

ISP-D3000

User's Guide

←INSIZE→

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0. Preface

Mounting and maintenance

0.1 Environmental conditions

- (1) Avoid exposing ISP-D3000 under the sun or high temperature environment, and operating temperature is 0°C to 40°C.
- (2) Keep far away from high voltage, large current or strong magnetic machines;
- (3) Scale signal cable should be kept far away from power cable;
- (4) Avoid installing in the oil, water or dust and high vibration environment;
- (5) Keep away from corrosive chemical.

0.2 Attention

- (1) Finding something wrong with ISP-D3000, please contact Rational Corporation or it's agents instead of opening ISP-D3000's enclosure.
- (2) Never open the ISP-D3000's enclosure and the optical plug if the power is on
- (3) Confirm ISP-D3000 is connected to ground

0.3 Maintenance

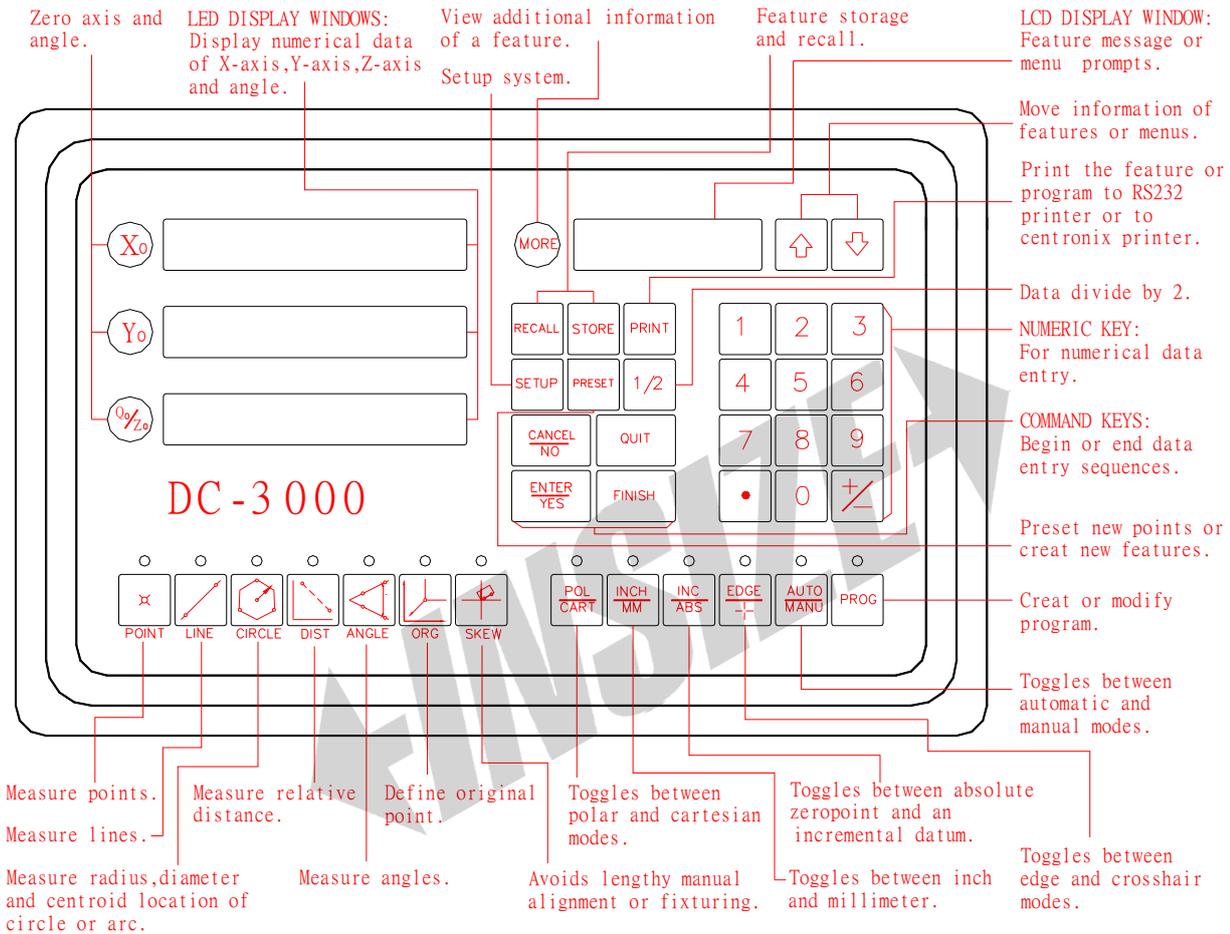
- (1) Shut off the power supply when clean ISP-D3000
- (2) Cleansing with dry cloth or cotton;
- (3) Don't clean the external shuck with toluol or aether;
- (4) Cleaning screen with alcohol or neuter detergent.

0.4 Warranty

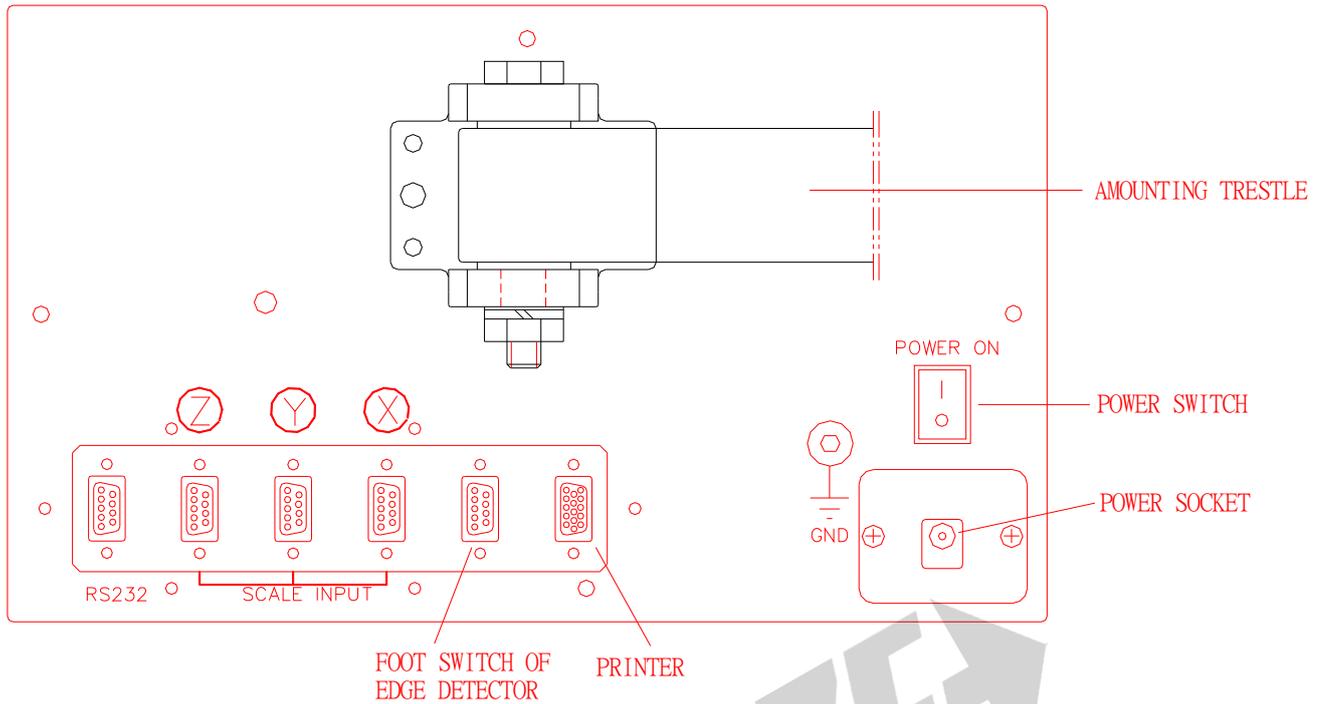
We guarantee maintenance ISP-D3000 with the factory's original warranty. You should return the warranty card to our company. The valid warranty card must be filled with the specific model, machine model and install data.

1. Front panel, rear panel and keys

1.1 Front panel



1.2 Illustration of rear panel



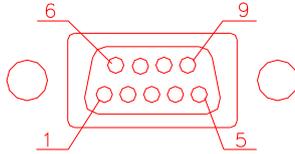
1.3 Description of key functions

	Key mark	Key name	description
1	X° Y° Q°	Zero axes	Set the selected axis' display value to zero
2	1/2	find the middle point	Display value of selected axis is divided by 2
3	INC/ABS	Absolute/Incremental conversion	Toggle between Incremental and Absolute Modes
4	INCH/MM	Metric/Imperial selection	Toggle between imperial mode and metric mode
5	POL/CART	Polar/Cartesian conversion	Toggle between Polar coordination and Cartesian coordination
6	EDGE/+	Edge/Crosshair conversion	Toggle between Optical Edge mode and crosshair mode
7	AUTO/MAN	Auto/Manual conversion	Toggle between automatic mode and manual mode
8	PROG	User program	Enter user program function
9	PRESET	Preset	Preset X/Y axis, preset feature
10	STORE	Store	Store temporary feature as permanent feature
11	RECALL	Recall	Recall a permanent feature as temporary feature a0
12	PRINT	Print	Print current feature or ISP-D3000 display content
13	SETUP	Setup	Setup entry
14	ENTER/YES	ENTER	Confirm inputted value or operation
15	CANCEL/NO	CANCEL	Cancel the last inputted value or operation
16	FINISH	Finish	Finish measure operation or other
17	QUIT	Quit	Give up an operation
18	0—9	Numeric	Number keys
19	.	Decimal point	Decimal point
20	+/-	+/- sign	Plus or minus sign
21	↑↓	Scroll up and down	Browse features or function's menu
22	MORE	View more	Show more information
23	ORG	Set datum	Set datum point
24	POINT	Point feature	Probe point feature
25	LINE	Line feature	Probe line feature
26	CIRCLE	Circle feature	Probe circle feature
27	DIST	Distance feature	Probe distance feature
28	ANGLE	Angle feature	Probe angle feature
29	SKEW	Skew	Rotate the coordinate with a certain angle

Note: The shadow word indicates key in ISP-D3000, and so as following.

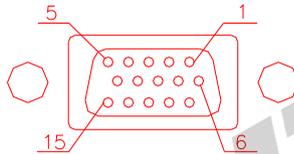
1.4 Linear scale pin designation

(1) 9 pin



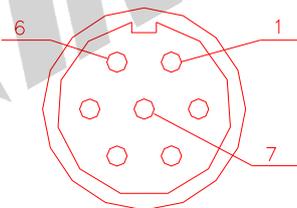
PIN NO.	SIGNAL	WIRE COLOR
1	+5V	Red
2	0V	Black
3	A+	Brown
4	B+	Yellow
5	ABS+	Orange
6		
7		
8		
9	FG	Shield

(2) 15 pin (optional)



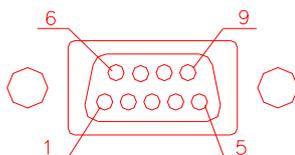
PIN NO.	SIGNAL	WIRE COLOR
1	+5V	Red
2	0V	Black
3	A+	Brown
4	B+	Yellow
5	NC	
6	FG	Shield
7-14	NC	
15	ABS+	White

(3) 7 pin (optional)



PIN NO.	SIGNAL	WIRE COLOR
1	0V	Black
2	NC	
3	A+	Brown
4	B+	Yellow
5	+5V	Red
6	ABS+	Orange
7	FG	Shield

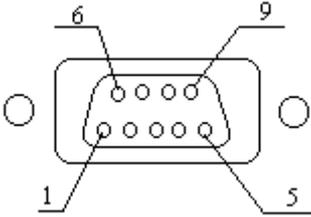
1.5 RS232 pin designation



PIN NO.	SIGNAL	WIRE COLOR
1	GND	Red
2	TXD	Black
3	RXD	Brown
4	NC	Yellow
5	NC	Orange
6-9	NC	

1.6 Foot switch and edge detector

pin designation

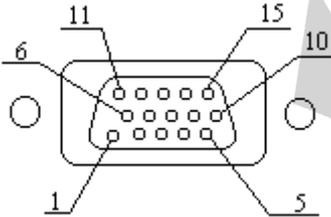


PIN	Signal	Color of cable	Description
1	FT1-1	Red	1.The foot switch operate such as when you press the ENTER key, it will be ON or OFF state.
2	FT1-2	Red	
3	FT2-1	Brown	2.The foot switch operate such as the FINISH key.
4	FT2-2	Brown	
5	EXT0-PLUS	Yellow	3. The edge detector cause latching (the external electric current cause isolated)
6	EXT0-RTN	Orange	
7	EDGE-PS	Blue	4. The edge detector cause latching (TTL Level)
8	EDGE-GND	Black	
9	NC		

1.7 Printer pin designation

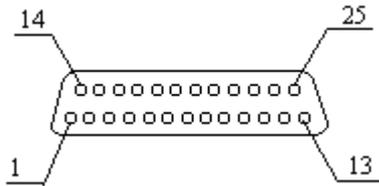
15 PD is the standard outlet, however, the 25 PD is optional.

(1) 15PD outlet



PIN	Signal	Color of cable
1	STROBE	Red
2	D0	Brown
3	D1	Yellow
4	D2	Orange
5	D3	Blue
6	D4	Purple
7	D5	Gray
8	D6	White
9	D7	Green
10	ACK	Pink
11	BUSY	Azury
12~15	GND	Black

(2) 25PD outlet(optional)



PIN	Signal	Color of cable
1	STROBE	Red
2	D0	Brown
3	D1	Yellow
4	D2	Orange
5	D3	Blue
6	D4	Purple
7	D5	Gray
8	D6	White
9	D7	Green
10	ACK	Pink
11	BUSY	Azury
12	GND	Black
13~17	NC	
18~25	GND	Black

Note: The pin designation about include that the 15 pin outlet can
Change to 25 pin outlet.

2. Terminology

2.1 Coordinate

(1) Incremental/Absolute coordinate

Absolute coordinate is the basic coordinate.

Incremental coordinate is coordinate which is relative to the absolute coordinate.

(2) Polar/Cartesian coordinate

Cartesian coordinate expresses a point with (x, y).

Polar coordinate expresses a point with (ρ , θ).

Example: "Current Position" is displayed in the message window

X window displays 1.000

Y window displays 2.125

Indicates that the current position is (1.000, 2.125) in Cartesian coordinate, and it is (2.349, 64.799) in polar coordinate.

Note: (1) The italics with ' _____' indicate that it is a terminology, the same as following.

2.2 Edge/Crosshair mode, AUTO/Manual mode

In Crosshairs mode, the display values of X window and Y window are updated continuously, yet in Edge mode, they are update only when the Optical Edge Detector are moving from dark area to light area or from light to dark. If ISP-D3000 is in the Edge mode and AUTO mode at the same time, sample points will be probed automatically and user needn't put the **ENTER** key; otherwise, the **Enter** key must be pressed to catch sample point.

2.3 Measurement Mode

ISP-D3000 has two Measurement Modes: Forward Annotation Measurement and Backward Annotation Measurement. The Forward Annotation Measurement means that the number (less than 50) of sample points are preset before measuring . In Backward Annotation Measurement, it is not necessary for operator to setup the number of sample points, the number of points is decided during the measuring. You can set the measurement mode at interior setting.

2.4 Saving features

Graphical feature is stored by two ways: temporary storing and permanent storing. The temporary features will be lost when power is off, however the permanent features will be kept for ever. So the permanent feature is used to save some used usually and important features.

ISP-D3000 can store ten temporary features from a0 to a9 and one hundred permanent features from 00 to 99. The current feature will be temporary feature a0 after measurement is finished, and the last a0 will be changed into a1, and the rest temporary features will does the

same way. The last a9 will be lost. The temporary feature can be changed into the permanent feature by store operation and the permanent feature also can be recalled as temporary feature a0.

2.5 User program

ISP-D3000 provides user program. User can create his own program, which makes measurement very quickly and conveniently.

Adopting E²PROM, ISP-D3000 has a capacity of 10 user programs which No is from 0 to 9. Each user program can contain 100 steps from 0 to 99, and one user program can invoke another user program, the invoked layers are utmost 10 layers.

2.6 Inputting value

Press **ENTER** to confirm after inputting value. Press **QUIT** to give up value and quit. Press the **CANCEL** to cancel the last inputted key, and you can also press **ENTER** at the beginning to enter the preset value which is shown on the message window.

2.7 Coordinate skewing

In order to improve measurement precision and make the measurement conveniently, ISP-D3000 provides coordinate skew function, which help user skew work-piece.

When work-piece's shape is irregular or there is an angle between work-piece's edge and X axis or Y axis, ISP-D3000 skew X-axis or Y-axis to the edge of work-piece to improve measurement precision and the measurement convenience.

2.8 Storing parameters when power fails

ISP-D3000 can store parameters when power fails. It can restore the failure state if the power is supplied again.

Note: (1) Temporary feature will be lost automatically if power failed.

(2) Linear scale cannot be moved after power fails.

2.9 Measure Easy

ISP-D3000 provides a function—Measure Easy. When the Measure Easy is open, the system can create a feature only inputting some points. Of course, some rules should be remember:

1. Input only one point, and then press “Finish” if you want to measure a point.
2. Input two points and then press “finish”, you will get a line feature.
3. If you input three or more than three points, system would calculating that the graphics is a circle or a line.

4. Measure Easy could not be used to measure distance feature and angle feature.

2.10 Presetting, measuring and constructing features

ISP-D3000 provides 3 methods ---- preset/ construct/measure to obtain a new graphical feature.

Preset: Users input value from panel, then ISP-D3000 gets message of feature.

Measure: ISP-D3000 get message of feature after it deals with the data get form scale. .

Construct: User uses existent features to construct a new feature (including temporary feature and permanent feature).

2.11 Showing feature's message

Graphical features' message can be viewed in different ways from Cartesian coordinate and polar coordinate

1. Point feature

(1) In *Cartesian coordinate*, the point feature is displayed with X offset value and Y offset value from datum point.

Example: " a0 Point X/Y " is displayed in the message window

1.000 is displayed in the X window

1.000 is displayed in the Y window

It indicates a0 is a point, its coordinate data is (1.000, 1.000) in *cartesian*, and it can be changed into (1.414, 45.000) in polar.

(2) In *polar coordinate*, the point feature data is displayed by the distance from the point to the datum point and the angle between positive direction of X axis and the line from datum point to the sampled point.

Example: " a1 Point r/a" is displayed in the message window

1.414 is displayed in the X window

45.000 is displayed in the Y window

It indicates a1 is a point feature, its coordinate is (1.414, 45.000) in polar, and it will be changed into (1.000, 1.000) in cartesian coordinate.

2. Line feature

The line feature will be displayed with it's one point element which is nearest from datum point and the angle between the line and positive direction of X axis.

Example: " a1 line X/Y " is displayed in the message window

1.000 is displayed in the X window

-1.000 is displayed in the Y window

It indicates a1 is a line, the *cartesian coordinate* of the point is (1.000, -1.000) which is nearest from datum. It will be changed into (1.414, 315.000) in polar.

Press **MORE**, “ < ” is displayed in the message window

45.000 is displayed in the X window

It indicates the angle between this line and x axis' positive direction is 45.000°.

3. Circle feature

A circle feature consists of its central point and its radius.

Example: “00 circle X/Y” is displayed in the message window

1.000 is displayed in the X window

1.000 is displayed in the Y window

It indicates the first permanent feature is a circle, the center of the circle (1.000, 1.000) in Cartesian coordinate, and it will be changed into (1.414, 45.000) in Polar coordinate.

Press **MORE**, “ r/d” is displayed in the message window

2.000 is displayed in the X window

4.000 is displayed in the Y window

It indicates the radius of the circle is 2.000 and the diameter is 4.000.

4. Distance feature

The distance feature is the offset values of X axis and Y axis between two point features.

Example: “ 00 offset X/Y ” is displayed in the message window

1.000 is displayed in the X window

1.000 is displayed in the Y window

It indicates that the first permanent feature is a distance feature, the offset value of X is 1.000, and the offset value of Y is 1.000.

Press the **MORE**, “ Distance ” is displayed in the message window

1.414 is displayed in the X window

It indicates the distance between two points is 1.414.

5. Angle feature

Angle feature is an angle between two lines.

Example: “ 02 Angle <12 ” is displayed in the message window

45.000 is displayed in the X window

315.000 is displayed in the Y window

It indicates the first permanent feature is an angle feature, and its value is 45°.

Press **MORE**, “ <34” is displayed in the message window
135.000 is displayed in the X window
225.000 is displayed in the Y window.

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3. Basic operation

Description:

1. **Normal monitor state:**

It is a state that message window display “Current Position” or “Last Edge Cross”, and it also indicates the state of showing the message of feature after operation is finished.

3.1 Getting started

Introduction

ISP-D3000 will automatically enter self-test state when power is on. Pressing any key or waiting until self-test finished, message window display “ Move Near X RI...” if *nonlinear compensation* mode has been selected for X-axis. Move the *linear scale near* to the *RI point*, then press **ENTER** key, “Search X RI...” will be displayed in the message window. Move the *linear scale* to *RI point*, at this time, “RI Found...” is displayed in the message window, which indicate that the *RI point* of the X-axis is found. Repeat the above steps if *nonlinear compensation* mode has been selected for Y-axis. ISP-D3000 will enter *normal monitor states* after the above is finished. When ISP-D3000 works normally, it can recall the followings:

- A. The last position when power was off;
- B. ABS/ INC Mode;
- C. MM/ INCH Mode;
- D. CART/ POL Mode;
- E. EDGE/CROSSHAIRS Mode;
- F. AUTO/MANU Mode;
- G: Whether ISP-D3000 is in skew state or not.

3.2 Clear (Zero)

Function description: When ISP-D3000 is in *normal monitor state*, user can setup the current position as the *datum point*,. And the new display value will be 0.000.

Operating steps:

1. Return the *normal monitor state*;
2. Press **X₀** to reset X axis display value,
Press **Y₀** to reset Y axis display value,
Press **Q₀** to reset Z axis or Q axis' display value.

Note: (1) User can't reset display value when ISP-D3000 is in other states.
(2) User can reset display value either in INC mode or ABS mode.

- (3) If user reset in ABS mode, the value in INC mode is also reset; however, if user resets in INC mode, the value of ABS mode doesn't change.

3.3 Find midpoint

Function description: Divide the current display value by 2, then user can set datum point at the middle point of the work-piece.

Example: make *the midpoint* of work-piece to be the datum point of X-axis.

Operating steps:

1. Return the normal monitor states;
2. Place the Optical Edge Detector on one edge of the work-piece, then press **X₀**.
3. Move the Optical Edge Detector to another edge of the part, and press **1/2**; "Axis to Half" will be displayed in the message window.
4. Press **X₀** and the operation is finished.
5. Move to the point whose displayed value is 0.000, and the point is the middle of the work-piece.

Note: If you want to find *the midpoint* of Y-axis and Q-axis, press **Y₀** or **Q₀** in the step 5.

3.4 ABS/INC conversion

Function description: toggle between ABS mode and INC mode

Operating steps:

1. Return normal monitor states;
2. Press **INC/ABS** to change mode.

Note: (1) You can't set up **INC/ABS** mode before that you return the *normal monitor state*.

(2) If the light above **INC/ABS** is on, the current coordinate is INC.

3.5 Metric/Imperial conversion

Function description: toggle between *metric* mode and *imperial* mode.

Operating steps:

1. Return *normal monitor states*;
2. Press **INCH/MM** to change mode.

Note: (1) Only in the *normal monitor state*, you can change **Metric / Imperial** mode.

(2) The current working mode is *Imperial* if the light is on.

3.6 Polar/Cartesian conversion

Function description: toggle between *Polar* mode and *Cartesian*. Mode operating steps:

1. Return *normal monitor states*;
2. Press **POL/CART** to change mode.

Note: (1) Only in the *normal monitor state*, you can change **Polar/Cartesian** mode.
(2) The current working mode is *Polar* if the light is on.

3.7 EDGE/Crosshairs conversion

Function description: toggle between *Crosshairs* mode and *EDGE detect* mode.

Operating steps:

1. Return to *the normal monitor states*;
2. Press **EDGE/+** to change mode.

Note: (1) Only in the normal monitor state you can change **Edge/Crosshair** mode.
(2) The current working mode is *Edge* if the light is on.

3.8 AUTO/Manual conversion

Function description: toggle between *AUTO* mode and *Manual* mode.

Operating steps:

1. Return *normal monitor states*;
2. Press **AUTO/MANU** to change mode.

Note: (1) Only in the normal monitor state you can set **auto/manual** mode.
(2) The current working mode is *AUTO* if the light is on.
(3) When *AUTO* mode is selected, *EDGE* mode must be selected too.
If *Crosshairs* mode is selected, you must select *MANUAL* mode.

3.9 Browse message of graphical features

Function description: To browse message of graphical features.

Operating steps:

1. Return *normal monitor states*;
2. Press **↑** or **↓** to browse message of features, and message is displayed in the message window, X window and Y window.

Note: User can't browse message of features until you return *normal monitor state*.

3.10 Store operation

Function description: Save *temporary feature* or permanent feature as *permanent feature*.

Example: Save temporary feature a1 as the 12th permanent feature.

Operating steps:

1. Return *normal monitor states*;
2. Press **STORE** key, "Store: 00" is displayed in the message window;

3. Press **1**, **2**, **ENTER**, input the destine No of permanent feature ;
Message window will display a feature. Example: “ a0 Line X/Y”, and its related message is displayed in the X window and Y window; “Select Source...” is displayed in the message window;
4. Press **↑** or **↓** to browse the feature’s message which is displayed on message window, X window and Y window.
5. When user find message of a1, press **ENTER** to let a1 as source feature, then store operation is finished.

Note: (1) User can’t save features until you return the normal monitor state.

- (2) According to different actual operation, the message displayed is different in step 2 and step3.

3.11 Recall operation

Function description: Save the *permanent feature* as *temporary feature* a0.

Example: Recall the twelfth permanent feature to temporary feature a0.

Operating steps:

1. Return to *normal monitor state*;
2. Press **RECALL**, “ Recall:00” appears in the message window;
3. Press **1 2 ENTER** to input source feature No, and the content of a0 is the copy of No12 permanent feature;

Note: (1) User can’t recall features until you return *normal moratoria state*.

- (2) In step 2, the message is displayed differently according to actual operation
- (3) The destine of recall operation is *temporary feature* a0.

3.12 Printing

Function description: Print user program or all graphical features

Example 1: Print all graphical features

Operating steps:

1. Return *normal monitor state*;
2. Press **PRINT**, “Print prog” is displayed in the message window;
3. Press **↑** or **↓** until “Print Features” is displayed in the message window;
4. Press **ENTER** to print.

Example 2: Print the first user program

Operating steps:

1. Return *normal monitor state*;
2. Press **PRINT**, “Print prog” is displayed in the message window;
3. Press **ENTER**, then “Prog Num:” is displayed in the message window;

4. Press **1** to select the first user program;
5. Press **ENTER** to print.

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4. Examples for measurement

Description

1. Initializing system setup include setting up measure unit 、 selecting coordinate and annotation mode 、 the points' number of forward annotation mode needs.
2. Work-piece skewing include coordinate circle and coordinate move.
3. Introduce the circle's measure and the line's measure.

4.1 Interior system setup

If you are going to measure, please make sure that the followings have been setup.

1. Measure unit

You can use unit of *MM* or *INCH* to measure with ISP-D3000. Select a kind of unit before you begin to measure. Please refer to 3.5. The default length unit is *MM*.

2. ABS and INC coordinate

Please refer to 3.4.

3. POL and CART coordinate

POL and CART coordinate display graphics using different modes. The default coordinate system is *CART*. Refer to 3.6 if you want to change the coordinate mode. And you can change it anytime also. In *CART* system, the offset length of X and Y map on axis is displayed. In the *POL* system, a point will be explained with a length from datum point and an angle.

4. Probing method

Feature points can be probed with *crosshairs* or an optical *edge detector*. You can use auto-find-edge mode also. The default mode is crosshairs. (Refer to 3.7 and 3.8)

5. Forward or backward annotation

Selecting annotation by steps as forward:

- (1). Press **setup**, enter setup mode.
- (2). Press **↑** and **↓** to browse menu until "Annotation" is displayed.
- (3). Press **ENTER**, then "Back Annotation" is displayed.
- (4). Press **↑** or **↓** until "Forw Annotation" is displayed.
- (5). Press **ENTER**, there is a "√" before annotation mode, which means this mode is selected.
- (6). Press **FINISH** to exit. And press **FINISH** again to quit setup.

6. Angle unit setting up

Angle's unit has two mode: DD and DMS. The forward steps display selecting:

Note: DMS expresses a angle with *****□**' **"** . $1□ = 60'$, $1' = 60''$

DD expresses an angle with *****.*****□ (度数)**

- (1). Press **SETUP**, enter setup.
- (2). Press **↑** or **↓** to browse menu until “Angle Type...” is displayed.
- (3). Press **ENTER**, “DMS Angle” is displayed.
- (4). Press **↑** or **↓** until “DD Angle” is displayed.
- (5). Press **ENTER** then a “√” is displayed before the mode on the screen, which means this mode is selected.
- (6). Press **FINISH** or **QUIT** twice to exit setup state, then return normal monitor state.

7. Setting up the number of points to be probed.

If the *forward annotation* has been selected, you should set up the number of points to be sampled:

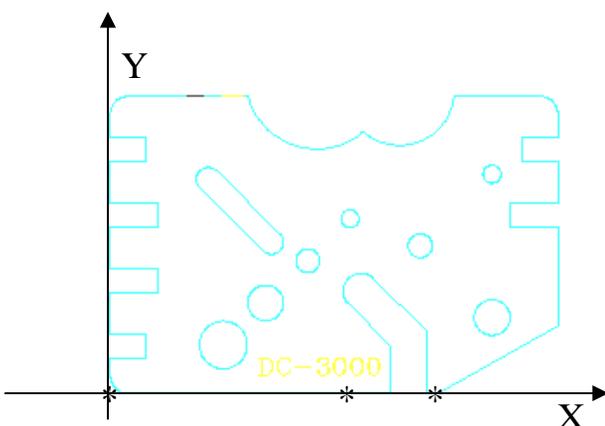
- (1). Press **SETUP** to enter setup, then “Clear...” is displayed
- (2). Press **↑** or **↓** to browse menu until “Annotation...” is displayed.
- (3). Press **ENTER** then “Back Annotation” is displayed.
- (4). Press **↑** or **↓** to browse menu until “Point Pts 01” is displayed.
- (5). Press **ENTER** and then “Value:01” is displayed.
- (6). Input the number you want to probe. For example, input **3** means that measuring a point feature needs to probe three points.
- (7). Press **ENTER**, system return “Point Pts 03” menu.
- (8). It is same to setup the number of points to get a circle feature or a line feature.
- (9). Press **FINISH** or **QUIT** twice to exit setup state, then return normal monitor state.

4.2 Skew alignment

Usually, we take it for granted that the workpiece is aligned on X axis or Y axis. An improperly aligned or “mis-skewed” workpiece will result in inaccurate measurement. It is a better choice to use skew function when user starts to measure a new workpiece.

User probes 2 – 50 points on the selected edge, then ISP-D3000 changes the display coordinate automatically. The selected edge becomes X axis or Y axis in the new coordinate.

steps:



(1). Press **SKEW**, then “Probe Line” is displayed and the light flashed.

(2). Probe three points at an edge. The sample point would be probed automatically in auto mode and by pressing **ENTER** in manual mode.

(3). Repeat the above steps to probe enough points. Press **FINISH** when enough points are sampled in forward annotation mode. User need not do press **FINISH** in backward annotation, then “X (or Y) Axis Skewed” is displayed , when the light is on but not flash. ISP-D3000

outputs display value in new coordinate through complex calculation.

(4). Press **POINT** to determine a right point on the line as *datum point*. Press **ENTER** when you select the point. If you probe enough points (you should press **FINISH** after all points are probed), the system would determine the suitable point. Then “a0 Point X/Y” is displayed, which means coordinate value of this point is displayed on the X screen and Y screen. Press **more** to get more message.

(5). Press **ORG** to set new datum point. The light would be on and “Select Point” is displayed. Then the feature probed last is displayed. (If there is no graphics, “No Feat Selected” is displayed and then quit from system). Press **↑** or **↓** to select a point or center of a circle or vertex of an angle .

(6). Press **ENTER** to determine the selected feature and then the new datum point is set.

Note:

- 1 If you want to exit the skew state, please keep pressing the **SKEW** key for about 3 second.
- 2 If you want to see the previous coordinate that had not been skewed, just press the **SKEW** key again. And press the **SKEW** key again, the ISP-D3000 will go back to the SKEW

state.

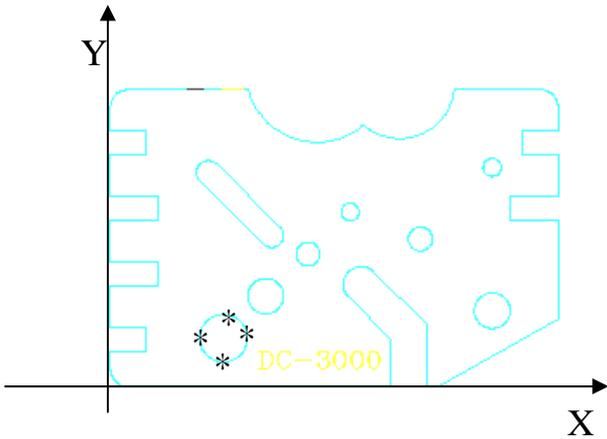
4.3 Measuring a circle

You can probe a minimum of 3 points and a maximum of 50 points when you measure a circle, the points is on the circle or around accordingly. And if you want to measure a circle preciously, you should probe at least 3 points, also the points is better to distribute uniformity on the circle. You can determine the number of points to be probed in *backward annotation*.

When you measure the circle in *forward annotation* mode, the required number points will be

displayed on LED windows. If you probe more than 3 points the system will calculate the circle with a most suitable arithmetic. The following will show you how to measure a circle in the *forward annotation* mode.

- (1). Press **CIRCLE**. Then “Probe Circle” and the number of points to be probed is displayed on LED windows. If you press **CIRCLE** again, the required number will increase with 1. (If ISP-D3000 is in *backward annotation*, the number you have probed will be displayed.)



- (2). Move the cross to the first point of circle, then press **ENTER**, the position of the point will be displayed on X window and Y window, and the number of points to be probed will decrease one.

- (3). Repeat the steps to probe next point until enough points have been probed. (If ISP-D3000 is in backward annotation, press **FINISH** after enough points have been probed. Parameters of the circle will be calculated automatically and “a0 Circle R/D” will be displayed in message window which means that

the circle is saved as temporary feature a0, and the radius is displayed in X window, diameter in Y window .

- (4). Press **MORE**, “a0 Circle X/Y” is displayed in message window. This position of the center is displayed in X window and Y window. Press **MORE** again, “a0 Circle +T/-T” is displayed which means that parameter +T is displayed in X window and –T in Y window.

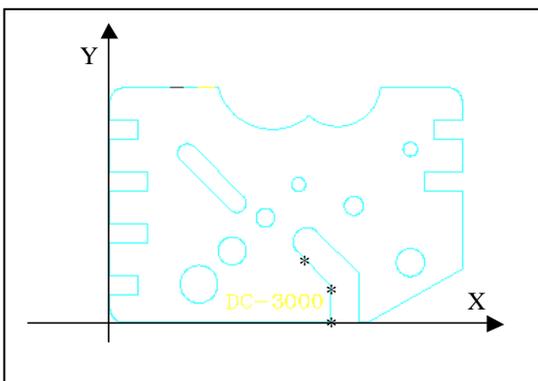
4.4 Measuring an angle

ISP-D3000 provides two methods to measure an angle: (1) to probe three points to get an angle; (2) to probe 2 lines to get an angle.

1. To probe three points to get an angle

The first sampled point is the vertex of the angle, and then measure the second and third point with *anticlockwise* direct. It is important that that the angle can't be more than 180°.

The following is the working steps:



- (1). Press **ANGLE**, then the light is on. Now prepare to measure an angle when “Probe Angle” is displayed.

- (2). Press **POINT**, then the light on **ANGLE** flash continuously which means that sampling three points to get an angle. “Probe 3 Points” is displayed on the screen.

- (3). Move the cross to the vertex of the angle and

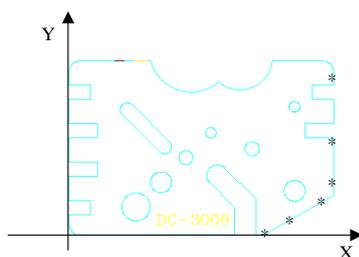
press **ENTER** to probe the first point. The position of this point is displayed on the X window and Y window. "1 Pts Probed" is displayed which means that first point is probed.

- (4). Repeat the step (3) to probe another two points with *anticlockwise* direct.
- (5). Press **FINISH** , and the measurement is completed. ISP-D3000 will calculate the angle automatic and "a0 Angle <12" is displayed in message window. The value of the angle is displayed in X window and the value of its supplementary angle is displayed in Y window.
- (6). Press **MORE** to get more message.

2. To probe 2 lines to get an angle.

User measures a first line and then measures the second with the *anticlockwise* direct. Make sure that the angle between two lines can't be more than 180°. The following is the steps:

- (1). Press **ANGLE** and then press any key except **POINT** to begin measurement. "Probe First Line" is displayed which means user is going to probe the first line. After a moment, "Probe Line 03" is displayed in *forward annotation* mode, yet "Probe 01" is displayed in *backward annotation* mode.
- (2). Move the cross to a point on the first line and press **ENTER** to probe a point. "02 More Point" is displayed which means two points left to be probed if ISP-D3000 is in the forward annotation mode. If in the backward annotation mode, "Probe 02" is displayed which means being ready to probe the second point.
- (3). Repeat the step (2) until enough points is sampled (press **FINISH** after enough points are probed in backward annotation mode), then ISP-D3000 will calculate parameters of the line based on the probed points. "Second Line" is displayed which means ISP-D3000 is ready to probe the second line.
- (4). Repeat step (2) and step (3) to probe the second line. Having probed the last point (press **FINISH** after the last point is input), ISP-D3000 will calculate parameters of the angle automatically. "a0 Angle <12" is displayed which means the measurement is over successfully. Press **MORE** to get more message.



5. Measuring and constructing features

Description

ISP-D3000 provides two modes to measure feature, *Forward annotation* measurement and *backward annotation* measurement. Because of different operation and message showing method between these two mode, we will show you how to measure feature respectively.

5.1 Measuring point feature

a. Forward Annotation Mode

Operating steps:

1. Return *normal monitor state*;
2. Press **POINT**, then “Probe Point *n*” is displayed in the message window (*n* is a number), which indicates that ISP-D3000 is waiting for next point to be sampled;
3. Moving the linear scale to the measuring point, press **ENTER**, then “*n* More Points” is displayed in the message window (*n* is a number, it will minus by 1 automatically after pressing **ENTER** every time);
4. Repeat step 3, during this operation, press **CANCEL** to delete the last entered point or press **POINT** to add a new point;
5. The measurement will be ended automatically when the sampled point number reaches the number needed, at the same time, “a0 Point X/Y” is displayed in the message window, the X coordinate of this point feature is displayed in the X window, the Y coordinate of this point is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) The number *n* in step 2 can be set up in interior setting (please refer to 7.10).

(3) Press **POINT** more times will increase the number of sample points for point feature.

(4) Press **FINISH** to end the operation.

b. Backward Annotation Mode

Operating steps;

1. Return *normal monitor state*;
2. Press **POINT**, then “Point 01” is displayed in the message window, which indicates that it is waiting for the points to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then “Point *n*” is displayed in the message window (*n* is a number, it will plus by 1 automatically after pressing

ENTER each time);

4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point ;
5. Press **FINISH** to end the measurement when the sampled points number is enough, at the same time, "a0 Point X/Y" is displayed in the message window, the X coordinate of this point feature is displayed in the X window, the Y coordinate of this point feature is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) Sample mode can be set up in interior system setting (please refer to 7.9).

5.2 Measuring line features

a. Forward Annotation Mode

Operating steps:

1. Return *normal monitor state*;
2. Press **LINE**, then "Probe Line *n*" is displayed in the message window (*n* is a number), which indicates that it is waiting for the points to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then "*n* More Points" is displayed in the message window (*n* is a number, it will minus by 1 automatically after pressing **ENTER** each time);
4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point or press **LINE** to add a sampled point;
5. The measurement will be ended automatically when sampled points is enough. At the same time, "a0 Line X/Y" is displayed in the message window. The X of the point, which is nearest to the current datum point of the line, is displayed in the X window, the Y of the point is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) The number *n* in step 2 can be set up in interior system setting (please refer to 7.11).

(3) Press **LINE** more times will increase the number of sampled points.

(4) Press **FINISH** to end the operation.

b. Backward Annotation Mode

Operating steps:

1. Return to *normal monitor state*;
2. Press **LINE**, then "Point 01" is displayed in the message window, which indicates that it is waiting for the next point to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then "Point *n*" is displayed in the message window (*n* is a number, it will plus by 1 automatically after pressing

ENTER every time);

4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point;
5. Press **FINISH** to end the measurement when the number of sampled points is enough.
At the same time, “a0 Line X/Y” is displayed in the message window, the X coordinate of the point, which is nearest to the current datum point of the line, is displayed in the X window, the Y coordinate of the point is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) Sample mode can be set up in interior system setting (please refer to 7.9).

5.3 Measuring circle feature

a. Forward Annotation Mode

Operating steps:

1. Return *normal monitor state*;
2. Press **CIRCLE**, then “Probe Circle *n*” is displayed in the message window (*n* is a number), which indicates that it is waiting for the next point to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then “*n* More Points” is displayed in the message window (*n* is a number, it will minus by 1 automatically after pressing **ENTER** each time);
4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point or press **CIRCLE** to add a sampled point;
5. The measurement will end automatically when the number of sampled points is enough, at the same time, “a0 Circle X/Y” is displayed in the message window, the X coordinate value of the circle’s center will be displayed in the X window, the Y coordinate value of this center is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) The number of sampled points can be set up in interior system setting (please refer to 7.12).

(3) Press **CIRCLE** more times will increase the number of sampled points.

(4) Press **FINISH** to end the operation.

b. Backward Annotation Mode

Operating steps:

1. Return to *normal monitor state*;
2. Press **CIRCLE**, then “Point 01” is displayed in the message window, which indicates that it is waiting for the next point to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then “Point *n*” is displayed

in the message window (n is the number, it will plus by 1 automatically after pressing **ENTER** each time);

4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point ;
5. Press **FINISH** to end the measurement when the number of sampled points is enough, at the same time, “a0 Circle X/Y” is displayed in the message window, the X coordinate value of the circle’ center is displayed in the X window, and it’s Y coordinate value is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

(2) Sample mode can be set up in interior system setting.

5.4 Measuring distance feature

a. Forward Annotation Mode

Operating steps:

1. Return to *normal monitor state*;
2. Press **DIST**, then “Probe Offset 02” is displayed in the message window, which indicates that it is waiting for the next point to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then “ n More Points” is displayed in the message window (n is a number, it will minus by 1 automatically after pressing **ENTER** each time);
4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point or press **DIST** to add a sampled point;
5. The measurement will end automatically when the number of sampled points is enough, at the same time, “a0 Offset X/Y” is displayed in the message window, the X axis’ value of distance feature is displayed in the X window, the Y axis’ value of distance feature is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

b. Backward Annotation Mode

Operating steps:

1. Return to *normal monitor state*;
2. Press **DIST**, then “Point 01” is displayed in the message window, which indicates that it is waiting for the next point to be sampled;
3. Move the linear scale to the measuring point, press **ENTER**, then “Point n ” is displayed in the message window (n is a number, it will plus by 1 automatically after pressing **ENTER** each time);
4. Repeat step 3, during this operation, press **CANCEL** to delete the last sampled point;

5. Press **FINISH** to end the measurement when the sampled points is enough, at the same time, “a0 Offset X/Y” is displayed in the message window, the distance feature’s X axis’ value is displayed in the X window, and it’s Y axis’ value is displayed in the Y window.

Note: (1) Press **QUIT** to quit the operation.

- (2) You can set to *forward annotation* mode or *backward annotation* mode in system setup. Please refer to 7.9 and 7.10.

5.5 Measuring angle feature

Measurement of angle feature refers to measuring the angle of two lines.

Operating steps:

1. Return to *normal monitor state*;
2. Press **ANGLE**;
3. Measure the first line feature (please refer to measuring line feature);
4. Measure the second line feature (please refer to measuring line feature);
5. “a0 Angle<12” is displayed in the message window after the measurement is over, which indicates the measurement is over successfully.

5.6 Measuring with measure easy

You can setup the Measure Easy in system setting if you want to measure features with measure easy. (Please refer to 7.8).

Measure Easy allow you concentrate your energy on measuring the points of a graphics. In lots of measurements, it can reduce your time and avoid many errors because of your carelessness.

The following is the basic operating routine:

1. There is one point in need if you want to measure one point only.
2. There are two or more than two points to determine a line.
3. When more than two points is probed, the system would calculate the graphics automatic base on the position of those points.

Operating steps:

1. Return to the *normal monitor state*.
2. Aim at the point you want to measure, and then press **ENTER**. “Measure Easy” is displayed which means that the system has enter the Measure Easy function.
3. Aim at the second point and press **ENTER**. “2 Pts Probed” is displayed which means two points probed.
4. Repeat the step 2 tile probing enough points and press **FINISH**.
5. “Measure Easy OK” is displayed which means the measurement is completed. The system would calculate the graphics automatic based on your points and display the

graphics.

Note:

1. You can use Measure Easy to measure point, line and circle but not angle and offset.
2. There is one point probed when you press **ENTER** to enter Measure Easy. It is wrong that thinking no point probed.
3. When you find that the data input is wrong, you can press **CANCEL** to cancel the input.
4. If you want to quit without completing, press **QUIT**.
5. Pressing **POINT** after enter Measure Easy means that you want to measure only one point in spite of you input some points. Pressing **LINE** or **CIRCLE** has the same effect as pressing **POINT**.

5.7 Measuring coordinate skew angle

Measurement of coordinate skew angle refers to measuring an edge of object workpiece, then rotate the coordinate a certain angle to let the edge be X axis of Y axis in the new coordinate system.

Operating steps:

1. Return to *normal monitor state*;
2. Press **SKEW**, the light above **SKEW** will flash;
3. Measure the line feature (please refer to measuring line feature);
4. If the operation is over successfully, "Axis Skewed" is displayed in the message window and the light above the **SKEW** will be light all the times.

Note: (1) If the operation is not over successfully, "Not Skew" is displayed in the message window.

(2) If the light above the **SKEW** is lighting (that is to say, the coordinate has been skewed), in step 2:

A. If press **SKEW** and release it immediately, ISP-D3000 will display the value of the coordinate before skew temporary, if press **SKEW** again, it will return skew state;

B. If press **SKEW** for about 3 second minutes, release the key after user hears sound "bibi", the skew will be deleted ,and you can go on a new skew.

(3) The object workpiece is skew on an edge or intend on the X axis, the Y axis' display value will be zero, else if the workpiece is skew on an edge oriented on the Y axis , the X axis' display value will be zero.

5.8 Constructing feature

Illustration

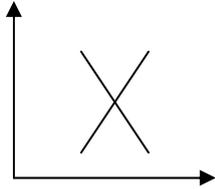
1. Constructing feature is another way to get a new feature; you can create a new feature basic on one or two existent feature.

2. Construct drawing feature tablet:

(1) To get a point

Press

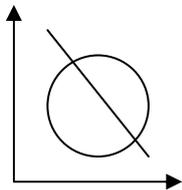
then Select



Intersection of two lines

POINT

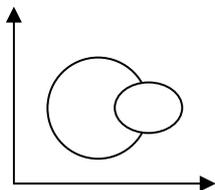
line 1 and line 2



Intersection of a line and circle

POINT

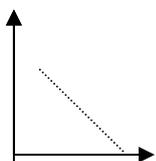
a line and a circle



Intersection of two circles

POINT

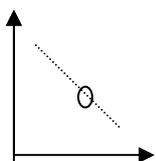
circle 1 and circle 2



Mid-point between two points

POINT

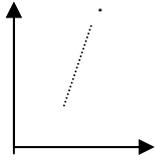
point 1 and point 2



Mid-point between a point and the center of circle

POINT

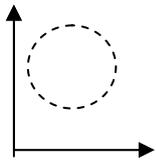
a circle and a point



An offset point

POINT

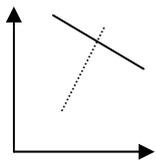
A point and a distance



Central point of a circle

POINT

a circle

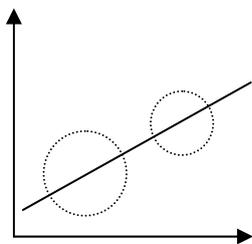


A perpendicular point

POINT

a point and a line

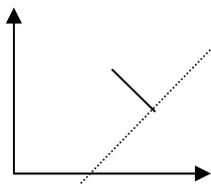
(2) To get a line



A line pass through two centers of circle

LINE

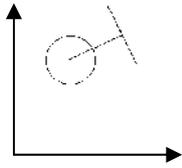
circle 1 and circle 2



A perpendicular to the line pass through the point

LINE

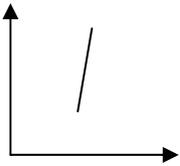
point and line



A perpendicular line to the line pass through center

LINE

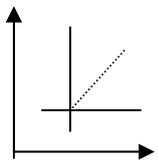
The circle and line



A line pass through two points

LINE

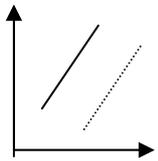
the point 1 and point 2



The bisector of angle

LINE

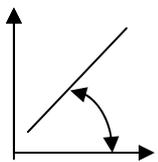
line 1 and line 2



The parallel line

LINE

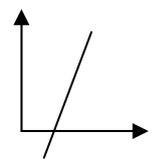
line and offset



A line pass through one point

LINE

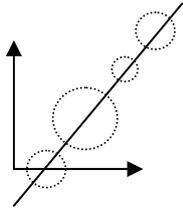
point and angle



A line pass through multi-point points

LINE

Press **↑** or **↓** key to select

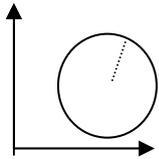


A line pass through multi-circle centers

LINE

Press \uparrow or \downarrow key to select circles

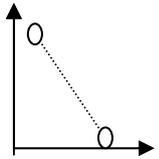
(3) To get a circle



Aciculate circle

CIRCLE

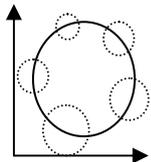
the point and a distance



Offset circle

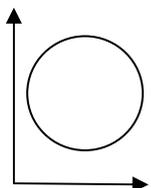
CIRCLE

the circle and a distance



A circle Constructed with multi-circle centers. Operating steps:

- i Press the **CIRCLE** key, LED will display "Probe Circle".
- ii Press \uparrow or \downarrow key to select existent circles. Remember to press the **ENTER** key when you select a circle. If a symbol of " \surd " is displayed at front of a circle feature, it means that you have selected the circle feature.
- iii Repeat step ii to select another circle feature, until you finish with pressing **FINISH** key.
- iv If the LED show you a message of "a0 Circle R/D", it means that a circle has been constructed.

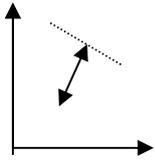


A circle constructed with multi-point points

CIRCLE

Press \uparrow or \downarrow to select existent

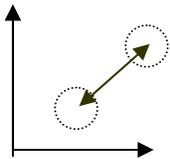
(4) Get an offset distance



A perpendicular line distance
Pass through the point

DIST

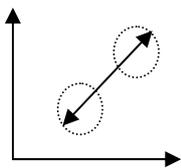
point and line



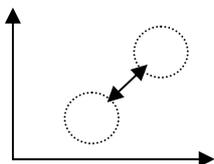
A distance between two circle centers

DIST

circle 1 and circle 2



The farthest distance between two circles.

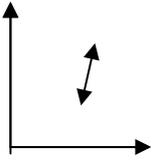


The nearest distance between two circles.

Description

The distance of two circles include:

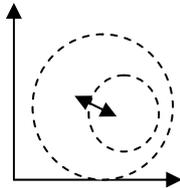
- i** Distance between two circle centers.
- ii** The most distance means the most length between two intersects, when a line pass through the two circle centers.
- iii** The least distance means the least length between two intersects, when a line pass through the two circle centers.
- iv** Accordingly, there are center distance, most distance and least distance between a point and a circle, and between a line and a circle



A distance between two points

DIST

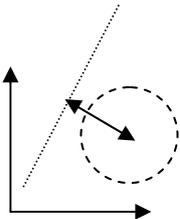
point 1 and point 2



The distance between two circle centers.
And the farthest and the nearest distance
of the two circle.

DIST

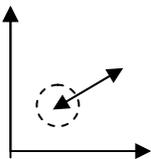
circle1 and circle 2



A perpendicular distance pass through the
circle center

DIST

line and circle



A distance between a point and a circle

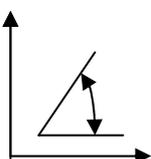
DIST

circle and point

Description

- i The center distance, farthest and the nearest distance from a point to a circle and from a line to a circle is different.
- ii The message of distance will be showed in multi LED windows, please refer to 2.10.

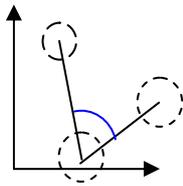
(5) *Get an angle*



The angle of two lines

ANGLE

line 1 and line 2



Take a point or a circle center as a vertex
or

ANGLE

circle1, circle2 and circle3

Point1, point2 and point3

Description

We will show you in detail how to measure and construct some particular features in the following samples.

Example 1: Construct a point feature from a1 and a5

Operating steps:

1. Return *normal monitor state*;
2. Press **POINT**, then “Point 01” is displayed in the message window;
3. Press \uparrow or \downarrow , then “a0 Point X/Y” is displayed in the message window;
4. Press \uparrow or \downarrow until “a1 Point X/Y” is displayed in the message window;
5. Press **ENTER**, then “√” is displayed at left of the string, which means that the feature has been selected;
6. Press \uparrow or \downarrow until “a5 Line X/Y” is displayed in the message window;
7. Press **ENTER**, “a0 Point X/Y” is displayed in the message window, which mean that a point feature has been constructed successfully.

Note: (1) In steps 2, the displayed message is in *Backward Annotation Mode*, and the displayed message will be “Probe point n” in *Forward Annotation mode* (n is a number).

(2) In steps 3, 4 and 6, the displayed message is the information of a0, a3 and a7, and the displayed message maybe different from this example.

(3) If you have finished the operation and the message of the constructed feature is not displayed on LED window, it means that the operation of construction is not successfully.

Example 2: Construct a line feature with C1,C,C3,C4 showed in the follow illustration.

Operating steps:

1. Return *normal monitor state*;
2. Press **CIRCLE** to measure the first circle C1. Please refer to 5.3
3. Repeat step 2, to measure C2,C3,C4 in turn.

4. Press **LINE**, LED then will show a message of “Point 01”

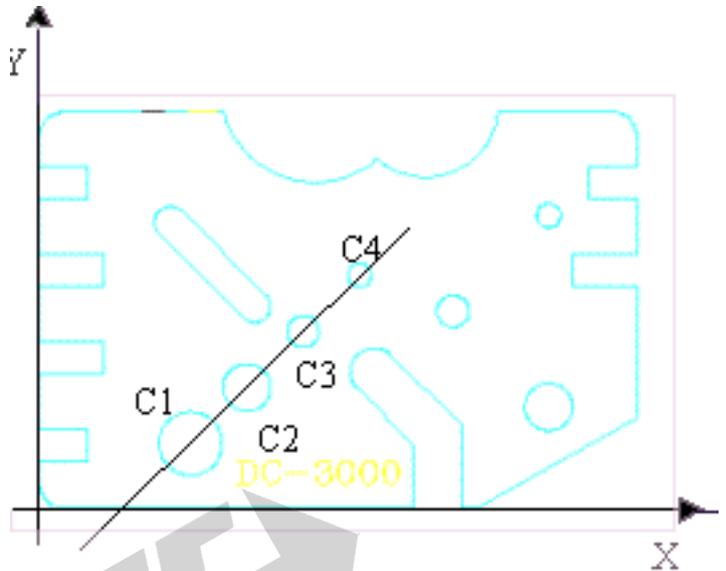
5. Press \uparrow or \downarrow , until LED display “a0 Circle R/D”;

6. Press **ENTER**, then “√” is displayed

at left of the LED window, which means that the feature has been selected.

7. Repeat step 5 and step 6, to select the last measured circles in turn.

8. Press **ENTER**, “a0 Line X/Y” is displayed on LED window, which means that a line feature is constructed successfully.



Note: (1) In step 2, the message displayed is in *Backward Annotation Mode*, and the displayed message will be “Probe point *n*” in *Forward Annotation mode* (*n* is a number).

(2) In steps 3, 4 and 6, the showing message is of the a0 a3 and a7, and the message displayed maybe different from this example.

(2) In steps 3, 4 and 6, the showing message is of the a0 a3 and a7, and the message displayed maybe different from this example.

Example 3: Construct a distance feature from C1 and C2 showed in the follow illustration.

Operating steps:

1. Return *normal monitor state*;

2. Press **CIRCLE** to begin measure the first circle C1. Please refer to 5.3.

3. Repeat step 2 to measure C2.

4. Press **DIST**, LED then display “Probe Offset 02”, means to wait you enter a feature.

5. Press \uparrow or \downarrow , then “a0 Circle R/D” is showed, it is the last measured feature C2.

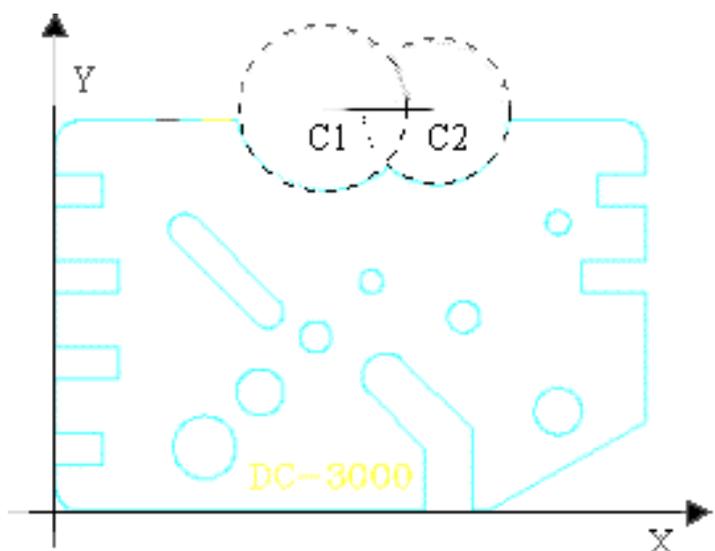
6. Press **ENTER**, then “√” is displayed

at left of LED window, which means that the feature is

selected;

7. Repeat step 4 and step 5 to select C2.

8. Press **FINISH** to finish. The

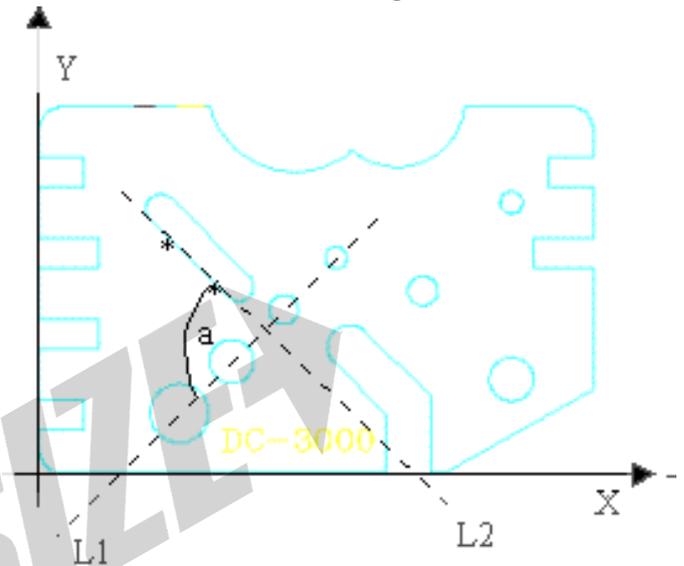


LED will show a message of “a0 Distance X/Y”, it means the distance feature has been constructed successfully.

Example 4: It is showed in the follow illustration that L1 pass through the centers of C1, C2, C3 and C4, and L2 pass through two points. We will construct the angle of these two lines.

Operating steps:

1. Refer to example 2, measure the line L1.
2. Refer to 5.2, measure feature L2.
3. Press **ANGLE**, then press any key Except the **POINT** key
4. Press \uparrow or \downarrow to select L1, L2.
5. Press **FINISH** to finish operating, if successfully, LED will display a message of “a0 Angle <12...”.



6. Preset feature

6.1 Getting started

Operating steps:

1. Go to *normal monitor state*;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you are going to preset features value.

Description

The features that preset are *temporary features*.

6.2 Presetting the current coordinate position

Function description: Preset the data value according to current position when DRO is in normal

monitor state.

Example: Preset 12.324 to the display value of current position of X-axis

Operating steps:

1. Return *normal monitor state*;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you just being to preset
3. Press **X0**;
4. Press **1 2 . 3 2 4 +/-** in turns ,the preset value will be -12.324 ;
5. Press **ENTER** to confirm the inputting value. Then the value -12.324 is displayed in X window, which means that the operation is successfully.

Note: (1) User can press **CANCEL** to cancel the last preset value or press **QUIT** to cancel the preset operation .

(2) If you want to preset the current position of Y-axis or Q-axis, just press **Y0** or **Q0** in step 3.

6.3 Presetting point feature

Function description: To get a point feature

Example: Preset a point feature, its coordinate is (1.234, -5.678)

Operating steps:

1. Return normal monitor state;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you have entered the preset operation;
3. Press **POINT**, then “X 0.000” appears in the LED window;
4. Press **1 . 2 3 4** in turns to input X axis' value;
5. Press **ENTER**, then “Y 0.000” appears in the message window;
6. Press **5 . 6 7 8** and **+/-** in turns, input Y axis value;
7. Press **ENTER** to confirm the above operation, then “a0 point X/Y” appears in the message window, 1.234 appears in the X window, -5.678 appears in the Y window, which means that the preset operation is successfully.

6.4 Presetting line feature

Function description: To get one line feature

Example: Preset a line feature, which pass through the point (1.234, -5.678), and its angle is 45° .(Between X axis position direction and the line);

Operating steps:

1. Return *normal monitor state*;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you are going to preset line;
3. Press **LINE**, then “X 0.000” appears in the message window;
4. Press **1** **·** **2** **3** and **4** in turn, input the point’s X axis’ value;
5. Press **ENTER**, then “Y 0.000” appears in the message window;
6. Press **5** **·** **6** **7** **8** and **+/-** in turn, input the point’s Y axis’ value;
7. Press **ENTER**, then “<: 0.000” appears in the message window;
8. Press **4** and **5** in turn;
9. Press **ENTER**, then “a0 point X/Y” appears in the message window, 3.456 appears in the X window, 3.456 appears in the Y window, which mean that the operation is over successfully.

- Note:** (1) During presetting line feature, ISP-D3000 will ask you to input the data value of a point that is in the line (showed in step 3 and step 5). ISP-D3000 does not record the coordinate of the point, however it records the point which is nearest to the datum point. So the displayed coordinate value maybe not the same as the coordinate value you input, yet it represent the same line.
- (2) Press **MORE** to toggle between the point information and the angle information after the preset operation has finished successfully.

6.5 Presetting circle feature

Function description: To get a circle feature

Example: Preset a circle feature, whose central point is (1.234, -5.678), and its radius is 2.000.

Operating steps:

1. Return *normal monitor state*;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you are going to preset circle;
3. Press **CIRCLE**, then “R: ” appears in the message window;
4. Press **2**, input radius;
5. Press **ENTER**, then “X 0.000” appears in the message window;
6. Press **1** **·** **2** **3** and **4** in turn, input central point X axis’ display value;
7. Press **ENTER**, then “Y 0.000” appears in the message window;
8. Press **5** **·** **6** **7** **8** and **+/-** in turn, input central point Y axis’ display value;
9. Press **ENTER**, then “a0 Circle X/Y” appears in the message window, 1.234 appears in the X window, -5.678 appears in the Y window, which means that the operation has finished successfully.

Note: (1) Press **MORE** to toggle between the center information and the diameter information or radius after the preset operation is over successfully.

6.6 Presetting distance feature

Function description: To get an distance feature

Example: Preset an distance feature, which offset value of X-axis is 1.234, and its offset value of Y-axis is -5.678.

Operating steps:

1. Go to *normal monitor state*;
2. Press **PRESET**, then “Axis to Preset” appears in the message window, which means that you are going to preset offset;
3. Press **OFFSET**, then “X 0.000” appears in the message window;
4. Press **1** **.** **2** **3** and **4** in turn, input X axis’ offset value;
5. Press **ENTER**, then “Y 0.000” appears in the message window;
6. Press **5** **.** **6** **7** **8** and **+/-** in turns, input Y axis’ offset value;
7. Press **ENTER**, then “a0 Offset X/Y” appears in the message window, 1.234 appears in the X window, -5.678 appears in the Y window, which mean that the operation is over successfully.

6.7 Presetting angle feature

Function description: To get an angle feature

Example: Preset an angle feature, whose angle is 45°.

Operating steps:

1. Return *normal monitor state*;
2. Press **ENTER**, then “Axis to Preset” is displayed in the message window, which means that you are going to preset angle;
3. Press **ANGLE**, then “<: 0.000” is displayed in the message window;
4. Press **4** and **5** in turn, input angle’s value;
5. Press **ENTER**, then “a0 Angle <12” is displayed in the message window, 45.000 is displayed in the X window, 315.000 is displayed in the message window, which mean that the operation is over successfully.

Note: (1) If you have preset an angle feature successfully, you can see the angle in 4 ways ($\angle 1$, $\angle 2$, $\angle 3$ and $\angle 4$):

$\angle 1$ =the inputted angle

$\angle 2$ = $180^\circ - i$

$\angle 3$ = $180^\circ + i$

$\angle 4$ = $360^\circ + i$

If the angle's value exceed the range $0^{\circ} \sim 360^{\circ}$, the system will convert the angle value to suit the range automatically.

- (2) Press **MORE** to convert between <12 and <34 after the preset operation is over successfully.

6.8 Presetting the coordinate skew angle's value

Function description: Skew the axis with the preset angle value

Example: Skew the X-axis with 15° in anti-clockwise

Operating steps:

1. Return the *normal monitor state*;
2. Press **ENTER**, then "Axis to Preset" is displayed in the message window, which means that you are going to preset skew angle;
3. Press **SKEW**, then "Skew: 0.000" is displayed in the message window;
4. Press **1** and **5** in turns, input skew angle's value;
5. Press **ENTER**, then program will return normal monitor state, the indicator light above **SKEW** is on, which means that the operation is over successfully.

Note:

- (1) If $45^{\circ} < \alpha < 90^{\circ}$, skew the Y-axis by $(90^{\circ} - \alpha)$ in clockwise;
 - (2) If $135^{\circ} > \alpha > 90^{\circ}$, skew the Y-axis by $(\alpha - 90^{\circ})$ in anti-clockwise;
 - (3) If $45^{\circ} > \alpha > 0^{\circ}$, skew the X-axis by $(-\alpha)$ in anti-clockwise;
 - (4) If $135^{\circ} < \alpha < 180^{\circ}$, skew the X-axis by $(-\alpha)$ in clockwise;
 - (5) The range of α is $0^{\circ} \sim 180^{\circ}$.
- (Note: α = the inputted angle's value)

6.9 Presetting datum point

Function description: To preset a new datum point

Example:

Operating steps:

1. Return *normal monitor state*;
2. Press **ORG**, then "Select a point" is displayed in the message window, which means that you are going to preset the datum point;
3. Press **↑** or **↓** to find a *temporary features* or a *permanent feature* to be set as the datum point;
4. Press **ENTER**, then program return *normal monitor state* and the new datum point was set at the new position.

Note: 1. Presetting a new datum point will cause the coordinate to move, which will change all the feature's value that are relative to point value, such as the point, the circle

center and the vertex of an angle.

2. The selected feature must include the point feature, such as the point, the circle and the angle etc. The line feature also includes the point feature, however, you can't use a line to preset a new datum point in this case.
3. If there is no feature to select, the LED window will show you "No feature". And you can't select a feature to preset a new datum point.

←INSIZE→

7. Interior system setting

Function

To make ISP-D3000 to work normally, you should set up all parameters in system setting according to the mounting of linear scale and ISP-D3000.

Description

1. When finishing a parameter setting, you should press **QUIT** all along, until return to the *normal monitor state*, otherwise you can't do the other operation.
2. Interior system setting's contents and tablet layer:

Clear...

- | | |
|-------------------|---------------------------------------|
| Clr Temp. Feat. ? | Clear all <i>temporary features</i> |
| Clr Perm. Feat. ? | Clear all <i>permanent features</i> |
| Clr All Prog. ? | Clear all <i>user programs</i> |
| Clr Prog. ? | Clear one <i>special user program</i> |

Angle Type...

- | | |
|-----------|--|
| DMS Angle | Use <i>degree, minutes and second(DMS)</i> format to describe an angle |
| DD Angle | Use <i>decimal degree</i> format to describe an angle |

Annotation...

- | | |
|-----------------|---|
| Back Annotation | Use <i>Back Annotation_Mode</i> to measure features |
| Forw Annotation | Use <i>Forward Annotation_Mode</i> to measure features |
| Point Pts 01? | Set the required number points when measuring a point feature,
Use only in <i>Forward Annotation</i> measurement |

- | | |
|--------------|--|
| Line Pts 02? | Set the required points when measuring a line feature,
Used only in <i>Forward Annotation</i> measurement |
|--------------|--|

- | | |
|----------------|---|
| Circle Pts 03? | Set the required number points when measuring a circle feature,
Used only in <i>Forward Annotation</i> measurement |
|----------------|---|

Axis Direction...

- | | |
|---------------|-----------------------------------|
| Reverse X: NO | Set the count direction of X-axis |
| Reverse Y: NO | Set the count direction of Y-axis |
| Reverse Q: NO | Set the count direction of Q-axis |

Print I/F...

- | | |
|--------|--|
| Centro | Set the printer port as Centronic port |
| RS232 | Set the printer port as RS232 port |

Baud Rate...

- | | |
|------|----------------------------|
| 4800 | Set the baud rate of RS232 |
|------|----------------------------|

9600
19200
28800

Super...

Auto Setup Reset the system. The default parameters value will be set.

Encoder Res...

X Resolution? Set up the *Encoder Resolution* of linear scale X-axis

Y Resolution? Set up the *Encoder Resolution* of linear scale Y-axis

Q Resolution? Set up the *Encoder Resolution* of linear scale Q-axis

Compensation...

X Linear Comp. Set X-axis *Linear Compensation* mode

X RI Mode: Low Set X-axis *RI polarity* (To be used in the *nonlinear compensation*

setup)

X Segment Comp. Set up X-axis *nonlinear compensation* mode

Y Linear Comp. Set up Y-axis *linear compensation* mode

Y RI Mode: Low Set up the *RI polarity* of Y-axis (To be used in the nonlinear
compensation setup)

Y Segment Comp. Set up Y-axis *Segment Compensation* mode

X Compensation? Set up the *compensation value* of X-axis

Y Compensation? Set up the *compensation value* of Y-axis

Q Compensation? Set up the *compensation value* of Q-axis

Prog Lock: NO Set up to lock the relative operation of *user program* or not

Prescale? Set up the *prescale coefficient*

7.1 Getting started

Operating steps:

1. Return to *normal monitor state*;
2. Press **SETUP**, then “clear” appears in the message window, means that ISP-D3000 is going to the system setup status;

7.2 Clear all temporary features

Operating steps:

1. Press **SETUP** until the LED display “Clear”;
2. Press **ENTER** key to go to the *clear function list*, then “Clr Temp. Feat. ?” appears in the message window;
3. Press **ENTER** to confirm to clear temporary features, then “Are You Sure?” appears in the message window;

4. Press **ENTER**, then “Completed” appears in the message window, which mean that the operation is finished. At the same time, the system will return to the “Clr Temp. Feat. ?” function list state.

7.3 Clear all permanent features

Operating steps:

1. Go to the setup state, LED will display “Clear”;
2. Press **ENTER**, then “ Clr Temp. Feat.” appears in the message window;
3. Press **↑** or **↓** to browse the function list until “Clr Perm. Feat. ?” appears in the message window;
4. Press **ENTER**, then “Are You Sure?” appears in the message window;
5. Press **ENTER**, then “Completed” appears in the message window, which means that the operation is finished, at the same time, the system will return the “Clr Perm. Feat. ?” function list.

7.4 Clear all user programs

Operating steps:

1. Press **SETUP** key, then LED display “Clear” message;
2. Press **ENTER**, then “ Clr Temp. Feat. ?” appears in the message window;
3. Press **↑** or **↓** to browse the function list until “Clr All Prog.?” appears in the message window;
4. Press **ENTER**, then “Are You Sure?” appears in the message window;
5. Press **ENTER**, then “Completed” appears in the message window, which means that the operation is finished, at the same time, the system will return the “Clr All Prog. ?” function list.

7.5 Clear one special user program

Example: Delete the second user program

Operating steps:

1. Go to the system setup state, LED will display “Clear” message;
2. Press **ENTER**, then “ Clr Temp. Feat.” appears in the message window;
3. Press **↑** or **↓** to browse the function list until “Clr Prog.?” appears in the message window;
4. Press **ENTER**, then “Prog Num?” appears in the message window;
5. Press **2** to enter numeric 2;
6. Press **ENTER** to delete the second user program, then “Completed” appears in the

message window, which mean that the operation is finished. At the same time, the system will return the “Clr Prog. ?” function list.

7.6 Setting up Measure Easy

Operating steps:

1. Press **SETUP** to go to the setup status;
2. Press **↑** or **↓** to browse tile “Measure Easy ...” is displayed;
3. Press **ENTER**, and then “Measure Easy: Dis” is displayed;
4. Press **ENTER** then “Measure Easy: Ena”. is displayed which means that *Measure Easy* is open. If you want to cancel the setup, press **CANCEL** and then “Measure Easy: Dis” is displayed which means that *Measure Easy* is close;
6. Press **FINISH** and then **QUIT** to complete the setup and quit the setup status.

7.7 Setting up angle format to DMS

Operating steps:

1. Go to the setup status;
2. Press **↑** or **↓** to browse function list until “Angle Type...” appears in the message window;
3. Press **ENTER**, then “DMS Angle” appears in the message window;
4. Press **↑** or **↓** to browse function list until “DMS Angle” appears in the message window;
5. Press **ENTER**, then “√” appears at left of the string, which mean that you have selected this angle notation format.

Note: in DMS format, use “***' **' ***” to describe an angle.

7.8 Setting up degree format to DD

Operating steps:

1. Go to the setup status;
2. Press **↑** or **↓** to browse function list until “Angle Type...” appears in the message window;
3. Press **ENTER**, then “DMS Angle” appears in the message window;
4. Press **↑** or **↓** to browse function list until “DD Angle” appears in the message window;
5. Press **ENTER**, then “√√” appears at left of the message string which mean that you have selected this angle notation.

Note: in DD format, use “***.***” format to describe an angle.

7.9 Setting up to use Backward Annotation Mode

Operating steps:

1. Go to the setup status;
2. Press **↑** or **↓** to browse function list until “Annotation...” appears in the message window;
3. Press **ENTER**, then “Back Annotation” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Back Annotation” appears in the message window;
5. Press **ENTER**, then “√” appears at left of the message string, which mean that you have selected this annotation mode.

7.10 Setting up to use Forward Annotation Mode

Operating steps:

1. Go to the setup state;
2. Press **↑** or **↓** to browse function list until “Annotation...” appears in the message window;
3. Press **ENTER**, then “Back Annotation” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Forw Annotation” appears in the message window;
5. Press **ENTER**, then “√” appears, which mean that you have selected this annotation mode.

7.11 Setting up the number points of measuring a point feature

Example: Measure three points to get a point feature

Operating steps:

1. Go to the setup status;
2. Press **↑** or **↓** to browse function list until “Annotation...” appears in the message window;
3. Press **ENTER**, then “Back Annotation” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Point Pts 01?” appears in the message window;
5. Press **ENTER**, then “Value:01” appears in the message window;
6. Press **3** to input numeric 3;
7. Press **ENTER** to confirm and return the “Point Pts 03?” function list.

7.12 Setting up the number points of measuring a line feature

Example: Measure points to get a line feature

Operating steps:

1. Go to the setup status;

2. Press **↑** or **↓** to browse function list until “Annotation...” appears in the message window;
3. Press **ENTER**, then “Back Annotation” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Line Pts 02?” appears in the message window;
5. Press **ENTER**, then “Value:02” appears in the message window;
6. Press **3** to input numeric 3;
7. Press **ENTER** to confirm and return the “Line Pts 03?” function list.

7.13 Setting up the number points of measuring a circle feature

Example: Measure 4 points to get one circle feature

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until “Annotation ...” appears in the message window;
3. Press **ENTER**, then “Back Annotation” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Circle Pts 03?” appears in the message window;
5. Press **ENTER**, then “Value: 03” appears in the message window;
6. Press **4** to input numeric 4;
7. Press **ENTER** to confirm and return the “Circle Pts 04?” function list.

Note: After the number of sample point has been set up, you can add the point temporarily during measuring one circle feature (please refer to 6.1, 6.2, 6.3).

7.14 Setting up the count direction of one special axis

Example: change the count direction of X-axis

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until “Axis Direction...” appears in the message window;
3. Press **ENTER**, then “Reverse X: YES” or “Reverse X: NO” appears in the message window;
4. Press **↑** or **↓** to browse function list until “Reverse X: YES” or “Reverse X:NO” appears in the message window;
5. Press **CANCEL** if “Reverse X: YES” appears in the message window in step 4;
Press **ENTER** if “Reverse X: NO” appears in the message window in step 4.

Note: If you want to reverse the direction of Y-axis, in step 4, you should press **↑** or **↓** to

browse the function list until “Reverse Y:YES” or “Reverse Y:NO” appears in the message window.

7.15 Resetting ISP-D3000's all parameter

Operating steps:

1. Enter setup status;
2. Press \uparrow or \downarrow to browse function list until “Super...” appears in the message window;
3. Press **ENTER**, then “Password:” appears in the message window;
4. Input the password “332” correctly;
5. Press **ENTER**.
6. Press \uparrow or \downarrow to browse function list until “Auto Setup” appears in the message window;
7. Press **ENTER**, then “Password:” appears in the message window;
8. Input password correctly;
9. Press **ENTER**, now ISP-D3000 begins to reset all parameter, then “Initial Starting” “Please Waiting” is displayed in the message window in turn, program will return the “Auto Setup” function list after Resetting is over.

Note: The operate of resetting ISP-D3000's includes the followings:

1. ABS zero
2. INC zero
3. The *Resolution* of X-axis and Y-axis are 1μ , the *Resolution* of Q-axis is 10μ or 0.01° , *Linear Compensation* value is 0.000000, the prescale coefficient is 1.000000.
4. The printer port is Centronic, the *Baud Rate* of RS232 is 9600bps, the angle display format is DD Angle, and the measurement mode is *Backward Annotation*.
5. The X-axis and Y-axis are of *linear compensation* mode.
6. All features and user programs are clear.

7.16 Setting up axes' encoder resolution

Example: Set the resolution of X-axis to 5μ

Operating steps:

1. Enter setup status;
2. Press \uparrow or \downarrow to browse function list until “Super...” is displayed in the message window;
3. Press **ENTER**, then “Password:” is displayed in the message window;
4. Enter the password: 332
5. Press **ENTER**;
6. Press \uparrow or \downarrow to browse function list until “Encoder Res ...” is displayed in the message window;

7. Press **ENTER**, then “X Resolution?” is displayed in the message window;
8. Press **↑** or **↓** to browse function list until “X Resolution?” is displayed in the message window;
9. Press **ENTER**, then “Value:0. 001000” is displayed in the message window;
10. Press **0** **.** **0** **0** **5** to input new resolution for X axis ;
11. Press **ENTER**, confirm new resolution for X axis, then program will return the “X Resolution” function list.

Note: (1) If user want to set the Encoder Resolution of Y-axis and Q-axis, please repeat the above steps, and in step 8 press **↑** or **↓** until “Y Resolution?” or “Q Resolution?” is displayed in the message window.

(2) The Encoder Resolution range of X-axis and Y-axis are from 0.1 μ to 10 μ (0.0001, 0.0002, 0.0005, 0.001, 0.002, 0.005, 0.01). The resolution of Q-axis is from 0.0001° to 0.1° or from 0.1 μ to 100 μ .

7.17 Setting up compensation mode

Example: Set X-axis *nonlinear compensation* mode

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until “Super...” is displayed in the message window;
3. Press **ENTER**, then “Password:” is displayed in the message window;
4. Enter the password: 332
5. Press **ENTER**;
6. Press **↑** or **↓** to browse function list until “Compensation...” is displayed in the message window;
7. Press **ENTER**, then “X Linear Comp.” is displayed in the message window;
8. Press **↑** or **↓** to browse function list until “X Segment Comp.” is displayed in the message window;
9. Press **ENTER**, then “ $\sqrt{\quad}$ Segment Comp.” is displayed which mean that you have selected *nonlinear compensation* mode.

Note: (1) The default compensation mode of axes is *linear compensation*.

- (2) If you want to set the Y-axis *nonlinear compensation* mode, in step 8, Press **↑** or **↓** to browse function list until “Y Segment Comp.” is displayed in the message window;
- (3) You should set the *nonlinear compensation* parameters if you select *nonlinear compensation* mode.

7.18 Setting up the linear compensation

Example: set the X axis' *linear compensation's* value 0.00005

Operating steps:

1. Enter setup status;
2. Press \uparrow or \downarrow to browse function list until "Super..." is displayed in the message window;
3. Press **ENTER**, then "Password:" is displayed in the message window;
4. Enter password correctly; password: 332
5. Press **ENTER**, enter super setup status;
6. Press \uparrow or \downarrow to browse function list until "Compensation..." is displayed in the message window;
7. Press **ENTER**, then "X Linear Comp." is displayed in the message window;
8. Press \uparrow or \downarrow to browse function list until "X Compensation?" is displayed in the message window;
9. Press **ENTER**, then "Value:0. 000000" is displayed in the message window;
10. Press **0** **.** **0** **0** **0** **0** **5** in turns to input compensation's value;
11. Press **ENTER**, confirm the input value, then program return the "X Compensation?" function list.

Note: (1) This setup can compensate the error between the measuring value and the standard value.

(2) These are the operating steps in the linear compensation used to the axes.

(3) If you want to set the compensation value of Y-axis, in step 8 Press \uparrow or \downarrow to browse function list until "Y Compensation?" is displayed in the message window;

(4) Calculation of the linear compensation value:

$$\text{Linear compensation value} = \frac{\text{Measure value} - \text{standard value}}{\text{Standard value}}$$

7.19 Setting up the nonlinear compensate

Example: Set up the nonlinear compensative value of X axis

Operating steps:

1. Enter setup status;
2. Press \uparrow or \downarrow to browse function list until "Super..." is displayed in the message window;
3. Press **ENTER**, then "Password:" is displayed in the message window;
4. Enter password correctly; password: 332
5. Press **ENTER**, now enter super setup status;
6. Press \uparrow or \downarrow to browse function list until "Compensation..." is displayed in the message window;

7. Press **ENTER**, then “X Linear Comp.” is displayed in the message window;
8. Press **↑** or **↓** to browse function list until “X Compensation?” is displayed in the message window;
9. Press **ENTER**, then “Move Near RI” is displayed in the message window;
10. Move the linear scale near to the RI point, then press the **ENTER**, “Search RI...” is displayed in the message window.
11. Move the linear scale to search RI point. After RI is found, “RI Found ...” “node 00:000” are displayed in the message window, which indicates that ISP-D3000 is waiting for your to input value of the first compensation point.
12. Enter the standard value of each compensation point. The number of sample points is from 2 to 100.
13. Press **FINISH** when the entering of compensation point is finished, “Finished ...” is displayed in the message window, and program will return the “X Compensation?” function list.

- Note:** (1) This setup can compensate the error between the measuring value and the standard value.
- (2) In *nonlinear compensation* mode, user must setup up *nonlinear compensation* parameters.
- (3) If you want to set up the compensation value of Y-axis, in step 8 Press **↑** or **↓** to browse function list until “Y Compensation?” is displayed in the message window;
- (4) When you input the compensative value of one certain point, you must select the sample points from one port to another of the axis in sequence, and it is best that its direction is the same as the count direction of the axis.

7.20 Setting up to lock or unlock the user programs

Example: Lock the user programs

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until “Super...” is displayed in the message window;
3. Press **ENTER**, then “Password:” is displayed in the message window;
4. Enter password correctly; password: 332
5. Press **ENTER**, now user enter super setup;
6. Press **↑** or **↓** to browse function list until “Prog Lock:NO” is displayed in the message window;
7. Press **ENTER**, then “Prog Lock:YES” is displayed in the message window, which mean that the user programs is locked.

Note: (1) After the user program is locked, the user programs can't be recorded and edited, you can only view or run the programs.

(2) Unlock the user program:

1. The 1-5 steps are the same as the lock steps.
2. In step 6, the display of message window is "Prog Lock: YES".
3. In step 7, press **CANCEL**, then "Prog Lock:NO" is displayed in the message window, which means that the user programs is unlocked.

7.21 Setting up the prescale coefficient

Example: set up the prescale coefficient equal to 1.00005

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until "Super..." is displayed in the message window;
3. Press **ENTER**, then "Password:" is displayed in the message window;
4. Enter password correctly;
5. Press **ENTER**, now user enter super setup status;
6. Press **↑** or **↓** to browse function list until "Prescale" is displayed in the message window;
7. Press **ENTER**, then "Value: 1. 000000" is displayed in the message window;
8. Press **1** **.** **0** **0** **0** **0** **5** in turns to input data 1.0005;
9. Press **ENTER**, confirm 1.0005 is the right value, then the system return the "Prescale?" function list.

Note: (1) The calculation of *prescale coefficient*:

$$\text{Presales coefficient} = \frac{\text{displayed value}}{\text{actual value}}$$

7.22 Setting up printer port

Example: Set printer port as **RS232** interface

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until "Printer I/F" appears in the message window;
3. Press **ENTER**, then "Centronic" appears in the message window;
4. Press **↑** or **↓** to browse function list until "RS232" appears in the message window;
5. Press **ENTER**, then "√RS232" appears which mean that you have selected this item.

Note: (1) The default printer port is **Centronic**.

(2) If you want to set the printer port as **Centronic** interface, in step 4, you should

browse the function list until “Centronic” appears in the message window.

7.23 Setting up RS232 format

Example: Set up the transmit mode to pack BCD format.

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse function list until “Super...” appears in the message window;
3. Press **ENTER**, then “Password:” appears in the message window;
4. Enter the correct password “332”.
5. Press the **ENTER** key.
6. Press **↑** or **↓** to browse function list until “RS232 FORMAT...” appears in the message window;
7. Press **ENTER** key.
8. Press **↑** or **↓** key until LED display “Pack BCD Code”.
9. Press **ENTER**, then “√” appears at left of LED window, it means that you have selected the pack BCD format.

Note: (1) If you want to set to ASCII format, just repeat above steps, and in step 8 select “ASCII Character”.

(2) In step 9, you will finish setting.

7.24 Setting up use format of RS232

Example: Set the baud rate of RS232 19200bs.

Operating steps:

1. Enter setup status;
2. Press **↑** or **↓** to browse until “Baud Rate...” is displayed.
3. Press **ENTER**, and then “4800” is displayed.
4. Press **↑** or **↓** until “19200” is displayed.
5. Press **ENTER**, then “√19200” is displayed, it means that you have selected the baud rate.

Note:

(1) The default baud rate of RS232 is 9600bps.

(2) If you want to set the baud rate of RS232 to another value, in step 4, just select the baud rate format that you want.

8. Creating, running and editing user program

Description

1. Special key

Special key are the keys, which cannot be inputted from the panel when user create or edit user program. For instance, when user program is edited, it needs inputting **QUIT** in the middle of the key series, if the **QUIT** is inputted from the keypad, it will result in quitting the user program edition instead of inputting **QUIT** successfully.

2. Special key options

- (1) **Finish Record?** It indicates that the inputted *user program* is accepted, a new *user program* is created at the same time and ISP-D3000 exits the *user program create state*.
- (2) **Quit Record?** It indicates the user program inputted is not accepted, a new *user program* is not created and then ISP-D3000 exits the *user program creating state*.
- (3) **Run Prog?** It indicates another *user program* is invoked by the *current user program*.
- (4) **Finish?** It indicates **FINISH** key is inserted before the current *editing position*.
- (5) **Quit?** It indicates **QUIT** key is inserted before the current *editing position*.
- (6) **Cancel?** It indicates **CANCEL** key is inserted before the current *editing position*.
- (7) **Up?** It indicates a ↑ is inserted before the current *editing position*.
- (8) **Down?** It indicates a ↓ is inserted before the current *editing position*.
- (9) **Wait Enter?** It indicates a state waiting for **ENTER** to be inputted from the panel, and the state is inserted before the current *editing position*.
- (10) **Wait Finish?** It indicates a state of waiting for **FINISH** to be inputted from the keypad, and the state is inserted before the current *editing position*.

- Note:**
1. (1), (2) and (3) of Special Key options are used in *creating new user program*, (3), (4), (5), (6), (7), (8), (9) and (10) are used to *edit user program*.
 2. (9) and (10) are only used to *edit user program* which are relative to the measuring operation.
 3. User must return to the *normal monitor states* when the special key (3) is selected.

8.1 Creating user program

Example 1: Create the 0th user program to accomplish the following functions.

This example will show you how to create a program which measure a *point feature* with “n” points.

(“n” is a numeric number, if use of *forward annotation* format, to set n value in internal system, if use of *backward annotation* also set n value in internal system)

The key index:

0	Program
1	0
2	Point
3	Enter?
4	Enter?
5	Enter? (this index key examples describe a measurement of one point from 3 points. There are n points. There are n “Enter?”)
6	Store
7	1
8	Enter
9	Enter
10	End

Operating steps:

1. Return *normal monitor state*;
2. Press **PROG**, then “Run Program?” appears in the message window;
3. Press **↑** or **↓** until “Record Program?” appears in the message window;
4. Press **ENTER** then “Prg Num:” appears in the message window;
5. Press **0** to input **No 0 user program**;
6. Press **ENTER**, then the light above the key is flashing, means that it is in state of creating new *user program*, and all valid inputted keys (until the recording is finish) will be saved;
7. Press **POINT**, then press **ENTER** for **3** times, at last press **STORE**, **1**, **ENTER** and **ENTER** in turns, the point feature is saved as **No 1** permanent feature.
8. Press **PROG**, then “Special Key?” appears in the message window;
9. Press **ENTER**, then “Finish Record?” appears in the message window;
10. Press **↑** or **↓** until “Finish Record?” appears in the message window;
11. Press **ENTER** to input this special key, then the light above the PROG is off, which means the creation is finished and **No 0 user program** is acquired.

Note: (1) you can press **QUIT** to quit creation before step 6, after step 6 pressing **QUIT** results in adding QUIT key to *user program* in stead of quit creating program. Not according

to the step 8, 9, 10 and 11, user can't exit the state of creating program

- (2) In step 10, you can choose "Quit Record?" to quit creation and user program is not created.

Example 2: Create the second user program to accomplish the following functions:

To measure a *line feature* with "n" points and save the feature as **2nd** permanent feature, then call the **0th**

user program. ("n" is a numeric number, it can be set in internal system. Use of *forward annotation*

format)

The key index as follow:

1	Program
2	1
3	Line
4	Enter?
5	Enter?
6	Enter?
7	Enter?
8	Enter? (This index key example is a measurement of a line from 3 points. There are n points, there are n "Enter?")
9	Store
10	2
11	Enter
12	Enter
13	Program
14	0
15	End

Operating steps:

1. Return *normal monitor state*;
2. Press **PROG**, then "Run Program?" is displayed in the message window;
3. Press **↑** or **↓** until "Record Program?" is displayed in the message window;
4. Press **ENTER** then "Prg Num:" is displayed in the message window;
5. Press **1** to input the No of *user program*;
6. Press **ENTER**, then the light above the key is flashing, it means that it is in state of creating new user program, and all inputted valid keys (until finish this recording) pressed will be saved;

7. Press **LINE**, then press **ENTER** for “n” times, at last press **STORE**, **2**, **ENTER** and **ENTER** in turns;
8. Press **PROG**, then “Special Key?” is displayed in the message window;
9. Press **ENTER**, then “Finish Record?” is displayed in the message window;
10. Press **↑** or **↓** until “Run Program?” is displayed in the message window;
11. Press **ENTER**, then “Prg Num:” is displayed in the message window;
12. Press **0** to recall the **0th** user program;
13. Press **ENTER**;
14. Press **PROG**, then “Special Key?” is displayed in the message window;
15. Press **ENTER**, then “Finish Record?” is displayed in the message window;
16. Press **↑** or **↓** until “Finish Record?” is displayed in the message window;
17. Press **ENTER** to input this special key, then the light above the PROG is off, which means that creation is finished and **No 1 user program** is acquired.

Note: (1) you should go back to the *normal monitor state* when the current *user program* recalls another *user program*.

8.2 Editing user program

Description

1. Editing *user program* means that user can delete or add keys to the user program’s key list after the *user program* is created,
2. Some basic operation in *edition state*:
 - (1) Press **↑** or **↓** to browse key index.
 - (2) Press **CANCEL** to delete current key.
 - (3) Press **FINISH** to save the *edition* and exit the state of editing.
 - (4) Press **QUIT** to give up the *edition* and exit the state of editing.
 - (5) Press **PROG** to enter the state of inserting *special key*.
 - (6) Press other keys means inserting the key before the current key.

Example: Edit **No 0** user program and change the seventh key from 1 to 2

Operating steps:

1. Return to *normal monitor state*;
2. Press **PROG**, then “Run Program?” appears in the message window;
3. Press **↑** or **↓** until “Edit Program?” appears in the message window;
4. Press **ENTER**, then “Prg Num:” appears in the message window;
5. Press **0** to edit **No 0** user program;
6. Press **ENTER**, the light above the key is flashing, it indicates that it is in editing state now;
7. Press **↑** or **↓** until “007” appears in the message window;

8. Press **CANCEL** to delete this key series;
9. Press **2** to insert this key, then “007 2” appears in the message window;
10. Press **FINISH** to save the change of this user program and exit the *editing* state.

Note: In step 10, if press **QUIT**, the change would not be saved and exit the edition.

8.3 Running user program

Description

1. The *user program* will run automatically, but sometimes it will stop to wait for the user to input some message.

For instance, it will wait for the user input **ENTER** to probe points or **FINISH** to end probing points during the measuring operation.

2. During *running* user program, it waits for user to press **ENTER** if “Wait Key Enter” is displayed in the message window, it waits for the measurer to enter **FINISH** if “Wait Key Finish” is displayed in the message window.

Example: *Run No 1 user program*

Operating steps:

1. Return normal monitor state;
2. Press **PROG**, then “Run Program?” appears in the message window;
3. Press **↑** or **↓** until “Run Program?” appears in the message window;
4. Press **ENTER**, then “Prg Num:” appears in the message window;
5. Press **1** to run the second user program;
6. Press **ENTER** to confirm.

9. Correspond

Description

1. RS232 transmit data format. (How to setup the format, please refer to 7.23).
2. PRINT format.

Notice: *The following is the default setup*

1. baud rate : 9600bps.
2. no parity.
3. 8 data bits
4. One start bit and one stop bit

9.1 BCD code format

The DC3000 send 17 bytes to computer after getting a 'R' (ASCII code : 52H) from the computer. The following is the content of the 17 bytes:

Byte 1: Head=0x0fe (hexadecimal).

Byte 2: Bit 0: sign of the Y axis, 0 indicate "+" and 1 indicate "-".
 Bit 1: sign of the X axis, 0 indicate "+" and 1 indicate "-".
 Bit 2: sign of the Z axis, 0 indicate "+" and 1 indicate "-".
 Bit 3: reserved.
 Bit 4: 0: mm 1: inch. (display length unit)
 Bit 5—Bite 7: reserved.

Byte 3: Status (error message) bit

 Bit 0: X axis status, 0 indicate "OK" and 1 indicate "ERROR".
 Bit 1: Y axis status, 0 indicate "OK" and 1 indicate "ERROR".

Bit 2: Z axis status, 0 indicate "OK" and 1 indicate "-ERROR".

Bit 3—Bit7: reserved.

Byte 4—Byte 7: display value of X axis: (compact BCD code format)

$$X\text{-value} = B4+B5*10^2+B6*10^4+B7*10^6$$

Byte 8—Byte 11: display value of Y axis: (compact BCD code format)

$$Y\text{-value} = B8+B9*10^2+B10*10^4+B11*10^6$$

Byte 12—Byte 15: display value of Z axis: (BCD code format)

$$Z\text{-value} = B12+B13*10^2+B14*10^4+B15*10^6$$

Byte 16—Byte 17: Check sum (compact BCD code format) :

$$B17 \oplus B16 = B2+B3+B4+B5+B6+B7+B8+B9+B10+B11+B12+B13+B14+B15$$

Byte16.: LSB of sum.

Byte17.: MSB of sum.

Notice:

1. Don't care for the value which axis do not exist.
2. B4: the forth byte, and so is other bytes.
3. The content form B4 to B17 is wrote in compact BCD format.

9.2 ASCII format

ISP-D3000 sends 60 bytes total, 20 bytes for X axis, 20 bytes for Y axis and 20 bytes for Z axis:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
17	18	19															
X	s	s	s	.	x	x	x	x	.	x	x	x	s	m	m	s	s
\r	\l																

Example: X - 3 0 . 0 5 3 m m
\r \l

Note:

1. The bytes form byte 0 to byte 19 is used for X axis, the bytes form byte 20 to byte 39 is used for Y axis and the bytes form byte 40 to byte 59 is used for Z axis.
2. The byte 14 and byte 15 are used as unit bytes (mm or inch) of the X axis; and so are byte 34, byte35 and byte54, byte55.
3. X – the X axis Y – the Y axis Z – the Z axis x – 8 bite (include number and sign bite)
s – space \r – enter \l – to the next line - — negative sign
4. DC3000 sends 60 bytes to the computer after receiving a "R" from the computer.

5. The example show the value of X axes is -30.053mm.

9.3 PRINT format

The character “v” indicates one of the following characters:

X, Y, Z, R, D, <, T, A

The character “d” indicates number.

The character “-” indicates negative sign.

The character “s” indicates space.

1. Line graphics print format

The default setup is mm.

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Content:	v	s	s	s	s	-	d	d	d	d	.	d	d	d	
Example1: X									1	5	9	.	0	0	0
Example2: R									-	1	.	4	6	7	

2. Angle format

The default setup is DD format.

(a). DD format.

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Content:	v	s	s	s	s	-	d	d	d	d	.	d	d	d	
Example1: <	1								6	0	.	5	0	1	
Example2: A									1	4	7	.	3	5	0

(b). DMS format

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14			
Content:	v	s	s	s	s	-	d	d	.	d	d	.	d	d			
Example1: <									6	0	.	3	0	.	0	3	
Example2: A									1	4	7	.	2	1	.	0	0

Accessories

A. Specification

Weight:	1360 g
Volume:	297mm*184mm*48mm(60mm)
Power Supply:	5.1V(DC) \pm 5%
Optical Signal:	TTL, 50 K Hz (Max)
RS232:	9P D- interface, <-5V('1'), >+5V('0')
Printer Port:	Centronix port
Edge detector Port:	TTL or Isolate-electric-current pulse
Pedal Switch Port:	Short-circuit contact

←MIN SIZE→