ANILAM

3000 Commando
Programming and Operations
Manual

Warranty

ANILAM warrants its products to be free from defects in material and workmanship for one (1) year from date of installation. At our option, we will repair or replace any defective product upon prepaid return to our factory.

This warranty applies to all products when used in a normal industrial environment. Any unauthorized tampering, misuse or neglect will make this warranty null and void.

Under no circumstances will ANILAM, any affiliate, or related company assume any liability for loss of use or for any direct or consequential damages.

The foregoing warranties are in lieu of all other warranties expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

The information in this manual has been thoroughly reviewed and is believed to be accurate. ANILAM reserves the right to make changes to improve reliability, function, or design without notice. ANILAM assumes no liability arising out of the application or use of the product described herein.

Section 6 - Editing Programs

Section 7 - Viewing Programs with Draw

Section 8 - Running Programs

Section 9 - Program Management

Section 10 - Tool Management

31-October-05

Section 11 - Communications and DNC

Section 12 - DXF Converter

Section 13 - Calculators

Section 14 - Off-line Software

Section 15 - Commando Software

Introduction

This manual supports the 3000 Commando software package. Most of the manual consists of short topical descriptions, followed by step-by-step instructions. Reference material is located at the back of the manual.

There are two basic approaches to learning a software package, read the book, and later try to remember what it said, or go through the steps on the machine with the book in hand. This manual is written to walk the first time operator through the steps at the machine. We do recommend all operators scan the entire manual at least once to become familiar with its contents.

To facilitate readability, not all topics are presented in the "Table of Contents," instead the emphasis is on programming and operation. An alphabetic listing of all subjects is located in the rear of the manual (Index) if needed.

In this manual references to the 3000 Commando are simply the Commando.

Effectivity

The 3000 Commando is a product to increase productivity of large machines. The 3000 Commando may be setup in 2- or 3-axis configurations. The following notation is used in places where information applies to one configuration but not another.

(2-axis only)   Denotes information applicable to two-axis configurations only.

(3-axis only)   Denotes information applicable to three-axis configurations only.

Keystroke Notation

Bold Face Type

Labels displayed on Commando's screens are bolded and capitalized as they appear on the monitor.

Keypad or keyboard keys are identified by bolded capital letters. For example, **ENTER**.

[Descriptive Marker]

Descriptive markers (with brackets) mark the place in a prompt that a specific entry is typed in. The operator does not type in the brackets – only the described text. For example, if the text reads, [program name], the operator would type in the name of the appropriate program at that spot in the prompt.

31-October-05

ANILAM

Section 1 - Machine Basics

Programs

A program is a precise sequence of machine instructions. Each program consists of instruction blocks that direct the machine movements. Every block is independent of the others, allowing a program to be stepped along one block at a time.

Programs are stored in the Commando's memory, and are accessed from the program screen, user listing. This listing contains all the programs stored in the Commando's memory. The operator can create, edit, delete, copy, or rename programs from the program screen.

Axis Descriptions

The machine moves along its axis of motion, all movements along an axis are in either a positive or negative direction. Not all machines use the same system for identifying axes. The descriptions here are commonly used for two- and three-axes boring machines.

NOTE: When trying to visualize machine movements, imagine tool motion, rather than the table motion. This helps to keep the directions straight.
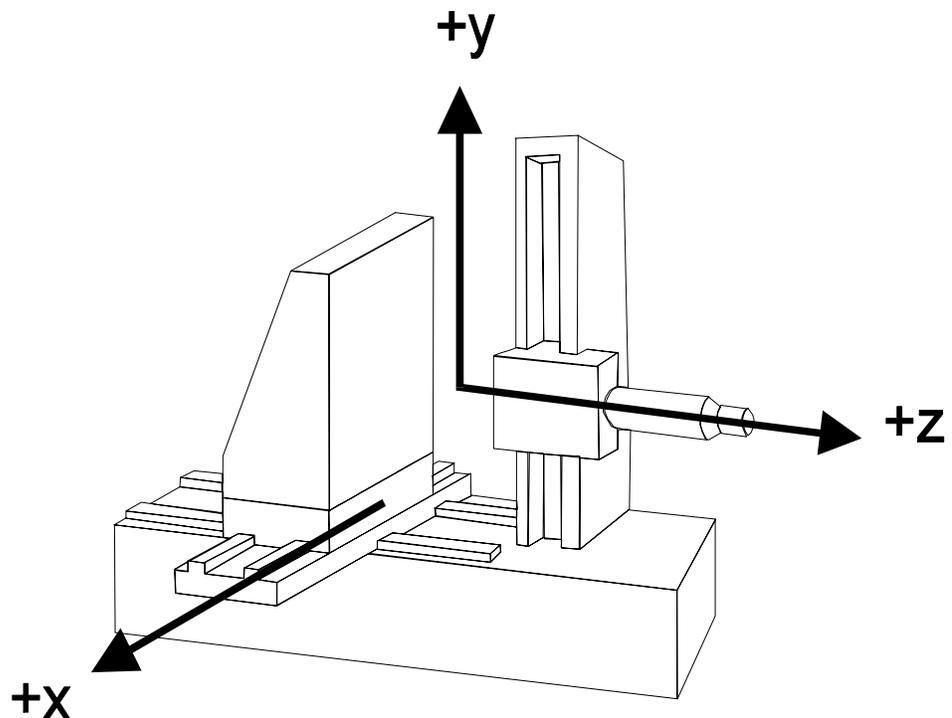
Figure 1-1, Boring Mill Position Axes

X-Axis

Table movement along the X-axis is left and right. Positive motion is the table moving to the left, positions on the right are positive on the workpiece. See Figure 1-1, Boring Mill Position Axes.

Y-Axis

Head movement along the Y-axis is up and down. Positive motion is the head moving up. See Figure 1-1, Boring Mill Position Axes.

Z-Axis

Tool movement along the Z-axis is in and out. Positive motion is the tool moving out; positions into the work are negative. See Figure 1-1, Boring Mill Position Axes.

Defining Positions

Absolute zero is the point all positions are measured from. Using the Commando, absolute zero can be set anywhere in space.

Its coordinates identify every X, Y, and Z position. If a position 2 inches to the right, and 3 inches up, and 4 inches toward the operator, were programmed, the X coordinate would be X -2.0, and the Y coordinate would be Y+3.0, and the Z coordinate would be Z+4.0. See **Figure 1-2**.
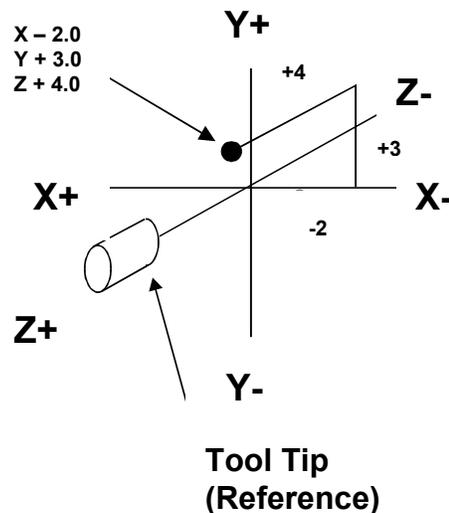
Figure 1-2, Locating a Position

ANILAM

Polar Coordinates

Sometimes it is not convenient to use X, Y, Z coordinates to define a position. Another system used is a Polar Coordinate System. The polar coordinate system is only useful for defining points on a single plane, usually the machine X, Y plane. Polar coordinates use the distance from the origin, and one angle to locate points. See **Figure 1-3**.
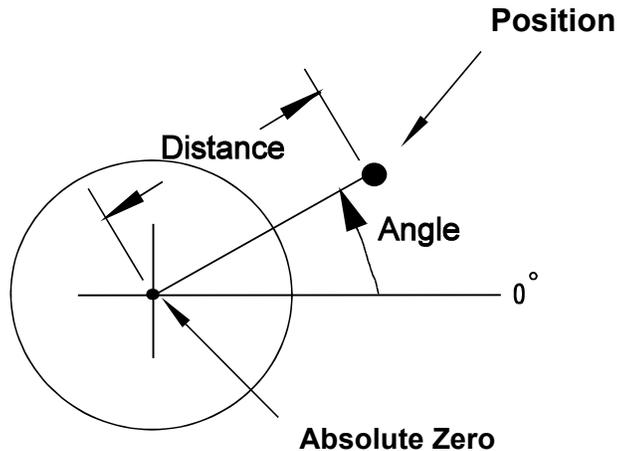
Figure 1-3, Polar Coordinate System

Absolute and Incremental Reference

Absolute and Incremental are the two Commando position identification modes. For instructions on changing this mode, see "Section 3 - Manual Operation and Machine Setup" or "Section 4 - Writing Programs."

31-October-05

Absolute Positioning

Absolute positions are measured from absolute zero. The operator can set absolute zero anywhere it is easiest to apply dimensions directly off a print. See **Figure 1-4**.

X0   **Absolute Zero**

Y0

All Positions Measured from
an Absolute Zero Reference
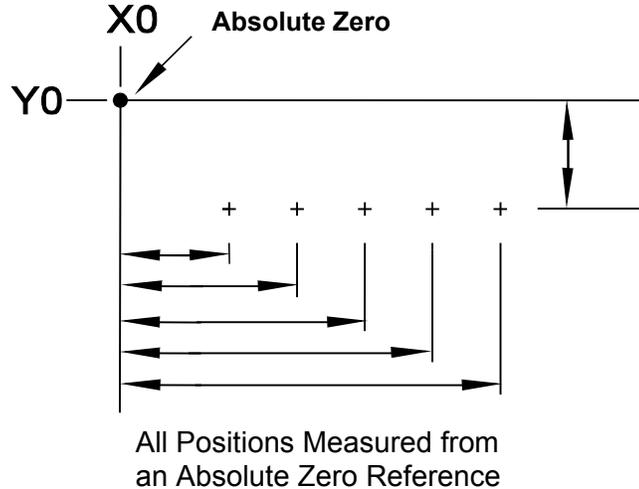
Figure 1-4, Absolute Positioning

Incremental Positioning

Incremental positions are referenced from one point to another, or from the machines present position. See **Figure 1-5**. This is sometimes convenient for programming an operation to occur at regularly spaced intervals. An incremental position is measured from the present tool position.

First Increment

Second Increment

Third Increment

Fourth Increment

Original Location
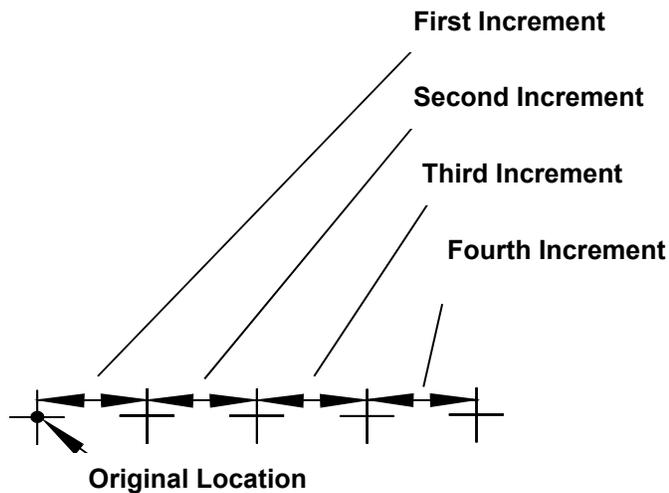
Figure 1-5, Incremental Positions

Tool-Length Offsets

Tool-length offsets tell the Commando each tool's Z location in reference to the operators zero plane. The Commando uses this information directly, to save the operator the trouble of calculating the starting Z position of each cut when using different length tools.

Length Offsets

Tool-length offsets allow the operator to set a zero plane, at some predetermined location from the work piece for each tool used, regardless of its length. Generally, the Z position of the zero plane is the starting position for the Commando to begin a cut. The Commando rapids to the zero plane, then feeds for the cut. The zero plane is ideally set at the surface of the part.
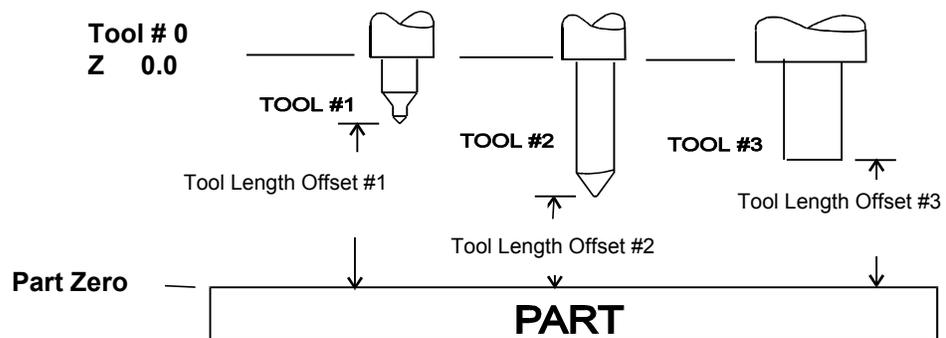
Figure 1-6, Tool Length Offset

The actual position of a tool length offset is defined as the distance from machine Z 0.00 to the part zero. See **Figure 1-6**.

Since it is unlikely that different tools will have the same offsets, the tool page stores this position for different tools. See "Section 10 - Tool Management."

Tool Diameter Compensation

Tool compensation is available for any move programmed on the Commando.

When using tool compensation the operator must specify compensation right or left. Right or left compensation relates to which side of the path the tool is on, looking from behind the tool as it moves. When right-hand tool compensation is activated, the tool is shifted to the right of the line between the start and stopping points of a move. See **Figure 1-7**.
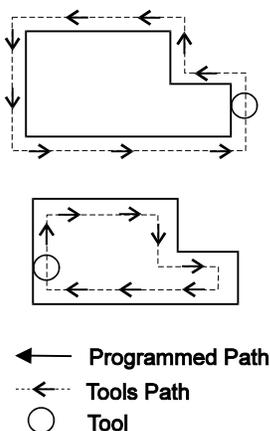
Right-Hand Tool Compensation

Figure 1-7, Right-Hand Tool Compensation

When left-hand tool compensation is activated, the tool is shifted to the left of the line between the start and stopping points of a move. See **Figure 1-8**.
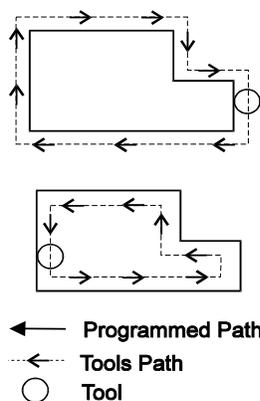
Left-Hand Tool Compensation

Figure 1-8, Left-Hand Tool Compensation

Tool compensation allows the operator to program the edge of the part being machined.

ANILAM

Section 2 - Commando Console and Software Basics

Console

The Commando console consists of a 14-inch monochrome VGA monitor and two keypads: one just to the right of the monitor, and the other beneath. See **Figure 2-1**.
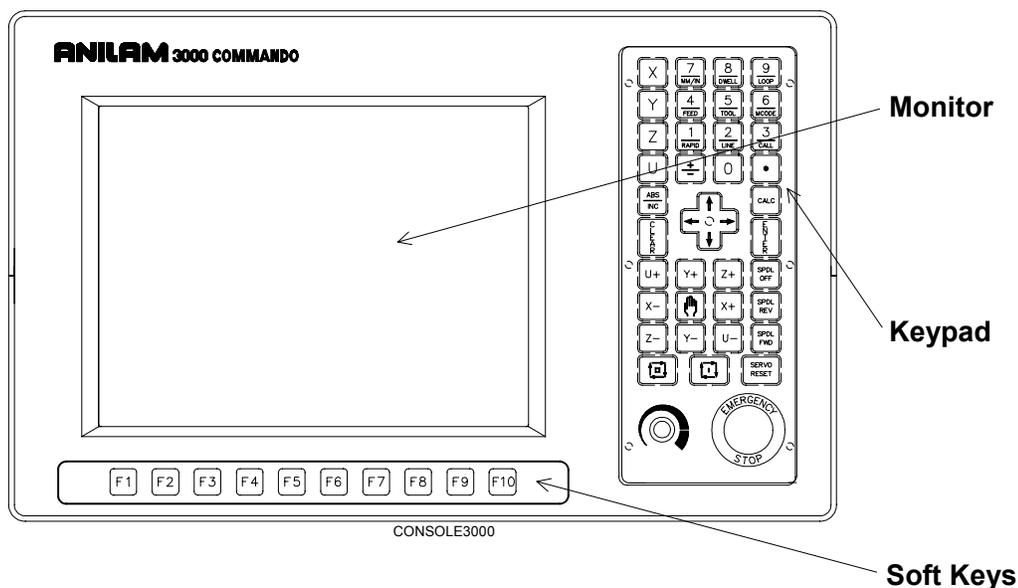
Figure 2-1, Commando Console
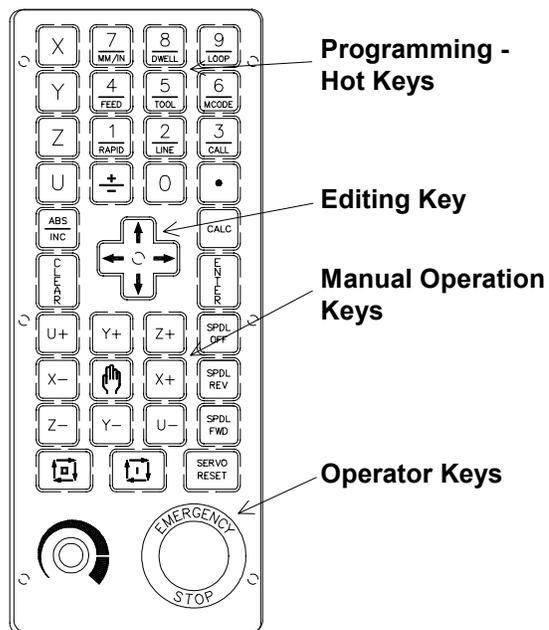
Figure 2-2, Keypad

Keypad

The keypad to the right of the monitor is laid out in four groups. See Figure 2-2, Keypad.

- ❑ Programming - Hot Keys
- ❑ Program Editing Keys
- ❑ Manual Operation Keys
- ❑ Operator Keys

Programming - Hot Keys

The Programming - Hot Keys give the operator access to numbers for keying in position coordinates. All of these keys have additional Hot Key functions to speed up programming and manual operations. When in the **Edit** or **MANUAL** mode, pressing a numbered key, activates the hot key function, unless, the Commando is specifically prompting for a numeric entry. The key functions are summarized as follows:

Table 2-1, Programming - Hot Keys

Label or Name	Key Face	Purpose
X	X	Selects X-axis for position inputs.
Y	Y	Selects Y-axis for position inputs.
Z	Z	Selects Z-axis for position inputs.
ABS/INC	ABS INC	Switches the measurement mode between **INCREMENTAL** and **ABSOLUTE**.
0	0	Zero / Toggles comment asterisk in edit mode.
1/RAPID	1 RAPID	One / Hot key for programming a Rapid move.
2/LINE	2 LINE	Two / Hot key for programming a Line move. **NOTE:** A line move is a move in feed.
3/CALL	3 CALL	Three / Hot key for calling a subprogram. **NOTE:** The (**3/ CALL**) subprogram functions are active in the **Edit** mode only.
4/FEED	4 FEED	Four / Hot key for changing feed rate. **NOTE:** Actual feed rate selection is available only on specially configured Commandos.
5/TOOL	5 TOOL	Five / Hot key for activating a tool on the tool page.

(Continued…)

Table 2-1, Programming - Hot Keys (Continued)

Label or Name	Key Face	Purpose
6/MCODE	6 MCODE	Six / Hot key for programming Misc. code.
		NOTE: Misc. codes only apply on specially configured Commandos.
7/MM/IN	7 MM/IN	Seven / Hot key for switching between inches (Inch) and millimeters (mm).
8/DWELL	8 DWELL	Eight / Hot key for programming a Dwell.
9/LOOP	9 LOOP	Nine / Hot key for programming a **Loop** program.
		NOTE: The (**9/ LOOP**) subprogram functions are active in the **Edit** mode only.
+/-	±	Sign change / Toggle hot key
DECIMAL	.	Period/Decimal point
CALC	CALC	Calculator key – Activates the calculator

Editing Keys

Editing keys allow you to edit program blocks. These keys are located below the Programming Hot Keys. Refer to .

Table 2-2, Editing Keys

Label or Name	Key Face	Purpose
CLEAR	CLEAR	Clears the selected messages, values, commands, and program blocks.
ARROW		Allows you to move highlight bars and cursor around the screen.
ENTER	ENTER	Selects blocks for editing, activates menu selections, activates number entry, or presets XYZ positions.

31-October-05

Manual Operation Keys

Manual Operation Keys allow you to control machine movements manually. These keys are located below the Editing Keys. Refer to Figure 2-2, Keypad.

Table 2-3, Manual Operation Keys

Label or Name	Key Face	Purpose
JOG	✋	Cycles the Commando through movement modes.
		NOTE: Any specific Commando, depending on its setup may be capable of **RAPID, RAPID Slow**, **FEED**, and **CREEP** modes.
		NOTE: The actual speed of the machine during a **RAPID** or **FEED** move is determined by the machine builder.
Z+	Z+	Move machine axis in positive Z direction.
Z-	Z-	Move machine axis in negative Z direction.
Y+	Y+	Move machine axis in positive Y direction.
Y-	Y-	Move machine axis in negative Y direction.
X+	X+	Move machine axis in positive X direction.
X-	X-	Move machine axis in negative X direction.
U+	U+	Move machine axis in positive U direction.
U-	U-	Move machine axis in negative U direction.
SPINDLE OFF	SPDL OFF	Stops the spindle.
SPINDLE REVERSE	SPDL REV	Starts spindle in a counterclockwise direction (viewed from the top of the motor). Optional.
SPINDLE FORWARD	SPDL FWD	Starts spindle in a clockwise direction (viewed from the top of the motor). Optional.

Operator Keys

Operator Keys allow you to control machine movements manually. These keys are located below the Manual Operation Keys. Refer to Figure 2-2, Keypad.

Table 2-4, Operator Keys

Label or Name	Key Face	Purpose
E-STOP	EMERGENCY STOP	The emergency stop button, **E-STOP**, (RED), stops all machine functions.
START		The **START** key (GREEN) starts all machine moves except jog.
HOLD		The **HOLD** key (RED) pauses any running program or programmed move. Press **START** to continue.
SERVO RESET	SERVO RESET	If a servo operated system, the **SERVO RESET** key is used to energize the system.

Soft Keys (F1) to (F10)

The soft keys, also called function keys, labeled (**F1**) through (**F10**), are located below the monitor. They are called soft keys because their functions are not hard wired, the function of these keys changes depending on the Commandos operating mode.

The current function of each soft key is displayed in a label on the monitor directly above each key. If a soft key label is **blank**, the soft key has no active function.

> **NOTE:** A soft key only performs the function displayed on its label at that time.

Optional / Off-line Keyboard

The 3000 Commando supports an optional external keyboard installation. Any standard PC computer keyboard may be used. All Commando inputs are possible with a keyboard, with the exception of **E-STOP**. See "Section 14 - Off-line Software."

> **WARNING:** Emergency shutdown cannot be made using a keyboard, use the **E-STOP** button to perform emergency shutdowns.

Software Basics

The Commando's screens change as it is put in different modes for different operations. Some screen displays appear only when needed, regardless of the mode. These standard displays are outlined here.

Pop-up Menus

Pop-up menus are temporary boxes that are displayed when the operator needs to make a selection. Each pop-up menu has a highlight bar to mark the desired selection, the highlighted selection is activated pressing the **ENTER** key. The **ARROW** keys move the highlight bar up and down through the menu. If none of the selections are suitable, the operator cancels the pop-up by pressing **CLEAR**.
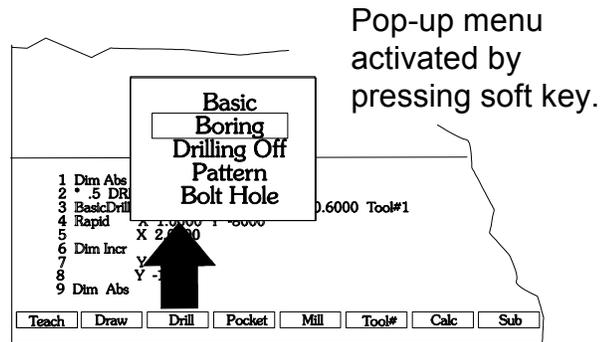
Figure 2-3, Pop-up Menu

Screen Saver

When the Commando is inactive for a set time, the screen dims to preserve the display, pressing any key restores the Commando to a ready status. Keystrokes are not recognized until after the monitor is reactivated.

Angle Measurements

The Commando sometimes prompts the operator to key in angles; all angular measurements use the 3 o'clock position as the zero degree reference. Positive angles rotate to the counter clockwise direction; negative angles rotate to the clockwise direction. See **Figure 2-4**.
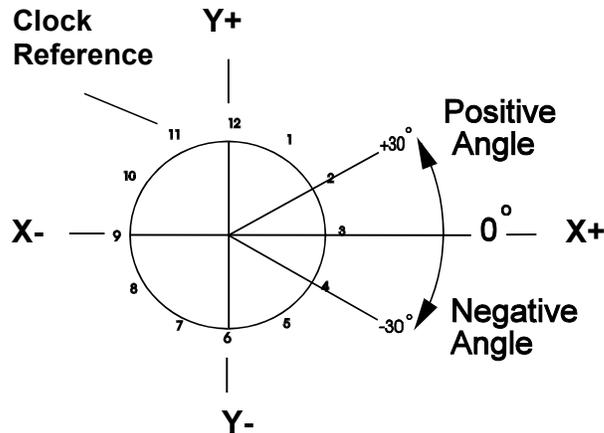
Figure 2-4, Angle Convention

Toggled Selections

When the Commando prompts for a choice between one of several possible selections, the operator can toggle between the two options by pressing the **+/-** key.

The Highlight Bar

Many procedures require the operator move the highlight bar up, down, left, or right to mark a choice. Pressing the appropriate **ARROW** keys makes these movements.

Clearing Entries

Pressing the **CLEAR** key deletes all portions of an incomplete entry for the operator to begin over.

Screen Prompts

The Commando prompts the operator when it requires specific information. There are two types of prompts:

❏ A display box with a labeled diagram and blank data fields.

❏ A message line prompt asking for name, word, or number.

Screen Diagrams

During program editing, the Commando presents labeled diagrams, adjacent to data fields. The operator must key in the required information as labeled in the diagram. There are two types of data fields:

❏ Completely blank

❏ Filled with zeros

Blank fields require no data be keyed in. If no value is keyed in, the value assumed is the Commando's current setting or position.

Fields filled with zeros must have a number keyed in to run.

Message Line Prompts

When The Commando prompts for a name, word, or number, the soft key line displays an **ASCII**, (**F2**) soft key label. The ASCII chart allows the operator to key in letters from the keypad.

ASCII Chart

When the Commando prompts for a text entry, the **ASCII** (**F2**) soft key is displayed. Press **ASCII** (**F2**) to toggle the ASCII Chart On and Off. The ASCII Chart allows you to enter text from the keypad. Refer to **Figure 2-5**.
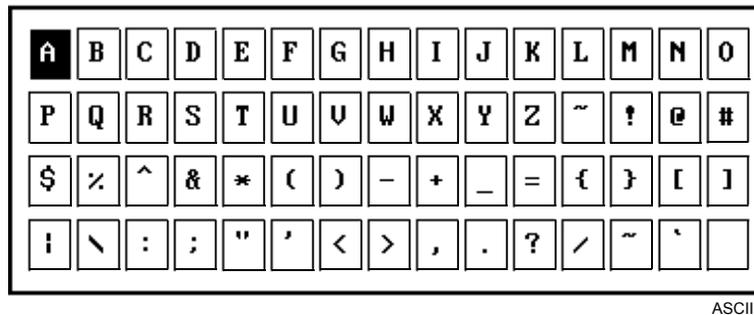
Figure 2-5, ASCII Chart Pop-Up

Using the **ARROW** keys, select the character you want to enter. Press the **ENTER** key to display the character in the prompt area. Turn off the ASCII Chart, and press **ENTER** to complete the text entry.

Cursor and Highlight Functions

The Commando uses either a cursor or highlight to mark an item for selection or editing.

The highlight is displayed in the Edit Mode, Program Directory, Manual Mode and ASCII Chart. Use the **ARROWS** to move the highlight. The software highlights a selected item in a menu or window. Selected items can be activated or changed in some way. For instance, you highlight a program block in Edit Mode to edit it. You highlight an entry field label in a Graphic Menu to enter a value or switch between the available choices.

The cursor is displayed when the Tool Page activates. The cursor is a white underline that indicates where letters and numbers will be inserted.

Entering Text

Use the ASCII Chart or a keyboard to enter text.

To enter text using the **ASCII** (**F2**) chart:

1. Press **ASCII** (**F2**). ASCII Chart activates.

2. Highlight desired character.

3. Press **ENTER**. Selected character is displayed at the cursor.

4. Select all required characters.

5. Press **ASCII** (**F2**) to close the ASCII Chart.

Typing Over and Inserting Letters and Numbers

The ASCII Chart has two text entry modes: Typeover (default) and Insert.

In the Typeover Mode, new characters replace characters marked by the cursor.

In the Insert Mode, new characters are displayed at the cursor and existing characters move to the right. When the Insert Mode is active, **Ins** (**F3**) highlights.

To put the Commando in the Insert Mode:

1. When the Commando prompts for a name, press **Ins** (**F3**). **Ins** (**F3**) highlights.

Deleting Letters

To delete letters:

1. With the ASCII Chart active, move the cursor to underline the letter being deleted.

2. Press **Del** (**F4**). The selected letter disappears.

> **NOTE:** Press **CLEAR** to delete an entire word.

Messages / Error Messages

Messages generated by the Commando are displayed in the message box. The message box is present in all program-running modes. When the Commando generates more than one message, only the message with the highest priority is displayed in the message box, and lower priority messages are stored in memory. A pending message highlight is displayed around the **MESSAGE** label when pending messages are stored in memory. There are two ways to review pending messages.

* Press **CLEAR** (current message clears; next message is displayed).

* Go to the **MANUAL** screen, and press **MESSAGE**, (**F1**). The **MESSAGE SCREEN** pops up.

The **MESSAGE SCREEN** allows the operator to view the last eight messages whether they have been displayed or not. As more messages are generated, the oldest is cleared. Messages that have not been displayed appear above the arrows. Old messages appear below. See **Figure 2-6**. Close the **MESSAGE SCREEN** by pressing **Cont**, (**F10**).

Clear pending messages by closing the **MESSAGE SCREEN** and pressing **CLEAR**, until pending message highlight no longer shows.

Some messages are advisory in nature; others put the Commando in hold. If an error puts the Commando in hold, usually the operator will need to go to **MANUAL** to correct the problem, and then re-run the program.
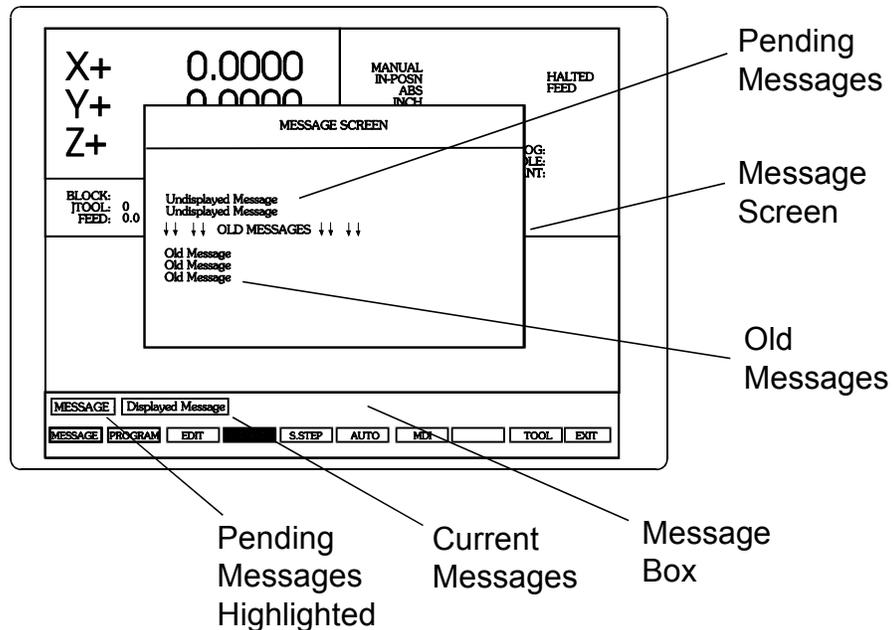
Figure 2-6, Messages Display

Section 3 - Manual Operation and Machine Setup

The Commando's function is modal. Being in a mode means it has a single method or function, and keeps using that method or function until its mode is changed. If the operator puts the Commando in **RAPID** mode, it will move to all locations in **RAPID** until the operator changes it to the **FEED** mode using **Line**. The Commando can be in two modes at once such as **ABS** and **INCH**, so long as the being in one mode does not conflict with another.

> **NOTE:** A line move is a move in feed.

Manual Mode Screen

In the **MANUAL** mode, the Commando displays the **MANUAL** screen. The **MANUAL** screen is a basic operating screen. When the Commando first starts, it displays this screen. All operating mode screens are similar in appearance, and are selected from the **MANUAL** screen soft key line. See **Figure 3-1**. The **MANUAL** (**F4**), soft key label is highlighted when the Commando is in **MANUAL** mode.
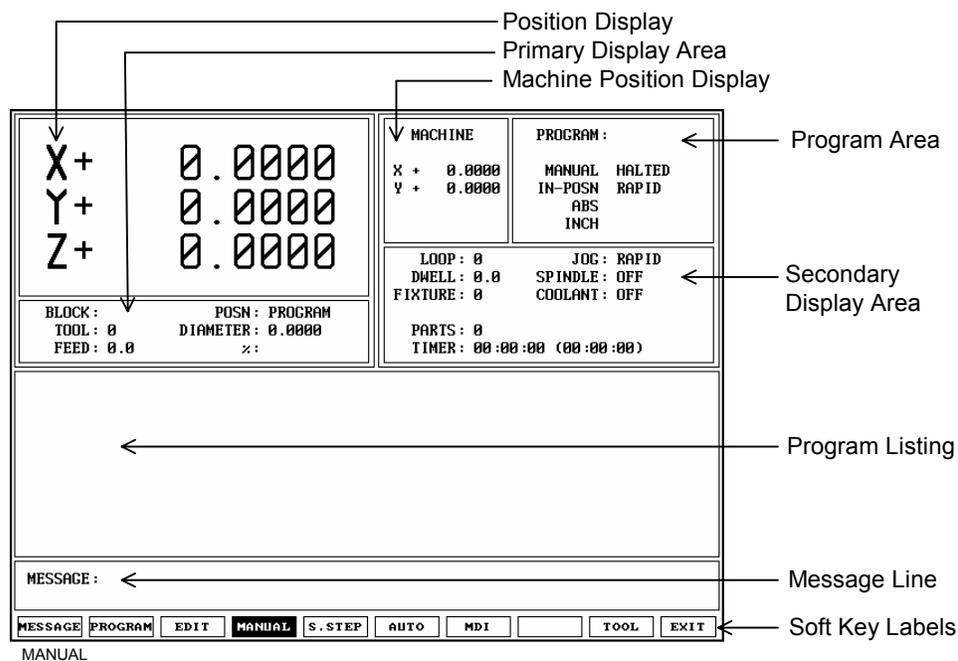
Figure 3-1, Manual Mode Screen

The Manual Mode screen features:

Position Display	Displays X-, Y-, and Z-position (position coordinates) as they are keyed in, and while running.
Primary Display Area	Displays additional operating information. (Not shown when Draw activates.)
Machine Position Display	Displays the axis positions in reference to Machine Home. (Not shown when Draw activates.)
Program Area	Displays program information.
Secondary Display Area	Displays essential operating information. See "Manual Screen Labels" for label descriptions.
Program Listing	Displays program blocks as they run in Auto or S.Step Mode.
Message Area	Where Commando displays messages, prompts, or reminders to the operator.
Soft Key Labels	Identify the function of the soft key directly underneath. Labels change from screen to screen. A highlighted label indicates an active mode.

Manual Screen Labels

BLOCK:	Program block number currently running.
TOOL:	Tool number currently active.
FEED / RAPID:	Current programmed move mode.
DIA:	Active Tool diameter.
MANUAL:	Current operating mode, if it is in **AUTO** or **S.STEP** it shows here.
IN-POSN / RUN:	Tells operator when machine is in position.
ABS / INC	Current positioning mode.
INCH / MM	Current units mode.
HALTED/*HALTED/RUNING	
	Without the asterisk, indicates machine is in a hold, or has completed its program. With asterisk, indicates hold was activated by an event such an external input, or because the **HOLD** key was pressed.
PROGRAM:	Name of program currently loaded.
LOOP:	Counts down loops remaining, when running a looped subprogram.
DWELL:	Counts down seconds remaining in a dwell.
JOG:	Current jog mode.
SPINDLE	Spindle status, only on machines equipped.
COOLANT:	Coolant status, only on machines equipped.

ANILAM

Position Display

Refer to **Figure 3-2**. The **POSN:** option sets the CNC to display machine position in one of two ways:

Program	Position Display shows the programmed position.
Distance To Go	Position Display shows the remaining distance to the commanded position. (**DISTTOGO**)

To switch the **POSN:** setting:

1. In Manual, S. Step, or Auto Mode, press **0** (zero) to switch the setting between **PROGRAM** and **DISTTOGO**.
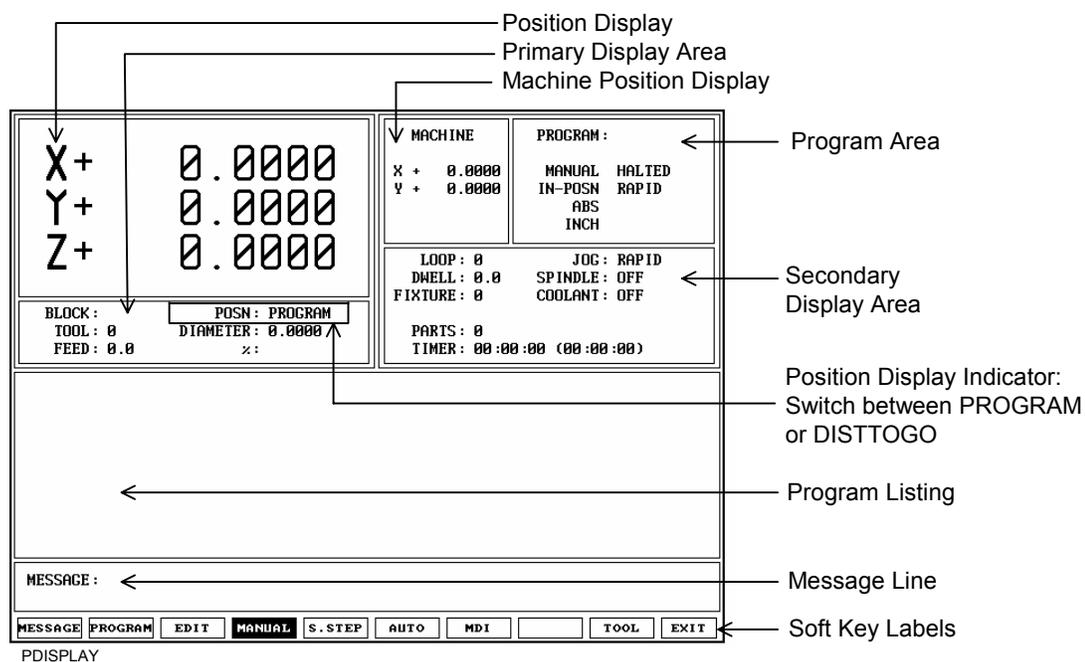
Figure 3-2, Position Display Options

Machine Settings

The operator should set, or be aware of the settings for the position mode, unit mode, move mode, and the absolute zero location, before attempting any machine moves. The Commando's settings are specifically as listed:

❑ The position mode, whether the Commando is set to use absolute or incremental positions.

❑ The units mode, whether the Commando is set to use inches or metric dimensions.

❑ The move mode, either rapid or feed.

❑ The location of the machines absolute zero reference.

This section tells the operator how to manually make these settings from the keypads. For information on changing these settings in a program, see "Section 4 - Writing Programs."

Feed / Rapid Mode Selection

Any specific Commando installation in the manual mode could be capable of up to four move modes, depending on the machines setup. The actual rate of travel for each mode is also determined when the machine is set up. The four possibilities are as follows:

❑ Rapid

❑ Rapid - slow

❑ Feed

❑ Creep

In the manual mode, the operator can change the move mode at any time. Change the move mode as follows:

1. Put the Commando in the **MANUAL** mode (current move mode is displayed next to the **JOG** label in the status box).

2. Press the **JOG** key (mode cycles to next choice, new mode is displayed next to **Jog** label). Repeatedly pressing the **JOG** key advances the Commando through all available choices.

NOTE: The operator can change the move mode at any time, only when operating in the **MANUAL** mode.

Absolute / Incremental Modes

The Commando recognizes both absolute and incremental positions, and may be switched between the two manually or from a program at anytime. In the absolute mode, the Commando measures all points from the absolute zero point. In the incremental mode, the Commando measures the next move from its present position. The status box of the **MANUAL** mode screen indicates the current position mode as follows:

❑ **ABS** in the status box indicates Absolute Mode.

❑ **INC** in the status box indicates Incremental Mode.

NOTE: The Commando's position display always displays absolute position.

Absolute / Incremental Mode Selection

To activate the Absolute or Incremental Mode:

1. Put the Commando in the **MANUAL** mode.

2. Press the **ABS/INC** key (positioning mode changes as label changes in status box).

Inch / MM Modes

The Commando understands two units of measurement: inches and millimeters. When the Commando encounters a position value, if it is in **Inch**, it will see it as the number of inches; if it is in **MM** it will see it as the number of millimeters.

When the Commando is first set up, default inch or millimeter settings are made in the setup utility. The units mode can also be selected from the **MANUAL** screen and in programs. If the Commando losses power, when it powers up again, the setup file reloads, and default settings are restored.

The Commando displays its current units setting in the status box. The operator at can change the unit mode anytime from the **MANUAL** mode.

Inch / Metric Mode Selection

Method 1, Using Hot Keys

1. Put the Commando in **MANUAL** mode, and press the **7/UNIT** key (Commando prompts for units change).
2. Press TOGGLE, **+/-**, to toggle between **inch** and **mm** modes (selected mode displays in status box).

Method 2, From Edit Screen

1. With the Commando in the **Edit** mode, press the **7/UNIT** hot key (units mode changes, status box displays units selected).

Absolute Zero

Absolute zero is the point the Commando recognizes as X=0, Y=0, Z=0. All absolute positions are measured from this point. The Commando also uses Z=0 position, for tool changes. The Commando uses a floating absolute zero reference. A floating absolute zero can be located within, or beyond, the machines range of travel. This lets the operator apply dimensions, referenced outside the range of travel, without conversion.

CAUTION:	If the absolute zero reference is not correctly located, the Commando will not correctly position.

Setting Absolute Zero

Method 1 - Locating Machine at Absolute Zero

1. Put the machine in the **MANUAL** mode.
2. Manually adjust the machines position so the tip of the tool is located at absolute zero.
3. Press **X**.
4. Press **Y**.
5. Press **Z**, and then press **ENTER**.
   (Position display: displays X 0.0, Y 0.0, Z 0.0)

Method 2 - Locating Machine Known Distance from Absolute Zero

1. Put the Commando in **MANUAL**.
2. Adjust the machine position to some known position from the desired absolute zero, and key in the position and direction, from absolute zero along each axis as follows:
3. Press **X**, [Position and direction].
4. Press **Y**, [Position and direction].
5. Press **Z**, [Position and direction.], then press **ENTER**.

CAUTION:	Be sure to press **ENTER**, and not **START**, to enter positions – pressing **START**, starts a move to the entered position.

NOTE:	Absolute zero may be a point outside the machines actual range of travel.

ANILAM

Manual Machine Operation

The operator can manually operate the machine from the keypad with the Commando on, or from the machines traditional controls, with the Commando off.

The Commando may have been set up one of several ways. Some axes may be only manual, and some axes may or may not display position on the screen. A Commando is generally configured one of the following ways:

❑ Control over certain axes only, position displayed for the same axes only.

❑ Control over certain axes only, position displayed for all axes.

NOTE: These options are configured at machine setup.

Taking the Commando Off-line

1. Locate the **Manual/Auto** switch on the back of the console.

2. Toggle switch machine to **Manual** position (machine now no longer responds to Commando's input).

NOTE: All references to manual control, assume the Commando is on, and the machine is to be operated using the Commando's keypads.

NOTE: The emergency stop button is active when the Commando is in **MANUAL** mode.

Putting the Commando On-line

1. Locate the **Manual/Auto** switch on the back of the console.

2. Position switch to **Auto** (Commando now operates the machine).

NOTE: All references to manual control, assume the Commando is on, and the machine is to be operated using the Commando's keypads.

NOTE: The emergency stop button is active when the Commando is in **MANUAL** mode.

Manual Moves

If the **EMERGENCY STOP** is engaged, the machine stops all operations. Gently rotate the button in the direction of the arrows to reset the emergency stop.

From **MANUAL** mode there are two manual moves available: a continuous jog and a one-shot move.

Continuous Jog Moves

Continuous jog moves are made along a selected axis and direction, but instead of moving a preset distance, movement occurs for as long the key is pressed. Continuous jog moves are enabled when the Commando is in the **MANUAL** mode, the **Teach** mode, and the tool page.
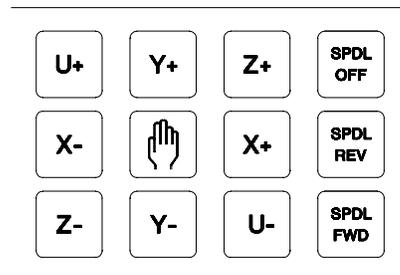
Figure 3-3, Manual Operation Keys

The manual operation keys are used for continuous jog moves. See **Figure 3-3**. There are two keys for each axis, one for moves in the positive direction, and one for moves in the negative direction. Accomplish a continuous jog move as follows:

1. With the commando in the **MANUAL** mode, use the **JOG** key to advance through move mode choices (depending on setup, **RAPID**, **RAPID Slow**, **FEED**, or **CREEP** might be available).

2. Press **X+**, **X-**, **Y+**, **Y-**, **Z+**, and **Z-**, for desired axis and direction (movement occurs as long as key is pressed).

One-shot Moves

One-shot moves allow the operator to move the table to a specific position, in either the absolute or incremental mode. A typical one-shot move might be accomplished as follows:

1. Place the Commando in **MANUAL** mode

2. Using the **JOG** key, select move mode: (**RAPID**, **RAPID Slow**, **FEED**, or **CREEP**, may be available.

3. Using the **7/UNIT** key, select units mode: **Inch** or **MM**.

4. Using the **ABS/INC** key, select positioning mode: **Abs** or **Inc**.

5. Press **X** [Position and direction].

6. Press **Y** [Position and direction].

7. Press **Z** [Position and direction].

8. Press **START**.

NOTE: One-shot moves can be paused by pressing the **HOLD** key. (To resume, press the **START** key.) To cancel one-shot moves, press **MANUAL** (**F4**).

CAUTION: **Be sure to press START, and not ENTER, to start a one-shot move. (Pressing ENTER changes the position of absolute zero.)**

CAUTION: **It is important the operator be aware of where part zero reference is set, before attempting moves defined by an absolute X-, Y-, and Z- position.**

One-shot Moves Using the Hot Keys

Many of the Programming – Hot Keys (see "Section 2 - Commando Console and Software Basics") are also available for keying in one-shot moves. Some of these keys toggle mode changes, while others activate labeled screens with fields for the operator to fill in. General use of these screens is outlined in "Section 2 - Commando Console and Software Basics," while the specifics of any particular screen is discussed in "Section 4 - Writing Programs." The hot keys available are as shown, see **Table 3-1**.

Table 3-1, Hot Keys Available For One-shot Moves

Label or Name	Key Face	Purpose
X	X	Selects X-axis for position inputs.
Y	Y	Selects Y-axis for position inputs.
Z	Z	Selects Z-axis for position inputs.
ABS/INC	ABS/INC	Switches the measurement mode between **INCREMENTAL** and **ABSOLUTE**.
1/RAPID	1/RAPID	Number one / Hot key for programming a rapid move.
2/LINE	2/LINE	Number two / Hot key for programming a line move. **NOTE:** A line move is a move in feed.
4/FEED	4/FEED	Number four, / Hot key for changing feed rate. **NOTE:** Actual feed rate selection is available only on specially configured Commandos.
5/TOOL	5/TOOL	Number five / Hot key for loading a tool from the tool page.
6/MCODE	6/MCODE	Number six / Hot key for programming Misc. code. **NOTE:** Misc. codes only apply on specially configured Commandos.
7/MM/IN	7/MM/IN	Number seven / Hot key for toggling between Inch and MM.
8/DWELL	8/DWELL	Number eight / Hot key for programming a Dwell.
+/-	±	Sign change key / Toggle key at active prompts.

ANILAM

Manual Data Input

Manual Data Input (MDI) is a quick way for the operator to program a single move, or a series of moves, that will be used only once. Although MDI requires knowledge of programming, because its use is often associated with manual operations it is included in this section. See "Section 4 - Writing Programs" for instructions on writing MDI moves. Refer to **Figure 3-4**.

NOTE:	The Manual Data Input Mode gives the operator access to all programming options, and can be used to write a complete part program.

MDI blocks are stored in a permanently created program named MDI.M. MDI blocks are programmed the same way regular program blocks are programmed. The MDI editor has all the same features as the regular program editor. Draw is also available to view an MDI move before running.

Moves programmed in MDI remain in the permanent program unless cleared or edited by the operator. If the program, MDI.M is deleted the Commando automatically creates a new one the next time MDI is used. Because MDI has the same features as the program editor, the screen looks very similar to the Edit screen. When the Commando is in the MDI mode, the program name, MDI.M is displayed in the upper-left hand corner of the screen, next to the **Program** label (circled).
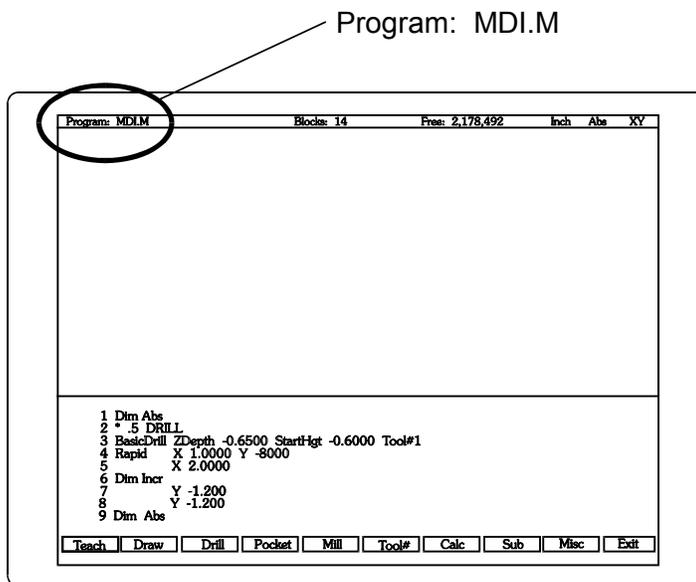
Program: MDI.M

Figure 3-4, Manual Data Entry (MDI) Screen

The MDI can be run as often as necessary. If the operator decides to save the MDI as a program, he renames the **MDI.M** program, and leaves it in the user program listing. See "Section 9 - Program Management" for instructions on renaming programs.

Running MDI

1. From the **MANUAL** screen press **MDI** (**F7**) (Commando displays the program editor).

   > **NOTE:** Observe the default name MDI.M in the right-hand corner of the status line.

2. Enter the desired program.

3. Run **Draw** to simulate the move, if necessary.

4. Press **Exit** (**F10**) to return to the **MANUAL** screen).

5. Press **START**. Commando executes the **MDI** move.

   – *or* –

   Press **MANUAL** (**F4**) to cancel the **MDI** move.

Section 4 - Writing Programs

Sections 4 and 5 in this manual deal with writing programs and using the Canned Cycles in the Commando. The Commando software behaves slightly differently in a 2-axes application as opposed to a 3-, or 4-axes application. The main difference is that when running a program in the 2-axes application the machine operator must manually perform Z-axis moves and press **START** in various scenarios to allow a program to continue to run in a safe manner. For more information on the operators' role in a 2-axes application, refer to "2-Axes Commando Operator's Role." All examples in this book assume a 3-axes machine. For a 2-axes machine, the operator may enter values in prompts that have to do with the Z-axis but these values are just for reference; meaning, the Commando will not perform this motion.

2-Axis Commando Operator's Role

Manually position the Z-axis. If the Z-axis is equipped as a digital readout, the control displays the Z-axis position, but does not control movement along Z.

To prevent machine damage or bodily injury, the Commando has a number of built-in machine holds.

Operator, Commando roles, and restrictions for running programs follow:

❑ The Commando will hold and prompt, "**Position Z axis and press START.**" whenever it encounters a Z-axis command.

❑ In cycles that use a programmed starting height (**StartHgt**) and cutting depth (**DepthCut**), the control calculates the number of passes needed to peck from the StartHgt to the pocket depth (ZDepth) when incrementing the DepthCut on each pass. The Commando will hold and prompt, "**Position Z axis and press START.**" on each pass.

❑ In cycles that use a programmed finish stock (**FinStock**), the control calculates the number of passes required to peck to the pocket depth (**ZDepth**) and leave enough stock for a finish pass. Leave finish stock on the pass before the finish pass and be sure to accurately position the Z-axis on the finish pass.

❑ The Commando will hold and prompt, "**Prepare for feed move and press START.**" every time the Commando changes from Rapid to Feed. This enables you to verify the Z-axis position before feeding into the part. This hold also occurs in canned cycles.

❑ The Commando will hold and prompt, "**Prepare for rapid move and press START.**" every time the Commando changes from Feed to Rapid. During this hold, verify the clearance before making a Rapid move to another location. This hold also occurs in canned cycles.

❑ The Commando will hold and prompt, "**Program stopped on tool mount, press START.**" at the start of every block that activates a tool. This hold enables you to verify the Z position (and length of the new tool) before executing the block.

> **NOTE:** Following a Rapid/Feed Mode change programmed after a Z move, more than one hold may occur.

❑ The 2-axis Commando has the same "Programming a Tool Change" and "Activating a Tool" 3-axis features. Refer to the "Setting Length Offsets at Tool Change (2-axis only)" feature.

Setting Length Offsets at Tool Change (2-axis only)

When collet-type tool holders are used, set the length offsets at tool change on the fly from the Auto or Single Step Mode. Be sure to use the correct tool diameter.

To set tool length offsets at tool change while running a program:

1. Execute a move to the tool change position and activate a programmed hold.
2. Mount the new tool.
3. Touch the tip of the tool to the part Z0 position and press **SET-Z** (**F8**).
4. Press **START** to continue the program.

Program Basics

Each program consists of blocks of instructions that direct machine movements. Give each program a unique name.

Many settings remain active until changed or turned off. These are modal settings. For example, move type (Rapid/Feed), units (Inch/MM), or ABS/INCR.

Write programs with combinations of moves, mode changes, and canned cycles. The Commando has a built-in library of canned cycles stored in its permanent memory.

Developing Part Programs

First, decide how to clamp the part and where to set Part Zero (Absolute Zero). Locate Part Zero at a point on the work positively positioned by the clamping fixture. This allows consistent machining of subsequent parts. Since Absolute positions are measured from Part Zero, locate Part Zero at a convenient location.

Determine the required tools and set the length offset for each tool. If necessary, adjust the position of the knee so that the longest tool clears the top of the part in a Rapid, Tool #0 move to Z0. Treat tool information like part of the program.

Refer to the blueprint to select a Part Zero. Note the moves, positions, and tools needed to cut the part. The Commando has a calculator that finds coordinates for complex geometric shapes (refer to "Section 13 - Calculators").

To develop a part program:

1. Enter the Program Directory (the **PROGRAM** screen) and create the program for the part (refer to "Section 9 - Program Management").

2. Enter the Program Editor (the **Edit** screen) to open the new program and begin to write blocks (refer to "Section 6 - Editing Programs").

3. The first block in a program is usually an Absolute Mode block. Put the Commando in the Absolute Mode at the start of a program to enable absolute positioning. (Use Incremental Mode only when specifically needed.)

4. Put the Commando in the appropriate Inch/MM Mode in the second block.

5. In the first move of the program, rapid to Tool #0, Z0 to retract the quill fully for the next move.

6. In the second move, rapid to a convenient part-change position.

7. Execute moves toward a part in two steps: A Rapid X, Y move at a clear height, followed by a Z move to 0.1 inch (2mm) above the surface of the cut (standard starting height). If necessary, activate the first tool mount at this time.

> **NOTE:** Program tool changes in separate blocks to make them easier to find.

8. Subsequent blocks in the program are the moves, cycles, and tool changes required to machine the part.

9. Make the last three blocks of the program as follows:

   a) Rapid move to Tool #0, Z0

   b) Rapid XY move to the same part change position used at the start of the program, and

   c) An **EndMain** block.

10. To verify and troubleshoot finished programs, run them in Draw Graphics Mode. Refer to "Section 7 - Viewing Programs with Draw."

11. Secure the work on the table with the appropriate work-holding device.

12. Go to the Manual screen and set Part Zero at a convenient point on the part. Refer to "Section 3 - Manual Operation and Machine Setup."

13. Go to the Tool Page and organize the tooling. Assign each tool a number (in the order of use). Assign length offset and tool diameter as appropriate. Refer to "Section 10 - Tool Management."

14. If Fixture Offsets are used, define them in the Fixture Offsets Table. Refer to "Programming Fixture Offsets" in this section.

15. Before you cut a part, perform a dry run. There are several ways to get a close look at the programmed moves. Run the program in Motion Mode to hold between each move or in Single-Step Mode to hold between each block. Run the program with no tool installed, or with a tool installed, but the knee lowered so the tool never contacts the work.

16. After a successful dry run, the program is ready for production. Back up the program for safekeeping. Refer to "Section 9 - Program Management."

Writing Program Blocks

You can program a block for a move type, mode, or cycle using one of the following: hot keys, soft keys, or pop-up menus.

To program a block, activate its graphic menu and fill in the appropriate values. To save a program block, press **Save** (**F10**) or press **ENTER** on the last entry field in the graphic menu. The Commando adds the new block to the Program Listing.

The **<End Of Program>** block is the last line of a program. The Commando automatically numbers new blocks and inserts them in front of the **<End Of Program>** block.

Using Graphic Menus

The Program Editor displays full screen graphic menus to write and edit program blocks. Refer to **Figure 4-1**.
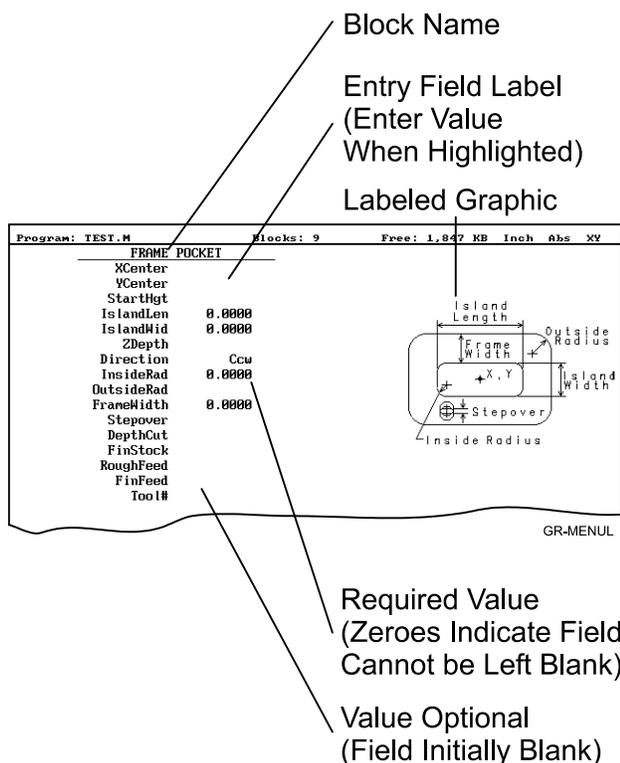
Figure 4-1, Sample Graphic Menu

Graphic menus activate with the first entry field highlighted. To enter values, highlight the appropriate entry field. Press **ENTER** to advance the highlight to the next entry field. With the last entry field highlighted, press **ENTER** to close the menu and add the block to the program.

Press **Save** (**F10**) from any entry field to close the graphic menu and add the block to the program. Move the highlight from field to field using the **ARROW** keys. Fill out entry fields in any order.

Press **CLEAR** to remove values in the highlighted field.

There are two types of entry fields in a graphic menu:

Optional entry fields   Blank when the graphic menu activates.

Required entry fields   Contain **0.000** when the graphic menu activates.

Required entry fields contain a 0.0000 default value. Change the value as required. Optional entry fields do not require a value. When left blank, the Commando usually assumes a default value or position. If the optional field is a position, the value defaults to the current position. If the optional field is a mode or tool change, the current mode and tool remain active. If the optional field is an angle, the value defaults to 0.0 degrees.

Enter decimal points and negative signs where needed. Otherwise, the Commando assumes a positive whole number.

Press **+/-** to insert a negative sign or toggle selections in some entry fields (for example, **Cw/Ccw** fields).

No Move Blocks

No Move Blocks does not initiate machine moves. Use No Move Blocks to set modes (Incremental/Absolute, etc.), activate tools (**Tool#**), and set feedrates (**Feed**).

Programming an Absolute/Incremental Mode Change

A **Dim** (dimension) block sets the Absolute (**Abs.**) or Incremental (**Incr.**) Mode.

To program a **Dim** block:

1. In Edit Mode, press **ABS/INC**. The **SET ABS/INCR DIMENSION** graphic menu prompts you to select **Abs** or **Incr**.

2. Press **+/-** to toggle the mode.

3. Press **Save** (**F10**) or **ENTER** to add the block to the Program Listing.

Programming an Inch/MM Mode Change

A Unit block sets the Inch (**Inch**) or Millimeter (**MM**) Mode.

To program a Unit block:

1. In Edit Mode, press **7/UNIT**. The **SET INCH/MM UNIT** graphic menu prompts you to select **Inch**/**MM**.

2. Press **+/-** to toggle the selection.

3. Press **Save** (**F10**) or **ENTER** to add block to the Program Listing.

ANILAM

Programming a Tool Change

Identify tools with tool numbers. When you activate a tool, its tool length and diameter offsets activate. List these values on the corresponding row of the Tool Page. Refer to "Section 10 - Tool Management" for information on the Tool Page.

> **NOTE:** The Commando also activates listed coolant (optional) and spindle operations (optional).

Tool-length offset remains in effect until a different tool activates. Always turn off tool-diameter compensation and ramp off before activating a new tool.

> **NOTE:** You can program tool numbers with most moves; they do not require a separate block. Each time a tool activates, the Commando holds the program to permit installation of the new tool. Programming unnecessary tool changes slows down production.

Activate Tool #0 to set the tool-length offset and diameter to 0.0.

To change a tool:

> **NOTE:** An absolute move to Tool #0, Z0 fully retracts the quill. An incremental command to Z0 maintains the current position.

1. In Absolute Mode, program a Rapid Z0, Tool #0 to cancel length offsets and retract the quill to a safe position.

2. Program a Rapid move to the tool change XY position (usually Machine Zero).

3. Program a block to activate the required tool (example: **Tool#1**). When the Commando encounters the **Tool#** command, it holds optional spindle and coolant functions. The operator can now change the tool.

4. Press **START** to resume operation. The Commando activates applicable tool compensation, spindle, and coolant activities.

> **NOTE:** Program tool changes in separate blocks to make them easier to find.

Activating a Tool

To activate a tool:

1. In Edit Mode, press **5/TOOL**. The **TOOL MOUNT** graphic menu prompts for **Tool #**.

2. Enter tool number and press **ENTER** to add the **Tool#** block to the Program Listing.

Activating Tool-Diameter Compensation

Refer to "Section 1 - Machine Basics" for basic information on tool-diameter compensation. You can compensate most move types. Compensation is modal and remains active until you cancel or change it.

Turn compensation on or off in (Rapid or Line) ramp moves. Ramp moves offset the tool on the programmed path by half the tool diameter. Tool compensation affects all subsequent moves until canceled.

The **ToolComp** command, available in Line or Rapid graphic menus, sets the required tool compensation. Settings include:

❑ **Left** (of the path)

❑ **Right** (of the path)

❑ **Off** (cancel compensation)

When the field is left blank, the current compensation, if any, remains in effect.

Many canned cycles include automatic tool compensation. Activate the correct tool diameter to ensure accuracy in these cycles. The required tool activates within the cycle.

Refer to **Table 4-1** for a list of move and cycle compensation requirements.

Table 4-1, Move and Cycle Compensation Requirements

Move or Cycle	Program a Rapid or Line move to activate tool comp before you program the move or cycle. Tool diameter must be active.	Activate/deactivate compensation automatically when you program the move or cycle. Tool diameter must be active.
Rapid	X	---
Line	X	---
Modal	X	---
Face (Affects only step-over.)	---	X
Rectangular Pocket Cycle	---	X
Frame Pocket Cycle	---	X

ANILAM

Programming a Dwell

Dwell pauses a running program for a specified length of time, in seconds. Dwell resolution is 0.1 sec. When the operator enters 0.0 seconds (infinite dwell), the Commando will hold indefinitely. Press **START** to restart the Commando after an infinite dwell.

To program a Dwell using hot keys:

1. In Edit Mode, press **8/DWELL**. The **DWELL** graphic menu prompts for length of time in seconds.

2. Enter the time, and press **ENTER** to add Dwell block to the Program Listing.

To program a Dwell using soft keys:

1. In Edit Mode, press **Sub** (**F8**) to display the Secondary soft key functions.

2. Press **Dwell** (**F7**) to activate the **DWELL** graphic menu.

3. Enter the time, and press **ENTER** to add Dwell block to the Program Listing.

Programming a Return to Machine Zero

> **NOTE:** The Commando measures all entered coordinates in the Machine Home graphic menu from Machine Zero. The Commando homes axes one at a time, in the order indicated in the Setup Utility.

A **Home** block re-establishes a permanent reference position located on the machine. The position is called Machine Zero. Program a Home block using one of the two methods described in **Table 4-2**.

Table 4-2, Homing Methods

Homing Method	Required Action
1. Indicate axes	Activate Machine Home graphic menu. Press required **X**, **Y**, **Z**-axis keys. On each axis selected, machine feeds from the current position to the limit switch, reverses direction and travels to the first detected zero crossing, and sets Machine Zero at that point.
2. Enter coordinates	Activate Machine Home graphic menu. For each required axis, highlight the axis entry field and enter a coordinate (example: X0, Y-1, Z-4). The machine rapids to the entered coordinate, then feeds to the limit switch, reverses direction and travels to the first detected zero crossing, and sets Machine Zero at that point.

Use Homing Method 1 to execute a homing sequence in feed. Use Homing Method 2 to execute a homing sequence that rapids to the entered coordinate, then initiates the homing sequence.

To activate the Machine Home graphic menu:

1. In the Edit Mode, press **Mill** (**F5**) to display the Mill soft keys.

2. Press **More** (**F7**) to display the More pop-up menu.

3. Highlight **Home** and press **ENTER** to display the Machine Home graphic menu.

The method used to set Machine Zero depends on which options the builder installs. Check with the machine builder for detailed information.

Programming Fixture Offsets

Refer to **Figure 4-2**.

> **NOTE:** Presets and **SetZero** will work with Fixture Offsets.

Figure 4-2, Fixture Offset Graphic Menu

To program a Fixture Offset:

1. In Edit Mode, press **Mill** (**F5**) to display the Mill soft keys.

2. Press **More** (**F7**) to display the More pop-up menu.

3. Select **Offsets** and press **ENTER** to display the Fixture Offset graphic menu.

4. Fill in the labeled entry fields, as follows:

Fixture#   The Fixture-Offset number. Indicates which set of values from the Fixture Offsets Table will be activated or changed. Enter a number **1** through **9**, corresponding to the Fixture Offsets Table, to activate or change an offset. Enter **0** to cancel fixture offsets.

ANILAM

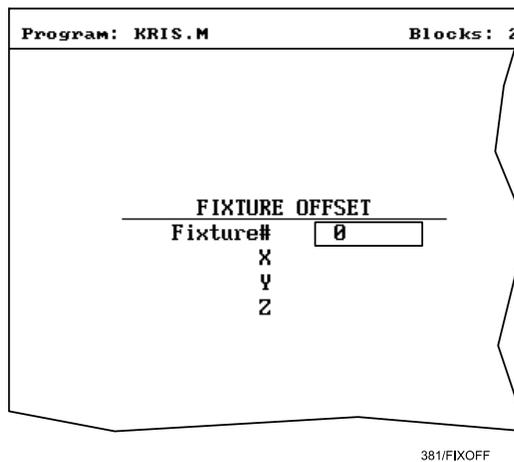|	
X	X-offset coordinate. If you do not enter a value, the Commando activates the offsets listed in the Fixture Offsets Table for the entered **Fixture#**. If you do enter a value, the Commando applies the entered offset. When the program runs, the Commando updates the Fixture Offsets Table with the specified X offset and clears the previous value. (Optional)
Y	Y-offset coordinate. If you do not enter a value, the Commando activates the offsets listed in the Fixture Offsets Table for the entered **Fixture#**. If you do enter a value, the Commando applies the entered offset. When the program runs, the Commando updates the Fixture Offsets Table with the specified Y offset and clears the previous value. (Optional)
Z	Z-Offset coordinate. If you do not enter a value, the Commando activates the offsets listed in the Fixture Offsets Table for the entered **Fixture#**. If you do enter a value, the Commando applies the entered offset. When the program runs, the Commando updates the Fixture Offsets Table with the specified Z offset and clears the previous value. (Optional)

To cancel Fixture Offsets:

1. In Edit Mode, press **Mill** (**F5**) to display the Mill soft keys.

2. Press **More** (**F7**) to display the More pop-up menu.

3. Select **Offsets**, and press **ENTER** to display the **Fixture Offset** graphic menu.

4. Select **Fixture#**. In the highlighted entry field, enter **0** to cancel Fixture Offsets. (Do not fill in the other entry fields.)

Fixture Offsets Table

The Fixture Offsets Table, accessed using the Tool Page, contains the entered values for Fixture Offsets 1 through 9. Refer to Figure 4-3, Fixture Offsets Table.

NOTE: Handwheel and Jog features are available while the Fixture Offsets Table is active.

```
                      Fixture Offsets

                  X           Y           Z
          1. ▶  0.0000      1.0000      0.0000
          2.    0.0000      0.0000      0.0000
          3.    0.0000      0.0000      0.0000
          4.    0.0000      0.0000      0.0000
          5.    0.0000      0.0000      0.0000
          6.    0.0000      0.0000      0.0000
          7.    0.0000      0.0000      0.0000
          8.    0.0000      0.0000      0.0000
          9.    0.0000      0.0000      0.0000
```

381/FIXOFFTB

Figure 4-3, Fixture Offsets Table

Activating the Fixture Offsets Table

To activate the Fixture Offsets Table:

1. In the Tool Page, press **OFFSETS** (**F1**).

Changing Fixture Offsets in the Table

There are three ways to change the values in the table: manually enter a value, or calibrate the fixture offset table entry to the machine's current location (shown on the axis display), or adjust an existing entry.

To change a fixture offset to a manually entered coordinate:

1. Highlight a Fixture Offset (row 1 through 9).

2. Press an axis key (**X**, **Y**, or **Z**).

3. Enter a value, and press **ENTER** to store the value in the table.

To calibrate the fixture offset table entry to the machine's current location:

1. Highlight a Fixture Offset (row 1 through 9).

2. Press **CalibX** (**F5**), **CalibY** (**F6**), or **CalibZ** (**F7**) to store the current machine position for the selected axis in the table.

To adjust a fixture offset table entry:

1. Highlight a Fixture Offset (row 1 through 9).

2. Press the **ABS/INC** key, or **ALT** + **E** on a keyboard, to display a pop-up message, "Enter axis and adjustment value."

3. Type the axis to adjust (**X**, **Y**, or **Z**) and the amount of the adjustment. The adjustment value may be positive or negative.

4. Press **ENTER** to adjust the value, and display the adjusted value in the table.

Resetting Absolute Zero (Part Zero)

Absolute Zero is the X0, Y0 position for absolute dimensions. Refer to "Section 1 - Machine Basics" for information on Absolute Positioning. A **SetZero** block sets the Absolute Zero Reference of one or more axes to a new position. Use **SetZero** in one of two ways: to reset X0 Y0 or to preset the current location to entered coordinates.

In axis presetting, non-zero XY values set the current machine position to the entered coordinates. In axis resetting, X0 and Y0 values set the current machine position as the new Absolute Zero Reference.

When the Commando executes the block, the X and Y values (zero or non-zero) in the graphic menu redefine Absolute Zero.

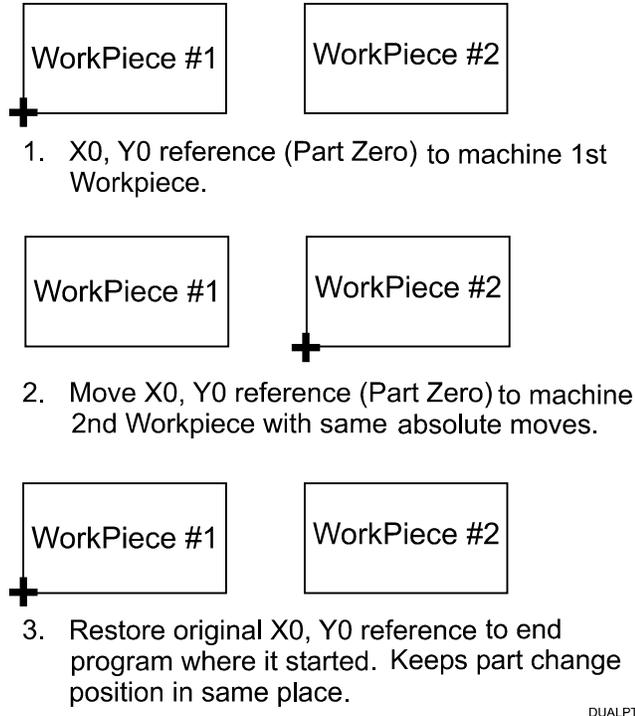In **Figure 4-4**, diagram A shows Part Zero and tool position prior to a **SetZero** block. In this example, the operator programs a **SetZero** block with the following coordinates: **X2**, **Y-1**.

Diagram B shows Part Zero and tool position following the **SetZero** block. The coordinates at the tool position become **X2**, **Y-1**. This, in effect, moves Part Zero, as indicated.
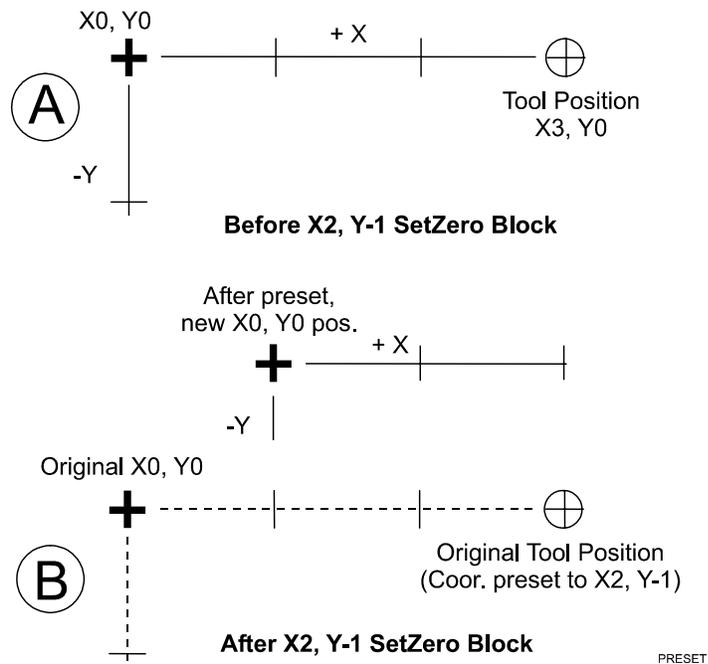
Figure 4-4, Executing a SetZero Block

Change Absolute Zero to cut more than one part with the same moves. Restore the location of the original X0, Y0 reference at the end of the program so that programmed part change positions do not move each time the program runs. Refer to **Figure 4-5**.

WorkPiece #1   WorkPiece #2

1. X0, Y0 reference (Part Zero) to machine 1st Workpiece.

WorkPiece #1   WorkPiece #2

2. Move X0, Y0 reference (Part Zero) to machine 2nd Workpiece with same absolute moves.

WorkPiece #1   WorkPiece #2

3. Restore original X0, Y0 reference to end program where it started. Keeps part change position in same place.

DUALPT

Figure 4-5, Using SetZero in a Program

When an axis entry field (**X**, **Y**, or **Z**) remains blank in a graphic menu, the Commando does not change the position of that axis. Refer to **Figure 4-6**.

NOTE: In most programs, the Z-axis position does not change. Changing the Z-axis position changes the Tool #0, Z0 position, which alters all existing tool-length offsets.

```
Program: TEST.M (edited)      Blocks: 10      Free: 1,847 KB  Inch  Abs  XY
```

Set Program Zero
X
Y
Z
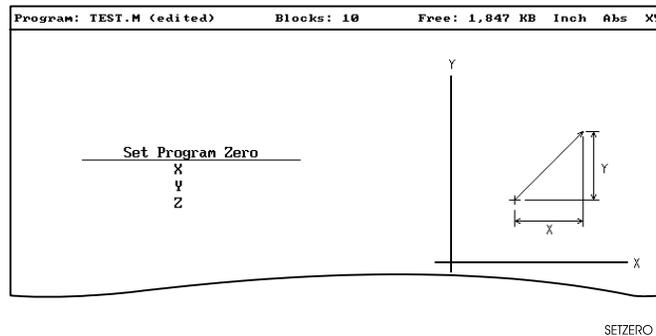
SETZERO

Figure 4-6, Set Zero Graphic Menu

To program a **SetZero** block:

1. In Edit Mode, press **Mill** (**F5**) to change the Soft Key labels.

2. Press **More** (**F7**) to display the pop-up menu.

3. Position the highlight to select **SetZero**, and then press **ENTER**. The **Set Program Zero Graphic** menu prompts for the absolute coordinates of the machine's current position.

4. Enter the appropriate **X**, **Y**, and **Z** coordinates, and press **ENTER** to add the block to the Program Listing.

Straight Moves

Programming a Rapid Move

Rapid moves run at the Commando's Rapid rate and save time when positioning for a cut or a canned cycle.

Use Rapid moves to activate/deactivate tool diameter compensation and cutter compensation. Refer to **Figure 4-7**.
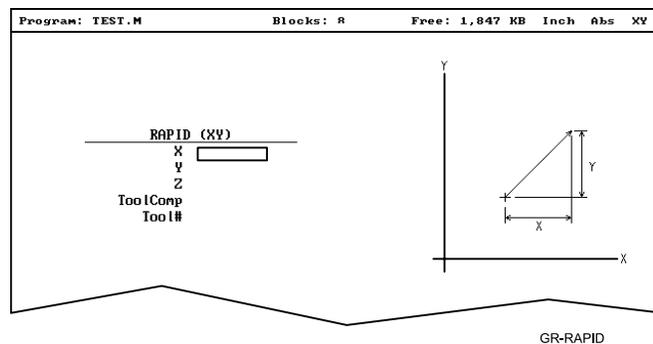
Figure 4-7, Rapid Move Graphic Menu

To program a Rapid move using hot keys (the keypad):

1. In Edit Mode, press **1/RAPID** to activate the **RAPID (XY)** graphic menu.

2. Enter the **X**, **Y**, and **Z** coordinates in the appropriate entry fields.

3. Press **+/-** to set **ToolComp** (optional) and press **ENTER** to highlight **Tool#**.

4. Type a tool number (optional), and press **ENTER** to add the Rapid block to the Program Listing.

To program a Rapid move using soft keys:

1. In Edit Mode, press **Mill** (**F5**) to display the Mill soft keys.

2. Press **Rapid** (**F2**) to activate the **RAPID (XY)** graphic menu.

3. Enter the appropriate values and settings in the labeled entry fields.

Programming a Line Move

Straight-line moves run in Feed. Refer to **Figure 4-8**.
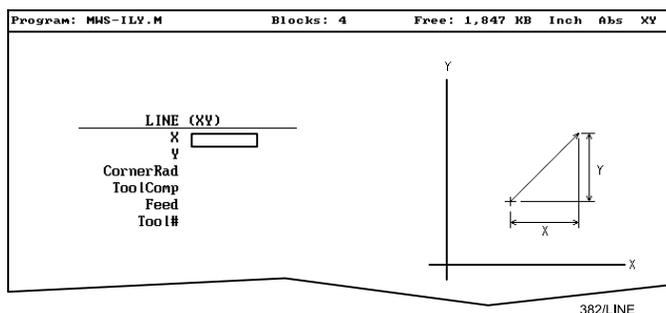
Figure 4-8, Line Move Graphic Menu

To program a Line move using hot keys (the keypad):

1. In Edit Mode, press **2/LINE** to activate the **LINE (XY)** graphic menu.

2. Enter the appropriate values and settings in the labeled entry fields.

To program a Line move using soft keys:

1. In Edit Mode, press **Mill** (**F5**) to change the Soft Key labels.

2. Press **Line** (**F3**) to display the **LINE (XY)** graphic menu.

3. Enter the appropriate values and settings in the labeled entry fields.

4. With the last entry field highlighted, press **ENTER** to add the block to the Program Listing.

Programming a Modal Move

A modal move is a straight move executed in the active Rapid or Feed Mode.

To program a Modal move:

1. In Edit Mode, press **X**, **Y**, or **Z**. The **MODAL MOVE** graphic menu prompts for the X, Y, and Z positions.

2. Enter the required positions.

3. From the last field on the graphic menu, press **ENTER** or **Save** (**F10**) to add the modal move block (Xn Yn Zn) to the program.

> **NOTE:** When using modal moves, be sure the Commando is in the required Rapid or Line Mode. The Commando executes Line Mode moves in Feed Mode.

ANILAM

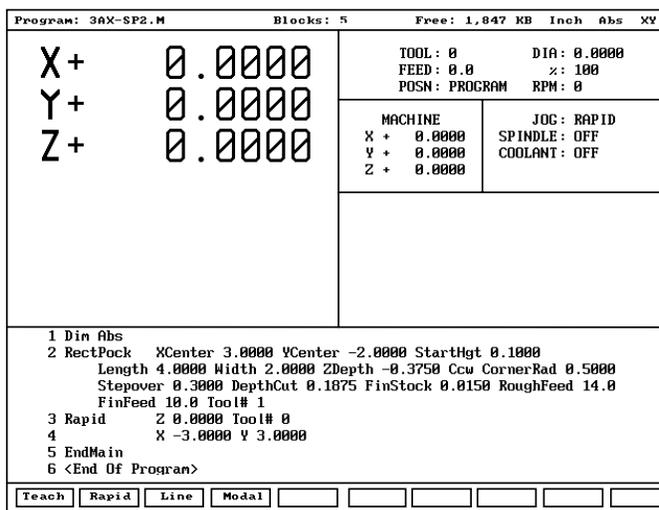## Teach Mode (Programming from the Part)

In Teach Mode, the Commando writes program blocks that duplicate manually executed moves. Teach Mode allows you to select endpoints from a part diagram to program a move without knowing the coordinates.

Teach Mode also operates in DRO Mode.

To activate the Teach Mode from the Edit screen:

1. Press **Teach** (**F1**). The **Teach** (**F1**) soft key highlights.

Use Teach Mode to program a Line, Rapid, or Modal move. Refer to **Figure 4-9**.


```
Program: 3AX-SP2.M          Blocks: 5          Free: 1,847 KB   Inch   Abs   XY

 X+      0.0000              TOOL: 0          DIA: 0.0000
                             FEED: 0.0          %: 100
 Y+      0.0000             POSN: PROGRAM    RPM: 0

 Z+      0.0000              MACHINE           JOG: RAPID
                            X +   0.0000     SPINDLE: OFF
                            Y +   0.0000     COOLANT: OFF
                            Z +   0.0000




 1 Dim Abs
 2 RectPock   XCenter 3.0000 YCenter -2.0000 StartHgt 0.1000
        Length 4.0000 Width 2.0000 ZDepth -0.3750 Ccw CornerRad 0.5000
        Stepover 0.3000 DepthCut 0.1875 FinStock 0.0150 RoughFeed 14.0
        FinFeed 10.0 Tool# 1
 3 Rapid       Z 0.0000 Tool# 0
 4            X -3.0000 Y 3.0000
 5 EndMain
 6 <End Of Program>

Teach   Rapid   Line   Modal
```

381TEACH

Figure 4-9, Teach Mode Screen

To program a Teach move:

1. In Edit Mode, press **Teach** (**F1**) to activate Teach Mode. The display shows the current location.

2. Manually position the machine at the endpoint.

3. Press **Rapid** (**F2**), **Line** (**F3**), or **Modal** (**F4**) to indicate the required move type. The Commando inserts the appropriate block into the listing.

4. Program all required moves in Teach Mode.

5. Press **Teach** (**F1**) to deactivate Teach Mode.

Line or Rapid Moves

Using the X, Y, or XY endpoints, the Commando can write Line or Rapid moves. The Commando calculates the missing endpoint(s). Define the move as part of a right triangle with the components identified as in **Figure 4-10**.
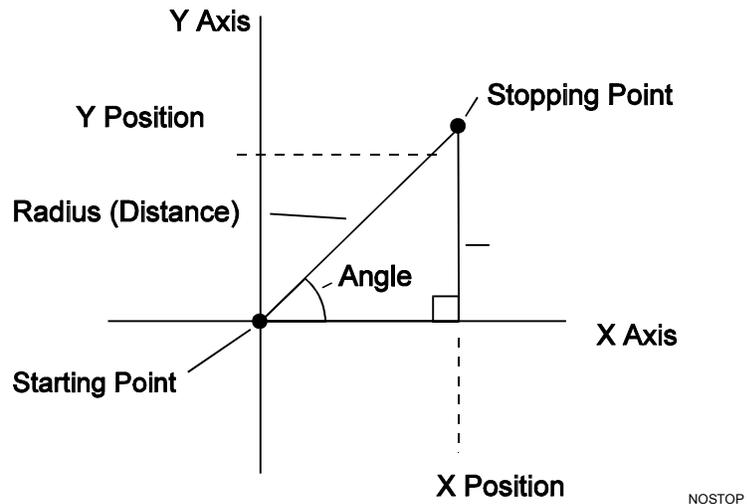
Figure 4-10, Move Orientation

The Commando can calculate move endpoints, given:

❑ Angle and radius
❑ X position and angle
❑ Y position and angle
❑ X position and radius
❑ Y position and radius

The **Rapid** and **Line** graphic menus are similar. However, the **Rapid** graphic menus do not contain **CornerRad** or **Feed** entry fields. Use either the Absolute or Incremental Mode.
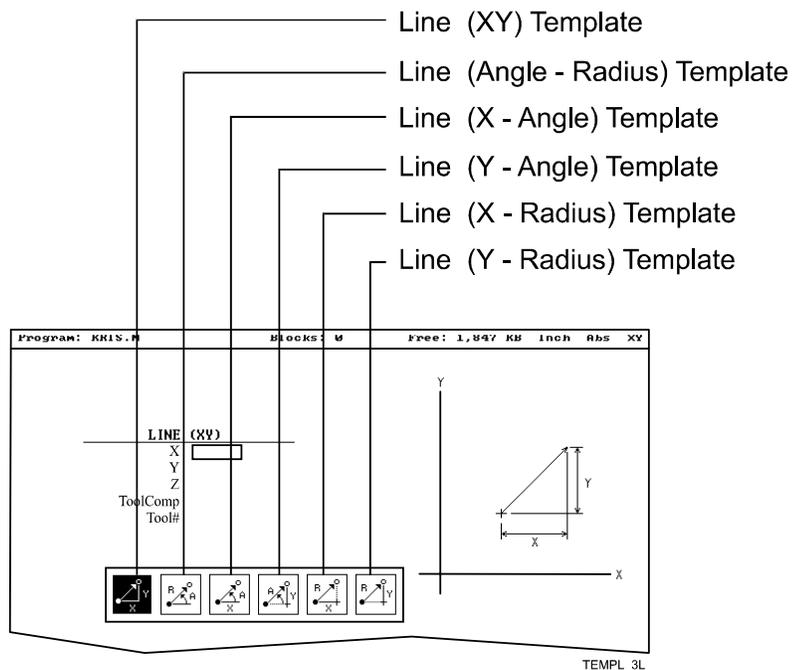
Programming a Move Using XY Location, Radii, or Angles

To program a move using a Line or Rapid block:

1. In Edit Mode, press **Mill** (**F5**) and select either **Rapid** (**F2**) or **Line** (**F3**).

    – or –

    In Edit Mode, press **1/RAPID** or **2/LINE** to display the **RAPID (XY)** or **LINE** (**XY)** graphic menu.

2. Press **More. . .** (**F4**) to display the Template pop-up menu. Refer to **Figure 4-11**.

Line (XY) Template

Line (Angle - Radius) Template

Line (X - Angle) Template

Line (Y - Angle) Template

Line (X - Radius) Template

Line (Y - Radius) Template

Figure 4-11, Rapid/Line Template Pop-up Menu

3. Highlight the appropriate template, and press **ENTER** to display the graphic menu.

4. Enter the required values/settings in the entry fields.

Programming M-Code Blocks

The Commando supports M-Code functions. Enable available M-Codes at installation. Refer to the machine builder's technical data to determine which M-Codes are available.

Some programmed events initiate the same functions activated using M-Codes. Refer to **Table 4-3** for a list of the most commonly used M-Code functions.

Table 4-3, M-Code Functions

M Code	Programmed Event	Standard Function Usage (ref. EIA Standard RS 274-D)
M02	**EndMain** block.	Stops spindle and coolant.
M03	Activation of a tool that lists a **FWD** spindle direction on the Tool Page.	Start **CW** spindle rotation.
M04	Activation of a tool that lists a **REV** spindle direction on the Tool Page.	Start **CCW** spindle rotation.
M05	Activation of a tool block (to allow a tool change). Activation of a tool that contains a Tool Page spindle direction **OFF**.	Stop spindle in normal manner.
M08	Activation of a tool with coolant **ON** listed on the Tool Page.	Turn coolant pump **ON**.
M09	Activation of a tool with coolant **OFF** listed on the Tool Page.	Turn coolant pump **OFF**.

To program an **MCode** block:

1. In Edit Mode, press **MCode** (**F8**). The Graphic menu prompts for the **MCode** number and **X**, **Y**, **Z** values.

2. Type the values and press **Save** (**F10**) or **ENTER** to add **MCode** block to the program.

ANILAM

Section 5 - Programming Canned Cycles

Drilling Cycles

> **NOTE:** Program all blocks by filling in the entry fields of a Graphic Menu.

Drill cycles simplify the programming required for repetitive drilling, boring, and tapping operations. Select specific drill cycles from the Program Editor's Drill (**F3**) pop-up menu:

- ❑ Basic (drill cycle)
- ❑ Pecking
- ❑ Boring
- ❑ Drilling Off
- ❑ Pattern
- ❑ Bolt Hole

Drill cycles are modal. When the Commando encounters a block for any type of Drill cycle, it executes that cycle at the endpoint of each subsequent move until it encounters a **DrillOff** block. To change drill cycle parameters between moves, program a new drill block.

Basic Drill Cycle

The Basic Drill Cycle is a modal operation. When the Commando receives a **BasicDrill** command, it performs the drilling operation at the endpoint of every subsequent block until it receives a **Drilling Off** block. To change Basic Drilling dimensions cancel the current cycle and program a new cycle.

During the cycle, the tool rapids to the **StartHgt**, then Z feeds to **ZDepth**. To provide clearance for the next move, at the end of the cycle, the tool rapids to **ReturnHgt**.

Program a **DrillOff** block to deactivate the cycle. You can program any number of patterns and moves before turning off the cycle.

To program a **BasicDrill** block:

1. In Edit mode, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

2. Highlight **Basic**, and press **ENTER** to display the **BASIC DRILLING** Graphic Menu. Refer to Figure 5-1, BASIC DRILLING Graphic Menu.
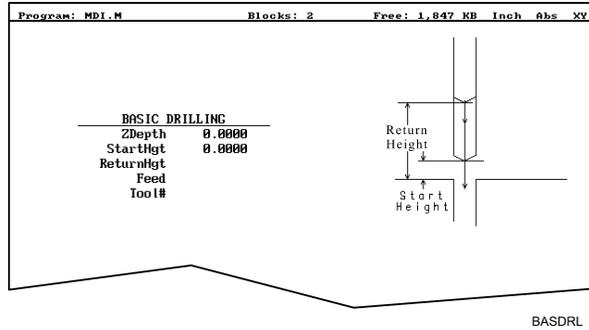
Figure 5-1, BASIC DRILLING Graphic Menu

3. Enter the required values and settings in the entry fields. With the last entry field highlighted, press **ENTER**. The display clears and the Commando adds the **BasicDrill** block to the program listing.

4. Program subsequent moves to position the tool at the required drilling location(s). The Commando will drill a hole at the endpoint of every move.

5. After programming the last drill move, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

6. Highlight **Drilling Off**, and press **ENTER** to cancel the Drilling Mode.

BASIC DRILLING entry fields:

ZDepth	The absolute depth of the finished hole. (Required)

> **NOTE:** **ZDepth** must be lower than **StartHgt**. **StartHgt** is 0.100 inches (2.0 mm) above the work surface.

|	
StartHgt	The absolute Z position the Commando rapids to before feeding into the work. (Required)
ReturnHgt	The absolute position to which the tool returns at the end of the cycle. (Optional)
Feed	Feedrate. (Optional)
Tool#	Active tool. (Optional)

Peck Drilling Cycle

Peck drilling is a modal operation. When the Commando receives a **PeckDrill** command, it peck-drills at the endpoint of every subsequent block until it receives a **Drilling Off** block. To change Peck Drilling dimensions, cancel the current **PeckDrill** cycle and program a new cycle.

The cycle starts when the Commando is in position. The tool rapids to the Z start height (**StartHgt**); feeds to the **Peck** depth; then rapids back to the **StartHgt**. This cycle repeats until the tool reaches **ZDepth**. At the end of the cycle, the tool rapids to the **ReturnHgt** to provide clearance for the next move.

ANILAM

To program a Peck Drilling cycle:

1. In Edit mode, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

2. Highlight **Pecking**, and press **ENTER** to display the **PECK DRILLING** Graphic Menu. Refer to **Figure 5-2**.
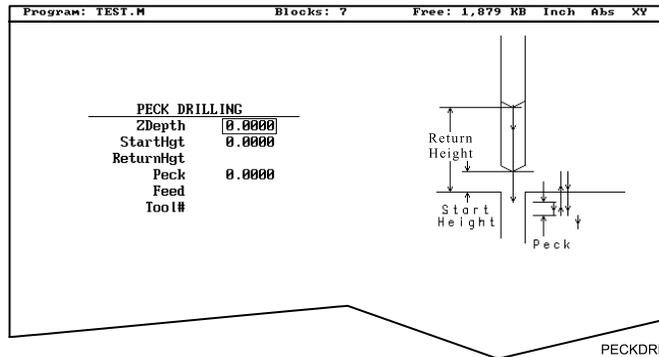
Figure 5-2, PECK DRILLING Graphic Menu

3. Enter the required values and settings in the entry fields. With the last entry field highlighted, press **ENTER**. The Display clears and the Commando adds the **PeckDrill** block to the program listing.

4. Program subsequent moves to position the tool at the required drilling location(s). The Commando will drill a hole at the endpoint of every move.

5. After programming the last drill move, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

6. Highlight **Drilling Off**, and press **ENTER** to cancel the Drilling Mode.

PECK DRILLING entry fields:

    ZDepth   Absolute depth of the finished hole. (Required)

> **NOTE:** **ZDepth** must be lower than **StartHgt**. **StartHgt** is 0.100 inches (2.0 mm) above the work surface.

    StartHgt   Absolute Z position the Commando rapids to before feeding into work. (Required)

    ReturnHgt   Absolute position the tool returns to at the end of the cycle. (Optional)

    Peck   Depth drilled in each peck. (Required)

    Tool#   Active tool. (Optional)
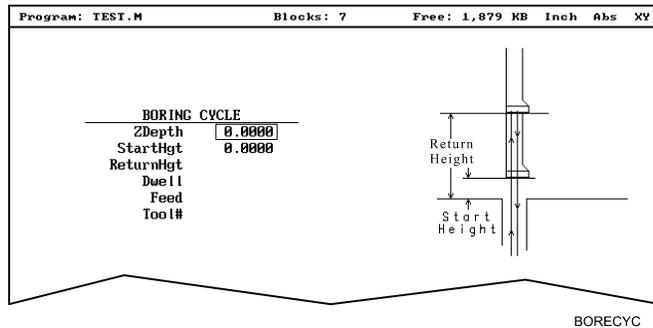
Boring Cycle

Boring is a modal operation. When the Commando encounters a **Boring** block, it executes a Boring Cycle at the endpoint of every subsequent move until it sees a **Drilling Off** block. To change Boring Cycle dimensions between moves, deactivate the cycle and program a new boring block.

The cycle starts when the Commando is in position. The tool rapids to the **StartHgt**, feeds to **ZDepth**, and then feeds back to **StartHgt**. At the end of the cycle, the tool moves to **ReturnHgt** to provide clearance for the next move.

When running a **Dwell** block, the Commando pauses at **ZDepth** for the indicated time period (in seconds). **Dwell** resolution is 0.1 sec. When you enter 0.0 sec., the Commando dwells until manually restarted.

To program a Boring cycle:

1. In Edit mode, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

2. Highlight **Boring**, and press **ENTER** to display the **BORING CYCLE** Graphic Menu. Refer to **Figure 5-3**.

Figure 5-3, BORING CYCLE Graphic Menu

BORING CYCLE entry fields:

ZDepth	Absolute depth of the finished hole. (Required)

> **NOTE:** **ZDepth** must be lower than **StartHgt**. **StartHgt** is 0.100 inches (2.0 MM) above the work surface.

StartHgt	Absolute Z position the Commando rapids to before feeding into work. (Required)
ReturnHgt	Absolute position to which the tool returns at the end of the cycle. (Optional)
Dwell	Length of time for pause at **ZDepth**.
Feed	Feedrate. (Optional)
Tool#	Active tool. (Optional)

3. Enter the required values and settings in the entry fields. With the last entry field highlighted, press **ENTER**. The display clears and the Commando adds **Boring** block to the program listing.

4. Program subsequent moves to position the work at the required boring locations. The Commando executes the Boring Cycle at the endpoint of every move.

5. After programming the last boring position, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

6. Highlight **Drilling Off**, and press **ENTER** to cancel the cycle.

Drill Pattern

The Pattern Cycle instructs the Commando to execute a pattern of regularly spaced moves. Locate a Pattern Cycle between a Drill Cycle and a **DrillOff** block. The Commando executes the Drill Cycle at every endpoint in the pattern.

In a Pattern Cycle, enter a size, location, spacing, Tool #, and rotation angle of the pattern.

To program a Drill Pattern cycle:

1. In Edit Mode, press **Drill** (**F3**) to display the **Drill** cycle pop-up menu.

2. Select **Pattern** from the **Drill** pop-up menu, and press **ENTER** to display the **PATTERN DRILL** Graphic Menu. Refer to **Figure 5-4**.
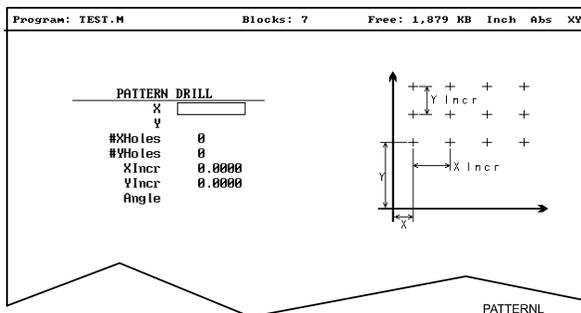
Figure 5-4, Pattern Drill Graphic Menu

PATTERN DRILL entry fields:

X	X coordinate of corner hole. If no entry made, Commando puts corner hole at present location. (Optional)
Y	Y coordinate of corner hole. If no entry made, Commando puts corner hole at present location. (Optional)
#XHoles	Number of rows that lie along the X-axis. Must enter value greater than 0. (Required)
#YHoles	Number of rows that lie along the Y-axis. Must enter value greater than 0. (Required)

> **NOTE:** Enter **1** in either the **#XHoles** or the **#YHoles** field to drill a single row or column.

Xincr	X-axis increment (spacing) of holes. (Required)
Yincr	Y-axis increment (spacing) of holes. (Required)
Angle	This value rotates the pattern. The XY corner hole is the pivot, and the rotation angle is the number of degrees counterclockwise from the X-axis or 3 o'clock position.

> **NOTE:** Use a **Drilling Off** block to cancel cycle.

3. Enter the required values and settings in the entry fields.

Bolt Hole Pattern

The Bolt Hole Cycle instructs the Commando to run a series of moves with endpoints that form a circular pattern. At each of these endpoints, you can run a previously programmed Drill Cycle.

You should first program a Drill Cycle to describe the hole being drilled. Then follow the Drill Cycle by one or more moves, patterns, or Bolt Hole cycles to position the Commando for the Drill Cycle. A **DrillOff** block cancels the cycle.

To program a Bolt Hole Cycle:

1. In Edit Mode, press **Drill** (**F3**) to display a pop-up menu.

2. Select **Bolt Hole** from the pop-up menu, and press **ENTER** to display the **BOLTHOLE DRILL** Graphic Menu. Refer to **Figure 5-5**.
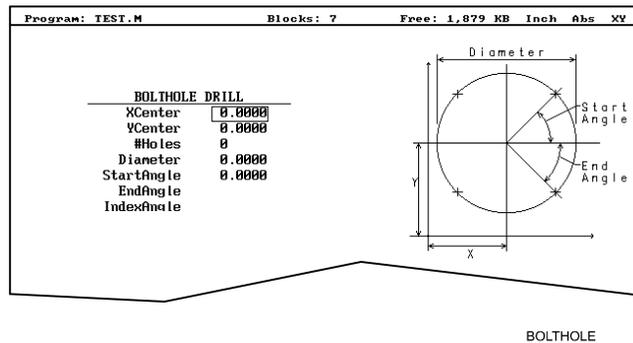
Figure 5-5, BOLTHOLE DRILL Graphic Menu

3. Enter the following required values and settings in the **BOLTHOLE DRILL** entry fields:

| **XCenter** | Absolute X center of the bolt hole pattern. If no entry is made, the Commando puts the center of the Bolt Hole pattern at X0. (Required) |
| **YCenter** | Absolute Y center of the bolt hole pattern. If no entry is made, the Commando puts the center of the Bolt Hole pattern at Y0. (Required) |

ANILAM

> **NOTE:** Use absolute center point coordinates whenever possible.

#Holes   Number of equally spaced holes in the circular pattern. (Required)

Diameter   Diameter of the circular pattern. (Required)

StartAngle   The number of degrees (from the 3 o'clock position) to the first hole. (Required)

EndAngle   The number of degrees (from the 3 o'clock position) to the last hole. (Optional)

IndexAngle   The number of degrees that the 3 o'clock reference position rotates around the center (rotates entire pattern).

> **NOTE:** Use a **Drilling Off** block to cancel the cycle.

Pocket Cycles

> **NOTE:** Program all blocks by filling in the entry fields of a Graphic Menu.

Pocket canned cycles simplify the programming of repetitive moves required to mill out pockets. Select the pocket-canned cycles from the Program Editor **Pocket** (**F4**) pop-up menu. Refer to **Figure 5-6**.

> **NOTE:** Programming a **Tool#** in a pocket cycle automatically activates the necessary tool compensation for that cycle.

```
  1 Dim Abs
  2 Unit Inch
  3 Rapid        X 0.00000 Y 0.00000
  4 Tool# 1      MCode 6
  5 Mill         XStart    ▶Face        00000 StartHgt 0.10000
        ZDepth -0.5000   Rectangular   0 ToolComp Right ZFeed 20.0
        FinStock 0.050      Frame
  6 Y 1.00000
  7 X 2.00000

 Teach   Draw   Drill  Pocket   Mill   Tool   Calc   Sub   Misc   Exit
```
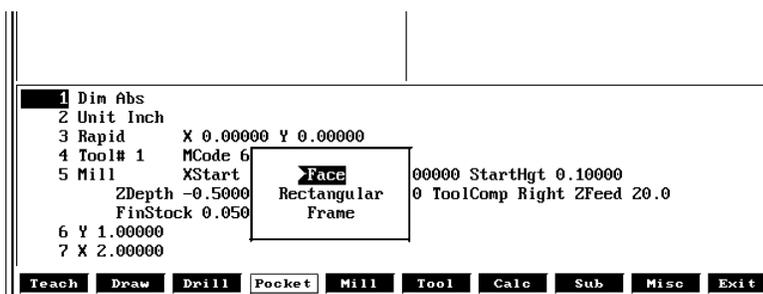
Figure 5-6, Pocket Pop-up Menu

Facing Cycle

Facing cycles simplify the programming required to face the surface of a part.

Execution begins one tool radius from the start point. The selected step-over determines the approach axes.

> **NOTE:** A **ZDepth** entry is not necessary if you program only one level plus finish stock.

Facing cycles can start in any corner of the surface and cut in any direction, depending on the sign (+/-) of the **Length** and **Width** values. Program a slightly oversize **Length** and **Width** to ensure complete facing of the surface.

At the end of the cycle, the tool rapids to **StartHgt**, then rapids back to the start position. Refer to **Figure 5-7**.
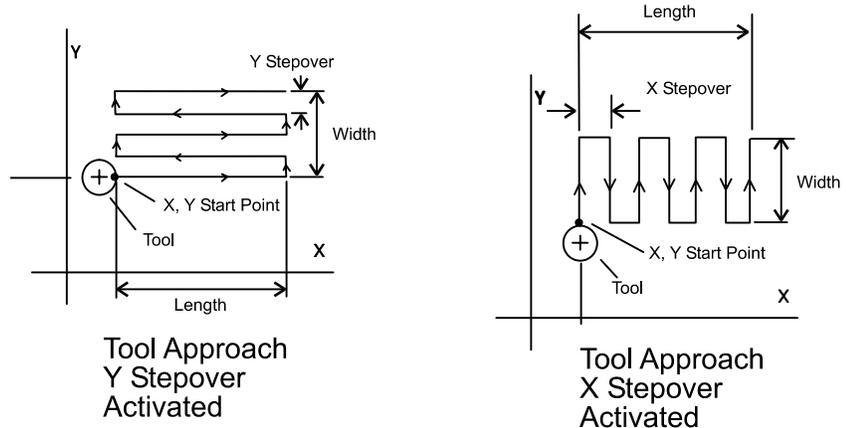
Figure 5-7, Face Cycle Tool Approach

To program a Facing cycle:

1. In Edit Mode, press **Pocket** (**F4**) to display a pop-up menu.

2. Move the highlight to select **Face**, and press **ENTER** to display the **FACE POCKET** Graphic Menu. Refer to **Figure 5-8**.
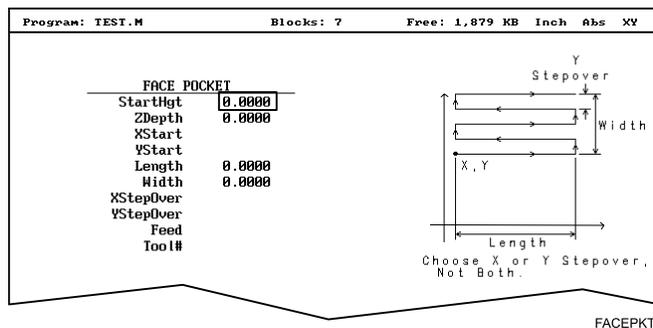
Figure 5-8, FACE POCKET Graphic Menu

31-October-05

ANILAM

> **NOTE:** **ZDepth** must be lower than **StartHgt**. **StartHgt** is 0.100 inches (2.0 mm) above the work surface.

FACE POCKET entry fields:

ZDepth	Absolute depth of the finished surface. (Required)
StartHgt	Absolute Z position the Commando rapids to before feeding into work. (Required)
XStart	X coordinate of the starting point. (Optional)
YStart	Y coordinate of the starting point. (Optional)

> **NOTE:** Enter the required absolute **XStart** and **YStart** coordinates when possible.

Length	X-axis length to be faced. (Required)
Width	Y-axis length to be faced. (Required)
XStepover	Width of cut in the X-axis direction. When no value is entered, the Commando defaults to 70% of the active tool radius. Maximum step-over permitted is 70% of the active tool radius.
YStepover	Width of cut in the Y-axis direction. When no value is entered, the Commando defaults to 70% of the active tool radius. Maximum step-over permitted is 70% of the active tool radius.

> **NOTE:** Enter either an X or Y step-over. Do not enter both.

> **NOTE:** The Program Editor inadvertently will allow you to write a block containing a **Stepover** value greater than 70% of the active tool radius. To reveal this type of error, test the program in the Draw Graphics Mode.

Tool#	Active tool. (Optional)

3. Enter the required values and settings in the entry fields.

Rectangular Pocket Cycle

Rectangular Pocket cycles simplify the programming required to mill out rectangular pockets. When executed, the Commando rapids to the center of the lower left radius, rapids to the **StartHgt**, then ramps into the work toward the narrow center of the pocket. From the pocket center, the Commando mills increasingly larger rectangles until it reaches the specified **Length** and **Width**.

The Rectangular Pocket Cycle automatically compensates for tool diameter. Activate the correct tool diameter before or within the **RectPock** block.

If you enter **DepthCut**, the Commando executes the number of passes required to get from the **StartHgt** to the **ZDepth**, cutting the **DepthCut** on each pass.

Use **FinStock** to leave the specified stock on the profile and depth for a finish pass. The Commando cuts the rectangle to the **Length**, **Width**, and **ZDepth** dimensions on the finish pass. Enter a negative **FinStock** to leave the finish stock without adding a finish pass.

If you do not enter a **RoughFeed** or **FinFeed** value, the Commando executes feed moves at the current feedrate. **RoughFeed** controls the feedrate of the roughing cycle. **FinFeed** controls the feedrate of the finishing cycle.

To program a Rectangular Pocket cycle:

1. In Edit Mode, press **Pocket** (**F4**) to display a pop-up menu.

2. Highlight **Rectangular**, and press **ENTER** to display the **RECTANGULAR POCKET** Graphic Menu. Refer to **Figure 5-9**.
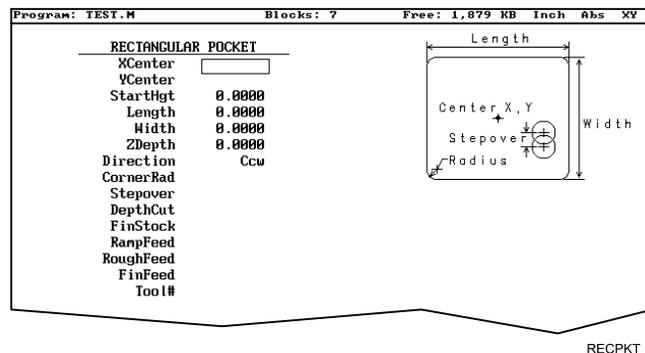
Figure 5-9, RECTANGULAR POCKET Graphic Menu

ANILAM

3. Fill in the **RECTANGULAR POCKET** entry fields:

XCenter	X coordinate of the center. If you do not enter a coordinate, the pocket centers at the present position. (Optional)
YCenter	Y coordinate of the center. If you do not enter a coordinate, the pocket centers at the present position. (Optional)
StartHgt	Absolute Z position to which the Commando rapids to before feeding into the work. (Required)

> **NOTE: StartHgt** is 0.100 inches (2.0 mm) above the work surface. **ZDepth** must be lower than **StartHgt**.

Length	Inside Y length of the finished pocket. (Required)
Width	Inside X length of the finished pocket. (Required)
ZDepth	Absolute depth of the finished pocket. (Required)
Direction	Allows you to select a clockwise (**Cw**) or counterclockwise (**Ccw**) direction. Press **+/-** to toggle the selection. Selection required.
Stepover	Width of cut. If you do not enter a value, the Commando defaults to 70% of the active tool radius. The maximum step-over permitted is 70% of the active tool diameter. (Optional)
DepthCut	Depth the machine takes in a single pass. Defaults to a single **ZDepth** cut minus the finish stock. (Optional)
FinStock	Amount of stock left by the machine before the finish pass. [Default: **0**] Enter a negative value to leave the stock without making a finish pass. (Optional)
ZFeed	Z-axis feedrate. (Optional)
RoughFeed	Rough pass feedrate. (Optional)
FinFeed	Finish pass feedrate. (Optional)
Tool#	Active tool. (Optional)

Frame Pocket Cycle

A Frame Pocket Cycle simplifies the programming required to mill out a Frame. When executed, the Commando rapids to a starting position near the island, rapids to **StartHgt**, then ramps into the work while moving across the **Frame**. The Commando cuts from the outside edge to the island in rectangles of decreasing size to complete the pass.

The Frame Pocket Cycle automatically compensates for tool diameter. Activate the correct tool diameter before or within the **FramePock** block.

If you enter a **DepthCut** value, the Commando executes the number of passes required to get from the **StartHgt** to the **ZDepth**, cutting the **DepthCut** on each pass.

Use **FinStock** to leave the specified stock on the profile and depth for a finish pass. The Commando cuts the frame to the **IslandLen**, **IslandWid**, and **FrameWidth** dimensions on the finish pass. Enter a negative **FinStock** value to leave the finish stock without adding a finish pass.

Leave **RoughFeed** and **FinFeed** blank to execute feed moves at the current feedrate. **RoughFeed** controls the feedrate of the roughing cycle. **FinFeed** controls the feedrate of the finishing cycle.

To program a Frame Pocket cycle:

1. In Edit Mode, press **Pocket** (**F4**) to display a pop-up menu.

2. Highlight **Frame**, and press **ENTER** to display the **FRAME POCKET** Graphic Menu. Refer to **Figure 5-10**.
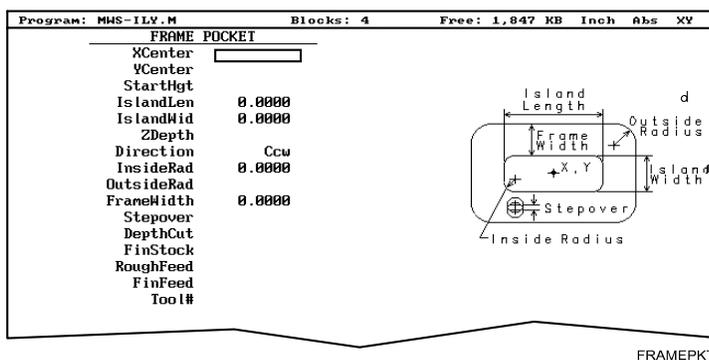
Figure 5-10, FRAME POCKET Graphic Menu

3. Fill in the **FRAME POCKET** entry fields:

XCenter	X coordinate of the center. [Default: pocket centers at present position] (Optional)
YCenter	Y coordinate of the center. [Default: pocket centers at present position] (Optional)

                                    31-October-05

ANILAM

StartHgt	Absolute Z position to which the Commando rapids before feeding into the work. (Required)

> **NOTE:** **StartHgt** is 0.100 inches (2.0 mm) above the work surface. **ZDepth** must be lower than **StartHgt**.

IslandLen	Outside length (X-axis) of finished island. (Required)
IslandWid	Outside width (Y-axis) of finished island. (Required)
StartHgt	Absolute Z position to which the Commando rapids before feeding into the work. (Required)
Direction	Allows you to select conventional or climb milling for the pocket. The selections are clockwise (**Cw**) and counterclockwise (**Ccw**). Press **+/-** to toggle the selection. Selection required.
InsideRad	Radius of the island corners. (Required)
OutsideRad	Outside radius of the frame corners. (Required)
FrameWidth	Width of the finished frame. (Required)
Stepover	Width of cut. If no value is entered, the Commando defaults to 70% of the active tool radius. Maximum step-over permitted is 70% of the active tool diameter. (Optional)
DepthCut	Z-axis increment used for each pass. (Optional)
FinStock	Amount of stock left by the machine before the finish pass. [Default: **0**] Enter a negative value to leave the stock without making a finish pass. (Optional)
RampFeed	Z-axis feedrate. (Optional)
RoughFeed	Rough pass feedrate. (Optional)
FinFeed	Finish pass feedrate. (Optional)
Tool#	Active Tool. (Optional)

Subprograms

Program repetitive operations in a subprogram called from the main program.

❑ Call (or nest) subprograms within other subprograms. The Commando supports up to ten levels of nesting.

❑ Repeat or loop subprograms, moving along any axis in increments each time the loop runs.

❑ Rotate, scale, or mirror subprograms.

The following examples describe two situations where subprograms save time.

Situation: 1 (Repetitive Drilling Cycle)

When a workpiece must be center-drilled, drilled, then counterbored, each of the three tools must go to the same hole positions consecutively. Ten hole positions would require thirty programmed hole locations (ten for each tool). Program the ten hole locations in a subprogram called three times from the main program (once for each tool).

Situation: 2 (Rough and Finish Cycles)

Use subprograms for jobs that require both roughing and finishing cycles. Rough out the outside of a workpiece with a roughing mill, and then finish it with a finishing mill. Program the profile in a subprogram. The main program calls the subprogram twice, once for each tool. You can set the tool diameter to 0.5300 inches for the .5-inch roughing mill and to 0.5000 inches for the 0.5-inch finishing mill. Tool #1 will leave 0.0150 inch excess stock per side. Tool #2 finishes the work to size.

Subprogram Structure

When using subprograms, define the end of the main program and the start and end of each subprogram.

Subprogram Example

1	Dim Abs		
2	Rapid	X 5.0000 Y -5.0000	
3	Call 1		
4	Rapid	X 6.0000 Y -6.0000	
5	Call 1		
6	Rapid	X 7.0000 Y -5.0000	
7	Call 1		
8	**EndMain**		**End of Main Program**
9	**Sub 1**		**Start of Subprogram 1**
10		Z -0.0625	
11	Dim Incr		
12	Line	X 0.375	
13	Line	Y 0.375	
14	Line	X -0.375	
15	Line	Y -0.375	

ANILAM

```
16  Dim Abs
17              Z  0.1000
```
18 EndSub   End of Subprogram 1
19 <End Of Program>   End of Program

The main program begins at Block 1 and runs through Block 8. The subprogram begins at Block 9 and runs through Block 18.

When the main program reaches Block 3, the Commando jumps to Block 9, runs the subprogram through Block 18, and then returns to the main program, Block 4.

Blocks 5 and 7 call the subprogram again.

Organizing Programs Containing Subprograms

To write a program that includes a subprogram:

1. Write the main program and include the subprogram **Call** blocks.

2. Insert an **EndMain** block at the end of the main program.

3. Insert a **Sub** block, followed by a unique subprogram call number (1 to 9999), on the first block of the subprogram. Example: Sub1.

4. Write the subprogram blocks.

5. Finish the subprogram with an **EndSub** block.

6. End the program with an **<End of Program>** block.

Calling Subprograms from the Main Program

To call a subprogram from the main program:

1. In Edit Mode, press **Sub** (**F8**) to display the Subprogram soft key labels.

2. Press **Call** (**F3**). The Graphic Menu prompts for the subprogram number.

3. Enter a subprogram number, and press **ENTER** to add **Call** block to program.

Ending Main Programs

To program an **EndMain** block:

1. In Edit Mode, press **Sub** (**F8**) to display the Soft key subprogram labels.

2. Press **EndMain** (**F4**) to display the **EndMain** block in the program listing.

Starting Subprograms

Start subprograms with a **Sub** block.

To program a **Sub** block:

1. In Edit Mode, press **Sub** (**F8**) to display the **Sub** soft keys.

2. Press **Sub** (**F2**). The Commando prompts for subprogram number.

3. Enter **Sub** number, and press **ENTER** to add a **Sub** block to the program. The **Sub** number must agree with the matching **Call** number.

Ending Subprograms

End subprograms with an **EndSub** block.

To program an **EndSub** block:

1. In Edit Mode, press **Sub** (**F8**) to display the **Sub** soft keys.

2. Press **EndSub** (**F2**) to add an **EndSub** block to the program.

Looping Subprograms

Looping subprograms repeat a set number of times before they return to the main program. The Commando tracks the number of loops.

NOTE: Only subprograms can loop.

To call a Loop subprogram:

1. In Edit Mode, press **Sub** (**F8**) to display the **Sub** soft keys.

2. Press **Loop** (**F5**) to activate the **LOOP SUB** Graphic Menu.

3. Fill in the **LOOP SUB** entry field:

Sub#	Subprogram identification number. (Required)
#Loops	Number of times loop repeats before it returns to the main program. (Required)
Xincr	Distance X-axis increments every cycle. (Optional)
Yincr	Distance Y-axis increments every cycle. (Optional)
Zincr	Distance Z-axis increments every cycle. Cannot be used with **Xincr** or **Yincr**. (Optional)
ZFeed	Feedrate used with **Zincr** (Optional)
Tool#	Active tool. (Optional)

Sample Programs

Five sample programs are provided to demonstrate Commando three-axis programming concepts. First time Commando programmers may find it helpful to key in these programs and view them in **Draw**, or run them in a machine without a tool.

> **NOTE:** The following programs are examples of 3-axis Commando programs.

Drill Program - Example #1

This program drills 5 holes in a surface using tool #1, then returns to tool change position. See **Figure 5-11**. Before running, enter a 0.5 in. diameter for tool #1, on the tool page. See "Section 10 - Tool Management."
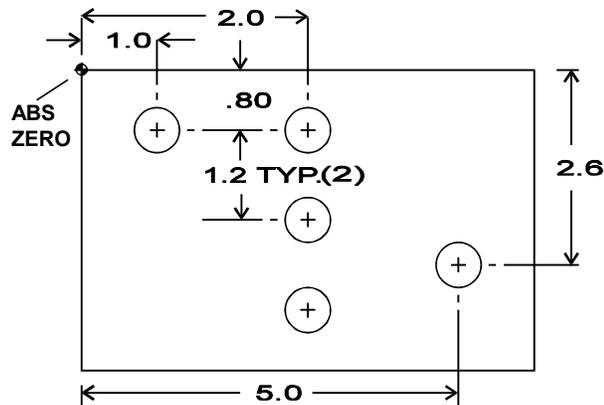
Figure 5-11, Example Program #1 Layout

```
1    Dim Abs
2    *  .5  DRILL
3    BasicDrill  ZDepth  -0.6500  StarHgt  0.10  Tool# 1
4    Rapid        X  1.0000  Y  -.8000
5          X  2.0000
6    Dim Incr
7          Y-1.2000
8          Y-1.2000
9    Dim Abs
10         X  5.0000  Y  -2.6000
11   DrillOff
12   Tool#  0
13   Rapid        Z  0.0000
14         X  -3.0000  Y  1.0000
15   <End Of Program>
```

Mill Program - Example #2

This program will use tool #1 to climb-cut around the inside of the part. See **Figure 5-12**. Before running, enter a 0.5 in. diameter for tool #1, on the tool page. See "Section 10 - Tool Management."

Figure 5-12, Example Program #2 Layout

```
1   Dim Abs
2   *  1/2 ENDMILL
3   Rapid      X -3.0000 Y 0.5000 Tool# 1
4          Z 0.1000
5   Line  Z -2.500
6   Line  X -3.5000  ToolComp  Left
7   Line  Y 0.0000
8   Line  X 4.5000
9   Line  Y -2.0000
10  Line  X 6.0000
11  Dim Incr
12  Line  Y -2.5000
13  Dim Abs
14  Line  X 7.5000
15  Line  Y 2.5000
16  Line  X -3.500
17  Line  Y 0.5000
18  Line  Z 0.1000
19  Rapid      X 0.0000  ToolComp  Off
20  Rapid      Z 0.0000  Tool# 0
21  <End Of Program>
```

ANILAM

Pocket Program - Example #3

This program uses tool #1 to mill out a rectangular pocket. See **Figure 5-13**. Before running, enter a 0.5 in. diameter on the tool page for tool #1. See "Section 10 - Tool Management."
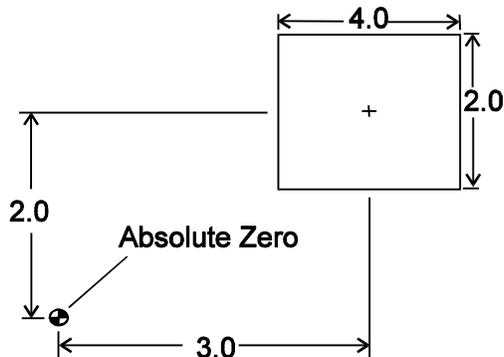
Figure 5-13, Example Program #3 Layout

1 Dim Abs
2 RectPock XCenter 3.0000 YCenter 2.0000 StartHgt 0.1000
   Length 4.0000 Width 2.0000 ZDepth -0.3750 Ccw
   Stepover 0.3000 DepthCut 0.1875 FinStock 0.0150 Tool# 1
3 Rapid   Z 0.0000 Tool# 0
4   X -3.0000 Y 3.0000
5 <End Of Program>

Program with Subprogram - Example #4

This program uses tool #1 to center drill, tool #2 to drill, and tool #3 to counterbore four holes. See **Figure 5-14**. Before running, enter a 0.25 in. diameter for tool #1, a 0.5 in. diameter for tool #2, and 0.5 in diameter for tool #3, on the tool page. See "Section 10 - Tool Management."
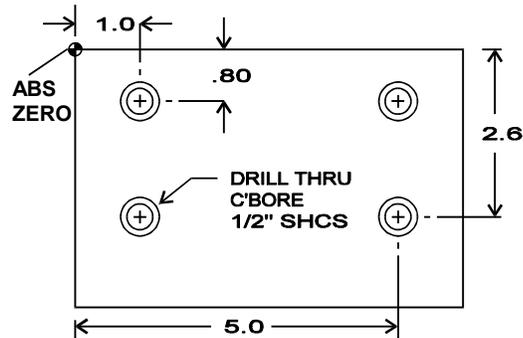
Figure 5-14, Example Program #4 Layout

```
 1   DimAbs
 2   Tool#  1
 3   BasicDrill   ZDepth  -0.1800  StartHgt  0.1000
 4   Call  1
 5   Tool#  2
 6   BasicDrill   ZDepth  -0.6500  StartHgt  0.1000
 7   Call  1
 8   Tool#  3
 9   Boring        ZDepth  -0.2800  StartHgt  0.1000  Dwell  0.7
10   Call  1
11   EndMain
12   Sub  1
13   Rapid        X  1.0000  Y  -0.8000
14         X  5.0000
15         Y  -2.6000
16         X  1.0000
17   DrillOff
18   Tool#  0
19         Z  0.000
20         X  -1.0000  Y  1.0000
21   EndSub
22   <End Of Program>
```

Program with Looping Subprogram - Example #5

This program loops a subprogram to cut three L shaped pockets. using tool #1. Because the subprogram runs in the incremental mode, the shape can be cut anywhere on the workpiece. See **Figure 5-15**. Before running, enter a 0.25 in. diameter for tool #3, on the tool page. See See "Section 10 - Tool Management."
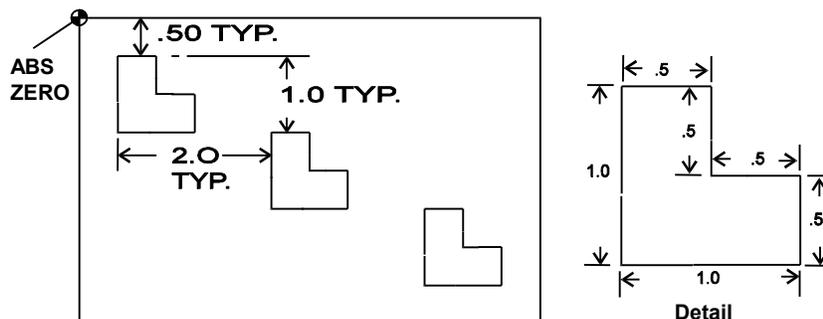
Figure 5-15, Example Program #5 Layout

```
1   DimAbs
2   Rapid      X 0.7500 Y -0.7500 Tool# 3
3   * TOOL DIA .25
4   Loop Sub# 1 #Loop 3 XIncr 2.0000 YIncr -1.0000
5   Rapid      Z 0.0000 Tool# 0
6   EndMain
7   Sub 1
8   Dim Abs
9   Rapid      Z 0.1000
10  Line Z -0.5000
11  Dim Incr
12  Line Y 0.2500 ToolComp Left
13       X -0.2500
14  Line Y -1.0000
15       X 1.0000
16       Y 0.5000
17  Line X -0.5000
18       Y 0.5000
19       X -0.2500
20  Line Y -0.2500 ToolComp Off
21  DimAbs
22  Rapid      Z 0.1000
23  EndSub
24  <End Of Program>
```

ANILAM

Section 6 - Editing Programs

Write and edit program blocks in the Commando's Program Editor (the Edit screen). Activate the Program Editor to put the Commando in the Edit Mode.

The Program Editor activates from the Program Directory or the Manual screen. When the Program Editor activates from the Program Directory, the highlighted program opens for editing. When the Program Editor activates from the Manual screen, the loaded program opens for editing.

Activating the Program Editor

There are two ways to activate the Program Editor screen.

To activate the Program Editor from the Program Directory:

1. From the Program Directory, highlight a program.

2. Press **Edit** (**F4**). The Program Editor opens selected program for editing.

To activate the Program Editor from the Manual screen:

1. From the Manual screen, press **EDIT** (**F4**). The Editor opens the loaded program. If no program is loaded, the Commando will display a "**No Program Selected !**" message.

2. Press **PROGRAM** (**F2**) to activate the Program Directory.

3. Highlight a program.

4. Press **Edit** (**F4**). The Program Editor opens selected program for editing.

The Program Editor Screen

The Program Editor monitors mode changes written to a program. The mode indicators displayed in the Program Editor indicate the Commando's active modes. Refer to Figure 6-1, Program Editor.

Program Name

(edited) Marker

Program Size (Blocks)

```
Program: TEST.M (edited)      Blocks: 7      Free: 1,879 KB   Inch  Abs  XY
```

Active Plane

Active Positioning Mode

Active Units Mode

Available Memory

Graphic Menu
Display Area

```
1 Dim Abs
2 * .5 DRILL
3 BasicDrill ZDepth -0.6500 StartHgt -0.6000 Tool# 1
4 Rapid      X 1.0000 Y -8.0000
5 Rapid      X 2.0000
6 Dim Incr
7 Dim Abs
8 <End Of Program>
```

```
Teach   Draw   Drill   Pocket   Mill   Tool   Calc   Sub   Misc   Exit
```

EDITORL

Program Listing

Soft Key Labels

Figure 6-1, Program Editor

Program Name	Name of program opened for editing.
(edited) Marker	Indicates that the programmer has edited the program, but the edits have not been saved.
Program Size	Number of blocks in the program.
Active Plane	Current operating plane (XY).
Active Positioning Mode	
	Current measurement mode (**Abs/Inc**).
Active Units Mode	
	Current units mode (**Inch/MM**).
Available Memory	Space remaining in the Editor's memory.
Graphic Display Menu Area	
	Area for displaying Graphic Menus.
Program Listing	Current listing of the blocks in the open program.
Highlight	Enables you to select a block to edit and acts as an insertion marker to add new blocks. The Commando tracks program mode changes up to this point in the Program Listing.

ANILAM

Soft Key Labels These labels define the soft key functions. Three sets of soft keys are available:

❑ Default set, normally visible.

❑ Misc soft keys, activated by pressing Misc (**F9**).

❑ Sub soft keys, activated by pressing Sub (**F8**).

Saving Edits

The Program Listing displays text entered by the programmer. The Commando does not save edits until you exit the Editor. If the **(edited)** marker is visible at the top of the Program Editor, the open program contains unsaved edits.

To save edits:

1. In Edit Mode, press **Exit** (**F10**). The Commando saves all edits and returns to the Program Directory.

Canceling Unsaved Edits

To cancel unsaved edits:

1. In Edit Mode, press **Misc** (**F9**). Misc soft key labels are displayed.

2. Press **Quit** (**F8**). A "**WARNING: Program has been edited. Sure you want to QUIT?**" message is displayed and soft key labels change.

3. Press **Yes** (**F1**). The Commando returns to the Program Directory. No edits are saved. Press **No** (**F2**) to cancel.

Deleting a Block

To delete a program block:

1. In Edit Mode, highlight a block.

2. Press **CLEAR**.

Inserting a Block

To insert a program block:

1. In Edit Mode, highlight the block that will follow the inserted block.

2. Program the new block from the appropriate Graphic Menu. When you save the new block, it is displayed in front of the highlighted block. Blocks are automatically renumbered.

31-October-05

Editing Blocks

To edit a program block:

1. In Edit Mode, highlight a block.

2. Press **ENTER** if the existing block is a move or cycle. The appropriate Graphic Menu opens.

3. Highlight the entry fields that require changes. Press **CLEAR** to erase existing values.

4. Make the appropriate changes. Press **Save** (**F10**) to close the block.

NOTE:	When the program block's Graphic Menu offers a choice of two modes (example, Cw/Ccw), highlight the block and press the (**+/-**) key to change the selection.

Searching Blocks for Words or Numbers

Use **Search** to find a block number or word. **Search** hunts forward from the cursor position only. To search an entire program, place the cursor at the beginning of the program, then activate **Search**.

To search for a block number or word:

1. In Edit Mode, Press **Misc** (**F9**). The soft key menu changes.

2. Press **Search** (**F3**). The Commando prompts for block number or word.

3. Use the ASCII chart to enter the block number or word. (You can also use the keypad to enter numbers.)

4. Press **ENTER**. The Commando searches and highlights the next block that contains the specified word or block number.

Scrolling the Program Listing

In Edit Mode, use the up and down **ARROWS** to scroll through the Program Listing.

Paging through the Program Listing

To scroll through the Program Listing one page at a time:

1. In Edit Mode, Press **Misc** (**F9**). Soft key secondary functions are displayed.

2. Press the **PgUp** (**F4**) or **PgDn** (**F5**) keys to go forward or backward.

3. Press **Prev** (**F9**). The Program Editor default soft keys return.

Jumping to First or Last Block in the Program

To jump to the first or last block of the Program Listing:

1. In Edit Mode, press **Misc.** (**F9**). Soft key secondary functions are displayed.

2. Press **Begin** (**F6**). The Commando displays the first block of the program.

    – or –

    Press **End** (**F7**). The Commando displays last block of the program.

Using Comments

The Commando will ignore comment blocks. You can add a new comment block to a program or convert an existing block into a comment. Comment blocks typically contain program setup or tool information, or are used to comment out existing blocks.

Writing a Comment Block

To write a comment block:

1. In Edit Mode, press **Misc.** (**F9**). Soft key secondary functions are displayed.

2. Press **Comment** (**F2**). The Commando prompts for a comment and the **ASCII** soft key label is displayed.

3. Use the ASCII Chart to enter comments.

Commenting Out Existing Blocks

To comment out an existing block:

1. In Edit Mode, highlight the block being commented out.

2. Press **0** on the keypad. An asterisk is displayed after block number.

NOTE:	Off-line keyboard users must use the **0** key (not the asterisk) to produce a comment block.

Canceling a Comment

To cancel a comment:

1. In Edit Mode, highlight the comment block to be canceled.

2. Press **0**. The asterisk disappears. The block is no longer ignored during program execution.

NOTE:	Off-line keyboard users must use the **0** key to switch the asterisk on or off.

Using Block Operations to Edit a Program

In conversational editor, use the **Misc** (**F9**) – **More** (**F1**) soft key to display the More pop-up menu. See **Table 6-1** for a description of the features. See **Figure 6-2**. To display the More pop-up menu:

1. In the conversational editor, select **Misc** (**F9**).

2. Press **F1** (**More**) to display the More pop-up menu.

Table 6-1, More Pop-up Menu

Feature	Hot Key	Description
Mark	'M'	Allows program blocks to be marked for a subsequent Cut, Copy, or Delete operation. Selecting Mark again turns off marking.
Copy	'C'	Copies marked blocks into scrap buffer for a subsequent Paste operation. Marking is turned off. Selecting Copy with no blocks marked copies the current block into the scrap buffer.
Paste	'P'	Paste contents of scrap buffer in current location (i.e., above current block).
Cut	'V'	Copies marked blocks into scrap buffer and deletes them. Marking is turned off. Selecting Cut with no blocks marked cuts the current block into the scrap buffer.
Delete	CLEAR	Deletes marked blocks.
Open Program	'O'	Allows the user to open another program for editing without leaving the editor. The scrap buffer is preserved which allows blocks to be copied or moved from one program to another program.
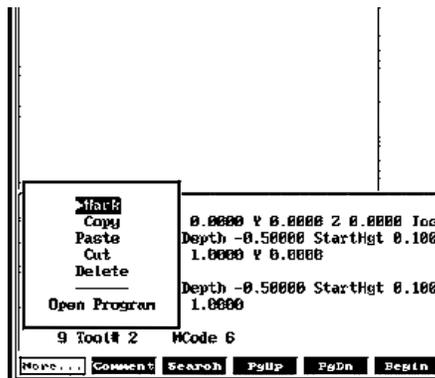
Figure 6-2, More Pop-up Menu

Section 7 - Viewing Programs with Draw

The Commando has two Draw Modes:

Draw Simulation Mode   The Commando runs programs to simulate machine movements in the viewing area. The machine does not move.

Real-time Draw Mode   The Commando displays machine moves in the viewing area as it makes them.

In this manual, "Draw Mode" (upper and lowercase letters) refers to the Commando's Draw Simulation Mode. "DRAW" (all uppercase letters) refers to the Commando's Real-Time Draw Mode. The same spelling convention is used for the soft keys.

NOTE: Although both Draw screens have viewing areas in the upper-right corner of the screen, the operation of each varies. Real-Time DRAW looks like a programmed operation screen (Manual, Auto, Single-Step) with a viewing area in the upper-right corner. The **DRAW** (**F10**) soft key highlights and the soft keys change. Simulation Draw looks like an **Edit** screen with a viewing area in the upper-right corner, with the Draw soft keys active.

This section of the manual explains how to use the Draw Simulation Mode to view programs. It also explains how to change viewing settings to permit a detailed inspection of programmed moves.

Use the Draw Simulation Mode soft keys to change Draw Mode view settings. Refer to "Section 8 - Running Programs" for instructions on how to run DRAW while cutting a part.

Draw Mode allows you to verify a program before you cut any material. In Draw, you can zoom in or out, or scale the drawing as required.

NOTE: You can make display setting changes at any time in the Draw Simulation Mode, but not in the Real-time Draw Mode.

Activate **Draw Simulation Mode** from the Edit Mode or Manual Data Input (MDI) Mode. Activate **Real-Time Draw Mode** from Manual, S. Step or Auto Mode.

Starting Draw Mode

Start Draw Simulation Mode from the Edit or MDI Mode. The **DISPLAY** (**F5**) and **Parms** (**F9**) settings determine how Draw Mode looks and runs. Adjust view settings before you start the simulation. Make setting changes via the soft keys.

In Draw Simulation Mode, the Commando does not halt for dwells and tool mounts.

To activate the Draw Simulation Mode:

1. In Edit Mode, with a program selected, press **Draw Mode** (**F2**). The viewing area is displayed in the upper-right corner of the screen. Draw Mode soft keys activate.

2. Press **DISPLAY** (**F5**). A pop-up menu is displayed with **Fit** highlighted.

3. Press **ENTER**. **Fit** scales the image to fit in the viewing area.

4. Press **Run** (**F3**) to run the loaded program. The image of the tool path is displayed in the viewing area and the machine remains idle.

NOTE:	The Draw Mode display remains on the Edit screen until cleared.

NOTE:	If you set Draw Mode to display both compensated and uncompensated moves, Draw Mode runs the program twice: once with and once without compensated moves. The tool paths of both versions appear simultaneously on the screen for comparison.

Draw Mode Screen Description

The Draw Mode screen looks like the Edit screen with the addition of a viewing area in the upper-right corner. Draw Mode soft keys activate and the **Draw** (**F2**) soft key highlights. Refer to **Figure 7-1**.
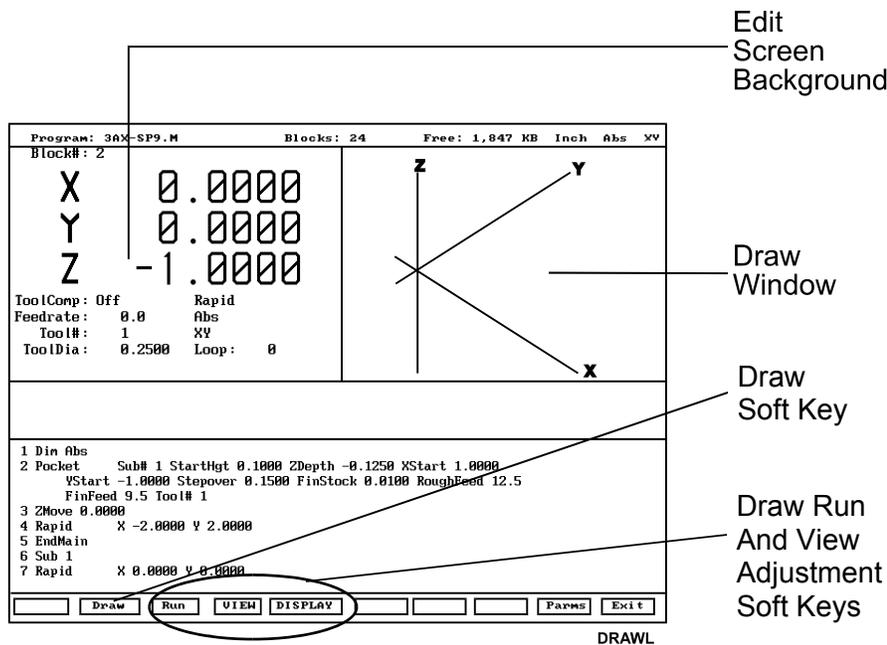
Figure 7-1, Draw Mode Simulation Mode

Putting Draw Mode in Hold

Press **Hold** (**F8**) or **HOLD** to pause a program running in Draw Mode.
Press **Start** (**F7**) or **START** to resume.

Canceling Draw Mode

Press **Cancel** (**F9**) to stop program execution in Draw Simulation Mode.

Draw Mode Parameters

In Draw Mode, rapid moves appear as dotted lines; feed moves appear as solid lines; tools and drilled holes appear as cylinders.

Certain view parameters deactivate during program simulation. To set viewing parameters before you run the program, activate the **Parms** (**F9**) pop-up menu. Refer to **Figure 7-2**. To set viewing parameters while you run a program, press the appropriate soft keys.
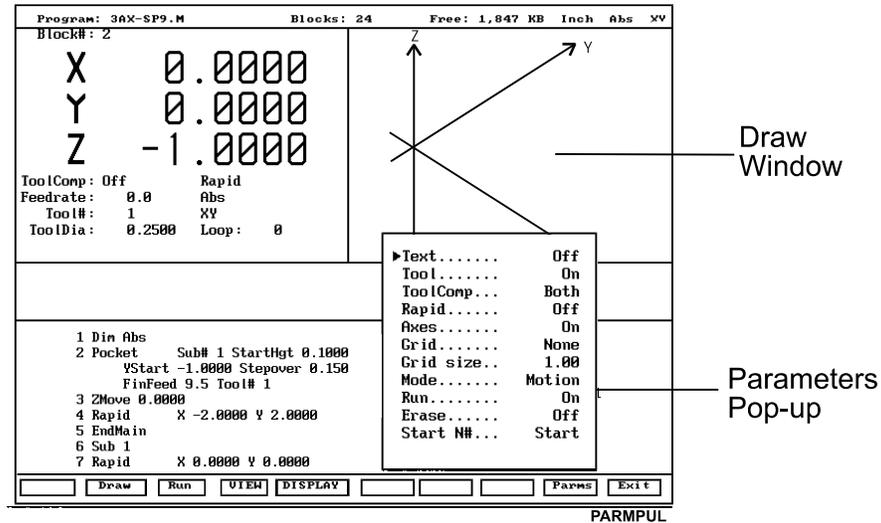
Figure 7-2, Draw Mode Parameters Pop-Up Menu

Text On or Off

Turn **Text On** to display program blocks as they run. This can help you to pinpoint a problem. Draw Mode runs slightly faster with **Text** turned **Off**. [Default: **Text On**]

To switch the **Text On**/**Off** setting:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Text**, and press **ENTER**. **Text** switches **On** and **Off**.

3. Press **Parms** (**F9**). Pop-up closes.

NOTE: In Draw Mode, press **Text** (**F4**) to change the **Text** parameter.

31-October-05

ANILAM

Tool On or Off

Turn **Tool On** to display a drawing of the tool as it moves through the program. Draw Mode displays only the active tool. The tool must have a diameter on the Tool Page to appear in Draw Mode. Draw Mode displays the tool as a cylinder scaled to the corresponding diameter.
[Default: **On**]

To switch **Tool On/Off** setting:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Tool**, and press **ENTER**. **Tool** switches between **On** and **Off**.

3. Press **Parms** (**F9**). Pop-up closes.

> **SHORTCUT:** Press **Tool** (**F5**) to switch the Tool **On/Off**.

Draw Mode Compensated Moves

Use **ToolComp** to view compensated moves in Draw Mode.
[Default: **Both**]

There are three **ToolComp** options:

❑ **Ignore** a program's compensated moves.
❑ **Use** (display) a program's compensated moves.
❑ **Both** runs the program twice. (First without compensation then with compensation.) Draw Mode displays both tool paths simultaneously for comparison.

To set the compensation parameters:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **ToolComp**, and press **ENTER**. Second pop-up is displayed.

3. Highlight the desired selection, and press **ENTER**. Smaller pop-up closes.

4. Press **Parms** (**F9**). Pop-up closes.

Showing Rapid Moves

Draw Mode displays Rapid moves as dotted lines. Switch the parameter **Off** to eliminate screen clutter. This parameter does not affect how the program runs, only how it is displayed. [Default: **On**]

To switch **Rapid** setting:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Rapid**, and press **ENTER**. **Rapid** switches **On** and **Off**.

3. Press **Parms** (**F9**). Pop-up closes.

> **SHORTCUT:** Press **Rapid** (**F6**) to switch the rapid move dotted lines **On** and **Off**.

Setting Grid Line Type

Draw Mode displays a 2-dimensional grid with dotted or solid lines. Grid lines are not displayed in the **Iso** view. [Default: **None**]

To set the **Grid** parameter:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Grid**, and press **ENTER**. Grid pop-up menu is displayed.

3. Highlight the desired selection, and press **ENTER**. Grid pop-up closes.

4. Press **Parms** (**F9**). Pop-up closes.

Setting Grid Size

The adjustable grid size is measured in the active Inch/MM Mode. [Default: **1.00**]

To set the **Grid size**:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Grid size**, and press **ENTER**. Number entry field is displayed.

3. Type desired size, and press **ENTER**. New value displays on pop-up menu.

4. Press **Parms** (**F9**). Pop-up closes.

Putting Draw Mode in Motion, Single-Step, or Auto Mode

The Draw Simulation Mode runs programs in one of three ways:

Automatic Mode	Fully automatic (**Auto**)
Single-Step Mode	One program block at a time (**Single-Step**)
Motion Mode	One move at a time (**Motion**)

> **NOTE:** To switch the Commando running mode: press **Auto** (**F1**) for the Automatic Mode; press **S.Step** (**F2**) for the Single-Step Mode; and press **Motion** (**F3**) for the Motion Mode.

In **Automatic Mode (Auto)**, the Commando executes blocks sequentially until one of the following situations occurs: it reaches the end of the program, the Commando holds, or an error stops the program.

In **Single-Step Mode (S.Step)**, the Commando executes one block each time you press **START**. This allows you to run the program one block at a time.

In **Motion Mode (Motion)**, the Commando executes one motion at a time. This means that the Commando does not halt for blocks without motion commands (for example, **Dim** blocks), as in Single-Step Mode. This decreases program run time. Press **START** to execute each motion.

> **NOTE:** You can use the **spacebar** on an off-line keyboard to continue the program after each hold in the Single-Step or Motion Mode.

To select the default operating mode:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Mode**, and press **ENTER**. Pop-up menu is displayed.

3. Highlight the desired mode, and press **ENTER**. Mode pop-up closes.

4. Press **Parms** (**F9**). Pop-up closes.

Automatic Draw Mode Restart

The **Run** parameter determines whether Draw Mode automatically restarts after a **DISPLAY** or **VIEW** setting changes. This allows you to make more than one setting change before restarting Draw Mode.

When the **Run** parameter is turned **Off**, press **Run** (**F3**) to start or restart the Draw Mode. With **Run** turned **On**, Draw Mode automatically starts after each **DISPLAY** or **VIEW** change.
[Default: **On**]

To set the **Run** parameter:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Run**, and press **ENTER**. **Run** switches **On** or **Off**.

3. Press **Parms** (**F9**). Pop-up closes.

Setting the Erase Display Parameter

Turn **Erase On** to clear the display each time a new program runs in Draw Mode. Turn **Erase Off** to display the new program tool path without clearing the previous graphic. This allows you to compare two or more program paths.
[Default: **On**]

To set the **Erase** parameter:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Erase**, and press **ENTER**. **Erase** switches **On** or **Off**.

3. Press **Parms** (**F9**). Pop-up closes.

Running Draw Mode for Selected Blocks

Use the **Start N#** and **End N#** commands to run a portion of a program or subprogram in Draw Mode. Specify the **Start N#** and **End N#** block settings on the **Parms** menu. The default settings are the **Start** (first) and **End** (last) blocks.

To run a subprogram, select the starting and ending blocks from the main program. Include the **Call**, **Loop**, or **RMS** block.

If a starting block is in a subprogram and the ending block is in the main program, the Commando will stop and generate an error message at the **EndSub** block.

Starting Draw Mode at a Specific Block

To start Draw Mode at a specific block:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **Start N#**, and press **ENTER**. Start N# pop-up menu is displayed.

3. Highlight the desired selection, and press **ENTER**. If **Start Of Program** is selected, Draw Mode will start at Block 1. If **Other Block** is selected, type the block number (between 1 and 99999999), and press **ENTER**.

4. Press **Parms** (**F9**). Pop-up closes.

Ending Draw Mode at a Specific Block

To end Draw Mode at a specific block:

1. In Draw Mode, press **Parms** (**F9**). Parameter pop-up menu is displayed.

2. Highlight **End N#**, and press **ENTER**. Start N# pop-up menu is displayed.

3. Highlight the desired selection, and press **ENTER**. If **End Of Program**, Draw Mode will stop at the last program block. If **Other Block**, type the block number (between 1 and 99999999), and press **ENTER**.

4. Press **Parms** (**F9**). Pop-up closes.

31-October-05

7-9

Adjusting Draw Display

Draw Mode has several display settings for the moves shown in the viewing window. Refer to **Figure 7-3**. Activate these settings from the **DISPLAY** (**F5**) pop-up menu.
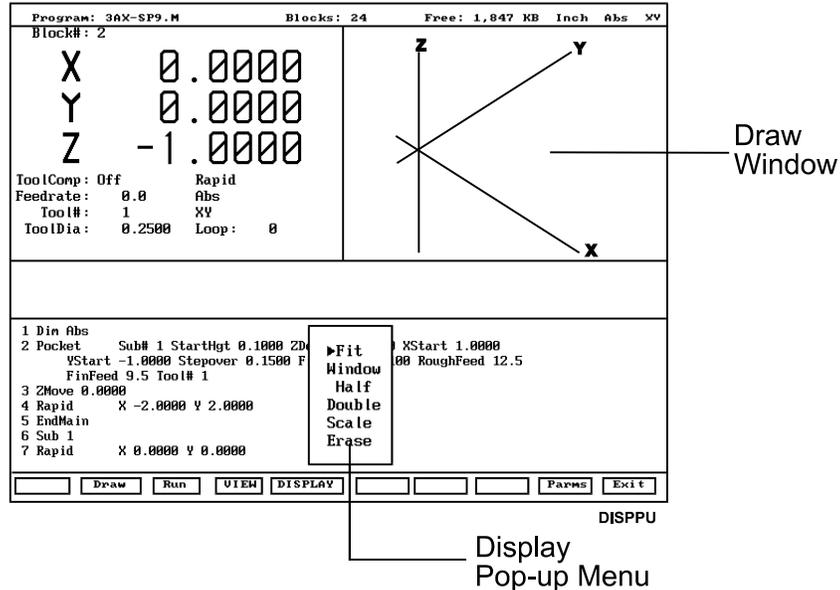
Figure 7-3, Display Pop-Up Menu

Fitting the Display to the Viewing Window

To fit the display in the viewing area:

1. In Draw Mode, press **Display** (**F5**). Pop-up menu is displayed.

2. Highlight **Fit**, and press **ENTER**. The Commando closes the pop-up menu, and the display adjusts to fit in the viewing window.

Halving the Display Size

To reduce the display size by half:

1. In Draw Mode, press **Display** (**F5**). Pop-up menu is displayed.

2. Highlight **Half**, and press **ENTER**. The display is scaled to half its original size.

Doubling the Display Size

To double the size of the display:

1. In Draw Mode, press **Display** (**F5**). Pop-up menu is displayed.

2. Highlight **Double**, and press **ENTER**. The display is scaled to twice its original size.

Scaling the Display by a Factor

To scale the Draw Mode display by a factor:

1. In Draw Mode, press **Display** (**F5**). Pop-up menu is displayed.

2. Highlight **Scale**, and press **ENTER**. Pop-up closes. The Commando prompts for the scale factor.

> **NOTE:** Enter a number preceded by a decimal point to reduce the display, or enter a whole number to enlarge the display.

3. Type the required factor, and press **ENTER**. The Commando scales the display to the specified factor.

Zooming In

To zoom in on a portion of the display:

1. In Draw Mode, press **Display** (**F5**). Pop-up menu is displayed.

2. Highlight **Window**, and press **ENTER**. A white window is displayed inside the viewing window.

3. Use the **ARROWS** to center the window over the area of interest.

4. Press **Expand** (**F5**) or **Compres** (**F6**) to expand or compress the window size.

> **NOTE:** Use **Reset** (**F7**) to restore window to original size.

5. With the window sized and positioned, press **Enter** (**F10**). The window closes. The next time Draw Mode runs, the Commando will zoom in on the selected portion of the display.

Erasing Display

To erase the display:

1. In Draw Mode, press **Display** (**F5**). Display pop-up menu is displayed.

2. Highlight **Erase**, and press **ENTER**. Display clears.

Changing Draw Views

Activate different view orientations from the **VIEW** (**F4**) pop-up menu. Refer to **Figure 7-4**.
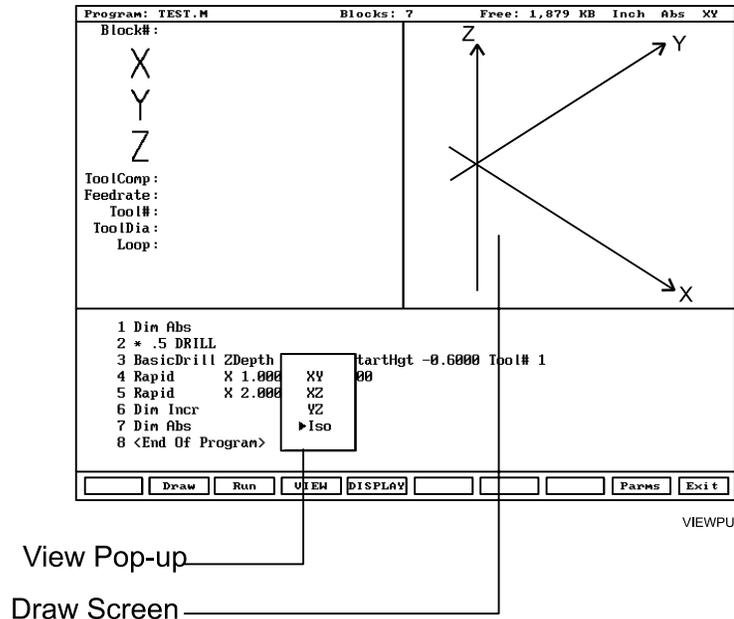
Figure 7-4, View Pop-up Menu

Selecting the View

To view Draw Mode from a different plane:

1. In Draw Mode, press **VIEW** (**F4**). VIEW pop-up menu is displayed.
2. Highlight a plane (XY, YZ, XZ, or Iso), and press **ENTER**. Draw Mode orients display to selected plane:

   XY   Top view

   YZ   Side or "end" view

   XZ   Front view

   Iso   3-D or isometric view (The Iso view does not show grid lines.)

31-October-05

Section 8 - Running Programs

There are three modes of programmed operation:

Single-Step Mode	Runs a program one block at a time.
Motion Mode	Only available in Single-Step Mode. Run a program from motion to motion.
Automatic Mode	Runs a program automatically.

The Automatic and Single-Step screens are based on the Manual Mode screen. Use the soft key labels to distinguish between modes. The Commando highlights the soft key for the active mode.

The Commando will only run the currently selected program. Select programs from the Program Directory. (Refer to "Section 9 - Program Management.")

In the Manual Data Input Mode (MDI), it is not necessary to select MDI code blocks.

In MDI Mode you can program moves without creating and saving a program. MDI is only available in Manual Mode. (Refer to "Section 3 - Manual Operation and Machine Setup.")

All programming tools, moves and cycles are available in the MDI Mode.

Loading Programs for Running

The first step in running any program is loading the desired program into the Commando's memory. Programs can only be loaded from the **PROGRAM** screen. See "Section 9 - Program Management" for instructions on loading a program.

Running a Program One Step at a Time

The Single-Step screen provides access to the Single-Step Mode (**S.STEP**) and the Motion Mode (**MOTION**) screens. Either mode enables you to step through the program and verify the moves before production.

The **S.STEP** screen differs from the Manual screen as follows:

❑ There are fewer active soft keys
❑ The **S.STEP** (**F5**) soft key highlights
❑ The **S.STEP** indicator appears in the status box (upper-right corner of screen)

To run a program in Single-Step Mode:

1. From the Program Directory, select the required program and return to the Manual screen.

2. Press **S.STEP** (**F5**). Single-Step Mode activates.

3. Press **START**. Commando executes a single block or motion.

NOTE: In Auto Mode, press **S.STEP** (**F5**) to activate Single-Step Mode.

Single-Step Mode vs. Motion Mode

In Single-Step Mode, the Commando holds after each block, even if a block does not include a move command. Press **START** to execute the following block.

In Motion Mode, the Commando holds after each machine move. It will not pause on blocks that do not command a motion. Press **START** to execute each machine move.

To switch the Commando between Single-Step (**S.STEP**) and Motion (**MOTION**) Modes:

1. Press **MOTION** (**F7**). Active soft keys highlight.

Holding or Canceling a Single-Step Run

Press **HOLD** to pause program execution. To restart the program, press **START**. To cancel a program that is on hold, press **MANUAL** (**F4**). This cancels active canned cycles and tool compensation. All other modal settings remain active.

Single-Step Execution of Selected Program Blocks

To select a starting block using **ARROWS**:

1. Select the desired program and return to the Manual screen.
2. Press **S.STEP** (**F5**). Single-Step Mode activates.

NOTE: Press **MOTION** (**F7**) to activate the Motion Mode.

3. Highlight the desired starting block.

4. Press **START**. The Commando executes the next block or motion.

SEARCH directs the Commando to search the program for a block number, a block containing a number, or a block containing specific text. The Commando searches forward from the cursor and highlights and displays the first occurrence of the entered item.

To select a starting block with the **SEARCH** feature:

1. Select the desired program and return to the Manual screen.

2. Press **S.STEP** (**F5**). Single-Step Mode activates.

3. Press **SEARCH** (**F3**). The Commando prompts for search text or number.

4. Enter the search text or number, and press **ENTER**. The Commando runs the search and highlights the first occurrence of the search criteria.

5. Press **START**. The Commando starts the program from the highlighted block.

Switching from Single-Step to Auto

To switch the Commando from Single-Step to Auto Mode:

1. In the Single-Step Mode, press **AUTO** (**F6**). The Commando completes the current move then holds.

2. Press **START**. The Commando restarts and runs the rest of the program in the Automatic Mode.

Automatic Program Execution

Auto Mode is the Commando's production mode. Execute any portion of a program in Auto Mode. Activate Auto Mode from the Manual or Single-Step screens.

The AUTO screen differs from the Manual screen as follows:

❑ There are fewer active soft keys

❑ **AUTO** (**F6**) highlights

❑ The **AUTO** indicator is displayed in the status box (upper-right screen)

To run a program in Automatic Mode:

1. Select the required program and return to the Manual screen.

2. Press **AUTO** (**F6**). Automatic Mode activates.

3. Press **START**. The Commando runs the entire program.

Holding or Canceling an Auto Run

Press **HOLD** to pause program run. To restart a program after a hold, press **START**.

To cancel program run when a program is on hold, press **MANUAL** (**F4**). This cancels any active tool compensation and canned cycles. All other modal settings remain active.

Starting at a Specific Block

> CAUTION: Choose the specified starting block carefully. Modes and compensations enabled in the program before the specified block may no longer be effective.

To select a starting block before you run the program, using the **ARROWS**:

1. Select the required program and return to the Manual Mode.

2. Highlight the required starting block.

3. Press **START**. The Commando automatically runs the program from the selected block.

To select the starting block before you run a program, use the **SEARCH** feature:

1. Select the required program and return to the Manual screen.

2. Press **AUTO** (**F6**). Auto Mode activates.

3. Press **SEARCH** (**F3**). The Commando prompts for search criteria.

4. Enter search number or text, and press **ENTER**. The Commando runs the search and then highlights and displays the first occurrence of the search criteria.

5. Press **START**. The Commando runs the program forward from the highlighted block.

SEARCH directs the Commando to search the program for a block number, a block containing a number or a block containing specific text. The Commando highlights and displays the first block found that contains the specified information. **SEARCH** only seeks forward in the program.

Clearing a Halted Program

When the Commando encounters a program block that generates an error, it displays a warning message and stops the program. Press **MANUAL** (**F4**) to reactivate the keypad.

A program error could generate more than one message. Refer to "Section 2 - Commando Console and Software Basics" for instructions on how to review undisplayed error messages.

After you have corrected the program, restart it from the appropriate block.

Out Of Tolerance Restart

When movement along an axis stops outside of the machines "in position" tolerances the program holds, and an "Out Of Tolerance" message is displayed. You now have the option to continue the program by pressing **START**. Continuing the program:

❑ Only executes subsequent blocks.
❑ Does not contribute to positioning error later in the program.

Using Draw while Running Programs

In Real-Time Draw, the Commando displays the moves being executed. When Draw activates, the secondary display area changes into a DRAW viewing area and **DRAW** (**F10**) highlights.

Real-Time Draw Mode and Draw Simulation Mode contain the same settings. Make setting adjustments from the Draw Simulation Mode. (Refer to "Section 7 - Viewing Programs with Draw.") Press **CLEAR** at any time to clear the Draw display.

NOTE: Do not confuse the two types of Draw screens. The Draw Real-Time screen looks like the Manual screen with a viewing window in the upper-right corner. In Draw Real-Time, **DRAW** (**F10**) highlights and the program execution soft keys activate. Draw Simulation Mode resembles an Edit screen that has a window in the upper-right corner, with the Draw soft keys active.

To activate **Draw** while running a program:

1. Select the required program and put the Commando in the required execution mode (**S.STEP** or **AUTO**).
2. Press **DRAW** (**F10**). Upper-right status box changes to a window.
3. Press **START**. Program starts and the Commando displays moves as they are executed.

Parts Counter and Program Timer

```
PROGRAM :

   MANUAL                    HALTED
   IN-POSN                   FEED
      ABS
      INCH

   LOOP :  0           JOG :  RAPID
   DWELL :  0.0    SPINDLE :  OFF
     RPM :  0      COOLANT :  OFF

   PARTS :  0 ←
   TIMER :  00 :00 :00 ←
                                    TIMER
```

Number of
Completed Parts
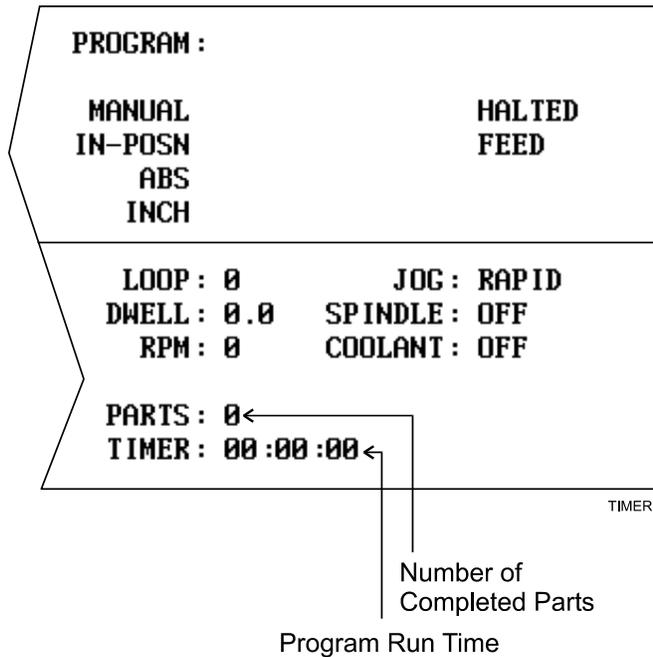
Program Run Time

Figure 8-1, Program Timer and Parts Counter

Refer to **Figure 8-1**. The Commando keeps track of program run time (**TIMER**) and the number of successfully completed parts (**PARTS**). Run time is displayed in hours, minutes and seconds. These two features are available in the Manual, Auto and S. Step Modes.

The Timer begins timing the program run when you press **START** and stops when it encounters an **EndMain** block. Therefore, ensure that an **EndMain** block has been included at the end of the program.

The timer pauses if the Commando holds. The timer stops if you switch to Manual Mode. The Timer value remains the same until you switch to Auto or S.Step Mode again. Then, the timer resets to zero.

The Parts counter starts at zero and increments by one every time the Commando runs an **EndMain** block. Therefore, ensure that an **EndMain** block has been included at the end of the program. The Commando continues to count parts when you re-run the program in Auto or Single-Step. The parts counter value is maintained when you switch to Manual Mode, but will reset to 0 when you switch back to Auto or Single-Step Mode.

The Parts Counter value can be modified via M-Codes. Refer to
Table 8-1.

Table 8-1, M-Codes Used with Parts Counter and Program Timer

M-Code	Function
M9355 X0	Prevents the parts counter from resetting to zero.
M9356 X0	Disables the Timer and Counter.
M9376 Xx	Presets any value into the parts counter register. For example, program M9376 X5 to preset 5 in the parts counter register.
M9377 Xx	Adds entered number to the parts counter. For example, if the current parts counter value is 4 and you then program M9377 X6, the new parts counter value will be 10.

Section 9 - Program Management

Program Directory

The Program Directory provides access to all program management and disk functions. These include creating, selecting, deleting, undeleting and copying programs. The Program Directory also provides access to the floppy disk drives and the communication configuration screens.

To activate the Program Directory from the Manual screen, press **PROGRAM** (**F2**).

The Program Directory's **USER** listing displays programs stored in the Commando. Commando program names are followed by an "**.M**" extension. Change the display mode to view programs in other formats. Refer to **Figure 9-1**.
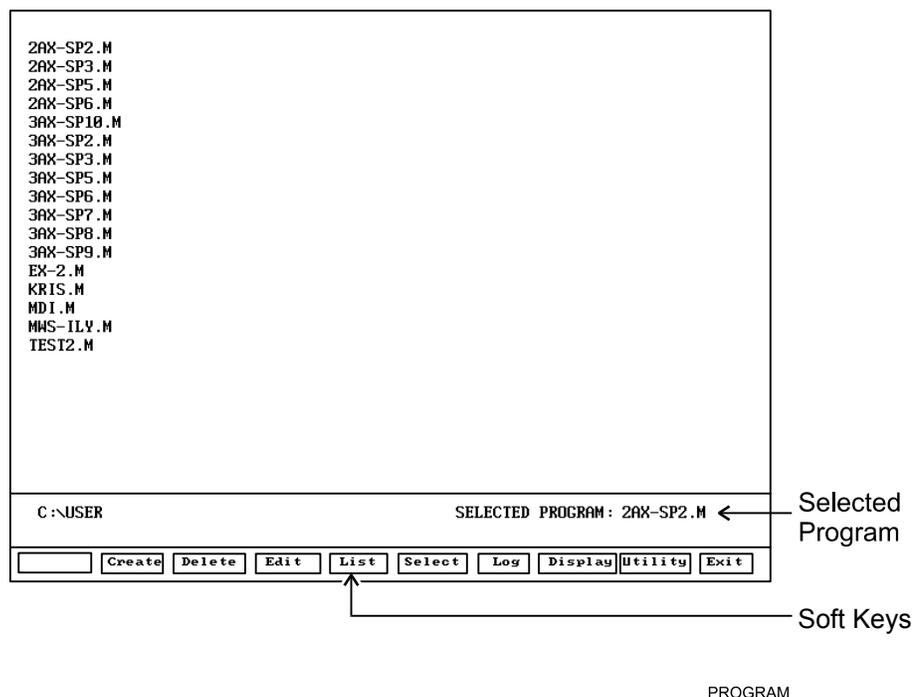
Figure 9-1, Program Directory

Changing the Program Directory

The Program Directory has four display modes:

- ❑ Display only Commando programs (names with "**.M**" extensions).
- ❑ Display Commando programs (names with "**.M**" extensions) with size, date and time of last edit.
- ❑ Display all programs in all formats.
- ❑ Display all programs in all formats with size, date and time of last edit.

Press **Display** (**F8**) to cycle the Program Directory through different display modes. Usually, only part programs with an "**.M**" extension are shown.

CAUTION:	The Program Directory can provide access to internal Commando programs. Tampering with internal programs can cause a machine malfunction.

Creating a New Program

To create new programs in the Program Directory:

1. In Manual Mode, press **PROGRAM** (**F2**). Program Directory activates. **USER** listing is displayed.

2. Press **Create** (**F2**). Message line displays prompt:
   "**NEW PROGRAM: _**"

3. Press **ASCII** (**F2**). ASCII Chart activates.

4. Use the ASCII Chart and the number keypad to enter the new program's name.

5. Press **ASCII** (**F2**). ASCII pop-up is displayed.

6. Press **ENTER** to place the new program in the **USER** listing in alphabetical order.

Choosing Program Names

Program names can contain up to eight characters. The Commando displays program names in capital letters. Use letters, numbers and dashes to name programs. Give each program a unique name. The Commando automatically assigns the "**.M**" extension.

NOTE:	You can use blank spaces in the program name.

Loading a Program for Running

The Commando will only run a program that you select. Only one program can be selected at a time.

To Load a program:

1. In the Program Directory, use **ARROWS** to highlight a program.

2. Press **Select** (**F6**). The Commando loads the program. The name of the currently loaded program displays next to the **SELECTED PROGRAM** label at the bottom of the screen.

Selecting a Program for Editing and Utilities

Delete (**F3**), **List** (**F5**), and most other utilities carry out their functions on the program marked by the highlight.

> **NOTE:** The selected program is the program selected for cutting parts.

To select a program for editing:

1. From the Program Directory, press **Display** (**F8**) to switch the display setting until only the Commando programs (*.M) are displayed in the Program Directory.

2. Highlight a program name.

3. Press **Edit** (**F4**). The Program Editor activates and the highlighted program is displayed on the Edit screen.

Maximizing Program Storage

The Commando has a finite amount of space available for programs. Use the System Information screen to check available space. Refer to Figure 9-2, System Information Screen.

Total Space Available for the System	Available program storage space
Total Free User Space	Remaining new programs storage space

During program execution, the control generates a second program given the same name, followed by an ".S" extension. The ".S" programs contain information required by the Commando. Normally ".S" programs are slightly larger than the part programs that generated them. Deleting a part program also deletes the associated ".S" file.

The Commando is not the optimal place for long-term storage of part programs. Back up part programs to floppy disks (or other computers).

If a lot of old programs accumulate, the Commando could run out of memory. To make room, temporarily delete inactive ".S" files. The Commando will automatically replace the ".S" files the next time the programs are run.

By default, the Program Directory displays only part programs (programs followed by ".M"). To list *.S files on screen, press **Display** (**F8**) until the ".S" programs are displayed in the Program Directory.

Program File Utilities

You can access some utilities directly from the soft keys and others through the **Utility** (**F9**) pop-up menu. The Utility pop-up menu lists fourteen utilities on two pages. Highlight **MORE ...**, and press **ENTER** to activate the second page of the menu.

Displaying Program Blocks (Listing a Program)

List (**F6**) displays the blocks in a program. This allows you to view a program without making inadvertent changes. The **List** feature only displays Commando programs (programs with an "**.M**" extension).

The soft keys available on the List screen include: **Draw** (**F2**), **Search** (**F3**), **PgUp** (**F4**), **PgDn** (**F5**), **Begin** (**F6**), **End** (**F7**), and **Exit** (**F10**). They function the same way as in the Program Editor. (Refer to "Section 4 - Writing Programs.")

To list a program:

1. Highlight the required program.

2. Press **List** (**F5**). The Commando displays the programs blocks. The Commando will not make editing changes in the List Mode.

Deleting a Program

To delete a program:

1. From the Program Directory, highlight a program.

2. Press **Delete** (**F3**). The Commando prompts you to confirm the deletion. The soft keys change based on your response.

3. Press **Yes** (**F1**) to delete the selected program. Press **No** (**F2**) to cancel.

NOTE: Deleting a program automatically deletes its associated ".S" file.

Reading Disks in Floppy Drives (Logging on to Other Drives)

Most utilities apply to programs in the **USER** listing by default. The **Log** feature makes it possible to use the utilities on floppy disks.

To log the Commando to a floppy disk drive:

1. From the Program Directory, press **Log** (**F7**). The Commando prompts you to select a drive.

2. Highlight a drive, and press **ENTER**. The Program Directory lists files stored on the selected drive.

Marking and Unmarking Programs

Most utilities can operate on more than one program at a time. The Program Directory allows you to select one, some or all of the programs in the **USER** listing.

Marking Programs

To mark a program:

1. From the Program Directory, highlight the program.
2. Press **ENTER**. The marked program highlights; the highlight bar advances to the next name.
3. Press **ENTER** to mark the next program.

    – or –

    Highlight another program in the listing, and press **ENTER**.
4. Repeat these steps to mark all required programs.

Unmarking Marked Programs

To unmark a program:

1. Highlight any previously marked program, and press **ENTER**. The highlight clears.

Marking all Programs

To mark all programs:

1. From the Program Directory, press **Utility** (**F9**). Utility pop-up menu is displayed.
2. Highlight **More . . .**, and press **ENTER**. Second page of pop-up menu is displayed.
3. Highlight **Mark All**, and press **ENTER** to mark all programs for pending operation.

Unmarking all Marked Programs

To unmark all marked programs:

1. From the Program Directory, press **Utility** (**F9**). The Utility pop-up menu is displayed.
2. Highlight **More . . .**, and press **ENTER**. The second page of pop-up menu is displayed.
3. Highlight **Unmark All**, and press **ENTER**. All programs are unmarked.

Deleting Groups of Programs

To delete a group of programs:

1. From the Program Directory, mark the required programs and press **Delete** (**F3**). The Commando prompts you to confirm deletion. The soft keys change based on your response.

2. Press **Yes** (**F1**) to delete the selected programs. Press **No** (**F2**) to cancel command.

Undeleting Programs

You can recover most deleted programs. Sometimes, only a portion of a deleted program can be recovered. Recover a program as soon as possible after it was deleted.

To undelete a program:

1. From the Program Directory, press **Utility** (**F9**). Utility pop-up is displayed.

2. Highlight **UnDelete**, and press **ENTER**. If the control finds programs to undelete, it displays a pop-up menu listing recoverable programs. If the control cannot recover any deleted programs, it prompts: "**No programs available for undelete**"

> **NOTE:** When you delete a program, the Commando inserts a ? in place of the first letter of the program.

3. Highlight the desired program, and press **ENTER**. The Commando prompts for the first letter (automatically removed when a program is deleted) of the deleted program's name and ASCII soft keys activate.

4. Use the ASCII Chart to enter the first letter, and press **ENTER**. The Commando presents an information message.

5. Press **Cont** (**F10**) to transfer the program to the **USER** listing.

> **NOTE:** Recovered programs might not contain all of the original information. Review the entire program.

Copying Programs to Floppy Disks

To copy a program to a floppy disk:

1. From the Program Directory, mark the required programs.

2. Press **Utility** (**F9**). The Utility pop-up menu is displayed with **Copy** selection highlighted.

3. Press **ENTER**. **Copy to:** pop-up menu is displayed.

4. Highlight the target drive. (This is usually **A:** for floppy drives.) Press **ENTER**. The Commando copies the marked programs to the target drive.

Renaming Programs

To rename a program:

1. From the Program Directory, highlight a program.

2. Press **Utility** (**F9**). A Utility pop-up menu is displayed.

3. Highlight **Rename**, and press **ENTER**. The Commando prompts for a new program name and the ASCII Chart soft keys display.

4. Use the ASCII chart and the number keypad to enter the new name. Press **ENTER**. The Commando renames the program.

Printing Programs

Print paper copies of part programs to any standard IBM PC-compatible printer. The Commando sends all marked programs to the printer.

To print one or more programs:

1. From the Program Directory, highlight or mark the desired program(s).

2. Press **Utility** (**F9**). A Utility pop-up is displayed.

3. Highlight **Print**, and press **ENTER**. The Commando prompts you to confirm the command. The soft keys change for your response.

4. Press **Yes** (**F1**) to send programs to the printer. Press **No** (**F2**) to cancel.

Formatting Floppy Disks

Transfer programs to formatted floppy disks. Most disks are pre-formatted. The Commando can also format disks.

To format a floppy disk:

1. From the Program Directory, press **Utility** (**F9**). A Utility pop-up is displayed.

2. Highlight **Floppy Format**, and press **ENTER**. The Commando displays a warning message and prompts you to confirm the command. The soft keys change based on your response.

CAUTION: Formatting a floppy disk erases all data on the disk.

3. Press **Yes** (**F1**). Commando prompts for disk insertion. Press **No** (**F2**) to cancel.

4. Insert the floppy disk in the Commando's disk drive and press **Cont** (**F10**). The Commando displays disk statistics as it formats.

Converting G-Code Programs to Commando Conversational Format

The Commando runs programs written in the ANILAM Conversational Language Format. The G-Code conversion utility translates G-Code programs to the ANILAM Conversational Language Format. Thus, it is unnecessary to rewrite part programs written for other machines.

By default, converted programs are given the same name as the original, but with an ".M" extension added. If necessary, you can assign any valid name to a converted program. The conversion utility does not alter the original G-Code program in any way. The Commando will not convert **".M"** or **".S"** programs.

By default, the conversion utility writes the translated program to the Commando's current drive, usually the **USER** listing. You can force the location of the new program to any valid location by selecting **No** (**F2**) when prompted to confirm the new program name.

Ensure that the Commando has enough space available to store the converted program, which will be slightly larger than the original. The Commando can only convert one program at a time.

The G-Code utility supports an enhanced version of the RS-274D specification for G-Codes. Some G-Code blocks might not convert directly. The Commando inserts unconverted G-Code blocks as comment blocks, marked by an asterisk (*).

Review and test all converted programs with Draw before running them. Refer to "Section 7 - Viewing Programs with Draw" for details.

> **NOTE:** The Program Directory's default display setting only displays program names that end with the .M extension. Press **Display** (**F8**) to switch the display setting and view programs in other formats.

To convert a G-Code program to conversational format:

1. To transfer the program to the control, copy it from a floppy disk or download it via the RS-232 link. Refer to "Section 11 - Communications and DNC" for downloading instructions.

2. From the Program Directory, mark the program being converted.

3. Press **Utility** (**F9**). A Utility pop-up menu is displayed.

4. Highlight **G-Code Converter**, and press **ENTER**. The Commando prompts you to confirm the conversion. The soft keys change for your response.

5. Press **Yes** (**F1**). The Commando prompts you to confirm the new program name. The soft keys change for your response. Press **No** (**F2**) to cancel.

ANILAM

6. To use the same name and location, press **Yes** (**F1**). The Commando converts the program and displays conversion statistics.

    – or –

    To enter a different name (or location), press **No** (**F2**). Commando prompts for new name. ASCII soft keys activate.

7. Enter the desired name (or path). Close the ASCII pop-up menu, and press **ENTER**. The Commando writes the conversational program. The Status box tracks the progress of the conversion.

Refer to **Table 9-1** and **Table 9-2** for G-Code compatibility specifications.

Table 9-1, G-Code Conversion Number Formats

	Maximum Number of Digits to Right & Left of Decimal Place		**Example of Properly Formatted Value**	
	Mode		Mode	
	Inch	MM	Inch	MM
Axes	4.4	5.3	X9999.9999	X99999.999
Feed	3.1	4.1	F999.9	F9999.9

Table 9-2, G-Code Equivalents

G-Code Format			**Conversational Equivalent**
XYZ			XYZ
G90/1			Dim Abs/Incr
G17/8/9			Plane XY/XZ/YZ
G75 Xn Yn Hn Zn An Bn In Jn Un Vn Wn Sn Kn Pn			Frame Pock
	X =	IslandLen	
	Y =	IslandWid	
	H =	StartHgt	
	Z =	ZDepth	
	A =	Stepover	
	B =	DepthCut	
	I =	RampFeed	
	J =	RoughFeed	
	U =	InsideRad	
	V =	OutsideRad	
	W =	FrameWidth	
	S =	FinStock	
	K =	FinFeed	

(Continued…)

Table 9-2, G-Code Equivalents (Continued)

G-Code Format			Conversational Equivalent
G78 Xn Yn Hn Zn Un An Bn In Jn Sn Kn Pn			Rectangular Pockets
	X =	XCenter	
	Y =	YCenter	
	H =	StartHgt	
	Z =	ZDepth	
	U =	CornerRad	
	A =	Stepover	
	B =	DepthCut	
	I =	RampFeed	
	J =	RoughFeed	
	S =	FinStock	
	K =	FinFeed	
G79 Xn Yn Cn An Bn Hn Dn			Bolt Hole Drill
	X =	XCenter	
	Y =	YCenter	
	C =	IndexAngle	
	A =	StartAngle	
	B =	EndAngle	
	H =	#Holes	
	D =	Diameter	
G80			Drilling Off
G81 Zn Rn Fn Pn			BasicDrill
	Z =	ZDepth	
	R =	StartHgt	
	F =	Feed	
	P =	ReturnHgt	
G83 Zn Rn Fn In Pn			PeckDrill
	Z =	ZDepth	
	R =	StartHgt	
	F =	Feed	
	I =	Peck	
	P =	ReturnHgt	
G85 Zn Rn Fn Pn			Boring
	Z =	ZDepth	
	R =	StartHgt	
	F =	Feed	
	P =	ReturnHgt	

(Continued…)

Table 9-2, G-Code Equivalents (Continued)

G-Code Format			Conversational Equivalent
G179 Xn Yn Cn Bn En Un Vn			Drill Pattern
	X =	X	
	Y =	Y	
	C =	Angle	
	B =	#XHoles	
	E =	#YHoles	
	U =	XIncr	
	V =	YIncr	
Tn			Tool# n
G4 Tn			Dwell n
On			Sub n
M99			EndSub
M98 Pn			Call n
M2			EndMain
Fn			Feed n
G00/1			Line with XYZ/XR/YR/RC format
G02/3			Arc with XYZIJK/XYZR/IJKABC format
G05			Ellipse with XYZIJABCL format
G06			Spiral with XYZIJKL format
G40/1/2			ToolComp Off/Left/Right

Checking Disks for Lost Data

Sometimes, a computer disk contains fragments of lost programs. This might happen if the computer loses power while saving a program. Lost program fragments do not display in the **USER** listing, but continue to take up disk space.

To check a disk for lost program fragments:

1. From the Program Directory, press **Utility** (**F9**). A Utility pop-up is displayed.

2. Highlight **More . . .**, and press **ENTER**. The second page of the pop-up menu is displayed.

3. Highlight **Check Disk**, and press **ENTER**. The Commando prompts you to select a drive.

4. Highlight the drive, and press **ENTER**. The Commando checks the disk. If it finds lost clusters, it prompts you for recovery instructions and soft keys change for your response.

5. Press **Yes** (**F1**). The Commando attempts to recover lost clusters on the disk. Press **No** (**F2**) to cancel.

Display System Information

The System Information screen displays specific details about the Commando and its software. The information comes in handy during machine setup or troubleshooting. Refer to **Figure 9-2**.

System Information	
Product:	3000 Commando
Serial ID:	0000000
PC software version:	0.04A
DSP firmware version:	-----
DOS version:	5.0
Processor detected:	1586
Total RAM:	262,064 KB
Available RAM:	4,096 KB
Available base RAM:	344 KB
Total space drive C:	1,023 MB
Available space drive C:	1,023 MB (1000.00%)
Screen Resolution:	640x480x16
Press F10 to continue.	

SYSINFO

Figure 9-2, System Information Screen

ANILAM

To display the System Information screen:

1. From the Program Directory, press **Utility** (**F9**). The Utility pop-up menu is displayed.

2. Highlight **More . . .**, and press **ENTER**. The second page of the pop-up menu is displayed.

3. Highlight **System Info**, and press **ENTER**. The System Information screen is displayed.

> **SHORTCUT:** On an offline system or via PC keyboard, press **ALT** + **I** to display the System Information screen.

Copying Programs from/to Unspecified Locations

To copy programs from floppy disk drives to the **USER** listing:

1. From the Program Directory, press **Utility** (**F9**). A Utility pop-up is displayed.

2. Highlight **More . . .**, and press **ENTER**. The second page of the pop-up menu is displayed.

3. Highlight **Copy ?**, and press **ENTER**. The Commando prompts for program source and ASCII soft key activates.

4. Use the ASCII Chart to enter the complete location (path) of the program, and press **ENTER**. A pop-up menu prompts for the destination drive or **Other . . .**

5. Highlight **Other**, and press **ENTER**. The Commando prompts for the destination drive and the ASCII soft keys activate.

6. Use the ASCII Chart to enter **C:\USER**[program name]**.M**. Press **ENTER**. The Commando copies the program to the **USER** listing.

> **NOTE:** As an alternative, log on to the floppy disk drive that contains the program, mark the program and use the **Copy to:** utility.

Renaming Programs from/to Unspecified Locations

To rename a program located on any drive:

1. From the Program Directory, press **Utility** (**F9**). A Utility pop-up menu is displayed.

2. Highlight **More . . .**, and press **ENTER**. The second page of the pop-up menu is displayed.

3. Highlight **Rename?**, and press **ENTER**. The Commando prompts for the location of the source program and the ASCII soft keys activate.

4. Use the ASCII Chart to enter the location (complete path) of the program, and press **ENTER**. The Commando prompts for program destination and ASCII soft keys activate.

5. Use the ASCII Chart to enter the location and new name (complete path) of the program, and press **ENTER**. The Commando renames the program.

> **TIP:** Use the **Rename?** feature to move a program to a different drive. Log on to the drive that contains the program and activate the **Rename?** feature. Enter the destination drive as part of the new program name. The Commando saves the program to the specified drive.

Printing from Floppy Drives

The Commando can print to any standard IBM PC-compatible printer.

To print programs from floppy drives:

1. From the Program Directory, press **Utility** (**F9**). A Utility pop-up is displayed.

2. Highlight **More . . .**, and press **ENTER**. The second page of the pop-up menu is displayed.

3. Highlight **Print ?**, and press **ENTER**. The Commando prompts for source program on message line and ASCII soft keys activate.

4. Use the ASCII Chart to enter the location (complete path) of the program, and press **ENTER**. The Commando prompts you to confirm the instruction. The soft keys change for your response.

5. Press **Yes** (**F1**) to send programs to the printer. Press **No** (**F2**) to cancel.

> **NOTE:** As an alternative, log on to the desired drive, mark the desired program, and use the **Print** utility.

Section 10 - Tool Management

Tool Page

The Tool Page contains the tool-length offsets and tool diameter values for each tool. When a tool activates, the Commando automatically activates its length offset and diameter values.

The active diameter value affects compensated moves and cycles with built-in tool compensation.

Enter tool-length offset and tool diameter values on the numbered rows of the Tool Page. The numbered lines on the Tool Page identify the tool number (**Tool #**) that activates those values.

Program a Tool # command as a separate block or with another block.

The Tool Page can hold the information for up to 99 tools.

The Tool Page stores spindle speed, spindle direction and coolant information for machines equipped with these functions.

On machines equipped with collet-type tool holders, it is impractical to store tool-length offsets on the Tool Page. Set the tool-length offsets at tool change. Compensated moves and cycles with built-in compensation still require a tool diameter value in the Tool Page.

Entering the Tool Page

To enter the Tool Page from the Manual Mode:

1. In Manual Mode, press **TOOL** (**F9**). Commando displays Tool Page.

To enter the Tool Page from the Edit Mode:

1. In Edit Mode, press **Tool** (**F6**). Commando displays Tool Page.

Tool Page Description

To edit tool information, highlight the required row (**Tool #**) and enter the appropriate values. The Commando displays the highlighted row at the bottom of the screen. The cursor indicates where entered information will display on the screen. Refer to **Figure 10-1**.

Position Display

Active Tool

Highlighted Row Display

Soft Key Labels
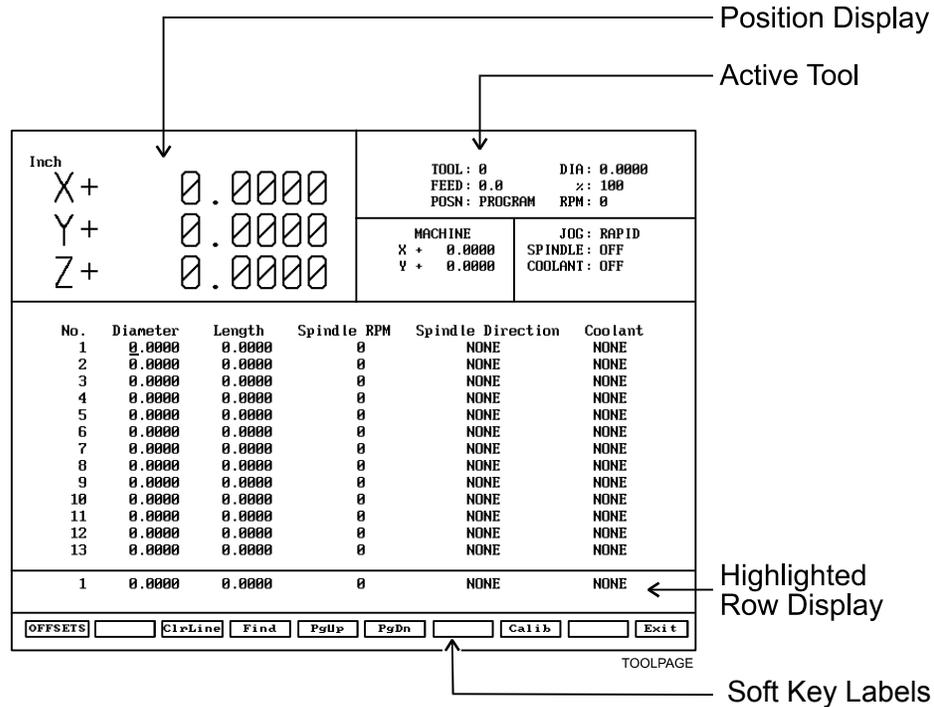
Figure 10-1, Tool Page

Row numbers correspond to tool numbers. When the Commando runs a program block that activates a tool number, it activates the values on the corresponding row of the Tool Page.

The Tool# 0 command cancels active diameter and length offsets. Set the Tool# 0, Z0 position at the fully retracted position of the quill.

All Jog features operate in the Tool Page. The features of the Tool Page include:

No.	Row numbers link the values on a row of the Tool Page to a tool number. A program block that activates a tool number activates the values and settings on that row of the Tool Page.
Diameter	Indicates appropriate tool diameter.
Length	Z-axis length offsets. Length offsets adjust the Z-axis position for the length of the active tool.

Spindle RPM	The required spindle RPM on machines set up for spindle RPM control. On machines not set up for spindle functions, the feature is used with the tapping cycle only.
Spindle Direction	Option. On machines equipped for spindle direction control (machines built with M-functions), these settings control spindle direction.
Coolant	On machines equipped for coolant control (machines built with M-functions), these settings control the coolant pumps.

Using the Tool Page

Use the up and down ARROWS to highlight and select tool numbers (row numbers). Use the left and right **ARROWS** to move from column to column. The Tool Page automatically converts values to the active inch/mm equivalents.

NOTE:	The Tool Page is the only place the Commando converts values from Inch to MM Mode and vice versa.

Press **PgUp** (**F5**) or **PgDn** (**F6**) to scroll up and down the Tool Page.

Finding Tools by Number

To locate tools by number:

1. From the Tool Page, press **Find** (**F4**). The Commando prompts: "**Enter Tool Number:_.**"

2. Enter a tool number, and press **ENTER**. The Commando displays the appropriate tool information.

Changing Tool Page Values

CAUTION:	**Set the Commando for the required Inch/MM Mode. The active Inch/MM Mode is displayed in the top left corner of the Tool Page.**

To change Tool Page values:

1. Highlight the desired row. Position the cursor in the desired column.

2. Enter the new value.

3. Press **ENTER** or any **ARROW**. The Commando accepts the value.

Clearing a Tool (Whole Row)

To clear a Tool Page row:

1. Go to the Tool Page and position the highlight bar on the row to be cleared.

2. Press **ClrLine** (**F3**). Commando resets all values in the row to zero.

Clearing a Single Value

To clear a single value:

1. Go to the Tool Page and move the highlight bar to select the row.

2. Position the cursor at the required column.

3. Press **CLEAR** to change value to zero.

Setting Tool-Length Offset

Setting tool-length offsets actually produces a Z-axis Part Zero position for each tool used in a program. All tool-length offsets are measured from Machine Zero, which is a permanent, physical reference on the machine. Determine the exact location of Tool #0, Z0 before you enter any tool-length offsets. Refer to "Section 3 - Manual Operation and Machine Setup" for instructions on how to set the location of Tool# 0, Z0.

> **NOTE:** All Z moves are manual moves.

> **NOTE:** All Jog features operate in the Tool Page.

Automatically Setting Tool-Length Offsets from the Tool Page

To set length offsets from the Tool Page automatically:

1. Activate the Tool Page and highlight a tool number.

2. Load the tool and manually position its tip at the part's Z0 position.

3. Press **Calib Z** (**F8**). The Commando inserts the Z position in the length-offset column.

Manually Setting Tool-Length Offsets from the Tool Page

To set length offsets from the Tool Page manually:

1. Retract the Z-axis to the Tool# 0, Z0 position.

2. Load tool and manually position its tip at the part's Z0 position.

3. Manually enter the ±Z position, as it is displayed in the position display. Press **ENTER**. The Commando enters the Z position in the offset column.

> **NOTE:** Most tool-length offsets are negative numbers.

ANILAM

Setting Tool-Length Offset for Ball-End Mills

When you use a ball-end mill to cut contoured surfaces, use tool diameter and length offsets. Set Z0 half the tool's diameter from the tool tip.

To set the offset for a ball-end mill:

1. Use the procedure outlined for a standard-end mill to set the tool-length offset.
2. Add half the tool's diameter to the value listed in the **Length** column.
3. Highlight the **Length** column and enter the calculated value.

ANILAM

Section 11 - Communications and DNC

Communications

The Commando can exchange data with any other RS-232 compatible devices. The baud, parity, data bits, stop bits and software parameters of the Commando and the other machine or computer must agree.

The machine builder sets up the default communication parameters at installation. The operator can temporarily adjust these parameters from the Communications screen. Every time the Commando starts, it reloads the default settings.

CAUTION: **Only qualified personnel should alter the settings in the Commando's Setup Utility. Incorrect settings could disable the machine.**

NOTE: The Commando loads the updated setup file when setup parameters change, or when the Commando is turned on.

Installing the RS-232 Cable

RS-232 communication requires a cable connection between the sending and receiving machines. Connect one end of the cable to the RS-232 9-pin connector on the back of the console. Connect the other end to the other machine or computer.

NOTE: The builder determines the exact location of the RS-232 connector.

Use a cable designed for RS-232 communication. An appropriate cable has internally crossed wires between Pins 2 and 3. Refer to **Figure 11-1**.

RS-232 Connector
(Male 9-Pin)

```
 1  2  3  4  5
 O  O  O  O  O
   O  O  O  O
   6  7  8  9
```
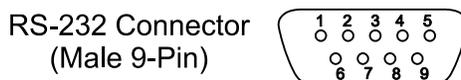
Pin 2 - Recieve Data
Pin 3 - Transmit Data

DB-9

Figure 11-1, RS-232 Communications Connector

Data sent from Pin 3 (transmit) of one machine must go to Pin 2 (receive) of the other.

Do not use computer extension cords for RS-232 communications (Pins 2 and 3 not crossed).

Accessing the Communication Package

To access the Communication screen:

1. In Manual Mode, press **Program** (**F2**). The Program Directory activates.

2. Press **Utility** (**F9**). Utility pop-up is displayed.

3. Highlight **Communications**, and press **ENTER**. Communication screen is displayed. Refer to **Figure 11-2**.

RS-232 Serial
Communication
Parameters

```
SERIAL COMMUNICATION PARAMETERS

          PORT: COM1
     BAUD RATE: 9600
        PARITY: EVEN
     DATA BITS: 7
     STOP BITS: 1
      SOFTWARE: ON
     DATA TYPE: ASCII
```

```
C:\USER                    COMM         PROGRAM: TEST.M

[Receive] [   ]  [Send ]  [DNC ] [    ]  [   ]  [TestLnk] [   ]  [Param] [Exit]
```

COMM

Program

Figure 11-2, Communication Screen

31-October-05

ANILAM

Setting Communication Parameters

This manual does not attempt to discuss the merits of the different parameter choices. Refer to an appropriate computer communications reference for this information.

To change communication parameters:

1. From the Communication screen, press **Param** (**F9**). Parameter Pop-up Menu is displayed. Refer to **Figure 11-3**.

```
┌─────────────────────────────┐
│  Parameter Settings         │
│                             │
│  1.▶Port.......     COM1     │
│  2. Baud rate..     9600     │
│  3. Parity.....     EVEN     │
│  4. Data bits..        7     │
│  5. Stop bits..        1     │
│  6. Software...       On     │
│  7. Data Type..     ASCII    │
│                             │
└─────────────────────────────┘
```

Figure 11-3, Parameter Settings Pop-Up

> **NOTE:** Both the sending and receiving devices must have the same baud, parity, data bits, stop bits and software parameter settings.

2. Highlight the setting to be changed, and press **ENTER**.

3. When you select the **Port**, **Baud** or **Parity** parameter, the Commando activates an additional pop-up. In the pop-up, select the appropriate setting, and press **ENTER** to store the setting.

4. For the **Data Bits**, **Stop Bits**, **Software**, or **Data Type** parameter, press **ENTER** to cycle through the available choices.

Selecting the Communications Port

Most Commando installations have at least one RS-232 connector. It is usually labeled and mounted on the back of the console. The Commando sends signals via its **COM1** port to the RS-232 connector. This configuration cannot be changed. Personal computers that run the offline software can use **COM2** if they are equipped with the necessary hardware.

Setting the Baud

The Commando supports the following bauds: 110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19,200. [Default: **9600**]

Setting Parity

The Commando supports the following parity settings: Odd, Even, or None. [Default: **Even**]

Setting Data Bits

The Commando supports the following data bit settings: 5-bit, 6-bit, 7-bit, or 8-bit. [Default: **7-bit**]

Setting Stop Bits

The Commando supports the following stop bit settings: 0-bit, 1-bit, or 2-bit. [Default: **1-bit**]

Software Settings

The Commando supports the following protocol settings: ON or OFF. Software protocol is frequently referred to as "Xon" or "Xoff", or "handshaking" in commercial communications packages. [Default: **ON**]

Setting Data Type

The Commando supports the following data display types: ASCII or BINARY. This setting does not affect the data exchanged, only how it is displayed on the screen during transmission. [Default: **ASCII**]

Testing the Data Link

The Commando has a utility to test the data link. With the Commando connected to another machine, set the parameters on both machines. If the other machine has a manual test screen, activate it.

Activating the Test Link Screen

Refer to <u>Figure 11-4, Test Link Screen</u>. With the communications Screen active, press **TestLnk** (**F7**) to display the Test Link screen.

```
                    SERIAL COMMUNICATION PARAMETERS

                              PORT: COM1
                         BAUD RATE: 9600
                            PARITY: EVEN
                         DATA BITS: 7
                         STOP BITS: 1
                          SOFTWARE: ON
                         DATA TYPE: ASCII
```

Active Settings

```
        ┌─── RECEIVE ───┐          ┌─── TRANSMIT ───┐
        │               │          │                │
        │               │          │                │
        │               │          │                │
        │               │          │                │
        │               │          │                │
        │               │          │                │
        └───────────────┘          └────────────────┘
```

Receive Area

Transmit Area

Selected Program

```
   C:\USER                 LINK TEST    PROGRAM: KRIS.M
```

```
   [      ][ClearRx][      ][ClearTx][      ][      ][      ][Param][Prev]
```
                                                               LINKTST

Active Mode
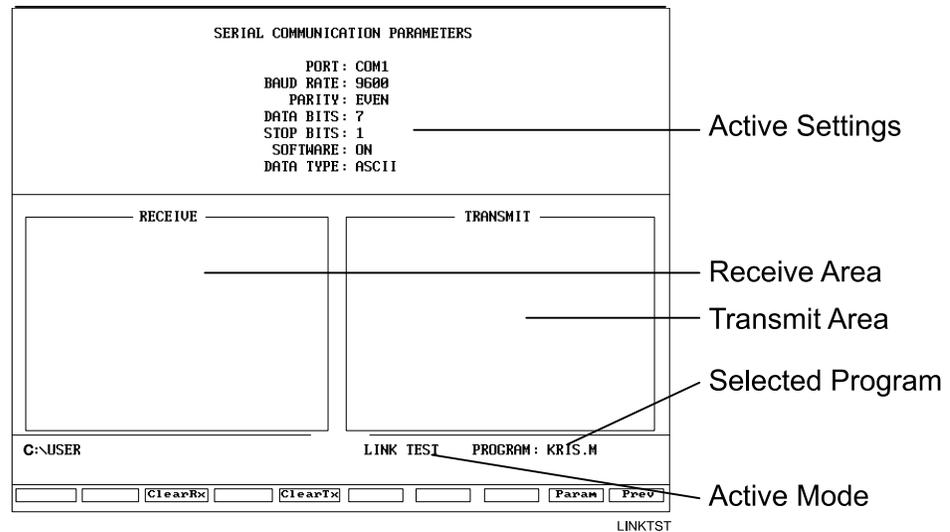
Figure 11-4, Test Link Screen

Setting Test Link Display Modes

To test the link, visually verify that the test data sent matches the test data received. The data type setting determines how characters are displayed on the screen.

If the data type is set to ASCII, letters and numbers are displayed. If the data type is set to binary, the hexadecimal equivalents are displayed. Set both machines to use the same data display type.

> **NOTE:** Hexadecimal characters are displayed as pairs of numbers or numbers and letters.

To change the Link test screen data display:

From the Link test screen, press **Data** (**F1**) to switch between ASCII and binary display formats. The Commando displays the current mode in the settings area of the Link Test screen.

Testing the Link

To test the Link:

1. Set up an RS-232 connection with another machine (or computer).

2. Set the other machine to receive.

3. With the Link Test screen active, use the Commando's keypad to enter any series of numbers. These characters are displayed in the transmission area.

4. Verify that the other machine (or computer) received the entire transmission correctly.

5. Set the other machine (or computer) to transmit.

6. Manually transmit a series of characters from the other machine (or computer).

7. Verify that the Commando received the entire transmission correctly.

Clearing the Receive Area

Press **ClearRx** to clear the receive area.

Sending a Program

Highlight the appropriate program in the Program Directory before you activate the Communications screen. The active program name is displayed next to the **PROGRAM** label on the screen. The Commando sends the selected program. A prompt enables the operator to select another program to transmit during the sending process.

To send a program:

1. With the Communications screen active, the parameters set and the link tested, press **Send** (**F3**). The Commando prompts the operator to send the selected program or to change the program being sent.

2. Press **Select** (**F1**). The Commando sends the program.

   – *or* –

   Press **Change** (**F3**). ASCII soft keys are displayed. Enter the name of the desired program.

Receiving a Program

Enter a name for the received program before transmission.

To receive a program:

1. With the Communications screen active, the parameters set and the link tested, press **Receive** (**F1**). The Commando prompts the operator to type a name for the incoming program. ASCII soft keys are displayed.

2. Key in the desired name, and press **ENTER**. The Commando displays a "**Ready to Receive...**" message.

3. Begin transmission from the sending machine.

Setting the Transmission and Receiving Display

When transmitting or receiving with Text Mode on, the transmitted program is displayed on the screen. With Text Mode off, the display area remains blank. When Text Mode is on, **Text** (**F4**) highlights.

When data is exchanged, the "Transfer in Progress" symbol is displayed just above the soft key line.

Press **Text** (**F4**) while transmitting or receiving in order to switch the Commando in and out of Text Mode. The transmission or receiving process is faster in Text Mode Off.

Holding Transmission/Receiving Operations

Press **Hold** (**F1**) to pause the program being sent or received. Press **Resume** (**F2**) to continue the exchange.

> **NOTE:** You should set the software parameter (Xon/Xoff) **ON** for both machines. If this parameter is **OFF**, a hold command could overload the Commando's buffer, resulting in data loss.

Running in DNC

Under Direct Numeric Control (DNC), the Commando runs the program received over the RS-232 link. The Commando can run incoming programs in Single-Step or Automatic Mode. Real-Time Draw Mode is also available.

The Commando only runs programs written in its conversational language format. Do not attempt to run other types of programs.

In the DNC Mode, the Commando cannot look ahead to verify completion of a subprogram. Therefore, in DNC Mode, do not run a program that contains subprogram calls.

31-October-05

The DNC screen is similar to other operating screens, but contains communications information. Refer to **Figure 11-5**.


```
                    MACHINE      PROGRAM:
 X+    0.0000      X +   0.0000             HALTED
                   Y +   0.0000   IN-POSN   FEED
 Y+    0.0000                        ABS
                                     INCH
 Z+    0.0000      LOOP:            JOG: RAPID
                   DWELL: 0.0     SPINDLE: OFF
 BLOCK: 0   POSN: PROGRAM  RPM: 0   COOLANT: OFF
 TOOL: 0    DIA: 0.0000
 FEED: 0.0  %: 100         PARTS: 0
                           TIMER: 00:00:00




 MESSAGE: Start sending data from offline system.
 Total Blks Rec:        % Rec Buf Full:       % Exec Buf Done:   0.00
 [    ][    ][    ][DNC][S.STEP][AUTO][    ][    ][    ][DRAW]
                                                          DNC
```

Total Blocks Received

Start Sending Prompt

% Receiving Buffer Full

% Executing Buffer Full

Figure 11-5, DNC Screen

Total Blks Rec: The total number of program blocks the Commando has received at that point.

% Rec Buf Full Percentage of receiving buffer used.

% Exec Buf Full Percentage of executing buffer used.

An RS-232 link transmits program blocks faster than the receiving machine can run them. This makes it necessary to manage the memory and timing between the two machines.

The Commando uses two buffers: One to store incoming program blocks and one to store blocks being run. When the Commando has run all of the blocks in the execution buffer, it moves the blocks in the receiving buffer to the executing buffer. The receiving buffer continues to store the blocks being sent over the RS-232 cable.

When using the software protocol (Xon/Xoff), the Commando can signal the sending machine to pause, if necessary, to avoid data loss.

NOTE:	Most machines default to the Buffer Mode for DNC operations. Some machines can be set to default to the Drip Feed Mode for DNC. In Drip Feed Mode, the transmitting machine sends one block at a time and the receiving machine executes each block as it receives it, without buffering the data.

To put the Commando in Direct Numeric Control Mode:

1. With the Communications screen active, parameters set and the link tested, press **DNC** (**F4**). The DNC soft key highlights.

2. Press **Receive** (**F1**). The DNC screen activates and the Commando prompts the operator to start transferring from the other machine.

3. Press **START**. The Commando runs the incoming program.

Using Data Control (DC) Codes

Data Control (DC) codes are sometimes required to automate the operation of a paper tape reader or punch. Refer to **Table 11-1** for the available DC Codes.

Table 11-1, DC Codes

ASCII	Function	Hex Code	Commando Key
DC1	Reader Start	0x11	1
DC2	Punch Start	0x12	2
DC3	Reader Stop	0x13	3
DC4	Punch Stop	0x14	4

The "ASCII" column lists the codes required to perform the corresponding "Function." The "Hex Code" is the hexadecimal equivalent of the ASCII code. The "Commando Key" column lists the key you press on the Commando keypad or a PC keyboard to transmit the required DC code.

A reader or punch will turn ON (start) or OFF (stop) in response to these codes. To test reader or punch communication, activate the Communications screen and press any of these keys. The paper tape reader or punch should respond appropriately.

Using DC Codes In Receive Mode

Usually a receive operation involves the paper tape reader. You must start the reader, thereby initiating the reading of the paper tape. Do this after the Commando has been set up to receive the file.

1. Set up to the Commando to receive a program.

2. Press **1** to send the DC1 code to the reader. The reader starts.

3. After the Commando has read the tape, press **3** to stop the reader, if necessary. The Commando sends the DC3 code to the reader and the reader stops.

Using DC Codes in Send Mode

Usually, a send operation involves the paper tape punch. Set up and start the punch prior to initiating the send operation.

1. Select the program that will be sent to the tape punch.

2. Press **2** to send the DC2 code to the punch. The punch starts.

3. Press **Send** (**F3**) to start sending the program. If necessary, change the name of the program.

4. When the program has been completely transferred to the punched tape, press **4** to stop the punch, if necessary. The Commando sends the DC4 code to the punch and the punch stops.

ANILAM

Section 12 - DXF Converter

The DXF Converter feature allows information in a Drawing Exchange File (.DXF extension) to be used to create a Commando conversational (.M extension) file.

Contours and drill hole locations in the DXF file can be put in the Commando file in the form of subroutines, using a mouse and "point and click" approach.

The DXF Converter feature creates a Commando program that must be edited to be usable, but most of the program creation is already done.

Requirements

Off-line Software

The Personal Computer (PC) must have a mouse installed. The ANILAM Off-line Software is required. The ANILAM Off-line Software will run in an MS-DOS or Windows environment. (See "Section 14 - Off-line Software.")

Machine Software

A mouse or other pointing device (for example, track ball) must be installed to properly operate the DXF converter on the machine. As part of installing a mouse, it is necessary to install a driver. A suitable driver should be included with the mouse when purchased. Follow the manufacturer's instruction to install an MS-DOS compatible driver. Typically, this will require editing AUTOEXEC.BAT and adding a line to load the mouse driver before the Commando software starts running. See sample AUTOEXEC.BAT below. The mouse can be a serial mouse or a PS/2 style mouse (PS/2 style mouse only supported on systems manufactured after January 1, 2003). The serial mouse must be connected to the RS-232 port. If using a PS/2 style mouse, it must be connected to the keyboard connector on the console through a PS/2 Y-splitter cable. The mouse will only be operational while in the DXF Converter. Depending on the mouse and mouse driver, it may be necessary to have the mouse connected before turning the Commando on.

```
ECHO OFF
PROMPT $P$G
PATH C:\;C:\DOS
ECHO Loading Commando software
SET P3CSYS=C:\P3C
C:
CD \P3C
\MSMOUSE\MOUSE      <<<< Line added to load mouse driver
P3C
```

Entry to the DXF Converter

To open the DXF Converter:

1. Open the ANILAM Off-line Software

2. Gain access to the Program page and highlight the DXF file you wish to convert. For details on how to work with the Program page see "Section 9 - Program Management."

3. Select the **Utility** soft key to display a pop-up menu

4. Select DXF Converter on the pop-up menu to bring the drawing into the DXF Converter.

The drawing display screen shows the file name in the upper-left border, the current X Y position of the mouse pointer at the upper-right corner, a message and information area along the bottom border, and several soft keys along the bottom edge.

Creating Shapes

The part drawing is used to create shapes. Shapes are then output to Commando programs as subroutines. There are many features to make the drawing screen easier to use. Layers may be turned on or off. Any area of the screen can be zoomed in or out. Refer to Table 12-1, Mouse Operations and Table 12-2, DXF Hot Keys.

Each shape is given a sequential number. The number is displayed on the screen at the beginning of the shape. Press **F1** to toggle Select mode on. With Select mode on, entities can be selected to be part of a shape. Left click with the mouse to make selections. When an entity is selected, it will change color.

When selecting entities, direction is determined by where the mouse pointer is positioned. If nearer the left side of a line, direction will be left to right.

There are two types of shapes:

❑ One used for contouring or feed motion
❑ One for drilling a series of holes

Contours

Pick an entity where the shape will begin. Pick the last entity in the shape. All entities that are connected will be chained together and change color to verify this. Some shapes have to be selected one entity at a time. This is determined by the way the part was drawn in the DXF file.

If an entity is selected that is not connected to the previous one, a message is displayed, "Entity not connected, connect anyway (Y/N)?" Answering Yes will join and allow the shape to be continued. This is sometimes needed when the drawing was not properly made. The same message is displayed when a shape is finished and a new shape is started. Answering No produces a second message, "Create new shape (Y/N)?" If this is answered Yes, a new shape number is displayed.

Entities in a shape can be un-selected by clicking them again. This un-selects everything previously selected to that point. To delete a shape, click on the first entity.

Drilling

When circle entities are selected, they are assumed to be drilling hole locations. As circles are selected, a dotted line shows the rapid path between holes. Selecting anything other than a circle, ends the drilling shape and produces the message, "Create new shape (Y/N)?"

If you wish to create a second drilling shape, select the first hole of the next shape by right clicking the mouse. The message, "Create new shape (Y/N)?" is displayed.

Commando Code

Each shape that is created is made into a subroutine. If the option was selected as a setup parameter, for each subroutine, there is a call in the main program. (Refer to Table 12-4, Output Menu Descriptions.) Running the Commando program in Draw mode allows the tool paths to be seen.

The file must be edited to add tool numbers, feed rates, cutter comp on or off, and so forth.

The tool paths are only as accurate as the DXF drawing file used.

The Output Parameter pop-up menu contains a Shift X and Shift Y entry. The purpose of these entries is to shift the X Y coordinate system of the Commando program. This is usually done, since the coordinates in the drawing file are based from some corner of the drawing and it is preferable to use some feature of the part as the X0 Y0 position. Refer to "Shift X, Shift Y Descriptions" later in this section.

Mouse Operations

Refer to **Table 12-1** and Table 12-2, DXF Hot Keys.

Table 12-1, Mouse Operations

Button	Event	Function
Left	Press–Drag–Release	Zoom Window
Right	Press–Drag-Release	Pan
Left	Double click	Zoom Fit
Left	Click Top Edge	View XY Plane
Left	Click Right Edge	View YZ Plane
Left	Click Bottom Edge	View XZ Plane
Left	Click Left Edge	View ISO
Left	**SHIFT** + Click	Zoom In
Right	**SHIFT** + Click	Zoom Out
Left	Click (Select mode on)	Select Entity
Right	Click (Select mode on)	Link Unconnected Entities or Create New Shape
Left	**CTRL** + Click	Basic Entity Information is displayed on the bottom of the screen.

DXF Hot Keys

Refer to **Table 12-2**.

Table 12-2, DXF Hot Keys

Hot Key	Event	Hot Key	Event
ALT + **A**	Zoom Fit	**ALT** + **N**	All Layers On
ALT + **B**	Redo View Change	**ALT** + **O**	View Plane ISO
ALT + **C**	Erase Text	**ALT** + **P**	Toggle Axes
ALT + **D**	Zoom In	**ALT** + **Q**	Quit / Exit
ALT + **E**	Set Chain Delta	**ALT** + **R**	Redraw
ALT + **F**	Toggle Entity Endpoints	**ALT** + **S**	Save Shape to Output Filename
ALT + **G**	Toggle Dotted Grid	**ALT** + **T**	Paste Entity Info to Shift Field
ALT + **H**	Zoom Out	**ALT** + **U**	Undo View Change
ALT + **K**	Cycle Tracking Resolution	**ALT + X**	View Plane XY
ALT + **L**	Toggle Layers	**ALT + Y**	View Plane YZ
ALT + **M**	Invert Layers	**ALT + Z**	View Plane XZ

Toggle Entity Endpoints (ALT + F)

This hot key places a small X at the end of every entity. If a shape is not chaining as expected, using this feature helps determine the problem. Look for X's in unexpected positions. Two lines may be overlapped, for example.

Using the mouse (CTRL + left click) with endpoints on will 'flash' each entity and also provide more information. Zoom the problem area for the best view.

DXF Soft Keys

Refer to **Table 12-3**.

Table 12-3, Soft Key Descriptions

Soft Key	Function	Description
F1	Toggle Select Mode	Select mode must be on when chaining shapes.
F3	Layers Menu	Pop-up menu has: ▪ All Layers on ▪ Invert Layers ▪ Toggle Layers Layers can be turned on or off as desired. **NOTE:** The mouse (**CTRL** + left click), that is hold down the **CTRL** key while left clicking an entity, provides the layer name of the clicked entity at the end of the basic entity information displayed at the bottom of the screen. This is helpful to determine which layers to turn on and/or off.
F4	View Menu	Pop-up menu has: XY, XZ, YZ, and ISO selections.
F5	Display Menu	Pop-up menu has: Fit, Window, Redraw, Half, and Double. Select the desired display.
F8	Save	Creates Commando code. The message, "Successfully created (filename) (.M)." is displayed when Save is activated. If no shapes are defined, a warning message is displayed.
F9	Setup	Pop-up menu provides access to Output or Display parameters. Refer to Table 12-4, Output Menu Descriptions and to Table 12-5, Display Menu Descriptions.
F10	Exit	**F10** exits the Setup menus, exits the DXF Converter, and returns to the Program page. Be sure to **Save** (**F8**) any work done before exiting. Anything not saved will be lost. If shapes have been created, a message, "Exit (Y/N)?" is displayed. This is a reminder to be sure you have saved your work.

Output Menu Options

Refer to **Table 12-4**.

Table 12-4, Output Menu Descriptions

Parameter	Default	Input Definition
Output program name	DXF filename	Different filename. No extension required.
Shift X	0.000	X position offset value (See "Shift X, Shift Y Descriptions.")
Shift Y	0.000	Y position offset value (See "Shift X, Shift Y Descriptions.")
Output dim.	Absolute	Incremental or Absolute.
Create mode	Smart	Overwrite or Smart. Overwrite replaces existing program file. Smart replaces duplicate subs only.
Starting sub number	1	Beginning sub number. To keep previously created subs, use next higher number.
Output warnings	Yes	Yes or No. A setting of Yes outputs warnings in the program.
Re-calc Intersections	Yes	Yes or No. A setting of Yes recalculates the intersections in the DXF file.
Output resolution	5	Number of decimal digits (3 to 6)
Create main in new	Yes	Yes or No No will not create main to call subs in new programs.
Convert values	None	None or (to)Metric or (to)Inch
Convert polyline	None	None or To Arc or Prompt (See "Convert Polyline Descriptions.")

Shift X, Shift Y Descriptions

The end of an entity or center of a circle can be used to automatically make this point the X0 Y0 of the program. To select the desired point:

1. Use the mouse (**CTRL** + left click) to display Basic entity information.

2. Press **ALT** + **T** to paste the coordinates into the Shift XY fields.

A line or arc entity uses the end closest to the mouse pointer.

Convert Polyline Description

Some DXF files have arcs as polylines. Set the parameter "Convert to Arc" to Yes to have an arc output in the Commando program.

Polylines that are not converted to arcs are executed as a series of short line moves.

Circles that have been converted to polylines by the DXF file creation software cannot be used for hole drilling or circle center information. Hence, given the option, it is the best choice that arcs and circles not be converted to polylines when creating the DXF file.

Display Menu Options

Refer to **Table 12-5**.

Table 12-5, Display Menu Descriptions

Parameter	Default	Input Definition
Mouse position resolution	4	Number of places to display
Axes	Off	Toggle display of axes
Grid	None	None, Solid, Dotted
Grid size	1	In current units
Chaining accuracy	.0001	Maximum separation between chainable entities
Picking accuracy	3	Pixel distance from pointer to selected entity
Shape color	Green	Choose color
Entity flash color	Yellow	Choose color

ANILAM

DXF Entities Supported

See **Table 12-6** for the DXF entities supported.

Table 12-6, DXF Entities Supported

Entities	Drawing	Transformation	Chaining	Information
Line	X	X	X	X
Point	X	X		X
Circle	X	X	X	X
Arc	X	X	X	X
Trace	X	X		X
Solid	X	X		X
Text	X	X		
Shape	X	X		
Insert	X	X		
Attdef	X	X		
Attribute	X	X		
Vertex	X	X		X
Polyline	X	X	X	X
Line3d	X	X	X	X
Face3d	X	X		X

Drawing Entities Not Supported

See **Table 12-6**. Note that the Extrusion, Dimension, and Viewpoint entities are not supported. Dimensions may be seen on the displayed DXF file. Some DWG (an AutoCad drawing file) to DXF converters convert the dimension entities into lines and arcs, which are supported entities.

File Created

The DXF Converter creates the Commando file, .M for conversational.

A file is also created with the extension .fxd. This file saves the status of parameter settings that were used in Setup.

DXF Example

From the Program listing open the DXF file. Refer to **Figure 12-1**.
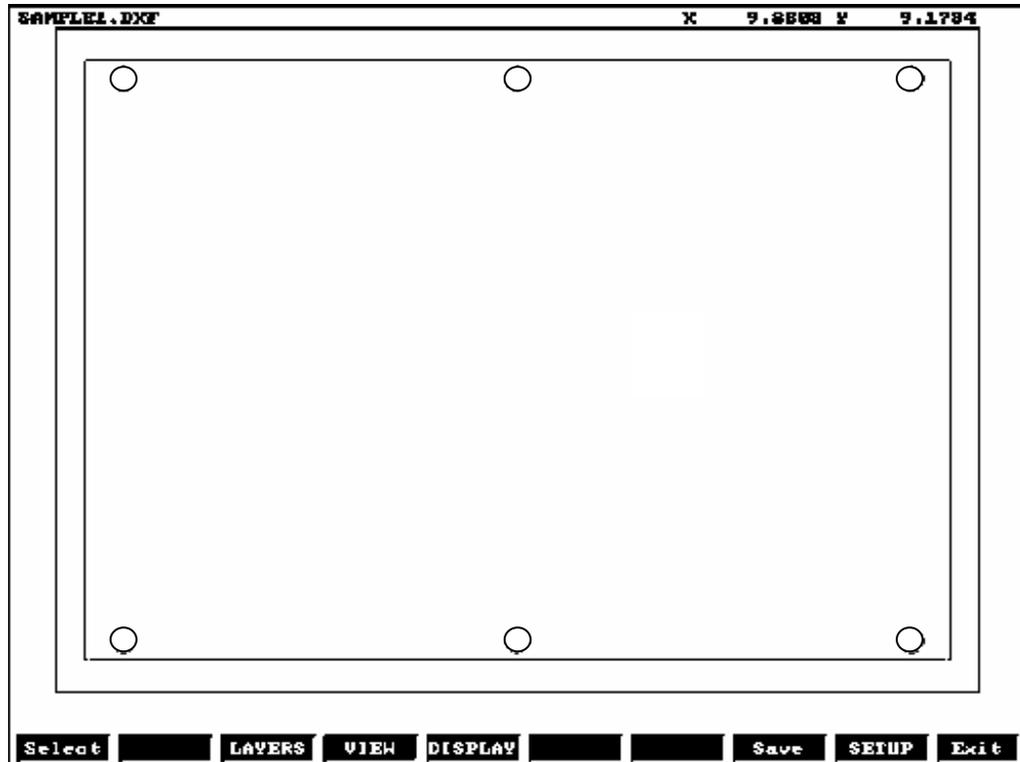
Figure 12-1, Example DXF File

Refer to **Figure 12-2**. All unneeded layers have been turned off. The Figure shows the drill locations and the contour selected.
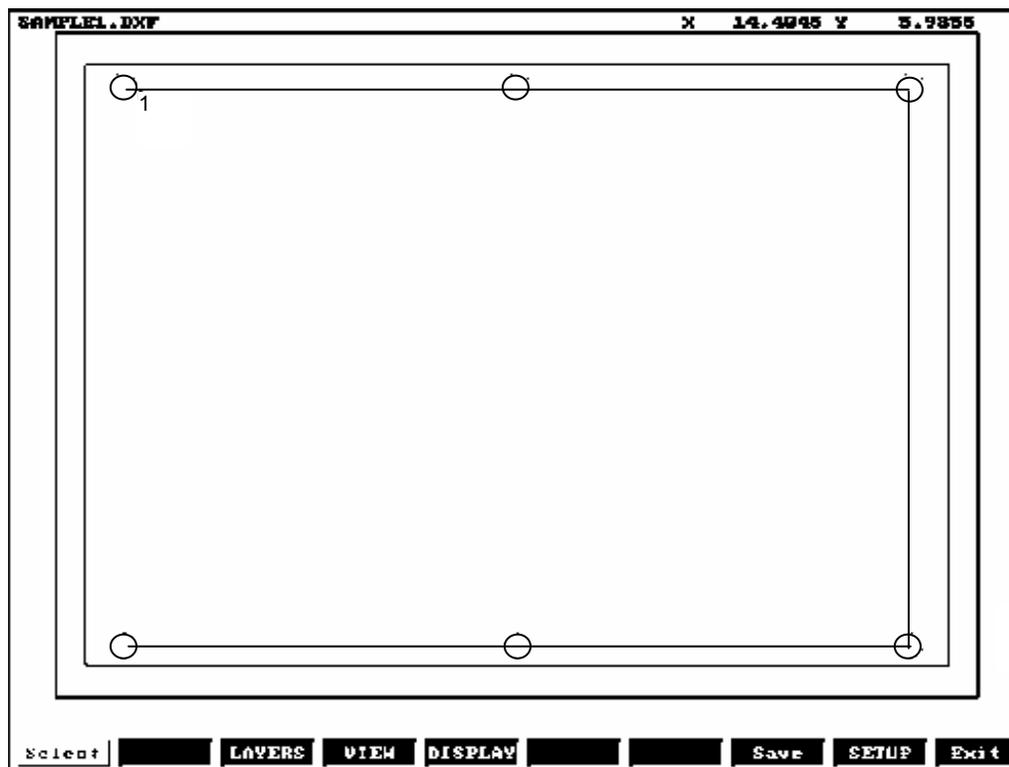
Figure 12-2, Zoomed Part with Unneeded Layers Turned Off

From **Figure 12-2**, the Output Menu (see Table 12-4, Output Menu Descriptions) would display as follows:

Table 12-7, Output Menu for Figure 12-2

Output program name	SAMPLE1
Shift X.	0.00000
Shift Y.	0.00000
Output dimensions	Absolute
Create Mode.	Smart
Starting sub number.	1
Program type.	Conversational
Output warnings.	Yes
Re-calc Intersections.	Yes
Output resolution.	5
Create main in new	Yes
Convert values.	None
Convert polyline.	None

Unedited Conversational Program Listing

The Commando conversational program is created that must be edited to be usable. An unedited conversational program created from the example above follows. See **Table 12-8**.

Table 12-8, Unedited Conversational Program Listing

```
Call 1
Call 2
EndMain

Sub 1
Dim Abs
Rapid     X 2.74175 Y 12.68128
Rapid     X 7.95175 Y 12.68128
Rapid     X 13.17175 Y 12.68128
Rapid     X 13.17175 Y 5.49128
Rapid     X 7.95175 Y 5.49128
Rapid     X 2.74175 Y 5.49128
EndSub

Sub 2
Dim Abs
Rapid     X 2.24175 Y 12.92128
Line      X 13.67175 Y 12.92128
Line      X 13.67175 Y 5.24128
Line      X 2.24175 Y 5.24128
Line      X 2.24175 Y 12.92128
EndSub
```

The conversational program must be edited to add tool numbers, feed rates, cutter comp on or off, and so forth. When the edits are complete, use Draw to check the tool path. See Figure 12-3, Edited Conversational Tool Path.

ANILAM

Edited Conversational Tool Path

The edited conversational tool path is illustrated in **Figure 12-3**.
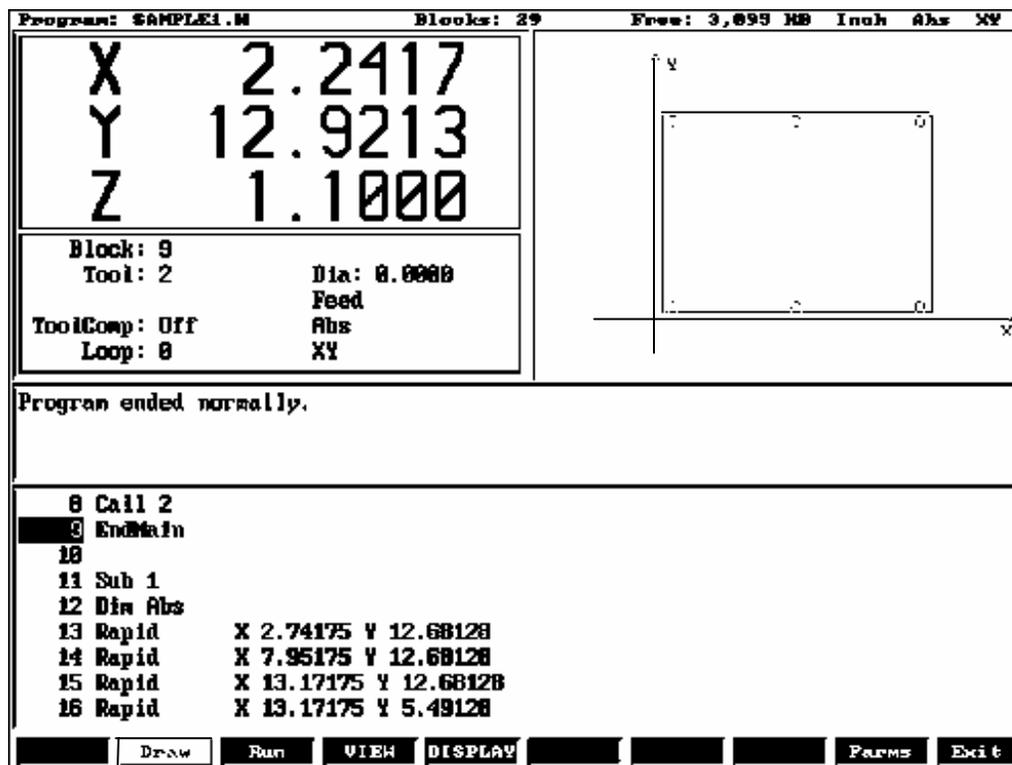
Figure 12-3, Edited Conversational Tool Path

Edited Conversational Program Listing

The edited conversational program used for the example above follows.
Refer to **Table 12-9**.

Table 12-9, Edited Conversational Program Listing

```
Unit Inch
Dim Abs
Offset     Fixture# 1
BasicDrill ZDepth -0.1000 StartHgt 0.1000 Tool# 1
Call 1
DrillOff
Tool# 2
Call 2
EndMain

Sub 1
Dim Abs
Rapid     X 2.74175 Y 12.68128
Rapid     X 7.95175 Y 12.68128
Rapid     X 13.17175 Y 12.68128
Rapid     X 13.17175 Y 5.49128
Rapid     X 7.95175 Y 5.49128
Rapid     X 2.74175 Y 5.49128
EndSub

Sub 2
Dim Abs
Rapid     X 2.24175 Y 12.92128
Line      X 13.67175 Y 12.92128
Line      X 13.67175 Y 5.24128
Line      X 2.24175 Y 5.24128
Line      X 2.24175 Y 12.92128
EndSub
```

12-14

31-October-05

ANILAM

Section 13 - Calculators

The Commando features a powerful calculator package that contains three separate calculators:

❑ Math Calculator
❑ Right Triangle Calculator
❑ Geometry Calculator

The programmer can recall calculator solutions directly into the labeled fields of a Graphic Menu. All three calculators have separate memory space for storing and recalling solutions.

Math Calculator

The Math Calculator performs all of the operations typically offered in a scientific calculator. These include basic math, trigonometry, unit conversion, logs, exponential operations, angle/radian conversions, and finding inverses.

Activating the Math Calculator

To activate the Math Calculator:

1. In Edit or MDI Mode, press **Calc** (**F7**). The calculator selection menu is displayed on the screen. Refer to **Figure 13-1**.
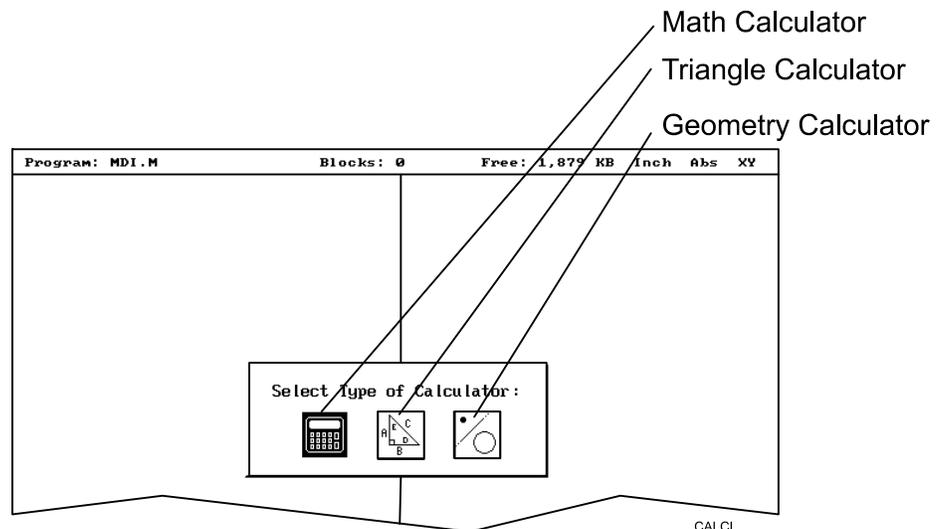
Figure 13-1, Calculator Selection Menu

2. Highlight the **MATH CALCULATOR** template, and press **ENTER**. The Math Calculator activates.

3. The Math Calculator is displayed in a pop-up box in the center of the screen. Refer to Figure 13-2, Math Calculator and Soft Keys.
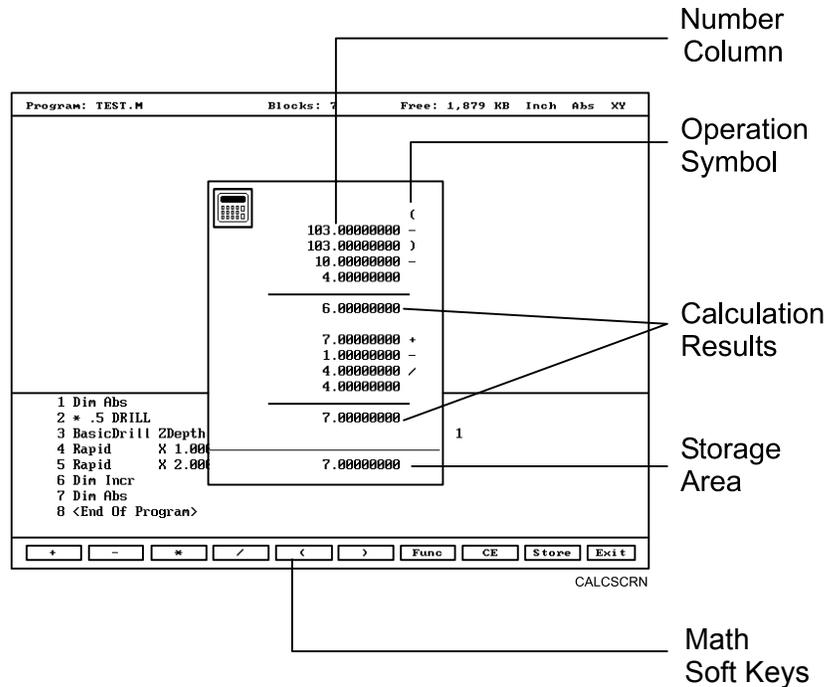
Figure 13-2, Math Calculator and Soft Keys

Math Calculator Basics

Numbers appear in the storage area, as entered. Select math operations using the appropriate soft key. Refer to .

Refer to . Enter the first number of the calculation, and then press an operation soft key. The Commando places the number in the column. Next, select the operation performed with the next number. Enter the second number, and so forth.

After you enter the last number of a calculation, press **ENTER**. The Commando places the final number in the column and calculates the answer. The result is displayed in the storage area. Press **Store** (**F9**) to copy the result to the calculator's memory.

Press **CE** (**F8**) to clear previous calculations.

If the operator enters illogical combinations of operations and numbers, the Commando displays an error message or a row of asterisks.

Table 13-1, Math Operation Soft Keys

Operation	Soft Key Label	Soft Key Number
Addition	**+**	(**F1**)
Subtraction	**-**	(**F2**)
Multiplication	*	(**F3**)
Division	/	(**F4**)
Left Hand Parenthesis	**(**	(**F5**)
Right Hand Parenthesis	**)**	(**F6**)
Misc. Function Pop-Up Menu	Func	(**F7**)
Clear	CE	(**F8**)
Store Number For Recall	Store	(**F9**)

Operations Involving Two Numbers

To add, subtract, multiply or divide two numbers:

1. With the Math Calculator active, enter the first number, followed by the appropriate function hot key: **+** (**F1**), **-** (**F2**), * (**F3**), or / (**F4**). The Commando adds number and operation symbol to the column.

2. Enter the second number, and press **ENTER**. Commando adds second number to the column and displays the answer in the storage area.

Math with a Column of Numbers

The Commando can manage a column of numbers requiring multiple operations, such as a continuous equation, in standard mathematical order (multiplication, division, addition, subtraction). Press **ENTER** to generate the result.

Using Parentheses

Use parentheses to indicate arithmetical operations in a non-standard order. (Example: find a sum before using it as a multiplication factor.) The Commando performs operations within parentheses first.

When the Commando encounters parentheses, it solves the operation within the parentheses immediately, and substitutes that value for the parenthetical expression in the column.

Use parentheses in pairs, if at all. Make sure the parenthetical expression contains a left parenthesis "(" at the beginning and a right parenthesis ")" at the end. Otherwise, the Commando will not calculate the result.

The Commando performs operations within parentheses top to bottom, as they appear in the column, and solves innermost expressions first.

For example, the following expression:

(7 + 4 + ((6 * 9) -1)) / 8

would generate a result of 8.

Order of calculation:

6 * 9 = 54

54 -1 = 53

53 + 7 = 60

60 + 4 = 64

64 / 8 = 8

Using Additional Functions

The **Func** (**F7**) key activates a pop-up menu that provides access to additional math functions. These functions perform their listed operations on a single number. Refer to **Table 13-2**.

Table 13-2, Function Selection Pop-Up Listing

Pop-up Box Label	Function
Sine	Sine Function
Cosine	Cosine Function
Tangent	Tangent Function
ASine	Arcsine Function
ACosine	Arccosine Function
ATangent	Arctangent Function
SQRT	Square Root Function
SQR	Squaring Function
LN	Natural Log Function
Log	Log Function Base 10
Exp	Exponential Function
ToMetric	Inch to Metric Conversion
ToInch	Metric to Inch Conversion
ToDegs	Radian to Degree Conversion
ToRads	Degree to Radian Conversion
Inverse	Inverse Function

ANILAM

To use an additional function:

1. With the Math Calculator active, enter the number and press **Func** (**F7**). The Function pop-up menu is displayed to the right of the calculator.

2. Highlight a function, and press **ENTER**. The result is displayed in the storage area.

Storing Numbers from the Math Calculator

Press **Store** (**F9**) to copy the number from the storage area to the calculator's memory. The Math Calculator's memory holds 64 numbers. Numbers stored in memory can be recalled directly in a program.

Right Triangle Calculator

The Right Triangle Calculator solves the angles and sides of a right triangle, given any two sides, any two angles or an angle and a side. Store any or all of the values in the calculator's memory.

Activating the Triangle Calculator

To activate the Right Triangle Calculator:

1. In the Edit or MDI Mode, press **Calc** (**F7**). The calculator selection menu is displayed.

2. Highlight the **TRIANGLE CALCULATOR** template, and press **ENTER**. The Triangle Calculator activates. Refer to **Figure 13-3**.
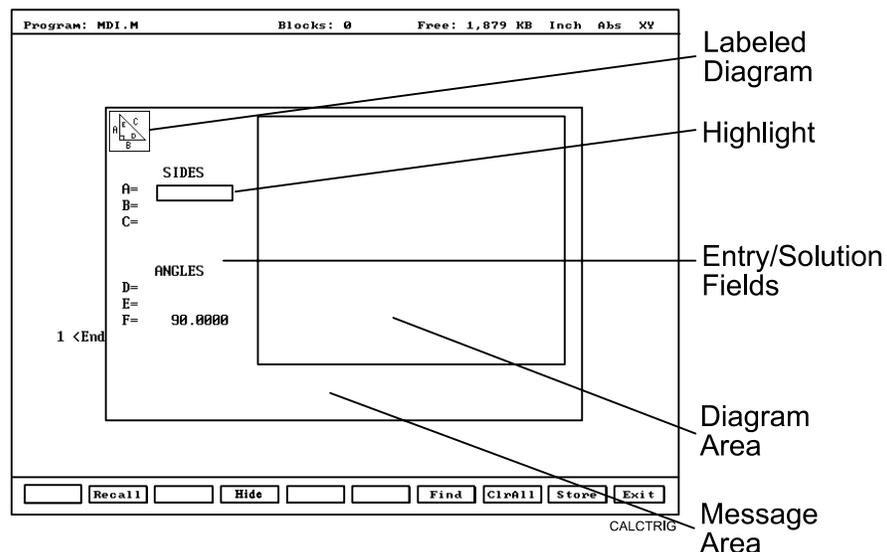
Figure 13-3, Right Triangle Calculator Screen

Using the Triangle Calculator

The Right Triangle Calculator only solves right triangle problems. The Right Triangle Calculator's pop-up screen contains three main areas: the entry/solution area, the diagram area and the message area.

The labeled entry fields in the entry/solution area correspond to the sides and angles shown in the diagram.

To use the Right Triangle Calculator, the operator enters known element values: any two angles, any two sides, or one angle and one side.

After the operator enters two known elements, the Commando calculates and displays values for the remaining sides and/or angles. The Commando places an asterisk after solved element values. A scaled drawing of the solved triangle is also displayed in the diagram area.

To clear a single incorrect value, highlight the value and press **CLEAR**. To clear all displayed values, press **ClrAll** (**F8**).

An illogical entry generates an error message.

Recall Right Triangle Calculator solutions directly into a program (for positive (+) incremental moves only). To adjust these solutions to produce absolute coordinates, recall the values in the Math Calculator and add an offset value.

To solve for the sides and angles of a right triangle:

1. With the Right Triangle Calculator active, highlight the field for the first side or angle and enter the value.

2. Highlight a second side or angle and enter the value.

3. Press **Find** (**F7**). Scaled drawing of triangle is displayed in the solution box. Calculated sides and angles are displayed in unused fields.

Storing Right Triangle Calculator Results

The Commando will save any side or angle value. Maximum: 64 values.

To store a value:

1. Solve the required triangle.

2. Highlight the value to be stored.

1. Press **ENTER** to store the selected value in memory.

Hiding the Right Triangle Calculator Screen

To hide the Right Triangle Calculator Screen temporarily:

1. Press **Hide** (**F4**) to hide the Right Triangle Calculator Screen temporarily.

2. Press **Find** (**F7**) to show the screen again.

Geometry Calculator

The Commando uses Cartesian coordinates (X, Y-axis values) to define most positions. However, the operator must sometimes determine position coordinates based on the known construction of other elements on the print, including lines, circles and angles.

The Geometry Calculator provides an assortment of line, circle, angle and point templates. Use these templates to sketch a geometry construction that identifies the unknown position. The Geometry Calculator inserts a point at the required position. The calculator automatically solves the coordinates of all points. Recall stored coordinates as necessary in a program.

Activating the Geometry Calculator

1. Refer to **Figure 13-4**. In Edit or MDI Mode, press **Calc** (**F7**). Calculator selection menu is displayed on the screen.

2. Highlight **GEOMETRY CALCULATOR** template, and press **ENTER**. Geometry Calculator activates.

Geometry Calculator Screen

The Geometry Calculator consists of a pop-up screen with a display area, a message area and eighteen geometry templates. The geometry construction is displayed in the display area. Refer to **Figure 13-4**.

CALCGEOM
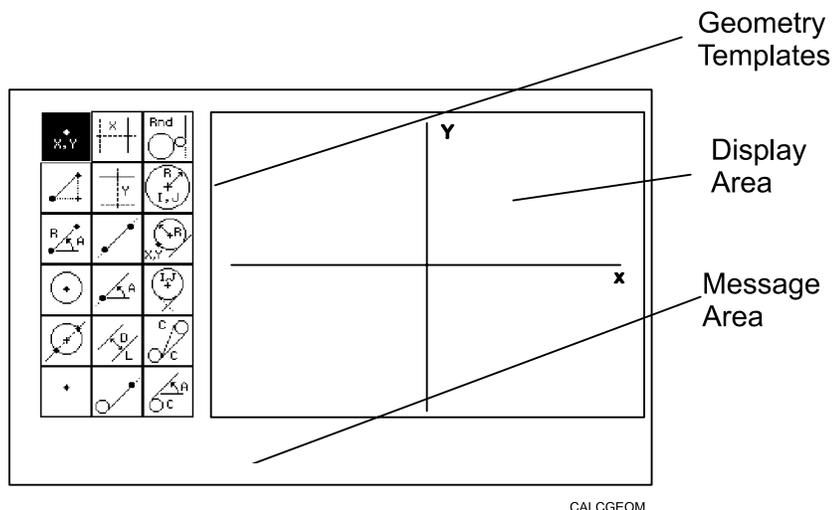
Figure 13-4, Geometry Calculator

Use the **DISPLAY** (**F5**) soft key selections to alter the view of display area. The **DISPLAY** (**F5**) options work the same as they do in the Draw Mode display.

The calculator prompts for required values and selections. Pay close attention to the prompts.

Using the Geometry Calculator

Use the **ARROWS** to select a template. Press **ENTER** to activate the selected tool.

Points, lines and circles are the basic elements of all sketches. Use the eighteen geometry templates to define these elements. Each geometry tool defines an element differently. More than one tool will probably be needed to define the required geometry construction. Templates that require pre-existing points will prompt the operator to activate one of the point identification templates.

Display area grid lines appear as solid lines; constructed lines and circles appear as dotted lines; and points are marked with an "**x**" (lowercase x).

The Commando assigns a number to each element in a sketch. Sketches can contain a maximum of 50 elements.

All elements in the sketch also appear on the Geometry List. The element numbers on the Geometry List correspond to the element numbers in the sketch.

The Geometry List contains the following details about each element:

Circles	Absolute position of center and radius
Lines	Orientation (angle) and absolute position at which it crosses X and/or Y-axis
Points	Absolute positions

The calculator automatically numbers each element and stores the following details in memory:

Points	Absolute position
Circles	Absolute position of center

> **NOTE:** The Geometry Calculator does not automatically save the coordinates of an intersection between two elements. Insert a point at the intersection to save its coordinates.

When the operator deletes an element from the sketch, the Commando deletes all stored information pertaining to that element.

There are three categories of Geometry templates:

Point templates	Refer to Table 13-3, Point Templates.
Line templates	Refer to Table 13-4, Line Templates.
Circle templates	Refer to Table 13-5, Circle Templates.

Review the tables to see the requirements for each template. Many templates require some feature of an existing element as a reference. Experiment to understand how each template operates.

> **NOTE:** After a series of deletions and additions, the display could appear incomplete. Press **Display** (**F5**) and select **Redraw** to refresh the screen.

ANILAM

Point Templates

Some point templates insert points at positions defined by the operator. Other point templates use other elements as references.

Many line and circle templates display a "**Select point definition . . .**," message when activated. This indicates that the selected tool requires the operator to select (or create) a reference point.

Templates that insert points at circle centers and element intersections will prompt the operator for the required element number(s). The Commando displays all possible intersections; the user selects one.

Table 13-3, Point Templates

Template	Purpose	Requirements
The following line templates are in the first column of the Calculator screen.		
X, Y	Defines a point in a sketch.	Must know absolute X and Y position of the point.
	Defines a point at an X & Y increment from existing point.	Must know incremental X and Y distances from existing point.
R, A	Defines a point at radius and angle from existing point.	Must know distance from existing point. Must know number of degrees and direction ($\pm$) from the 3 o'clock position.
	Defines the center of an existing circle.	The circle must already be an element of the sketch.
	Defines the point of intersection between two existing elements. Prompts user to select an intersection when more than one exists.	Sketch must contain two intersecting (or tangential) elements.
	Identifies an existing point. Usually used when the construction of a new element requires a reference point.	Point must already be an element of the sketch.
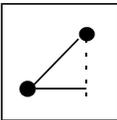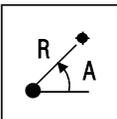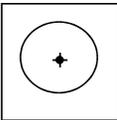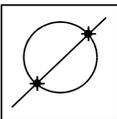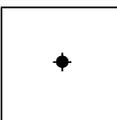
Line Templates

Line templates use other elements or axis positions as references. Templates that draw lines tangent to circles display all possible tangent lines and prompt the operator to select one. Refer to **Table 13-4**.

Table 13-4, Line Templates

Template	Purpose	Requirements
The following line templates are in the second column of the Calculator screen.		
X	Constructs a line parallel to Y-axis.	Must know absolute X-axis position of the line.
Y	Constructs a line parallel to X-axis.	Must know absolute Y-axis position of the line.
	Constructs a line between any two points. Prompts user to select a point tool to define each endpoint.	Use any point to locate the two endpoints.
A	Constructs a line through a point, rotated specified number of degrees from the 3 o'clock position. Prompts user to select any point tool to define point of rotation.	Must know number of degrees and direction (±) from the 3 o'clock position. Use any point to locate point of rotation.
D L	Constructs a line parallel to existing line at specified (positive or negative) distance.	Existing line must already be an element of the sketch.
	Constructs a line through a selected point and tangent to an existing circle. Prompts user to select any point for point. Displays tangent lines on both sides of circle. User selects required tangent.	Circle must already be an element of the sketch. Use any point to locate the point.
The following line templates are in the third column of the Calculator screen.		
C C	Constructs a line tangent to any two circles. Displays the four tangent lines possible. User selects required tangent.	Two circles must already be elements of the sketch.
A C	Constructs a line rotated a specified number of degrees from the 3 o'clock position and tangent to the existing circle.	Circle must already be an element of the sketch. Must know number of degrees of rotation from the 3 o'clock position.
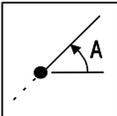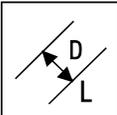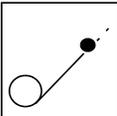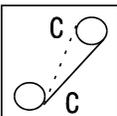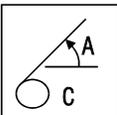
ANILAM

Circle Templates

Circle templates use other elements as positioning references.

Templates that draw circles tangent to other circles, lines or points display all possible tangent circles and prompt the operator to select one. Refer to **Table 13-5**.

Table 13-5, Circle Templates

Template	Purpose	Requirements
The following line templates are in the third column of the Calculator screen.		
	Constructs a circle of specified radius tangent to any two existing elements. All possible tangential circles are displayed. The user selects the required tangent.	Sketch must contain at least two elements.
	Constructs a circle of specified radius centered on a position. Prompts user to select a point to define the center point.	Use any point to locate the center. Must know radius.
	Constructs a circle of specified radius tangent to an existing line and through an existing point. Prompts user to select a point to define point.	Line must already be an element of the sketch. Use any point to locate the point.
	Constructs a circle centered on a point and tangent to an existing line. Prompts user to select any point to define center point.	Line must already be an element of the sketch. Use any point to locate the center.
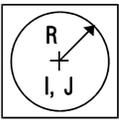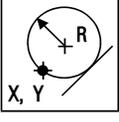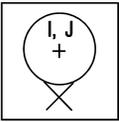
Deleting Selected Elements

To delete an element from the sketch:

1. With the Geometry Calculator active, press **GEOMETR** (**F7**). A pop-up menu is displayed.

2. Highlight **Delete Item**, and press **ENTER**. The screen prompts for the element number being deleted.

3. Enter the element number, and press **ENTER** to delete item.

Deleting All Elements

To clear all elements from the display area:

1. With the Geometry Calculator active, press **GEOMETR** (**F7**). A pop-up menu is displayed.

2. Highlight **Delete All**, and press **ENTER**. The screen prompts the user to confirm deletion.

3. Press **Yes** (**F1**) to clear the screen. Press **No** (**F2**) to cancel the command.

Listing All Geometry Elements

The Commando stores information on all points, circles and lines created in the Geometry Calculator in the **Geometry List**. For a point, the Commando lists the X, Y coordinates. For a line, endpoint coordinates, and, sometimes, the angle in reference to the 3 o'clock, 0 degree position. For a circle, the circle center and radius.

To display the Geometry List:

1. With the Geometry Calculator open, press **GEOMETR** (**F7**). A pop-up menu is displayed.

2. Highlight **Geometry List**, and press **ENTER**. The Geometry List is displayed.

Calculating the Distance between Two Elements

Use **Calc. Distance** to calculate the shortest distance between any two elements drawn with the Geometry Calculator.

> **NOTE:** For circles, the Commando calculates the shortest distance from the circle center to the other element.

To calculate the distance between two elements in the Geometry Calculator:

1. With the Geometry Calculator open, press **GEOMETR** (**F7**). A pop-up menu is displayed.

2. Highlight **Calc. Distance**, and press **ENTER**. The Commando prompts, "**Enter number of first element:**"

3. Enter the first element number. The Commando prompts, "**Enter number of second element:**"

4. Enter the second element number. The Commando calculates and displays the shortest distance between the two elements.

Last Position Recall

Whenever the calculator prompts for an X position, Y position or circle, the operator can recall the last X position, Y position or circle used by the calculator.

To recall a position:

1. When the calculator prompts for an X position, Y position or circle number, press the up and down **ARROWS** to recall the last position, Y position or circle number used.

ANILAM

Recalling Values in a Program

The Program Editor always displays **Recall** (**F2**) when a Graphic Menu activates. Recall calculator solutions stored in memory directly to the entry fields of a Graphic Menu. The operator can recall saved values only from the same calculator in which they were saved. Use the menu to select the type of recall. Refer to **Figure 13-5**.
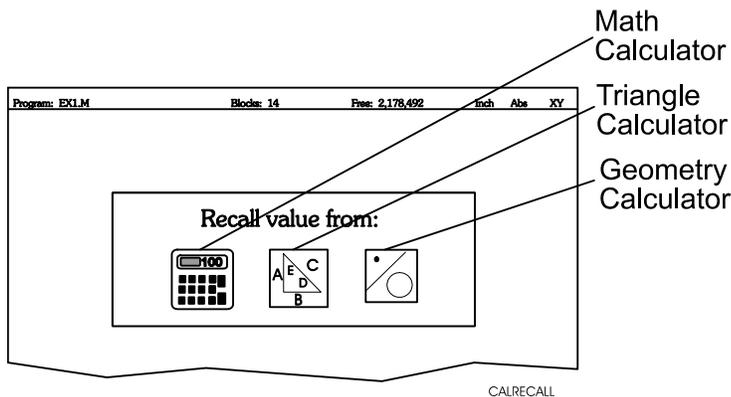
Figure 13-5, Recall Selection Pop-Up

Recalling Values from the Math Calculator

To recall a value from the Math Calculator:

1. From the Graphic Menu for the block being edited, highlight the field and press **Recall** (**F2**). Calculator recall selection menu is displayed. Refer to **Figure 13-5**.

2. Highlight the **MATH CALCULATOR** template, and press **ENTER**. The **Select value:** pop-up is displayed with the most recently saved value displayed at the top. Refer to **Figure 13-6**.

3. Highlight the required value, and press **ENTER** to copy the stored value into the Graphic Menu.
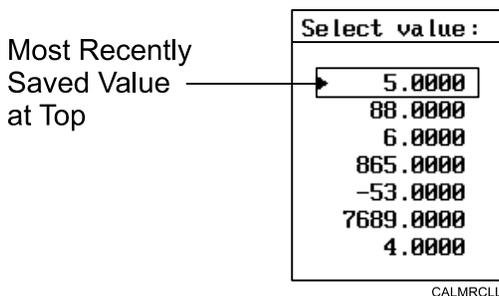
Figure 13-6, Math Calculator Select Value Pop-up

Recalling Values from the Right Triangle Calculator

To recall values from the Right Triangle Calculator:

1. From the Graphic Menu for the block being edited, highlight the field receiving the recalled value.

2. Press **Recall** (**F2**). The **Select value:** menu is displayed. Refer to Figure 13-5, Recall Selection Pop-Up.

3. Highlight the **TRIANGLE CALCULATO**R template, and press **ENTER**. The Triangle Calculator memory selection pop-up is displayed. Refer to **Figure 13-7**.

4. Highlight the required value, and press **ENTER** to copy stored value to the Graphic Menu.
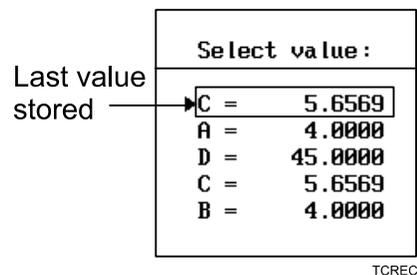
Figure 13-7, Triangle Calculator Recall Pop-Up

Recalling Values from the Geometry Calculator

Recall Geometry Calculator values from the calculator's **Select point:** pop-up menu. This menu is displayed next to a copy of the sketch that generated the points. The recall listing corresponds to the numbered elements on the sketch.

Positions on the recall list followed by a **[C]** are circle centers.

Positions on the recall list followed by a **[P]** are points.

Either or both of the position coordinates can be recalled.

To recall a value from the Geometry Calculator:

1. From the Graphic Menu for the block being edited, highlight the field receiving the recalled value.

2. Press **Recall** (**F2**). The calculator recall selection menu is displayed. Refer to Figure 13-5, Recall Selection Pop-Up.

3. Highlight the **GEOMETRY CALCULATOR** template, and press **ENTER**. The **Select point:** pop-up menu is displayed. Refer to **Figure 13-8**.

4. Highlight the required values, and press **ENTER**. The **Select term:** pop-up menu prompts for **Both X and Y** values, **X only** or **Y only**.

5. Select the required terms, and press **ENTER**. The Commando copies selected values to the Graphic Menu.

NOTE: Position coordinates can only be recalled to Graphic Menu entry fields that require X and/or Y coordinate values.

[C] - Indicates Position is a Circle Center
[P] - Indicates Position is a Point

```
┌─────────────────────────────────────────┐
│            Select point:                 │
│                                          │
│ ▶ 1. X    0.0000 Y    0.0000 [P]         │
│   2. X    1.0000 Y    1.0000 [C]         │
│   4. X    5.0000 Y    6.0000 [P]         │
│   6. X    6.0000 Y    6.0000 [P]         │
│   7. X    3.0000 Y    3.0000 [P]         │
└─────────────────────────────────────────┘
```
CALGRCL

Figure 13-8, Geometry Calculator Select point Pop-up Menu

Recalling Values from Calculator to Calculator

Both the Math Calculator and the Triangle Calculator recall values from other calculators.

In the **Triangle Calculator**, press **Recall** (**F2**) to activate recall. In the **Math Calculator**, press an **ARROW** to activate recall.

ANILAM

Section 14 - Off-line Software

The off-line version of the software requires an **Intel® based Personal Computer (PC) or 100% compatible. A minimum of 4MB of RAM is required. The hard disk drive must have a minimum of 4MB of space available.

The off-line software is also compatible with **Microsoft® **Windows® Operating Systems, such as **Windows NT®, Windows 95, Windows 98, or Windows 2000.

Passwords

Access to some setup parameters is restricted. Where required, the Commando prompts the user to enter a password. Refer to **Table 14-1**.

To access protected parameters:

1. Type the service password at the insertion point, and press **ENTER**. The Commando will enable you to change the protected settings.

2. There are four access levels protected by passwords. Operators are assigned limited passwords, which enable them to set parameters used in normal machine operations. Service passwords enable a higher level of access. The PLC (Programmable Logic Control) requires a separate password. The factory password is not used outside the manufacturer's plant.

Table 14-1, Off-line Passwords

Restriction Level	Password
Limited access	Q1
Service access	Q2

Exiting the Software

Press **ESC** to exit the software from the Main Menu selection screen.

- - - - -
** Intel® is a registered trademark of Intel Corporation in the United States and/or other countries.

** Microsoft®, Windows®, and Windows NT® are registered trademarks of Microsoft Corporation in the United States and/or other countries.

Windows Off-line Software Installation

1. Insert the installation disk in the floppy drive.

2. Go to the task bar, and click on the **Start** button. Select **Run**. The Run window activates.

3. In the **Open** entry field, type "**A:setup**". Click on **OK**. The installation procedure will then begin.

4. Follow the on-screen prompts as they appear.

> **NOTE:** Substitute "**B:setup**" for "**A:setup**" if your 3.5 inch floppy is in the B:-drive.

Running Off-line Software from Windows

1. If you selected "Desktop Icon" (recommended) during the installation, click the Commando icon on your desktop.

2. If you selected Start Menu, start from there.

System Settings

Maximum Memory Allocated

In the Setup Utility, you can adjust the amount of memory allocated to the Commando software. Set the **Maximum Memory Allocated** parameter between 2 MB and 18 MB. This feature limits the amount of memory available to the software, preventing the Commando program from tapping into Windows' large virtual memory supply. Allocating too much memory to the control software will dramatically increase startup time and make the software run slower.

To change the **Maximum Memory Allocated** parameter:

1. In the Commando's startup screen, select **Setup Utility**, and press **ENTER**. The Setup Options menu is displayed.

2. Select **General Software**, and press **ENTER**. The General Software menu is displayed.

3. Select **Control Software**, and press **ENTER**. The Control Software menu is displayed.

4. Select **Maximum Memory Allocated**, and press **ENTER**. Type the appropriate value, and press **ENTER**.

The only time it might be necessary to increase this parameter is when editing a program that is larger than this value. In this case, the Commando will generate an error message indicating that there is not enough memory to edit the program. To correct this problem, change this parameter to be the size of program plus 1MB.

ANILAM

Disabled Features

The following software features found in the Program Directory's **Utility** (**F9**) pop-up are not available in Windows:

❑ Check Disk

❑ Floppy Format

❑ Disk Optimization

❑ Program Restore

If you select one of these features, a Commando display will inform you that the feature is disabled.

Using Soft Keys from a Keyboard

The (**F1**–**F10**) keyboard keys correspond to the Commando's (**F1**–**F10**) soft keys, located below the CRT on the console. The **SHIFT** key activates secondary soft key functions, when applicable. To access secondary soft key labels on an off-line keyboard, press the **SHIFT** key and the appropriate function key (**F1**–**F10**) together.

Refer to Table 14-2, Keyboard Keystroke Equivalents. To make jog moves via keyboard, use the (**ALT** + **F1**) to (**ALT** + **F5**) keys to select the increment. Press the **AXIS/DIRECTION** key to start the jog. (Example: Press **ALT** + **K** to initiate a positive X jog move.)

To make continuous jog moves, press (**ALT** + **F1**) (Rapid) or (**ALT** + **F2**) (Feed). Press the **AXIS/DIRECTION** key to start the jog. Press any key to stop a continuous jog.

Keypad Equivalent Keyboard Keys

Refer to Table 14-2, Keyboard Keystroke Equivalents for keyboard keystroke equivalents to the keypad keys, Table 14-3, Off-line Keyboard, Tool Page Utilities for off-line keyboard and tool page utilities, and Table 14-4, Off-line Keyboard, Program File Directory Utilities for the keyboard equivalents of the keypad keys.

Table 14-2, Keyboard Keystroke Equivalents

Key Name	Key Face	Keyboard Keystroke Equivalent
ABS/INCR	ABS INC	**ALT** + **E**
(**+/-**) key	+/-	**+** OR **-**
CLEAR	CLEAR	**ALT** + **C** *– or –* **DELETE**
ARROWS		**ARROWS**
ENTER	ENTER	**ENTER**
RAPID		**ALT** + **F1**
FEED		**ALT** + **F2**
JOG: 100		**ALT** + **F3**
JOG: 10		**ALT** + **F4**
JOG: 1		**ALT** + **F5**
STOP CONTINUOUS JOG	none	**ALT** + **T**
X+	X+	**ALT** + **X**
X-	X-	**ALT** + **K**
Y+	Y+	**ALT** + **Y**
Y-	Y-	**ALT** + **L**
START		**ALT** + **S**
HOLD		**ALT** + **H**
SPINDLE FORWARD	SPDL FWD	**ALT** + **F**
SPINDLE OFF	SPDL OFF	**ALT** + **O**
SPINDLE REV	SPDL REV	**ALT** + **G**

Table 14-3, Off-line Keyboard, Tool Page Utilities

Function	Keystroke	Operation
Clear all entries on Tool Page.	**SHIFT** + **F3**	Clears all entries from Tool Page; prompts for confirmation before clearing page.
Exit Tool Page without saving changes.	**SHIFT** + **F10**	Exits Tool Page; unsaved edits lost.

Table 14-4, Off-line Keyboard, Program File Directory Utilities

Function	Keystroke	Operation
Create a subdirectory.	**SHIFT** + **F2**	Prompt for **NEW DIR:__** is displayed above soft key labels.
Delete any program in specified path.	**SHIFT** + **F3**	Prompt for **PROGRAM TO DELETE: _** is displayed above soft key labels.
Display System Information screen.	**ALT** + **I**	Displays System Information screen.

Editing with a Text Editor

Refer to **Figure 14-1**. The operator can also edit programs with the ASCII text editor:
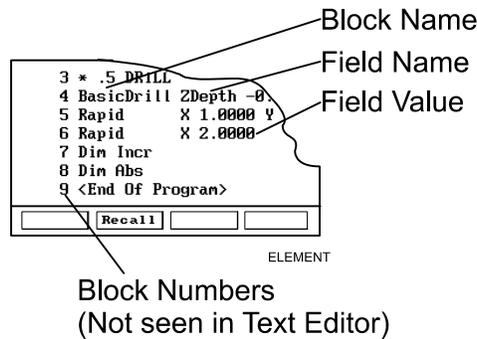
Figure 14-1, Program Block Elements

The following rules apply when you create or edit Commando blocks with a text editor:

❑ Start every program block with the block name. The name identifies the move, cycle or mode change.

❑ All required entry field names and values must appear after the block name. Separate all block names, field names and field values by at least one blank space.

❑ Do not enter block numbers in ASCII text editors. The Commando automatically numbers the blocks when it loads the program.

❑ The Program Editor uses all uppercase letters to make the Program Listing easier to read, but text editors are not case-sensitive.

❑ Spell block names as they appear in the Program Listing.

❑ A decimal point is not necessary after whole numbers.

❑ Include one Carriage Return/Line Feed combination (CR/LF) at the end of every block. Press **ENTER** to insert a CR/LF. The CR/LF will not appear on most ASCII text editor screens. Do not use more than one consecutive CR/LF.

❑ Use an asterisk (*) as the first character of a block to comment out blocks in a text editor.

❑ Rapid and Line moves involve one, two or three axes.

❑ List a **Feed** (feedrate) value at least once, in the first feed move of the program.

❑ Program **ToolComp** (Left, Right, or Off) blocks with a Line or Rapid move of a length equal to or greater than the cutter radius.

Numbered values must conform to the specification listed for the G-code converter. (Refer to "Section 9 - Program Management.")

Section 15 - Commando Software

Machine Software Installation

To install the machine software:

1. Insert the software disk in the floppy disk drive.

2. From the Commando's startup screen, select **Setup Utility** and press **ENTER** to display the **Setup Options** menu.

3. Select **Builder Setup** and press **ENTER** to display the **Builder Setup** menu.

4. Select **Software Update** and press **ENTER** to begin the installation sequence. Follow the instructions on the screen.

Software Option Kit Installation

The software option kit contains new or optional features for the Commando.

Each kit typically contains the following items:

❑ Installation Procedure
❑ Installation Diskette
❑ Hardware Key

The hardware key enables purchased options.

Procedure

To install the software option kit:

1. Use the shipping document to verify that the kit contains the ordered options.

2. Gain access to the female DB-25 printer port connector and install the hardware key.

> **NOTE:** Remove any previously installed hardware key before you install the new key.

3. Insert the floppy disk into the floppy disk drive.

4. Install the software as described above.

> **NOTE:** In the Setup Utility, make any necessary configuration changes to enable the purchased options.
>
> Refer to the *3000 Commando Setup Utility Manual*, P/N 70000544, for instructions on how to change the Setup Utility.

> **NOTE:** After you install and verify the operation of the software upgrade, discard the original software disk.

Using Soft Keys from a Keyboard

Refer to "Section 14, Using Soft Keys from a Keyboard."

Keypad Equivalent Keyboard Keys

Refer to "Section 14, "Keypad Equivalent Keyboard Keys."

Making Jog Moves from a Keyboard

Refer to "Section 14, "Using Soft Keys from a Keyboard."

ANILAM

F

F1, soft key, More,
  conversational editor, 6-6
F1, Teach soft key, 4-17
F1, toggle select mode, DXF
  converter, 12-6
F10, exit, DXF converter, 12-6
F2, ASCII, 2-8
F2, Create, 9-2
F3, Delete, 9-4
F3, Ins, 2-9
F3, layers menu, DXF converter,
  12-6
F4, Del, 2-9
F4, view menu, DXF converter,
  12-6
F5, display menu, DXF
  converter, 12-6
F8, Calib Z, 10-4
F8, save, DXF converter, 12-6
F8, Sub, 6-3
F9, Misc, 6-3
F9, Misc soft key, 6-6
F9, setup, DXF converter, 12-6
Face, 4-8
face pocket, entry fields, 5-9
face pocket, graphic menu,
  illustration, 5-8
facing cycle
  description, 5-8
  to program, 5-8
features, disabled, off-line, 14-3
FEED, hot key (4), 2-2
finding, coordinates, 4-3
first block, 4-3
fitting, the display to the viewing
  window, 7-10
fixture offset
  changing, adjust fixture offset table entry,
    4-12
  changing, calibrate the fixture offset table,
    4-12
  changing, manually enter a value, 4-12
  define, in fixture offset table, 4-4
  number, 4-10
  to calibrate, 4-12
  to cancel, 4-11
  to change, 4-12
  to program, 4-10

fixture offsets table
  define fixture offsets, 4-4
  fixture offset, number, 4-10
  illustration, 4-11, 4-12
  to activate, 4-12
  Z-offset coordinate, 4-11
floating absolute zero, defined,
  3-6
floppy disk
  checking for lost data, 9-12
  copy programs, to, 9-6
  formatting, 9-7
  printing from, 9-14
  rename programs, 9-13
  to read, 9-4
formatting, floppy disks, 9-7
frame pocket cycle
  description, 5-12
  to program, 5-12
Frame Pocket Cycle, 4-8
frame pocket, graphic menu,
  illustration, 5-12
front view, selecting, 7-12
function keys, description, 2-5

G

G-code
  conversion number formats, listed, 9-9
  converter, 9-8
  converting, programs to conversational
    format, 9-8
  equivalents, table, 9-9
geometry calculator
  circle template, description, 13-11
  description, 13-7
  line template, description, 13-10
  point template, description, 13-9
  recall, a position, 13-12
  recalling, values, 13-14
  screen, illustration, 13-7
  templates, listed, 13-8
  to activate, 13-7
  using, 13-8
geometry elements, list all,
  13-12
geometry list, element numbers,
  13-8
graphic menu
  area, program editor, illustration, 6-2
  basic drilling, illustration, 5-2
  bolthole drill, illustration, 5-6

ANILAM

ANILAM