2)
BIT 2	Input 3 is a 0 (I3)	Input 3 is a 1 (I3)
BIT 3	Input 4 is a 0 (I4)	Input 4 is a 1 (I4)
BIT 4	Output 1 is a 0 (O1)	Output 1 is a 1 (O1)
BIT 5	Output 2 is a 0 (O2)	Output 2 is a 1 (O2)
BIT 6	Output 3 is a 0 (O3)	Output 3 is a 1 (O3)
BIT 7	Output 4 is a 0 (O4)	Output 4 is a 1 (O4)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 7-7 SYSTEM COMMANDS

System commands interact with the Unidex 1 and perform operations such as resetting the Unidex 1, printing a program, printing position values, running a program, downloading a program, transferring status byte information from Unidex 1, etc. Commands requiring Unidex 1 to send back information will be ignored if more than one Unidex 1 is active. Each system command establishes a mode of operation once it is received by the Unidex 1. Each system command must be entered as an **upper case letter.**

7-7-1 GETTING UNIDEX 1'S ATTENTION

The system command required from the host device to get Unidex 1's attention is two consecutive >, the two-digit device number and <CR>. For example:

>>01 <CR>

A non-activated Unidex 1 will echo back **>>01 <CR>**.

7-7-2 AUTO RUN MODE

Executing a program in the Auto Run mode enables the program to run automatically, executing the motion commands of the program with no need of further User intervention.

To run a program in the Auto Run Mode, send **A**, the program number "nn", and <CR>. For example:

A 10 <CR>

If in Service Request mode (see Section 7-5), once the program has been executed, Unidex 1 will send the Service Request character and wait for a Serial Poll. After the Serial Poll, you may execute the same program again by sending another <CR>. To run a different program, send **A nn <CR>** again.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-3 BLOCK RUN MODE

A motion program can be run one block at a time, instead of automatically, as discussed in the above subsection. To run a program in the Block Run mode, send **B** for Block, the program number ("nn") and a <CR>. For example:

B 10 <CR>

If in the Service Request mode, Unidex 1 will send the SRQ character after each block has been executed. If this is the case, the host must Serial Poll Unidex 1 after the execution of each block.

After the execution of the first command block and the Serial Poll, send a <CR> to execute the next block. Bit 1 of the status byte (Section 7-5) may be checked to detect completion of the program.

The print status (PS) and print position (PX) commands can be used in the Block Run Mode after the block had been executed. To quit Block Run Mode without going through the entire program, use <CTRL>A (hex 01).

NOTE: During Interrupt operations, the interrupts will cause some blocks to terminate or be exited while motion is still in progress. An example of such a block is HX*.

7-7-4 REMOTE RESET

Sending the command **C** followed by <CR> resets the Unidex 1. This returns it to power up conditions. For example:

C <CR>

This stops motion (decel to stop) and program execution in all active Unidex 1s. All units that have responded to this reset will need to be reactivated before they will accept a command again.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-5 DISABLING REMOTE MODE

The system command **D < CR >** will disable the Remote Mode and return control to the host. (The position registers are updated with the Absolute position values before returning control.)

When the Remote Mode is active, Unidex 1 will only recognize the D command and the Serial Poll command. All other system commands will be ignored.

7-7-6 DOWNLOADING A PROGRAM FROM HOST

The **E** command, followed by a program number ("nn") and an end-of-block character (* or /), will put the Unidex 1 into the Edit mode and set it up to enter the program commands into program "nn" in the User memory. If an existing program with the same number already resides in the Unidex 1, it will be deleted automatically when the new program "nn" is downloaded. At the end of the program, a % must be sent to terminate the editor, and return to the system command level.

7-7-7 DELETING A PROGRAM

In order to delete a program from the Unidex 1 User memory, send the command **E**, followed by the character **$**, the program number "nn" and an end-of-block character, either * or /. The following example would erase program 10:

E $ 10 / (or *)

7-7-8 DELETING ALL PROGRAMS FROM USER MEMORY

In order to delete **all** programs from the Unidex 1 User memory, send the command **E**, followed by the character "$", two zeros ("00") and an end-of-block character, either * or /. Sending **E $ 00** / would erase all programs.

7-7-9 BLOCK NUMBERING

If it is desired that the programs be printed with block numbers, send **F < CR >**. Block numbering may make editing the program easier.

After this command is sent to the Unidex 1, any program printed will contain block numbers.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-10 BLOCK NUMBERING CANCEL

In order to cancel block numbering when a program is printed, as established in the above subsection, send the command **G** along with < CR >. After sending **G <CR>** to Unidex 1, programs will be printed without block numbering.

System commands F and G do not change the system set up feature stored in the battery backed memory (see Section 7-2).

7-7-11 HOLD

The command to "Hold" the execution of a command string or an entire program is established by the **H** command and a < CR >. Sending **H <CR>** will cause Unidex 1 to suspend execution of any Immediate, Auto or Block commands which may follow it. This is useful when synchronizing axis motion to some other action. Unidex 1 will only execute the commands when it receives a "T" (for Trigger) command. For example:

H < CR >	
A 20 < CR >	Program #20 held (not executed)
T < CR >	Program #20 triggered (executed)

7-7-12 IMMEDIATE MODE

The **I** command, followed by motion program commands, an end-of-block character (* or /) and a < CR >, allows a motion command to be executed immediately instead of being entered as a motion program. (For an explanation of the motion program commands, see Section 7-8.) Each block of Immediate commands must begin with an **I**. For example:

I X F10000 D20000 * <CR>

The above immediate command will send the X axis 20000 steps at a feedrate of 10000 steps per second (or whatever units might be set in the system). If in SRQ mode, Unidex 1 will send a Service Request and wait for a Serial Poll after the command is executed. After being polled, Unidex 1 is ready to execute another block of commands.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-13 SERVICE REQUEST SET UP

In order to establish the Service Request mode, send the **J** command, followed by <CR>. After the SRQ mode has been established via the J command, Unidex 1 will send the SRQ signal **% <CR> <LF>** under conditions described in Section 7-5. It will then wait until it receives a Serial Poll from the host device before executing any further commands. For more detailed information on SRQ, see Section 7-5.

The SRQ character may be programmed for something other than % by sending the character after the J command. For example:

J ! <CR>

This command sets the SRQ character to "!". Keep in mind a Service Request will only be sent by Unidex 1 if it is the only active unit. Otherwise, it will wait until this is the case.

7-7-14 SERVICE REQUEST CANCEL

In order to cancel the Service Request (SRQ) mode set up by the J command (see above), send a **K <CR>**. (This is the default status.)

7-7-15 STATUS BYTE IN BINARY FORMAT

Sending the command **M <CR>** establishes the format of the status bytes as binary upon transmission. Transmission of the status bytes in binary format is the default status.

7-7-16 STATUS BYTES IN HEX-ASCII FORMAT

To establish the status bytes in the Hex-ASCII format upon transmission, send **N <CR>**. In this mode, each status byte will be sent as two bytes. Each byte will be the equivalent ASCII character of each hexadecimal byte.

7-7-17 HOLD MODE CANCEL

To cancel Hold mode, send the command "O" along with <CR>. After sending **O <CR>**, programs will no longer require a Trigger (T command).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-18 PRINT AXIS POSITION

Print X Axis Position (PX)

In order to print the X axis position register, send **PX <CR>**.

The axis position is sent in the following format:

(<Space> or <->) <10 Digits> <CR> <LF>

↑ Positive ↑ Negative

7-7-19 PRINTING DIRECTORY LISTING

A listing of the programs in the Unidex 1 directory as well as the number of bytes remaining in memory may be obtained by entering **PD <CR>**.

Following the Directory listing a **<CTRL> C** (ETX) (Hex 03) is sent to signify the end of the file.

7-7-20 PRINTING A PROGRAM

To print one program, send the command **P**, the program number "nn", and <CR>. For example:

P10 <CR>

The above command will cause program #10 to be printed.

Following the Directory listing a **<CTRL> C**, (ETX, Hex 03) is sent to signify the end of the file

7-7-21 PRINTING ALL PROGRAMS

To print all programs, send the command "P", two zeros (00) and <CR>. Sending **P00 <CR>** will cause all programs in memory to be printed.

Following the printing of all programs a **<CTRL> C**, (ETX, Hex 03) is sent to signify the end of all programs.

7-7-22 PRINTING STATUS BYTES

To print the status bytes listed in Section 7-6, send **PS <CR>**.

The return will terminate with a **<CR> <LF>**.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-7-23 PRINTING VERSION OF SOFTWARE

To print the version of software that uou are currently using send the command **PF**. If using a computer interface, the reply will be sent in the following format:

SOFTWARE USI_xx
(where xx represents the software level)

The return will terminate with a **<CR><LF>**.

7-7-24 QUERY (SERIAL POLL)

The host device may Serial Poll (Query) Unidex 1 by sending **Q <CR>**. In response to a query, Unidex 1 returns its status (see Section 7-5).

The return will terminate with a **<CR><LF>**.

7-7-25 REMOTE MODE

The system command **R <CR>** will enable Unidex 1 to be driven via the auxiliary clock and direction controls. The host controller may then signal an external device to take control of Unidex 1. (See Section 2-7.)

The Unidex 1 keeps track of the axis position during external control.

7-7-26 TRIGGER

To execute the program that is suspended with a Hold command (H), send **T <CR>**. In multiple axis operation, this will allow the simultaneous program execution of multiple Unidex 1s.

7-7-27 RESETTING UNIDEX 1

To Reset Unidex 1, you may send the hexadecimal number 7F or FF. Either is the ASCII code for <DEL>. You may also send the **<CTRL>D** character (hex code 04) to reset Unidex 1. Any of these resets will return the Unidex 1 to power up conditions and will reset all of the units that are connected in daisy chain, even if they are not in the active mode.

NOTE: Sending the <CTRL>D command will cause the <CTRL>D to be echoed back.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A Soft Reset will reset only the active Unidex 1s (in-progress motion) and is initiated by sending the **<CTRL> A** character (hex code 01). This reset will stop motion (decel to stop) and program execution in all active Unidex 1s. All units that have responded to this reset will still be active and ready to accept a command.

The command **<CTRL>B** (hex code 02) will deactivate all active Unidex 1s on the daisy chain line.

7-7-28 XON/XOFF TRANSMISSION PROTOCOL

The XON/XOFF protocol regulates the transfer of information between two devices. This is required for reliable transfer of information. The XOFF character <CTRL>S (hex 13) instructs a device to halt transmission. The XON character <CTRL>Q (hex 11) instructs a device to resume transmission.

The Unidex 1 responds to XON/XOFF protocol at all times when it is active and operating from within the computer interface mode. This implies that the Unidex 1 will suspend transmission to the User upon receipt of the XOFF character. Transmission will resume upon receipt of the XON character. Unidex 1 may also send XON/XOFF characters to request transmission be suspended until it is ready to accept more commands.

SECTION 7-8 MOTION PROGRAM COMMANDS

These are the User program blocks in a motion program that Unidex 1 executes when running a program in the Auto run or Block run mode. These commands are valid only if entered in the Immediate or Edit mode.

7-8-1 END OF BLOCK

An end-of-block command terminates a block of a program. It may be one of two characters, *** or /**. For example:

X F10000 D150000 * (or /)

7-8-2 AXIS MOTION COMMANDS

The axis must be specified by an axis command (X). (The X axis designation is used to maintain consistency with the Unidex 11 Series of controllers.)

The speed with which the axis travels must be specified by a feedrate command (F). The distance which it is to travel (or the position it is to reach, if in the absolute mode) is specified with a distance command (D).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

An example of a program block utilizing the above commands is:

X F10000 D-150000 *

The above command would send the X axis a distance of -50000 system units at a feedrate of 10000 system units/second.

NOTE: When programming via Computer Interface communication Port A, the feedrate need only be entered with the first index block. Thereafter, the feedrate need be entered only if it is to be changed.

7-8-2-1 AXIS FREE-RUN

The axis is commanded to free-run by the command **R** and a "**+**" or "**-**" sign to signify CW (+) or CCW (-). For example:

X F10000 R+ *

The above command tells the axis to free-run in the CW direction at a speed of 10000 system steps/second.

7-8-3 DWELL

A program dwell can be entered into your program with a **DW** command, followed by the duration of the dwell in tenths of seconds. For example:

DW 10 *
DW 1.0 *

Either of the above commands will cause a 1 second dwell within the program.

7-8-4 HOME

Send the axis Home with command **H** followed by the axis and an end-of-block character. The command **H X *** will send the axis home.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-5 OUTPUT STATUS

To establish the output as a 1 (true), a 0 (false) or an X (don't care), send the command "**OT**" followed by a **1, 0** or **X**. For example:

OT 10XX *

In the above example, O1 is to be programmed to a 1, O2 to a 0, O3 is a "don't care" and O4 is also a "don't care". "Don't care" leaves the status of an output unchanged.

7-8-6 INPUT STATUS

To set up the status you wish the inputs to reach before the program continues, program an "**IT**" command, followed by the desired statuses and an end-of-block character. For example:

IT X001 *

The above command states that the program should wait until I2 is a 0, I3 is a 0 and I4 is a 1. The state of input I1 does not matter since it is programmed as a "don't care". (See Section 2-7 for Input signal specifications.)

7-8-7 OUT/STOP STATE

To put out values to the outputs when the program is stopped via a feedhold, enter the command "**OS**" followed by the desired values and an end-of-block character. For example:

OS 0011 *

When the program is stopped, a zero will be output to O1 and O2, and a 1 will be output to O3 and O4. (See Section 2-7 for output signal specifications.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-8 OUT/RUN

To output values when the program run is permitted to continue, release the feed-hold key (after it has been pressed), and program "**OR**", followed by the desired values and an end-of-block. For example:

OR XXXX *

In the above example, when the program run is permitted to continue, the outputs will remain unchanged (all have been programmed as "don't care").

7-8-9 REPEAT LOOP START

The command to start a Repeat Loop in your program and the number of times the loop executes is established with a "**RS**" command, followed by the number of times to repeat and an end-of-block (9999 maximum). For example:

RS 8 *

The above example marks the beginning of the Repeat Loop and indicates it will repeat 8 times. A maximum of eight nested loop commands are permitted. An un-limited number of un-nested loop commands are permitted.

7-8-10 REPEAT LOOP END

To mark the end of the repeat loop (see above subsection), program command **RE ***.

Repeat loops may be nested eight levels deep.

7-8-11 CONDITIONAL REPEAT LOOP END

To end the repeat loop based on input conditions, prior to completing the specified number of loops, program **RC** followed by the required input state and an end-of-block. For example:

RC 10XX *

The above example states that the repeat loop will end when the inputs are as follows: I1 is a 1, I2 is a 0. I3 and I4 are "don't cares" and have no control over the program block.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-12 STARTING FREE RUN AFTER A STOP FREE RUN

After a free run has been stopped (discussed in the next subsection), programming an "**RX**" will start the axis again. For example:

RX *

7-8-13 STOP AXIS FREE RUN

To stop the axis free run, program **SX ***.

7-8-14 REPEAT PROGRAM

To repeat the entire program from the start, enter command "**RP**" and an end-of-block. Remember, any commands following **RP *** within your program will not be executed.

7-8-15 LOAD POSITION REGISTER

You may load the axis position register with an **LX** command, followed by a distance and an end-of-block. The value, which is in system units, may be a positive or negative number or may be a zero. For example:

LX 0 *

In the above example, the position register is loaded with zeros. This command may be used to establish an absolute reference position. The axis may be moved to this reference position by programming an Index block with distance values equal to the reference position while in the Absolute mode.

7-8-16 INCREMENTAL MODE/ ABSOLUTE MODE

In the Incremental mode, (established with a **IN ***), a distance command tells Unidex 1 how much further to move the axis. For example:

X F10000 D1000 *

The above command will move the axis 1000 steps in the positive direction each time it is executed.

In the absolute mode (established by entering **AB ***) a distance command is an absolute position. For example:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

X F10000 D1000 *

When in the Absolute mode, the above example tells Unidex 1 to send the axis to the position 1000. Once there, the re-execution of the above command will not move the axis any further since it is already at the position commanded.

7-8-17 LABEL (LB)

A label (1 to 99) labels a block of program as the place to which the program goes when a GOSUB (go to subroutine) or a GOTO command is encountered. It is programmed with a "**LB**" command, followed by the number and an end-of-block. For example:

LB 55 *

7-8-18 GOTO (GT)

This command directs program flow to a label. Enter "**GT**" and a label number, followed by an end-of-block. Example:

GT 20 *

The above command tells Unidex 1 to continue program execution at label 20.

7-8-19 GOSUB

The command "**GS**", followed by the block label number and an end-of-block, tells Unidex 1 to execute a subroutine at label #nn. For example:

GS 15 *

The subroutine to be executed is located at label #15. A maximum of 8 nested subroutines are permitted. An unlimited number of un-nested subroutines are permitted.

7-8-20 SUBROUTINE RETURN

This command causes Unidex 1 to return from the subroutine execution to the program block immediately after the **GS nn** block that called the subroutine. Every subroutine should end with an **SR ***.

Subroutines may be nested 8 levels deep.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-21 PROGRAM STOP

The Program Stop command marks the place in the program at which program execution ends. Subroutines should be placed after the **PS *** block.

7-8-22 CONDITIONAL GOTO

The command **CT**, followed by a label number, an **I** and four input values, states that the program should go to a specific block if the input statuses match the specified values. For example:

CT 22 I 10X0 *

The above command tells Unidex 1 to go to the program block labeled "22" when I1 is a 1, I2 is a 0, and I4 is a 0. If the inputs are not these values, continue with the next program block.

7-8-23 CONDITIONAL GOSUB

The command to send the program to a subroutine if the input statuses match specified values is **CS**, followed by the label number, an **I** and the desired input values. For example:

CS 33 I 110X *

The above command tells the Unidex 1 to go to the subroutine labeled "33" when the value of I1 is 1, I2 is 1, and I3 is 0. If these input conditions do not exist, continue with the next program block. If conditions are met, the subroutine will execute, then return to execute the next instruction.

Conditional subroutines may be nested in combination with regular subroutines to 8 levels deep.

7-8-24 REMOTE MODE

The command to send the Unidex 1 into the Remote Mode if input conditions are met is :

RI 0X10 *

The unit will go into Remote when the input conditions match those programmed, and will remain there as long as the input conditions stay the same.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-25 ACCELERATION/DECELERATION RAMP TIME

The Accel/Decel ramp time can be programmed in milliseconds by using the command "**AD**" followed by the desired time and an end-of-block character. For example:

AD 250 *

In the above example, the acceleration ramp time as well as the deceleration ramp time will be 250 milliseconds. The maximum value is 9999.

(For more information on Accel/Decel, see Chapter 8.)

7-8-26 BRANCH ON MARKER

This command will cause the program to go to a specified block if the marker is present (1) or continue with the next block if the marker is not present (0).

MT 13 *

The above command tells the Unidex 1 to go to the program block labeled 13 if the marker is present (1). If the marker is not present (0), the program will continue with the next block.

7-8-27 GOSUB ON MARKER

This command will cause the program to go to the subroutine specified if the marker is present (1), or continue with the next block if the marker is not present. The subroutine will return program execution to the next instruction upon completion (with Subroutine Return **SR**.)

MS 17 *

The above command tells the Unidex 1 to go to the subroutine labeled 17 if the marker is present (1).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-28 ENABLE INTERRUPT

This command will enable interrupt capability. Either a GoTo (BI) or GoSub (SI) on Interrupt must have previously been programmed. Interrupts are monitored as often as possible. However, certain program blocks require longer periods of time in which interrupts must be present (Example: Move blocks). Interrupt conditions present and stable for over 60 milliseconds, should prevent the missing of interrupts.

The command **EI *** would enable the interrupt command and is valid until a disable interrupt block is executed or an interrupt occurs.

7-8-29 DISABLE INTERRUPT

This command will Disable Interrupts, if already enabled. The **DI *** command disables the interrupt.

7-8-30 BRANCH ON INTERRUPT

The Branch on Interrupt command sets the conditions for an interrupt. The interrupt branch block is specified by the label portion and the conditions for interrupt are specified by the I portion (same as Conditional GoTo). An Enable Interrupt command is required to enable the interrupt.

BI 31 I XXX1 *

When the interrupt is enabled, the inputs will be monitored and compared with the I conditions. If the I conditions are met, the program will go to block label 31. Special action is taken if an interrupt occurs while executing any of the following blocks.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index, Home: Interrupt will branch to a block with motion still in operation. However, if any type of axis move is attempted before the axis has completed its move, the present move will be stopped and the new move will be executed immediately.

Dwell: Dwell is terminated

Wait on Input: Input is terminated

Remote on Input: Remote is terminated

7-8-31 GOSUB ON INTERRUPT

The GoSub on Interrupt command sets the conditions for an interrupt. For example:

SI 24 I X1X0 *

The interrupt subroutine block is specified by the label portion and the interrupt conditions by the I portion (same as conditional GoSub). An Enable Interrupt command is required to enable the interrupt. Once interrupted, the interrupt cannot be enabled again until the return from Interrupt (Return from Subroutine) occurs.

When the interrupt is enabled, the inputs will be monitored and compared with the I conditions. If the I conditions are met, the program will go to subroutine label (label 24 in the previous example). Special action is taken for interrupts that occur during the execution of the following blocks.

Index, Home: Interrupt will branch to block while motion is still in operation. Note that moves (Index or Home moves) initiated in the interrupt subroutine will cause previously initiated Indexes and Homes to be aborted if still in progress. However, if the interrupt subroutine contains no motion commands, the interrupted move (Index or Home) will continue while the interrupt is serviced. The Return from Subroutine will occur when the move is completed.

Dwell: Dwell is terminated.

Wait on Input: Wait on Input is terminated. Program will return to next block.

Remote on Input: Remote is terminated

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-32 SET POSITIVE LIMIT

To load the Positive Limit Absolute Position Register, enter the command **LP** followed by the (CW) limit position and an end-of-block. The value is in system steps (maximum 10 digits) and may be a positive, negative or zero number. For example:

LP -10000 *

In the above example, the (CW) Limit Position is loaded with the position value -10000. When this limit is enabled by either an EP (Enable Position Limit) or an EL (Enable Limits) command, moves which would or could potentially result in a **more positive** position than the limit value specified above, will not be executed. Values for the LP command can be positive (+) or minus (-). If a limit is encountered, the program will be terminated. The Unidex 1 checks for a potential limit overrun *BEFORE* actually making a given move. This command applies only to auto (or block) executed programs.

7-8-33 SET MINUS LIMIT

To load the negative limit absolute position register, enter the command **LM** followed by the (CCW) limit position and an end-of-block. The value is in system steps (maximum 10 digits) and may be a positive, negative or zero number. For example:

LM -50000 *

In the above example, the minus (CCW) limit position is loaded with the position value -50000. When this limit is enabled by either an **EM** (Enable Minus Limit) or an **EL** (Enable Limits) command, moves which would or could potentially result in a **more minus** position than the limit value specified above, will not be executed. If a limit is encountered, the program will be terminated. The Unidex 1 checks for a potential limit overrun *BEFORE* actually making a given move. This command applies only to auto (or block) executed programs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-34 ENABLE POSITIVE LIMIT

To enable the positive (CW) limit, enter the command **EP**, followed by an end-of-block. For example:

EP *

In the above example, the set positive (CW) limit will be enabled. This block will check for a present or possible positive limit condition. If any limit condition exists, the program will be terminated and the motion will be stopped. All moves following this block will be checked before the moves are executed. Positive free run and home commands **will not be started** and the program will be terminated. Moves which will exceed the positive limit will cause program termination and will not be executed. Either a **DP** (disable positive limit) or a **DL** (disable limits) command will disable the positive limit checks.

7-8-35 ENABLE MINUS LIMIT

To enable the minus (CCW) limit, enter the command **EM**, followed by an end-of-block. For example:

EM *

In the above example, the previously set Minus (CCW) Limit will be enabled. This block will check for a present or potential Minus Limit condition. If any limit condition exists, the program will be terminated and the motion will be stopped. All moves following this block will be checked before the moves are executed. Minus Free Run and Home commands will not be started and will cause the program to terminate as will any move which will exceed the Minus Limit . Either a **DM** (disable minus limit) or **DL** (disable limits) command will disable the Minus Limit checks.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-36 ENABLE LIMITS

To enable both the positive (CW) and minus (CCW) limits, enter the command **EL** followed by an end-of-block. For example:

EL *

In the above example, the previously set positive and minus limits will be enabled. This block will check for a present or potential limit condition. If any limit condition exists, the program will be terminated and the motion stopped. All moves following this block will be checked for a limit condition before the moves are executed. All free run and home commands **will not be started** and will result in the termination of the program. Moves which will exceed the positive or minus limits will not be executed and will cause the program to be terminated. A **DL** (disable limit) command will disable all limit checks. A **DP** (disable positive limit) or **DM** (disable minus limit) command can be used to disable one or both of the limits.

7-8-37 DISABLE POSITIVE LIMITS

To disable the positive limit check, enter the command **DP** followed by an end-of-block. For example:

DP *

In the above example, the positive limit check will be disabled. The minus limit enable will not be effected.

7-8-38 DISABLE MINUS LIMITS

To disable the minus limit check, enter the command **DM**, followed by an end-of-block. For example:

DM *

In the above example, the minus limit check will be disabled. The positive limit enable will not be effected.

7-8-39 DISABLE LIMITS

To disable the positive and minus limit check, enter the command **DL** followed by an end-of-block. For example:

DL*

In the above example, both the positive and minus limit checks will be disabled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7-8-40 END EDIT

The character that is placed at the end of a downloadable file is the percent sign (%). The end-of-block character is not needed with this command.

When downloading a program, this character signals the Unidex 1 to move out of the Edit mode and back to the System Command mode after the download.

7-8-41 PROGRAM COMMENTS

Comments may be placed within a program by preceding them with a semicolon (;). Except for the characters listed below, anything following the semicolon will be ignored and will not be stored in Unidex 1's memory. The command field is terminated by a <CR> or a <LF>.

The characters that may not be used in the comments are:

1. **#, < or >**
2. Control codes **<CTRL>A, <CTRL>B, <CTRL>D**
3. Hex code **7F** or **FF**.

SECTION 7-9 COMPUTER INTERFACE COMMANDS

A few brief samples will help demonstrate the commands discussed in the previous Section.

Example Immediate Commands

```
>><device number> <CR>      ; Interface active
I H X * <CR>                ; Send home axis
I X F10000 D10000 * <CR>    ; Axis move
I X F100 D1000 * <CR>       ; Axis move
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example Motion Program

```
>><device number> <CR>          ; Interface active
E 01 *                          ; Select program 1
H X *                           ; Send X axis home
X F10000 D10000 *               ; X axis move
DW .2 *                         ; Dwell for 2/10 second
%                               ; End edit mode
```

Send **F <CR>** to set Unidex 1 to the block number printing mode. The command **P01 <CR>** will now cause program #1 to be printed with block numbers.

Command **G <CR>** will cancel the numbering command.

The command to run program #1 in the Block mode is **B01 <CR>**. For each successive block send another **<CR>**.

To run program #1 in the Auto run mode, send **A01 <CR>**.

To delete program #1, send **E $ 01 ***. (Check your directory with a **PD** command to verify that program #1 has been deleted.)

The position register may be read by sending **PX <CR>**.

Send **J <CR>** to put the Unidex 1 in the Service Request mode. (You may enter a character of your own choosing or use the default Service Request character, %.) When this character is sent by Unidex 1, acknowledge it with a **Q <CR>** (query) before continuing. If running the program in the Auto mode, the Service Request will come after the program execution. If running a program Block by Block, it will follow each block.

Send command **K <CR>** to cancel the Service Request mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 8: PROGRAMMABLE ACCEL/DECEL

Programmable Accel/Decel increases the performance of the motion control system by providing the ability to achieve higher motion speeds. The ramp time (the time to attain a programmed feedrate) is programmable from 50 milliseconds to 9999 milliseconds. The acceleration/ deceleration profile may be set up to be linear or parabolic. The start/stop feedrate is also programmable. (The start/stop setting is used as a default speed for very short moves where Accel/Decel cannot be used.)

Once the User has established the desired ramp time, start/stop feedrate and the profile for acceleration/deceleration (linear or parabolic), (see Chapter 5) the values are stored in the battery backed memory. The system default values for these parameters are:

Accel/Decel Ramp Time:	250 Milliseconds
Start/Stop Feedrate:	500 Steps/Second
Accel/Decel Profile:	Linear

These parameters are modal, which means they stay in effect in both the Program Run (Auto or Block) and Immediate modes of Unidex 1. However, Unidex 1 can be programmed (in the Auto or Block mode) to change the Accel/Decel ramp time during program execution. (Start/stop feedrate and Accel/Decel profile can only be changed in the Set Up Mode.) If the Accel/Decel ramp time is changed during program control, that value becomes the new modal Accel/Decel parameter.

SECTION 8-1 MANUAL PROGRAMMING OF RAMP TIME

Acceleration and Deceleration parameters are programmed in the Set Up mode (Chapter 5). (See Chapter 6 for the Hand Held terminal operation and Chapter 7 for the Computer Interface operation.)

A required ramp time may be pre-programmed . This value may be from 50 to 9999. Any value below 50 will be entered in the system as zero and this will turn acceleration and deceleration OFF.

User memory (battery backed) will be updated as a result of manually programming the ramp time.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8-2 START/STOP FEEDRATE PROGRAMMING

The Start/Stop speed is also programmed in the Set Up Mode.

Feedrate values from 1 to 500000 units/sec may be entered (in this case, 0 to 500000 steps/sec). Start/stop speed is the speed to which the axis defaults when a programmed move is too short to implement acceleration and deceleration (see Section 8-5). If the time for the move is less than 16.384 milliseconds, acceleration/ deceleration is temporarily turned off and the move is executed at the Start/Stop feedrate.

SECTION 8-3 ACCEL/DECEL PROFILE SET UP

The Accel/Decel profile is set up as Linear or Parabolic, from the Set Up mode (Chapter 5).

SECTION 8-4 RAMP TIME PROGRAMMING WITHIN PROGRAM

The motion command for entering the Ramp time when downloading a program is:

AD nnnn *

where "nnnn" is the Ramp time in milliseconds. To turn off acceleration/deceleration, program 0 milliseconds.

The Ramp time may be programmed as many times as required within a program. At the end of program execution, the value of the most recently programmed Ramp time will be the new value. If programmed manually in setup before running a program, this value will be effective at the start of the program. The last Ramp time block executed from a program becomes modal to the system, but is **NOT** retained in the battery-backed User memory after power down.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8-5 ACCEL/DECEL IS NOT IMPLEMENTED

The conditions under which Accel/Decel is not implemented are:

1. Ramp time programmed is less than 50 mSec.
2. Feedrate for the move is less than 16 steps/second.
3. Total time for the move is less than 16.384 mSecs.

SECTION 8-6 ACCEL/DECEL IN OPERATION

Acceleration and deceleration velocity profiles in Unidex 1 are achieved by updating the clock rate from the Indexer at fixed intervals, pre-computed from the programmed Ramp time. The minimum clock-rate-update interval is 1 mSec., the maximum number of updates is 250. If the Ramp time programmed is 250 mSecs., the controller increments the clock rate from 0 to the programmed feedrate in 250 steps of a 1 mSec. interval. For Ramp times less than 250 mSecs. but greater than 125 mSecs., the number of updates is 125 and the interval is accordingly computed. For Ramp times between 125 and 50 mSecs., the number of updates is 50. The following table provides an illustration:

RAMP TIME	NUMBER OF UPDATES	UPDATE INTERVALS (mS)
500	250	20.0
400	250	1.6
200	125	1.6
80	50	1.6
30	*No Accel/Decel*	

In LINEAR Accel/Decel mode, the clockrate is updated linearly. In PARABOLIC mode, the clock rate update is a parabolic function of time. In the following description, N stands for the number of updates computed from the programmed ramp time as explained above, Fn represents feedrate at interval number n, and Fp represents programmed feedrate.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The feedrate as a function of an update interval number during acceleration is shown below:

Linear

$F_n = (F_p/N) * n \qquad n < N$

$F_n = F_p \qquad n = N$

Parabolic

$F_n = (F_p/N) * n\,(2-n/N) \qquad n < N$

$F_n = F_p \qquad n = N$

In the linear Accel/Decel mode, when the programmed move is longer than the ramp time, a trapezoidal velocity profile is achieved. When the move is shorter, (but greater than 16.384 mSec.), a triangular velocity profile results and the axis does not attain the programmed feedrate. Parabolic profile is truncated when the programmed move is not long enough to attain programmed feedrate.

Figures 8-1 and 8-2 prove examples of linear and parabolic ramping in both full and truncated profiling modes.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

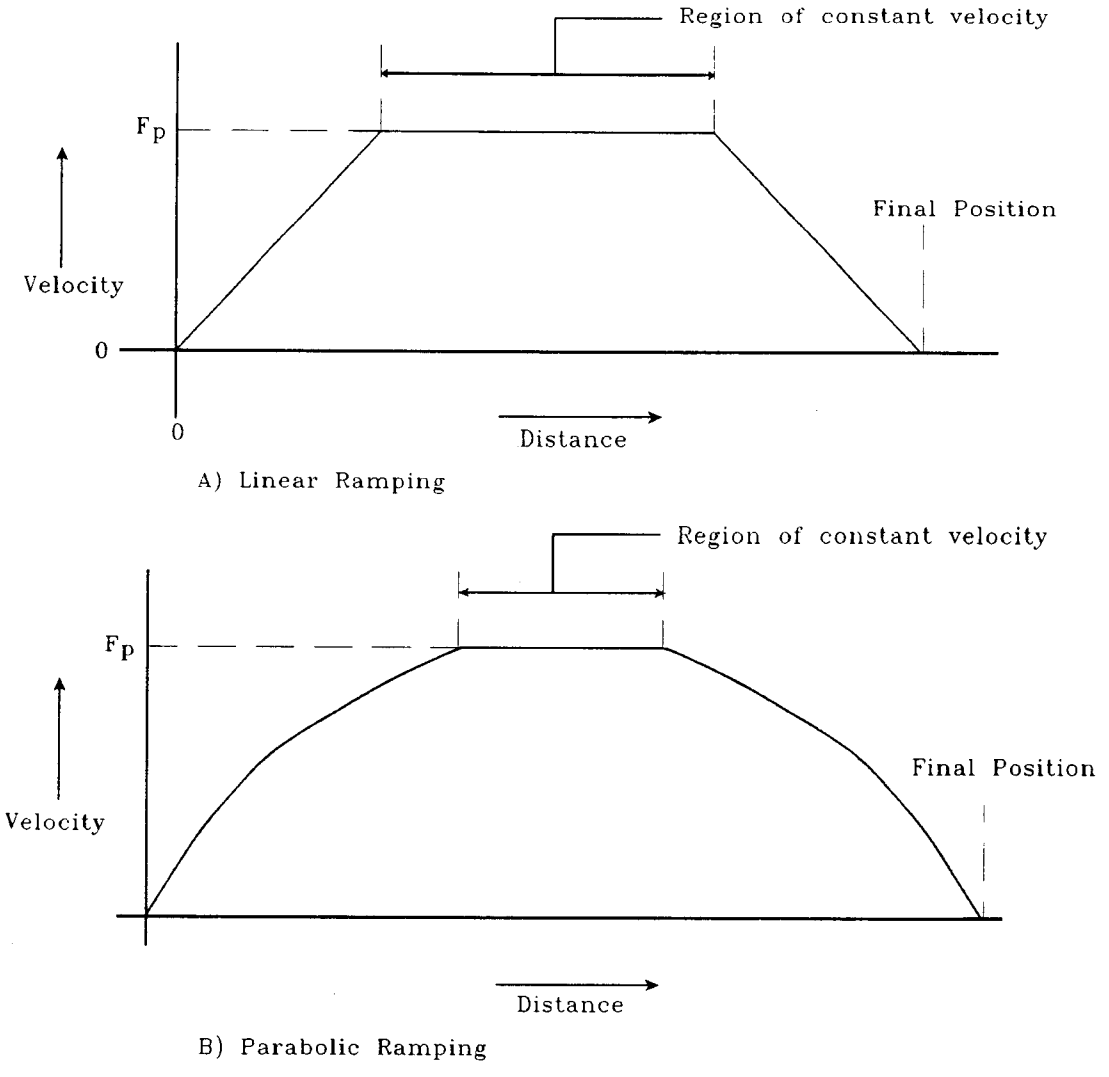
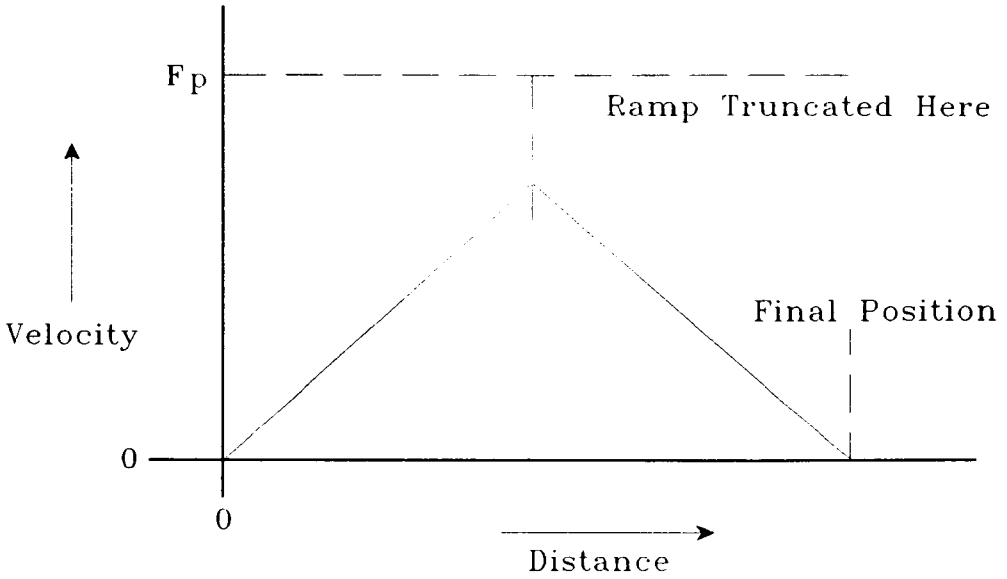
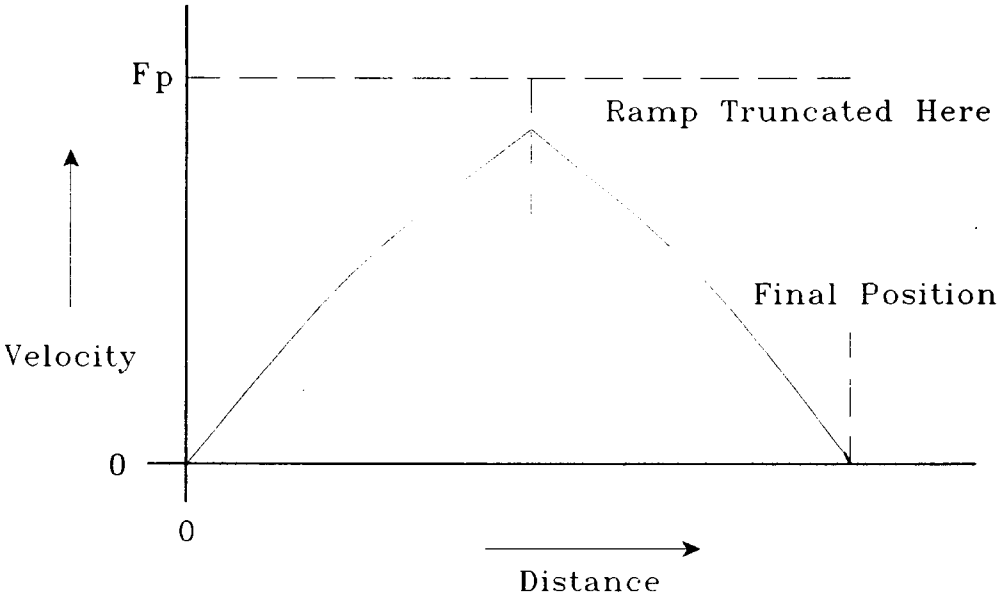


Figure 8-1: Full Ramp Profiles for Linear and Parabolic Ramping

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



A) Linear Ramping



B) Parabolic Ramping

Figure 8-2: Truncated Ramp Profiles for Linear and Parabolic Ramping

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8-7 RAMPING LIMITATIONS

The system hardware imposes certain restrictions on the performance of the programmable Accel/Decel. The maximum axis feedrate with Accel/Decel is 125000 steps/sec. The period resolution of the Indexer's clock pulses is 8 microseconds. To compensate for this, the number of update intervals (ramp time) is modified.

Example:

Programmed feedrate:	50000 Units/Sec.
Required system clock period:	20 μSec. (reciprocal of feedrate)
Number of updates (N):	250
Closest feedrate of which the system is capable:	16 μSec or 62500 Units/Sec.
Modified number of updates (N):	250 * 16/20 = 200
Modified ramp time:	Ramp Time * 16/20
Feedrate at end of Accel:	62500 * 16/20 = 50000 Units/Sec.

Computations for Ramp time modification of a Parabolic Ramp is based on the computation of an equivalent linear Accel/Decel ramp, as shown above. In the Parabolic mode, with a similar computation as done above, the Parabolic Ramp profile becomes "clipped" at the top. Also, the feedrate attained at the end of acceleration is higher than the programmed feedrate.

For the above example, the modified number of update intervals is 200.

NOTE: When decelerating at the end of a move, the feedrate "levels off" at the programmed start-stop value in order to mask any nonlinearities of the system. If desired, the User may configure his system for optimum performance by changing the Stop/Start Feedrate parameter.

For an equivalent parabolic ramp with the same programmed feedrate shown in the previous example:

Feedrate Attained (F_N)

= (62500/250) * [250 - ((200-250) ^ 2/250)]
= 62500/250 * 240
= 60000 steps/sec.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 8-8 OTHER LIMITATIONS

Accel/Decel control in Unidex 1 is implemented with individual hardware VCO (v-Voltage Control Oscillator) circuitry. Hardware VCOs are used because of the need for feeding back electronic damping control signals from the Aerotech Stepping Translators when the Unidex 1 is used to control Stepping Motor systems. Since these VCOs are analog drivers, and operate asynchronously with respect to the indexing circuitry of Unidex 1, the actual programmed velocity when running in the Accel/Decel mode may be off as much as 5%.

This limitation is not considered a flaw in Unidex 1 performance, since the basic design criterion is one of point to point motion control.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 9: APPLICATION PROGRAM

This section provides a sample program (Figure 9-2) to demonstrate some of the programming capabilities of the Unidex 1. Also included is an Application Summary and a Flow Chart (Figure 9-1).

Review Section 7-8 for a description of commands listed in Figure 9-2.

SECTION 9-1 SAMPLE PROGRAM DESCRIPTION

Application

A manufacturer of precision widgets wants to automatically inspect them at the output point of the widget production line.

Solution

A single-axis Unidex 1 Motion Controller is used to control the motion of a linear stage to position the widgets for inspection and fault processing. The Controller, through its discrete inputs and outputs, also controls the other devices used in the inspection process. The process progresses basically as follows:

a) The axis is sent Home, all outputs are initialized and an initial reference, or starting point, is established.

b) Normal inspection operation commences when the presence of a widget is sensed. It is then moved to the Inspection/Fault processing position.

c) If, during positioning, the product sensor senses that the widget has been skewed, an indicator will light and the process will stop.

d) A subroutine (#50), is used to process the faulty widgets. One hundred tries are attempted, if the fault remains, the widget is ejected.

The Flow Chart and Program Code for the example are provided on the following pages. Note the power of the Unidex 1 programming language exhibited by its ability to branch on interrupt, conditionally branch and repeat loops.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

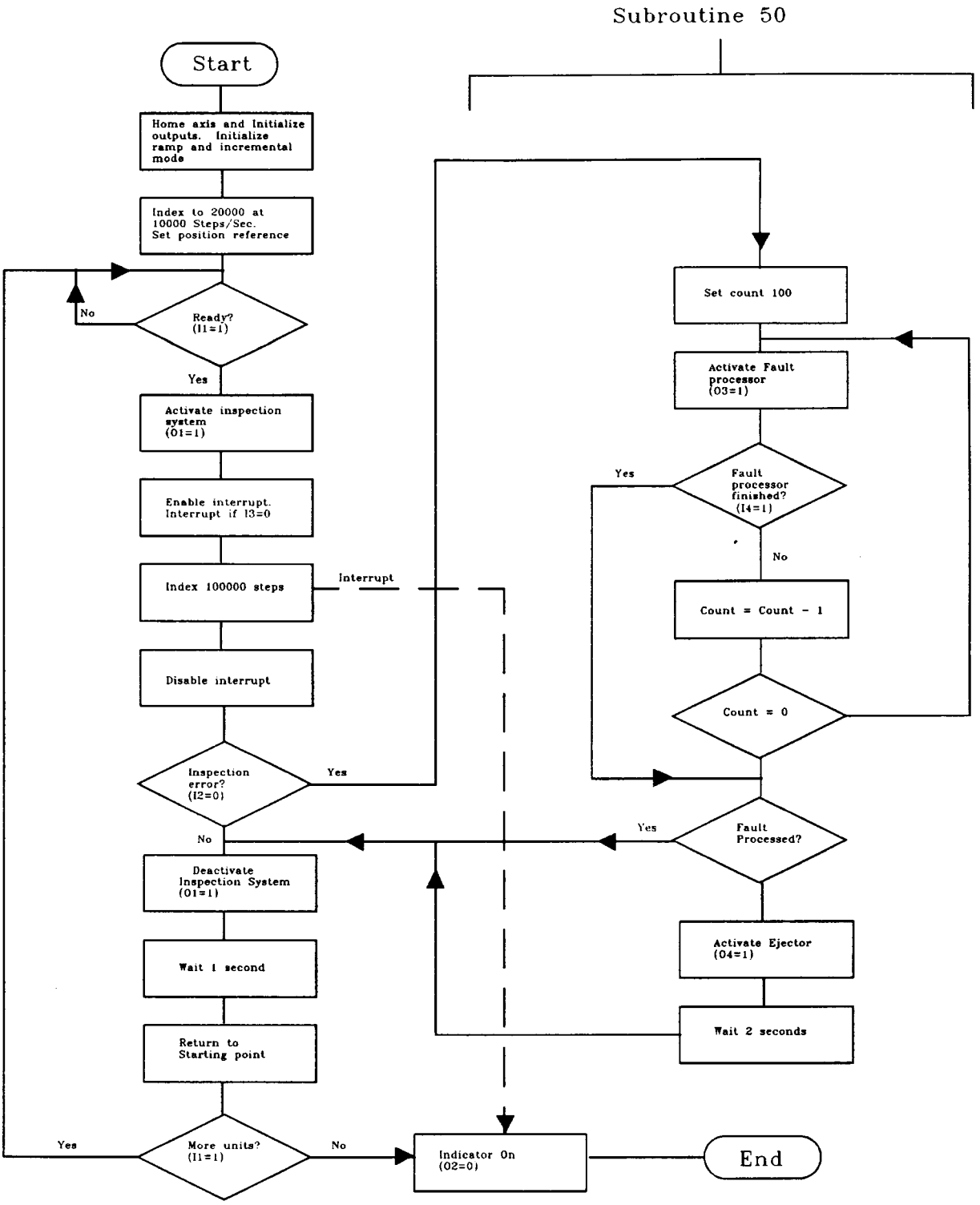


Figure 9-1: Flow Chart of Example Program Shown In Figure 9-2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Example Program

-UNIDEX 1 CODE-

```
HX *                    ; Home axis
OT 1111 *               ; Initialize outputs to 1
AD 100 *                ; Accel/decel time = 100 mS
IN *                    ; Incremental mode
XF10000 D20000          ; Home offset
LX 0 *                  ; Set position to zero
LB 90 *                 ; Label
IN *                    ; Incremental mode
IT 1XXX *               ; Wait for input I1 = 1
OT 0XXX *               ; Output O1 = 0
EI *                    ; Enable interrupt
BI 10 I XX0X *          ; Branch to label 10 if I3 = 0
X D 100000 *            ; Index 100,000 steps
DI *                    ; Disable interrupt
CS 50 I X0XX *          ; If input I2 = 0, do subroutine 50
OT 1XXX *               ; Output O1 = 1
DW 10 *                 ; 1 second wait
AB *                    ; Absolute mode
X D 0 *                 ; Index back to zero
CT 90 I 1XXX *          ; If input I1 = 1, repeat process
LB 10 *                 ; Label 10
OT X0XX *               ; Else output O2 = 0
PS *                    ; End of program

LB 50 *                 ; Subroutine 50
RS 100 *                ; Repeat 100 times or until I4 = 1
OT XX0X *               ; Output O3 = 0
DW 01 *                 ; Dwell 0.1 second
OT XX1X *               ; Output O3 = 1
RC XXX1 *               ; If input I4 = 1, quit loop
CT 60 I XXX1 *          ; If I4 = 1, go to 60
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
OT XXX0 *       ; Output O4 = 0
DW 05 *         ; Dwell 0.5 second
OT XXX1 *       ; Output O4 = 1
DW 20 *         ; Wait 2 seconds
LB 60 *         ; Label 60
SR *            ; Return from subroutine
```

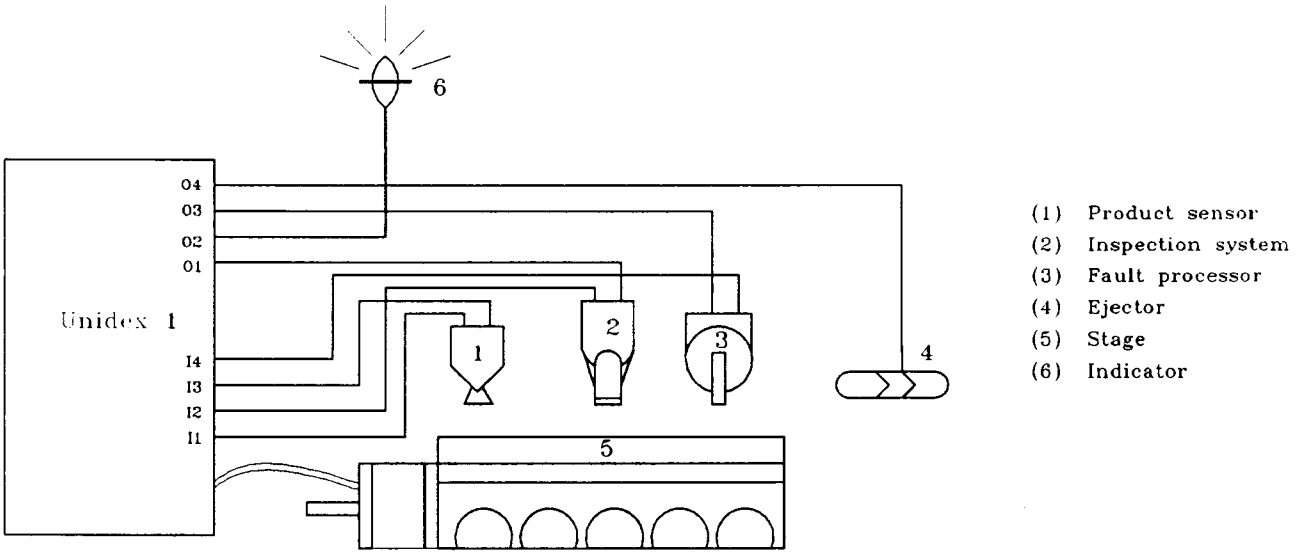


Figure 9-2: Example Program for Unidex 1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 10: TROUBLESHOOTING

Troubleshooting the Unidex 1 consists of reviewing the check list of possible software and hardware (Sections 10-1 and 10-2) malfunctions and performig the suggested solutions. Error codes, for the RS-232 Computer Interface mode, are listed in Section 7-6. For the Hand Held terminal mode, they are listed in Section 6-1.



WARNING: **Customer troubleshooting and repair must be limited to the procedures of Section 10-1 and 10-2. Any attempt to repair the electronics without the supervision of an Aerotech trained field representative may void the warranty.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 10-1 SOFTWARE MALFUNCTIONS, STATUSES

10-1-1: POWER UP

Status Code	Possible Cause And Solution
System check fail: User memory checksum error. (Status Byte 2, Bit 4) *	A check sum verification is performed on the RAM upon power up. At end of program editing or Manual Mode parameter changes, Unidex 1 modifies the checksum register. When Unidex 1 is powered up again, a sum of all bytes in the RAM is done. This sum is then compared to the check sum register. If they do not match, one or more bytes in RAM has been altered. **Note that a checksum error may not necessarily mean a damaged RAM. In some instances, battery backed RAM may be altered by a system software malfunction or a power failure during editing.**

* **Information in parentheses is status-code polling, associated with the Computer Interface mode (Chapter 7). Status code descriptions are polling-associated with the Hand Held terminal mode (Chapter 6).**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10-1-2: PROGRAM EDITING

Status Code	Possible Cause And Solution
Blk Not saved, Mem full. (Status byte 2, bit 1)	If an attempt is made to enter an additional block of statements after an End of Memory warning is encountered, and the block size is larger than the available remaining memory space, a "Block not saved" status will occur. Note that some block sizes are larger than others, depending on the statement being entered, so it is possible that small blocks (such as GoTo, GoSub,etc.) may be entered without being truncated. If the Memory Full warning is encountered after entering a block which exceeds the amount of memory available, the block will be ignored.
Memory Altered. (Status byte 2, bit 4)	When an existing program is accessed in the Edit mode, Unidex 1 performs a checksum on the entire contents of program memory. Unidex 1 also evaluates the statements of each program block as they are pulled for editing purposes. Each statement is analyzed for the proper format. If in either of the two cases above, a Memory Altered status occurs, Unidex 1 automatically performs a Memory Repair™ on the program which has been accessed. If undefinable statements of a given block of the program are encountered, the entire block containing the statements is deleted. What is left is a program with missing blocks. The user need only scan this program and replace the missing blocks. Memory Repair™ is a very important feature because it reduces the possibility of Unidex 1 "locking up" if a faulty program is executed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10-1-2: PROGRAM EDITING (con't)

	A Memory Altered warning can only exist due to faulty RAM or some unrecoverable transient power glitch on the input power supply. In both cases, the occurrence is rare.
Format Warning. (Status byte 2, bit 3)	A character was entered that did not conform to the required format during a command or program block entry.

10-1-3: RUN MODE

Status Code	Possible Cause And Solution
Illegal byte in memory. (Status byte 3, bit 4)	If, during manual or program execution, a user memory byte cannot be identified by the Unidex 1, an illegal byte in memory status will occur. This detection mechanism monitors on a block by block basis, unlike the checksum and block verification mechanisms described in the previous sections on the Power Up and Editing Mode. These mechanisms "scan" the entire user memory before execution takes place.
Exceeded 8 repeat loops. (Status byte 4, bit 3)	The Unidex 1 Programming Mode allows only a maximum of eight "nested" repeat loops (i.e., a loop within a loop, eight times). A possible user-stack overload condition exists if the level of loop nesting exceeds eight levels. Remember, an unlimited amount of unnested repeat loops are permitted. The "Exceeded 8 Repeat Loops" error is detected during program execution.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10-1-3: RUN MODE (con't)

Invalid repeat loop end. (Status byte 4, bit 1)	This status declares that a repeat loop "End Repeat" statement was encountered without a preceding "Start Repeat" statement. This error is detected during program execution.
Incomplete repeat loops. (Status byte 4, bit 2)	This status declares that a "Start Repeat" statement was encountered without a following "End Repeat" statement. This error is detected at the End of Program execution.
Incomplete subroutines. (Status byte 4, bit 5)	This error status is similar to an "Incomplete Repeat Loop" error status in that a "GoSub" statement was detected without a following "Subroutine Return" statement. This error is detected at the End of Program execution.
Missing Label. (Status byte 4, bit 7)	This status declares that a program label does not exist for a label number specified in a given GoTo, GoSub, Conditional GoTo, Conditional GoSub or similar statement. This error is detected during program execution.
Exceeded 8 subroutines. (Status byte 4, bit 6)	This error status is similar to an "Exceeded 8 Repeat Loops" error status in that a maximum number of 8 "nested" subroutines has been exceeded. A possible user stack overload exists if the level of subroutine nesting exceeds eight levels.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10-1-3: RUN MODE (con't)

Status Code	Possible Cause And Solution
	Up to 99 unnested subroutines are allowed (i.e., up to 99 available labels per program). This problem is detected during program execution.
Invalid return-from-sub. (Status byte 4, bit 4)	This status declares that a "Subroutine Return" statement exists without a corresponding "GoSub" statement. This error is detected during program execution.
No programs in memory. (Status byte 3, bit 6)	This status declares that no programs exist in user memory as indicated by the directory command.
Invalid program #. (Status byte 3, bit 5)	This status declares that a specific program number does not exist in user memory or it cannot be used for the requested function.
Axis in limit. (Status byte 3, bit 0)	If a CW or CCW limit is encountered during manual, block or auto run modes, an "Axis in Limit" status will occur. Motion will be stopped and program execution will be terminated.
Illegal Program Exit. (Status byte 3, bit 3)	This status declares that a program has been exited during an Index or Home operation. (The move is stopped when the program is exited.)
Program Limit. (Status byte 3, bit 1)	A program limit has occurred during program execution. Program has been terminated and axis has stopped.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SECTION 10-2 HARDWARE MALFUNCTIONS

Symptom	Possible Cause And Solution
"Reset" LED blinks ON and OFF after power is applied.	A system RAM Read/Write error caused by a memory byte failure somewhere within the 8K RAM chip of the Unidex 1 control board. On power up, Unidex 1 checks all byte locations of the RAM by writing a value back for verification. The user area (program area) is not tested.
"Reset" LED stays on continously after power is applied.	Input AC voltage supplies are below minimum operating level (see Table 1-2). Short circuit condition in Stepping Motor wiring (see Chapter 2).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

THIS PAGE INTENTIONALLY LEFT BLANK

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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!

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Aerotech Sales and Service offices are listed below. For service and information, contact the office servicing your area.

AEROTECH, INC. SALES OFFICES

WORLD HEADQUARTERS
AEROTECH ,INC.
101 Zeta Drive
Pittsburgh, Pa. 15238

Phone (412) 963-7470
FAX (412) 963-7459
TWX (710) 795-3125

AEROTECH, LTD.
Aldermaston
Berkshire RG7 4QW, England

Phone (07356) 77274
TLX 847228
FAX (07356) 5022

AEROTECH GMBH
Neumeyerstrasse 90
8500 Nuernberg 10
West Germany

Phone (0911) 521031
TLX 622474
FAX (0911) 521235

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INDEX

A

Absolute/Incremental, 6-18, 6-24
Accel/Decel, 5-9, 6-24, 8-1
Activation, 4-2
Active State, 5-9
Auto-Boot, 4-4, 5-8

B

Baud Rate, 5-7

C

Computer Interface, 2-16, 4-1, 7-1
    Commands, 7-6
    Format, 7-5
    Hardware,7-1
Conditional Input, 2-18
Control Connections, 2-15
CW/CCW Limit, 2-24

D

Device Address, 5-8
Default, 5-11

E

Error Codes, 7-13
External Clock/Direction, 2-25

F

Fault Interface, 2-25
Features, 1-2
Feedhold, 2-23
Form A/B, 2-27

H

Hand Held Terminal
    Display/Setup, 5-5
    Initialization, 5-3
    Interface Connections, 6-1
    Operation, 6-2
High Motor Current, 5-10
Home Limit, 2-27
Home Reference, 2-27

I

Initialization, 4-1
Input Power Connections
    High Power Panel Mount, 2-7
    Low Power Panel/Desktop, 2-1
    6U Eurocard, 2-4
I/O Connector, 2-16

L

Limits Connector, 2-26

M

Motor Conections, 3-1
Motor Power Connections
    High Power Panel Mount, 2-13
    Low Power Panel/Desktop, 2-9
    Low Power 6U, 2-11
Multi-Axis,4-3

O

Options, 6-1

P

Packaging, 1-1, 2-1
Parity, 5-8
Power Up, 4-1
Print Setup, 5-6, 5-12

R

Ramp Time, 8-1
Ramping Limitations, 8-7
Ramp Profile, 5-9
RS-232, 7-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

S

Sample Program, 9-1
Service Request/Serial Poll, 7-10
Setup, 5-1
    Alter, 5-6
    Code, 5-7
    Display/Setup, 5-5
    Print, 5-6
Slew, 6-24
Specifications, 1-4, 1-6
Start/Stop, 5-9
Stop Bits, 5-8
System Commands, 7-17

T

Thumbwheel Indexer
    Index Speed, 5-11
    Interface Connections, 6-23
    Operation, 6-23
Thumbwheel Programmer
    Interface Connections, 6-19
    Operation, 6-20
    Power Up, 6-22
Torque/Speed Curves, 1-7
Troubleshooting, 10-1

W

Word Length, 5-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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.

AEROTECH, Inc., 101 Zeta Drive, Pittsburgh, Pennsylvania 15238

Phone (412) 963-7470 • TWX 710-795-3125 • FAX (412) 963-7459

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP