ANILAM

Wizard 900/900E
Digital Readout
Operations Manual
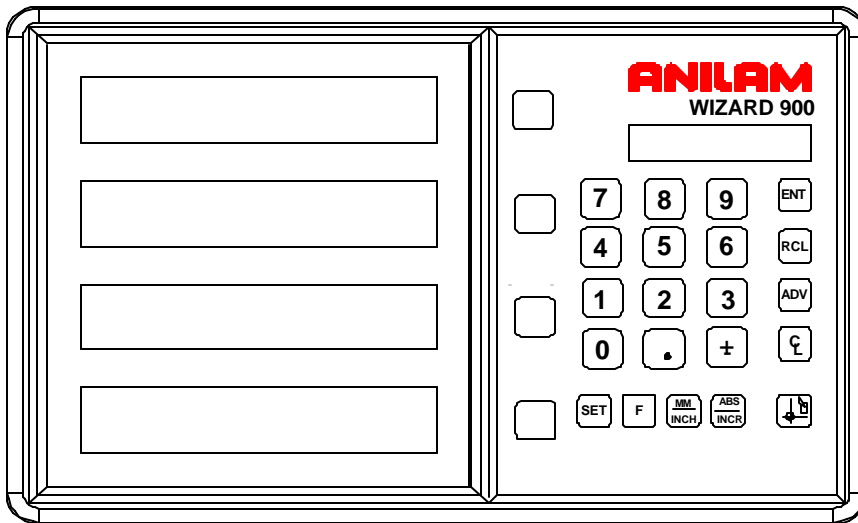
ANILAM
WIZARD 900

7	8	9	ENT
4	5	6	RCL
1	2	3	ADV
0	.	±	

| SET | F | MM INCH | ABS INCR | |

P/N 70000423B

Warranty

Anilam warrants its products to be free from defects in material and workmanship for three (3) years 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.

System Purchased From: _____

Console Part Number: _____

Console Serial Number: _____

Date of Installation: _____

Feature, Operation, and Technology

WIZARD Digital Readouts provide the absolute latest in ease of operation, capability, and technology. As a result, Anilam Inc. may alter and enhance operation, features, and capabilities without notice.

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Introducing the Wizard

Thank you for purchasing the ANILAM Wizard 900/900E Digital Readout (DRO).

Review these pages carefully to learn how to properly operate your new DRO.

The new DRO offers many features and capabilities never before used in conventional DRO systems. Two models are available: the standard **Wizard 900 DRO** and the special EDM version **Wizard 900E DRO**. The 900E includes EDM features such as three Z-axis EDM Mode during the spark cycle, spark out, and **SparkArrest^{TM}, a useful safety feature.

The following three options are available with the 900 DRO.

- Input/Output Module (I/O)   Includes a DA 15 output connector, a DE 9 input connector, and a DE 9 connector for RS-232 serial communication.
- Constant Surface Speed (CSS)   Allows you to control the spindle speed to maintain a constant surface speed independent of diameter.
- Spindle Speed Display (SSD)   Allows you to display the spindle speed (rotary encoder required).

The 900E provides the Input/Output Module option as standard.

This manual was written with you, the operator, in mind. Please take the time to study it. A little well-spent time now will ensure many years of trouble-free operation.

For additional information, contact your local authorized ANILAM distributor, or call us directly:

<div align="center">

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</div>

**SparkArrest^{TM} SparkArrest^{TM} is a trademark of ACU-RITE Companies, Inc.

Introducing the Wizard (Continued)

The ANILAM Wizard 900/900E Keypad and Display Windows

NOTE: The Wizard 900 DRO is available in 2-axis, 3-axis, and 4-axis models; the Wizard 900E DRO is available only in 3-axis models. For simplicity, most of the procedures in this manual describe a 3-axis model.

* Message Window

Axis Keys

Axis Displays

ANILAM
WIZARD 900

Numeric Keys

SET Key

Function Key

MM/INCH Key

ABSolute/INCRemental Key

Plus/Minus Key

Datum/Tool Offset Key

Centering Key

ADVanced Functions Key

ReCaLl Key

ENTer Key
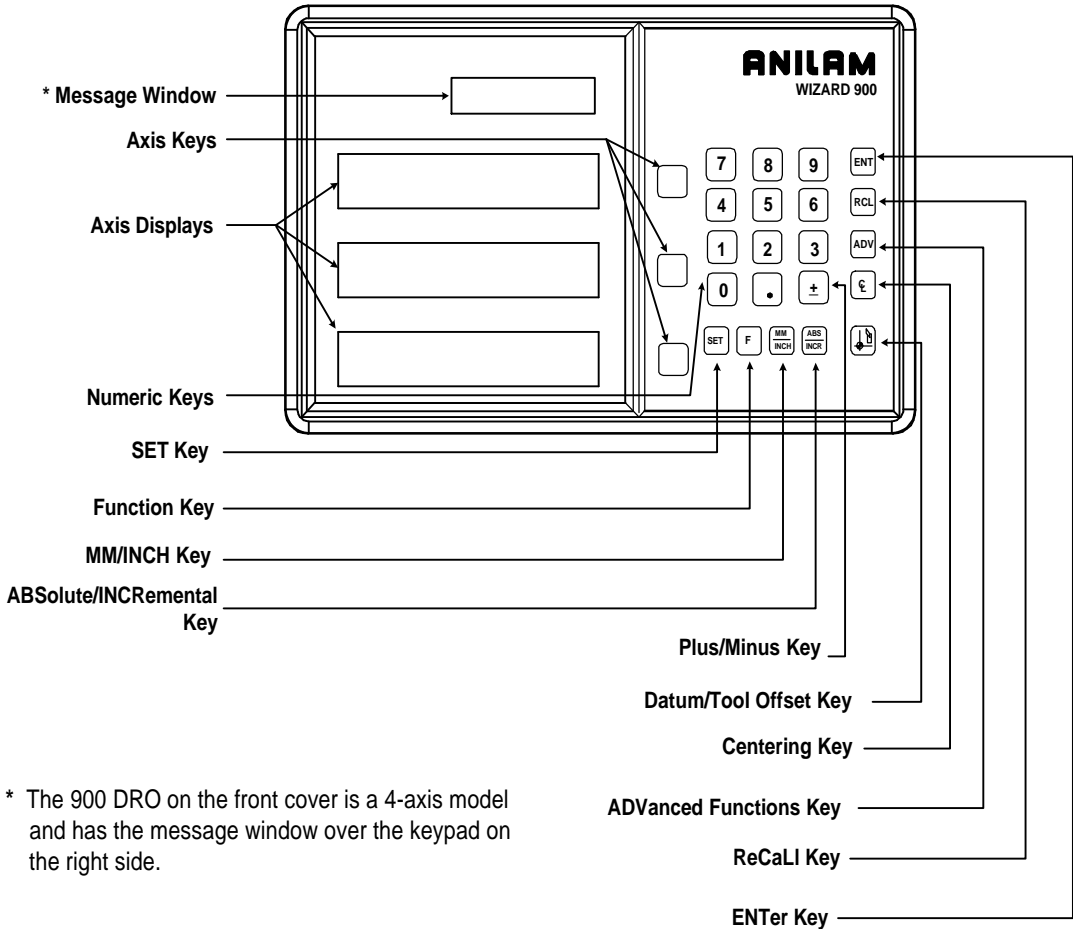
* The 900 DRO on the front cover is a 4-axis model and has the message window over the keypad on the right side.

Introducing the Wizard (Continued)

The ANILAM Wizard 900/900E Back Panel

I/O Outputs Connection (* I/O Option)

RS 232 Connection (* I/O Option)

I/O Inputs Connection (* I/O Option)

Edge Sensor Connection

Encoder Connections

Cover Slot

ON/OFF Switch

Power Cord Connection

Ground Connection
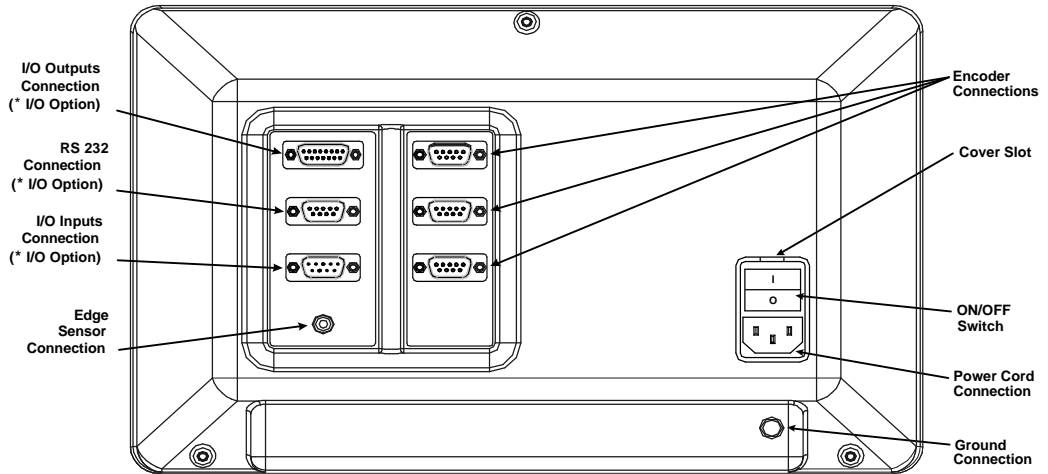
* I/O Option is standard on 900E.

Introducing the Wizard (Continued)

Your Wizard's display was designed to be easy to read:

Axis Indicator

Indicates X_1 or Z_1

Coarse Resolution

Diameter Mode

Absolute Mode

Axis Reset Only

Correction Factor

Reference Indicator

MM or INCH Mode

Edge Sensor

Approaching Zero Indicator
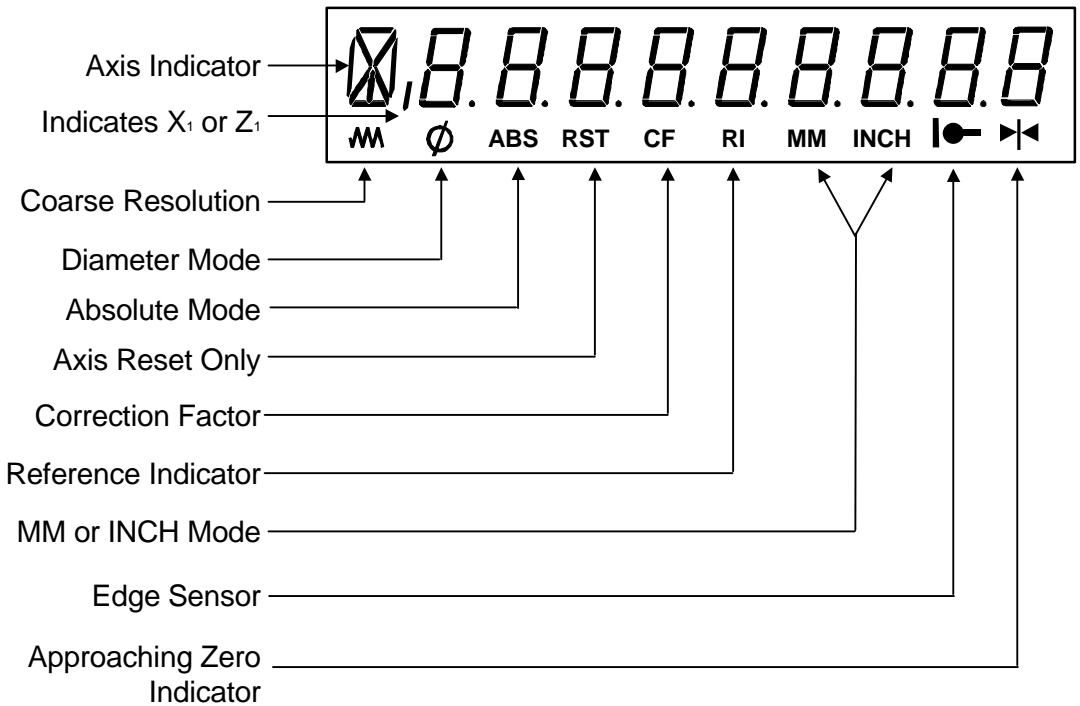
First-Time User Checklist

Your new DRO has many preset values. Before you proceed, please review the following list to verify default settings. If you need to change any setting(s), refer to Parameter Settings – F 20.

Description of Setting		Factory Setting			Your Setting
		900 DRO		**900E DRO**	
1. Mill/Lathe/EDM Operation		MILL	LATHE	EDM	
2. Linear Encoder Resolution	Axis 1	5 µm			
	Axis 2	5 µm			
	Axis 3	5 µm			
	Axis 4	5 µm			
3. Direction of Count	Axis 1	**+**			
	Axis 2	**+**			
	Axis 3	**+**			
	Axis 4	**+**			
4. Position Tolerance Indicator	Axis 1	Set to Zero			
	Axis 2	Set to Zero			
	Axis 3	Set to Zero			
	Axis 4	Set to Zero			
5. Audible Keyboard Tone		ON			
6. Display Resolution	Axis 1	.0002 inches (.005mm)			
	Axis 2	.0002 inches (.005mm)			
	Axis 3	.0002 inches (.005mm)			
	Axis 4	.0002 inches (.005mm)			
7. Display Dimming		15 Minutes			
8. Radius/Diameter Mode	Axis 1	Radius	Diameter	Radius	
	Axis 2	Radius	Diameter	Radius	
	Axis 3	Radius	Diameter	Radius	
	Axis 4	Radius	Diameter	Radius	

First-Time User Checklist (Continued)

For your safety, and to prevent damage to the machine, please verify the following:

9. DRO arm and DRO are securely mounted to the machine.	Yes/No
10. The DRO Input-voltage switch on the power-entry module (back panel) is set to the correct input voltage.	Yes/No
11. DRO is properly grounded. (Earth ground to wall conduit or water pipe, for example, not grounded to the machine).	Yes/No
12. All cables are off the floor and out of the range of moving parts.	Yes/No

About This Manual

This manual contains limited text and enlarged graphics for easy use. Actual keystrokes are represented by graphics.

The format is as follows:

Function Heading

Function Description

Example with Keystrokes

Explanation of Procedures and Observations

NOTE: Indicates you must use caution.

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Function Code List

You can access most DRO features using function codes. Function codes are codes entered by pressing the Function key (**F**) and then pressing the two-digit code for the feature. The following table lists the function codes available with your DRO. The page number indicates where the function is described in this manual.

Code	Description	Page
F 01	Absolute Zero Set	23
F 02	EverTrack^{TM} Mode	25
F 03	Setting a Correction Factor	37
F 04	Correction Factor OFF/ ON	47
F 05	Radius/Diameter per Axis	35
F 06	Approaching Zero	49
F 07	Approaching Zero Range	51
F 08	Approaching Zero Audio ON/OFF	53
F 09	Edge Sensor Probe	55
F 10	Last Position Save	30
F 11	Last Position Recall	30
F 14	Approaching Zero Output Axis Select **(900 With I/O Option Only)**	140
F 16	Axis Reset Only	21
F 17	Mirror Image	135
F 18	Axis Coupling **(900, 3-/4-Axis Only)**	120
F 19	Axis Coupling **(900, 4-Axis Only)**	120
F 20	Parameter Settings	60
F 21	Beeper OFF/ ON	11
F 22	Display Dim OFF	71
F 23	Display Dim ON	71

Function Code List (Continued)

Function Code List (Continued)

Beeper OFF/ON – F 21

The beeper is a standard feature on all ANILAM DROs. Use the beeper to acknowledge a keystroke. For correct keystrokes, a short tone sounds. For incorrect keystrokes, a long tone sounds.

F 21 allows you to enable/disable the beeper in the DRO (Default: ON).

To turn the beeper OFF:

1. Press $\boxed{F}$ $\boxed{2}$ $\boxed{1}$

The DRO displays the following in the message window:

$$BEEP\ OFF$$

To turn the beeper ON:

1. Press $\boxed{F}$ $\boxed{2}$ $\boxed{1}$

The DRO displays the following in the message window:

$$BEEP\ ON$$

Keyboard Entry Error

If you enter an incorrect value, press the axis key again to clear the axis display. If you enter too many numbers on an axis, the DRO display reverts to zero on that axis. When this happens, enter the correct number again.

Inch/Metric Conversion

This feature allows you to convert inch values to metric values and vice-versa on all axes.

Example: Change **1.000 in.** to its metric (**mm**) equivalent.

1. Press the desired axis key to select the axis.

2. Press $\boxed{1}$ $\boxed{.}$ $\boxed{\text{SET}}$

The DRO displays the following:

```
X                    1.0000
     ABS                    INCH
```

3. Press $\boxed{\frac{\text{MM}}{\text{INCH}}}$

The DRO displays the following:

```
X                    25.400
     ABS                    MM
```
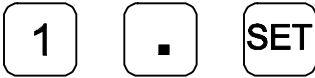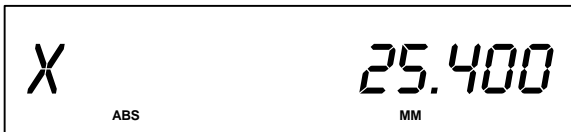
NOTE: The DRO displays the **INCH** or **MM** symbol under each axis display.

Decimal Degree to Degree-Minutes-Seconds Conversion

You can use every axis to display angular position when you connect a rotary encoder to the DRO. The display range is ± 360 degrees.

NOTE: The axis must be set to rotary using Parameter Settings – F 20.

To convert all angular axis displays from decimal-degree display to degree-minutes-seconds display:

1. Press $\boxed{\text{F}}$ $\boxed{\text{±}}$

Plus/Minus (±) Key

The ± key allows you to:

- Change the sign of a preset value.
- Change the direction of travel on a linear encoder while in parameter setting.
- Add and subtract values.
- Scroll through options lists while making selections.
- Scroll through the Advanced Functions (**ADV**) list.
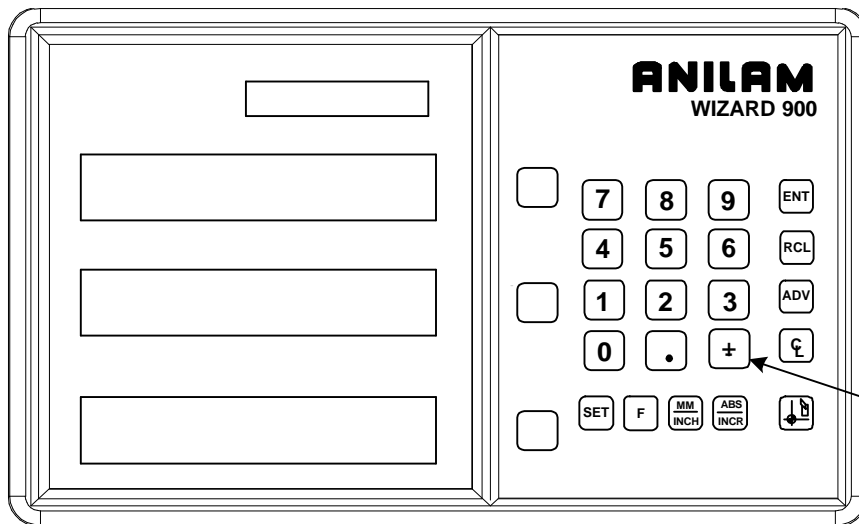
Plus/Minus Key

Absolute/Incremental (ABS/INCR) Key

When the Absolute Mode indicator is OFF, the DRO measures in increments and internally tracks the corresponding absolute (**ABS**) dimensions. This is a safeguard and serves to measure the total distance being moved along a given axis.

Press **ABS/INCR** to switch the display to Absolute Mode. The DRO displays the Absolute dimension from the starting point on the axis display.

Example: If a series of six **2.00 in.** (**50.8 mm**) incremental moves are made, change to **ABS** Mode to display the total distance moved, which is **12.000 in.** (**304.80 mm**).

Absolute/Incremental Key

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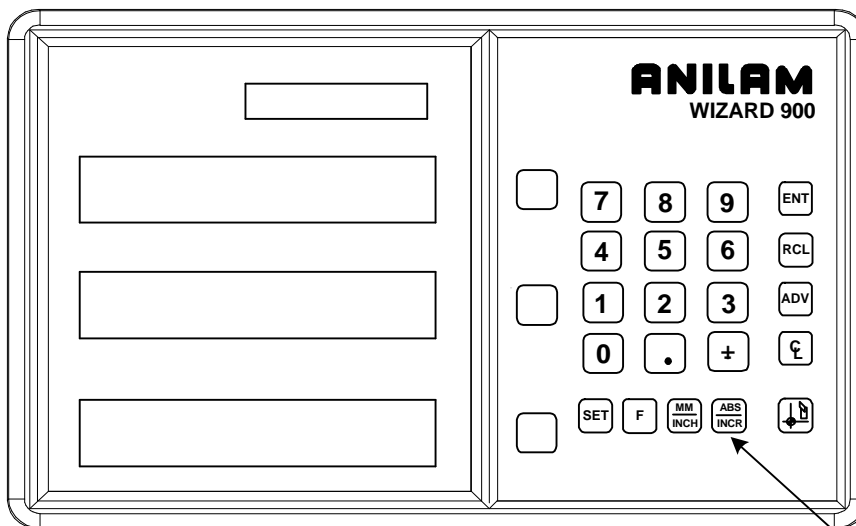
Presetting a Dimension

Presetting allows you to enter a dimension into an axis display. After you have preset the dimension, you can move the machine until the axis indicates zero.

You can also use the preset feature as a one-line recall mode if the display is set in Incremental Mode.

Example 1: Preset the dimension **1.2500** (**31.75 mm**) on the axis display.

1. Press the desired axis key.

2. Press $\boxed{1}$ $\boxed{\blacksquare}$ $\boxed{2}$ $\boxed{5}$ to enter the dimension.

3. Press $\boxed{\text{SET}}$ to preset the dimension.

Example 2: Preset the dimension **- 1.2500 in.** (**- 31.75 mm**) on one axis display and **.5000** (**12.7 mm**) on another axis display.

1. Press the desired axis key.

2. Press $\boxed{\pm}$ $\boxed{1}$ $\boxed{\blacksquare}$ $\boxed{2}$ $\boxed{5}$ to enter the dimension.

3. Press the desired axis key.

4. Press $\boxed{\blacksquare}$ $\boxed{5}$ to enter the dimension.

5. Press $\boxed{\text{SET}}$ to preset the dimension.

NOTE: As a safety feature, the preset axis does not display movement until you press **SET**. If you press **SET** after you move the machine, the DRO automatically updates to the new position.

Recalling a Preset Dimension

This feature allows you to recall a preset dimension to the axis display.

Use this feature when making multiple moves of the same dimension.

NOTE: This feature works only in Incremental Mode.

To recall a preset dimension:

1. Press $\boxed{\begin{array}{c}\textbf{ABS}\\\textbf{INCR}\end{array}}$ to set the display to Incremental Mode.

2. Press the desired axis key(s) to select the axes.

3. Enter the incremental dimension.

4. Move the machine to zero.

5. Press the desired axis key twice to recall the dimension.

NOTE: You can recall a dimension after you reset absolute zero or when you have regained power after a power loss.

To clear a preset dimension while in Incremental Mode:

1. Press the desired axis key(s) to select the axes.

2. Press $\boxed{\textbf{SET}}$

Clearing a Preset Dimension

When you clear a dimension, you automatically zero the previously entered dimension in an axis.

To clear preset dimensions, one axis at a time:

1. Press the desired axis key to select the axis.

2. Press **SET**

To clear entered dimensions for all axes:

1. Press the desired axis key(s) to select the axes.

2. Press **SET**

Resetting an Axis to Zero

When you reset an axis, the display for that axis reverts to zero

Use the reset feature when establishing part zero (datum) or clearing the axis at each part location (making incremental moves).

To reset one axis (X, Y, or Z):

1. Press the desired axis key to select the axis.

2. Press $\boxed{\text{SET}}$

To reset two or more axes at the same time:

1. Press the desired axis key(s) to select the axes.

2. Press $\boxed{\text{SET}}$

NOTE: See also Absolute Zero Reset – F 01.

Axis Reset Only – F 16

F 16 is useful for quick positioning. Press the axis key once to zero the display in either **ABS** or **INCR** Mode.

Example 1:   Set one axis as Axis Reset Only – for example, X-axis:

1. Press $\boxed{\text{F}}$ $\boxed{\text{1}}$ $\boxed{\text{6}}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{AXIS\ \ RESET}$$

2. Press the desired axis key to toggle axis reset only
ON (or OFF).

The DRO turns ON the **RST** symbol in the axis display:

$$\boxed{X\ \ F\ 16 \atop \qquad\ \ \text{RST}}$$

3. Press $\boxed{\text{SET}}$ to set the feature.

4. Press the X-axis key to zero the axis display in either **ABS** or **INCR** Mode.

NOTE: Perform the same procedure to turn OFF Axis Reset Only.

Axis Reset Only – F 16 (Continued)

Example 2: Set two or more axes as Axis Reset Only – for example, X-axis and Y-axis:

1. Press $\boxed{F}$ $\boxed{1}$ $\boxed{6}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{AXIS\ RESET}$$

2. Press the desired axis key to toggle Axis Reset Only ON (or OFF).

The DRO turns ON the **RST** symbol in the axis displays.

Axis Reset Only Indicator →
$$\boxed{X \qquad\qquad .00000 \atop \text{RST}}$$

Axis Reset Only Indicator →
$$\boxed{Y \qquad\qquad .00000 \atop \text{RST}}$$
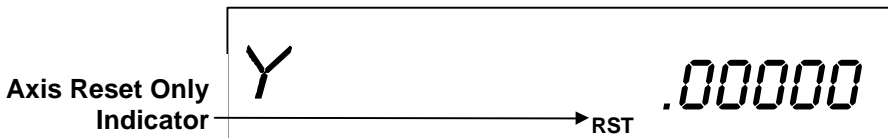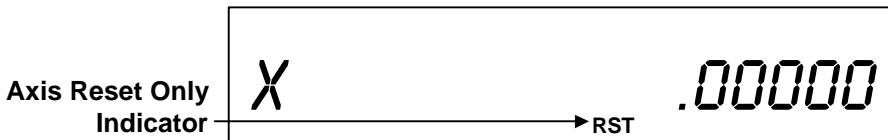
3. Press $\boxed{\text{SET}}$ to set the feature.

4. Press the X-axis key to zero the axis display in either **ABS** or **INCR** Mode.

NOTE: Perform the same procedure to turn OFF Axis Reset Only.

Absolute Zero Set – F 01
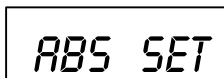
F 01 allows you to establish a part zero. The DRO clears all axis counters, both absolute and incremental, to zero.

NOTE: This feature does not clear a preset dimension entered in Incremental Mode. To clear a dimension entered in Incremental Mode; refer to Recalling a Preset Dimension.

To reset all axes to zero:
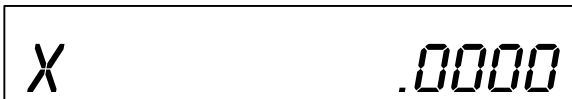
1. Press $\boxed{F}$ $\boxed{0}$ $\boxed{1}$

The DRO temporarily displays the following in the message window:
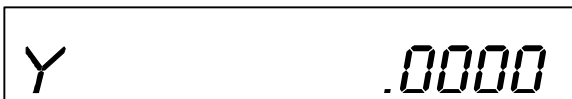
$$\boxed{RBS\ \ SET}$$

and then clears the axis displays.

$$X \qquad\qquad\qquad\qquad .0000$$

$$Y \qquad\qquad\qquad\qquad .0000$$

Absolute Zero Set at Reference Mark – F 90

F 90 allows you to reset one or more axes to zero at the reference mark. You must use this feature when you use 100-point axis error compensation (**F 80/F 81**).

To reset all axes at the reference mark:

1. Press $\boxed{F}$ $\boxed{9}$ $\boxed{0}$

The DRO resets all axis displays and displays the following in the message window:

$$\boxed{MARKER}$$

To reset one axis at the reference mark:

1. Press $\boxed{F}$ $\boxed{9}$ $\boxed{0}$

2. Press the desired axis key.

3. Press $\boxed{SET}$

The DRO resets the specified axis display and displays the following in the message window:

$$\boxed{MARKER}$$

EverTrack^{TM} Mode – F 02

F 02 allows you to permanently store a part zero position (machine home, tool-change position, or datum). This allows you to return to a specific location on a workpiece such as when power fails before the work is complete.

NOTE: This feature works **ONLY** with **RBS-T** and **RBM-T** linear encoders, which contain absolute reference marks. If your application uses linear encoders without absolute reference marks, disable EverTrack^{TM} Mode (NO E-TRAC) using Parameter Settings – F 20.

EverTrack^{TM} Mode can be set either one axis at a time or all axes at a time. If you have a three-axis application but require fewer than three axes, we recommend that you set the part zero positions one axis at a time.

Setting a Part Zero - One Axis

To set up a part zero position for one axis:

1. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{2}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{\textit{EVERTRACK}}$$

2. Press the desired axis key.

3. Press $\boxed{\text{SET}}$

The axis display resets to zero and the Reference Indicator (**RI**) begins to blink.

CAUTION: During the following step, do not change the machine axis travel direction. This will cause an error.

4. Move the machine axis approximately **1 in.** (**25.4 mm**) in one direction until the **RI** stops blinking and the display starts to count.

EverTrack™ Mode – F 02 (Continued)

5. Move the machine axis to the part zero position.

6. Press $\boxed{\textsf{F}}$ $\boxed{\textsf{0}}$ $\boxed{\textsf{1}}$

This will be the absolute part zero position.

CAUTION: If you require a temporary datum while in EverTrack™ Mode, we recommend you exit the feature before you set the temporary datum.

To exit EverTrack™ Mode:

7. Press $\boxed{\textsf{F}}$ $\boxed{\textsf{0}}$ $\boxed{\textsf{2}}$

8. Press $\boxed{\textsf{F}}$

The DRO turns off the **RI** and stores the absolute part zero position. Now you can perform an absolute reset (Axis key + **SET** key) on an axis or an absolute reset (**F 01**).

Setting a Part Zero – All Axes

To set up a part zero position for all axes:

1. Press $\boxed{\textsf{F}}$ $\boxed{\textsf{0}}$ $\boxed{\textsf{2}}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{\textit{EVERTRACK}}$$

2. Press $\boxed{\textsf{SET}}$

The axis displays reset to zero and the **RI**s begin to blink for each axis.

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EverTrack™ Mode – F 02 (Continued)

CAUTION: During the following step, do not change the machine axis travel direction. This will cause an error.

3. Move each machine axis approximately **1 in.** (**25.4 mm**) in one direction until the **RI**s stop blinking and the display starts to count.

4. Move each machine axis to the part zero position.

5. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{1}$

This will be the absolute part zero position.

To exit EverTrack™ Mode:

6. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{2}$

The DRO displays the following in the message window:

$$\boxed{\textit{EVERTRACK}}$$

7. Press $\boxed{\text{F}}$

The **RI** turns off and the DRO stores the absolute part zero position.

8. Continue with normal operations.

EverTrack™ Mode – F 02 (Continued)

Recalling a Part Zero Position

To recall a part zero position activate the **RI** as follows:

One Axis

1. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{2}$ to select the feature.

2. Press the desired axis key.

3. Press $\boxed{\text{SET}}$

The axis display resets to zero and the **RI** begins to blink.

All Axes

1. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{2}$ to select the feature.

2. Press $\boxed{\text{SET}}$ to select all axes.

The axis displays reset to zero and the **RI**s begin to blink for each axis.

CAUTION: During the following step, do not change the machine axis travel direction. This will cause an error.

3. Move the machine axis approximately **1 in.** (**25.4 mm**) in one direction until the display starts counting.

The value displayed on the axis display indicates the exact distance from the absolute part zero position.

4. Move the machine axis until the display indicates zero.

Zero indicates the exact absolute part zero position.

EverTrack™ Mode – F 02 (Continued)

To exit EverTrack™ Mode:

5. Press [F] [0] [2]

6. Press [F]

Last Position Save/Recall – F 10/F 11

F 10 allows you to save the machine's last position before turning OFF the machine; **F 11** allows you to recall the saved position after turning ON the machine.
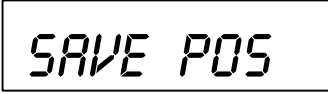
NOTE: If you have **EverTrack™ Mode**, you can always recall all datum points, even if you move the table during power-off.

IMPORTANT: Lock all axes of machine movement first.

To select the feature and save the last position:

1. Press $\boxed{\text{F}}$ $\boxed{1}$ $\boxed{0}$

The DRO displays the following in the message window:

$$\boxed{\textit{SAVE POS}}$$

2. Turn OFF the DRO power.

To recall the saved position:

1. Turn ON the DRO power.

2. Press $\boxed{\text{F}}$ $\boxed{1}$ $\boxed{1}$ to recall the last machine position.

The DRO displays the following in the message window:

$$\boxed{\textit{RECALL POS}}$$

3. Unlock the machine and continue with the job.

NOTE: This feature stores display information only. It does not track table movement when power is turned OFF.

Adding/Subtracting Values

This feature allows you to add or subtract values using the axis display values. You can add/subtract a value to/from a value displayed for a machine position or for values you enter in an axis display.

Example 1: The axis display indicates **3.425 in.** (**87 mm**). To add **1.259 in.** (**32 mm**) to this value:

1. Press the desired axis key to select the axis.

2. Press $\boxed{1}$ $\boxed{.}$ $\boxed{2}$ $\boxed{5}$ $\boxed{9}$ $\boxed{F}$

The axis display now indicates **4.684** (**119 mm**).

Example 2: To subtract **1.259 in.** (**32 mm**) from **3.425 in.** (**87 mm**) in the axis display:

1. Press the desired axis key to select the axis.

2. Press $\boxed{3}$ $\boxed{.}$ $\boxed{4}$ $\boxed{2}$ $\boxed{5}$ $\boxed{\text{SET}}$

3. Press the desired axis key to select the axis.

4. Press $\boxed{\pm}$ $\boxed{1}$ $\boxed{.}$ $\boxed{2}$ $\boxed{5}$ $\boxed{9}$ $\boxed{F}$

The axis display now indicates **2.166 in.** (**55 mm**).

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Dividing an Axis Value by 2

This feature allows you to divide a value on an axis display by **2**. You can also divide any values entered in an axis display by **2**.

Example 1: The axis display indicates **7.126 in.** (**181 mm**). To divide this value by **2**:

1. Press $\boxed{\text{F}}$

2. Press the desired axis key.

The axis display now indicates **3.563 in.** (**90.5 mm**).

Example 2: To divide **1.260 in.** (**32 mm**) by 2 in the axis display:

1. Press the desired axis key.

2. Press $\boxed{1}$ $\boxed{.}$ $\boxed{2}$ $\boxed{6}$ $\boxed{0}$ $\boxed{\text{SET}}$

3. Press $\boxed{\text{F}}$

4. Press the desired axis key.

The axis display now indicates **.630 in.** (**16 mm**).

NOTE: You can use this feature to find the center point of a workpiece by zeroing the tool at one edge of the workpiece, then moving the tool to the opposite edge and dividing by 2.

Centering Key

The Centering Key allows you to center the tool on the centerline of the workpiece, or on a specific position on the workpiece.

Example: To center the tool on the centerline of the workpiece:

Position 3 — Position 1 — Position 2 — Position 4

Position 3 — Position 1 — Position 2 — Position 4
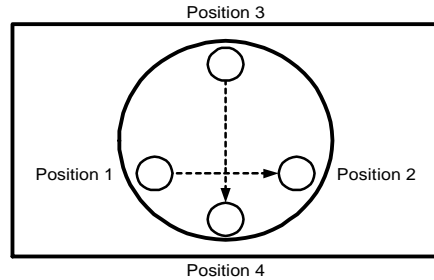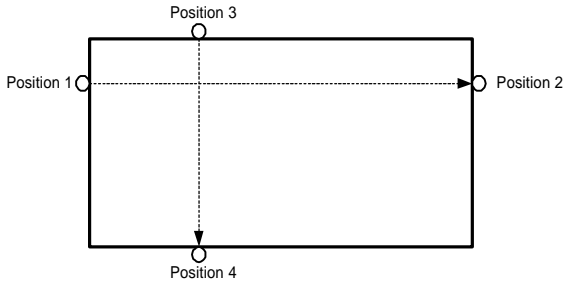
1. Press ⊄ to activate the feature.

The DRO displays the following in the message window:

$$EDGE \ XI$$

2. Move the tool to position 1.

3. Press **ENT**

The DRO displays the following in the message window:

$$EDGE \ X2$$

4. Move the tool to position 2.

5. Press **ENT**

Centering Key (Continued)

The DRO displays the following in the message window:

$$EDGE\ \ Y1$$

6. Move the tool to position 3.

7. Press **ENT**

The DRO displays the following in the message window:

$$EDGE\ \ Y2$$

8. Move the tool to position 4.

9. Press **ENT**

10. Move both axes until the displays indicate **0** (zero).

This is the centerline of the workpiece.

To exit the centering feature:

11. Press **F**

NOTE: To center the tool on the centerline of the X-axis only, skip the steps for the Y-axis entries. To center the tool on the centerline of the Y-axis only, press the Y-axis key after you press the centering key.

34
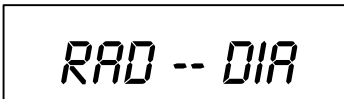
Radius/Diameter per Axis – F 05

F 05 allows you to display a specified axis in Radius or Diameter Mode. The DRO doubles axis movement and resolution In Diameter Mode. (Default for Lathe Mode: ON)

Example 1: Set one axis display in Diameter Mode.

1. Press $\boxed{F}$ $\boxed{0}$ $\boxed{5}$ to select the feature.

The DRO displays the following in the message window:

$$RAD -- DIA$$

2. Press the desired axis key to select the axis.

The DRO displays the radius-diameter mode indicator in the selected axis display.
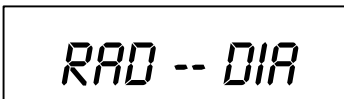
Radius-Diameter Mode Indicator ⟶ X F 05
ø

3. Press $\boxed{SET}$ to activate the feature.

Example 2: Set two or more axis displays in Diameter Mode.

1. Press $\boxed{F}$ $\boxed{0}$ $\boxed{5}$ to select the feature.

The DRO displays the following in the message window:

$$RAD -- DIA$$

Radius/Diameter per Axis – F 05 (Continued)

2. Press the desired axis key(s) to select the axes.

The DRO displays the radius-diameter mode indicator in the selected axis displays.

Radius-Diameter Mode Indicator ⟶ $\varnothing$

$$X \quad F \ 05$$

Radius-Diameter Mode Indicator ⟶ $\varnothing$

$$Y$$
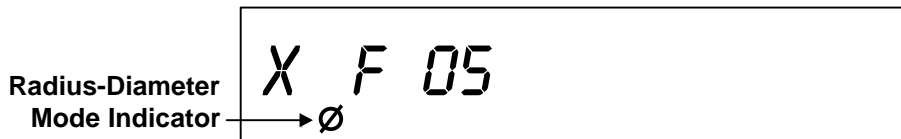
3. Press **SET** to activate the feature.

To turn Diameter Mode OFF:

1. Press **F** **0** **5**

2. Press the axis key(s).

The DRO turns OFF the radius-diameter mode indicator symbol(s), indicating the radius-diameter mode is turned off.

Setting a Correction Factor – F 03

F 03 allows you to compensate for nominal linear inaccuracies due to your machine or for adding material shrinkage/expansion, as in mold work.

The maximum allowable settings are **± 40%**.

Example: Consider a **1.325-in.** (**33.655 mm**) travel on the display that is only **1.320 in.** (**33.528 mm**) actual distance moved on the axis.

To set a correction factor for the axis:

1. Press $\boxed{\mathsf{F}}$ $\boxed{\mathsf{0}}$ $\boxed{\mathsf{3}}$ to activate the **CF** feature.

The DRO displays the following in the message window:

$$\boxed{\mathit{SET\ CORFCT}}$$

2. Press the desired axis key to select the axis.

The DRO displays the following in the axis display:

$$\boxed{\mathit{X \qquad\qquad 00000}}$$

3. Move the machine axis to **1.325** on the display.

4. Press the desired axis key again.

5. Press $\boxed{\mathsf{1}}$ $\boxed{\mathsf{.}}$ $\boxed{\mathsf{3}}$ $\boxed{\mathsf{2}}$ $\boxed{\mathsf{0}}$ to enter the actual distance.

6. Press $\boxed{\mathsf{SET}}$

Setting a Correction Factor – F 03 (Continued)

The Correction Factor (**CF**) indicator in the displayed axis turns ON indicating the Correction Factor is active.

```
X                          1.320
                    CF
```

100-Point Axis Error Compensation – F 80/F 81

F 80/F 81 allow you to correct non-linear errors. The DRO allows setting a compensation table with a maximum of 100 different points per axis. This feature allows you to compensate for machine tool inaccuracies.

To determine the compensation values it is necessary to measure the axis with a Laser Interferometer or other measuring device.

Axis Error Compensation is only possible if the Reference mark evaluation is activated (EverTrack™).

1. Press [F] [0] [2]

2. Press the desired axis key and [SET]

Move the linear encoder for the axis across the reference mark until **RI** stops blinking and the display starts to count.

Measure the Axis

To measure the axis, switch the DRO to mode "REFERENCE DISPLAY".

1. Press [F] [8] [0]

The DRO displays the following in the message window:

```
SEL AXIS
```

100-Point Axis Error Compensation F 80/F 81
(Continued)

Measure the Axis (Continued)

2. Press the desired axis key.

3. Press $\boxed{\begin{array}{c}\text{ABS}\\\text{INCR}\end{array}}$ key.

   The DRO displays the following in the message window:

   $$\boxed{\textit{REF.DISPLAY}}$$

   The decimal point in the left display field indicates that the display values are referenced to the Reference mark. If the decimal point blinks, the Reference mark has not been traversed.

Now, if required, you can set a zero to datum point for the "Reference Display".

For example, press the desired axis and

Press $\boxed{0}$ $\boxed{\text{SET}}$ to set zero point for "Reference Display".

Measure the axis and note the compensation values for later programming.

As the compensation is always related to the "Reference Display", you are not allowed to change the zero or datum point for the "Reference Display" after measuring.

Press $\boxed{F}$ to leave the "Reference Display" mode.

100-Point Axis Error Compensation F 80/F 81
(Continued)

Selecting the Compensation Table, Entering an Axis Compensation

1. Press $\boxed{\text{F}}$ $\boxed{8}$ $\boxed{0}$

   The DRO displays the following in the message window:

   $$\boxed{\quad SEL\ AXIS \quad}$$

5. Press the desired axis key.

   The DRO displays the following in the message window:

   $$\boxed{\quad AXIS\ X \quad}$$

6. Press $\boxed{\text{SET}}$

   The DRO displays the following in the message window:

   $$\boxed{\quad DATUM\ X \quad}$$

   Datum point for the axis to be corrected. Here you enter the start point at
   which the axis with error is to be corrected. This point indicates the
   distance to the zero position for the "Reference Display".

100-Point Axis Error Compensation F 80/F 81
(Continued)

Selecting the Compensation Table, Entering an Axis Compensation (Continued)

Enter, for example: 0 mm

Press $\boxed{0}$ $\boxed{\text{SET}}$

The DRO displays the following in the message window:

$$\boxed{\quad SPACING \ X \quad}$$

Enter the spacing between the compensation points.
Factory setting: 10 mm

Enter, for example: 5 mm

Press $\boxed{5}$ $\boxed{\text{SET}}$

The DRO displays the following in the message window:

$$\boxed{\quad X \qquad NO. \ 00 \quad}$$

$$\boxed{. \qquad 0.000}$$ X-axis display shows compensation point no. 0

$$\boxed{\qquad 0.000}$$ Y-axis display shows compensation value no. 0

NOTE: Compensation point 0 always has the compensation value 0 and cannot be changed.

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100-Point Axis Error Compensation F 80/F 81
(Continued)

Selecting the Compensation Table, Entering an Axis Compensation (Continued)

Press [SET]

The DRO displays the following in the message window:

$$X \quad NO.\ 01$$

$$.\qquad 5.000$$

X-axis display shows compensation point no. 1

$$- - - - - - - - -$$

Y-axis display shows compensation value no. 0

Enter the associated compensation value for point no. 1 and confirm with SET.
For example: 0.002 mm

Press [.] [0] [0] [2]

Press [SET]

The DRO displays the following in the message window:

$$X \quad NO.\ 02$$

Repeat this procedure for all further compensation points (no. 2 – no. 99).

100-Point Axis Error Compensation F 80/F 81
(Continued)

Selecting the Compensation Table, Entering an Axis Compensation (Continued)

NOTE: For 1-axis version, the compensation point displays only briefly in axis display, before compensation value is shown. If you press, the **CE** key, the compensation point is shown again.

Key Functions for Compensation Table

SET key: Confirm entry and page forward in the compensation table

MM/INCH key: Page backward in the compensation table.

ABS/INCR key: Change to "REFERENCE DISPLAY" mode.

ADV key: Direct selection of compensation points.
Press the ADV key and the two-digit number of the desired compensation point.

F Exit the compensation table.

100-Point Axis Error Compensation F 80/F 81
(Continued)

Deleting a Compensation Value Table

To delete a compensation value table:

1. Press $\boxed{\mathsf{F}}$ $\boxed{\mathsf{8}}$ $\boxed{\mathsf{0}}$

   The DRO displays the following in the message window:

   $$\boxed{\mathit{SEL\ AXIS}}$$

2. Select the table for the specified axis with the axis key.

   The DRO displays the following in the message window:

   $$\boxed{\mathit{AXIS\ X}}$$

3. Press $\boxed{\mathsf{CL}}$

   The DRO displays the following in the message window:

   $$\boxed{\mathit{DELETE\ X}}$$

Delete the compensation value table with $\boxed{\mathsf{SET}}$ key, or cancel with $\boxed{\mathsf{CL}}$ key.

100-Point Axis Error Compensation F 80/F 81
(Continued)

Axis Error Compensation ON/OFF

1. Press $\boxed{\text{F}}$ $\boxed{8}$ $\boxed{1}$

The DRO displays the following in the message window:

$$\boxed{99 - PT.ACTIV}$$

A programmed error compensation can be switched ON or OFF for each axis with the axis key. If compensation is active, the red symbol "**CF**" in the corresponding display is on.

Correction Factor OFF/ON – F 04

F 04 allows you to turn the Correction Factor (**CF**) OFF or ON selectively and store the values in memory.

To turn the correction factor ON or OFF:

1. Press ⎡F⎤ ⎡0⎤ ⎡4⎤ to select the feature.

The DRO displays the following in the message window:

$$\boxed{\textit{CF ON--OFF}}$$

2. Press the desired axis key to select the axis to enable or disable **CF**.

3. If necessary, turn the correction factor ON or OFF for any axis.

To clear the correction factor from memory:

1. Press ⎡F⎤ ⎡0⎤ ⎡3⎤

The DRO displays the following in the message window:

$$\boxed{\textit{SET CORFCT}}$$

2. Press the desired axis key to select the axis to clear.

3. Press the axis key twice to clear the **CF**.

4. Press ⎡SET⎤

Approaching Zero Indicator

This feature indicates that the machine is within a set range and is approaching zero.

The approaching zero indication range must be set using Approaching Zero Range – F 07.

```
 APZ SET
```

```
X          .0000
```

Approaching Zero Indicator

48
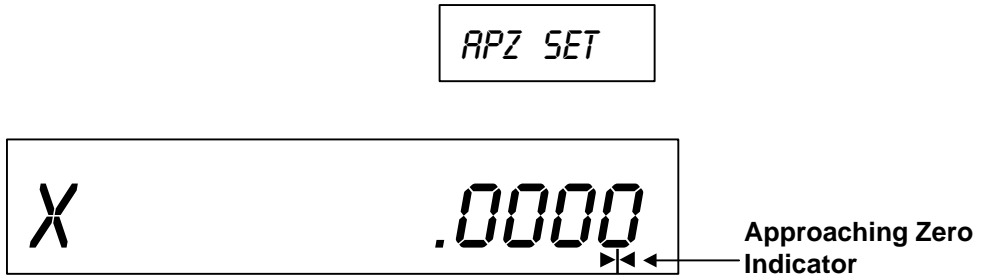
Approaching Zero – F 06

F 06 indicates when an axis is within a set range and approaching zero, or at zero.

1. Press ⎡F⎤ ⎡0⎤ ⎡6⎤ to select the feature.

The DRO displays the following in the message window and axis displays:

```
APZ SET
```

```
X  F 06
```

```
Y
```

2. Press the desired axis key(s) to select the axes.

The DRO displays the approaching zero indicator(s) on the selected axis display(s).

```
APZ SET
```

```
X  F 06
                      ▶◀
```

```
Y
                      ▶◀
```

3. Press ⎡SET⎤ to activate the feature.

Approaching Zero – F 06 (Continued)

To turn the approaching zero indicator OFF:

1. Press $\boxed{\text{F}}$ $\boxed{0}$ $\boxed{6}$ to select the feature.

2. Press the desired axis key to deselect the axis.

3. Press $\boxed{\text{SET}}$

NOTE: The following example shows an axis with an approaching zero position tolerance set to **.5**. The symbols in the lower right corner of the display indicate the axis is approaching zero, at zero, or past zero. The arrows indicate the direction of travel toward zero only if you preset a range using Approaching Zero Range – F 07.

X	.50000 ▸

Approaching zero.

X	.00000 ı

At zero.

X	-.50000 ◂
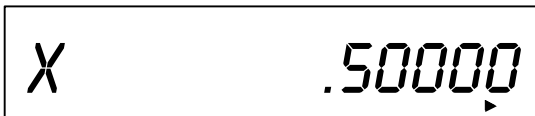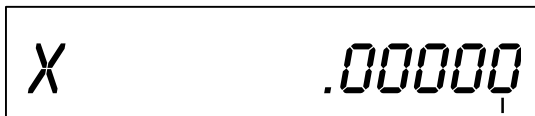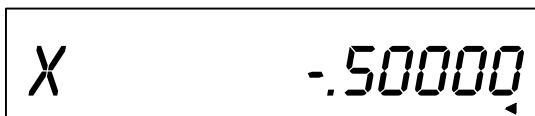
Past zero.

Approaching Zero Range – F 07

F 07 allows you to set the range for approaching zero indication in one or more axes.

Example: To set the range for the X-axis to **.5**:

1. Press $\boxed{F}$ $\boxed{0}$ $\boxed{7}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{APZ\ RANGE}$$

The axis displays indicate the current approaching zero range.

2. Press axis 1 key to select the axis.

The DRO displays the following in the axis display:

$$\boxed{X \qquad\qquad\qquad 0}$$

The X is blinking.

3. Press $\boxed{.}$ $\boxed{5}$

The DRO displays the following in the axis display:

$$\boxed{X \qquad\qquad\qquad .5}$$

Approaching Zero Range – F 07 (Continued)

To set the range for another axis:

4. Repeat steps 2 and 3 for each axis.

5. Press $\boxed{\text{SET}}$ to activate the feature.
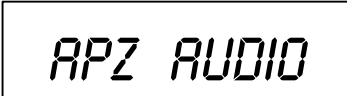
Approaching Zero Audio ON/OFF – F 08

F 08 enables/disables an audible beep to notify you when the selected axis is within the approaching zero range. (Default: OFF)

To turn on audio notification for the selected axis:

1. Press $\boxed{\text{F}}$ $\boxed{\text{0}}$ $\boxed{\text{8}}$

The DRO displays the following in the message window:
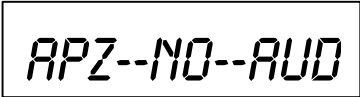
$$\boxed{APZ\ AUDIO}$$

To turn off audio notification for the selected axis:

1. Press $\boxed{\text{F}}$ $\boxed{\text{0}}$ $\boxed{\text{8}}$

The DRO displays the following in the message window:

$$\boxed{APZ\text{-}\text{-}NO\text{-}\text{-}AUD}$$

Connecting the Edge Sensor Probe

LED
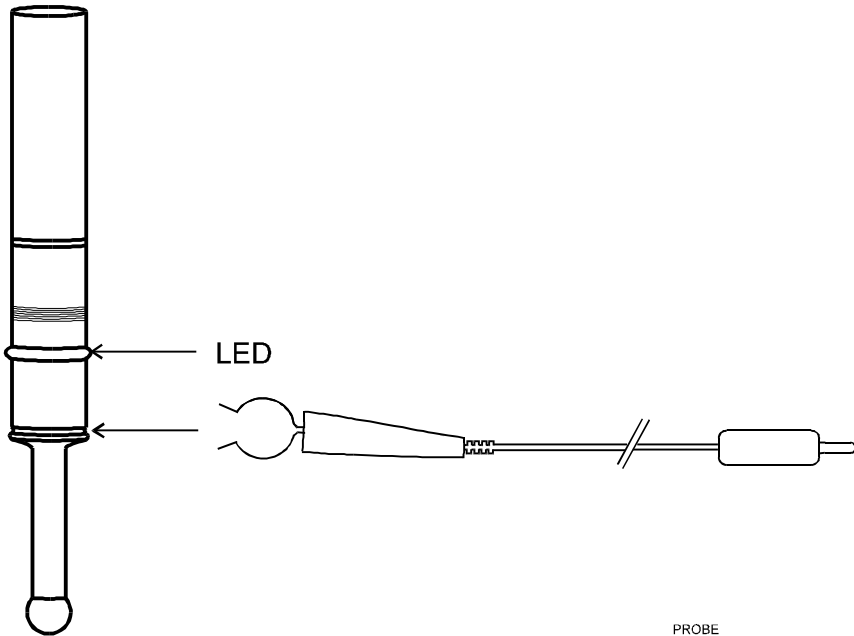
PROBE

CAUTION: To avoid electrical shock, unplug the DRO from the power source.

1. Connect the ground wire on the back of the DRO to a proper earth ground.

2. Place the round spring clip in the appropriate groove on the probe.

NOTE: Ensure that the round spring clip on the probe cable is connected to the probe below the LED.

3. Plug the other end of the probe cable into the circular jack on the back of the DRO.

The red LED on the probe should glow dimly, indicating a proper connection. When you touch the probe tip to the workpiece, the red LED should glow brightly.

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Edge Sensor Probe – F 09

F 09 allows you to position the spindle on the edge of the workpiece.

To activate the edge sensor probe:

1. Press
$$\boxed{\text{F}} \quad \boxed{0} \quad \boxed{9}$$

The DRO displays the following in the message window:

$$\boxed{\textit{PROBE EDGE}}$$

NOTE: When you move the X-axis from left to right enter a positive diameter; when you move the X-axis from right to left enter a negative diameter (See Figure 1).
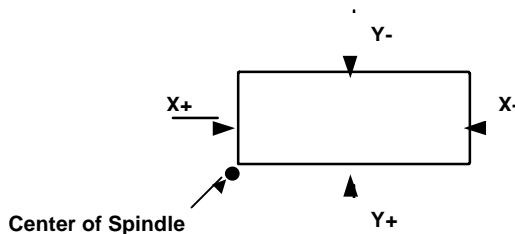
Figure 1: Selecting Direction of Movement

Example: To enter a probe diameter of **.2 in.** (**5.08 mm**) for the X-axis (moving from left to right):

2. Press the axis key to select the axis.

The DRO displays the following in the message window:

$$\boxed{\textit{PROBE DIA}}$$

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Edge Sensor Probe – F 09 (Continued)

To enter the probe diameter:
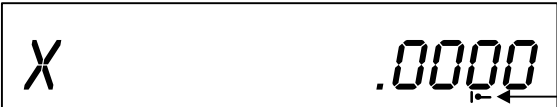
3. Press [±] to toggle to plus or minus, for the desired direction of movement (See Figure 1).

4. Press [.] [2] [SET]

The DRO displays the following in the message window and axis display:

$$\boxed{PROBE \quad X+}$$

$$\boxed{X \qquad\qquad .0000}$$ **— Edge Sensor Indicator**

5. Move the edge sensor until it touches the edge of the workpiece and the edge sensor indicator turns off.

6. Move the spindle until the axis display indicates zero.

This is the edge of the workpiece.

Feedrate ON/OFF – F 26

F 26 allows you to display the maximum feedrate for all axes in the message window (if feedrate is greater than 0.4 inches per minute or greater than 10 mm per minute). The DRO displays the feedrate in inches per minute if set to **INCH** Mode and mm per minute if set to **MM** Mode. If you move two or more axes at the same time, the DRO displays the feedrate for the fastest moving axis. (Default: OFF)

To turn on the feedrate:

1. Press $\boxed{\text{F}}$ $\boxed{\text{2}}$ $\boxed{\text{6}}$

The DRO displays the following in the message window:
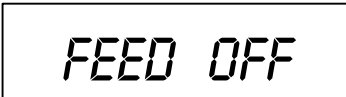
$$\boxed{FEED\ ON}$$

To turn off the feedrate:

1. Press $\boxed{\text{F}}$ $\boxed{\text{2}}$ $\boxed{\text{6}}$

The DRO displays the following in the message window:

$$\boxed{FEED\ OFF}$$

Job Clock ON/OFF – F 34

F 34 allows you to toggle the DROs integrated job clock ON or OFF. When activated, the job clock displays the time in hours, minutes, and seconds in the message window. (Default: OFF)

To turn the job clock ON:

1. Press $\boxed{\text{F}}$ $\boxed{3}$ $\boxed{4}$

The DRO temporarily displays the following in the message window:

$$\boxed{\text{CLOCK ON}}$$

The DRO resets the axis display windows to zero and displays the job clock in the message window.

$$\boxed{\text{JC} \quad 00.00.00}$$

To start or stop the job clock:

2. Press $\boxed{\text{∎}}$

To reset the job clock to 0 (zero):

3. Press $\boxed{0}$

To redisplay the message window and run the job clock in the background or to redisplay the job clock:

4. Press $\boxed{\pm}$

Job Clock ON/OFF – F 34 (Continued)

To turn the job clock OFF:

1. Press $\boxed{\mathsf{F}}$ $\boxed{3}$ $\boxed{4}$

The DRO temporarily displays the following in the message window:

$$\boxed{\textit{CLOCK OFF}}$$

The DRO clears the job clock display in the message window and resets the axis display windows to **0** (zero).

Parameter Settings – F 20

F 20 allows you to set up encoder parameters and axis display resolutions. The following section describes two different types of resolution:

❑ Encoder Resolution   the resolution of the measurement, an encoder parameter.

❑ Display Resolution   the resolution of displayed values.

You can vary the resolution of the values displayed in the linear axis displays for both **INCH** and **MM** Mode. For a rotary axis, you can set up the display resolution for degrees in both decimal and minutes/seconds format. You can set the display resolution individually for each axis.

F 20 allows you to enter parameters for the encoders used for feedback. These can be set up individually for each axis. Your DRO will support three different types of encoders:

❑ Metric Linear Encoders (encoders with grating pitch measured in microns, μm)

❑ Inch-Based Linear Encoders (encoders with grating pitch measured in inches)

❑ Rotary Encoders

All modern linear encoders are of the Metric type.

NOTE: **F 20** is also used to specify the parameters of the spindle encoder used for feedback for Spindle Speed Display (SSD). See Parameter Setting for SSD (2-Axis and 3-Axis With SSD Option Only).

Setting Up Encoder Parameters

To enter encoder and axis display parameter settings:

1. Press $\boxed{\text{F}}$ $\boxed{\text{2}}$ $\boxed{\text{0}}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{PARAMETER}$$

2. Press the desired axis key(s) to select the axes.

Parameter Settings – F 20 (Continued)

NOTE: You can select one or more axes to set up simultaneously as long as they use the same encoders and the same display fo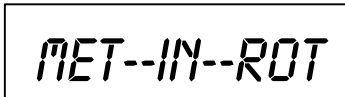rmat is desired. You must repeat the **F 20** feature and select the appropriate axis (axes) for each different type of encoder setup.

The DRO displays the following in the message window:

$$MET--IN--ROT$$

The axis display indicates the encoder type (default **Metric**).

The available encoder types are:

- ❑ **Metric**   Metric Linear Encoders
- ❑ **Inch**   Inch-Based Linear Encoders
- ❑ **Rot**   Rotary Encoders

3. Press ⟮ **±** ⟯ repeatedly to scroll through the encoder type options.

4. Press ⟮ **SET** ⟯ to set the desired encoder type option.

NOTE: Most linear encoders, and all modern ANILAM encoders are metric, i.e., they have a grating pitch measured in microns (μm). Some older linear encoders (for example, **BT** and **JB** type encoders) are inch-based, i.e., they have a grating pitch measured in inches. Select **rot** if the encoder is a rotary encoder.

Go to the section for the selected type of encoder:

- ❑ Metric Linear Encoders
- ❑ Inch Linear Encoders
- ❑ Rotary Encoders

Parameter Settings – F 20 (Continued)

Metric Linear Encoders

If you have performed steps 1 through 4 in the Setting Up Encoder Parameters section and selected Metric Linear Encoder, the DRO prompts for the encoder resolution and direction of positive travel in the message window, and displays the default encoder resolution (**5µm**) in the axis display:
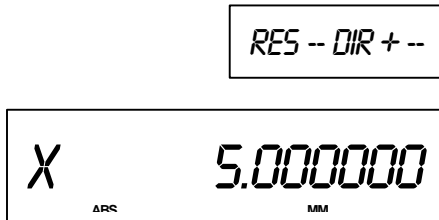
$$RES -- DIR + --$$

$$X \qquad 5.000000$$

ABS   MM

The axis designation (in this example, **X**) is blinking, indicating that you can enter a value. The default value for the encoder resolution is **5mm**. The encoder resolution value must be set for the linear encoder type you are using.

The following table lists the encoder resolution (in microns) for common ANILAM encoders:

Linear Encoder Type	Encoder Resolution
RBS-05T, RBM-05T	**.5**
RBS-1, RBS-1T, RBM-1T, B-1, E-1	**1**
RBS-2, A-2, C-2, E-2, F-2,	**2**
RBS-5, RBS-5T, RBM-5T, PGS-E, PGS-P, B-5, C-5, E-5, KM-5,	**5**
5 micron resolution Rack and Pinion RBS-10, A-10, C-10, D-10, KM-10 10 micron resolution Rack and Pinion	**10**

Parameter Settings – F 20 (Continued)

Setting Encoder Resolution

If you need to change the encoder resolution setting – for example, **1μm**:

1. Press | 1 |

If you need to change the direction of positive travel:

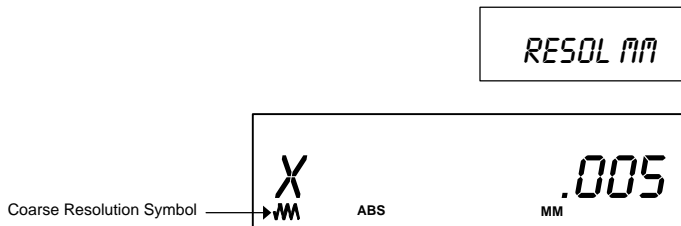2. Press | ± | to change the direction of positive travel.

3. Press | SET | to set the encoder resolution and direction of travel.

Setting Display Resolution (MM Mode)

The DRO displays the following in the message window and axis display(s):

RESOL MM

X   .005

Coarse Resolution Symbol ——▶ ·₩₩   **ABS**   **MM**

This is the display resolution measured in **MM** for the axis display(s) when the **MM/INCH** key has been toggled to **MM** Mode only. The axis designation (in this example, **X**) is blinking, indicating that you can enter a value. The DRO will default the same display resolution as the encoder resolution. ANILAM recommends that you use the same display resolution as you use for the encoder resolution.

NOTE: The DRO turns on the Coarse Resolution Symbol in the axis display(s) if the selected display resolution is coarser than the encoder resolution.
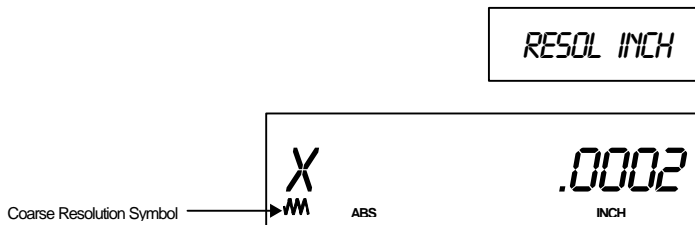
Parameter Settings – F 20 (Continued)

1. Press ⌈±⌋ repeatedly to scroll through the display resolution options in MM Mode.

2. Press ⌈SET⌋ to select the desired display resolution in MM Mode.

Setting Display Resolution (INCH Mode)

The DRO displays the following in the message window and axis display:

```
RESOL INCH
```

X   .0002
Coarse Resolution Symbol ──────▶ ▶W   ABS   INCH

This is the display resolution measured in inches for the axis display(s) when the **MM/INCH** key has been toggled to **INCH** Mode only. The axis designation (in this example, **X**) is blinking, indicating that you can enter a value. The DRO will default the same display resolution as the encoder resolution. ANILAM recommends that you use the same display resolution as you use for the encoder resolution.

NOTE: The DRO turns on the Coarse Resolution Symbol in the axis display(s) if the selected display resolution is coarser than the encoder resolution.

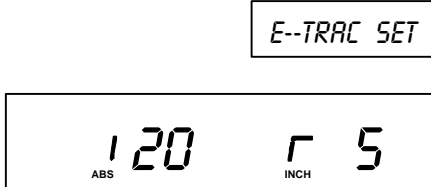1. Press ⌈±⌋ repeatedly to scroll through the display resolution options in INCH Mode.

Parameter Settings – F 20 (Continued)

To change the Resolution Setting:

2. Press
$\boxed{\text{SET}}$
to select the desired display resolution in INCH Mode.

Setting EverTrack™ Mode

The DRO prompts for the EverTrack™ Mode in the message window and displays the default EverTrack™ Mode in the axis display:

$$\boxed{\text{E--TRAC SET}}$$

$$\boxed{\begin{array}{cc} \text{ABS } i20 & \text{INCH } r\ 5 \end{array}}$$

The available settings are:

| Setting		Linear Encoder
i20	r05	RBS-05T and RBM-05T
i20	r1	RBS-1T and RBM-1T
i20	r5	RBS-5T and RBM-5T (default)
no E-trac		All other linear encoders

1. Press
$\boxed{\pm}$
repeatedly to scroll through the options.

2. Press
$\boxed{\text{SET}}$
to set the option and exit.

Parameter Settings – F 20 (Continued)

Inch Linear Encoders (BT or JB Linear Encoders)

If you have performed steps 1 through 4 in the Setting Up Encoder Parameters section and selected **Inch Linear Encoder**, the DRO prompts for the encoder resolution and direction of positive travel in the message window:

$$RES -- DIR + --$$

$$X \qquad 1.000000$$

ABS   MM
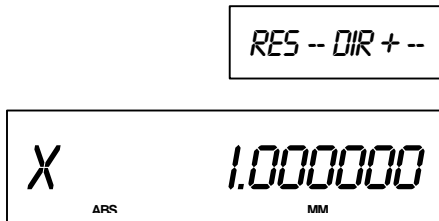
The axis designation (in this example, **X**) is blinking, indicating that you can enter a value. The default value for the encoder resolution is **.0001 in.** (display resolution is in ten thousands of an inch). The encoder resolution value must be set for the linear encoder type you are using.

NOTE: If you do not know the encoder resolution for the linear encoder(s) you are using, call ANILAM at the number listed on page 1.

Setting Encoder Resolution

If you need to change the encoder resolution setting – for example, **.0002 in.**:

1. Press ⎡ **2** ⎤

If you need to change the direction of positive travel:

2. Press ⎡ **±** ⎤ ⎡ **SET** ⎤   to change the direction of positive travel and to set the encoder resolution.

3. For the remainder of the inch linear encoder parameter setup procedures, proceed with Setting Display Resolution (MM Mode**)** after step 7 of the Metric Linear Encoders section.

Parameter Settings – F 20 (Continued)

Rotary Encoders

If you have performed steps 1 through 4 in the Setting Up Encoder Parameters section and selected **rot** (Rotary Encoder), the DRO prompts for the Line Count in the message window. The default rotary encoder line count (**9000**) is displayed in the axis display:
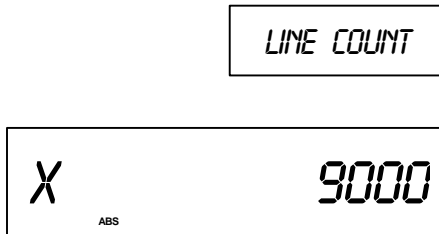
```
LINE COUNT
```

```
X              9000
   ABS
```

The axis designation (in this example, **X**) is blinking, indicating that you can enter a value. The default value for the encoder resolution is **9000**. The encoder resolution value must be set for the linear encoder type you are using.

Changing the Line Count and Direction of Positive Rotation

If you need to change the line count – for example: **18000**:

1. Press ⬜1 ⬜8 ⬜0 ⬜0 ⬜0

If you need to change the direction of positive rotation:

2. Press ⬜±   to change the direction of
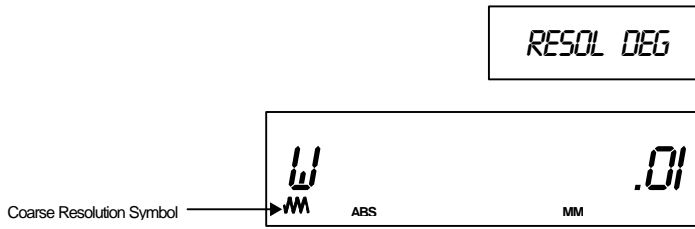   positive rotation.

3. Press ⬜SET   to select the direction of
                                                        rotation and line count.

Parameter Settings – F 20 (Continued)

Setting Display Resolution (Display Degrees in Decimal Mode)

The DRO displays the following in the message window and the axis display:

$$RESOL\ DEG$$

Coarse Resolution Symbol ⟶ ►₩ **ABS** **MM** $.0I$

This is the display resolution for the axis display(s) when you set the DRO to display degrees in Decimal Mode only. The axis designation (in this example, **W**) is blinking, indicating that you can enter a value. The DRO will default the same display resolution as the encoder resolution (in this example, **.0I Degrees**). ANILAM recommends that you use the same display resolution as you use for the encoder resolution.

The available display options are:

> **Display Resolution Options
> in Decimal Degree Mode**
>
> .0005, .001, .002, .005, .01, .02, .05, .1, .2, .5, 1

NOTE: The DRO turns on the Coarse Resolution Symbol in the axis display(s) if the selected display resolution is coarser than the encoder resolution.

1. Press $\boxed{\textbf{+}}$ repeatedly to scroll through the options.

To select the display resolution:

2. Press $\boxed{\textbf{SET}}$

Parameter Settings – F 20 (Continued)

The DRO displays the following in the message window and the axis display:

```
MIN--SEC
```

```
W              .00.30
ᴡᴡ  ABS
```

This is the display resolution for the axis display(s) when you set the DRO to display degrees in minutes and seconds mode only. The axis designation (in this example, **W**) is blinking, indicating that you can enter a value. The DRO will default the same display resolution as the encoder resolution (in this example, **30 seconds**). ANILAM recommends that you use the same display resolution as you use for the encoder resolution.

The available display options are:

> **Display Resolution Options
> in Minutes and Seconds Mode**
>
> .00.01, .00.02, .00.05, .00.10, .00.20, .00.30, .01, .02, .05, .10, .20

NOTE: The DRO turns on the Coarse Resolution Symbol in the axis display(s) if the selected display resolution is coarser than the encoder resolution.

3. Press $\boxed{\pm}$ repeatedly to scroll through the options.

To select the display resolution:

4. Press $\boxed{\text{SET}}$

Parameter Settings – F 20 (Continued)

Resetting Parameters to Factory Settings

To reset all parameter settings to their original factory settings:

1. Press ⎡F⎤ for approximately 5 seconds.

To cancel the reset:

2. Press ⎡F⎤ again.
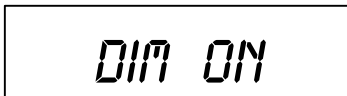
   OR

To reset all parameters:

1. Press ⎡SET⎤

Display Dim OFF/ON – F 22/F 23

F 22 allows you to activate Dim Mode; **F 23** allows you to deactivate Dim Mode. To increase the life of the display, the DRO automatically dims if it is not used for 15 minutes (similar to a computer terminal's screen-saver mode). When you activate Dim Mode the axis displays show blinking decimal points. The DRO remains in Dim Mode until you press a key or move one or more linear encoders. (Default: ON)

To select DIM ON:

1. Press $\boxed{F}$ $\boxed{2}$ $\boxed{2}$

The DRO displays the following in the message window:
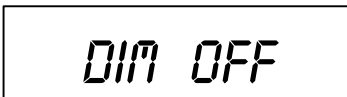
$$\boxed{\textit{DIM ON}}$$

To select DIM OFF:

1. Press $\boxed{F}$ $\boxed{2}$ $\boxed{3}$

The DRO displays the following in the message window:

$$\boxed{\textit{DIM OFF}}$$

NOTE: You can disable this feature, however the DRO still goes into Dim Mode after standing idle for one hour.

Axis Designation – F 24

F 24 allows you to assign an axis to each display you select. You can change the assignment of any axis to **X**, **Y**, **Z**, **W**, Z_1, X_1 or no axis designation.

1. Press $\boxed{F}$ $\boxed{2}$ $\boxed{4}$ to select the feature.

The DRO displays the following in the message window and axis display:

$$\boxed{NAME\ AXIS}$$

$$\boxed{X\ \ F\,24}$$

2. Press the desired axis key to scroll through the available settings.

3. Press $\boxed{SET}$ to activate the axis assignment.

   OR

4. Press $\boxed{F}$ to exit without changing the axis assignment.

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Select Language – F 99

F 99 allows you to select the language the DRO will use to display text and messages.

The available languages are:

- ❑ English
- ❑ German
- ❑ French
- ❑ Italian
- ❑ Spanish
- ❑ Swedish
- ❑ Czech
- ❑ Portuguese

To select the language:

1. Press ⎡F⎤ ⎡9⎤ ⎡9⎤

The DRO displays the selected language in the message window:

ENGLISH

Linear Encoder Error Detect OFF/ON – F 40/F 41

Your DRO has advanced Linear Encoder error-checking capability. This feature determines if there are any Linear Encoder miscounts or repeatability problems. **F 40** allows you to turn OFF Linear Encoder Error Detect; **F 41** allows you to turn ON Linear Encoder Error Detect. (Default: ON)

To turn OFF the Linear Encoder Error Detect feature and deactivate all axes:

1. Press $\boxed{\text{F}}$ $\boxed{4}$ $\boxed{0}$

The DRO momentarily displays the following in the message window:

$$\boxed{\textit{ENCERR OFF}}$$

To turn ON Linear Encoder Error Detect and activate all axes:

1. Press $\boxed{\text{F}}$ $\boxed{4}$ $\boxed{1}$

The DRO momentarily displays the following in the message window:

$$\boxed{\textit{ENCERR ON}}$$

If the DRO detects an error, it displays the error in that axis display. The other axis displays remain blank for a short time and then the beeper sounds.

For example:

$$\boxed{\textit{X} \qquad\qquad \textit{ERROR}}$$

Diagnostics – F 45

F 45 allows you to perform system diagnostic tests on the keyboard, internal EEPROM, and internal counters. If any of these tests fail, contact your local distributor or ANILAM Customer Services. You do not need to unplug the linear encoders for these tests.

Display Test

1. Press $\boxed{\text{F}}$ $\boxed{4}$ $\boxed{5}$

to display all segments of the display and message window.

EEProm Test

2. Press $\boxed{\text{SET}}$

to activate the internal EEPROM test.

The DRO displays the results in the axis window:

EEProm nF (no fail).

EEPR. FAIL

Counters Test

3. Press $\boxed{\text{SET}}$

to activate the internal counters test.

The DRO displays the results in the axis window:

Count nF (no fail).

CNT FAIL

Diagnostics – F 45 (Continued)

Keyboard Test

4. Press **SET**

to activate the keyboard test.

5. Press any key on the DRO

to display the key on the DRO display.

Blank Test

6. Press **SET** for 2 seconds

to blank all segments of the display.

7. Press **SET**

to end the system diagnostics test.

Mill/Lathe Setup (900 Only) – F 29

F 29 allows you to set up the DRO to operate in Mill or Lathe Mode. (Default is Mill)

To set up the DRO in Mill or Lathe Mode:

1. Press $\boxed{\text{F}}$ $\boxed{2}$ $\boxed{9}$

The DRO displays one of the following in the message window:

MILL	LATHE

2. Press $\boxed{\pm}$ to toggle between the Mill and Lathe Mode setting.

3. Press $\boxed{\text{SET}}$ to activate the setting.

Advanced (ADV) Functions Key

The Advanced Functions Key allows you to access the following DRO advanced functions:

❑ Help for DRO Features

❑ Bolt-Hole Patterns **(N/A for 900, Lathe Mode)**

❑ Linear-Hole/Frame Hole Patterns **(N/A for 900, Lathe Mode)**

❑ Taper Calculation **(900, Lathe Mode Only)**

❑ Skew Compensation **(900, Mill Mode Only)**

NOTE: To select Mill or Lathe Mode for a 900, use Mill/Lathe Setup – F 29.

To access the Advanced functions:

1. Press **ADV**

The DRO displays the following in the message window:

$$HELP$$

2. Press **ADV** repeatedly to scroll through the functions list.

Help Function
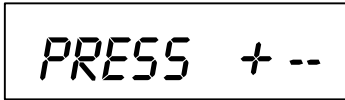
HELP allows you to scroll through a list of feature names and their codes or quickly access a DRO feature from the list.

To display the list of features and their codes:

1. Press **ENT**

Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window:
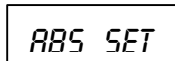
$$PRESS \ + --$$

2. Press ⊞ repeatedly to scroll through the feature list.

The DRO displays the following in the message window and axis display 1:

$$ABS \ SET$$

$$FOI$$

Each time you press the plus/minus key, the DRO displays the next feature code in axis display 1 and the feature name in the message window.

To reverse the scrolling direction:

3. Press ▪ ⊞

To activate a displayed feature:

4. Press **ENT**

To exit the Help function:

5. Press **F**

Advanced (ADV) Functions Key (Continued)

Bolt-Hole Pattern Function (N/A for 900, Lathe Mode)

The **Bolt-Hole Pattern** function allows you to program the X and Y positions for a maximum of 10 different bolt-hole patterns (maximum 360 holes each) around the circumference of a specified circle. The DRO can program the following types of bolt-hole patterns:

❑ Partial Pattern   In a partial pattern, the holes do not cover the entire circumference of the circle. Instead they form an arc, called a partial pattern. (See Figure 2)

❑ Full Pattern   In a full pattern, the holes cover the entire circumference of the circle. (See Figure 3)

Diameter:	**1.00 Inch (25.4 mm)**
Beginning Angle:	**-10 °**
End Angle:	**80 °**
Holes:	**3**
X Center:	**1.00 Inch (25.4 mm)**
Y Center:	**1.00 Inch (25.4 mm)**
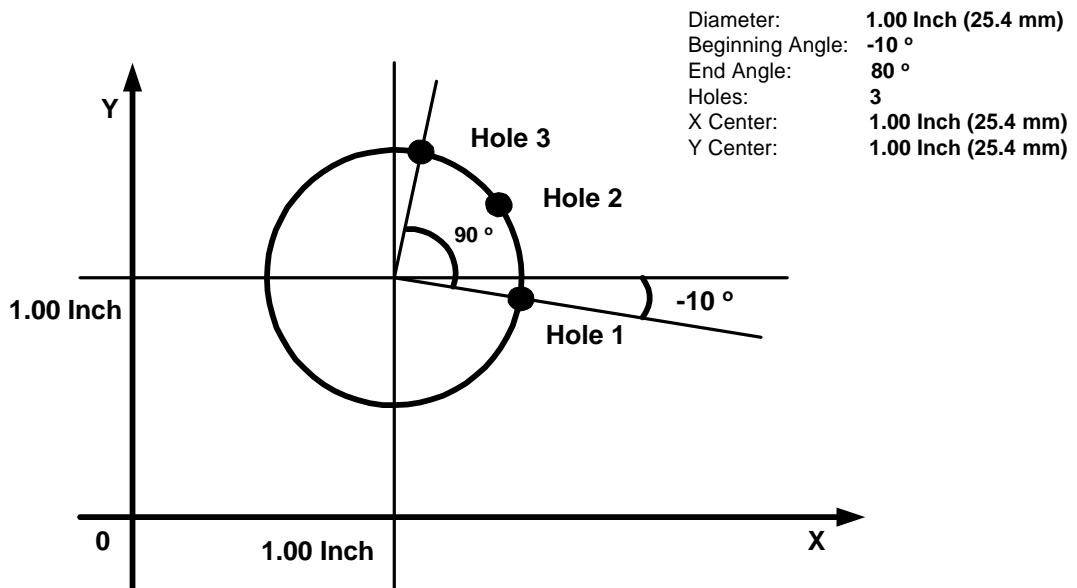
Figure 2: Partial Bolt-Hole Pattern

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Advanced (ADV) Functions Key (Continued)

Diameter: **2.00 inches (50.8 mm)**
Beginning Angle: **-10 °**
Holes: **4**
X Center: **+1.00 inch (25.4 mm)**
Y Center: **+1.00 inch (25.4 mm)**
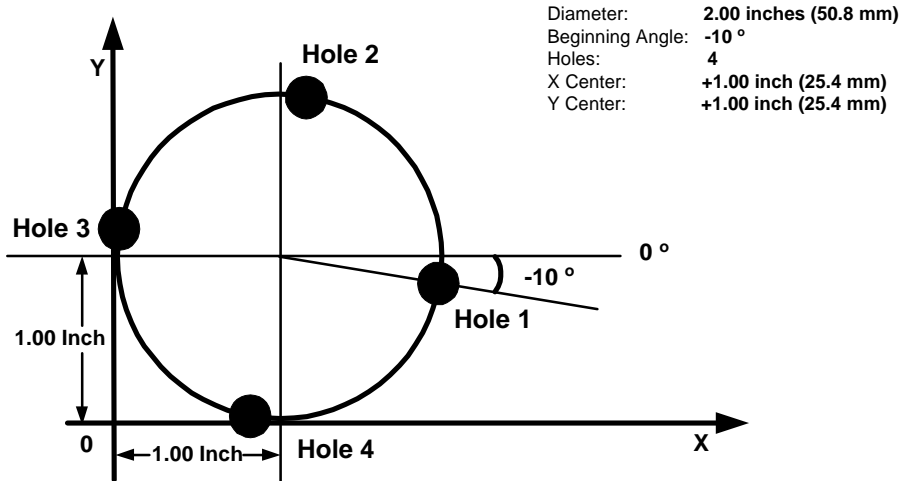
Figure 3: Full Bolt-Hole Pattern

To access the Bolt-Hole pattern function:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

When the DRO displays the following in the message window:

$$BOLT\ HOLE$$

2. Press **ENT**

The DRO displays the following in the message window:

$$BHP\ NUMBER$$

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Advanced (ADV) Functions Key (Continued)

NOTE: If you are entering a full bolt-hole pattern, skip this section and go to the Full Bolt-Hole Pattern section.

Partial Bolt-Hole Pattern

To enter a partial bolt-hole pattern for program number **1** (Range is 0 through 9):

1. Press [1] [ENT]

The DRO displays the following in the message window:

> *FULL*

To enter a partial bolt-hole pattern:

2. Press [±]
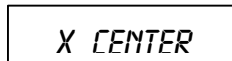
The DRO displays the following in the message window:

> *PARTIAL*

3. Press [ENT]

The DRO displays the following in the message window and axis display 1:

> X CENTER

> X   .0000

Advanced (ADV) Functions Key (Continued)

To enter the X dimension for the center of the pattern – for example, **1.00 in.** (**25.4 mm**):

4. Press $\boxed{1}$ $\boxed{\textbf{ENT}}$

The DRO displays the following in the message window and axis display 2:

Y CENTER

Y .0000

To enter the Y dimension for the center of the pattern – for example, **1.00 in.** (**25.4 mm**):

5. Press $\boxed{1}$ $\boxed{\textbf{ENT}}$

The DRO displays the following in the message window and axis display 1:

BHP DIA

X .0000

To enter the diameter of the bolt-hole pattern – for example, **1.00 in.** (**25.4 mm**):

6. Press $\boxed{1}$ $\boxed{\textbf{ENT}}$

Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window and axis display 1:

$$QTY\ HOLE$$

$$X \qquad\qquad 0$$

To enter the number of bolt-hole patterns (maximum 360 holes) – for example, **3**:

7. Press   3   ENT

The DRO displays the following in the message window and axis display 1:

$$BEG\ ANGLE$$

$$X \qquad\qquad .0000$$

To enter the beginning angle for the first hole (measured in a counter clockwise direction) – for example, **-10** degrees:

8. Press   ±   1   0   ENT

The DRO displays the following in the message window and axis display 1

$$END\ ANGLE$$

$$X \qquad\qquad 360.0$$

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Advanced (ADV) Functions Key (Continued)

To enter the end angle for the pattern (measured in a counter clockwise direction) – for example, for **80** degrees:

9. Press $\boxed{8}$ $\boxed{0}$ $\boxed{\text{ENT}}$

The DRO temporarily displays the following in the message window:

$$\boxed{\textit{BHP DONE}}$$

Advanced (ADV) Functions Key (Continued)

Full Bolt-Hole Pattern (N/A for 900, Lathe Mode)

To access the Full Bolt-Hole Pattern function:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

When the DRO displays the following in the message window:

$$BOLT\ HOLE$$

2. Press **ENT**

The DRO displays the following in the message window:

$$BHP\ NUMBER$$

To enter a full bolt-hole pattern for program number **2** (Range is 0 through 9):

3. Press **2** **ENT**

The DRO displays the following in the message window:

$$PARTIAL$$

4. Press **±**

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Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window:

$$FULL$$

5. Press **ENT**

The DRO displays the following in the message window and axis display 1

$$X\ CENTER$$

$$X \qquad\qquad .0000$$

To enter the X dimension for the center of the pattern – for example, **1.00 in.** (**25.4 mm**):

6. Press **1** **ENT**

The DRO displays the following in the message window and axis display 2

$$Y\ CENTER$$

$$Y \qquad\qquad .0000$$

To enter the Y dimension for the center of the pattern – for example, **1.00 in.** (**25.4 mm**):

7. Press **1** **ENT**

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Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window and axis display 1

<div align="center">

`BHP DIA`

</div>

<div align="center">

X	.0000

</div>

To enter the diameter of the bolt-hole pattern – for example, **2.00 in**. (**50.8 mm**):

8. Press `2` `ENT`

The DRO displays the following in the message window and axis display 1

<div align="center">

`QTY HOLE`

</div>

<div align="center">

X	0

</div>

To enter the number of bolt-hole patterns (maximum 360 holes) – for example, **4**:

9. Press `4` `ENT`

The DRO displays the following in the message window and axis display 1

<div align="center">

`BEG ANGLE`

</div>

<div align="center">

X	.0000

</div>

Advanced (ADV) Functions Key (Continued)

To enter the beginning angle for the first hole (measured in a counter clockwise direction) – for example, **-10** degrees:

10. Press $\boxed{\pm}$ $\boxed{1}$ $\boxed{0}$ $\boxed{\text{ENT}}$

The DRO temporarily displays the following in the message window:

$$BHP\ DONE$$

Advanced (ADV) Functions Key (Continued)
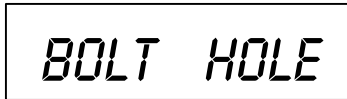
Recalling Bolt-Hole Pattern Function (N/A for 900, Lathe Mode)

The Recall Key (**RCL**) allows you to recall a maximum of 10 previously programmed bolt–hole patterns.

To recall bolt-hole pattern number **1** programmed in the previous section:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

When the DRO displays the following in the message window:

$$BOLT\ HOLE$$

2. Press **RCL**
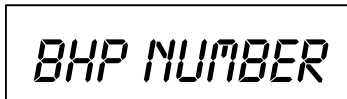
The DRO displays the following in the message window:

$$BHP\ NUMBER$$

3. Press **1** **ENT**

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Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window and the axis displays:

$$\boxed{\textsf{1 HOLE 001}}$$

$$\boxed{X \qquad\qquad -1.4924}$$

$$\boxed{Y \qquad\qquad -.9132}$$

The message window indicates bolt-hole pattern number **1** and hole number **1**. The axis displays show the distance to hole number **1**.

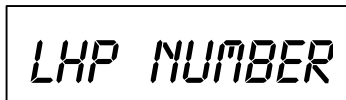4. Move the machine until the axis displays indicate zero and drill the hole.

To recall the distance to hole number **2**:

5. Press RCL

The DRO displays the following in the axis displays and the message window:

$$\boxed{\textsf{2 HOLE 002}}$$

$$\boxed{X \qquad\qquad +.0828}$$

$$\boxed{Y \qquad\qquad -.3736}$$

Advanced (ADV) Functions Key (Continued)

The message window indicates bolt-hole pattern number **2** and hole number **2**. The axis displays show the distance to hole number **2**.

6. Move the machine until the axis displays indicate zero and drill the hole.

To recall the distance to hole number **3**:

7. Press $\boxed{\text{RCL}}$

The DRO displays the following in the axis displays and the message window:

$$\boxed{2\ HOLE\ 003}$$

$$\boxed{X \qquad +.3228}$$

$$\boxed{Y \qquad -.2056}$$
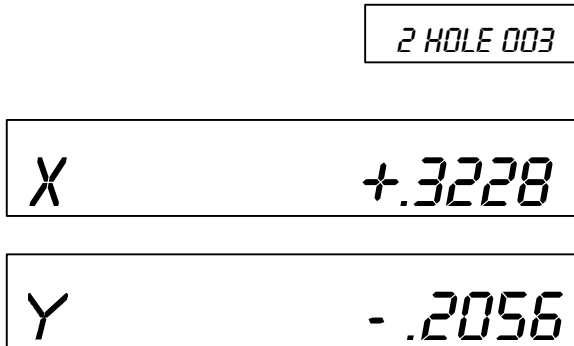
After you drill the last hole in the pattern the DRO returns to hole **1** and displays the following in the message window:

$$\boxed{BHP\text{-}END}$$
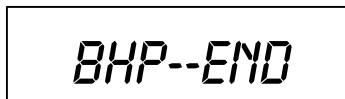
The DRO displays the incremental distance from the absolute zero position in the axis displays.

To exit the Recall function:

8. Press $\boxed{F}$

Advanced (ADV) Functions Key (Continued)
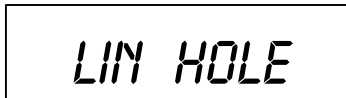
Linear-Hole/Frame-Hole Pattern Function (N/A for 900, Lathe Mode)

The **Linear Hole** pattern function allows you to program a combination of 10 different linear-hole patterns or frame-hole patterns. Each pattern can include a maximum of 999 holes.

To access the Linear-Hole function:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

When the DRO displays the following in the message window:

$$LIN\ HOLE$$

2. Press **ENT**

The DRO displays the following in the message window:

$$LHP\ NUMBER$$
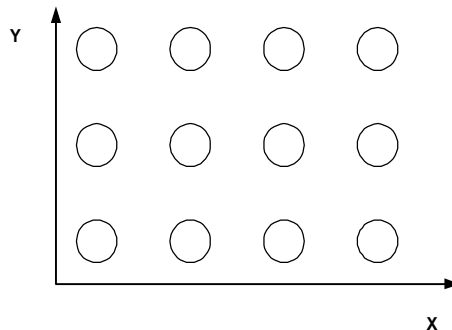
Figure 4: Linear-Hole Pattern

Advanced (ADV) Functions Key (Continued)

To program a linear-hole pattern (Range is 0 through 9) – for example, linear-hole pattern number **3**:

3. Press $\boxed{3}$

The DRO displays the following in the message window:

$$\boxed{\textit{LIN HOLE}}$$

If you are programming a linear-hole pattern go to step 5.
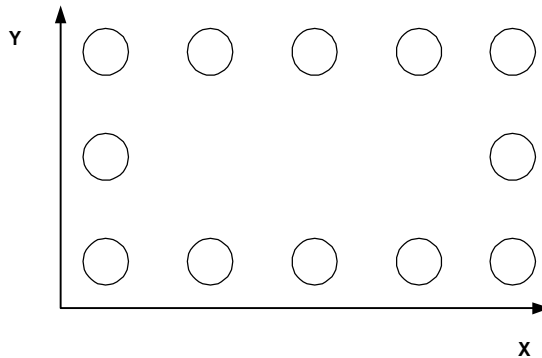
Figure 5: Frame-Hole Pattern

To select Frame-Hole Pattern:

4. Press $\boxed{\pm}$

The DRO displays the following in the message window:

$$\boxed{\textit{FRAME HOLE}}$$

Advanced (ADV) Functions Key (Continued)

To enter a frame-hole pattern:

5. Press **ENT**

The DRO displays the following in the message window:

$$X \ HOLE \ 1$$

To enter the dimension for hole 1 on the X-axis – for example, **1.00 in.** (**25.4 mm**):

6. Press **1** **ENT**

The DRO displays the following in the message window:

$$Y \ HOLE \ 1$$

To enter the dimension for hole 1 on the Y-axis – for example, **1.00 in.** (**25.4 mm**):

7. Press **1** **ENT**

Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window:

$$QTY\ HOLE\ X$$

To enter the number of holes on the X-axis – for example, **4**:

8. Press [4] [ENT]

The DRO displays the following in the message window:

$$X\ \text{--}\ X\ CENT$$

To enter the incremental distance between holes on the X-axis – for example, **1.00 in.** (**25.4 mm**):

9. Press [1] [ENT]

The DRO displays the following in the message window:

$$QTY\ HOLE\ Y$$

To enter the number of holes on the Y-axis – for example, **4**:

10. Press [4] [ENT]

Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the message window:

$$Y - Y \ CENT$$

To enter the incremental distance between holes on the Y-axis – for example, **1.00 in.** (**25.4 mm**):

11. Press 1 ENT

The DRO displays the following in the message window:

$$X004 \quad Y004$$

The message window indicates the calculated holes in the X-axis (4 holes) and the Y-axis (4 holes). This equals a total of 16 holes (4 X-holes x 4 Y-holes). The maximum number of holes you can program is 999 holes.

To activate the settings and exit the Frame Hole function:

12. Press F

OR

To exit the Frame-Hole function without activating the settings:

13. Press ENT

Advanced (ADV) Functions Key (Continued)

Recalling Linear-Hole/Frame-Hole Function (N/A for 900, Lathe Mode)

The Recall Key (**RCL**) allows you to recall a maximum of 10 previously programmed linear bolt–hole patterns.

To recall linear-hole pattern number **3** programmed in the previous section:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

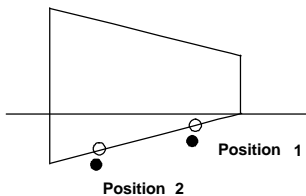When the DRO displays the following in the message window:

$$LIN \ HOLE$$

2. Press **RCL**

The DRO displays the following in the message window:

$$LHP \ NUMBER$$

To recall linear-hole pattern number **3** programmed in the previous section:

3. Press **3**

Advanced (ADV) Functions Key (Continued)

The DRO displays the following in the axis displays and the message window:

$$\boxed{\textit{1 HOLE 001}}$$

$$\boxed{X \qquad\qquad -\textit{1.9848}}$$

$$\boxed{Y \qquad\qquad -\textit{.8264}}$$

The message window indicates bolt-hole pattern number **1** and hole number **1**. The axis displays show the distance to hole number **1**.

4.   Move the machine until the axis displays indicate zero and drill the hole.

To recall the distance to hole number **2**:

5.   Press **RCL**

The DRO displays the following in the axis displays and the message window:

$$\boxed{\textit{2 HOLE 002}}$$

$$\boxed{X \qquad\qquad +\textit{.8110}}$$

$$\boxed{Y \qquad\qquad -\textit{1.1584}}$$

Advanced (ADV) Functions Key (Continued)

The message window indicates bolt-hole pattern number **2** and hole number **2**. The axis displays show the distance to hole number **2**.

6. Move the machine until the axis displays indicate zero and drill the hole.

7. Repeat these procedures until you have completed all holes in the linear-hole pattern.

To exit the Recall Linear-Hole Pattern function:

8. Press $\boxed{\text{F}}$

Advanced (ADV) Functions Key (Continued)

Taper Calculator Function (900, Lathe Mode Only)

The **Taper Calculator** function allows you to preset a taper angle on the lathe cross slide attachment without having to make a test cut. This function can also be used to calculate the taper on a workpiece.

To access the Taper Calculator function:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.
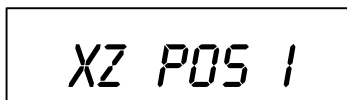
When the DRO displays the following in the message window:

$$TAPER\ CALC$$

2. Press **ENT**

The DRO displays the following in the message window:

$$XZ\ POS\ 1$$

Example:

Position 1
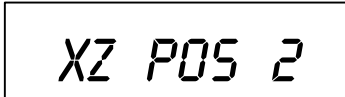
Position 2

To calculate the taper angle for this example:

3. Move to position 1.

Advanced (ADV) Functions Key (Continued)

4. Press **ENT**

The DRO displays the following in the message window:
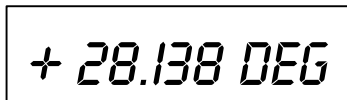
$$XZ \ POS \ 2$$

5. Move to position 2.

6. Press **ENT**

The DRO displays the taper angle in the message window:

$$+ \ 28.138 \ DEG$$

Position 1

Position 2

Calculated angle: 28.138 degrees
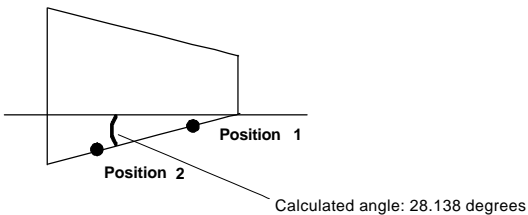
To exit the Taper Calculator function:

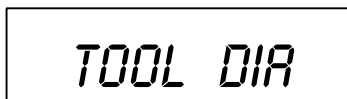7. Press **F** or **ENT**

Advanced (ADV) Functions Key (Continued)
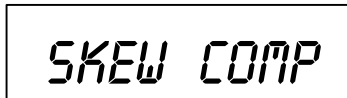
Skew Compensation (900, Mill Mode Only)

Skew compensation allows you to drill holes on a workpiece without aligning the workpiece on the machine. This feature can electronically align the workpiece on the machine for setup. Use this feature only for drilling holes.

To access the Skew Compensation function:

1. Press **ADV** repeatedly to scroll through the Advanced Functions list.

When the DRO displays the following in the message window:

$$SKEW \; COMP$$

2. Press **ENT**
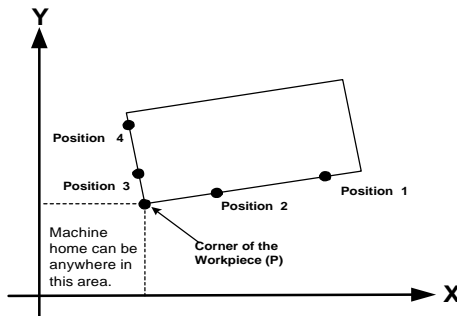
Example:

The DRO displays the following in the message window:

$$TOOL \; DIA$$

Advanced (ADV) Functions Key (Continued)

To enter the diameter of the tool or edge sensor probe – for example, **.25 in.** (**6.35 mm**):

3. Press $\boxed{.}$ $\boxed{2}$ $\boxed{5}$ $\boxed{\text{ENT}}$

The DRO turns off the axis displays and displays the following in the message window:
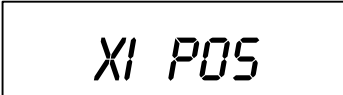
$$\boxed{\textit{HOME POS}}$$

4. Move to the machine home position.

5. Press $\boxed{\text{ENT}}$

The DRO displays the following in the message window:

$$\boxed{\textit{XI POS}}$$

6. Move to position 1 and touch the workpiece with the tool or edge sensor probe.

7. Press $\boxed{\text{ENT}}$

The DRO displays the following in the message window:

$$\boxed{\textit{X2 POS}}$$

8. Move to position 2 and touch the workpiece with the tool or edge sensor probe.

9. Press $\boxed{\text{ENT}}$

Advanced (ADV) Functions Key (Continued)

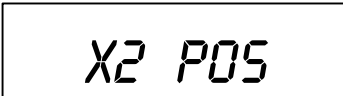The DRO displays the following in the message window:

$$Y1 \ POS$$

10. Move to position 3 and touch the workpiece with the tool or edge sensor probe.

11. Press **ENT**

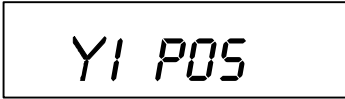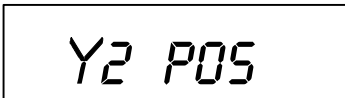The DRO displays the following in the message window:

$$Y2 \ POS$$

12. Move to position 4 and touch the workpiece with the tool or edge sensor probe.

13. Press **ENT**

The DRO displays the following in the message window:

$$SKEW \ ON$$

14. Move the quill to the up position.

15. Move the machine until the X-axis and Y-axis indicate zero.

This is the corner of the workpiece (P).

16. Recall information from the Electronic Notepad and move to zero.

Advanced (ADV) Functions Key (Continued)

The DRO automatically compensates for the misaligned workpiece on the machine.

To exit the Skew Compensation feature:

17. Press $\boxed{\text{F}}$

NOTE: When you recall a program with activated skew compensation, the DRO displays a blinking **S** on the left side of the message window.

Datum/Tool Offset Key

The Datum/Tool Offset Key is a dual-function key. When you set the DRO in 900, Mill Mode or 900E, the key functions as the Datum Key. When you set the DRO in 900, Lathe Mode, the key functions as the Tool Offset Key.
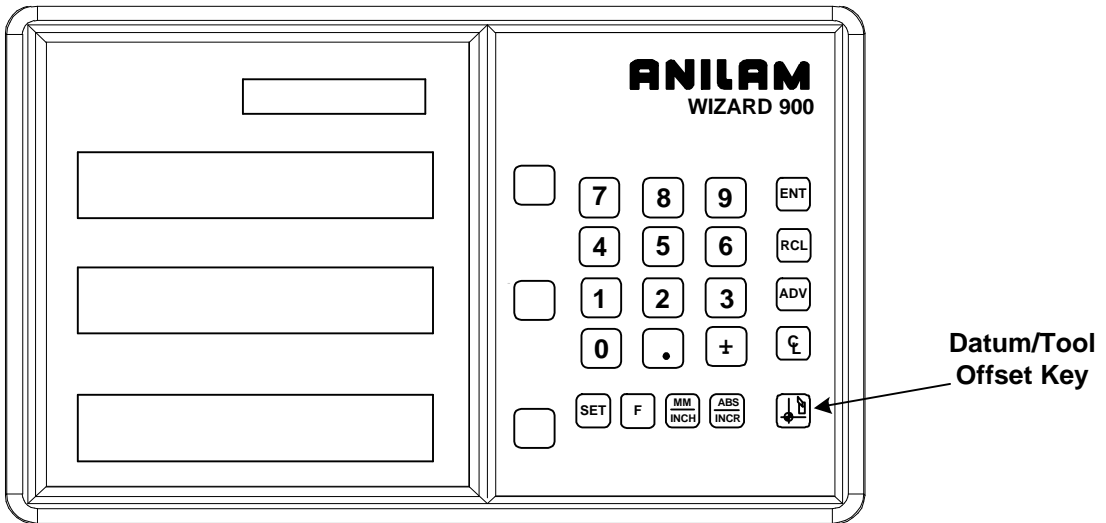
Datum Key (N/A for 900, Lathe Mode)

The Datum Key allows you to enter a datum table (maximum 99 datum points). A datum is a point or reference location, from which you can machine a part. Datum points allow you to machine similar programs on different parts. After you machine a group of parts, you can place a new group on the machine and machine the same programs on the new parts.

NOTE: Before you enter a datum table, establish a machine home position using Absolute Zero Set – F 01 or activate EverTrack™ Mode – F 02.

Example:
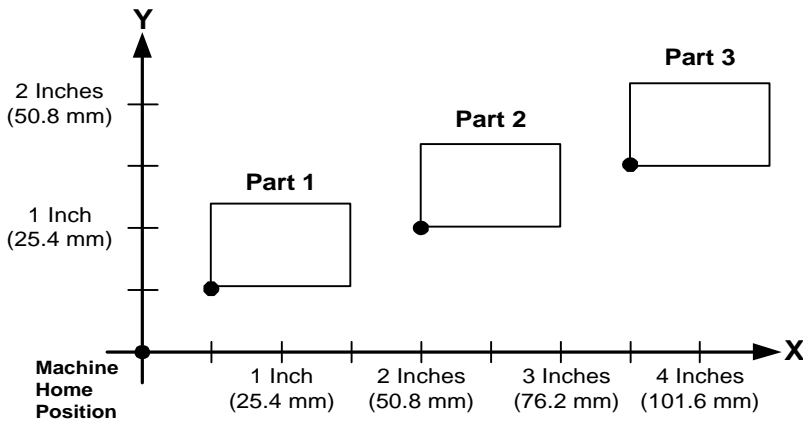
Enter Datum

To enter a datum table for the above example:

1. After power on, establish a machine home position using Absolute Zero Set – F 01 or activate EverTrack™ Mode – F 02.

2. Move the tool to the home position (indicated by the black dot).

3. Establish a part zero using Absolute Zero Set – F 01.

Datum 0, machine home is set.

4. Move the tool to the corner of part 1 (indicated by the black dot).

Datum (N/A for 900, Lathe Mode) (Continued)

5. Press ⬇️▢

The DRO displays the following in the message window:

$$DATUM\ 00$$

6. Press [0] [1]

The DRO displays the following in the message window:

$$DATUM\ 01$$

7. Establish a part zero using Absolute Zero Set – F 01.

Datum 1 is set.

8. Move the tool to the corner of part 2 (indicated by the black dot).

9. Press ⬇️▢

The DRO displays the following in the message window:

$$DATUM\ 01$$

10. Press [0] [2]

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Datum Key (N/A for 900, Lathe Mode) (Continued)

The DRO displays the following in the message window:

$$DATUM \ 02$$

11. Establish a part zero using Absolute Zero Set – F 01.

Datum 2 is set.

12. Move the tool to the corner of part 3 (indicated by the black dot).

13. Press

The DRO displays the following in the message window:

$$DATUM \ 02$$

14. Press $\boxed{0}$ $\boxed{3}$

The DRO displays the following in the message window:

$$DATUM \ 03$$

15. Establish a part zero using Absolute Zero Set – F 01.

Datum 3 is set.

Datum Key (N/A for 900, Lathe Mode) (Continued)

Enter Datum (Alternate Method)

If you know the axis locations for the corner of the parts, you can enter the datum table for the previous example without moving the tool from the machine home position as follows:

1. After power on, establish a machine home position using <u>Absolute Zero Set – F 01</u> or activate <u>EverTrack</u>^{TM} <u>Mode – F 02</u>.

To enter datum 1:

2. Press [↓] [0] [1]

3. Press the axis key for the X-axis.

4. Press [.] [5] to enter the X-axis value, **.5 in.** (**12.7 mm**).

5. Press the axis key for the Y-axis.

6. Press [.] [5] to enter the Y-axis value, **.5 in.** (**12.7 mm**).

7. Press [SET] to set datum 1.

To enter datum 2:

8. Press [↓] [0] [2]

Datum Key (N/A for 900, Lathe Mode) (Continued)

9. Press the axis key for the X-axis.

10. Press $\boxed{2}$ to enter the X-axis value, **2 in.** (**50.8 mm**).

11. Press the axis key for the Y-axis.

12. Press $\boxed{1}$ to enter the Y-axis value, **1 in.** (**25.4 mm**).

13. Press $\boxed{\text{SET}}$ to set datum 2.

To enter datum 3:

14. Press $\boxed{\text{↓}}$ $\boxed{0}$ $\boxed{3}$

15. Press the axis key for the X-axis.

16. Press $\boxed{3}$ $\boxed{.}$ $\boxed{5}$ to enter the X-axis value, **3.5 in.** (**88.9 mm**).

17. Press the axis key for the Y-axis.

18. Press $\boxed{1}$ $\boxed{.}$ $\boxed{5}$ to enter the Y-axis value, **1.5 in.** (**38.1 mm**).

19. Press $\boxed{\text{SET}}$ to set datum 3.

Datum Key (N/A for 900,Lathe Mode) (Continued)

Recall Datum

Recall Datum allows you to recall a preset datum.

Example: To recall datum 1 from the previous example:

1. Press [⬇📄] [0] [1]

While the datum is activated, the DRO displays the following in the message window:

$$\boxed{DATUM\ 01}$$

2. Move the X-axis and Y-axis until the axis displays indicate **0** (zero).

This is the location for Datum 1.

3. Perform the machine process on part 1.

To return to the machine home position (datum 0):

4. Press [⬇📄] [0] [0]

5. Move the X-axis and Y-axis until the axis displays indicate zero (0).

This is the location for the machine home position (datum 0).

Datum Key (N/A for 900, Lathe Mode) (Continued)

Clear Datum – F 31

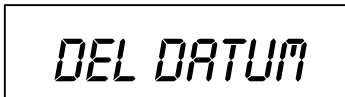Clear Datum (**F 31**) allows you to clear all preset datum points (maximum 99) before entering new information.

To clear all datum points:

1. Press $\boxed{\text{F}}$ $\boxed{\text{3}}$ $\boxed{\text{1}}$

The DRO temporarily displays the following in the message window:

$$\boxed{\textit{DEL DATUM}}$$

When the DRO resets the message window and axis displays, it clears all preset datum values from memory.

Tool Offset Key (900, Lathe Mode Only)

The Tool Offset Key allows you to preset X and Z offsets for each tool into a tool table (maximum 99). This feature requires an interchangeable tool system.

NOTE: Before entering a tool offset, establish a machine home position using Absolute Zero Set – F 01 or activate EverTrack™ Mode – F 02.

Z Tool Number 1

Workpiece

Tool Holder at
Home Position
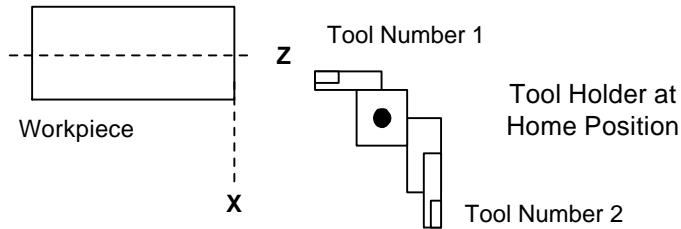
X Tool Number 2

Enter Tool Offset

Example: To enter an offset for a tool:

1. Press

The DRO displays the following in the message window:

$$TOOL\ 00$$
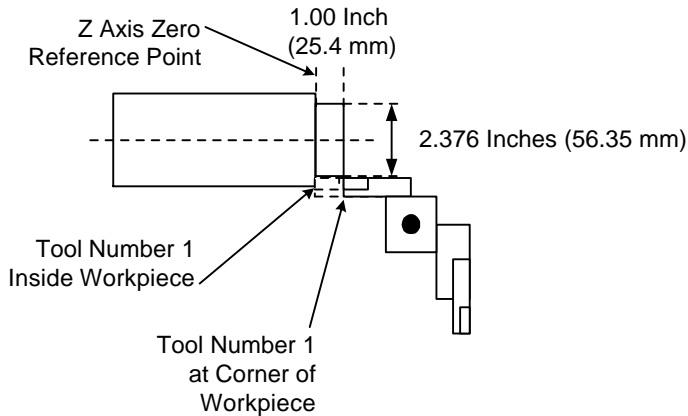
To select the tool number – for example, tool number **1**:

2. Press $\boxed{0}$ $\boxed{1}$

The DRO displays the following in the message window:

$$TOOL\ 0I$$

Tool Offset Key (900, Lathe Mode Only) (Continued)

Z Axis Zero Reference Point

1.00 Inch (25.4 mm)

2.376 Inches (56.35 mm)

Tool Number 1 Inside Workpiece

Tool Number 1 at Corner of Workpiece

3. Move the tool to the workpiece and make a skim cut on the diameter, about **1 in.** (**25.4 mm**), to allow a micrometer to measure the workpiece.

4. Measure the diameter of the workpiece. The measurement in the example is **2.376 in.** (**56.35 mm**).

5. Move the tool to the corner of the workpiece or any known position as illustrated in the example.

To preset the tool offset:

6. Press the axis key for the X-axis.

7. Press $\boxed{2}$ $\boxed{.}$ $\boxed{3}$ $\boxed{7}$ $\boxed{6}$ $\boxed{\text{SET}}$

8. Move the tool to the Z-axis reference point.

To store this reference point:

9. Press the axis key for the Z-axis.

10. Press $\boxed{0}$ $\boxed{\text{SET}}$

The offset for tool number 1 is preset.

Tool Offset Key (900, Lathe Mode Only) (Continued)

11. Repeat these procedures by touching each tool on the same reference point on the workpiece.

If you do not require tool offset for a tool:

12. Press $\boxed{\downarrow}$ $\boxed{0}$ $\boxed{0}$

The DRO displays the following in the message window:

$$\boxed{TOOL\ 00}$$

Recall Tool Offset

Recall Tool Offset allows you to recall a previously set tool offset (Range: 1 through 99).

Example: To recall the preset tool offset for tool number 18:

1. Press $\boxed{\downarrow}$ $\boxed{1}$ $\boxed{8}$

While the tool is activated, the DRO displays the following in the message window:

$$\boxed{TOOL\ 18}$$

Tool Offset Key (900, Lathe Mode Only) (Continued)
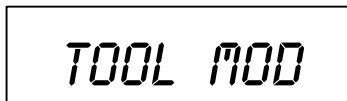
Modify Tool Offset – F 35

Modify Tool Offset (**F 35**) allows you to modify the Z-axis tool-offset value for all tools without reentering values. If you place a new part with a different length in the chuck, you must modify all the Z-axis tool offsets in the tool table. .

NOTE: To modify the tool offset, a tool number must be activated.

Example: To modify the Z offset to **.25 in.** (**6.35 mm**):

1. Press [F] [3] [5]

The DRO displays the following in the message window:

$$TOOL\ MOD$$

2. Press the axis key for the Z-axis.

3. Press [.] [2] [5] [SET]   to activate the feature.

Tool Offset Key (900, Lathe Mode Only) (Continued)

Clear Tool Offset – F 32

Clear Tool Offset (**F 32**) allows you to clear all preset tool offset values (99 tools) before entering new information.

To clear all preset tool offset values:

1. Press $\boxed{F}$ $\boxed{3}$ $\boxed{2}$

The DRO displays the following in the message window:

$$\boxed{DEL\ TOOL}$$

When the DRO resets the message window and axis displays, all preset tool offset values are cleared from memory.

Axis Coupling (900, 3-/4-Axis Only) – F 18/F 19

F 18 and/or **F 19** allow you to sum 2 parallel axes on 1 axis display. This allows you to move the coupled axes independently while the DRO automatically calculates the true tool position. The following table lists which axes are summed by **F 18** and **F 19** for a 3-axis DRO and a 4-axis DRO.

	3-Axis DRO	**4-Axis DRO**
F 18	Axis 2 + Axis 3	Axis 3 + Axis 4
F 19	N/A	Axis 1 + Axis 2

The DRO displays the summed axes in the message window.

Example: For a 4-axis 900 DRO set to Lathe Mode with axis designations **X**, **X$_1$**, **Z**, and **Z$_1$**:
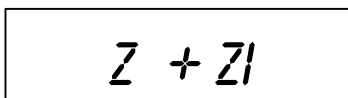
1. Press $\boxed{F}$ $\boxed{1}$ $\boxed{8}$ to set coupling of axis 3 and axis 4.

The DRO temporarily displays the following in the message window:

$$\boxed{COUP\ ON}$$

The DRO clears the **COUP ON** message and displays the following in the message window.

$$\boxed{Z + Z1}$$

indicating the summed axes.

2. Press $\boxed{F}$ $\boxed{1}$ $\boxed{9}$ to set coupling of axis 1 and axis 2.

Axis Coupling
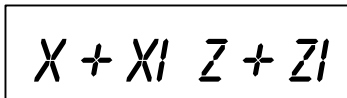# (900, 3-/4-Axis Only) – F 18/F 19 (Continued)

The DRO temporarily displays the following in the message window:

$$\boxed{\mathit{COUP\ ON}}$$

The DRO clears the **COUP ON** message and displays the following in the message window.

$$\boxed{\mathit{X + XI \ \ Z + ZI}}$$

indicating the summed axes.

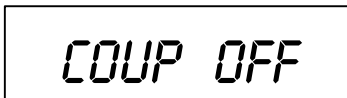To turn off axis coupling axis 3 and axis 4:

1. Press $\boxed{\mathsf{F}}$ $\boxed{1}$ $\boxed{8}$

     AND/OR

To turn off axis coupling axis 1 and axis 2:

2. Press $\boxed{\mathsf{F}}$ $\boxed{1}$ $\boxed{9}$

The DRO temporarily displays the following in the message window:

$$\boxed{\mathit{COUP\ OFF}}$$

Electronic Notepad

The Electronic Notepad allows you to program information into the DRO memory. You can program a maximum of 500 lines. Each line contains the desired position, which datum point it refers to (Mill Mode) or which tool (Lathe Mode), and whether the move is in Absolute or Incremental Mode. One line also can contain an entire preprogrammed hole pattern. You can store separate programs consecutively.

You can store the program directly by entering the data for desired positions or you can generate it through a teach-In process. Teach-In allows you to store the program while you perform the moves and operations to make the first part. When you recall the programmed information the DRO sets ABS or INCR, prompts for Datum or Tool, and displays the axis dimensions as a distance-to-go.

The Electronic Notepad retains the entered information, even after you turn off the power, for as long as 10 years.

You can enter the following information into the Electronic Notepad:

- ❑ ABSolute or INCRemental Mode
- ❑ Datums (Mill Mode) or Tools (Lathe Mode)
- ❑ Axis Dimensions
- ❑ Circular-Hole Patterns
- ❑ Linear-Hole/Frame-Hole Patterns

To enter information into the Electronic Notepad:

1. Press **ENT**

The DRO displays the following in the message window:

$$ENTER\ PROG$$

Electronic Notepad (Continued)

Entering Axis Dimensions

To enter axis dimensions into the Electronic Notepad:

2. Press $\boxed{\begin{array}{c}\textbf{ABS}\\ \textbf{INCR}\end{array}}$ to select the Absolute or Incremental Mode.

NOTE: In all cases, set the first line of a program to ABS (Absolute) Mode.

If required, you can specify a new Datum (Mill Mode) or Tool (Lathe Mode) – for example, Datum **1**:

3. Press $\boxed{\downarrow}$ $\boxed{0}$ $\boxed{1}$

Example: To program dimensions (**10**, **5.1**, and **5**) for axes 1 through 3 respectively:

4. Press axis key **1**.

5. Press $\boxed{1}$ $\boxed{0}$

6. Press axis key **2**.

7. Press $\boxed{5}$ $\boxed{.}$ $\boxed{1}$
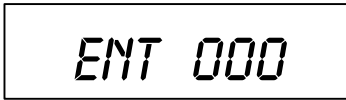
8. Press axis key **3**.

9. Press $\boxed{5}$

10. Press $\boxed{\textbf{ENT}}$

Electronic Notepad (Continued)

The DRO displays the following in the message window:

$$\mathit{ENT\ 000}$$

indicating memory location 000.

The DRO, by default, indicates the first empty memory location as the first line of a new program.

To store the entered axis dimensions into line 000:

11. Press **ENT**

> **OR**

To start the program in a different memory location – for example, line **026**:

Press **2** **6** **ENT**

The DRO displays the following in the message window:

$$\mathit{ENTER\ PROG}$$

NOTE: Always note the first memory location for a new program. This is the location you specify later when you need to recall the program.

12. Repeat steps 2 through 11 to enter additional axis dimensions.

NOTE: The DRO indicates memory locations consecutively.

Electronic Notepad (Continued)

To exit Axis Dimension Entry:

13. Press $\boxed{\text{F}}$

NOTE: When you exit, the DRO automatically stores a **PRG END** in the first memory location after the last line. This allows you to exit the axis dimension entry mode, before you finish the program and return later to complete the program by specifying one less than the memory location prompted by the DRO.

Electronic Notepad (Continued)

Entering Axis Dimensions by Teach-In

As an alternative to manually entering the axis dimensions, you can store the program the first time you machine the workpiece.

1. Make sure you properly zero the DRO or set the datum for the starting position.

2. Perform the steps described in **Entering Axis Dimensions** except when the DRO instructs you to enter an axis dimension, move the table to the desired location on the workpiece.

The axis displays will indicate the axis dimension values.

To automatically enter the values into the Electronic Notepad:

3. Press **ENT**

The DRO prompts for the correct memory location in the message window.

4. Make sure this is the correct location or change it.

To store the values into the Electronic Notepad:

5. Press **ENT**

Electronic Notepad (Continued)

Entering Bolt-Hole/Linear-Hole Patterns

The DRO allows you to store a bolt-hole or linear-hole pattern on one line in the Electronic Notepad (only in Absolute Mode).

NOTE: To use a bolt-hole or linear/frame-hole pattern in the Electronic Notepad, you must first program the hole pattern using the Advanced Functions, Bolt-Hole Pattern function.

If you are not already in the enter program mode:

1. Press **ENT** to enter information into the Electronic Notepad:
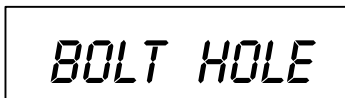
The DRO displays the following in the message window:
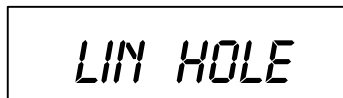
$$ ENTER\ PROG $$

To enter a hole pattern into the Electronic Notepad:

2. Press **ADV**

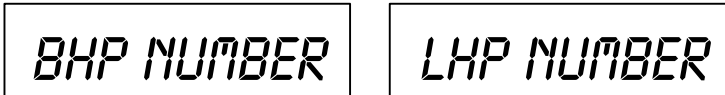The DRO displays one of the following in the message window:

$$ BOLT\ HOLE $$ $$ LIN\ HOLE $$

3. Press **±** to toggle between bolt-hole pattern and linear-hole pattern.

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Electronic Notepad (Continued)

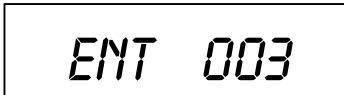4. Press **ENT** to select the desired type of hole pattern.

The DRO displays one of the following in the message window:

$$BHP\ NUMBER \qquad LHP\ NUMBER$$

To enter the desired pattern number – for example, BHP number 1:

5. Press 1

The DRO prompts for the memory location in the message window:

$$ENT\ \ 003$$

NOTE: If necessary, change the specified memory location by entering the desired location.

To store the pattern:

6. Press **ENT**

The DRO stores bolt-hole pattern number 1 in line 3 of the Electronic Notepad.

Electronic Notepad (Continued)
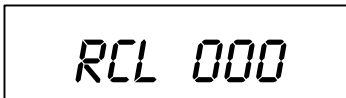
Recalling Dimensions

The DRO allows you to recall programmed information from the Electronic Notepad. You must know the memory location for the first line in the program you want to recall.

NOTE: Before you recall information from the Electronic Notepad, establish a machine home position using <u>Absolute Zero Set – F 01</u> or activate <u>EverTrack™ Mode – F 02</u>.

To recall information from the Electronic Notepad:

1. Press 〔**RCL**〕 to activate the feature.

The DRO displays the following memory location in the message window:
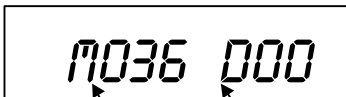
$$RCL\ 000$$

To specify a program – for example, memory location **036**:

2. Press 〔**3**〕 〔**6**〕 〔**RCL**〕
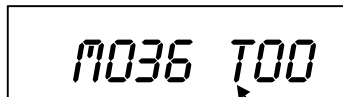
The DRO displays one of the following in the message window:

$$M036\ D00 \qquad M036\ T00$$

Line Number   Datum Point (Mill Mode)   Tool Number (Lathe Mode)

NOTE: If the **D** (Mill Mode) or **T** (Lathe Mode) is blinking, you must reset the specified datum or tool number. Press the Datum/Tool Offset key and enter the correct number. The blinking stops when the correct datum or tool number has been reset.

Electronic Notepad (Continued)

The values displayed on the axis displays indicate the distance to the programmed position.

3. Move the machine axis until the displays indicate zero.

This is the first position stored in the Electronic Notepad.
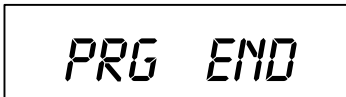
4. Press $\boxed{\text{RCL}}$ $\boxed{\text{RCL}}$ to recall the next line in the Electronic Notepad.

The DRO displays the following in the message window:

$$\boxed{RCL \ \ DOI}$$

When the DRO has displayed the last program line in the Electronic Notepad and the next line is recalled, the DRO displays the following in the message window:

$$\boxed{PRG \ \ END}$$

To recall a specific line of information from the Electronic Notepad – for example, line **001**:

5. Press $\boxed{\text{RCL}}$

6. Press $\boxed{0}$ $\boxed{0}$ $\boxed{1}$

7. Press $\boxed{\text{RCL}}$

Electronic Notepad (Continued)

To exit the recall feature:

8. Press ⌊F⌉

Electronic Notepad (Continued)

Clearing the Electronic Notepad

You can clear all 500 lines (including bolt-hole and linear-hole patterns) from the Electronic Notepad before you enter new information.

To clear information from the Electronic Notepad:

1. Press ⎡F⎤ ⎡3⎤ ⎡0⎤

The DRO momentarily displays the following in the message window:

$$\textit{MEM CLEAR}$$

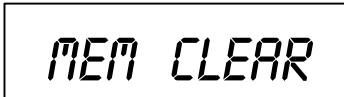The DRO clears the message window, axis displays, and all 500 Electronic Notepad lines.

Inserting/Deleting a Line
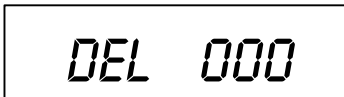
You can insert a line of information in the Electronic Notepad or delete a line of information from the Electronic Notepad.
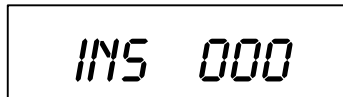
To insert or delete a line from the Electronic Notepad:

1. Press **ENT** for approximately 2 seconds.

The DRO displays one of the following in the message window:

$$\textit{DEL 000} \qquad \textit{INS 000}$$

2. Press ⎡±⎤ to toggle between Delete and Insert.

Electronic Notepad (Continued)

To insert/delete a line to/from the Electronic Notepad – for example, line **003**:

3. Press
$\boxed{0}$ $\boxed{0}$ $\boxed{3}$

4. Press
$\boxed{\text{ENT}}$

If you selected Delete, the DRO deletes the line from the Electronic Notepad.

If you selected insert, you can program a line on the new line number in the Electronic Notepad.

Select Axis for Recall – F 63

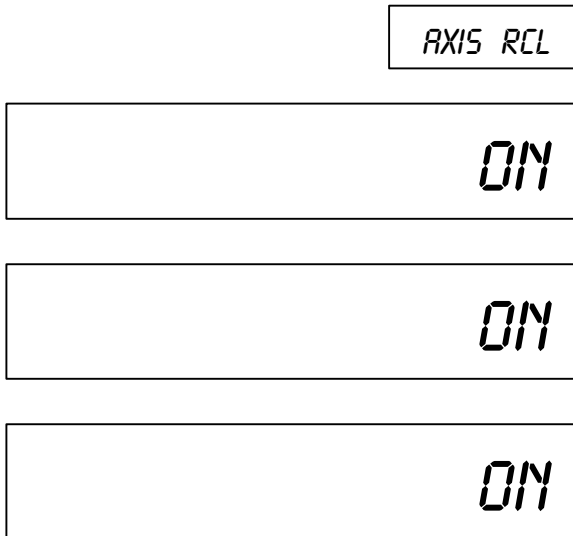**F 63** allows you to specify which axis dimensions the DRO recalls from the Electronic Notepad when you press the **RCL** key. You can recall dimensions for all axes or for one or more specific axes.

To select axis dimensions for recall:

1. Press ⌐F⌐ ⌐6⌐ ⌐3⌐

The DRO displays the following in the message window and axis displays:

```
AXIS RCL
```

```
ON
```

```
ON
```

```
ON
```

2. Press the desired axis key(s) to toggle the axis recall ON or OFF.

3. Press **SET**

The DRO will update only the axis dimensions set to ON when you recall from the Electronic Notepad.

Mirror Image – F 17

After you enter dimensions in the Electronic Notepad, **F 17** allows you to reverse or mirror all positions on the X-axis and/or Y-axis without re-entering the positions.

Example 1: To set the X-axis as a mirror image:

1. Press ⬚F ⬚1 ⬚7

The DRO displays the following in the message window:

$$NO\ MIRROR$$

2. Press axis key **1**.

The DRO displays the following in the message window:

$$MIRROR\ X$$

3. Press ⬚SET

Example 2: To set the X-axis and Y-axis as a mirror image:

1. Press ⬚F ⬚1 ⬚7

The DRO displays the following in the message window:

$$NO\ MIRROR$$

Mirror Image – F 17 (Continued)

2. Press axis key **1**.

The DRO displays the following in the message window:

$$\mathit{MIRROR\ X}$$

3. Press axis key **2**.

The DRO displays the following in the message window:

$$\mathit{MIRROR\ XY}$$

4. Press **SET**

NOTE: When you recall a program with mirror image activated, the DRO displays a blinking **M** on the left side of the message window.

Output Connections (With I/O Option Only)

Output connections are located on the back of the DRO. When DRO functions are activated, the DRO generates signals through these connections to operate external devices.

Each output can sink 500 mA of current when active. The output load of Relay 1 and Relay 2 should be a maximum of 10 VA (maximum 20 Volts, 0.75 A).
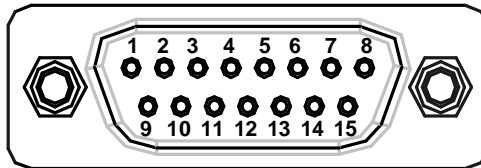
DA 15 Connector (Male)

|			
Pin 1	Relay 1 Output	Pin 9	Relay 2 Output
Pin 2	Relay 1 Output	Pin 10	Approaching Zero
Pin 3	X-Axis Zero	Pin 11	Y-Axis Zero
Pin 4	Z-Axis Zero	Pin 12	Relay 2 Output
Pin 5	W-Axis Zero	Pin 13	Ground
Pin 6	Ground	Pin 14	+24 Volts
Pin 7	+24 Volts	Pin 15	DAC Output for CSS
Pin 8	Analog Ground for DAC Output		(0-10 Volt/10mA, 12 Bit, galv. isolated)

The output connections, X-axis zero, Y-axis zero, Z-axis zero, W-axis zero, and approaching zero are enabled by applying a constant +24 VDC, 50 mA source to pin 7 and pin 14 and a ground to any of two ground pins.

When outputs are enabled, pin 3, pin 4, pin 5, and pin 11 generate a 24-V common signal as the corresponding axis value is zero. Pin 10 generates a 24-V common signal within a set range of an axis zero. The 24-V common output is generally used to complete a relay control circuit.

Input Connections (With I/O Option Only)

Input connections are located on the back of the DRO. These connections allow signals from external devices to activate specific DRO functions.

DRO functions are activated by applying a +24 VDC, 10 mA signal for a minimum of 100 ms. Inputs to the DRO are optically coupled for protection. The Ground pin is the reference ground for the inputs and should always be used.
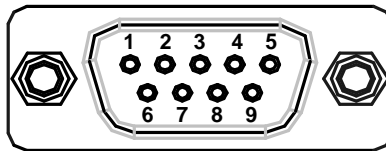
DE 9 Connector (Male)

Pin 1   X-Axis Zero

Pin 2   Z-Axis Zero

Pin 3   Recall (**RCL** Key for remote operations)

Pin 4   First-Spark Detection (900E Only)

Pin 5   Ground

Pin 6   Y-Axis Zero

Pin 7   Store (**ENT** Key for remote operations)
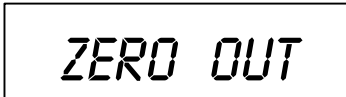
Pin 8   Print

Pin 9   W-Axis Zero

Zero Output ON/OFF (With I/O Option Only) – F 33

F 33 allows you to toggle the zero output ON or OFF. (Default: OFF)

To turn the zero output ON:

1. Press $\boxed{\sf F}$ $\boxed{\sf 3}$ $\boxed{\sf 3}$

The DRO displays the zero output setting in each axis display and the following in the message window:

$$\boxed{\textit{ZERO OUT}}$$

2. Press the desired axis key   to toggle the zero output
                                                                 setting ON or OFF.

3. Press $\boxed{\sf SET}$ to activate the setting.
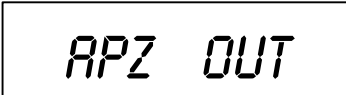
Approaching Zero Output Axis Select
(900 With I/O Option Only) – F 14

F 14 allows you to specify which axis the DRO will use for approaching zero (APZ) output. When the selected axis is within the range preset using Approaching Zero Range – F 07, the DRO turns on the output.

To specify the axis for APZ output:

1. Press $\boxed{F}$ $\boxed{1}$ $\boxed{4}$

The DRO displays the following in the message window:

$$\boxed{RPZ \quad OUT}$$

NOTE: You can select only one axis for APZ output.

2. Press the desired axis key to toggle the axis ON.

The DRO displays the following in the selected axis display:

$$\boxed{On}$$

To exit without specifying the axis for APZ output:

3. Press $\boxed{F}$

To set the axis for APZ output:
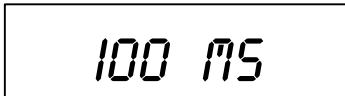
4. Press $\boxed{SET}$

Zero Output Time Select
(With I/O Option Only) – F 25

F 25 allows you to specify the time for which a remote device is turned on when the selected axis crosses zero. (Default: 100 ms) Zero Output – F 33 must be ON.

To change the setting:

1. Press $\boxed{\text{F}}$ $\boxed{2}$ $\boxed{5}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{100 \ \text{MS}}$$

The DRO displays the last-entered setting in the message window.

The available settings are:

> **Zero Output Time Settings**
> 30 ms, 100 ms (default), 200 ms, 300 ms,
> 400 ms, 500 ms, 600 ms, 700 ms, 800 ms,
> 900 ms, and 1 second

RS-232 Interface (With I/O Option Only)

The RS-232 Interface connection is located on the back of the DRO. This connection allows you to exchange data with other RS-232 devices.
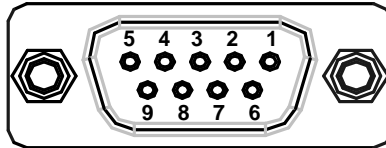
DE 9 Connector (Female)

Pin 1   Not Used
Pin 2   **TxD** (Transmit Data)
Pin 3   **RxD** (Receive Data)
Pin 4   Not Used
Pin 5   Ground
Pin 6   Not Used
Pin 7   **CTS** (Clear-To-Send)
Pin 8   **RTS** (Request-To-Send)
Pin 9   Not Used

NOTE: Clear-To-Send (**CTS**) and Request-To-Send (**RTS**) are connected but have no function.

RS-232 Setup (With I/O Option Only) – F 27
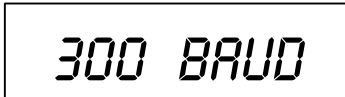
F 27 allows you to set up the following parameters for the RS-232 port:

- ❑ Baud Rate
- ❑ Parity
- ❑ Data Bits
- ❑ Printer or Computer Output

To set up RS-232 port parameters:

1. Press [F] [2] [7]

The DRO displays the following in the message window:

$$300 \; BAUD$$

The available baud rates are:

RS-232 Baud Rates
300 (default), 600, 1200, 2400,
4800, 9600, 19200, 38400

RS-232 Setup
(With I/O Option Only) – F 27 (Continued)

The available selections are:

❑ NO PARITY (default)
❑ EVEN PARITY
❑ ODD PARITY

4. Press [±] repeatedly to scroll through the options.

5. Press [SET] to set the parity.

The DRO displays the following in the message window:

$$8 \ DATA\text{-}BIT$$

The available selections are:

❑ 8 Data Bit (default)
❑ 7 Data Bit

NOTE: If you selected **NO PARITY**, you can only select **8 DATA-BIT**.

6. Press [±] repeatedly to scroll through the options.

7. Press [SET] to set the data bits.

RS-232 Setup
(With I/O Option Only) – F 27 (Continued)

The DRO displays one of the following in the message window:

$$PRINTER \qquad COMPUTER$$

The available selections are::

❑ **PRINTER** (default)   Each output of a string ends with a Carriage Return (CR) and a Line Feed (LF).

❑ **COMPUTER**   Each output of a string ends with a Carriage Return (CR).

8. Press [±]   to toggle between the options.

9. Press [SET]   to set the output.

OR

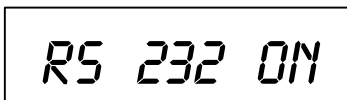10. Press [F]   to exit without change.

RS-232 ON/OFF (With I/O Option Only) – F 28

F 28 allows you to toggle the RS-232 port ON or OFF. (Default: OFF)

To toggle the RS-232 port ON:

1. Press $\boxed{\text{F}}$ $\boxed{2}$ $\boxed{8}$

The DRO displays the following in the message window:

$$\boxed{RS\ 232\ ON}$$

To toggle the RS-232 port OFF:

1. Press $\boxed{\text{F}}$ $\boxed{2}$ $\boxed{8}$

The DRO displays the following in the message window:

$$\boxed{RS\ 232\ OFF}$$

Printing Axis Values (With I/O Option Only)

NOTE: Before sending data to the printer, ensure that the DRO is not in the Preset Mode.

To print axis values to a printer:

1. Press $\boxed{1}$ to print the data from axis 1.

2. Press $\boxed{2}$ to print the data from axis 2.

3. Press $\boxed{3}$ to print the data from axis 3.

4. Press $\boxed{4}$ to print the data from axis 4.

5. Press $\boxed{5}$ to print the data from all axes.

Printed Axis Value Format

The DRO prints the axis values in the following format:

Axis   value   unit of measurement   counting mode   diameter mode

Examples:

```
X    -123.456    mm    ABS D
Y     454.902    in    INC
W    -235.12.30 dms                (dms = degree-min-sec)
```

Remote Operation (With I/O Option Only)

You can remotely operate the DRO from an IBM-compatible computer running a terminal program via the RS-232 Interface connection. The baud rate, parity, and data bit settings of the DRO and the terminal (or computer) must agree, and RS-232 must be ON. After you activate the RS-232 link, you can operate the DRO by pressing the computer keyboard.

DRO Keypad	Computer Keyboard Equivalent	DRO Keypad	Computer Keyboard Equivalent	DRO Keypad	Computer Keyboard Equivalent
Axis Key 1	X	⬇️	T	4	4
Axis Key 2	Y	₵	C	5	5
Axis Key 3	Z	ABS/INCR	I	6	6
Axis Key 4	W	MM/INCH	M	7	7
SET	S	±	-	8	8
ENT	E	.	.	9	9
RCL	R	0	0	Reset all Axes	P
F	F	1	1	XON	J
⬇️	D	2	2	XOFF	N
ADV	A	3	3		
ABS/INCR (Absolute)	G90	ABS/INCR (Incremental)	G91		
MM/INCH (Inch)	G70	MM/INCH (Metric)	G71		

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Send Program to External Device (With I/O Option Only) – F 60

F 60 allows you to send a program to an external device (such as a PC or disk drive) using the RS-232 port.

NOTE: The RS-232 port must be toggled ON using RS-232 ON/OFF – F 28.

To send a program to an external device:

1. Press **F** **6** **0**

The DRO displays the following in the message window:

```
SEND PROG
```

Example: Output Format

```
*
001 00 A N N +00001.000 –00001.000 +00002.000 –00005.000
002 01 I N N +00010.500 –00030.880 +00062.440 –00020.500
003 01 A N N +00030.000 –00020.200 -00005.020 +00030.000
004 00 A 2 N
005 00 A N 1
*
```

*	Beginning of Program	(Hex 2A)
001	Line Number	3 Characters – 000-500
00	Tool (Lathe)/Datum (Mill) Number	2 Characters – 00-99
A	Absolute/Incremental Mode	1 Character – A or I
N	Number of Bolt-Hole Pattern	1 Character – 0-9 or N
N	Number of Linear-Hole Pattern	1 Character – 0-9 or N (No)
Axis Value 1		±, 10 Characters, Decimal Point
Axis Value 2		±, 10 Characters, Decimal Point
Axis Value 3	(3-axis DRO Only)	±, 10 Characters, Decimal Point
Axis Value 4	(4-axis DRO Only)	±, 10 Characters, Decimal Point
*	End of Program	(Hex 2A)

Terminate every output line with LF (line feed).

Separate every data block in a line with a Space (Hex 20).

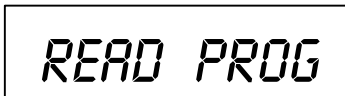# Recall Program from External Device (With I/O Option Only) – F 61

F 61 allows you to recall a program from an external device (such as a PC or disk drive) using the RS-232 port.

NOTE: The RS-232 port must be toggled ON using RS-232 ON/OFF – F 28.

To recall a program from an external device:

1. Press $\boxed{\text{F}}$ $\boxed{6}$ $\boxed{1}$

The DRO displays the following in the message window:

$$\boxed{READ\ PROG}$$

Print Program to External Printer (With I/O Option Only) – F 62

F 62 allows you to print a program to an external printer or PC using the RS-232 port.

NOTE: The RS-232 port must be toggled ON using RS-232 ON/OFF – F 28.

To print a program to an external device:

1. Press $\boxed{\text{F}}$ $\boxed{6}$ $\boxed{2}$

The DRO displays the following in the message window:

$$\boxed{\textit{PRINT PROG}}$$

Relay 1/Relay 2 Setup
(900 With I/O Option Only) – F 38/F 39

F 38 and **F 39** allow you to set up the parameters for Relay 1 and Relay 2.

The following procedures for setting up parameters for Relay 1 also can be used to set up parameters for Relay 2. Substitute **F 39** to set up Relay 2.

To set up Relay 1:

1. Press $\boxed{\text{F}}$ $\boxed{3}$ $\boxed{8}$

The DRO displays the following in the message window:

$$\boxed{\textit{RELAY1 OFF}}$$

2. Press $\boxed{\pm}$ to toggle Relay 1 ON.

3. Press $\boxed{\text{SET}}$

The DRO displays the following in the message window:

$$\boxed{\textit{CONT CLOSE}}$$

4. Press $\boxed{\pm}$ to toggle contact OPEN.

5. Press $\boxed{\text{SET}}$

The DRO displays the following in the message window:

$$\boxed{\textit{DIR SIGNAL}}$$

Relay 1/Relay 2 Setup
(900 With I/O Option Only) – F 38/F 39 (Continued)

6. Press ⎍±⎍   to toggle between Direct Signal and Coincidence Pulse.

7. Press ⎍SET⎍

If you select Coincidence Pulse, you can change the output time. The available output times for Coincidence Pulse are:
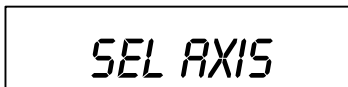
Coincidence Pulse Output Time
100 ms (default), 500 ms, 1 sec,
2 sec, 3 sec, 4 sec, 5 sec, 10 sec,
30 sec, 1 min, 2 min, 5 min, 10 min

8. Press ⎍±⎍   repeatedly to scroll through the options.

9. Press ⎍SET⎍   to select the Coincidence Pulse output time.

The DRO displays the following in the message window:

$$\boxed{\textit{SEL AXIS}}$$

Relay 1/Relay 2 Setup
(900 With I/O Option Only) – F 38/F 39 (Continued)

10. Press the desired axis key.

11. Press $\boxed{5}$ $\boxed{.}$ $\boxed{2}$ $\boxed{0}$ $\boxed{SET}$ to enter the value for the switch off point.

NOTE: You can assign each relay to each axis.

Direction Signal

Switch off Value ⟶

+ | −

Coincidence Pulse

Switch off Value ⟶ ⟵ Selectable Output Time
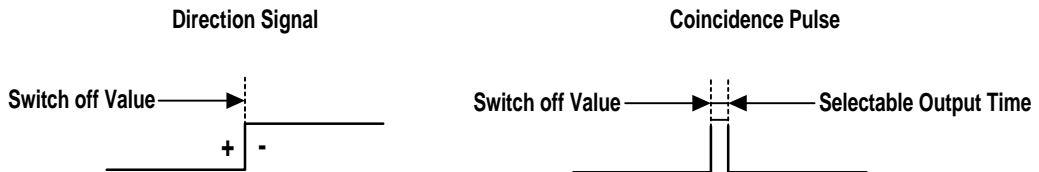
Output Test (With I/O Option Only) – F 42

F 42 allows you to test the following available DRO outputs:

- ❑ X ZERO OUT
- ❑ Y ZERO OUT
- ❑ Z ZERO OUT
- ❑ W ZERO OUT
- ❑ APZ OUT
- ❑ RELAY 1
- ❑ RELAY 2

If any of these tests fail, contact your local distributor or ANILAM Customer Services.

To start the output tests:

1. Press
$$\boxed{F} \quad \boxed{4} \quad \boxed{2}$$

The DRO turns on each available output for approximately 1 second. The message window displays the name of each output test and the beeper sounds a short beep when each test is complete.

To return to normal operation:

2. Press
$$\boxed{F}$$

Constant Surface Speed (CSS) Setup (900 With CSS and I/O Options)

If your DRO has the CSS option, you can use the DAC (Digital/Analog Converter) output voltage to control the spindle speed. You can vary the DAC output voltage between 0V and 10V with 12-bit resolution. A maximum of 5 different gears can be set up.

Use the following F-codes to set up the CSS feature:

F 96   DAC Output Voltage Setup

F 97   DAC Output Voltage Offset Adjustment

F 98   DAC Output Voltage Test
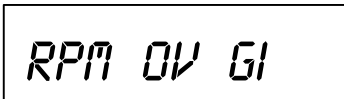
DAC Output Voltage Setup
(900 With CSS and I/O Options) – F 96

F 96 allows you to set up the DAC output voltage.

To set up the CSS feature:

1. Press $\boxed{F}$ $\boxed{9}$ $\boxed{6}$ to select DAC voltage setup.

The DRO displays the following in the message window:

$$\boxed{RPM\ \ 0V\ \ GI}$$

            prompting for the spindle
            speed at 0V for Gear 1.

To enter the spindle speed at 0V for Gear 1 (For example, 0 RPM):

2. Press $\boxed{0}$ $\boxed{\text{SET}}$

The DRO displays the following in the message window:

$$\boxed{RPM\ \ 10V\ \ GI}$$

            prompting for the spindle
            speed at 10V for Gear 1.

To enter the spindle speed at 10V for Gear 1 (For example, 2000 RPM):

3. Press $\boxed{2}$ $\boxed{0}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\text{SET}}$

4. Repeat steps 1 through 3 for each existing gear range (maximum 5).

 NOTE: Spindle speed refers to the speed of the spindle, not the spindle motor.

DAC Output Voltage Offset Adjustment (900 With CSS and I/O Options) – F 97
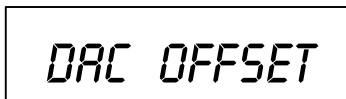
F 97 allows you to adjust the DAC output voltage offset. You will require a digital multimeter to perform this feature.

To set up the CSS feature:

1. Connect a multimeter to Pin 15 and Pin 8 and measure the DAC output voltage.

2. Press $\boxed{\text{F}}$ $\boxed{9}$ $\boxed{7}$

The DRO displays the following in the message window:

$$\boxed{\textit{DAC OFFSET}}$$

The DRO displays a value between 0 and 50 in the axis display. To change the output voltage, change this value.

To adjust the DAC offset to exactly 0mV:

3. Press $\boxed{\pm}$ repeatedly until the multimeter indicates 0 mV.

To reverse the scrolling direction:

4. Press $\boxed{.}$ $\boxed{\pm}$

To enter the adjusted DAC output voltage:

5. Press $\boxed{\text{SET}}$

DAC Output Voltage Test (900 With CSS and I/O Options) – F 98
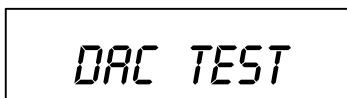
F 98 allows you to verify the DAC output voltage setting.

To verify DAC output voltage setting:

1. Connect a multimeter between Pin 15 and Pin 8 and measure the DAC output voltage.

2. Press ⎡F⎤ ⎡9⎤ ⎡8⎤

The DRO displays the following in the message window:

```
DAC TEST
```

3. Press ⎡0⎤ to display 0V on the axis display.

4. Press ⎡1⎤ to display 5V on the axis display.

5. Press ⎡2⎤ to display 10V on the axis display.

NOTE: The displayed DAC output voltage must be within 100mV of the nominal values.

Constant Surface Speed (CSS)/Direct RPM Operation (900 With CSS and I/O Options)

If your DRO has the CSS option, you can use the DAC (Digital/Analog Converter) output voltage to control the spindle speed. You can use this feature in Lathe Mode to obtain a constant surface speed as the tool changes the workpiece diameter.

Use the following F-codes to operate the CSS feature:

   F 48   CSS/Direct RPM Input

   F 50   DAC Output Voltage On/Off

NOTE: The CSS feature must be set up properly.

NOTE: Do not start the spindle with the DRO (For example, using **F 50**). The machine should have a separate switch for this purpose.

CSS/Direct RPM Input
(900 With CSS and I/O Options) – F 48

F 48 allows you to specify the desired Constant Surface Speed (CSS), which is entered in Feet per Minute (**INCH** Mode) or Meters per Minute (**MM** Mode). The DRO maintains the specified constant surface speed as the diameter of the workpiece changes. You can specify a maximum spindle speed (**MAX SPEED**) to restrict the spindle speed from exceeding this speed as the diameter decreases, or a specific spindle speed (**DIRECT RPM**) to maintain the spindle speed at a constant RPM.

To program a CSS operation:

1. Select a tool by using the Tool Offset.

2. Press $\boxed{\mathsf{F}}$ $\boxed{4}$ $\boxed{8}$

The DRO displays the following in the message window:
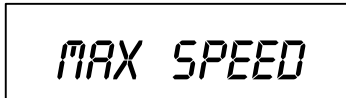
$$\boxed{\mathit{MAX\ SPEED}}$$

NOTE: You can limit the spindle speed to either the top speed (preset spindle speed at maximum DAC output voltage) or the specified maximum speed (MAX SPEED), whichever is lower.

To limit the spindle speed (For example, to **2500 RPM**):

3. Press $\boxed{2}$ $\boxed{5}$ $\boxed{0}$ $\boxed{0}$ $\boxed{\mathsf{SET}}$

NOTE: The decimal point at the left of the X-axis display will blink if the spindle speed is limited by MAX SPEED.

CSS/Direct RPM Input
(900 With CSS and I/O Options) – F 48 (Continued)

The DRO displays one of the following in the message window (depending on the number of available gears):

$$\boxed{GEAR\ 1} \qquad \boxed{GEAR\ 2}$$

4. Press ⎡ ± ⎤ ⎡SET⎤ to toggle and select the desired gear.

The DRO displays one of the following in the message window:

$$\boxed{CSS\ ON} \qquad \boxed{DIRECT\ RPM}$$

The available selections are:

❑ CSS ON   Activates the CSS feature. The DRO varies the spindle speed to maintain a constant surface speed as the workpiece diameter changes.

❑ DIRECT RPM   The DRO maintains the spindle speed at a constant RPM.

5. Press ⎡ ± ⎤ ⎡SET⎤ to toggle between the settings and to set the feature.

If you select **CSS ON**, the DRO displays the following in the message window:

$$\boxed{CS--SPEED}$$

CSS/Direct RPM Input
(900 With CSS and I/O Options) – F 48 (Continued)

The X-axis display indicates the previously used surface speed. The X designation is blinking, indicating you can enter a value.

If the displayed surface speed is acceptable:

6. Press [SET] to continue.
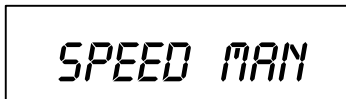
OR

To set a new surface speed (For example, **200** RPM):

7. Press [2] [0] [0] [SET] to set the surface speed.

NOTE: Surface speed must be entered in Feet per Minute when the DRO is set to **INCH** Mode or Meters per Minute when the DRO is set to **MM** Mode.

If you select **DIRECT RPM**, the DRO displays the following in the message window:

$$\boxed{\textit{SPEED MAN}}$$

prompting for the desired spindle speed.

To set the spindle speed (For example, **2500** RPM):

8. Press [2] [5] [0] [0] [SET] to set the spindle speed.
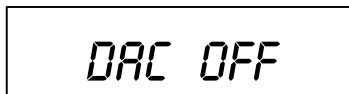
DAC Output Voltage ON/OFF
(900 With CSS and I/O Options) – F 50

F 50 allows you to turn the DAC output voltage ON or OFF:
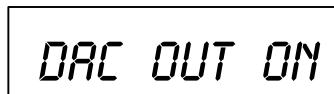
To turn the DAC output voltage **ON** or **OFF**:

1. Press $\boxed{\text{F}}$ $\boxed{5}$ $\boxed{0}$

The DRO displays one of the following in the message window:

$$\boxed{DAC\ OFF} \qquad \boxed{DAC\ OUT\ ON}$$

2. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to turn the DAC output voltage **ON** or **OFF**.

NOTE: Do not turn the spindle **ON** or **OFF** using **F 50**. The machine should have a separate switch for this purpose.

Parameter Setting for Spindle Speed Display (2-Axis and 3-Axis, With SSD Option Only)

If your DRO has the SSD Option, it includes a separate display in addition to the regular axis displays. For example, a 2-axis DRO with the SSD Option has 3 axis displays. The extra display (at the bottom of the DRO) indicates the spindle speed in revolutions per minute (RPM). The machine spindle must be fitted with a rotary encoder. The DRO back panel includes an additional encoder input connector to connect the rotary encoder.

You must set up the spindle speed display axis parameters for the rotary encoder using Parameter Settings - F 20.

To enter parameters for spindle speed display (SSD):

1. Press $\boxed{\text{F}}$ $\boxed{\text{2}}$ $\boxed{\text{0}}$ to select the feature.
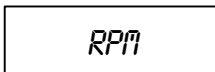
The DRO displays the following in the message window:

$$\boxed{PARAMETER}$$

2. Press the bottom Axis Key to select the SSD display.

The DRO displays the following in the message window and in the SSD display:

$$\boxed{RPM}$$

$$\boxed{RPM}$$

3. Press $\boxed{\text{SET}}$

Parameter Setting for SSD (2-Axis and 3-Axis, With SSD Option Only) (Continued)

The DRO displays the following in the message window and in the SSD display:

LINE COUNT

X   1000

ABS

indicating the default line count.

To enter the line count for the rotary encoder – for example, **1500** lines:

4. Press   1   5   0   0

5. Press   SET   to set the line count and exit.

EDM Features (900E Only)

The Wizard 900E is a high-performance programmable DRO designed for EDM applications. The 900E includes the I/O Option as standard.

NOTE: The Z-axis (Axis 3) must be used as the spark erosion axis for the EDM functions to work correctly.

The 900E includes the following EDM features:

- ❑ EDM Mode (Three Z-Axis Display Mode)
- ❑ First Spark Detection Setup
- ❑ Z-Depth Guard
- ❑ Spark Out
- ❑ SparkArrest™

EDM Mode allows you to change the display mode for axis displays 1, 2, and 3 to display three different Z-axis values during the sparking cycle. When you activate EDM Mode, the DRO turns off the X and Y designations and turns on the leftmost decimal point for each axis. The following table lists what each axis displays in Normal Mode and EDM Mode.

	Normal Mode	**EDM Mode**
Axis 1	Actual X-Position	Z-Depth to Go
Axis 2	Actual Y-Position	Target Z-Depth
Axis 3	Actual Z-Position	Actual Z-Position

EDM Features (900E Only) (Continued)

For Example: The DRO is in EDM Mode and the axis displays indicate the following:

.	*1.415*

Remaining distance to Target Depth

.	*5.200*

Desired Z-Depth

Z	*3.785*

Actual position relative to the zero position

EDM Features (900E Only) (Continued)

First Spark Detection Setup allows you to define how you activate the EDM Mode. It can be either manually activated or automatically activated if the DRO receives a signal from a first spark detector. The position at which the first spark occurs is the Zero position.

Z-Depth Guard allows you to track the depth of the erosion relative to the Zero position. A relay will switch when the desired Z-depth is reached, to terminate the main sparking cycle.

Spark Out allows you to specify an additional sparking cycle that allows sparking to continue for a selectable period of time in order to obtain a quality finish.

SparkArrest™ is a safety feature that allows you to set a limiting distance above the workpiece over which the DRO disables sparking. This can be used to avoid sparking if the electrode should move in the wrong direction during the sparking cycle, well before the electrode has moved out of the electrolyte.

You can set up the EDM features using the following F-codes:

❑ First Spark Detection Setup – F 46
❑ Relay 1 (Z-Depth Guard) – F 38
❑ Relay 2 (Spark Out/SparkArrest™) Setup – F 39

Relay 1 is used to limit the movement of the Z-axis when the target Z-Depth is reached. Relay 2 is used to turn off sparking, either after a preset Spark-Out time or if the electrode rises over the SparkArrest™ limit.

You can enter the parameters for the sparking cycle using the following F-code:

❑ Entering Target Z-depth and Spark-Out time – F 37

Figure 6 illustrates the terms used in the following setup procedures for the EDM features.

EDM Features (900E Only) (Continued)
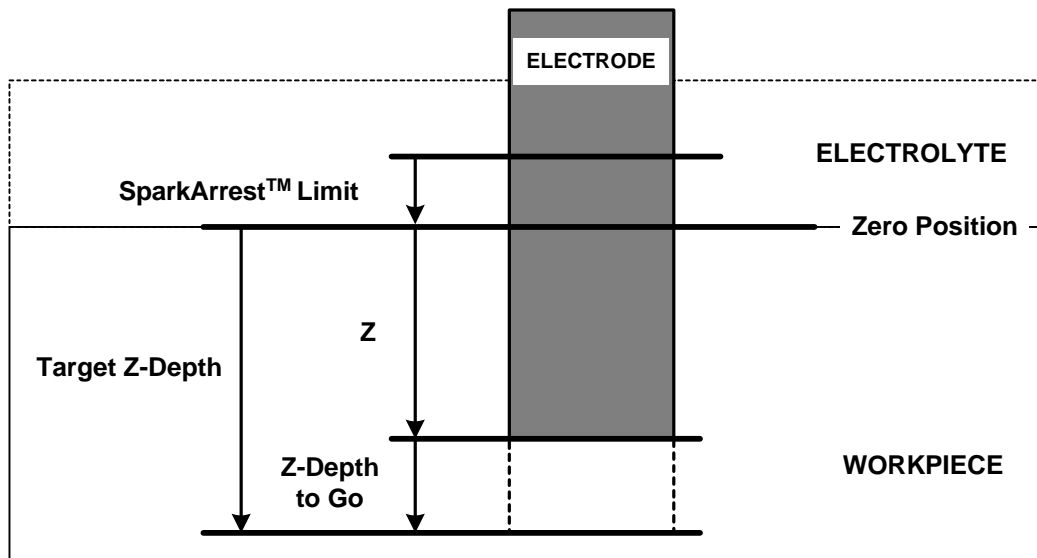
Figure 6: EDM Setup

First Spark Detection Setup (900E Only) – F 46

F 46 allows you to define how you activate the EDM Mode. It can be either manually activated or automatically activated if the DRO receives a signal from a first spark detector. The position at which the first spark occurs is the Zero position.

1. Press $\boxed{F}$ $\boxed{4}$ $\boxed{6}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{SPARK\ OFF}$$

2. Press $\boxed{\pm}$ to scroll through the options.

The available options are:

- ❑ SPARK OFF   No First Spark Detection
- ❑ SPARK MAN   Manual First Spark Detection
- ❑ SPARK AUTO   Automatic First Spark Detection

	SPARK OFF	**SPARK MAN**	**SPARK AUTO**
First Spark Detection	No	Manual	Automatic
EDM Display Mode	Manual	Manual	Automatic
Z Depth Guard	Manual	Automatic	Automatic
Spark Out	Manual	Automatic	Automatic
SparkArrest™	No	Automatic	Automatic

NOTE: Automatic first spark detection requires a sensor input.

NOTE: Automatic features require that you set up Relay 1 and Relay 2.

3. Press $\boxed{SET}$ to select the desired option.

4. Position the electrode in the desired X and Y positions.

First Spark Detection Setup (900E Only) – F 46
(Continued)

SPARK OFF – No First Spark Detection

NOTE: Lower the electrode until it touches the workpiece or the first spark occurs. This is the zero position.

5. Press the Z-axis key   **SET**   to zero the axis display.

6. Press   **SET**   to activate EDM Mode.

❑ Axis 1 display now indicates the distance to the target depth.

❑ Axis 2 display indicates the target depth.

❑ Z-axis display indicates the actual Z-position relative to the zero position.

7. Start the sparking cycle.

8. Press   **SET**   to toggle between EDM Mode and X-, Y-, and Z-axis display mode.

9. Terminate the sparking cycle when the Axis 1 display indicates zero and the Z-axis display equals the Target Z-Depth displayed in the Axis 2 display.

10. Press   **F**   to exit EDM Mode.

First Spark Detection Setup (900E Only) – F 46
(Continued)

SPARK MAN – Manual First Spark Detection

NOTE: You must also set up the desired EDM features using the procedures described in and .

1. Position the electrode in the desired X and Y positions.

2. Press **SET** to activate EDM Mode.

The DRO displays the following in the message window:

$$\boxed{\textit{WAIT SPARK}}$$

3. Lower the electrode until it touches the workpiece or the first spark occurs. This is the zero position.

4. Press the Z-axis key to manually activate EDM Mode.

❑ Axis 1 display now indicates the distance to the target depth.

❑ Axis 2 display indicates the target depth.

❑ Z-axis display indicates the actual Z-position relative to the zero position.

5. Start the sparking cycle.

6. Press **SET** to toggle between EDM Mode and X-, Y-, and Z-axis display mode.

When the electrode reaches the Target Z-Depth, Relay 1 will switch. This can be used to terminate the main sparking cycle.

First Spark Detection Setup (900E Only) – F 46
(Continued)

If Spark-Out is activated, Relay 2 switches at the same time as Relay 1. After the countdown of the preset Spark-Out time, Relay 2 will switch again. This can be used to perform a Spark-Out cycle for a specified duration.

If SparkArrest**™** is activated and the electrode should move in the wrong direction and reach the SparkArrest**™** level, then Relay 2 will switch allowing the EDM machine to turn off the sparking cycle for safety reasons. The DRO also disables Spark-Out if Relay 2 switches because the electrode reaches the SparkArrest**™** level.

When the cycle is finished, you can repeat the same cycle again.

To repeat the cycle:

7. Press the Z-axis key.

To exit EDM Mode:

8. Press $\boxed{\text{F}}$

First Spark Detection Setup (900E Only) – F 46
(Continued)

SPARK AUTO – Automatic First Spark Detection
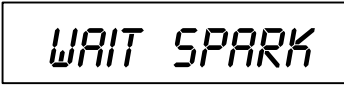
SPARK AUTO Mode requires a First Spark Detection signal from the EDM machine. Refer to Input Connections (With I/O Option Only).

NOTE: You must also set up the desired EDM features using the procedures described in Relay 1 (Z-Depth Guard) Setup – F 38 and Relay 2 (Spark-Out/SparkArrest™) Setup – F 39.

1. Position the electrode in the desired X and Y positions.

2. Press **SET** to activate EDM Mode.

The DRO displays the following in the message window:

$$WAIT\ SPARK$$

3. Lower the electrode until it touches the workpiece or the first spark occurs.

The DRO automatically activates EDM Mode.

❑ Axis 1 display now indicates the distance to the target depth.
❑ Axis 2 display indicates the target depth.
❑ Z-axis display indicates the actual Z-position relative to the zero position.

4. Start the sparking cycle.

If necessary:

5. Press **SET** to toggle between EDM Mode and X-, Y-, and Z-axis display mode.

First Spark Detection Setup (900E Only) – F 46
(Continued)

When the electrode reaches the Target Z-Depth, Relay 1 will switch. This can be used to terminate the main sparking cycle.

If Spark-Out is activated, Relay 2 switches at the same time as Relay 1. After the countdown of the preset Spark-Out time, Relay 2 will switch again. This can be used to perform a Spark-Out cycle for a specified duration.

If SparkArrest**TM** is activated and the electrode should move in the wrong direction and reach the SparkArrest**TM** level, then Relay 2 will switch allowing the EDM machine to turn off the sparking cycle for safety reasons. The DRO also disables Spark-Out if Relay 2 switches because the electrode reaches the SparkArrest**TM** level.

To exit EDM Mode:

6. Press $\boxed{F}$

Z-Depth Guard Setup, Relay 1 (900E Only) – F 38

F 38 allows you to set up Relay 1 to control the maximum electrode depth from the zero position (Target Z-Depth).
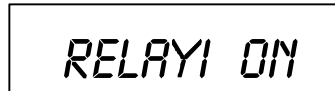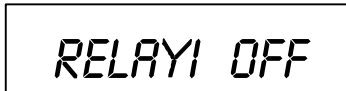
NOTE: For proper operation of the EDM functions, you must enter Target Z-Depth and Spark-Out time using Entering Target Z-depth and Spark-Out time – F 37.

NOTE: Refer to the instructions provided by the EDM machine builder for the appropriate setup parameters.

To set up Relay 1:

1. Press $\boxed{\text{F}}$ $\boxed{3}$ $\boxed{8}$ to select the feature.

The DRO displays one of the following in the message window:
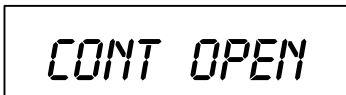
$$\boxed{RELAY1\ OFF} \qquad \boxed{RELAY1\ ON}$$

2. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to toggle Relay 1 ON and set the feature.

NOTE: Z-Depth Guard is activated only if Relay 1 is ON.

The DRO displays one of the following in the message window:

$$\boxed{CONT\ OPEN} \qquad \boxed{CONT\ CLOSE}$$

3. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to toggle between the settings and to set the feature.

Z-Depth Guard Setup, Relay 1 (900E Only) – F 38
(Continued)

The DRO displays one of the following in the message window:

$$\boxed{\textit{DIR SIGNAL}} \qquad \boxed{\textit{COIN PULSE}}$$

4. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to toggle between the settings and to set the feature.

If you select **COIN PULSE** (Coincidence Pulse):

5. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to scroll through the settings and set the output time.

Spark-Out/SparkArrest™ Setup, Relay 2 (900E Only) – F 39

F 39 allows you to set up Relay 2 to control the Spark-Out time and SparkArrest™ limit.

NOTE: For proper operation of the EDM functions, you must enter Target Z-Depth and Spark-Out time using Entering Target Z-depth and Spark-Out time – F 37.

NOTE: Refer to the instructions provided by the EDM machine builder for the appropriate setup parameters.

To set up Relay 2:

1. Press
$$\boxed{F} \quad \boxed{3} \quad \boxed{9}$$
to select the feature.

The DRO displays one of the following in the message window:

$$\boxed{RELAY2\ OFF} \qquad \boxed{RELAY2\ ON}$$

2. Press
$$\boxed{\pm} \quad \boxed{SET}$$
to toggle Relay 2 ON and set the feature.

NOTE: Spark-Out and SparkArrest™ are activated only if Relay 2 is ON.

The DRO displays the following in the message window:

$$\boxed{5\text{--}ARREST}$$

The Z-axis begins to blink prompting for a value.

Spark-Out/SparkArrest™ Setup, Relay 2

(900E Only) – F 39 (Continued)

To set up the SparkArrest™ limit (For example, **-1.1**):

NOTE: The SparkArrest™ limit is a negative value because it is located above the zero position.

3. Press $\boxed{\pm}$ $\boxed{1}$ $\boxed{.}$ $\boxed{1}$ $\boxed{\text{SET}}$ to set the SparkArrest™ limit to **–1.1** and exit Relay 2 setup.

The DRO displays one of the following in the message window:
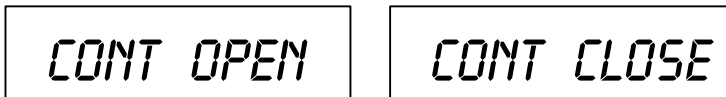
$$\boxed{\textit{CONT OPEN}} \qquad \boxed{\textit{CONT CLOSE}}$$

4. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to toggle between the settings and set the feature.

The DRO displays one of the following in the message window:

$$\boxed{\textit{DIR SIGNAL}} \qquad \boxed{\textit{COIN PULSE}}$$
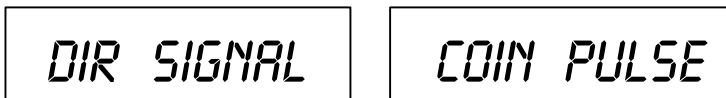
5. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to toggle between the settings and set the feature.

If you select **COIN PULSE** (Coincidence Pulse):

6. Press $\boxed{\pm}$ $\boxed{\text{SET}}$ to scroll through the settings and select the dwell time.

Entering Target Z-Depth and Spark-Out Time (900E Only) – F 37

F 37 is used before a sparking cycle to set up the Target Z-Depth (the maximum electrode depth from the zero position at which the main sparking cycle stops). EDM Mode also allows you to set up the desired time duration for a Spark-Out cycle when you reach the Target Z-Depth. This allows you to obtain a quality finish on the workpiece.

NOTE: You must first set up the desired EDM features using the procedures described in Relay 1 (Z-Depth Guard) Setup – F 38 and Relay 2 (Spark-Out/SparkArrest™) Setup – F 39. You must also select an EDM Mode option using First Spark Detection Setup – F 46.

To set up the Target Z-Depth:

1. Press $\boxed{\text{F}}$ $\boxed{3}$ $\boxed{7}$ to select the feature.

The DRO displays the following in the message window:

$$\boxed{\textit{TARGET Z--D}}$$

The DRO displays the last-entered Target Z-Depth in the axis display:

If the displayed Target Z-Depth is acceptable:

9. Press $\boxed{\text{SET}}$ to continue.

OR

To set a new Target Z-Depth (For example, **4.75**):

10. Press $\boxed{4}$ $\boxed{.}$ $\boxed{7}$ $\boxed{5}$ $\boxed{\text{SET}}$ to set the Target Z-Depth.

Entering Target Z-Depth and Spark-Out Time (900E Only) – F 37 (Continued)

The DRO displays the following in the message window:

$$\boxed{SPARKOUT\ T}$$

The DRO displays the last-entered Spark-Out time in the axis display:

If the displayed Spark-Out time is acceptable:

11. Press **SET** to exit the feature.

   OR

To set a new Spark-Out time (For example, **2**-hours and **30** minutes):

12. Press $\boxed{0}$ $\boxed{2}$ $\boxed{.}$ $\boxed{3}$ $\boxed{0}$ to set the Spark-Out time.

To exit the feature:

13. Press **SET**

The DRO is now prepared for the sparking cycle. Proceed according to the spark detection procedure selected, as described in .

Troubleshooting

This section lists problems that could arise with the DRO, and provides possible solutions to correct these problems.

Symptom	Solution
❑ Axis display does not illuminate.	1. Check that the power cord is properly connected and the DRO is turned on. 2. Check the AC voltage where the power cord is connected. 3. If all of the above are checked and OK, contact your local distributor or ANILAM Customer Services.
❑ When you move any axis, the displays do not update.	1. Check that the linear encoders are properly connected. 2. Run the system diagnostic tests (**F 45**). 3 If the DRO fails the diagnostics tests, contact your local distributor or ANILAM Customer Services. 4. If the DRO passes the diagnostics tests, turn on Linear Encoder Error Check (**F 41**). 5. Move the axis that is not updating. 6. If the DRO displays *ERROR* in the axis display, contact your local distributor or ANILAM Customer Services.
❑ When you press a key, the beeper does not sound.	1. Verify that the Beeper (**F 21**) is enabled. 2. If the Beeper is enabled, but still does not sound, contact your local distributor or ANILAM Customer Services.

Troubleshooting (Continued)

Symptom	Solution
❑ When the power is turned OFF, information in memory is lost. ❑ The DRO does not retain the set parameters as they were entered. ❑ Information recalled is incorrect. ❑ The DRO does not respond when you press a key or several keys.	1. Contact your local distributor or ANILAM Customer Services.

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