

Q16 Metrology Computer
ED50 Optical Edge Detector
ED51 Video Edge Detector

User's Guide

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Foreword

The Model Q16 Metrology Computer consists of two basic versions. Non-Battery back-up (serial numbers under 2500) and Battery Back-up (serial numbers over 2500).

The Battery Back-up version enables the power to be turned off while retaining the data in memory.

The Model ED50 Optical Edge Detector is used with Optical Comparators. The ED51 Video Edge Detector senses edges on Video Inspection Machines.

Both the ED50 and ED51 must be used with a Battery Back-up version of the Q16.

Overview

The Micro-Vu Q16 Computer is a very powerful system, using a 16 BIT Internal Processor. The bus is 8 BITS, for using many standard Peripheral Devices. The Q16 is extremely flexible, with the ability to address 1 million BYTES of Memory. A versatile software language results in a Digital Readout (DRO) for Metrology and Machines.

The front panel contains a power switch and keyboard with both touch and visual feedback. The keyboard consists of 31 keys, with standard 12 key numeric keypad, and 19 additional keys, 13 of which contain LED's to indicate toggle capability. An additional LED to the right of the PRESET key, designated PI (Positive Indicator), flashes each time any key is pressed.

The front panel also contains 3 complete banks of eight digit LED's. Two banks are designated as X and Y axis to display the positions of the encoders. The third bank is designated Z/REFERENCE and displays either unique Metrology Data, such as Memory Locations, or a third Axis Encoder.

Two communication RS232 ports (25 pin connectors), for Printer/Computer interface are contained on the back panel. The RS232 ports enhance Statistical Process Control (SPC) capabilities, via external computers. A 15 pin connector is supplied as a parallel remote for all the front panel keys and enables the addition of foot pedals. The back panel also contains three receptacles for connecting X, Y and Z encoders.

A removable access panel exposes 5 banks of DIP switches. The first three banks are used to read the appropriate Linear Encoders and for ERROR CORRECTION where the mechanical axes of the machine are incorrect and require electronic compensation. Switch Bank #3 is used for linear z-axis encoders. Switch Bank #5 is used for converting the Q16 to Metric and/or Machine mode when powered on and to set the approximate BAUD rates for each of the RS232 Communication Ports.

Setup and Calibration

Setup (X, Y, and Z axis encoder resolution)

(refer to APPENDIX D pictorial)

The Q16 is normally set-up at the factory to match a specific Micro-Vu Inspection Instrument. Set up requires removal of back panel switch cover, and setting switches as follows:

Switch Blocks S1 for X axis, S2 for Y axis, S3 for Z axis:

Resolution of encoder	Switch 1	Switch 2	Switch 3
0.01mm (often used on .0005" systems)	On	Off	On
0.005mm (often used on .0002" systems)	On	On	On
0.002mm (often used on .0001" systems)	Off	Off	On
0.001mm (often used on .00005" systems)	On	On	Off
0.0005mm (often used on .00002" systems)	Off	Off	Off
0.0002mm (often used on .00001" systems)	Off	On	Off
0.0001mm (often used on .000005" systems)	Off	On	On
0.0001" (only used for English .0001 encoders)	On	Off	Off

Calibration

The Q16 can compensate for mechanical errors and improve the accuracy of the Measuring Instrument by setting switches as follows:

	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
+ Add per linear inch					On
- Subtract per linear inch					Off
none	Off	Off	Off	Off	
.00001"	On	Off	On	On	
.000025"	Off	Off	On	On	
.00005"	On	Off	Off	Off	
.000075"	Off	On	On	On	
.0001"	Off	On	Off	Off	
.00015"	On	On	On	On	
.0002"	On	On	Off	Off	
.0003"	Off	Off	On	Off	
.0004"	On	Off	On	Off	
.0005"	Off	On	On	Off	
.0006"	On	On	On	Off	
.0007"	Off	Off	Off	On	
.0008"	On	Off	Off	On	
.0009"	Off	On	Off	On	
.001"	On	On	Off	On	

NOTE: Turning Power OFF & ON or pressing the "F" & "6" key will read the switches.

Error Compensation

Linear error compensation can be applied to X and Y on the Q16.

1. Align a standard, such as a glass scale or gage block, to one axis.
2. Take measurements near one edge, the center, and the other edge of the stage.
3. Calculate the incremental error for each measurement.
4. Average the incremental errors.
5. Note the current compensation settings on Q-16.
6. Adjust the Q-16 dipswitch settings as needed to compensate for the errors.

Set-Up (Electronic Protractor)

OBSOLETE

Switches S3 and S4 (refer to APPENDIX D) are used for SET-UP and ERROR CORRECTION of an ELECTRONIC ENCODER as follows. SET-UP and ERROR CORRECTION requires removal of the back panel switch cover, and setting switches as follows:

REFER TO

* Use as many switches as required to achieve proper compensation.

Q16 MANUAL UPDATE

Switch bank	Switch	Scale Factor for 14" or 30"
S3	1	Optical Comparator: On = 30" Off = 14"
S3	2	Compensation Sign: On = + Off = -
		Approximate Compensation Per One Revolution
S3	3	60 Degrees
S3	4	30 Degrees
S3	5	15 Degrees
S3	6	7 Degrees
S3	7	4 Degrees
S3	8	2 Degrees
S4	1	1 Degree
S4	2	30 Minutes
S4	3	15 Minutes
S4	4	7 Minutes
S4	5	4 Minutes
S4	6	2 Minutes
S4	7	1 Minute
S4	8	30 Seconds

Tutorials

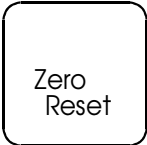
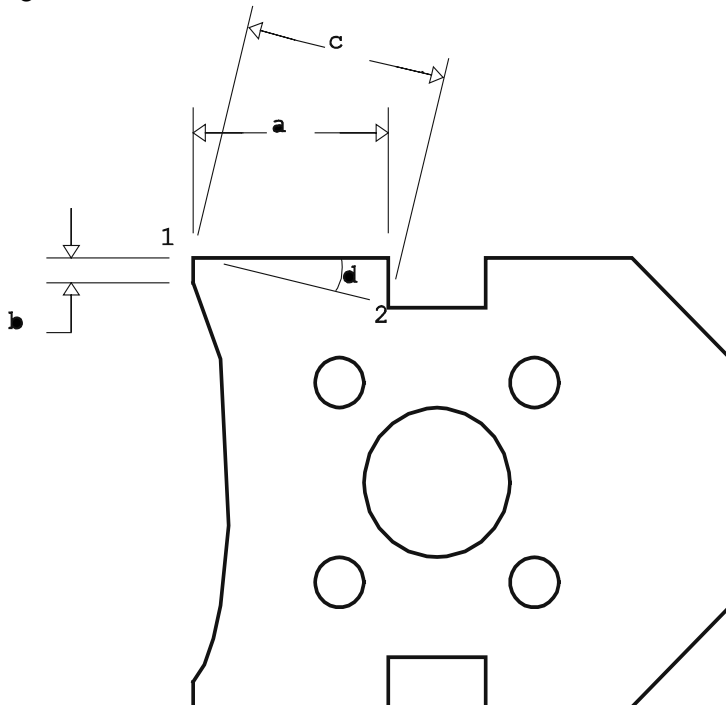


Operation	Keystroke	Display	Comment
A. Power on and Zero Reset	None	X= 0.0000 Y= 0.0000	Sets Absolute Zero when turned on.
	Move to 1	X= * Y= *	is distance from Absolute Zero to Position 1
		X= 0.0000 Y= 0.0000	Resets Absolute Zero at Position 1
B. Cartesian X & Y Absoute Measurement (Figure 1)	Move to 2	X=a Y=b	X & Y Distances from Absolute Zero to Position 2

Figure 1



Operation	Keystroke	Display	Comment
<i>C. Polar Conversion</i> (Figure 1)		X= c Y= d (angle)	Polar coordinates from Absolute Zero to Position 2
<i>D. Metric Conversion</i> (Figure 1)		X= a (mm) Y= b (mm) or X= c (mm) Y= d (angle)	Converts Cartesian or Polar coordinates to Metric





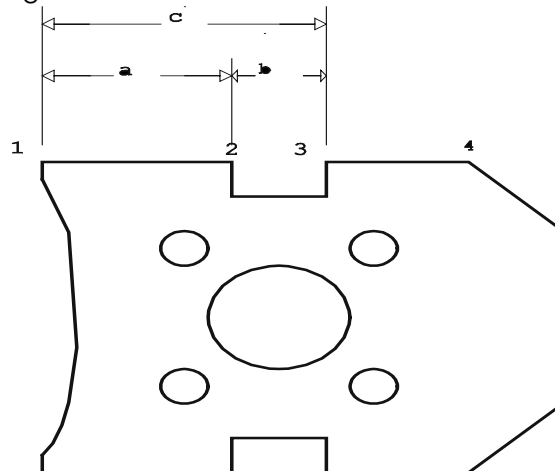




Operation	Keystroke	Display	Comment
<i>E. Incremental Measurement</i>	None	X= 0.0000 Y=0.0000	At Position 1
Example: X axis only Figure 2			
	Move to 2	X= a Y= 0.0000	X & Y Distance from Absolute Zero at Position 2
			
	X 	X= 0.0000 Y= 0.0000	Sets Incremental Zero at 2
	Y 		Can set Y Incremental Zero also
	Move to 3	X= b Y= 0.0000	X & Y distance from Position 2 to 3
		X= c Y= 0.0000	X & Y distance from Absolute Zero to Position 3
Can repeat for Position 3, 4, etc.			

Figure 2



Operation	Keystroke	Display	Comment
<i>F. Preset</i>		X= (n/c) Y= (n/c)	No change to displays
	X 	X= 0.0000 Y= (n/c)	Sets X display to zero
		X= 30.5 Y= (n/c)	Select 30.5 from keypad
		X= 30.5 Y= (n/c)	Sets display to position of machine

Note: If you make a mistake, press PRESET to exit the mode.



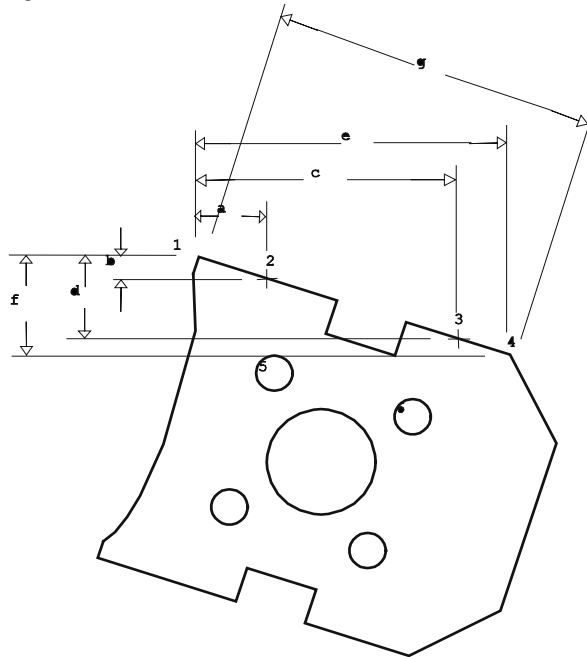

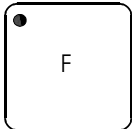

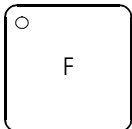
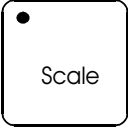
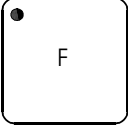
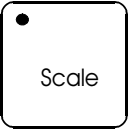


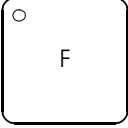
<i>G. Skew Calibration</i> (Figure 3)	Move to 2	X= a Y= b	Distance from Absolute Zero to Position 2
		X= a Y= b	Sets Position 2 as the calibration point.
	Move to 3	X= c Y= d	Distance from Absolute Zero to Position 3
			Sets Position 3 as the second calibration point
		X= g Y= 0.0000	Skew Mode goes on automatically

Figure 3



Operation	Keystroke	Display	Comment
<i>H. Skew Mode</i> (Figure 3)	move to 4	X= h Y= 0.0000	Skew Mode rotates for factor set in section G above.
		X= e Y= f	Skew Mode can be toggled on & off using Skew Mode button, if desired.
Viewing Skew Calibration Factor			
		X= h Y= 0.0000 Ref.= angle	Skew angle is shown in reference display.
			Pressing the F key to continue.

Operation	Keystroke	Display	Comment
<p><i>I. Scale Mode</i></p> <p>(Assume at position X= 10.0000 Y= 5.0000)</p>		X= 10.0000 Y= 5.0000 (Z= 1.0000)	Scale Mode is turned ON. Assuming Scale Factor is currently 1.0000, the DRO will read X= 10.0000, Y= 5.0000.
		X= factor Y= factor (Z= factor)	Displays current scale factors. Default factors are 1. Shows Z factor only on 3 axis Q16's.
		X= 1.0000 Y= 1.0000 (Z= 1.0000)	Function followed by Scale will display current Scale settings. The default setting is 1.0000.
		X= 0.9 Y= 0.9 (Z= 0.9)	Use the keypad to enter "0.9" as the scale factor.
		X= 0.9000 Y= 0.9000 (Z= 0.9000)	Press Enter Display to enter scale values.
		X= 9.0000 Y= 4.5000 (Z= 0.9000)	Exit scale factor setup. Displays are now adjusted using the 0.9 scale factor. Turn Scale Mode ON and OFF using the Scale button.

Note: Displays can be scaled individually by pressing the appropriate Zero Reset key before entering the value with the keypad.





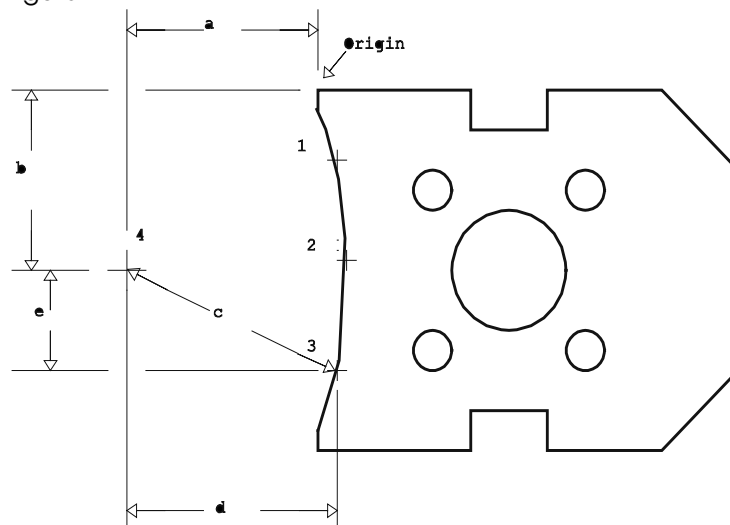
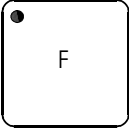

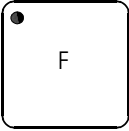
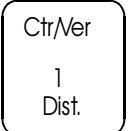
Operation	Keystroke	Display	Comment
<i>J. Radius and Center Locations</i> (Figure 4)		X= Y= Ref.= 3	Reference Display prompts user to target 3 points on the radius.
	Move to 1	X= * Y= * Ref.= 3	This example assumes you are using three points. Up to 9 can be used.
		X= * Y= * Ref.= 2	Enter Position 1 into calculation. Reference Display counts down
	Move to 2	X= * Y= * Ref.= 2	* denotes coordinates of position 2
		X= * Y= * Ref.= 1	Enter position 2 into calculation. Reference Display counts down.
Move to 3	X= * Y= * Ref.= 1	* denotes coordinates of position 3	
	X= a Y= b Ref.= c	Radius (c) is shown on Reference Display. X & Y Displays show position center	

Figure 4



Operation	Keystroke	Display	Comment
Diameter Conversion		X= a Y= b Ref.= c (radius)	While still in Radius Mode, Press F then 2.
		X=a Y= b Ref.= 2xc (diameter)	Diameter is shown in Reference Display
Center Distance		X= a Y= b Ref.= c	Press F key if not already lit
		X= d Y= e Ref.= c	X & Y Displays show distance from current machine position to center of radius. Machine can be moved to center by moving the stage until X & Y Displays read 0.0000.

Note: After measuring a Radius, you must press the Radius key (off) to exit the Radius mode before measuring new features.

K. Multi- Point Radius

Radius Measurements can be made using up to 9 points. To use more than nine points, press a digit on the keypad (from 4 to 9) after pressing the Radius Key. For example, to do a 9-point radius, press:



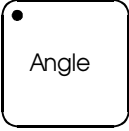




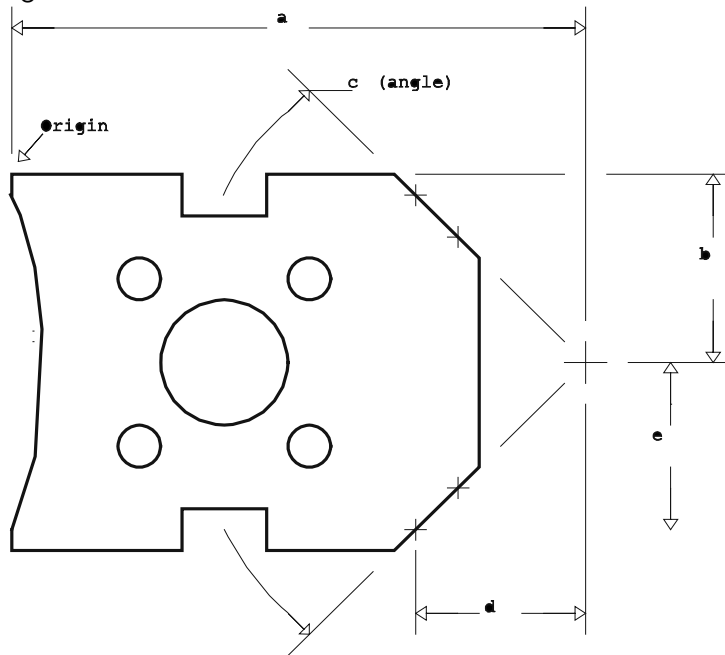

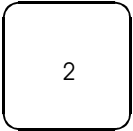
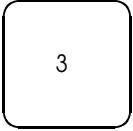
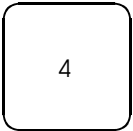
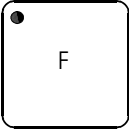

Operation	Keystroke	Display	Comment
<i>L. Angle and Vertex Locations</i>		X= Y= Ref.= 4	Reference Display prompts user to target 4 points on angle. Two points on each line.
	Move to 1	X= * Y=* Ref.= 4	* denotes coordinates of position 1
		X= * Y=* Ref.= 3	Enter position 1 into calculation. Reference Display counts down.
	Move to 2	X= * Y= * Ref.= 3	* denotes the coordinates of position 2
		X= * Y= * Ref.= 2	Enter position 2 into calculation. Reference Display counts down.
	Move to 3	X= * Y= * Ref.= 2	* denotes coordinates of position 3.
		X= * Y= * Ref.= 1	Enter position 3 into calculation. Reference Display counts down.
Move to 4	X= * Y= * Ref.= 1	* denotes coordinates of position 4.	
	X= a Y= b Ref.= c (angle)	Angle (c) is shown on Reference Display. X & Y Displays show position of angle vertex.	



Figure 5




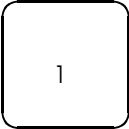



Operation	Keystroke	Display	Comment
Complimentary Angle		X= a Y= b Ref.= c (angle)	While still in Angle Mode, Press F then 2, 3, or 4.
		X= a Y= b Ref.= * (angle)	* denotes 360° - Angle
		X= a Y= b Ref.= * (angle)	* denotes 180° - Angle
		X= a Y= b Ref.= * (angle)	* denotes 90° - Angle

Operation	Keystroke	Display	Comment
Vertex Distance		X= a Y= b Ref.= c	Press F key if not already lit.
		X= d Y= e Ref.= c	X & Y Displays show distance from current machine position to vertex of angle. Machine can be moved to the vertex by moving the stage until X & Y Displays read 0.0000

Note: After measuring an Angle, you must press the Angle key (off) to exit the Angle mode before measuring new features.

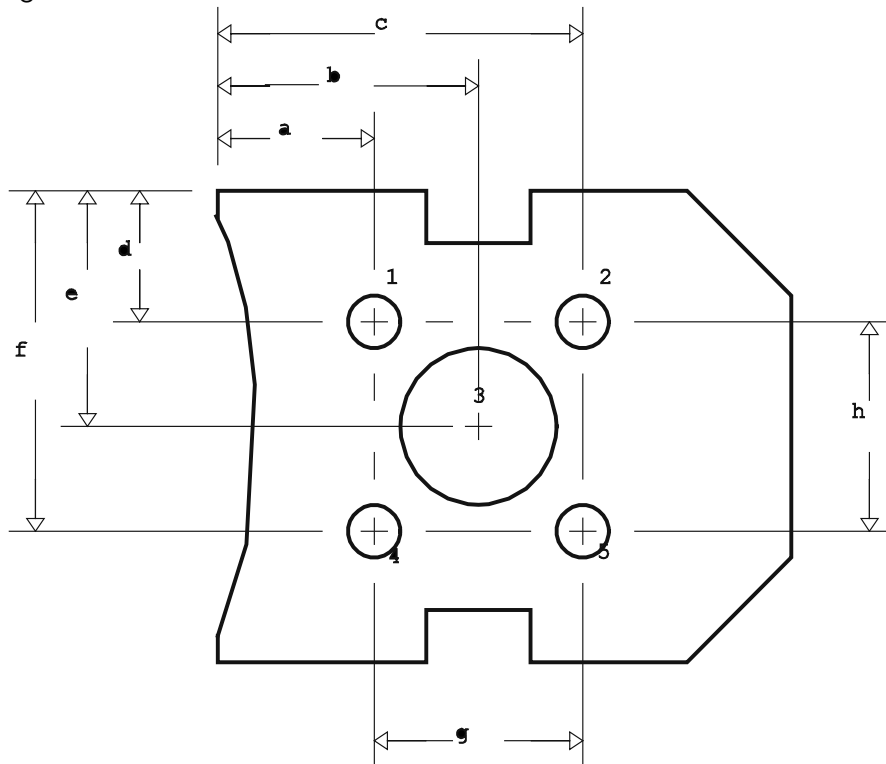
Operation	Keystroke	Display	Comment
<i>M. Store Memory</i>		X= Y= Ref.= *	* Reference Display shows first available memory location (out of 100). Just press Enter Display to accept and use this location. Otherwise you can use the keypad to select a different location
		X= Y= Ref.= *	Store data as it appears on the displays. Store Mem. light turns off.

Note: Refer to Figure 6 for the following example. The example assumes that you have store data in the first 5 memory locations as shown in Figure 6.




<i>N. Recall Memory</i>		X= Y= Ref.= *	* denotes location in memory with valid data. If the memory number in the Reference Display is not the one you want, use the keypad to select the proper location and press Enter Display
		X= Y= Ref.= 1	Use the keypad to select memory location 1 if 1 is not already in the Reference Display.
		X= a Y= d Ref.= 1	X & Y Displays show recalled position 1
		X= c Y= d Ref.= 2	Pressing Enter Display brings the next memory points onto the displays
		X= b, a, c Y= e, f, f Ref.= 3, 4, 5	Continue Pressing Enter Display to cycle through all memory locations.

Operation	Keystroke	Display	Comment
Call up a specific location	4	X= Y= Ref.= 4	To bring up a specific location without cycling through all the points, use the keypad. For example, press 4, then Enter Display.
	Enter Display	X= a Y= f Ref.= 4	


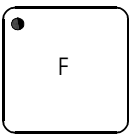
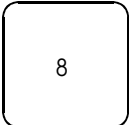

Figure 6



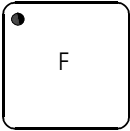
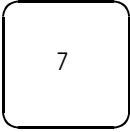

Operation	Keystroke	Display	Comment
Recall between 2 memory locations		X= a Y= f Ref.= 1	To recall the distance between 1 and 5, for example, use the keypad.
		X= a Y= f Ref.= 1-	Use the minus key or "dash" on the keypad.
		X= a Y= f Ref.= 1- 5	Now press 5 on the keypad.
		X= g Y= h Ref.= 1- 5	Enter Display brings up the distance between locations 1 and 5
Distance from machine position to point stored in memory.		X= g Y= h Ref.= 1	While still in Recall Memory mode, recall memory point 1 using the keypad and Enter Display.
		X= a Y= d Ref.= 1	
		X= a Y= d Ref.= 1	Press F key
		X= * Y= * Ref.= 1	* denotes distance from current machine position to memory location 1. Machine can be moved to location 1 by moving the stage until the X & Y Displays read 0.0000.

Operation	Keystroke	Display	Comment
<i>O. Clearing Memory</i>		X= Y= Ref=	To clear all 100 memories, press the F key...
		X= Y= Ref.=	...then press the Store Mem. key...
		X= Y= Ref.=	...then Enter Display.

Note: You can clear just one memory location by selecting the location with the keypad before pressing Enter Display. You can also clear a range of locations by entering the first and last memory locations, separated by the minus key, before pressing Enter Display.

Operation	Keystroke	Display	Comment
<i>P. Midpoint Origin</i>	X 	X= 0.0000 Y= 0.0000	This feature lets you set the origin to be at the midpoint between 2 points.
	Move to a new X location.	X= * Y=0.0000	This example uses the X axis only. Procedure can be used on the Y axis also
		X= * Y= 0.0000	* denotes the X axis position.
		X= * Y=0.0000	
X 	X= ** Y= 0.0000	** denotes one half the previous X axis position.	

Note: This Midpoint feature above is used to set the origin to the middle of a part, such as a turned part. It is usually used to set up the origin of a part. To measure midpoints as features, use the Two Point Radius (Midpoint) function described in the Q16 Manual Update.

Operation	Keystroke	Display	Comment
<i>Q. Reference Index</i>		X= Y= Ref.=	This example uses the X axis only.
		X= (blank) Y= (blank) Ref.=	The Displays will blank.
	X 	X= 0.0000 Y= (blank) Ref.=	Select any axis. (X axis for this example).
	Move stage to cross the RI mark	X= * Y= Ref.=	X axis begins counting when the edge is crossed.

Note: You can set the reference index mark to a preset number by pressing Preset after pressing the 7 key, then presetting in a number before crossing and edge. You can also store and recall offsets for reference index by pressing Store Mem. or Recall Mem. after pressing 7.

The Reference Index Feature has little value for optical comparators and video inspection equipment. It was mainly developed for instances when a Q16 is installed on a machine tool. Its main purpose is to allow the machinist to set the readout to some machine home position.

Concepts and Special Applications

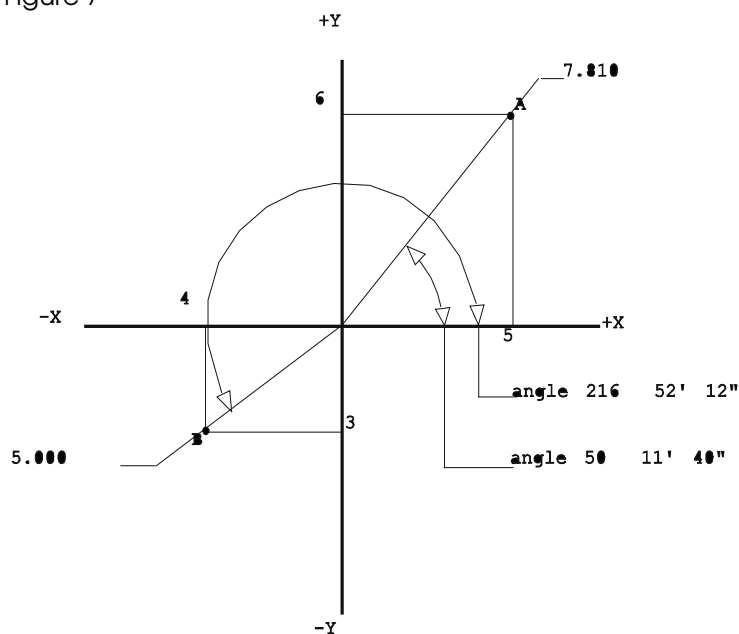
Polar/ Cartesian Concept

Cartesian Coordinates expresses the position of the Encoders (as displayed from the Q16), in mathematical format. For example, the position A and B on the following chart are expressed in Cartesian Coordinates from Absolute Zero, as follows:

Position A X= +5.0000, Y= +6.000

Position B X= -4.000 , Y= -3.000

Figure 7



Points A and B can also be expressed in POLAR Coordinates, where the distance is expressed as a direct line (RADIAL) distance from Absolute Zero and degrees from the X Axis as follows:

Position A: R= 7.810 (Radial Distance)

A= 50 11' 40" (Angle)

Position B: R= 5.000

A= 216 52' 12"

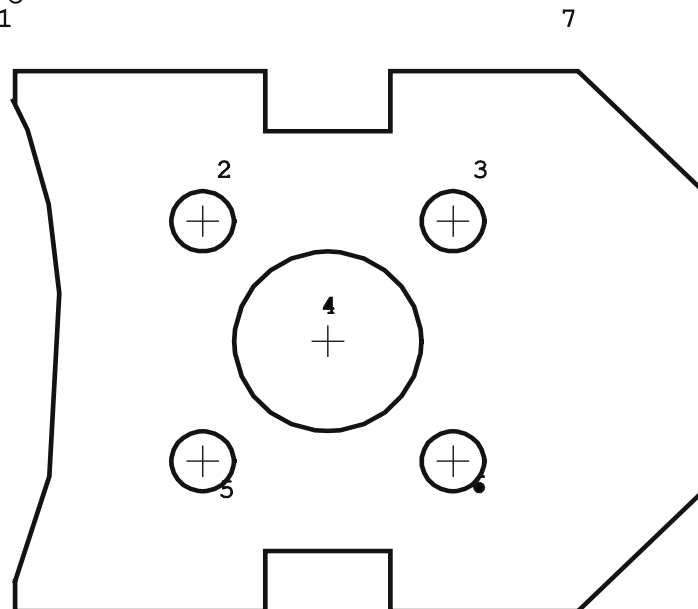
True Position

In its simplest form, the TRUE POSITION concept is the Radial difference between where a hole center should be, and the actual position. This Radial difference is essentially the POLAR distance and is normally accompanied by a plus (+) tolerance.

Incremental/Absolute Concept

All distances (Polar or Cartesian), are normally expressed as distances from Absolute Zero. The concept of Incremental can be thought of as having another Absolute Zero, which can be moved around without losing the original Absolute Zero. Following is an example of using the Incremental Zero:

Figure 8
1



Absolute Zero is set at position 1. The distance is measured from 1 to 4, as $X=.50$ and $Y=.50$. Then the Incremental Zero is set at position 4, in order to measure the specific hole pattern 2,3,4,5 and 6. The distances are measured from position 4 to 2, 4 to 3, 4 to 5, and 4 to 6. The Q16 is then toggled back to Absolute Zero in order to continue to measure the other parameters, such as 1 to 7.

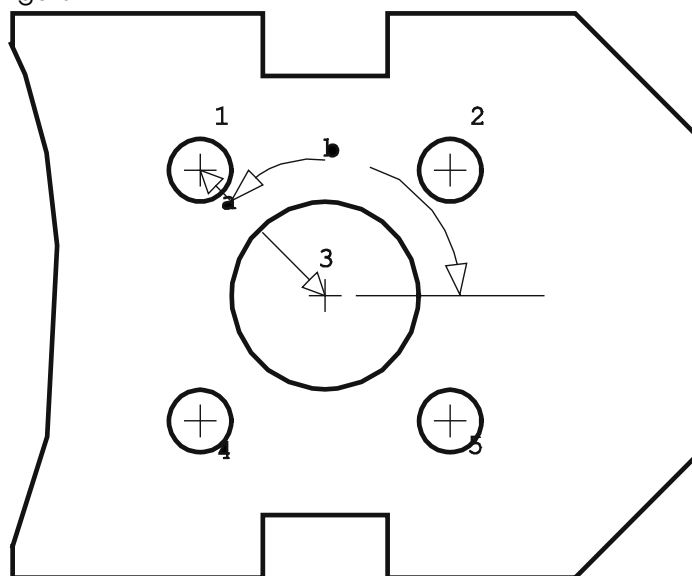
Rounded Corner, Intersection of 2 Lines & Perpendicularity

This paragraph is a reminder that the angle mode can be used to find the sharp corner, after it has been rounded, the intersection of two lines or perpendicularity. Refer to ANGLE Mode computations (Section L, page 13).

Bolt Hole Patterns

There are several ways of computing bolt hole patterns, the following being the most commonly used. First, store points 1, 2, 3, 4, and 5 in memory.

Figure 9



Once stored, move to Hole 3. The RECALL mode can be used from Hole 1 to 3. Converting to POLAR Mode will produce distance a from positions 1 to 3, and angle b . The ENTER DISPLAY Key is used to cycle through each Hole position. Another method of finding distances can be achieved by recalling between two points in memory which avoids the necessity of moving to Hole 3.

Preset for Metrology

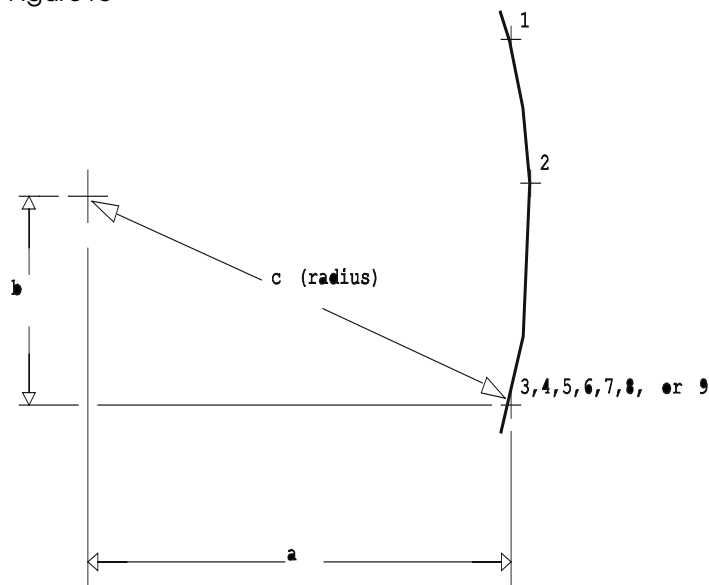
An example of using PRESET in Metrology applications is to set the Absolute Zero outside the travel of the machine as in the following example, where the machine has a limited travel of 12 inches.

The example RADIUS of 30 inches is computed from three positions. Position 3 is preset at Cartesian Coordinates $X=a$ and $Y=b$, position 3. This sets the Absolute Zero (Position 0) at the appropriate position.

Tracing a Radius

Compute a RADIUS and leave the machine at the last point (3,4,5,6,7,8 or 9). Use the "F" (Function) mode with key #1 to find distance from last point to center. In Figure 10, this distance is $X=a$, and $Y=b$. Convert the distance to POLAR and the X Axis Display will equal the computed Radius (distance C) on the REFERENCE Display. The machine can then be moved to trace the Radius (reading the X Display) as it compares to the computed Radius on the REFERENCE Display.

Figure10



RS232 Serial Interface

The Model Q16 has two RS232 Serial Interfaces. One interface is called the PRINT port. It is intended to be used with a printer. The other interface is called the XMIT (transmit) port. It is intended to be used with a computer or data collector. Both the PRINT port and XMIT port have a key on the front of the Q16 and a 25 pin connector on the back. (Refer to APPENDIX D pictorial.)

PRINT Port

The PRINT port allows the Q16 to be used with a printer. Pressing the PRINT key on the Q16 send the data to a printer where it is printed.

The Q16 works with certain types of printers called serial printers. These printers have an RS-232 port. Micro-Vu sells a cable for interfacing to the Weigh-tronix printer, part number C81807. The "24 Column Impact Printer" is available from Weigh-tronix, their phone number is 800-350-8550.

Another popular type of printer is called a parallel printer. This type of printer has a Centronics parallel port. In order for the Q16 to print to this type of printer, you must purchase an adapter. The "Parallel Printer Adapter for Q16" is available from Micro-Vu as part number C822.

Refer to Appendix E for examples of data sent via the PRINT Port.

XMIT (Transmit) Port

The xmit port provides a message designed for interfacing with a computer or data collector. The Q16 is commonly used with SPC programs. The XMIT port provides a fixed-length message. This message contains six lines. The first line contains four ASCII characters that contain information about which modes the Q16 is in. The second line contains the memory location if the Q16 is transmitting data from memory. The third line contains the X axis data. The fourth line contains the Y axis data. The fifth line contains either the Z axis data, or the rotary encoder data depending on whether the Z/REF. displays linear or rotary information. The sixth line contains the radius, diameter, or angle data if applicable.

Line 1	@ @ @ @ CR LF	← Modes
Line 2	X X X CR LF	← Memory Number
Line 3	X X X X X X X X X X CR LF	← X Display
Line 4	X X X X X X X X X X CR LF	← Y Display
Line 5	X X X X X X X X X X CR LF	← Z Display
Line 6	X X X X X X X X X X CR LF	← Angle, Radius, Diameter

The first four bytes of the message contain the mode information about the Q16. Each bit in a byte corresponds to a mode on the Q16. The following table defines these bits.

	0	1	X	Metric	Skew	Scale	Inc	Polar
1 ST Byte				X	X	X	X	X
2 ND Byte				X	X	Dia	Angle	Radius
3 RD Byte				X	X	X	X	Mem
4 TH Byte				X	X	X	X	X

Refer to Appendix E for examples of data sent via the XMIT Port.

Baud Rate Settings

In order for the Q16 to transfer data through the PRINT and XMIT port, the BAUD rate of the Q16 port must match the BAUD rate of the device (ie. printer, computer, data collector). The BAUD rate is set by turning the POWER OFF, removing the switch cover on the back panel, and setting the BAUD rate to match the Printer or Computer per the following diagram. The BAUD rate is normally set at the factory at 2400. NOTE: S4 is used for Q16 Serial Numbers prior to S/N 1000.

Baud Rate	Print Port Switch: S5			XMIT Port Switch: S5		
	1	2	3	4	5	6
110	Off	Off	Off	Off	Off	Off
300	On	Off	Off	On	Off	Off
600	Off	On	Off	Off	On	Off
1200	On	On	Off	On	On	Off
2400	Off	Off	On	Off	Off	On
4800	On	Off	On	On	Off	On
9600	Off	On	On	Off	On	On
19200	On	On	On	On	On	On

NOTE: Switches 7 and 8 are not used for BAUD RATE.

RS-232 Communications Parameter

Both the PRINT and XMIT ports use the following communications parameters.

1 START BIT
 8 DATA BITS
 1 STOP BIT
 NO PARITY

Both PRINT and XMIT are bi-directional serial RS-232 ports.

Cable Connections

The pins on each 25 pin RS232 connector are as follows:

Print Port Pin	XMIT Port Pin	Designation	Signal Direction
1	1	Ground	-
2	2	Data In	In
3	3	Data Out	Out
4	4	Transmission is Possible	In
5	5	Request To Send	Out
7	7	Signal Ground	-

Computer Keyboard Translation for Bi-Directional Handshake

The keys on the Q16 can be remoted on the Computer Keyboard per the following chart.

Q16 Keys	Computer Keyboard	Q16 Keys	Computer Keyboard
Zero Reset X	a	Radius	k
Zero Reset Y	m	Print	q
Enter Display	g	XMIT	r
Zero Reset Z	f	1	1
Metric/ Inch	b	2	2
Preset	c	3	3
Scale	l	4	4
F	l	5	5
Store Mem	e	6	6
Recall Mem	h	7	7
Incremental/ Absolute	d	8	8
Polar/ Cartesian	j	9	9
Skew. Cal	o	0	0
Skew	p	-	-
Angle	n	.	.
Z/ Ref.	s		

Appendix A: Theory of Operations

Concept of Toggles

This section contains a Theory of Operations, which may be sufficient information for some to operate the Q16 Metrology/Machine Computer. A previous section on "Operational Key Sequences", details the exact keystrokes to perform the required functions.

In order to understand this section, the concept of "Toggling" should be clearly understood. Keys with LED'S in the corner act as toggle switches. For example, the METRIC/INCH key toggles from the METRIC to INCH Mode. The LED is lit ("ON") when in the METRIC Mode, the LED being closest to the word METRIC. Other keys such as the SKEW, toggles from "ON" (LIT) to "OFF", indicating when in the SKEW mode or not. This concept of toggling is true for 13 of the 31 keys.

The Q16 contains 31 keys. Whenever a key is depressed, the operator receives a visual confirmation (the PI LED flashes) and TACTILE response. The PI (Positive Indicator) LED ensures that the key has been acknowledged by the computer.

The Q16 contains three eight digit displays. The upper and center displays are identified as X and Y; one digit of the display is used for the minus (-) sign and is blank for the plus (+) sign. The lower display is shared as a reference display for Metrology. In various modes, the Reference Display shows information pertinent to the operation. For example, in the Recall Mem. mode, the Reference Display shows the current's memory location. This Display is identified as Z/REF. and can be toggled to read a third Encoder. Micro-Vu Optical Instruments equipped with an ELECTRONIC PROTRACTOR display the rotational angle on the Z Axis.

There are six Display Toggles, which changes the contents of the display when on:

INCREMENTAL/ABSOLUTE
METRIC/INCH
POLAR/CARTESIAN
SKEW
SCALE
Z/REF.

In addition, there are Computing Toggles, with various Metrology Computations:

RADIUS
ANGLE
STORE MEMORY
RECALL MEMORY
"F" (FUNCTION)
PRESET
SKEW CAL (CALIBRATION)

Concepts of POLAR/CARTESIAN and INCREMENTAL/ABSOLUTE are also offered in Section V of this manual.

Power On and Zero Reset

When the Q16 is turned on, the X & Y displays zeroes. Each display counts the travel (+ or -) of the Linear Encoders in Cartesian Coordinates. Each Axis can be zeroed in either Incremental or Absolute Modes. Switch #7 of Switch Bank #5 will result in Power-On in the Metric Mode; Switch #8 of Bank #5 will result in Power-On in the Z AXIS Mode.

Display Toggles

Toggling with the Polar/Cartesian key will change the Cartesian to Polar, by displaying the direct distance on the X Display and angular rotation on Y display. The angular rotation is displayed from 0 to 360 in degrees, minutes and seconds.

The INCREMENTAL/ABSOLUTE toggle will display Incremental Numbers, if an Incremental 0 has been set. If not, the Incremental origin is set to where the machine is when you enter the Incremental Mode. Therefore, when you enter the Incremental mode for the first time, the X & Y displays show zero. The Incremental origin is also reset if you change the Absolute origin.

The METRIC/INCH Toggle will convert displayed numbers. Polar/Cartesian, Incremental/Absolute and Metric/Inch, can all be toggled simultaneously.

Other Display Toggles

The SKEW toggle rotates a part to either the X & Y Axis, if a SKEW factor has been set. The SCALING toggle adjusts any and all displays from .10X to 10X if a SCALE factor has been set. The existing factors can also be displayed.

Skew Calibration

This special SKEW CAL key is available to set the SKEW factor, while not in the SKEW Mode. Cartesian Coordinates from the display, such as the center of two holes, a Vertex and hole center, etc., can be set. The key toggles on when the first displayed Cartesian Coordinates are selected and toggles off at the second point. As previously stated, the SKEW can also be set while in the SKEW mode.

"F" (Function) Mode

This key is operational in most modes, to provide additional capability. For example, while in the RADIUS Mode the "F" key enables conversion of RADIUS to DIAMETER, etc...

The key is sometimes used in conjunction with keypad numbers. These numbers have additional information on the keys to prompt the operator.

Radius and Angle Modes

Toggling into the RADIUS Mode will set a "3" on the Reference Display. As three consecutive coordinate points of the machine are entered, the indicator will count down and show the computed RADIUS on the REFERENCE Display, while the Center location from Absolute Zero will appear on X & Y Displays.

While in the RADIUS Mode, the "F" key in conjunction with the keypad will display RADIUS Center location distances to the current position of the Q16 and convert the RADIUS to the DIAMETER.

The following toggles are operable in the RADIUS mode: METRIC/INCH, SCALE, "F", POLAR/CARTESIAN, MEMORY STORE, SKEW, PRESET, RECALL MEMORY and INC/ABS.

An angle is computed similar to a Radius. Toggling into the Angle Mode will set a 4 on the REFERENCE display. Entering 4 points, (2 towards the Vertex and 2 away) will count down first on the REFERENCE Display and then show the computed angle, in angles, minutes and seconds on the same display. The absolute distance to the Vertex will appear on the X & Y Displays. The F Key is again used while in the angle mode, to display the distance from current position of the Q16 to the Vertex, or convert the angle to the compliment (360 - Angle) or (180 - Angle). The following toggles are operative in the Angle Mode: METRIC/INCH, SCALE, "F", POLAR/CARTESIAN, MEMORY STORE, SKEW, RECALL MEMORY, PRESET and INC/ABS.

Preset

The Q16 can be used to PRESET numbers in either Absolute or Incremental Modes. In Metrology applications, the Absolute Zero can be moved outside the travel of the machine.

Memory Computations

There are 100 Memory Positions, from 1 to 100. Data from the X and Y Display can be stored in these memory locations, i.e., Cartesian Coordinates, Polar Coordinates, Radius Computations, Angle Computations. The data can be stored sequentially, randomly or deleted as required, while in the STORE MEMORY Mode.

Toggling into the STORE MEMORY mode will show the first available memory location on the Reference Display. To store in a random location, the keypad is used to change the location on the REFERENCE Display. Toggling out of the STORE MEMORY Mode, will store data on the X and Y display in locations shown on REFERENCE Display.

The RECALL MEMORY mode enables three variations; displaying distances from Cartesian Coordinates stored in memory to 1> Absolute Zero; 2> current position of Q16 and 3> other stored points in memory. The Incremental Mode is inoperable. Data other than Cartesian Coordinates can be recalled.

Operable toggles are: METRIC/INCH, POLAR/CARTESIAN, INC./ABS., SCALE, SKEW, "F". Inoperable toggles are: PRESET, ANGLE & RADIUS.

MEMORY STORE and RECALL for Machine Applications varies and is described in a paragraph further in this Section.

Printing, RS232 Transmissions and Memory Dumps

Contents of the Displays can be transmitted via the appropriate RS232 port, by pressing PRINT or XMIT keys. Data is transmitted in ASCII. Contents of Memory can also be transmitted via either RS232 port, with the appropriate key. A range of Memory locations or the entire memory can be transmitted using the keypad to define the locations.

The PRINT port is a Serial port for use with the printer. The XMIT port is a Serial port for communicating with Computers. Examples of PRINTED messages or are contained in Appendix E of this manual.

Error Message

An error message appears on the reference display, when a sequence of key is made erroneously or the wrong key is accidentally pressed. Refer to Appendix B on Error Messages, for explanation of each message. Error messages can be cleared using the Z ZERO RESET key.

Z/ REF. Axis

When the Q16 is reading a third (Z) Axis, the Z/REF. key toggles "ON" to display the Z Axis or "OFF" to show the reference Metrology Functions, such as RADIUS, etc. To zero the Z axis, the Z Zero Reset key is used when the Z Axis is "ON".

Reference Index (RI)

The Q16 can be used to set a Zero or Preset number at the Scale RI mark. This operation is normally performed when a machine is set-up and none of the modes (LED's) are lit. Putting the Q16 in the "FUNCTION" mode, followed by pressing the "7" key will flash all displays. Setting a Zero or Preset number on one display will align that number to the RI mark when the Read Head is passed over the mark.

Center Find - Midpoint

This operation enables you to set the origin (or zero point) to the midpoint between two points. It is most useful when measuring turned parts where the radius dimensions are drawn from the imaginary center line of the part. Zero Reset on one side of the part, move to the other side of the part, and press the "F" key followed by the "8" key. Next press the Zero Reset button for the axis you are trying to set. The origin is automatically set to the midpoint between the two sides and the display reads half the distance from edge to edge. You can now take measurements normally using standard measurement sequences.

Note: This Midpoint feature above is used to set the origin to the middle of a part, such as a turned part. It is usually used to set up the origin of a part. To measure midpoints as features, use the Two Point Radius (Midpoint) function described in the Q16 Manual Update.

Appendix B: Error Messages

Error Code	Description
1	Attempt to use the preset function while in polar mode
3	Duplicate points entered in vertex angle calculation
17	Attempt to store data when the memory is full
18	Attempt to recall data when there is no data to recall
21	Attempt to recall memory location which has no stored data
22	Attempt to recall distance between two memory locations where one or both of them has no stored data
28	Attempt to enter identical coordinates during skew calibration
29	Attempt to enter identical coordinates in radius mode
30	Unable to calculate radius using the input data
35	Invalid scale factor was entered. Scale factor must be between 0.1 and 10.0
36	Attempt to access a memory location which does not exist
37	Attempt to enter radius mode with unequal scale factors
38	Attempt to enter angle mode with unequal scale factors
40	Screen light level too bright (Edge Detector only)
41	Reference light level too bright (Edge Detector only)
42	Reference light too low (Edge Detector only)
50	Out of program memory (Program Feature only)
60	A counting error may have occurred on the X axis
61	A counting error may have occurred on the Y axis
62	A counting error may have occurred on the Z axis or rotary encoder

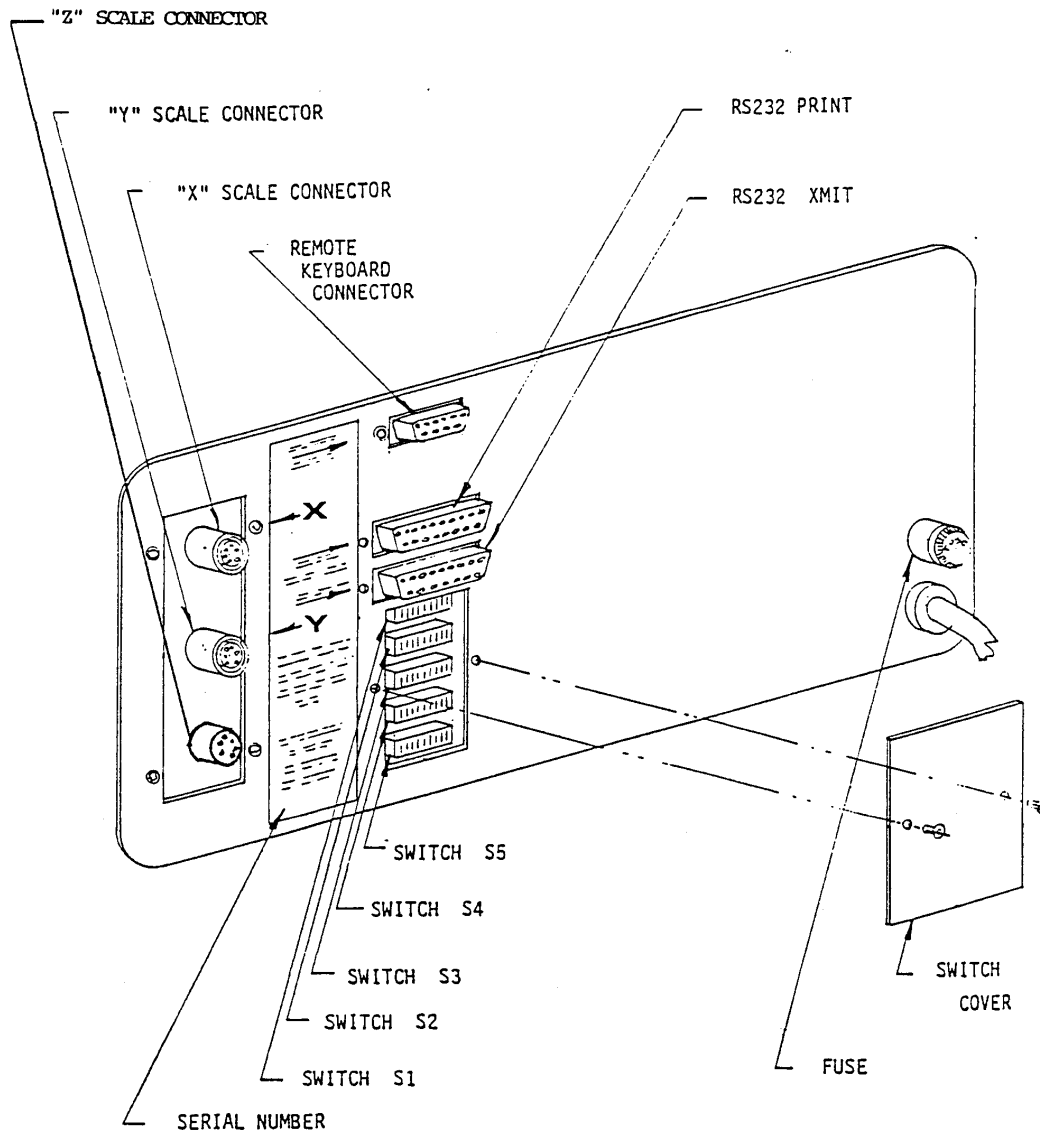
Use the Z Zero Reset key to delete error messages

Appendix C - Remote Keyboard

All keys on the Keyboard can be made remote via a 15 pin connector on the Rear panel. Remote can connect on alternate switches, foot pedals or any ON/OFF switch. Following is the Matrix for each key:

Q16 Keyboard	15 pin Connector Matrix
Angle	12 - 14
Enter Display	7 - 2
F	9 - 11
Inc. / Abs.	3 - 10
Metric / Inch	1 - 3
Polar / Cart.	10 - 11
Preset	1 - 11
Print	13 - 14
Radius	5 - 14
Recall Mem.	4 - 11
Scale	3 - 9
Skew Cal.	3 - 14
Skew Mode	11 - 14
Store Mem.	3 - 4
X Zero Reset	7 - 9
XMIT	6 - 14
Y Zero Reset	7 - 10
Z Zero Reset	14 - 7
Z/ Ref.	7 - 4
1	2 - 5
2	2 - 13
3	2 - 6
4	5 - 9
5	9 - 13
6	6 - 9
7	1 - 5
8	1 - 13
9	1 - 6
0	10 - 13
-	6 - 10
.	5 - 10

Appendix D - Back Panel Pictorial



APPENDIX D

NOTE: CHANGING SWITCHES WILL NOT CHANGE DISPLAY, UNLESS Q16 IS TURNED OFF AND THEN ON OR "F" KEY IS PRESSED.

Appendix E- Examples of Printed Messages

Printed Message	XMITted Message	Explanation
Q16> ABS X= 8.0000 Y= 6.0000 a = 0 00	@@@ 8.0000 6.0000 0 00	Basic X & Y Cartesian measurements in ABSOLUTE mode.
Q16> POL ABS R= 10.0000 A= 036.52.12 a = 0 00	A@@ 10.0000 036.52.12 0 00	Cartesian measurement above, converted to POLAR mode.
Q16> POL ABS MET R= 254.000 A= 036.52.12 a = 0 00	Q@@ 254.000 036.52.12 0 00	POLAR measurement above, converted to METRIC.
Q16> ABS SCA X= 4.0000 Y= 3.0000 a = 0 00	D@@ 8.0000 6.0000 0 00	Cartesian measurement above, biased by SCALE factor .50.
Q16> ABS SCW X= 5.1450 Y= 8.5749 a = 0 00	H@@ 5.1450 8.5749 0 00	Cartesian measurement above, biased by Skew factor.
Q16> POL ABS SCA SCW MET R= 127.000 A= 059.02.10 a = 0 00	J@@ 127.000 059.02.10 0 00	Cartesian measurement above, with many modes: POLAR, ABSOLUTE, SCALE, SKEW, METRIC.
Q16> INC X= -0.1500 Y= 2.8300 a = 0 00	B@@ -0.1500 2.8300 0 00	INCREMENTAL X & Y Cartesian measurement.
Q16> POL INC SCA R= 1.4170 A= 93.02.03 a = 0 00	G@@ 1.4170 93.02.03 0 00	INCREMENTAL measurement above, with both POLAR and SCALE modes.

Printed Message	XMITted Message	Explanation
Q16> ANGLE MODE ANGLE= 049.23.55 ABS MET X= 1.358 Y= 2.214 a = 0 00	PB@@ 1.358 2.214 0 00 049.23.55	Computed Angle and distance from VERTEX to Absolute Zero.
Q16> ANGLE MODE ANGLE= 049.23.55 ABS MET X= 4.642 Y= 2.786 a = 0 00	PB@@ 4.642 2.786 0 00 049.23.55	Distance from machine at point 4 of computed ANGLE to VERTEX
Q16> ANGLE MODE ANGLE= 310.36.05 ABS MET X= 1.358 Y= 2.214 a = 0 00	PB@@ 1.358 2.214 0 00 310.36.05	Complement of above ANGLE (360 -49 23'55") and VERTEX distance to ABSOLUTE ZERO.
Q16> RADIUS MODE RADIUS= 4.2906 ABS X= 3.7130 Y= -3.3241 a = 0 00	@A@@ 3.7130 -3.3241 0 00 4.2906	Computed RADIUS and distance from CENTER to ABSOLUTE ZERO
Q16> RADIUS MODE DIAMETER= 8.5813 ABS X= 4.2870 Y= -0.1759 a = 0 00	@E@@ 4.2870 -0.1759 0 00 8.5813	Computed RADIUS above, converted to DIAMETER, plus CENTER distance,
Q16> RADIUS MODE DIAMETER= 8.5813 POL ABS R= 4.2906 A= 357.39.00 a = 0 00	AE@@ 4.2906 357.39.00 0 00 8.5813	DIAMETER above, with CENTER distance converted to POLAR mode.

NOTE: There are many other possible messages. These are presented to help the user understand how messages are PRINTED and XMITTED.

Appendix F - Changing EPROMS

PROM SOCKETS TO CHANGE PROMS:

1. UNPLUG Q-16 FROM WALL.
2. REMOVE THE LOWER 4 COVER SCREWS ON EACH SIDE.
3. LIFT OFF COVER, DISCONNECT DISPLAY BOARD CONNECTORS.
4. LIFT OUT LOGIC BOARD (CENTER), LOCATE PROM(S).
5. CAREFULLY PRY UP OLD PROMS FROM THEIR SOCKETS WITH A KEY OR SCREWDRIVER.
6. INSERT NEW PROMS WITH THE NOTCH UP, U8 IN:U8, U7 IN:U7. NOTE IT MAY BE NECESSARY TO FORM THE PINS SO THE PROM WILL SLIDE IN THE SOCKET.
7. REINSERT LOGIC BOARD, AND RECONNECT DISPLAY BOARD.
8. REPLACE COVER AND SCREWS, TEST UNIT.
9. IF ANY PROBLEMS ARE FOUND PLEASE CALL YOUR DEALER OR MICRO-VU

(707) 838-6272

X - DENOTES REV. LEVEL

SCALE CONN.

MicroVu P/N 15103

ITEM	REQ'D	PART NO.	DESCRIPTION	EST. WGT.
TOLERANCES UNLESS NOTED				
XX = ±			DR 15 8-87 Q-16 LOGIC PCB	
.XXX = ±			CK PROM UPGRADE	
XXXX = ±			ZP	
ANGULARITY = ± 1/2°			SCALE	NEXT ASSY.
BREAK CORNERS = .010 MAX.			NONE	
FILET RADII = .015 MAX.				
175° MACHINED SURFACES				
DIMENSIONS ARE IN INCHES				

Appendix G- Switching the Power Supply

MICRO VU
P/N 15105 C

110 VAC

⊗ 220 VAC

NOTE:
TO CHANGE FROM 110VAC (STANDARD) TO 220VAC, REMOVE TOP COVER OF COUNTER, LOCATE POWERSUPPLY BOARD (AS ABOVE) PUSH THE TOGGLE SWITCH BAT TO THE DOWN POSITION. REPLACE COVER.

NOTE: FOR COUNTERS AFTER S/N 1184 THAT ARE NOT SUPPLIED WITH A SWITCH. THE POWER SUPPLY BOARD MUST BE REMOVED. AND FOUR TRACES CUT (SEE BELOW) ON THE REVERSE SIDE, CUT THESE FOUR TRACES

ADD FOUR JUMPERS FROM THE CENTER HOLES TO THE UPPER HOLES.

JUMPERS

ITEM	REQ'D	PART NO.	DESCRIPTION	EST. WT
DR 75		72-29	Q16-DUAL VOLTAGE OPTION	
GK				
AP				
				SCALE NONE
				NEXT ASSY

TOLERANCES UNLESS NOTED
 XX = ±
 .XXX = ±
 .XXXX = ±
 ANGULARITY = ± 1/4°
 BREAK CORNERS - .010 MAX.
 FILLET RADII - .015 MAX.
 125° MACHINED SURFACES
 DIMENSIONS ARE IN INCHES

Appendix H- Glossary of Technical Terms (as they relate to the Q16)

ABSOLUTE ZERO - the origin from where all CARTESIAN and POLAR distances are measured

ASCII - [AMERICAN STANDARD CODE for INFORMATION INTERCHANGE]; standard format of transmitted data

BAUD RATE - speed at which data is transmitted; defined in BITS per second

BI-DIRECTIONAL - capable of transmitting data to and from the Q16

BIT - [acronym: Binary Digit]; 0 and 1 (Binary Counting System) used for processing and counting all data

BYTE - representation of a character in Binary (eight BITS)

CARTESIAN - defining positions in terms of X and Y coordinates

CMM-2-AXIS - [COORDINATE MEASURING MACHINE]; measurements based on X and Y coordinates

DIP SWITCHES - [DUAL IN-LINE PACKAGE]; electronic device, mounted on a printed circuit board, containing several ON/OFF switches

LOCATION - specific place in Memory for storing data

MATRIX - an array with two or more dimensions; defines each switch location by a row and column

METROLOGY - having to do with measuring

MULTIPOINT RADIUS - computing a RADIUS from more than 3 points (4,5,6,7,8 or 9)

PARITY - processor checks BITS, place in transmitted data to insure no errors; a digit is added or subtracted to make sum of all digits odd or even

PERPENDICULARITY - a line or plane at right angles (90) to another line or plane

POLAR - defining positions in terms of straight line distance and angles

POSITION - specific point on a part being inspected

PRESET - setting numbers on the Displays from the keyboard

PROCESSOR - a set of chips that perform the basic functions of the Q16, as instructed by the SOFTWARE

RADIAL DISTANCE - direct distance between two points

RECALL MEMORY - displaying distances from memory positions to (1) each other, (2) ABSOLUTE ZERO, (3) current position of machine

RECYCLES - repeats RECALL from Memory positions from 0 to last location used

REMOTE KEYBOARD - provides for an additional keyboard at a distance from the Q16

RESOLUTION - the smallest increment of distance displayed usually (inch .0005", .0001", .00005"), (metric .01, .002, .001)

RS232 - [RADIO SIGNAL 232]; defines standard data requirements for communication between two devices

SCALE - changing the data on the displays by a factor (scale)

SOFTWARE - set of instructions which directs the Q16 computer to perform a specific function

STORE MEMORY - placing data in a specific memory location

SKEW - a part that is not aligned exactly to an X or Y axis

TOLERANCE - acceptable limits of a specified distance; example 5.100" +.010"

TOGGLE - where a keyboard switch changes from one state to another (ON to OFF)

TRANSMITTING - sending data to a Printer, Computer or other Communication Device

VERTEX - intersection of two straight lines; apex of a triangle

Supplement - Model ED50 and ED51 Edge Detectors

General

The Edge Detectors operates in conjunction with the Model Q16 Metrology Computer. The Edge Detectors can be retrofitted to most Q16 in the field. When installing an Edge Detector, the Q16 is Battery Backed-up such that calibration is maintained when power is turned off. Nine calibrations can be stored for different magnifications as well as varying parts. All edges are detected on the fly whether moving from light to dark or dark to light. Accuracy of the ED50 is dependent on several factors: speed at which the edge is crossed, contrast of the edge, and calibration technique. The calibration technique includes an Alignment Procedure, which is very critical! Please see section titled Alignment Procedure in this supplement.

Theory of Operations (ED50)

The ED50 detects edges by sensing light levels on the Comparator screen. A Fiber Optic Cable on the screen transmits the light levels to the ED50 console. An edge is determined as a level between Dark and Light. When an edge is crossed, a beeper sounds and the Q16 records the event. The Fiber Optic Cable referencing the light source compensates for fluctuations in light levels caused by AC line voltage.

The ED50 keyboard consists of 11 keys. Each key contains an LED to indicate the mode of operation. In addition, there is a PI (Positive Indicator) LED which lights each time a key is pressed.

The ED50 should be calibrated each time the Comparator is turned on, using the CAL DARK and CAL LIGHT keys. These keys read specific light and dark levels. The edge is normally set at a point, 50% between these two levels. A special calibration technique is available using the S1 key. Allowing the operator to set the edge at a specific level other than 50%, between dark and light. Nine calibrations can be stored using the S2 key and recalled as required.

The AUTO RADIUS EDGE and AUTO ANGLE EDGE keys place the Q16 in the appropriate modes enabling automatic computations. When an edge is crossed, the X & Y data from the display is automatically entered.

The AUTO SKEW EDGE key calibrates the SKEW based on the next two edges crossed and places the Q16 in the SKEW mode.

When the NEXT EDGE mode is on, the display freezes after crossing each edge. Each axis can be Zeroed at that edge or a number can be PRESET to that edge. Also, that edge can be Stored in Memory or Printed. Each time a new edge is crossed, the display is updated to show the coordinates of the new edge.

Pressing the AUTO EDGE key Zeroes all the displays. When the first edge is crossed, the Q16 begins counting from zero at that edge. The Q16 automatically enters the NEXT EDGE mode so that the displays freeze the second edge. All subsequent edges are updated. In addition, each display can be PRESET prior to crossing the first edge.

S3 and S4 are used for fine tuning the calibration of an edge. The edge calibration is normally set half way between light and dark (50%). These keys are used in conjunction with the S1 key to raise or lower the level from 50% to a different value.

Theory Of Operations (ED51)

The Theory for the ED51 is essentially the same as the theory for the ED50, except that on the ED51, the edge is sensed in the Optical System.

Alignment Procedure

This is the most critical part of using the Edge Detector. See Section 4 below for ED51 Video Alignment.

1. Insure that the Mechanical Portion of the appropriate Measuring Instrument is aligned;
 - a. The Camera and Lens assembly is perpendicular to the measuring plane.
 - b. The Profile Condenser Lens is Centered and perpendicular to the Video Camera & Lens Assembly.
 - c. The Profile Lamps are centered on the Condenser Lens.
2. To assure proper alignment, a Pin-hole Fixture or Iris over the Condenser lens will project a very small light circle on the Screen. This light circle should be in the center of the screen.
3. The true test of proper alignment is to measure a Gage Block in four directions, achieving repeatable measurements. If there is no repetition, see 4 b. below.

4. The ED51 Video Edge Detector requires Special Alignment of the Video Sensor PCB. (see figure L).
 - a. When the image is focused on the screen, it should be focused appropriately on the Sensor. There is no adjustment, as it is Factory Set.
 - b. If the Mechanical Alignment is set properly and a Gage Block will not repeat (see 3 above), then the Sensor PCB may not be centered properly. The four adjustment screws can be used to center the PCB, which should provide repeatable measurements.

Hardware (ED50)

The ED50 consists of the following items:

1 each	ED50 Console
1 each	Screen Sensor Assembly (Plastic Holder, Overlay Clips and Hardware)
2 each	Fiber Optic Cables

Normal Installation (ED50)

Note: The ED50 will be attached to the top of the Q16.

1. Place Plastic Holder on Screen using Screen Clips. Sensor Mounting hole should be in an area free of lines and within .100" of the center of the screen.
2. Connect one Fiber Optic Cable from ED50 (Sensor Designation) to Plastic Holder on Screen.
3. Connect other Fiber Optic Cable from ED50 (Reference Designation) to Profile Lamp Housing. It is important to point cable at light source and affix such that it does not move after calibration. A small cable clamp is provided.

Hardware (ED51)

The ED51 Video consists of the following items:

1 each	ED51 Console
1 each	Fiber Optic Cable (for reference light)
1 each	Video Lens Sensor Cable
1 each	Video Lens Sensor Assembly

Normal Installation (ED51)

The ED51 will be attached to the top of the Q16.

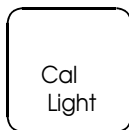
1. The Fiber Optic Cable is connected from the ED51 Console to the Profile Lamp Housing.
2. The Video Lens Assembly is attached to the Video Camera. The Video Lens mounts to the bottom of the assembly.
3. The Video Lens Sensor Cable attaches from the ED51 Console to the Video Lens Sensor Assembly.

Operational Key Sequences

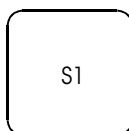
Calibration Sequence:



Move sensor over dark area of screen and press key. CAL DARK LED turns on then off and CAL LIGHT key LED lights.


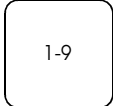


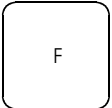
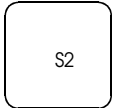
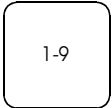
Move sensor over light area of screen and press key. LED extinguishes.



Pressing the S1 key will allow calibration of the edge at a specific light level. Once the S1 key is pressed the S1 LED will light and the threshold percentage is displayed in the Z Axis. It normally comes up at 50%. The threshold percentage can be changed over a range of 25% - 75%, in one percent increments. While the S1 light is on, pressing the S3 will raise the threshold; while pressing the S4 will lower the threshold. Raising the threshold (S3) sets the edge closer to the light side, therefore making the image appear larger. Lowering the threshold (S4) reverses the procedure.


The following Sequences can be used to store and recall nine calibrations. They can be assigned to various lenses as well as various types of parts.

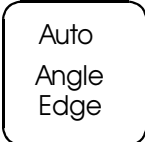
  Pressing keys in this sequence will store the calibration in one of the calibration memories.

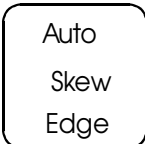
   Pressing keys in this sequence will recall the calibration store in one of the 9 calibration memories.

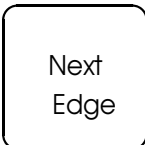
Note: Calibrate with a one inch to two inch gage pin or block. Insure that you are not flexing the table with a hand crank when crossing the edge. If there is difficulty using CAL DARK and CAL LIGHT, use the S1 calibration sequence until readings are correct.

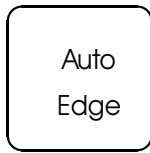
Operational Sequence:

 Lights both this key and the Q16 RADIUS key. Crossing consecutive edges will allow the Q16 to automatically compute the RADIUS and CENTER. Turning off either this key or the Q16 RADIUS key will extinguish both lights and exit RADIUS mode.

 Lights both this key and the Q16 ANGLE key. Crossing consecutive edges will allow the Q16 to automatically compute the ANGLE and VERTEX. Turning off either this key or the Q16 ANGLE key will extinguish both lights and exit ANGLE mode.

 Lights this key and Q16 CAL key. Crossing consecutive edges will allow the Q16 to automatically calibrate the skew. When the second point is entered (by crossing the edge) the SKEW CAL key will extinguish and SKEW key will light, placing Q16 in the SKEW mode.

 Updates the Q16 each time an edge is crossed enabling data to be entered on the display, entered into memory, or used in computations, such as RADIUS, and ANGLE. The edge can be set to ZERO or PRESET after the edge is crossed.



Zeroes all displays prior to crossing an edge. When the first edge is crossed, the AUTO EDGE light extinguishes and the Q16 begins counting from zero at the edge. Also, immediately after crossing the first edge, the NEXT EDGE mode is activated, causing the display to freeze when the next edge is crossed. Additionally, each display can be PRESET before crossing the first edge.

Error Messages

Error Code	Description
40	Screen light level too bright.
41	Reference light level too bright.
42	Reference light level too low.

Hit Z Zero Reset key to Clear Errors Message.

Remote Keyboard Connector and RS232 Codes

ED50 Keyboard	Remote 15 pin Connector	RS232 Keyboard
Cal Dark	1 – 5	A
Cal Light	1 – 9	B
Next Edge	1 – 2	C
Auto Edge	1 – 6	D
Auto Radius Edge	3 – 9	E
Auto Angle Edge	3 – 2	F
Auto Skew Edge	3 – 6	G
S1	8 – 5	H
S2	8 – 5	I
S3	8 – 2	J
S4	8 – 6	K

Troubleshooting

There are two major problems associated with the use of the ED50:

1. The first is associated with the proper light adjustment. Even though the ED50 calibrates DARK and LIGHT, the light must be set properly for repeatability. Refer to Alignment Procedure in this Section.
2. The second is the placement of the Reference Fiber Optic Cable. It must be fixed and directed at the bulb (lamp).
4. The third is a defective fiber optic light guide, which does not allow sufficient light to pass to the Edge Detector console.

Micro-Vu Q-16 — Quick Reference

Legend

● L.E.D. "ON"

○ L.E.D. "OFF"

Skew Calibrate

● CAL 1st Point

○ CAL 2nd Point

● SKEW Aligns To Two Points

Scaling

● F

● SCALE Displays Scale Factors

KEY PAD .10 to .10

ENTER DISPLAY

○ F Scales Displays

ZERO RESET Scale Axis Individually

Radius

● RADIUS

ENTER DISPLAY 1st Point

ENTER DISPLAY 2nd Point

ENTER DISPLAY 3rd Point

Multipoint Radius

KEY PAD Select 4, 5, 6, 7, 8 or 9

Angle

● ANGLE

ENTER DISPLAY 1st Point

ENTER DISPLAY 2nd Point

ENTER DISPLAY 3rd Point

ENTER DISPLAY 4th Point

Angle Functions

● F

CTRVPR 1 DIST Displays Distance from Vertex to Current Position

DIA 2 360° - A Complement 360° - Angle

3 180° - A Complement 180° - Angle

Memory Store

● STORE MEMORY Displays Next Available Location on Z/REF

ENTER DISPLAY Stores in Location on Z/REF

Random Store

KEY PAD Select Location

Clear Memory

● F

● STORE MEMORY Select One Location or Range

KEY PAD Select One Location

ENTER DISPLAY Clears Locations

Memory Recall

● RECALL MEMORY

ENTER DISPLAY Displays Distance From Location to ABS Zero

ENTER DISPLAY Cycles to Next Location

Random Recall

KEY PAD Select One Location

Recall Between Two Points

KEY PAD Select 1st Location

— Dash on Key Pad

KEY PAD Select 2nd Location

ENTER DISPLAY Displays Distance Between Two Points

Preset

● PRESET

ZERO RESET Zero X or Y Individually

KEY PAD Select New Numbers

ENTER DISPLAY Enter on X or Y Display

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