Sargon
Industries, Inc.

GOLD TRACER II
PROGRAMMABLE MILL DISPLAY

Made in USA

GOLD TRACER II

OPERATOR'S MANUAL

Industries, Inc.

Table of Contents

Programming

1

Press to select the appropriate axis.

Press a second time after numerical data has been keyed in.

Power input module at rear of Gold Tracer has:

- On/Off switch.
- Fuse protection.
- EMI filter for noise protection.

MEC switch at rear of Gold Tracer is used to set Machine Error Compensation.

Internal Nonvolatile Memory maintains data when Gold Tracer is off.

Bright, efficient LED display with wide viewing angle.

X   8.3500   ENTER

Y   12.0000   ENTER

Z   0.7000   ENTER

Made in USA
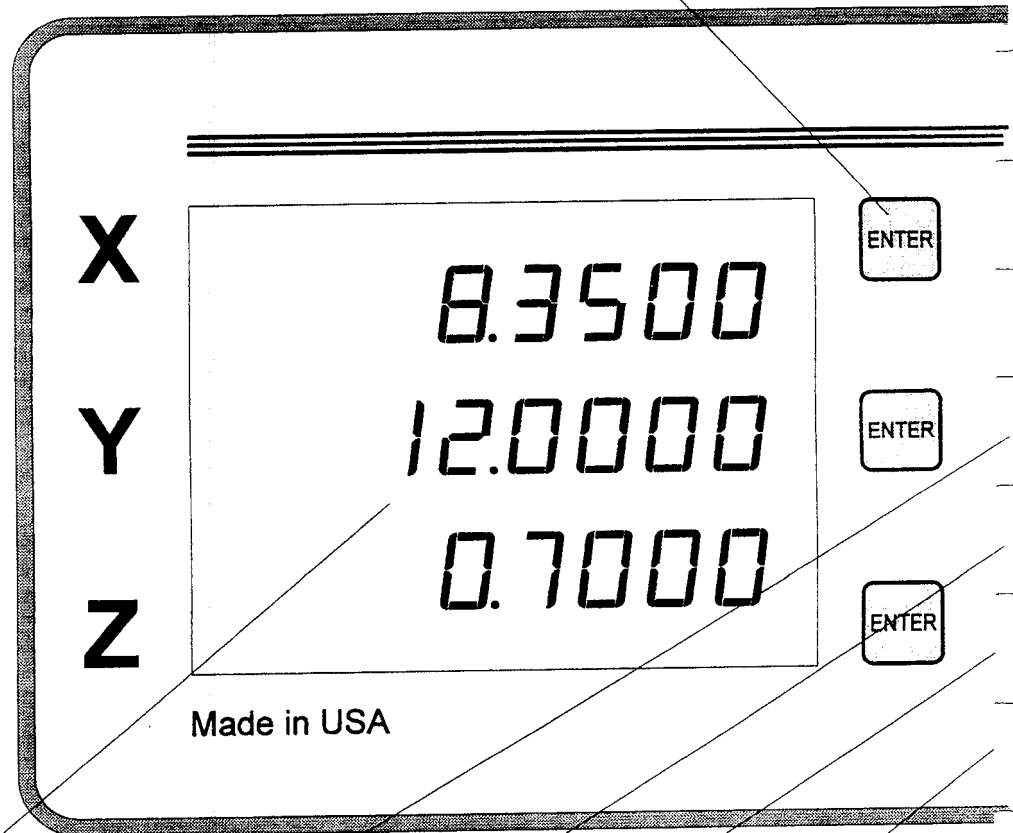
Clear a dimension.

Add to a dimension.

Subtract from a dimension.

Freeze display to make measurements easier.

Select normal DRO mode.

Up to 25 programmable tools.

Line hole patterns. Up to 10 line hole programs can be stored in memory.

Bolt hole patterns. Up to 10 bolt hole programs can be stored in memory.

Point to point programs. Up to 200 steps can be stored in memory.

Select 1 of 10 datum points.

Display absolute or incremental coordinates.

Press and hold at power-up to set:

- Scale resolutions.
- Scale directions.
- Axis Scale Factors.
- Near Zero Warning.

Optional RS232 Interface:

- DRO can be controlled through a PC.
- DRO displays can be sent to a printer.

Inch or millimeter display.

Fine or Coarse resolution: In Fine, maximum scale resolution is displayed. In Coarse, less resolution is displayed.

Create a program while machining a part.

Display current operating mode.

Center a dimension – divide the position display by 2.

Sargon

NOR	TOOL	LINE	BOLT	PROG	RUN CREATE
CLEAR	7	8	9	DATUM	A I
ADD	4	5	6	PRINT	in mm
SUB	1	2	3	SAVE	FINE CRS
TARGET	± XY/r⊙	0 SKEW	• MIRROR	₵ MARKER	

GOLD TRACER II

Enter a target dimension and machine to 0.0.

Align XY table axes to the work piece.

Display Cartesian or polar coordinates.

Mirror image for X, Y and Z displays. Mirror line hole, bolt hole and point to point programs.

Option: Search for marker pulse to set position.

2

Introduction

2

This manual covers operation of the Sargon Gold Tracer II Programmable Mill Display, which is also referred to as just the Gold Tracer or DRO (Digital Readout).

The Gold Tracer can be used for basic DRO operations or for more advanced programmable operations.

Getting started

To rapidly gain familiarity with your system and to get the most out of it, the following is recommended:

1. Install the system as described in Section 3.
2. Set the Gold Tracer scale resolutions, scale directions etc. as described in Section 4.
3. Move the mill axes and verify the readout displays position as expected.
4. Read the appropriate sections of this manual depending on the type of tasks to be performed and try out the various features.
5. Read this manual from cover to cover to become fully acquainted with all capabilities.

Basic DRO operation

Normal mode uses a datum point, a tool number and tool offsets. However, if the **DATUM** and **TOOL** keys are not used, the Gold Tracer can be operated as a basic DRO without knowing anything about these features.

To use the Gold Tracer as a basic DRO, use the keys shown in black below. This will get you started and then the other features can be used as needed and as you become familiar with them.
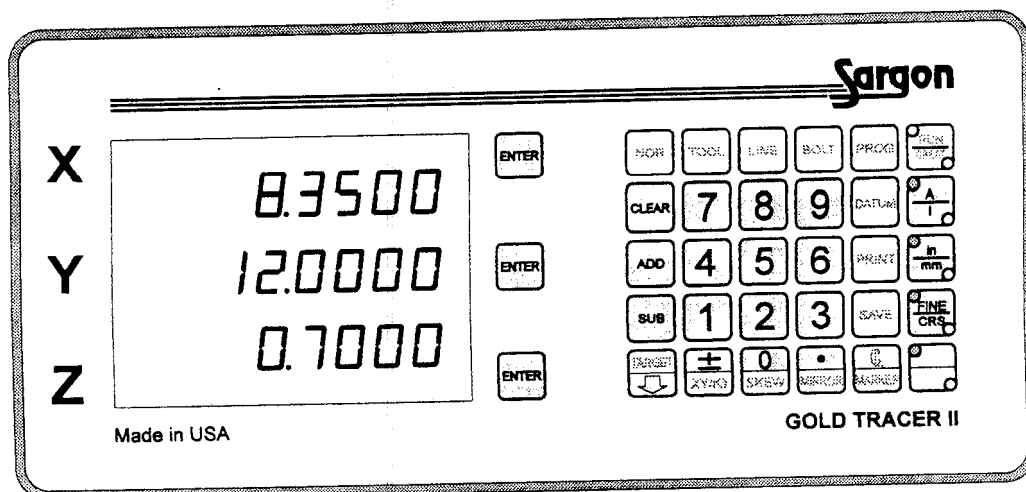
Preparation For Use

3

Unpacking

Inspect Shipping Containers. Inspect for obvious damage that would indicate mishandling during shipment. Make note of any indicators, such as: dented corners or torn sides.

Save Packing Material. The shipping box and packing material should be opened carefully to permit reuse in case it is necessary to return any portion of the equipment.

Notify Carrier In Case of Damage. If the display or other items show any external damage, or if parts have vibrated or broken loose, the carrier should be notified within ten days of receipt of shipment.

Check Packing List. Any discrepancy between the items received and the items listed on the shipment packing list should be reported immediately to the Sargon distributor.

General installation notes

WARNING HAZARDOUS VOLTAGES.
USE EXTREME CAUTION.

All required electrical work should be performed by a qualified electrician.

Mount the Gold Tracer a minimum of 6 inches away from any motors. The Gold Tracer may be mounted to the arm provided, or to a custom machined arm, mount, or stand.

Refer to the applicable manual for scale installation.

Typical display installation

1. Remove the large eye bolt located on top of the milling machine column (Index 1).

2. Mount the arm (Index 2) as shown.

3. Bolt the Gold Tracer to the mounting arm with the 5/16-18 bolt (Index 4) provided in the hardware kit.
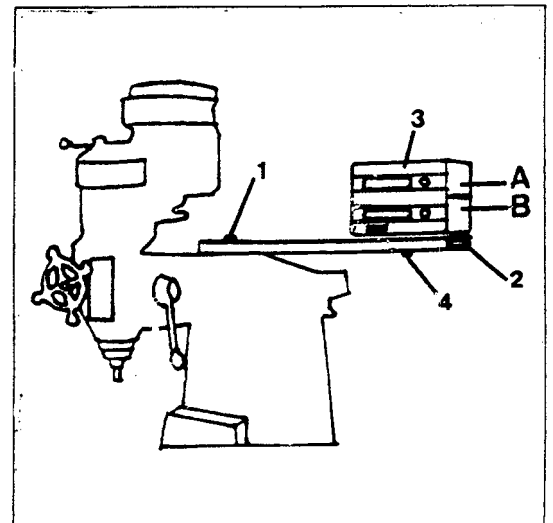
Installation under mounting arm

1. Remove screws at both sides of the Gold Tracer case extrusion.

2. Remove the top and bottom halves of the case extrusion.

3. Mount the bottom half of the case (Index B) on the top side of the Gold Tracer.

4. Mount the top half of the case (Index A) on the bottom side of the Gold Tracer. The top half should now have the mounting hole in its center.

5. Mount the Gold Tracer as shown.
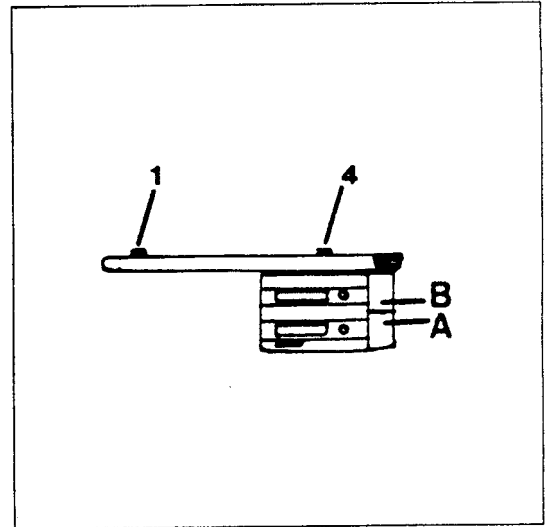
Grounding

The AC outlet should be a three prong grounded outlet (per article 250 of the US National Electrical Code). If it is not, use a grounded adapter and verify that the adapter is grounded.

Verify that the machine is grounded. If it is not, a ground must be installed.

Install a 14 AWG stranded wire (customer provided) from the ground lug located on the back of the Gold Tracer to the machine power ground connection. If this is not possible, drill/tap at an alternate location on the machine. Secure the ground wire using star or split washers to ensure adequate connection. Use an approved anti-oxidation compound at the connection where the paint is scraped.

AC power

Do not use machine power lines for the Gold Tracer. Use a separate 120 or 240 VAC outlet. If an outlet is not available, one should be installed near the Gold Tracer mounting location.

The AC power outlet should be of the same voltage as that indicated on the identification/serial number label on the back of the Gold Tracer.

Use the power cord supplied. Do not modify the power cord in any way.

Routing scale cables

Connect and secure the scale connectors to the Gold Tracer. Using tie-wraps, secure the scale cables and dress any excess slack. Do not wrap any AC power lines with the scale cables. Maintain a minimum of 6 inch spacing from AC lines and cross at right angles.

4

Setup Screens: Setting Scale Resolutions, Scale Directions, and Diameter Enable

Description

Instead of using internal switches, scale resolutions, scale directions, and diameter enable are programmed from the Gold Tracer front panel.

Scale resolutions, scale directions, and diameter enable are stored in the Gold Tracer's nonvolatile memory. Once set, the Gold Tracer may be powered down. When powered up at a later time the settings will still be intact.

Entering the setup screens
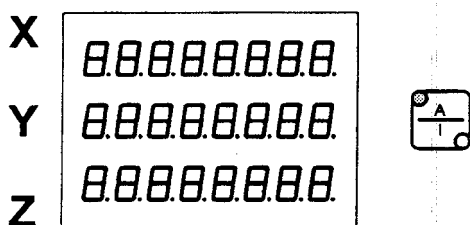
X `8.8.8.8.8.8.8.8.`

Y `8.8.8.8.8.8.8.8.`

Z `8.8.8.8.8.8.8.8.`

Set the power switch at the rear of the Gold Tracer to OFF (0) then back to ON (1). The display will flash **8.8.8.8.8.8.8.8.**

Selecting the desired setup screen

X `r E 5    .0005`

Y `n E G      - - ,`

Z `d I A        n0`

`5.F.      1.000`
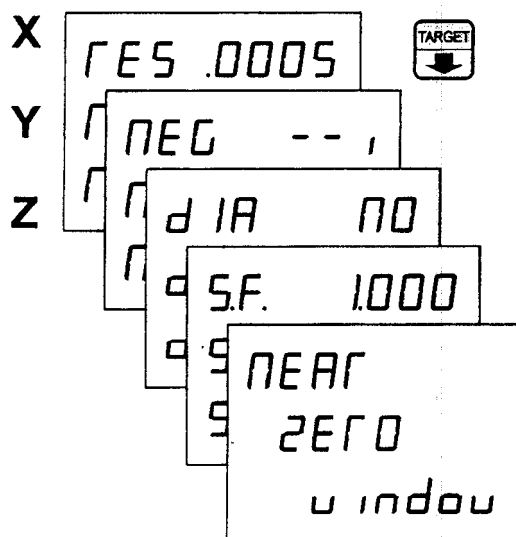
`n E A r`
`2 E r 0`
`u I n d o u`

Press and hold **A/I** until one of the setup screens is displayed.

NOTE   Scale Factor and Near Zero Warning set-up screens are also shown. These are covered in sections 23 and 10 of this manual respectively.

6

Scale resolutions

MICRON	INCH
10.0	0.0005
5.0	0.0002
2.0	0.0001
1.0	0.00005
0.5	0.00002

Each axis on the Gold Tracer must be set to the resolution which matches the scale being used for that axis. Resolutions available on the Gold Tracer are shown to the left. The scales must be metric. When inch mode is selected, the metric scale inputs are converted by the Gold Tracer to display in inches.

```
X  rES .0005        [ENTER]
Y  rES .0002
Z  rES .0001
   rE .00005
   rE .00002
   rES .0005
   rES .0005
```
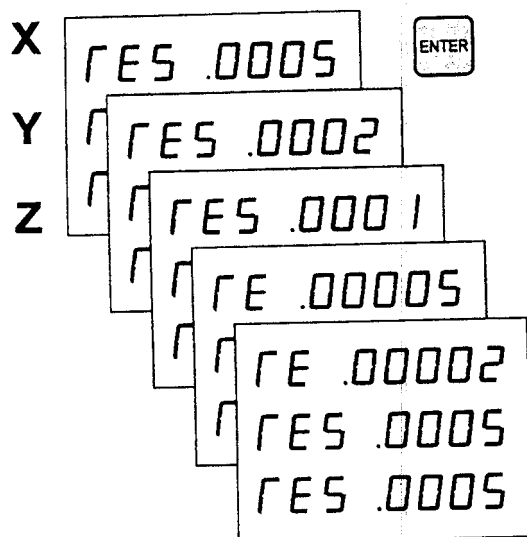
Repeatedly press the **DOWN ARROW** key until the resolution setup screen is displayed.

Repeatedly press **ENTER** for the desired axis until the correct resolution is displayed.

```
X  rES .0005        [in/mm]
Y  rES  10  u
Z  rES  10  u
   rES  10  u
```
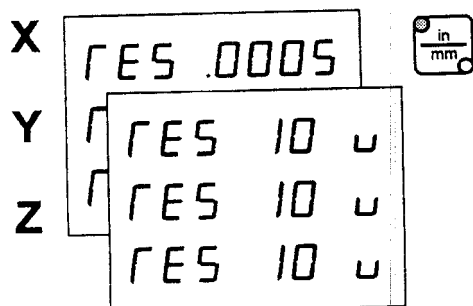
Press **inch/mm** to change between inch and metric displays. In mm mode the resolutions are displayed in microns (0.001 mm).

Scale directions

The display will count up or down, depending on the direction of table movement. Scale direction can be set, in the Gold Tracer, for each axis, so that movements are properly displayed.

```
X  nEG      -- 1
Y  1 --    POS        [ENTER]
Z  nEG      -- 1
```
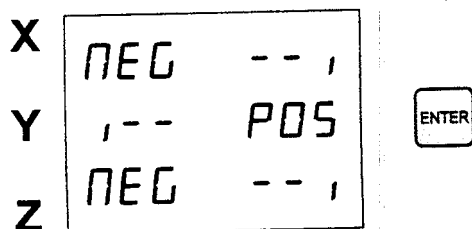
Repeatedly press the **DOWN ARROW** key until the scale direction setup screen is displayed.

Press **ENTER** for the desired axis to switch between positive and negative scale directions.

Diameter / radius

When diameter is enabled (set to YES) for an axis, as described below, the scale input for that axis is doubled. In other words, the displayed dimension is twice the actual distance traveled.

When diameter is disabled (set to NO) for an axis the displayed dimension tracks the actual scale movement.

X | d IA   NO
Y | d IA   YES
Z | d IA   NO

Repeatedly press the **DOWN ARROW** key until the *DIA YES/NO* screen is displayed.

Press **ENTER** for the desired axis to switch between diameter enabled *(YES)* and disabled *(NO)*.

Exiting the setup screens

When scale resolutions, scale directions, and diameter enable are correctly set, exit setup mode by pressing **A/I.**

5 Clearing All Memory

The following will occur when memory is cleared:

- Resolutions will be set to 10 micron.
- Scale directions will be set to negative.
- Diameter will be disabled for all axes.
- Near Zero Warning window will be set to ± 0.2000 inch.
- Bolt hole and line hole programs will be replaced by sample demo programs.
- Point to point program steps will be cleared.
- Scale factors will be set to 1.000.
- Position information will be lost.
- MEC factors will be set to 1.0.
- All other stored information will be lost.

Selecting clear all

CLEAR

X **CLEAr**
Y
Z **ALL**

ENTER

CLEAr

YES
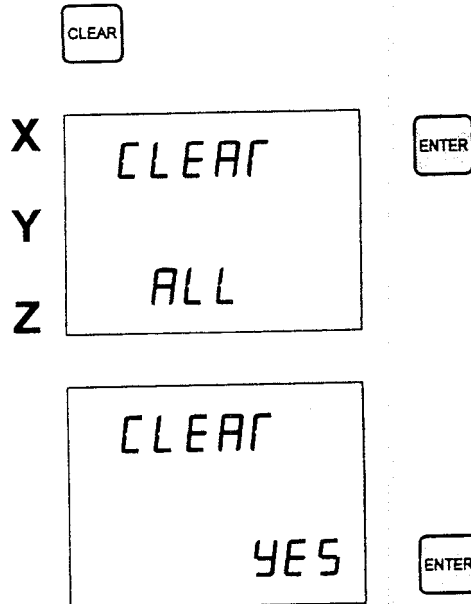
ENTER

After power up and while the display is still flashing *8.8.8.8.8.8.8.8.* press and hold the **CLEAR** key to display the *CLEAR ALL* screen.

Press the X axis **ENTER** key. *CLEAR, YES* will be displayed.

Press the Z axis **ENTER** key. *CLEARED, YES* will be momentarily displayed and all memory will be cleared. The Gold Tracer will then automatically go to the setup screens.

Exiting without clearing memory

To exit the clear all screen without clearing memory, press **A/I** or any other key except the X axis **ENTER**. The Gold Tracer will automatically go to the setup screens.

6 Absolute and Incremental Modes

The difference between absolute and incremental modes

The absolute position is the distance between a fixed starting point on the work piece and another point to which the machine has been moved. The incremental position refers to distances that are not measured with reference to a fixed origin, but instead, the distance is measured between the previous point and some new point.

Absolute and incremental registers are both updated during table movement regardless of which is currently displayed.

Absolute and incremental registers are otherwise independent; that is, clearing one will not affect the other.

Absolute and incremental on a sample work piece

Origin (0,0)

2.9 inches

1.9 inches

0.9 inch

0.7 inch

1.0 inch   1.0 inch

Absolute position
(0.9000, -0.7000)

Incremental position
(1.0000, 0.0000)

Incremental position
(1.0000, 0.0000)
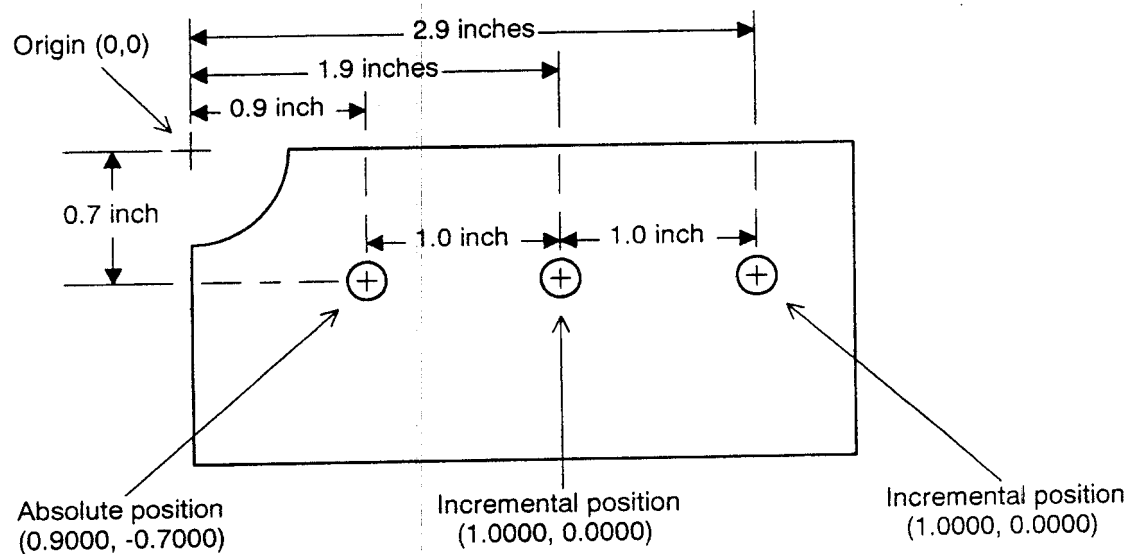
Switching between absolute and incremental display modes

Press the **A/I** key to switch between absolute and incremental position displays. LEDs behind the key indicate which mode is active.

7 Numerical Data Entry

Clearing absolute position register

The absolute and the incremental position registers are cleared independently. Clearing one will not affect the other.

1. The Gold Tracer must be in absolute mode to clear the absolute registers.

2. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

3. Press the **CLEAR** key. The selected axis will display *0.0* with the appropriate number of trailing zeroes. The decimal point will no longer be flashing.

Canceling an incorrect entry

This feature is to prevent accidentally losing the absolute position coordinates. It is applicable to absolute mode only.

If the **ENTER** key has been pressed in error and therefore the decimal point is flashing, again press **ENTER** (for the same axis) without keying in any value or pressing any other key. The original position will again be displayed.

If numbers have already been keyed in (other than a single zero, "0.") but the **ENTER** has not yet been pressed a second time: Press **CLEAR** then press **ENTER**. The original position will again be displayed.

Clearing incremental position register

The absolute and the incremental position registers are cleared independently. Clearing one will not affect the other.

1. The Gold Tracer must be in incremental mode to clear the incremental registers.

2. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

3. Press the **CLEAR** key. The selected axis will display *0.0* with the appropriate number of trailing zeroes. The decimal point will no longer be flashing.

Entering a preset dimension

NOTE When the **+/-** key is used while entering a dimension, it must be pressed after a number other than 0 has been keyed in. When the value is negative, the minus sign is displayed. When the value is positive, no sign is displayed.

1. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

2. Use the numeric keypad to key in the desired dimension.

3. Again press the **ENTER** key (for the same axis). The selected axis will display the preset dimension that was keyed in. The decimal point will no longer be flashing.

To preset both absolute and incremental dimensions at the same time, press **ENTER**, key in the value, use **+/-** if the value is negative, then press **A/I.**

Adding to or subtracting from a dimension

1. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

2. Use the numeric keypad to key in the desired value.

3. Press the **ADD** or **SUB** key as appropriate. The keyed in value will be added to or subtracted from the previous displayed value and the result will then be displayed.

Centering a dimension

The absolute and the incremental position registers are centered independently.

1. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

2. Press the **CL** key. The word *CENTERED* will be momentarily displayed. The dimension on the selected axis will be centered (divided by 2) and the result will then be displayed.

Recalling a preset dimension

This feature allows the operator to repeat an incremental step without again keying in the dimension. It is applicable to incremental mode only.

When the Gold Tracer is in incremental mode, press the **ENTER** key for the appropriate axis, twice, without keying in any value. The last preset incremental dimension that was entered for that axis will be recalled.

Negating a dimension

When the Gold Tracer is in incremental mode, press the **ENTER** key for the appropriate axis, then press the **+/-** key. The sign of the dimension will be changed.

8

Target Dimensions

Description

Target presetting is used to move from the current position to a specified absolute position. Target presetting is performed in incremental mode.

Entering target dimensions

1. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.
2. Use the numeric keypad to key in the target position coordinate.
3. Press the **TARGET** key. The Gold Tracer will display a value which when zeroed (by moving the table towards the target position) will locate the target position. If the Gold Tracer is not in incremental mode when the **TARGET** key is pressed, it will automatically switch to incremental mode.
4. Repeat the procedure for the remaining axes that are included as part of the target position.

Target dimension example

ORIGIN
Absolute position
(0.0000, 0.0000)

TARGET POSITION
Absolute position
(0.9000, -0.7000)

0.4 inch

CURRENT POSITION

2.3 inches
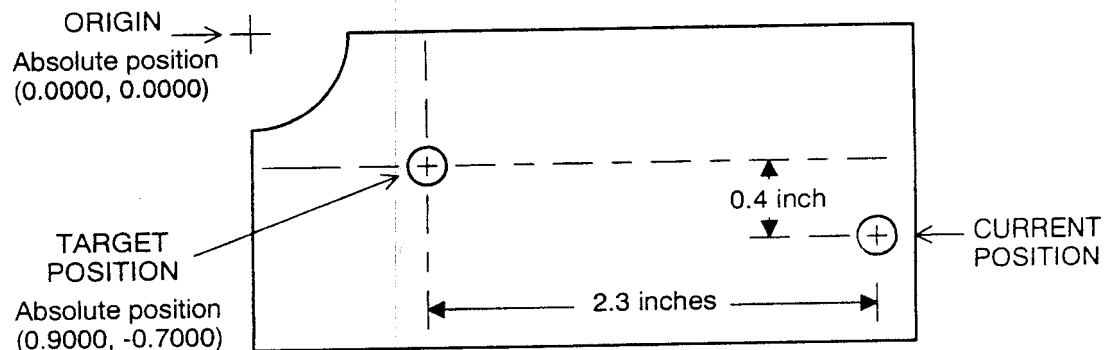
1. The cutting tool is at "current position" and the operator wishes to move to "target position."
2. On the X axis: Press **[ENTER] [.] [9] [TARGET]**. The X axis will display **2.3000**.
3. On the Y axis: Press **[ENTER] [.] [7] [+/-]** (changes the value to negative) **[TARGET]**. The Y axis will display **-0.4000**.
4. To reach the target point, move the table until X = **0.0000** and Y = **0.0000**.

<table>
<tr><td>

9

</td><td>

Cartesian and Polar Coordinates

</td></tr>
</table>

Description

Dimensions can be displayed as either Cartesian or polar coordinates.

These are best described by the figures shown below.

Cartesian coordinates

X   *16.0000*

Y   *12.0000*

Z   *0.0000*
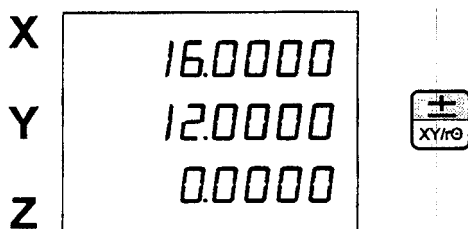
Press to switch from polar to Cartesian coordinates.

Polar coordinates

X   *r 20.0000*

Y   *A 36.87*

Z   *0.0000*
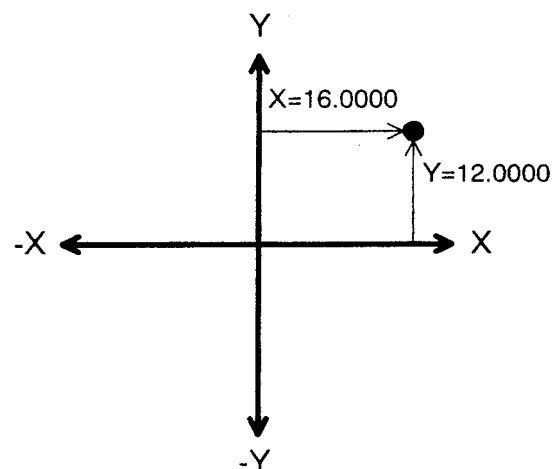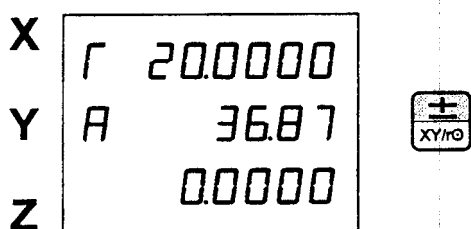
Press to switch from Cartesian to polar coordinates. Numbers cannot be entered while the Gold Tracer is in polar mode.
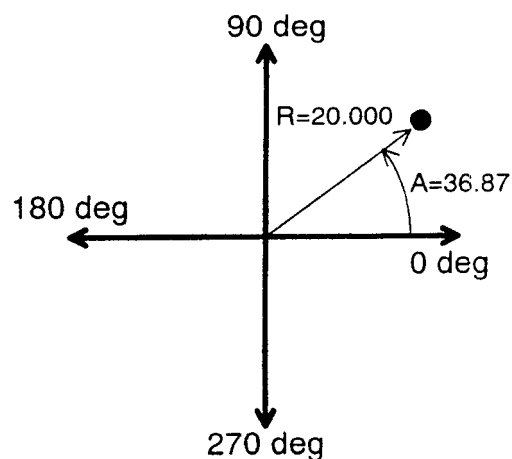
10 Near Zero Warning

Description

A near zero warning window is set for each axis as described below. The near zero warning indicator is set from the setup screens. When enabled, one of the following symbols will be displayed when the position is within the near zero warning window.

| ┠. | This symbol is displayed when zero is being approached from the positive direction. |

| ┨. | This symbol is displayed when zero is being approached from the negative direction. |

The window setting indicates the range (plus or minus from zero) for which the near zero warning indicator will be displayed when enabled.

Setting the near zero warning window
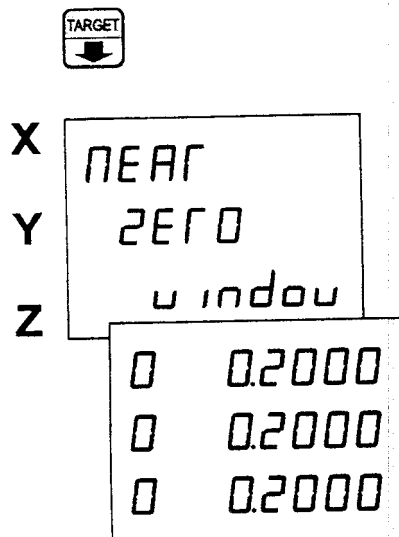
[TARGET ↓]

X ⊓EAⲅ
Y ㄹEⲅ0
Z ⊔⌐ndo⊔

0	0.2000
0	0.2000
0	0.2000

After power up and while the display is still flashing **8.8.8.8.8.8.8.8.** press and hold the **A/I** key to display the setup screens.

Press the **DOWN ARROW** key until the **NEAR ZERO WINDOW** screen is displayed.

ENTER the near zero window for each axis, as required.

```
         Near Zero Warning
   |←———— Window ————→|
   |        |          |
 -0.2       0        +0.2
```
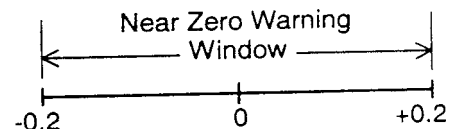
Press the **DOWN ARROW** key to display the next setup screen – the **NEAR ZERO ON/OFF** screen.

To exit the setup screens, press **A/I**.

Enabling and disabling the near zero warning indicator
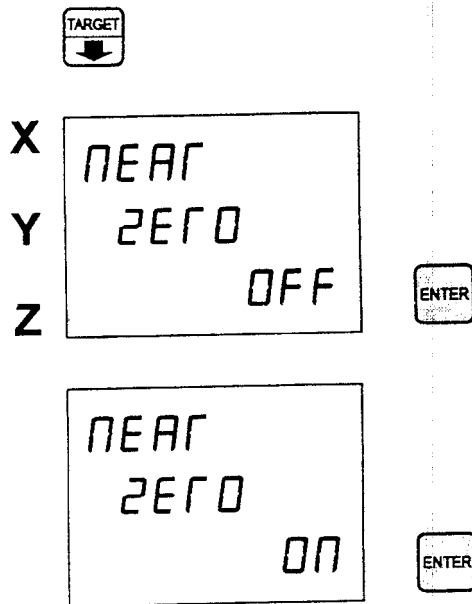
[TARGET ↓]

X
Y
Z

```
ПЕАГ
  ЗЕГО
        OFF
```

[ENTER]

```
ПЕАГ
  ЗЕГО
       ON
```

[ENTER]

After power up and while the display is still flashing **8.8.8.8.8.8.8.8.** press and hold the **A/I** key to display the setup screens.

Press the **DOWN ARROW** key until the **NEAR ZERO ON/OFF** screen is displayed.

Press the bottom axis **ENTER** key to toggle between near zero warning enabled (ON) and disabled (OFF).

To exit the setup screens, press **A/I**.

11 Datum Points

Description

Datum point zero is always 0, 0, 0, and cannot be changed. Datum points 1 through 9 can be set by the operator.
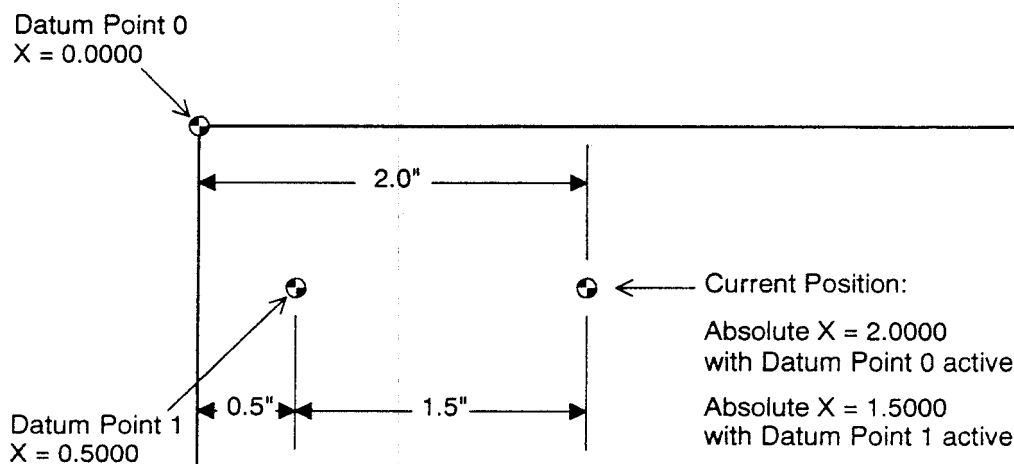
Datum Point 0
X = 0.0000

2.0"

Current Position:

Absolute X = 2.0000
with Datum Point 0 active

Absolute X = 1.5000
with Datum Point 1 active

Datum Point 1
X = 0.5000

0.5"

1.5"

Setting datum points

DATUM

X   INC   dEC
Y   UPdAtE
Z   dAtun   0

d.0   0.0000
d.0   0.0000
d.0   0.0000
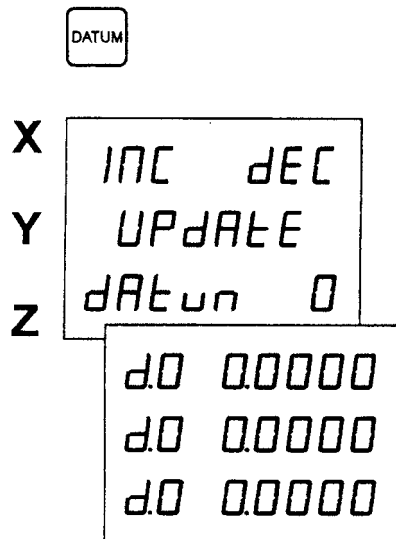
After power up and while the display is still flashing *8.8.8.8.8.8.8.8.* press and hold the **DATUM** key until *INC DEC DATUM PT* is displayed, then release. The datum point setup screen will be displayed.

Press the **ADD** or **SUB** key to increment or decrement the datum point number.

ENTER the dimensions for the selected datum point number.

Selecting datum points

During operation (not while in setup mode), press the **DATUM** key. *INC DEC DATUM PT* will be momentarily displayed, followed by the datum point screen.

Press the **ADD** or **SUB** key to increment or decrement the datum point number. Datum point dimensions cannot be changed in this mode

When the desired datum point has been selected, press the **DATUM** key or any number key to exit the datum point screen.

Datum points example

Set datum points 1 and 2 as follows:

Datum Point 1	Datum Point 2
X = 1.500	X = 1.500
Y = -1.500	Y = -3.500

Select datum point 0, move to 0,0 on the work piece, and set the absolute dimensions to 0.0000.

Select datum point 1 and move until absolute 0, 0 is displayed. This is the center of the top bolt hole pattern. Run the bolt hole program.

Select datum point 2 and move until absolute 0, 0 is displayed. This is the center of the bottom bolt hole pattern. Run the bolt hole program.

Datum Point 0
(0.0000, 0.0000)

1.5"

1.5"

3.5"

Datum Point 1
(1.5000, -1.5000)

Datum Point 2
(1.5000, -3.5000)
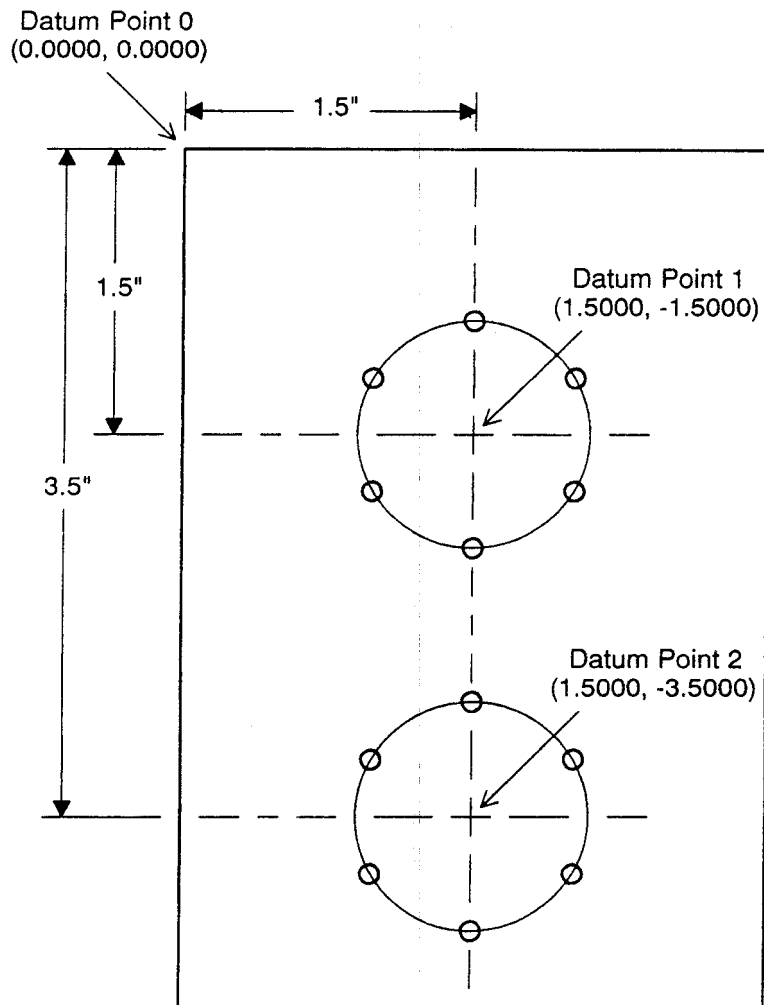
12 Skew Function

What are skewed coordinates?
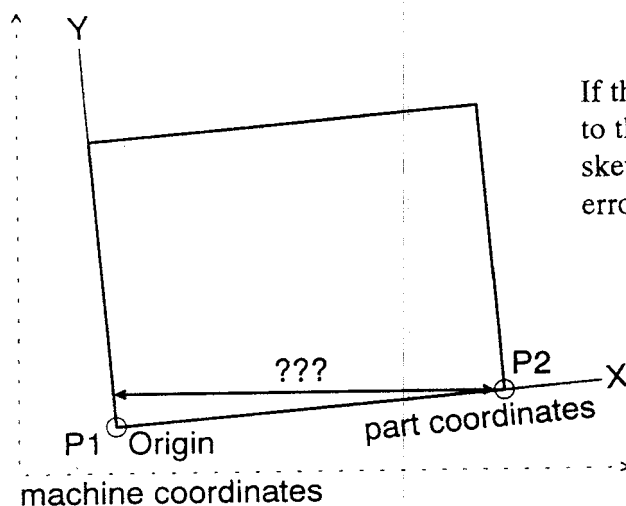
If the X and Y axes of a part are not parallel to the X and Y axes of the mill, the part is skewed. This will cause measurement errors.

Skew function description

One way to handle skewed coordinates is to perfectly align the part physically so that table movements exactly follow the X and Y axes of the part.

Another method is to use the skew function which automatically compensates for part misalignment.

It is only necessary to locate two points on the part which are on the same axis, either X or Y, in order for the Gold Tracer to compensate for the misalignment. The part must, however, be mounted within 45 degrees of its correct orientation, otherwise the X and Y axes will be switched. The points should be as far apart as possible to ensure the greatest accuracy.

Once skew is set for a part, all measurements will automatically be adjusted to eliminate the skew error. It may be noticed that when one axis is moved, the other axis also changes. This is the Gold Tracer compensating for the skew. The operator does not need to worry about the skew function until another part is mounted.

Setting skew

```
  0
 SKEW
```

X `SHEL nOd`

Y   `2.3465`

Z   `0.1075`

     `5`   `2`

```
TARGET
  ▼
```
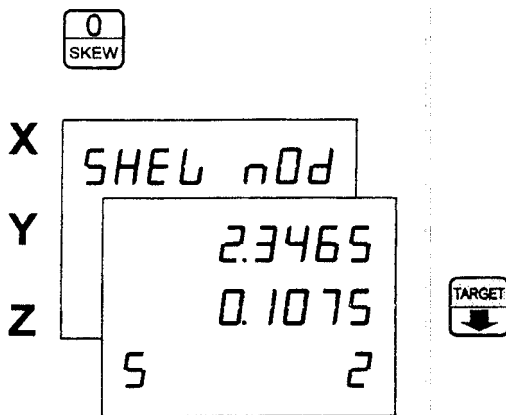
Press and hold the **SKEW** key.

A momentary screen will be displayed followed by *S2* and the current coordinates. It does not matter what the displayed coordinates are at this time.

To increase the number of points used to determine skew, press **ADD**. To decrease the number of points, press **SUB**. At least 2 points must be used.

Move the table to position a point on the X or Y axis of the part (such as P2 in the previous figure) at the tool (or indicator).

Press the **DOWN ARROW** key. The point number (such as S2) will be decremented.

Move the table to position another point on the same axis of the part (such as P1 in the figure) at the tool.

Press the **DOWN ARROW** key.

When all points have been entered, the skew will be set for the part.

Automatic origin setting

When skew is set, the current position of the table (P1 in the figure) is automatically set to 0, 0. In other words, this point becomes the origin. In this way both the skew and origin can be set in one operation.

Turning skew on and off

Once skew has been set, it can be turned off or turned back on by pressing the **SKEW** key.

Freeze Function

Description

The display can be "frozen" so that the table can then be moved without the displayed dimensions changing. This allows for easier part measurement while keeping track of the original position.

While in the frozen state, the Gold Tracer still tracks all scale movements. Actual positions will be displayed when the Gold Tracer is released from the frozen state.

Freeze function operation

X `FrEEZ On`   [5]

Y `FrEZ OFF`

Z
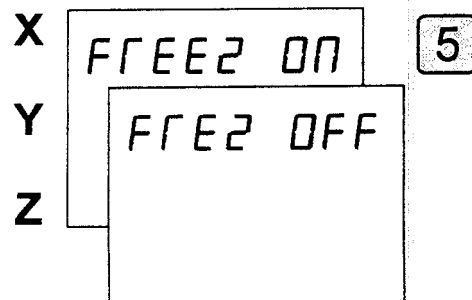
Press the number **5** key to freeze the display.

While in the frozen state, the Gold Tracer still tracks all scale movements internally.

To release the Gold Tracer from the frozen state, again press the number **5** key.

When a dimension is preset while the display is frozen, the display will first be updated as if the table were still at the frozen position,. When released from the frozen state the display will then be updated to reflect the distance moved since it was frozen.

Freeze example

Display frozen at X = 2.0000 → (+) ‑ ‑ ‑ ‑ ‑ (+) ← Table moved to X = 3.5000

|← 1.5 inches →|
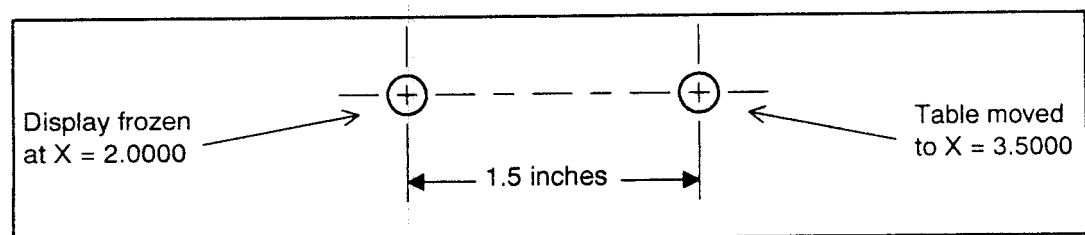
Table is moved to X = 2.0000 and the display is frozen.

Table is then moved to X = 3.5000. The display still shows 2.0000.

If the display is unfrozen at this point, it will be updated to show 3.5000.

If a dimension is entered while the display still shows 2.0000, the 2.0000 will be replaced by the new dimension. If 0.3000 is entered, the 2.0000 will be replaced by 0.3000. When released from the frozen state, the displayed dimension will be 1.8000.

14 | Tool Offsets

Description

Tool offsets are used to compensate for the tool radius when a dimension is referenced to the edge of the cutting tool rather than its center.

Tool offsets can be used in Normal mode to add or subtract the tool radius from the displayed dimension and eliminate manual calculations.

Tool offsets are also used in Program mode as part of each program step.

Setting tool number and diameter

[TOOL]

X | `Pr OGr An`
Y |
Z | `ᴴ OOL`

`SEᴴ - ᴴ   1`
`     0.0000`

`ᴴ - SEᴴ   1`
`     0.2500`

Press the **TOOL** key to select the *PROGRAM TOOL* screen.

Press the **ADD** or **SUB** key to increment or decrement the tool number or **ENTER** the tool number on the top axis.

ENTER the tool diameter on the middle axis.

Tool offsets in normal mode

In Normal mode, a tool radius can be added to or subtracted from the X or Y dimension.

X   *1.0000*

Y   *3.0000*

Z   *0.0000*

[ADD]

Press **ADD** to invoke *Add Rad* function.

Add rAd

Add rAd

USE-t   2

[ENTER]

The *USE-t* number is the last tool number which was accessed in tool mode.

Press the X axis **ENTER** key to add the tool radius to the X dimension. The tool offset (or sign) of X will be +1.

X   *1.1565*

Y   *3.0000*

Z   *0.0000*

[SUB]

Press **SUB** to invoke *Sub Rad* function.

SUb rAd

SUb rAd

USE-t   2

[ENTER]

Press the Y axis **ENTER** key to subtract the tool radius from the Y dimension. The tool offset (or sign) of Y will be -1.

X   *1.1565*

Y   *2.8435*

Z   *0.0000*

NOTE   Press **STATUS** to view the *Signs* of X and Y.

Normal mode example

X = 4.0000, Y = 2.0000

Actual target dimensions
X = 3.8750, Y = 1.8750

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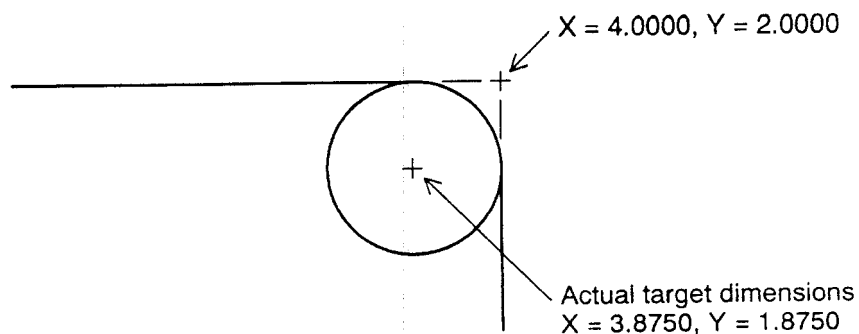
Assume the tool diameter is 0.2500". Press the **TOOL** key and select or set a tool for 0.2500".

Enter the target dimensions X = 4.0000 and Y = 2.0000. If the tool is currently centered at 0, 0, the displayed dimensions will be -4.0000, -2.0000.

Press **ADD** then the X axis **ENTER** key to add the tool radius to the X axis.

Press **ADD** then the Y axis **ENTER** key to add the tool radius to the Y axis.

The displayed dimensions will be -3.8750, -1.8750.

When worked to 0.0000, 0.0000, the tool will be at the desired target position.

NOTE   If you Clear, Enter, Add, Sub, or Negate the dimension on an axis, the tool offset (or sign) of that axis will be set to zero.

Tool offsets in program mode

In program mode, tool offsets are entered for each step as 0 (no offset), 1 (positive offset) or -1 (negative offset).

Tool offsets may be determined by imposing imaginary axis lines at the point on the drawing where dimensions are given. All possible tool offset combinations are shown in the following figure.
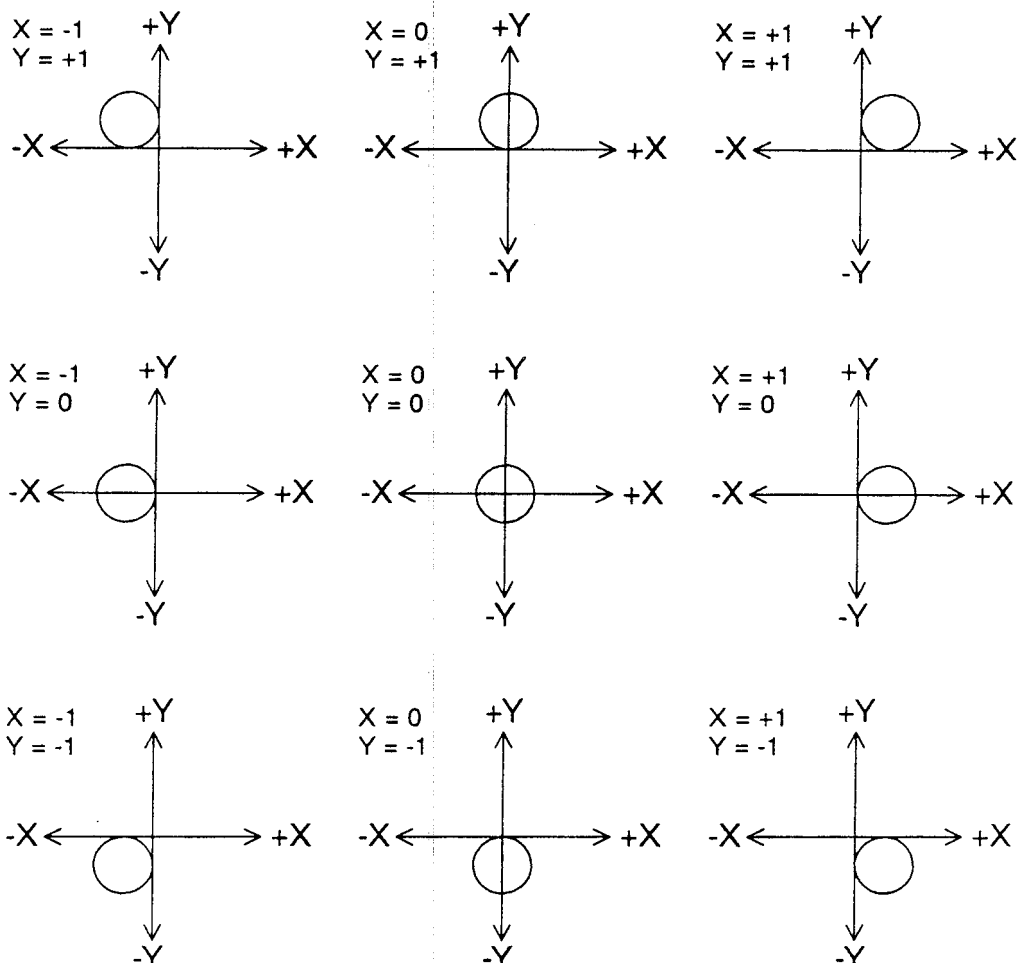
15 Machine Error Compensation

Description

A standard vertical milling machine would have no error if its table movements followed perfectly straight lines. This, however, is not the case. There will always be some finite transfer error.

Definition: Transfer Error is the difference between displacement at the linear scale and displacement at the cutting tool.

Machine tool error is the difference between the actual length of a standard certified gauge block and the value displayed by a digital readout when the gauge block is measured using standard machine shop practices. This error will also be present in any work piece machined in that axis.

Machine Error Compensation (MEC) multiplies incoming scale signals by a factor such that the displayed value will be correct. This factor is stored in the Gold Tracer's nonvolatile memory and is set at the factory to 1.000000.

Example: A 10.0000 inch standard gauge block is measured on a knee mill with a result of 9.9950 inches. MEC will re-proportion this dimension so that the correct value (10.0000 inches) is displayed. The 0.0050 inch error has been distributed over the 10.0000 inches of travel. Thus the "Machine Error" has been "Compensated" for.

$$MEC\ Factor = 10.0000\ /\ 9.9950 = 1.000500$$

MEC should be a one time job. However, an operator may wish to recalibrate for a particular area on the machine table where work is to be performed.

Although MEC can improve machine table performance, it is not intended as a substitute for proper machine maintenance.

Viewing MEC factors

Set the **MEC** switch (at the rear of the unit) to **CAL** to view the MEC scale factors for all axes.

$$MEC = True\_Value\ /\ Measured\_Value$$

Clearing MEC factor

1. Press the **ENTER** key to select the appropriate axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

2. Set the **MEC** switch (at rear of unit) to **CAL**. *1.000000* will be displayed for the cleared axis.

3. Return the **MEC** switch to **OFF.**

General MEC calibration notes

- The MEC procedure is performed on one axis at a time.
- For best results the Gold Tracer should be calibrated in the units (inch or mm) in which it will be used.
- The Gold Tracer should be calibrated on the table area that is most commonly used.
- Absolute and incremental modes have the same calibration factor for a given axis.

Calibrating MEC

1. Press **SKEW** key to turn *SKEW OFF.*

2. Clear the MEC factor as described above.

3. Measure the gauge block (with the Gold Tracer) using standard machine shop procedures and practices.

4. After the measured gauge block value is displayed, press the **ENTER** key for that axis. All but the leading zero will be blanked and the decimal point will flash for the selected axis.

5. Use the numeric keypad to key in the true value (the actual certified gauge block length).

6. Set the **MEC** switch (at rear of unit) to **CAL,** then return it to **OFF.**

7. Measure the gauge block again to ensure the Gold Tracer is now properly calibrated.

8. Repeat the procedure for the remaining axes if required.

Marker Operation (Option)

Finding the marker relative to a datum point

Move to the datum point.

Marker

Work Piece

Datum

distance to the marker
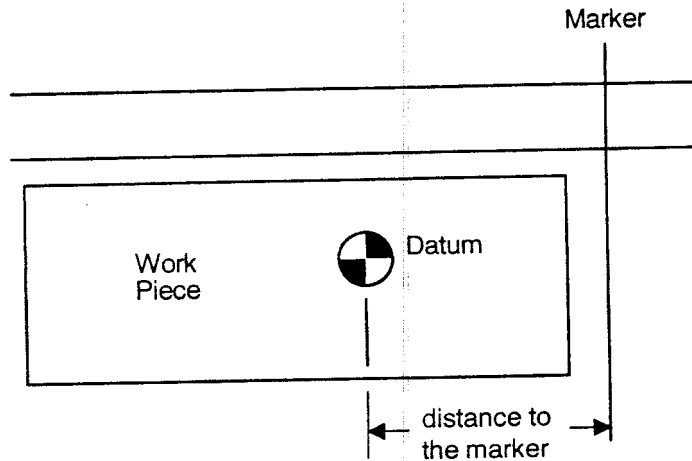
X SELECE

Y SELECE

Z SELECE

SEARCH

Press **MARKER** to display the **SELECT** screen.

This is the prompt for selecting the axis on which the marker pulse will be searched for.

Press the **ENTER** key to select an axis. **SEARCH** is displayed on the selected axis.

MARKER can be pressed to display the previously saved marker position..

CLEAR can be pressed to erase the previously saved marker position.

Move the selected axis in the positive direction to search for the marker pulse. Press any other key to cancel.

If moved in the negative direction , a message to that effect will be displayed.

X   0.0005
Y   0.7295.
Z
      FOUNd

When the marker is found, **FOUND** is displayed along with the distance from the datum point. This is the distance starting from when **MARKER** was pressed and ending at the instant the marker pulse was found.

MARKER can be pressed to display the previously saved marker position.

Press **SAVE** to save the currently found distance (for example: the 0.7295) in memory and overwrite the previous one.

Finding the datum point relative to the marker

Find the marker as described above.

Press **TARGET** to copy the saved distance to the display. Press any other key to end.

If the distance to the marker has been saved, the previous datum point is located by moving the axis until zero is displayed.

If the distance to the marker has not been saved, i.e., it is zero, the Gold Tracer will display the following message and exit when **TARGET** is pressed.

X   0.7295.
Y
Z   F IN ISHEd

17 RS232 Functions (Option)

Description

The RS232 option consists of two serial ports designated "COMPUTER" and "PRINTER" installed on the back panel of the Gold Tracer.

RS232 is the communication medium between the Gold Tracer and the computer (and/or the printer). The communication code is ASCII.

The printer and the computer may be used independent of each other.

Information can be sent from the Gold Tracer to the printer, using the Gold Tracer keypad, whether a computer is connected or not.

If a computer is also connected, information can be sent from the Gold Tracer to the printer using the computer keyboard

Information can also be sent from the computer, using the computer keyboard, to the Gold Tracer.

Connector pin assignments

Pin Number	Function
2	Tx
3	Rx
4	RTS
5	CTS
7	Signal Ground

Computer setup

A Terminal or Personal Computer can interface with the Gold Tracer through the serial port.

A floppy disk is provided for use with Microsoft Windows. Copy the file from the floppy to the IBM PC hard disk.

Run Microsoft Windows, choose Program Manager \ Accessories \ Terminal. Open the file to start the communication.

Printer setup

A serial printer can interface with the Gold Tracer provided they have the same protocol settings.

Setting RS232 protocol

Instead of using internal switches, RS232 protocol is programmed from the Gold Tracer front panel.
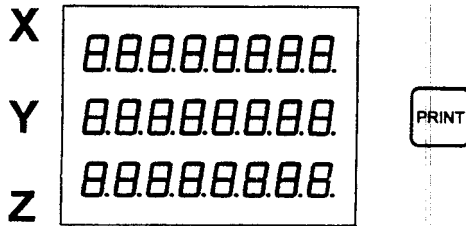
X | 8.8.8.8.8.8.8.8.
Y | 8.8.8.8.8.8.8.8.
Z | 8.8.8.8.8.8.8.8.

[PRINT]

Set the power switch at the rear of the Gold Tracer to **OFF (0)** then back to **ON (1)**. The display will flash **8.8.8.8.8.8.8.8.**

Press and hold the **PRINT** key until one of the setup screens is displayed.

Default protocol settings

X | bAUdrAtE
Y | 9600
Z |

[TARGET ↓]

PArItY
    nOnE

dAtAbItS
        8
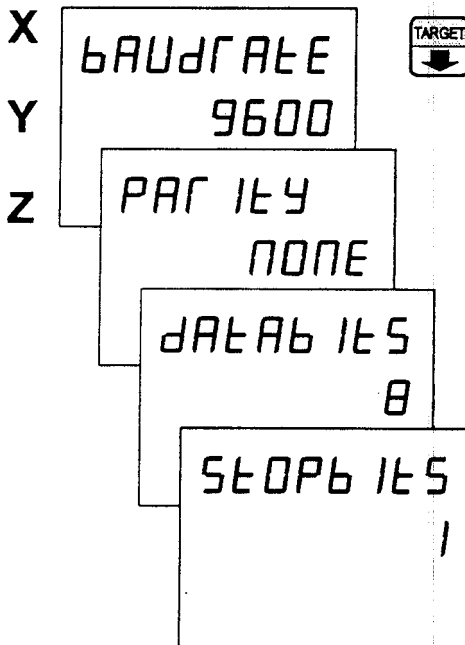
StOPbItS
        1

The Baud Rate options are: 19200, 9600, 4800, 2400, 1200, 600, 300, 150.

Default is 9600.

The Parity options are:
    None, Odd, Even, Mark.

Default is None.

The Data Bits options are:
    5, 6, 7, 8.

Default is 8.

The Stop Bits options are:
    1, 2.

Default is 1.

When Baud Rate, Parity, Data Bits and Stop Bits are correctly set, they are stored in the Gold Tracer nonvolatile memory. Once set, the Gold Tracer may be powered down. When powered up at a later time the settings will still be intact.

Changing protocol settings

Press the **DOWN ARROW** key until the desired setup screen is displayed.

Press **ENTER** to change a default setting.

Exit setup mode by pressing any button other than **ENTER** or the **DOWN ARROW**.

Most of the Gold Tracer functions can be performed through the computer keyboard.
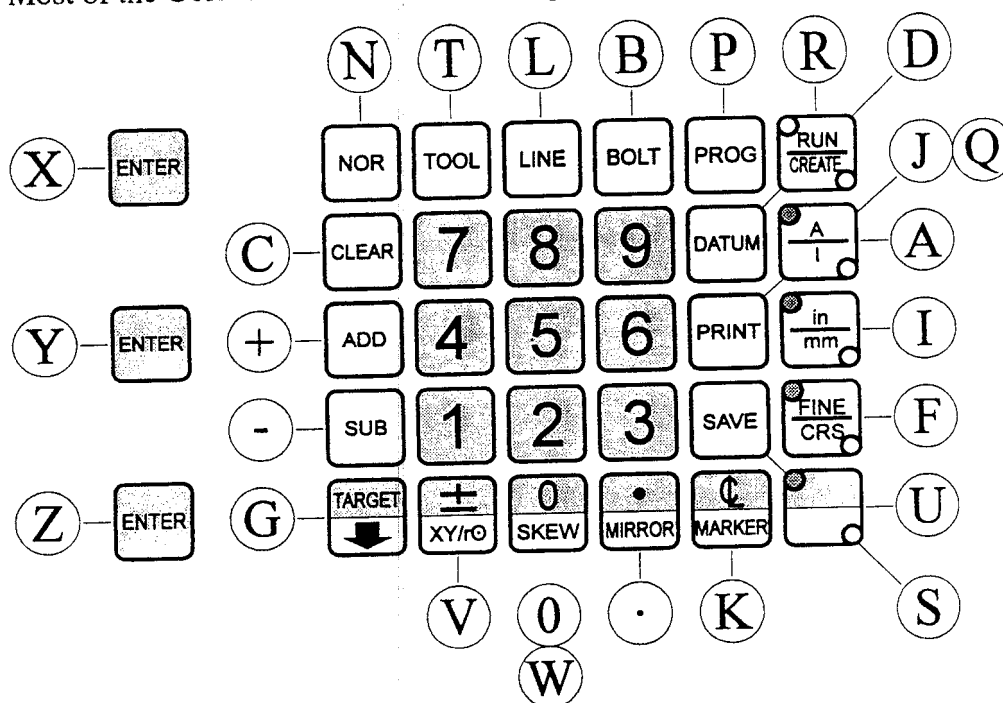
- Number keys (**0 - 9**) correspond to the same keys on the computer keyboard.
- Computer keys correspond to the remaining Gold Tracer keys as shown.
- **J** = PRINTER ON, **Q** = PRINTER OFF.
- Press and hold 5 for FREEZE.
- **0** = SKEW ON/OFF. Press and hold **W** to invoke the skew setup function.

Printing information

When the printer is on, information is printed as the Gold Tracer is operated. The top axis information is displayed first, followed by the middle axis , then the bottom axis. Some examples are shown below.

```
NOR
     2.0000      0.0000      0.0000
     2.0000      TOOL 1      0.0000
     2.0000      DEG 0.0     0.0000
```

Dimensions are printed when a value is entered on any axis, or when the display mode is changed.

Press **PRINT** to print current dimensions at any time.

```
CREATE PROG 1
     2.0000      STEP 1 TOOL 1      0.0000
     2.0000      STEP 2 TOOL 1      3.0000
     2.5000      STEP 3 TOOL 1      3.5000
```
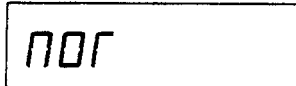
Program steps are printed as the target dimensions are entered.

Press and hold **PRINT** to turn printer off. Press **PRINT** to turn printer back on.
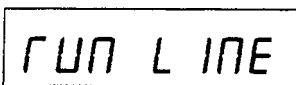
18 | Normal, Create and Run Modes

NOR
(normal mode)

X

`nor`

Y

Z

This is the basic digital readout mode. It is used for normal operations where programs are not required.
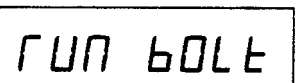
LINE
(create and run line hole patterns)

X

`run L InE`

Y

`CrEAtE`

Z

`L InE`

[RUN/CREATE]

The Gold Tracer memory will hold up to 10 line hole programs with up to 99 holes each.

Press **LINE** to select line mode. Press **RUN/CREATE** to switch between run and create modes once in line mode.
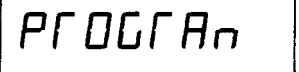
BOLT
(create and run bolt hole patterns)

X

`run bOLt`

Y

`CrEAtE`

Z

`bOLt`

[RUN/CREATE]

The Gold Tracer memory will hold up to 10 bolt hole programs with up to 99 holes each.

Press **BOLT** to select bolt mode. Press **RUN/CREATE** to switch between run and create modes once in bolt mode.

PROG
(create and run point to point programs)

X

`run ProG`

Y

`CrEAtE`

Z

`ProGrAn`

[RUN/CREATE]

The Gold Tracer memory will hold up to 200 program steps. Multiple programs can be created within these 200 steps.

Press **PROG** to select point to point program mode. Press **RUN/CREATE** to switch between run and create modes.

STATUS

Press the status key to determine which mode the Gold Tracer is currently in. The mode as well as the step within that mode (for create and run modes) will be displayed.

19 Line Hole Programs

Description

A line hole pattern is a series of holes spaced along a line segment. Once a line hole pattern has been programmed into the Gold Tracer's memory it may then be used as many times as required by running the line hole program. The program will stay intact even when the Gold Tracer is off.

The Gold Tracer memory will hold up to 10 line hole programs with up to 99 holes each.

Sample line hole pattern

```
                    90 degrees
                    +Y    4 Holes, evenly spaced
                     ↑    Length = 2.0000 inches

                       Hole 4  ↗
                          ⌀
                     Hole 3
                         ⌀
               Hole 2 ⌀         ANGLE
                          ⤾        ←
              Hole 1   45 degrees
180 degrees -X ←————————⊕————————→ +X  0 degrees, 360 degrees

                     ↓
                    -Y
                  270 degrees
```
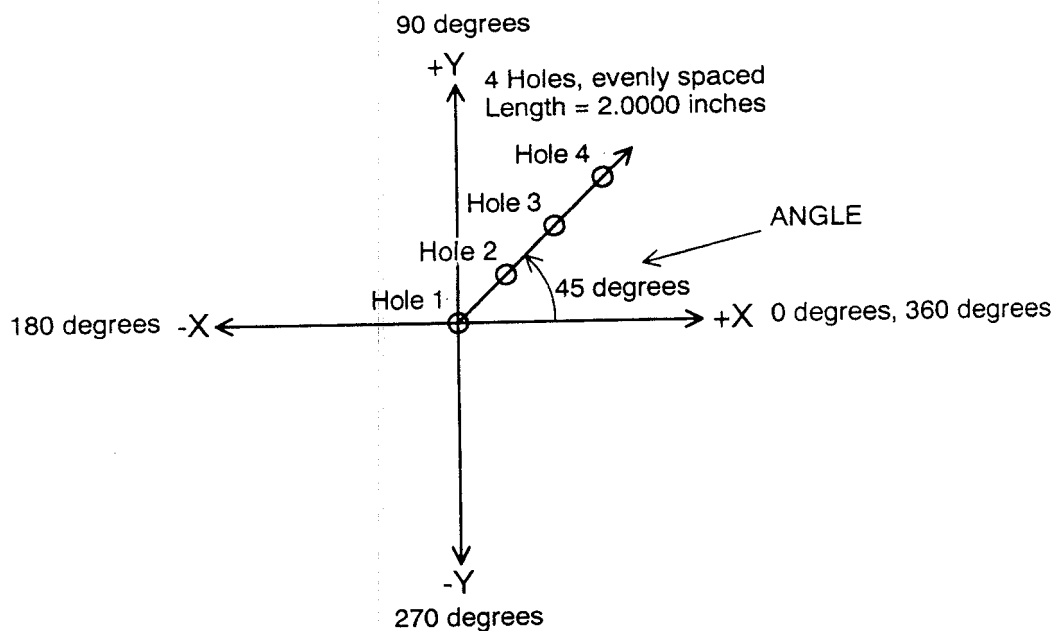
In order to create the line hole pattern shown above, the following information must be programmed into the Gold Tracer.

LENGTH	2.0000 inches
ANGLE	45 degrees
NUMBER OF HOLES	4

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**General notes
for using the
line hole
feature**

Press the **LINE** key to select line mode.

Press the **RUN/CREATE** key to switch between run and create modes once in line
mode.

Press the **NOR, BOLT,** or **PROG** key to exit line hole mode.

Press the status key to display the current mode and the current step within that mode.

Creating a line hole pattern

`LINE` `RUN/CREATE`

Press the **LINE** key to enter line hole mode.

X
Y
Z

```
CrEAtE

L InE
```

```
L InE      1
```

TARGET ⬇

Press the **RUN/CREATE** key, if required, to enter program mode. **CREATE LINE** will be momentarily displayed followed by the **LINE** screen.

Press the **ADD** or **SUB** key to increment or decrement the **LINE** hole program number (1 - 10), or **ENTER** the desired number on the top axis.

```
      2.0000


LEnGtH
```

TARGET ⬇

Enter the desired **LINE** segment length, from first hole to final hole, if different from the displayed value.

```
A     45.00


AnGLE
```

TARGET ⬇

Enter the desired **ANGLE** of the line segment if different than the displayed value.

```
             4


HOLES
```

TARGET ⬇

Enter the desired number of **HOLES** if different than the displayed value.

```
rEC  SAUE

End ProG
```

When the **REC SAVE** screen is displayed, the program has been stored in the Gold Tracer's memory.

Running a line hole pattern

`LINE`   `RUN/CREATE`

```
X ┌─────────────────┐
  │  run LInE        │
Y │  ┌───────────────┴──┐
  │  │   LInE        1  │
Z │  │                  │     TARGET
  └──┤                  │      ⬇
     │                  │
     └──────────────────┘
```

```
X ┌─────────────────┐
  │  GO    tO        │
Y │                  │
  │                  │
Z │  StArt        1  │
  │  ┌───────────────┴──┐
  │  │  HOLE         1  │
  └──┤                  │
     │  StArt        1  │
     │  ┌───────────────┴──┐
     │  │      0.0000      │
     │  │      0.0000      │   TARGET
     └──┤      0.0000      │    ⬇
        └──────────────────┘
```

```
X ┌─────────────────┐
  │  HOLE         2  │
Y │                  │
  │  L InE           │
Z │  ┌───────────────┴──┐
  │  │     -0.4715      │
  └──┤     -0.4715      │   TARGET
     │      0.0000      │    ⬇
     └──────────────────┘
```

```
X ┌─────────────────┐
  │  Erd   OF        │
Y │                  │
  │  L InE           │
Z └─────────────────┘
```
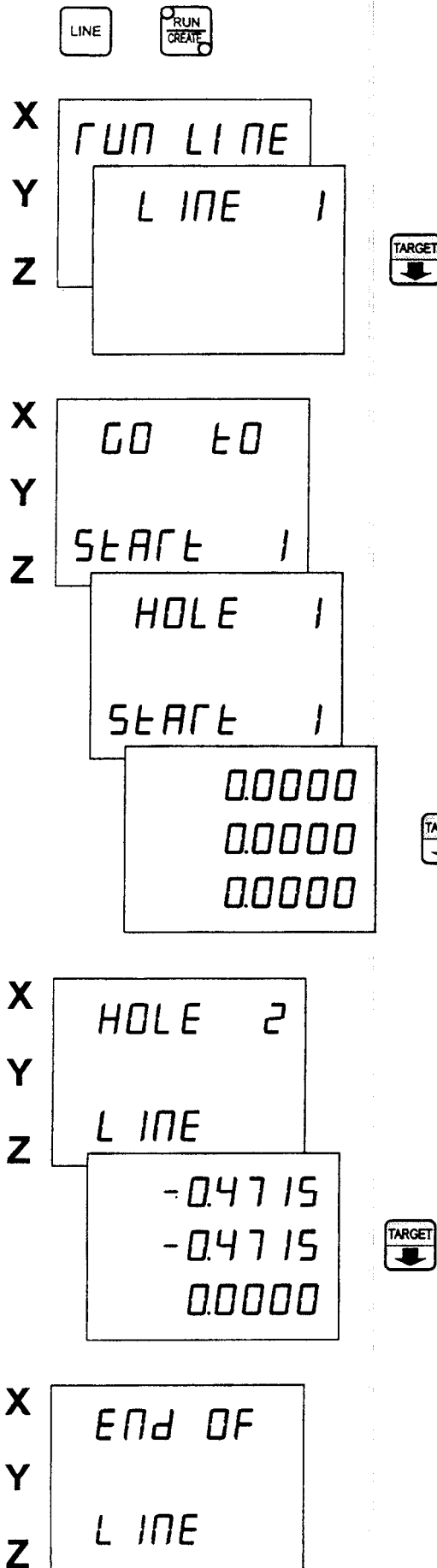
Press the **LINE** key to enter line hole mode.

Press the **RUN/CREATE** key, if required, to enter run mode. **RUN LINE** will be momentarily displayed followed by the **LINE** screen.

Press the **ADD** or **SUB** key to increment or decrement the **LINE** hole program number (1 - 10), or **ENTER** the desired number on the top axis.

The **GO TO START** and **HOLE** number screens are momentarily displayed.

Move the table to position the cutting tool at the first hole of the line hole pattern on the workpiece, then set both X and Y axes to 0. Perform cutting operation for first hole.

OR

If this is the second time through the same line hole pattern with the holes in the same position, do not set X and Y axes to 0. Move table until Gold Tracer displays 0 on both X and Y axes, then perform the cutting operation.

The **HOLE** number screen is momentarily displayed followed by X and Y coordinates required for the next hole.

Move the table until the Gold Tracer displays 0 on both X and Y axes, then perform the cutting operation.

Repeat the sequence of:

1. Press down arrow key.

2. Move table.

3. Perform cutting operation.

until the line hole pattern is complete.

The same line hole pattern may be run through as many times as required. For example: tapping, counter boring, etc.

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Bolt Hole Programs

Description

A bolt hole pattern is a series of holes spaced around the circumference of a circle. Once a bolt hole pattern has been programmed into the Gold Tracer's memory it may then be used as many times as required by running the bolt hole program. The program will stay intact even when the Gold Tracer is off.

The Gold Tracer memory will hold up to 10 bolt hole programs with up to 99 holes each.

Bolt hole pattern around the entire circumference of a circle

When the start angle and the end angle are the same, the Gold Tracer will evenly space the holes around the circumference of the bolt hole pattern.
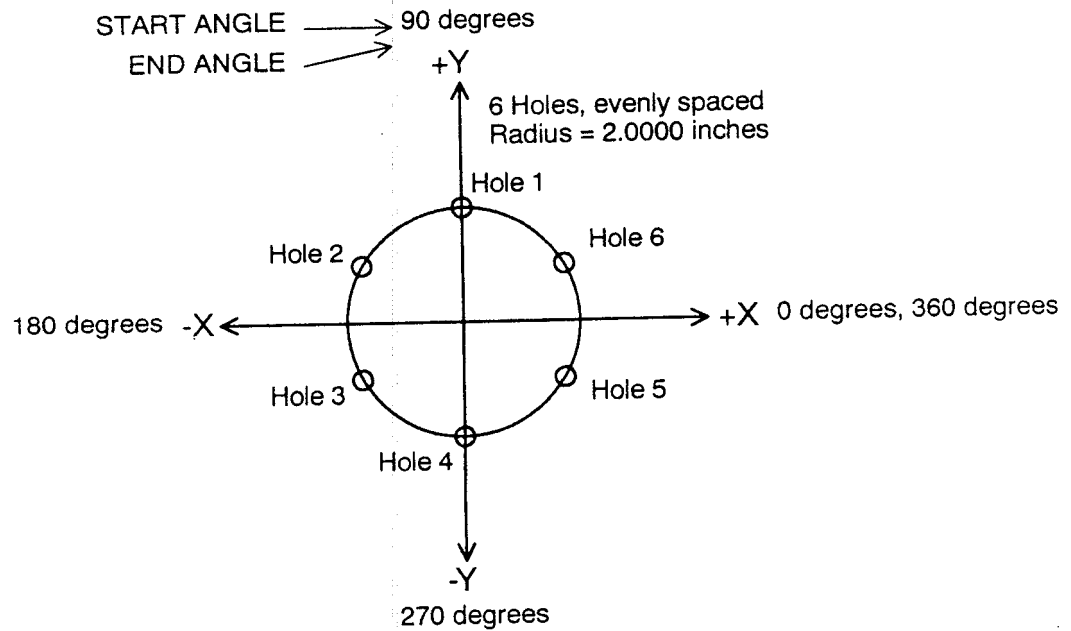
START ANGLE ⟶ 90 degrees
END ANGLE ⟶ +Y

6 Holes, evenly spaced
Radius = 2.0000 inches

Hole 1

Hole 6

Hole 2

180 degrees -X ⟵ ⟶ +X 0 degrees, 360 degrees

Hole 3

Hole 5

Hole 4

-Y
270 degrees

In order to create the bolt hole pattern shown above, the following information must be programmed into the Gold Tracer:

RADIUS	2.0000 inches
START ANGLE	90 degrees
END ANGLE	90 degrees
NUMBER OF HOLES	6

Bolt hole pattern around a portion of the circumference of a circle

When the start angle and the end angle are not the same, the Gold Tracer will place the first hole at the start angle position and the last hole at the end angle position. The remaining holes will be evenly spaced between the first and last holes.
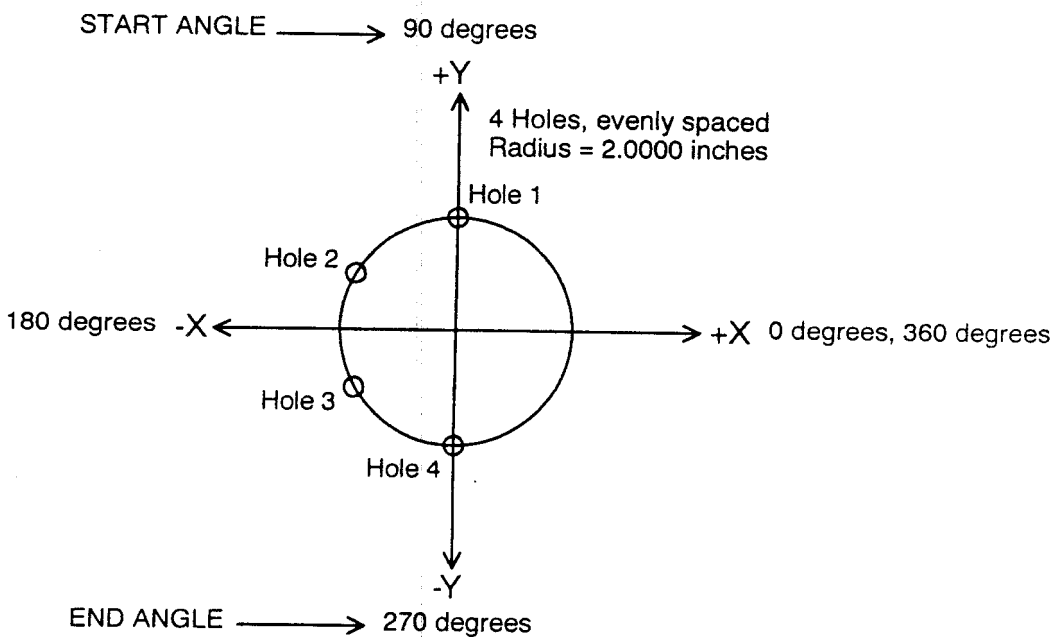
START ANGLE ——→ 90 degrees

+Y

4 Holes, evenly spaced
Radius = 2.0000 inches

Hole 1

Hole 2

180 degrees -X ←————————————→ +X   0 degrees, 360 degrees

Hole 3

Hole 4

-Y

END ANGLE ——→ 270 degrees

In order to create the bolt hole pattern shown above, the following information must be programmed into the Gold Tracer:

RADIUS	2.0000 inches
START ANGLE	90 degrees
END ANGLE	270 degrees
NUMBER OF HOLES	4

General notes for using the bolt hole feature

Press the **BOLT** key to select bolt mode.

Press the **RUN/CREATE** key to switch between run and create modes once in bolt mode.

Press the **NOR, LINE,** or **PROG** key to exit bolt hole mode.

Press the status key to display the current mode and the current step within that mode.

Creating a bolt hole pattern

BOLT   RUN/CREATE

X `CrEAtE`

Y `bOLt`

Z `CIrCLE  1`   [TARGET ↓]

`0.5000`

`rAdIUS`   [TARGET ↓]

`A      0.00`

`StArt  A`   [TARGET ↓]

`A      0.00`

`ENd ANG`   [TARGET ↓]

`4`

`HOLES`   [TARGET ↓]

`rEC SAUE`

`ENd PrOG`

Press the **BOLT** key to enter bolt hole mode.

Press the **RUN/CREATE** key, if required, to enter program mode. **CREATE BOLT** will be momentarily displayed followed by the **CIRCLE** screen.

Press the **ADD** or **SUB** key to increment or decrement the bolt hole program number (1 - 10), or **ENTER** the desired number on the top axis.

Enter the desired **RADIUS** if different from the displayed value.

Enter the desired **START ANGLE** if different than the displayed value.

Enter the desired **END ANGLE** if different than the displayed value.

If the end angle is the same as the start angle, the holes will be equally spaced around the entire circumference of the bolt hole pattern. The first hole will be determined by the start angle.

If the end angle is not the same as the start angle, the holes will be equally spaced along a segment of the circumference of the bolt hole pattern. The first hole will be determined by the start angle and the final hole will be determined by the end angle.

Enter the desired number of **HOLES** if different than the displayed value.

When the **REC SAVE** screen is displayed, the program has been stored in the Gold Tracer's memory.

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Running a bolt hole pattern
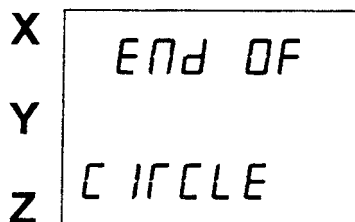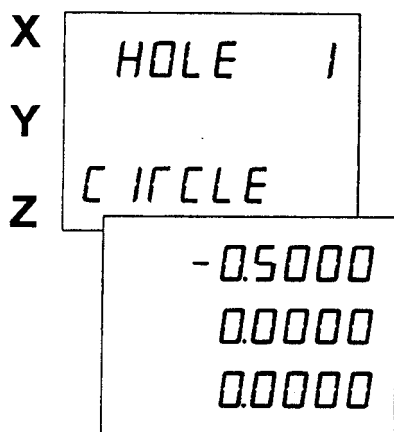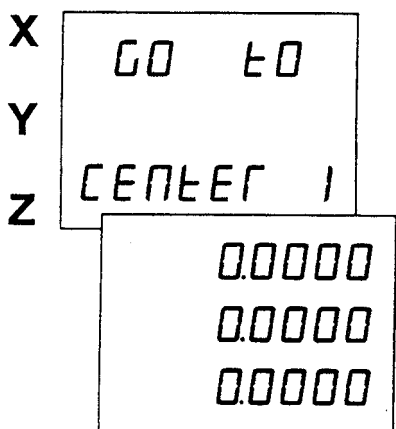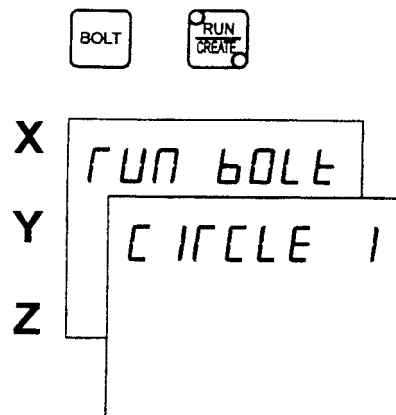
`BOLT` `RUN CREATE`

X `run bOLt`

Y `C IrCLE   I`

Z

Press the **BOLT** key to enter bolt hole mode.

Press the **RUN/CREATE** key, if required, to enter run mode. *RUN BOLT* will be momentarily displayed followed by the *CIRCLE* screen.

Press the **ADD** or **SUB** key to increment or decrement the bolt hole program number (1 - 10), or **ENTER** the desired number on the top axis.

X `GO    tO`

Y

Z `CEntEr   I`

`0.0000`
`0.0000`
`0.0000`

The *GO TO CENTER* screen is momentarily displayed.

Move the table to position the cutting tool at the center of the desired bolt hole pattern on the workpiece, then set both X and Y axes to 0.

OR

If this is the second time through the same bolt hole pattern around the same center, do not set X and Y axes to 0.

X `HOLE    I`

Y

Z `C IrCLE`

`- 0.5000`
`0.0000`
`0.0000`

The *HOLE* number screen is momentarily displayed followed by the X and Y coordinates required for the next hole.

Move the table until the Gold Tracer displays 0 on both X and Y axes, then perform the cutting operation.

Repeat the sequence of:

1. Press down arrow key.

2. Move table.

3. Perform cutting operation.

X `End OF`

Y

Z `C IrCLE`

until the bolt hole pattern is complete.

The same bolt hole pattern may be run through as many times as required. For example: tapping, counter boring, etc.

Point to Point Programs

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The user should be familiar with the normal mode functions before attempting to create or run a program.

Refer to the Sample Part Drawing, and to the Sample Program Listing shown below when reading this section.

Scale directions must be set as shown on the Sample Part Drawing. If the scale direction for an axis is reversed then tool offset signs (as shown in the Sample Program Listing) must also be reversed for that axis. Refer to Section 4 to set scale directions.

Sample Part Drawing

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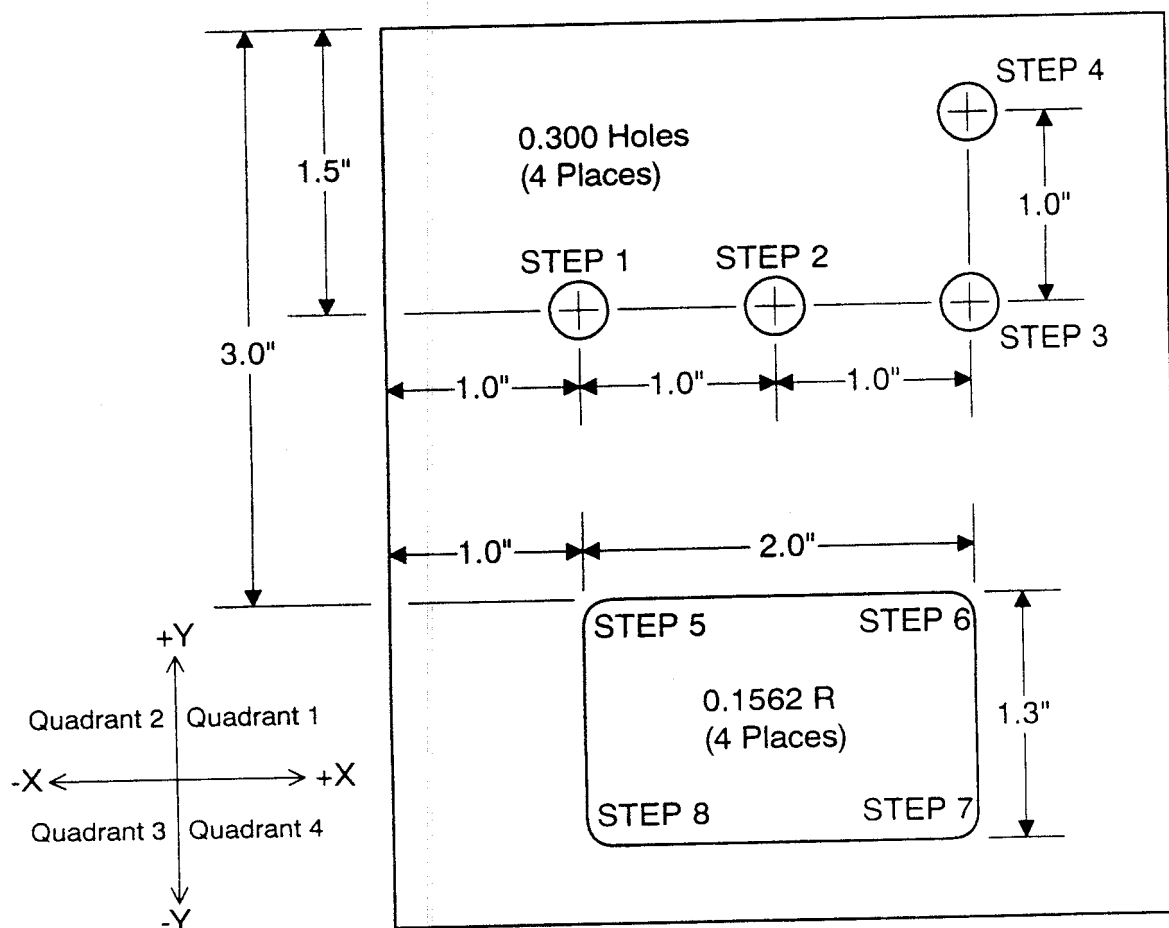
Sample Program Listing

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y	Z*
1	0	0	0	1	1.0000"	-1.5000"	0.0000"
2	1	0	0	1	1.0000"	0.0000"	0.0000"
3	1	0	0	1	2.0000"	0.0000"	0.0000"
4	3	0	0	1	0.0000"	1.0000"	0.0000"
5	0	1	-1	2	1.0000"	-3.0000"	0.0000"
6	5	-1	-1	2	2.0000"	0.0000"	0.0000"
7	6	-1	1	2	0.0000"	-1.3000"	0.0000"
8	7	1	1	2	-2.0000"	0.0000"	0.0000"
9	8	1	-1	2	0.0000"	1.3000"	0.0000"
10	0	0	0	0	0.0000"	0.0000"	0.0000"

NOTE There are many ways to program the same part. As an example, program step 9 above could be as follows and the results would be equivalent.

9	5	1	-1	2	0.0000"	0.0000"	0.0000"

*If Z axis is used.

Step

Each program step refers to a target point where a cutting operation is to begin and/or end. There are 200 program steps available. The final step of a program must be blank (all dimensions = 0.0000) to indicate End of Program.

Reference

REF indicates the reference point (program step number) from which the target dimensions are referenced. The reference must be a step within the current program prior to the current step. The exception is REF 0 which references the absolute zero point.

Dimension

The dimension is the distance to be traveled along the relevant axis, from the specified reference point to the desired target point as determined from the part drawing.

Tool number and tool diameter

Up to 25 different tool diameters are allowed. Tool number identifies the tool to be used and is correlated internally, in what is referred to as a tool table, to a specified diameter.

Tool Table

TOOL NO.	TOOL DIAMETER
1	0.2500"
2	0.3100"

Creating a program

Prior to creating the program, it is recommended that a program listing be created.
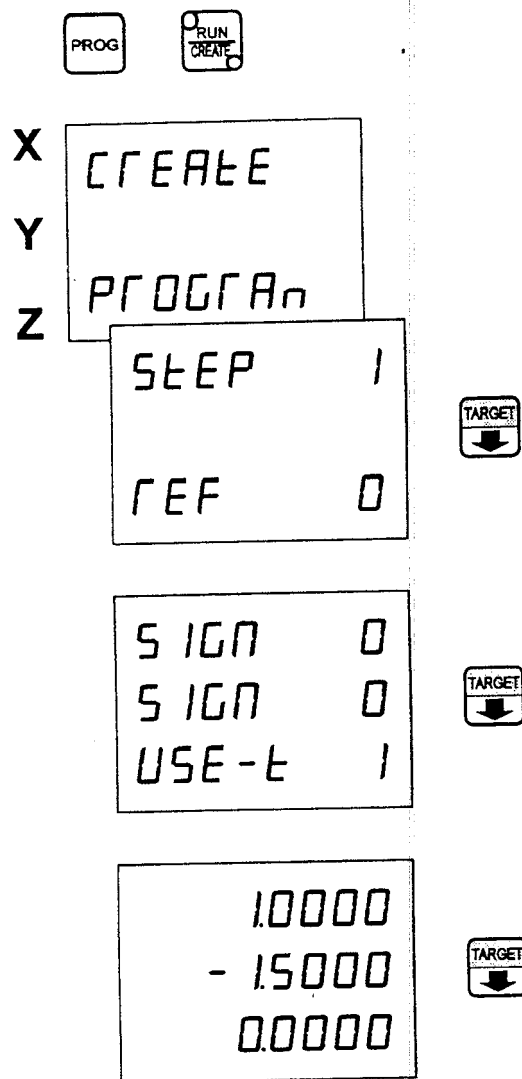
PROG   RUN/CREATE

X   **CrEAtE**

Y

Z   **ProGrAn**

    StEP   1

    rEF   0

TARGET ⬇

    S IGn   0
    S IGn   0
    USE-t   1

TARGET ⬇

    1.0000
    - 1.5000
    0.0000

TARGET ⬇

Press the **PROG** key to enter point to point program mode.

Press the **RUN/CREATE** key, if required, to enter create mode. *CREATE PROGRAM* will be momentarily displayed, followed by one of 3 screens:

1. Step and reference screen.

2. Tool offset and tool number screen.

3. Dimension screen.

Press the **DOWN ARROW** key to scroll through the screens.

Use **ENTER** as in normal mode to set the step, reference, tool number and dimensions.

Press **ENTER** to toggle through tool offsets (sign 0, 1, -1).

To copy information from one program step to the next, press the **ENTER** key twice without keying in a value. The corresponding entry from the previous step will be copied to the current step.

Press the **ADD** or **SUB** key to increment or decrement the program step number, or **ENTER** the step number on the top axis of the STEP screen.

NOTES

The program step number must be selected before the data pertaining to that program step is entered.

Program data is stored as it is entered. No further storage operation is required.

It is not required to enter data in any set sequence. For example, all dimensions may be entered before offsets, tool numbers or reference steps are entered.

If a tool is selected for which no diameter has been entered, the display will automatically go to the tool diameter screen.

Press **STATUS** to display the step number while in the tool or dimension screen.

The final program step must contain all zeros in the dimension screen to indicate End of Program (EOP).

Running a program

Adjust table to position cutting tool at starting point on work piece (Reference 0).

Reset absolute and incremental display registers as in normal mode
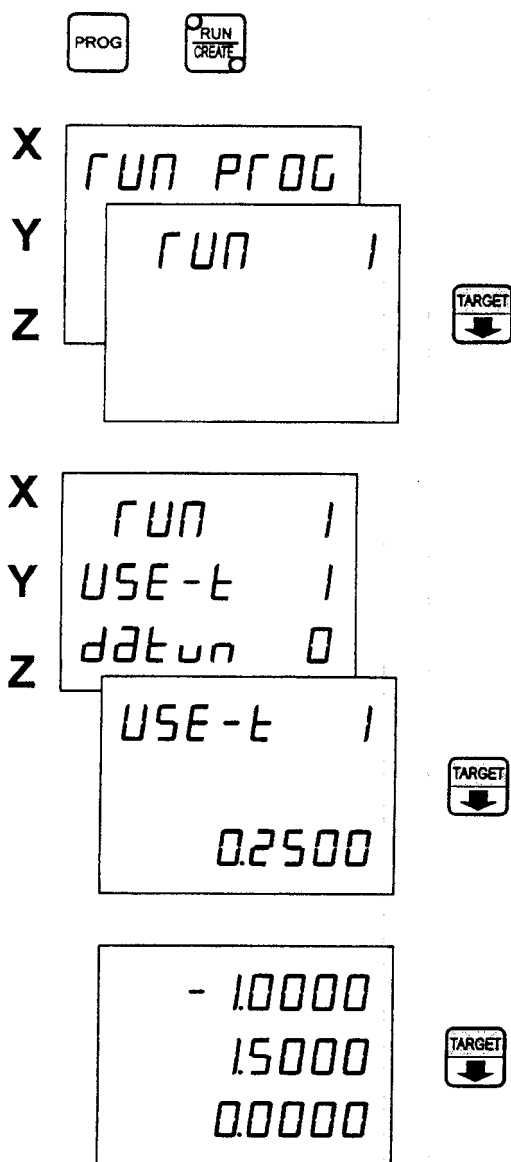
PROG   RUN/CREATE

X **run ProG**
Y **run   1**
Z

TARGET ↓

Press the **PROG** key to enter point to point program mode. Press the **RUN/CREATE** key, if required, to enter run mode. The **RUN PROGRAM** screen will be displayed.

ENTER the starting program step number if required.

Press the **DOWN ARROW** key to continue.

X **run   1**
Y **USE-t   1**
Z **datun   0**

   USE-t   1

   0.2500

At any point in the program where a tool is first specified or where it is to be changed, the tool number and tool diameter required for that program step will be displayed prior to the program step in which it is used.

Verify the tool is correct or install the correct tool.

TARGET ↓

Press the **DOWN ARROW** key to continue. The program step number will be momentarily displayed followed by a display of dimensions which are to be zeroed by table movement in order to reach the specified target point.

   - 1.0000
   1.5000
   0.0000

TARGET ↓

Move the table as required to zero all axes of the display.

NOTES

The Gold Tracer does not know which axis to move first within any one program step. This must either be noted by the operator or programmed as separate steps.

While dimensions are displayed, the operator may press **STATUS** to view the current program step number.

Press the **DOWN ARROW** key to:

1. Continue with the program.
2. To go to the beginning of the program when **EOP** is displayed.
3. To repeat the program from the beginning.

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Clearing all steps

While the *STEP/REF* screen is displayed, press the **CLEAR** key to display the screen shown below.

```
X  ┌─────────────┐
   │  ELr  SEEP  │
Y  │  Add  SEEP  │
   │  SUb  SEEP  │
Z  └─────────────┘
```

Press the top axis **ENTER** key to clear all program steps.

CAUTION Do not accidentally delete all program steps of every program when using the CLEAR STEP feature. To clear one program only, either write over it manually or use SUB STEP to delete single steps.

Deleting a program step

While the *STEP/REF* screen is displayed, go to the step which is to be deleted.

Press the **CLEAR** key to display the screen shown above.

Press the bottom axis **ENTER** key or the **SUB** key to delete the current program step.

The listing shown below is the sample program listing after step 7 has been deleted.

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y*	Z
1	0	0	0	1	1.0000"	-1.5000"	0.0000"
2	1	0	0	1	1.0000"	0.0000"	0.0000"
3	1	0	0	1	2.0000"	0.0000"	0.0000"
4	3	0	0	1	0.0000"	1.0000"	0.0000"
5	0	1	-1	2	1.0000"	-3.0000"	0.0000"
6	5	-1	-1	2	2.0000"	0.0000"	0.0000"
This step has been deleted.							
7	6	1	1	2	-2.0000"	0.0000"	0.0000"
8	7	1	-1	2	0.0000"	1.3000"	0.0000"
9	0	0	0	0	0.0000"	0.0000"	0.0000"

* Note that the Y dimension is not transferred from the deleted step 7 to the new step 7.

Adding a program step

While the *STEP/REF* screen is displayed, go to the step just after where a step is to be added.

Press the **CLEAR** key to display the screen shown on the previous page.

Press the middle axis **ENTER** key or the **ADD** key to add a step to the program.

The listing shown below is the Sample Program Listing after a new blank step (step 7) has been added. The current step was step 7 when the add operation was performed.

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y	Z
1	0	0	0	1	1.0000"	-1.5000"	0.0000"
2	1	0	0	1	1.0000"	0.0000"	0.0000"
3	1	0	0	1	2.0000"	0.0000"	0.0000"
4	3	0	0	1	0.0000"	1.0000"	0.0000"
5	0	1	-1	2	1.0000"	-3.0000"	0.0000"
6	5	-1	-1	2	2.0000"	0.0000"	0.0000"
7	6	0	0	0	0.0000"	0.0000"	0.0000"
8	7	-1	1	2	0.0000"	-1.3000"	0.0000"
9	8	1	1	2	-2.0000"	0.0000"	0.0000"
10	9	1	-1	2	0.0000"	1.3000"	0.0000"
11	0	0	0	0	0.0000"	0.0000"	0.0000"

Multiple programs

The Gold Tracer may have as many separate programs as allowed for by the 200 steps of program memory.

To create a new program, go to the program step number where the new program is to begin and enter the new program.

NOTES   There must be a blank program step between programs to indicate End of Program.

The reference steps for a program must be referenced to program step numbers within that program or to the REF 0 (absolute zero point).

The following is an example of the Sample Program Listing broken into 2 separate programs.

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y	Z
1	0	0	0	1	1.0000"	-1.5000"	0.0000"
2	1	0	0	1	1.0000"	0.0000"	0.0000"
3	1	0	0	1	2.0000"	0.0000"	0.0000"
4	3	0	0	1	0.0000"	1.0000"	0.0000"
5	0	0	0	0	0.0000"	0.0000"	0.0000"

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y	Z
6	0	1	-1	2	1.0000"	-3.0000"	0.0000"
7	6	-1	-1	2	2.0000"	0.0000"	0.0000"
8	7	-1	1	2	0.0000"	-1.3000"	0.0000"
9	8	1	1	2	-2.0000"	0.0000"	0.0000"
10	9	1	-1	2	0.0000"	1.3000"	0.0000"
11	0	0	0	0	0.0000"	0.0000"	0.0000"

Program Sheet

STEP	REF	OFFSET		TOOL	DIMENSION		
		X	Y		X	Y	Z

# Creating a Program While Machining a Part

Description

This feature allows for creating a program while a part is being machined in normal mode.

The tool number, tool offsets and the dimensions are saved to the next available program step each time the **SAVE** key is pressed.

Auto programming

Adjust the table to the starting point for the part (reference point 0) and reset the absolute and incremental display registers.

Move the table until the first target point is reached.

SAVE

X   SAUE ЬD

ENTER

Y

Z   SЬEP   5
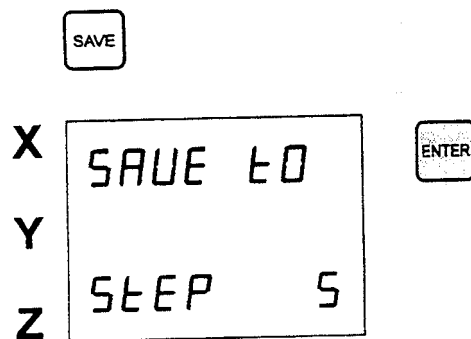
Press the **SAVE** key. The default step number is the first available step. The step number can be changed by entering a number on the bottom axis, or by pressing the **ADD** or **SUB** key.

To save the current position to the step shown, press the top axis **ENTER** key.

To cancel the save operation, press any other key.

NOTES   Each program step is referenced to the preceding program step number.

The program may be run and/or edited just as a manually entered program.

23 Scale Factors

Description

Scale factors are applicable to line hole, bolt hole and point to point programs.

Scale factors are also applicable to normal mode.

The dimensions of each axis are multiplied by the scale factor for that axis in normal mode or when a program is run.

Scale factor range is from 0.001 to 99.999.

Scale factors example

When the Y axis scale factor is changed from 1.000 to 0.500, a bolt hole pattern (which would normally be a circle) is changed into an elliptical pattern as shown below.

X S.F. = 1.000
Y S.F. = 1.000
Z S.F. = 1.000

X S.F. = 1.000
Y S.F. = 0.500
Z S.F. = 1.000
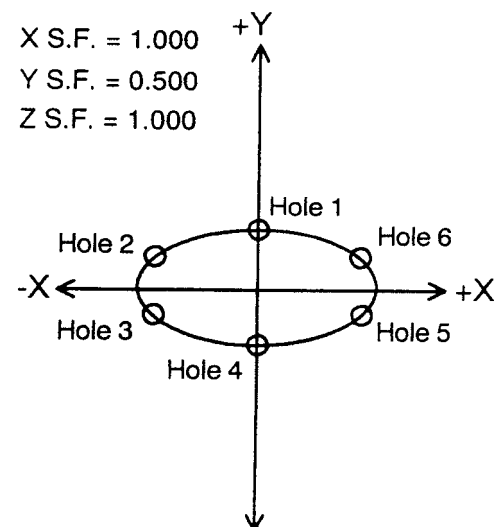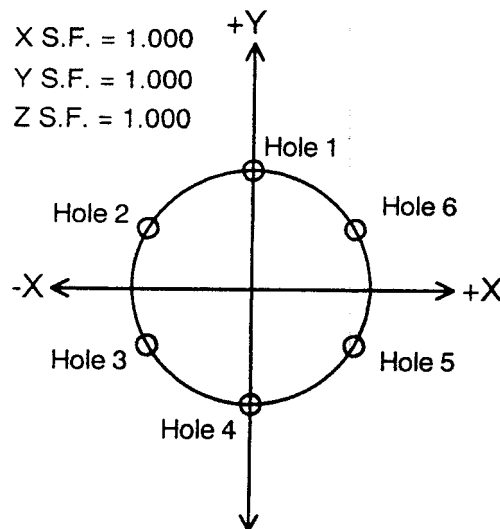
Setting scale factors

TARGET

X SCALE
Y
Z FACEOr

S.F   1.000
S.F   1.000
S.F   1.000

After power up and while the display is still flashing **8.8.8.8.8.8.8.8.** press and hold the **A/I** key to display the setup screens.

Press the **DOWN ARROW** key until the scale factor screen is displayed.

ENTER the scale factor for each axis, as required.

To exit the scale factor setup screen, press **A/I**.

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24 Mirror Image

Description

Mirror image is applicable to bolt hole, line hole and point to point programs.

For bolt hole and line hole, the entire current program will be mirrored.

For step to step programs, the starting and ending step for the mirror operation can be selected.

The following symbols indicate the current mirror setting:

No mirror (mirror reset)	Mirror with respect to X axis	Mirror with respect to Y axis	Mirror with respect to X and Y axes
$\square$	$\square \bar{\underline{}}$	$\bar{\square}\bar{}$	$\underline{}\square\bar{}$

Mirror a point to point program

In program mode, go to the first program step which is to be mirrored. This does not have to be the first step in the program.

```
X  StEP      5
Y
Z  rEF       4
```

```
StArt     5
n irr     o
End       9
```

Press the **MIRROR** key. An additional screen will be displayed for mirror information.

Continue to press **MIRROR** to go through the 4 mirror possibilities shown above.

The program will be mirrored from the selected start step to the selected end step. Default for the end step is the end of the program. A different end step can be entered on the bottom axis. The end step must be equal to or greater than the starting step number and equal to or less than the last program step number.

Canceling mirror image

Go to the first program step which is mirrored. The mirror screen and symbol will be displayed on the middle axis for that step.

Press the **MIRROR** key until no mirror is selected.

Program mode may be exited at this point. When this program step is later viewed (after mirror has been canceled) the middle display will again be blank.

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Mirror bolt and line programs

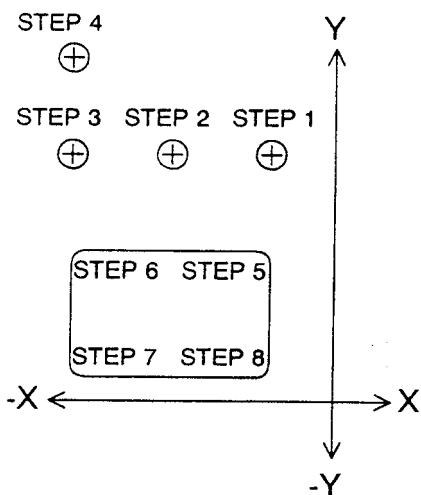In create or run mode, go to the first screen (CIRCLE or LINE).

X

```
CIrCLE  1
```
Y
```
 n irr   0_
```
Z
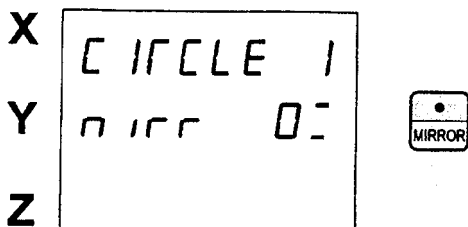
Press the **MIRROR** key to select the desired mirror axis.

The entire program will be mirrored.

Example of mirrored axes

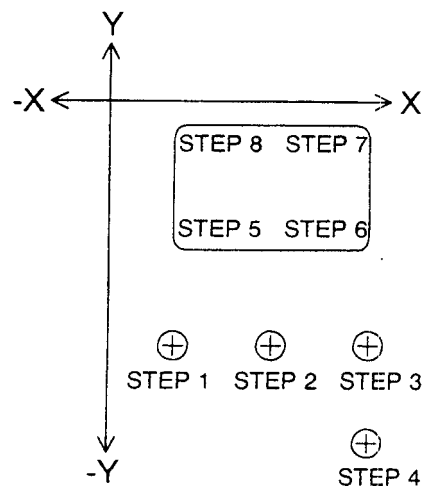All steps mirrored with respect to the Y axis.

STEP 4
⊕

STEP 3   STEP 2   STEP 1
⊕   ⊕   ⊕

STEP 6   STEP 5
STEP 7   STEP 8

-X ←————————→ X

-Y

Original program with no mirror applied.

Y   STEP 4
                         ⊕

STEP 1   STEP 2   STEP 3
⊕   ⊕   ⊕

STEP 5   STEP 6
STEP 8   STEP 7

-X ←————————→ X

-Y

Y

-X ←————————→ X

STEP 7   STEP 8
STEP 6   STEP 5

⊕   ⊕   ⊕
STEP 3   STEP 2   STEP 1

⊕
STEP 4   -Y
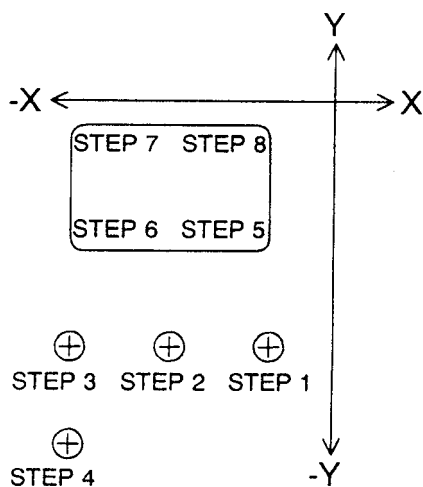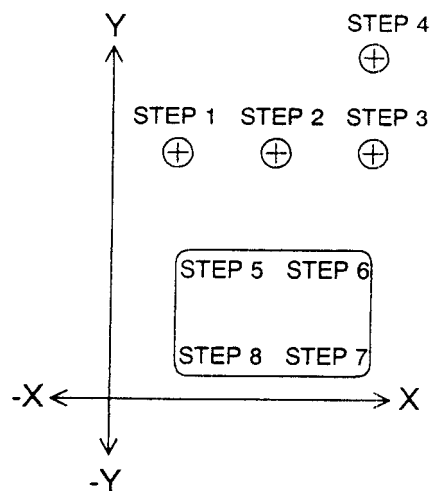
All steps mirrored with respect to the X and Y axes.

Y

-X ←————————→ X

STEP 8   STEP 7
STEP 5   STEP 6

⊕   ⊕   ⊕
STEP 1   STEP 2   STEP 3

                         ⊕
-Y   STEP 4

All steps mirrored with respect to the X axis.