

**QUICK-CHEK
QC-1000**

OPERATIONS MANUAL

FCC Rule NP15R
Rev. 23 Jun. 89

NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

TABLE OF CONTENTS

SECTION/TITLE	PAGE
I FEATURE SUMMARY	1-1
Feature summary	1-1
Front and Rear panels.....	1-4
System parameters	1-6
Axis type: (linear or angular).....	1-6
Encoder Resolution	1-6
Encoder Direction	1-6
Display Resolutions	1-6
Pre-scale factor	1-6
Linear error compensation factor.....	1-6
Incremental offset.....	1-6
Communications operations (RS-232 port)	1-7
Edge detector	1-7
Options	1-8
RS-232 interconnecting cables.....	1-8
Footswitch	1-8
II OPERATING INSTRUCTIONS	2-1
Power-up	2-1
Normal operation	2-1
Using the Quick-Chek.....	2-2
Front panel keys, primary function	2-3
III REFERENCE	3-1
Functional Description	3-1
System check-out.....	3-1
Installation instructions	3-1
Initial power-up	3-1
Set-up parameters.....	3-2
Operator setup.....	3-3
Feature description.....	3-4
External features	3-4
System configuration	3-5
Display operation.....	3-6
Display resolution	3-7
Display zeroing	3-8
Encoder reference signal axis zeroing function	3-8
Display modifying counter characteristics.....	3-9
Error compensation	3-9
Scaling factors	3-9
Data retention during display “off” conditions	3-9
Loss-of-power indication and recovery	3-9

TABLE OF CONTENTS

Encoder error indication and recovery.....	3-10
Multiple encoder resolution.....	3-10
Display counting vs encoder movement.....	3-10
Prescale factor.....	3-11
Linear error compensation.....	3-11
Print key.....	3-12
Self-test.....	3-13
Numeric entry.....	3-14
Setup errors.....	3-15
Axis identification character.....	3-16
Setting up the axes.....	3-16
RS-232 communications.....	3-18
Serial port RS-232 pin out.....	3-18
RS-232 data stream.....	3-19
Transmitting.....	3-19
Receiving.....	3-20
QC 1000 probe input.....	3-22
Setting parameter protection.....	3-23
Power-off setting retention.....	3-23
Factory default parameters.....	3-23
IV SETUP INSTRUCTIONS.....	4-1
Setup.....	4-1
Front panel keys, setup function.....	4-2
Setup menu.....	4-3
Setup instructions:.....	4-3
Setup buttons:.....	4-3
Numerical entry instructions.....	4-3
Numerical entry buttons:.....	4-3
Numeric entry.....	4-4
Front panel keys, numeric entry.....	4-5
Setup template.....	4-6
V APPENDIX A, B, C.....	5-1
Replacing the Fuse.....	5-1
Changing Voltage Selection.....	5-2
Seven Segment Display.....	5-3
INDEX.....	6-1

QUICK-CHEK QC-1000

SECTION I FEATURES SUMMARY

FEATURE SUMMARY

The Quick-Chek, QC-1000, is a digital measuring device that displays measurements corresponding to the movement of a machine table equipped with one or more encoders. For linear measuring the display shows a maximum measurement of seven digits, the actual measurement will depend on the resolution of the encoders.

SYSTEM FEATURES

- * Selectable encoder resolution down to .000004 inch or .0001 mm.
- * Selectable angular or linear readout.
- * Angular readout in decimal degrees or degrees, minutes, seconds.
- * Linear error compensation.
- * Reversible encoder direction.
- * Absolute and incremental datum.
- * Laser-Chek interface and footswitch compatible.
- * Instant conversion from inches to millimeters.
- * Reference mark capability.
- * Printout inspection data.
- * Continuously tracks table position even when display is "Off".

SPECIFICATIONS

FEATURES

- * Input: All encoders with TTL square wave as the standard interface input such as Acu-Rite, DRC, Sargon. Nikon and Mitituyo rotary or linear input and others are available as an option.
- * Output: RS-232 serial port.
- * Resolution: Down to .000004 inch or .0001 mm.
- * Power: 90 - 130 VAC or 200 - 240 VAC.
- * Operating Temperature: 0° to 40°.
- * Dimensions: Master - 2.74" High x 9.06" Deep x 6.64 Wide.
Slave - 1.92" High x 9.06" Deep x 6.64 Wide.
Combined master and 1 slave
4.66" High x 9.06" Deep x 6.64 Wide.

FEATURES

EXTERNAL FEATURES

- * Small "master/slave" single unit.
 - * "Master" and "slave" units have a single encoder input and display.
 - * "Master" permits control of system parameters and axis parameters.
 - * "Slave" controls parameters for specific axis
 - * Units are compatible with, and provide connectors for, Acu-Rite and Heidenhain encoder products
 - * Front panel keys:
 - PRINT
 - REF
 - DEG/DMS
 - INCH/MM
 - INCR/ABS
 - DISPLAY ON
 - DISPLAY OFF
 - ZERO
 - * Display: 8-decade vacuum fluorescent display with message areas beneath the numeric display:
 - ERR
 - REF
 - DMS
 - DEG
 - INCH
 - MM
 - ABS
 - INCR
 - * Removable 115v. power cord.
 - * Fused multiple voltage capability.
 - * Master ON/OFF switch
 - * Meets FCC Class A requirements.
 - * Selectable Display resolution.
 - * Five-axis systems availability using a single "master" unit and up four linked "slaves".
 - * 9-pin D-subminiature RS-232 connector on back of "master" for external printers, computers, etc.
 - * 8-pin phone receptacle on back of "master" for foot switch
 - * Accommodates encoder products supported by the Quadra-Chek counters
- (Optional)
- * 5-pin DIN receptacle for edge finder (Optional)

FEATURES

INTERNAL FEATURES

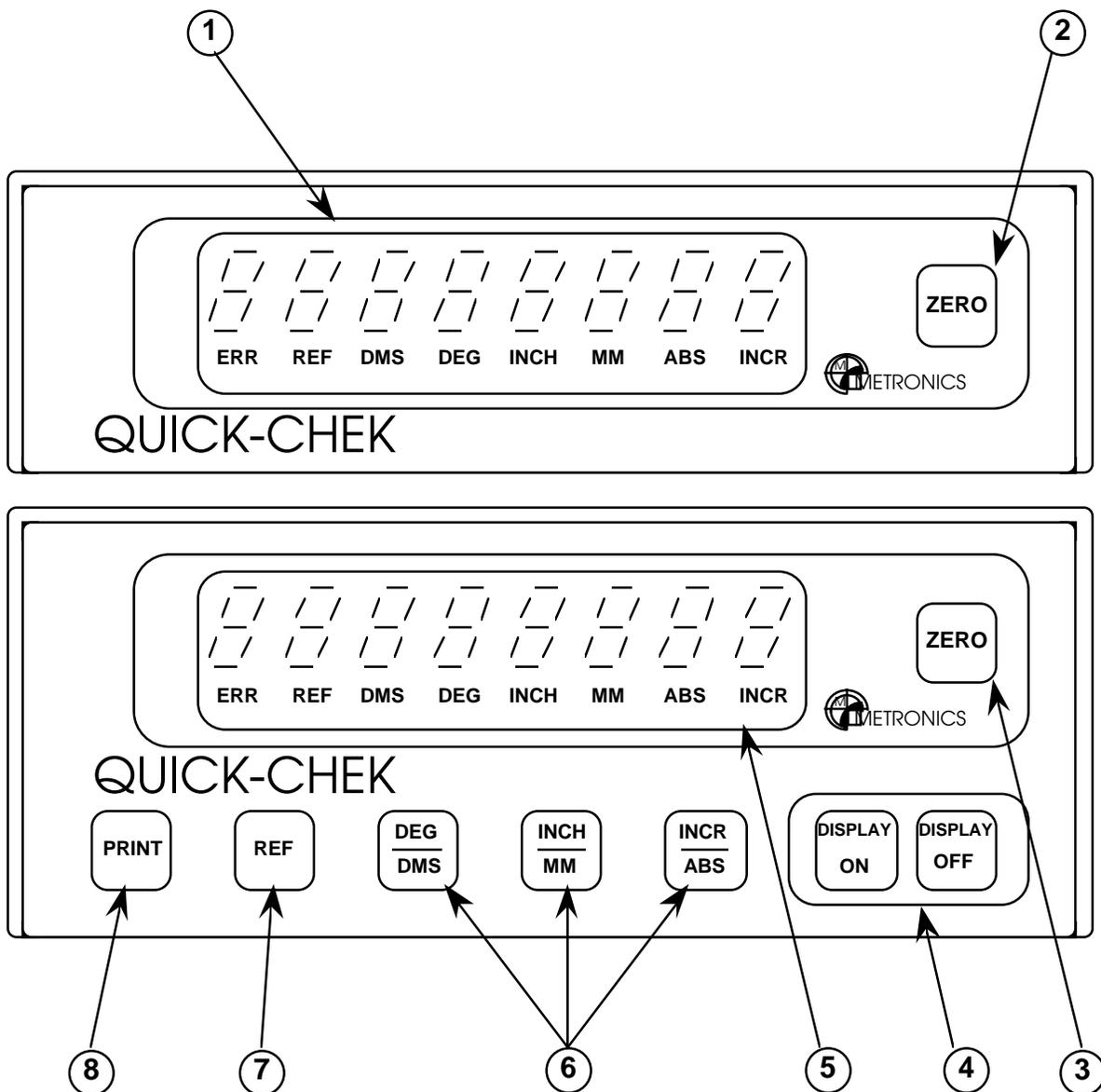
- * Display operation:
 - Compatible with current display readouts.
 - Indicates current selections for inch/mm, incremental/absolute, degrees/degrees-minutes-seconds, reference features enabled, encoder counting error detection.
 - Measurements displayed in linear or rotary calibration.
 - Linear displays shown in English or metric units.
 - Rotary displays shown in decimal degrees or degrees-minutes-seconds.
- * Constant update of incremental and absolute measurements.
- * Measurement of linear or angular movements.
- * Instant conversion; inches to millimeters, degrees to degrees-minutes-seconds.
- * Incremental and absolute display mode zeroing.
- * Encoder reference axis zeroing.
- * Incremental mode reference offset.
- * Factory pre-set and user-selected settings retained during power-off.
- * Current parameters protected via program access code.
- * Error indications for power-loss, encoder signal errors
- * Retention of current measurements, and updating, after pressing the DISP OFF key.
- * Self-test routine accessed through the set-up program.
- * Linear error compensation.
- * Heidenhain encoder compatibility.
- * Customer specified factory default settings available for internal encoder adaptor electronics.
- * Specific numeric entry parameters available during set-up.
- * Setting for edge finder operation (Optional)

FEATURES

FRONT AND REAR PANELS

QUICK-CHEK FRONT PANEL

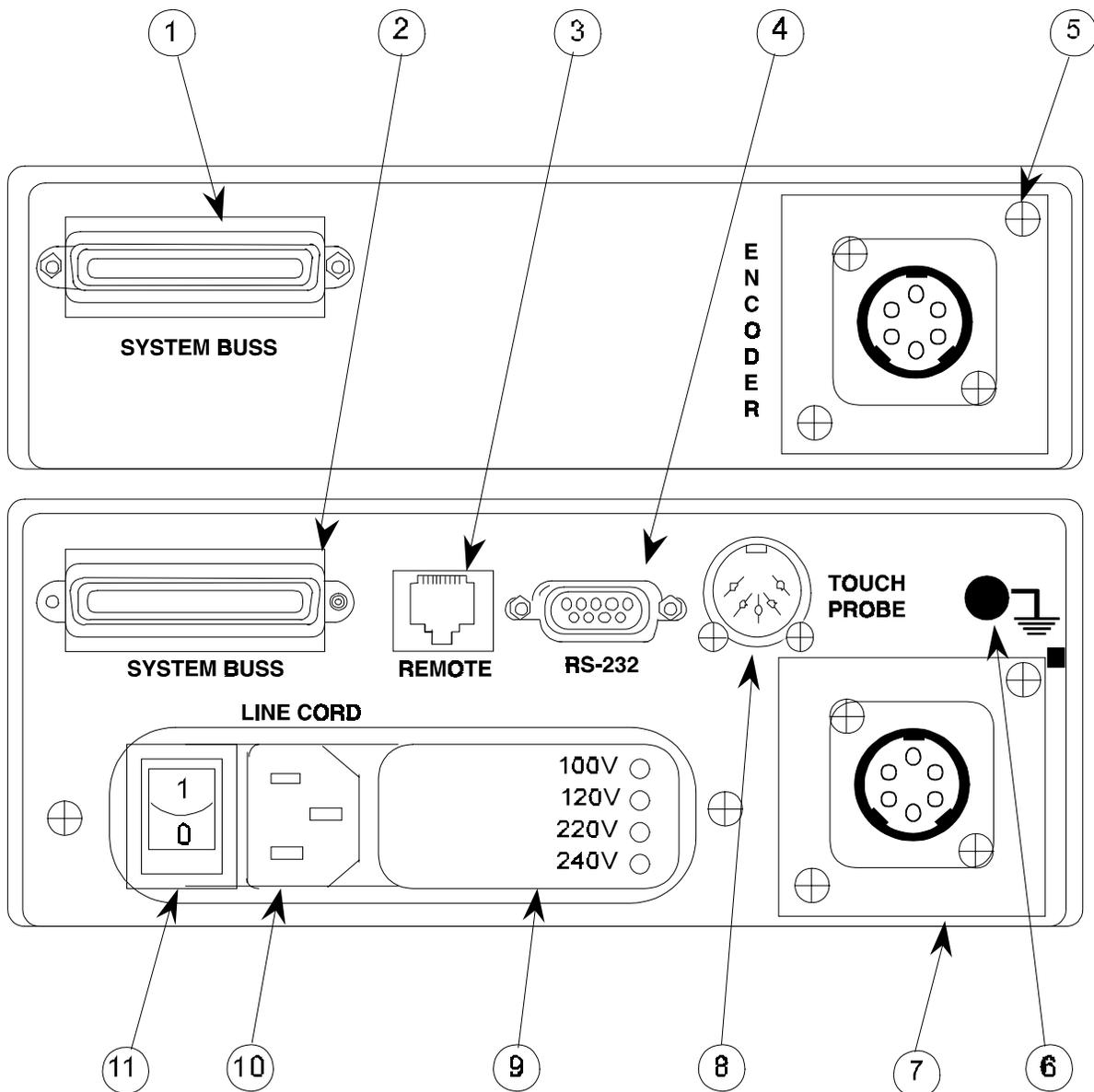
1. Slave Axis Window
2. Slave Axis Zeroing Key
3. Master Axis Zeroing Key
4. Display ON / OFF Keys
5. Master Axis Window
6. Mode Keys
7. Reference Feature Key
8. Print Function Key



FEATURES

QUICK-CHEK REAR PANEL

1. System Buss Connection
2. System Buss Connection
3. Remote Jack
4. RS-232 Port
5. Encoder Connection
6. Ground
7. Encoder Connection
8. Touch Probe Connection
9. Fuse and Voltage Select Pin
10. Line Cord Receptacle
11. ON/OFF Power Switch



SYSTEM PARAMETERS

Axis-specific parameters; individual settings may be for each axis:

Axis Type: (linear or angular).

Factory Default: linear

Encoder Resolution: Use the numeric entry routine.

Factory Default: all axes: 2um (linear)

Encoder Direction: ("pos" or "neg") for linear encoders only.

Factory Default: "pos"
(for standard sense)

Display Resolutions: mm, inch, deg, dms

Pre-scale Factor

Used as multiplier for odd resolutions where a linear system is composed of a rotary encoder and lead-screw. Since only specific operator required values are meaningful, no value menu is provided. This parameter can only be entered via the numeric entry routine or from a computer via the RS-232 port .

Factory Default: 1.000000

Linear Error Compensation Factor

Correct an encoder-generated measurement using this factor to produce a displayed measurement. Since only specific operator required values are meaningful, no value menu is given. This parameter is calculated by a "correction" routine using the observed numeric entries vs actual measurements. Positive and negative values for the LEC factor are allowed but the numeric values are all positive.

Factory Default: 0 ppm (no compensation).

Incremental Offset

This parameter can only be set by zeroing operations while using the unit. It cannot be set via the RS-232 port from a computer except as key strokes. The offset can be zeroed by specific zeroing operations or by resetting all parameters. Positive and negative values are created.

Factory Default: zero

FEATURES

ACCESSORY/OPTION PARAMETERS

These parameters are set for proper option and accessory operation. Factory setting: Each parameter has factory-set defaults. If the option or accessory is not installed do not change the parameters. Changes may cause unexpected results.

Communications Operations (RS-232 port)

The RS-232 port is a serial port that allows two-way communication of data between an external computer and the readout, or downloading data to a recording device, such as a printer. Refer to the "RS-232 communications" section for details.

Note: the parameters controlling the RS-232 operations initially may have to be set within the unit, to establish communications with an external computer before the computer can pass data to the unit.

The following parameters are set internally and cannot be changed:

PARITY	0
STOPBITS	2
WORDLENGTH	8
PROTOCOL	Hardware

The parameters below are presented as menus from which to make the selection:

Factory Defaults:	BAUD RATE	600
	END-OF-LINE CHARACTER	Carriage Return
	AXIS I.D. CHARACTERS	X
	PRINT	On for all axes

Edge Detector

Set parameters when the detector is activated. Serves as a remote PRINT key and/or display "update" when the detector is activated.

Factory Default: printing off, update off.

FEATURES

OPTIONS

The QC-1000 may be equipped with the following options. These options are available at the time of equipment purchase or any time afterward. The installation of some options for QC-1000 systems in the field may require the system to be returned to Metronics for reconfigure of the software and hardware. For additional information, please refer to the specific options paragraph.

RS-232 INTERCONNECTING CABLES

These cables are the standard product cables as used for the QC-3000 series.

FOOTSWITCH

The footswitch is the standard Metronics two key footswitch. The large key is used to zero all axes. The small key is used as a PRINT key

EDGE DETECTOR

The edge detector option is activated when the edge detector senses an edge of a part. When activated the edge detector can act as a remote **PRINT** key. When set to act as a remote **PRINT** key the action is the same as pressing **PRINT**.

When set to "update" the displays, the displays remain fixed at the measurement shown when the parameter was set. Further movement of the encoder will not change the display. When an edge is detected, the displays "update" to the current measurement "freezing" on those measurements (the measuring information has continued to be updated internally, but is not shown). Again, further encoder movement will not change the displays until the next edge is sensed, or the feature is turned off.

Note that when both printing and updating actions are set, the displays are updated immediately prior printing.

QUICK-CHEK QC-1000

SECTION II OPERATING INSTRUCTIONS

POWER-UP

Plug in the power cord and turn on the power switch, located on the back beside the plug receptacle. The Quick-Chek will show a non-flashing message "SF t 1.00" in the left-most digits of each display. This message shows the software version installed in each axis and indicates that the power has been off.

Press the **DISPLAY ON** key to clear the message, zero the displays and ready the unit for normal operation. Indicators under each axis display will be lit to indicate the factory settings for the measure mode (*ABS*) and measure units (*INCH*).

NORMAL OPERATION

The unit operates similar to most digital readout products (such as Quadra-Chek units). It will indicate measurements of movement on a display for items like milling machine tables, lathe beds or slides, coordinate measuring machine tables, etc.

All displays may be switched between incremental and absolute measuring modes by using a single key. The current mode is indicated by an *ABS* or *INC* message in each display.

Measurement units may be switched between English and metric units with a single key. The current selection is shown with an *INCH* or *MM* message in each display.

OPERATING INSTRUCTIONS

If any axes are to be used for angular measurements, a single key will switch between decimal degrees and degrees-minutes-seconds displays. Those axes will show a *DEG* or *DMS* message in the display.

If an encoder counting error occurs while using the measuring system, the affected axis will immediately show a flashing "ERR" message directly beneath the measurement display for the affected axis. The measuring information continues to be displayed but **THE OPERATOR SHOULD NOTE THAT THE MEASUREMENT MAY NOT BE ACCURATE**. The operator should reset the counter in both measuring modes at the first opportunity by using the REF features or pressing DISPLAY ON. Pressing the **DISPLAY ON** key will also zero both ABS and INCR modes and clear the error.

The axis display for the current measurement mode either *ABS* or *INCR* may be zeroed at any time by pressing the appropriate **ZERO** key for effected axis. Note that both modes are not zeroed, only the current mode. The alternate mode can be zeroed by changing modes, then pressing the appropriate **ZERO** key.

The absolute mode displays may be zeroed and the incremental mode reset to the last offset in combination with an encoder reference signal. Pressing the **REF** key will activate the reference signal function for all axes. When the encoder is moved past its reference mark the absolute mode will be zeroed, the incremental mode reset, the REF message extinguished and errors cleared. Pressing the **REF** key again will deactivate the REF function and turn off all remaining REF messages.

OPERATING INSTRUCTIONS

When the unit is turned off by pressing the **DISPLAY OFF** key, the display will blank but the readout will retain the current position information. If the encoders are moved while the unit is "off", this movement will be recorded internally and the measurement will be shown when the unit is turned "on". Any display messages that would have shown if the unit were "on" will be displayed when the unit is turned "on". Note that while the unit is "off" no front panel key presses will be acknowledged or stored. Press the **DISPLAY ON** key to again turn the display on and continue normal operations.

If the power to the system is lost or the rear-panel ON/OFF switch is turned "Off" all positioning information will be lost. When the power is restored a steady display of "SF t X.XX" in all axes indicates that the power has been interrupted. Press **DISPLAY ON** to zero all axes and return to normal operation. If reference offsets were used the encoder reference mark should be scanned also.

USING THE QUICK-CHEK

1. Turn "ON" the Quick-Chek by pressing the "ON/OFF" switch located at the rear of the the unit beside the power plug. *All axes will read SF t X.XX.*
2. Press the DISPLAY ON key to clear the software message. 0.00000 INCH/ABS will show in the display window.
3. Establish Absolute Zero by moving the encoder to a known position and pressing the axis ZERO key or by using the Reference feature.
4. Repeat step 3. for each axis being used.
5. Perform the operation that you wish.

OPERATING INSTRUCTIONS

FRONT PANEL KEYS, PRIMARY FUNCTION

Each front panel key is labeled to indicate its primary function which is explained in the following paragraphs.

- PRINT** The primary function is to enable the system to transmit axis information thru the RS-232 port to a printer. If a computer is connected to the port, pressing the key will initiate a transfer of data to the computer. The PRINT key has no primary function if a device is not connected.
- REF** The primary function enables the encoder reference axis display zeroing feature. A single key press will turn the axes "On". If any axes are "On" a second key press will turn the axes "Off".
- DEG/DMS** The primary function provides the toggling of all axes between decimal degrees and degrees-minutes-seconds display modes.
- INCH/MM** The primary function toggles the active measurement axes between inches and millimeters for the linear measuring mode.
- INCR/ABS** The primary function provides toggling of all axes between incremental and absolute measuring modes.
- DISPLAY ON** The **DISPLAY ON** key primary function reactivates the display and clears errors.
- If the displays indicates a loss-of-power after initial power-up, press the **DISPLAY ON** key to zero all displays in both incremental and absolute modes.
- DISPLAY OFF** The primary function of the **DISPLAY OFF** key is to turn "Off" the display. Encoder counting information is still processed.
- ZERO** The primary function of each ZERO key is to zero its associated display.

A single beep signals each key press. A triple beep signals loss of power to the system.

**QUICK-CHEK
QC-1000**

**SECTION III
REFERENCE**

FUNCTIONAL DESCRIPTION

SYSTEM CHECK-OUT

INSTALLATION INSTRUCTIONS

The shipped unit includes the Quick-Chek system, a power cord, and an operator's manual. The shipping carton and inserts should be retained in case the unit has to be returned to the factory for service.

If other than 115VAC power source is to be used for the unit move the pin setting in the fuse block of the unit, change the fuse and substitute a suitable power cord. These measures should properly protect the unit from excessive current draw.

Follow this procedure to install the unit.

- a. Mount the system to a secure base to prevent accidental damage.
- b. Install all options and accessories.
- c. Plug the 115vac power cord into the unit. The unit is factory set for 115vac operation.
- d. Install the system encoders and connect them to the counter.

INITIAL POWER-UP

Turn on the power switch which is located beside the plug receptacle on the back. The Quick-Chek will display the "*SF t X.XX*" message in the left portion of each unit window. This message indicates that the power has been off and shows the software version installed.

Press the **DISPLAY ON** key to clear the message, zero the displays and ready the unit for normal operation. Indicators under each axis display will be lit indicating the factory setting for the measure mode (ABS) and measure units (INCH).

Note: Pressing the **DISPLAY ON** key also zeros the absolute and incremental modes.

SET-UP PARAMETERS

The system set-up parameters reflect the encoder resolution which is an integral part of the measuring system. The factory settings are the defaults that are active when the system is turned on. The factory settings may be changed to reflect installed accessories, options and operator preferences for the system features.

Parameters which can be set for each axis include encoder resolutions, display resolutions, linear or angular measurements, encoder direction, pre-scale factor and linear error compensation. Default values and communications parameters can be set for options and peripheral equipment such as a printer, edge finder or computer.

The Quick-Chek setup mode can be used to select new settings to change the system parameters or may be used to reset the unit to the factory settings.

Refer to the Setup paragraph for the program steps and selections. The prompt messages are shown in the appropriate display windows for the menu items or list of parameter selections. Refer to the Appendix section for the seven-segment alpha/numeric display characters used in the display windows.

The current default parameter is shown for each setting. If a list of setting selections is given the list begins at the current setting. Pressing the **PRINT** key (which acts as a "NEXT" key) displays the next item on the list. Refer to the Setup section for a list of key secondary functions. Setting displays scroll to the top of the list and repeat until a selection is made. The new settings are entered into the program by pressing the **ZERO** key which acts as a SELECT or ENTER key.

Other parameters are set by using the numeric entry routine while in the setup mode. Parameters that utilize the numeric entry routine include encoder resolution (linear or angular), pre-scale factor, and error compensation factors.

The current system parameter selection that can be selected is shown in the lower display only. All other axes show a row of minus signs indicating that the unit is in a program mode.

Press the axis **ZERO** key to select the axis for a parameter for axis-specific operations. When a specific axis is being set only that display will show the parameter, the other displays will show a row of dashes. The lower display shows all system parameters plus those of the lower axis.

OPERATOR SETUP

The setup function is selected by holding down the **DISPLAY ON** key and pressing the **PRINT** key. A "code" request message appears in the lower display to show that the unit is waiting for operator access confirmation before starting the program mode. The operator must enter the access code consisting of the following key entries in the following sequence: PRINT, DEG/DMS, ZERO, PRINT, ZERO and REF. When the access code has been entered, the message "Set AX" is displayed in the lower axis. If the code is entered incorrectly the Quick-Chek returns to normal operation following the sixth key press. The program sequence must be started again.

The factory settings are retained unless changed by the operator. The setup mode enables system and axis parameters to be set that are retained when the counter is turned off/on. The settings may also be changed by external communication from a computer. The programming mode moves through several menus and sub-menus which may offer lists of parameters from which to choose a selection. The current value is always the first item shown.

Certain parameters can be entered as specific numbers, using a numeric entry routine. These entries include: linear or rotary encoder resolutions, prescale multiplier and linear error compensation factors.

The setup mode menu moves through a hierarchy or order of presentation. Some of the program sections require a parameter be selected. If none are selected, the menu scrolls back to the top of a list.

A summary of the numeric entry steps follows:

1. A prior setting for the parameter will show in the display.
2. The prior setting may be cleared by pressing the appropriate measurement unit's key (**INCH/MM** or **DEG/DMS** depending on the axis measurement type).
3. The left-most digit will flash indicating that it is the currently-selected digit.
4. Check the Current units of measurement indicated in the display. The units must be compatible with the number being entered. The units are changed by pressing the **INCH/MM** or **DEG/DMS** keys. This also converts the currently displayed number to a measurement compatible with those units. Parameters (like scaling factors) are dimensionless and no unit indicators are lit. A single press of either unit key clears the present value and does not affect the unit indicators.
5. Press the **PRINT** key until the desired number is shown in the currently selected digit.

REFERENCE

6. If a decimal point is to follow this digit, press the **REF** key. To enter a number smaller than zero, the first digit must be set to zero, and the decimal point entered on that digit (the number will be entered in the form 0/XXXX).
7. When the current digit entry is complete, press **INCR/ABS** key to set the value and select the next digit to the right. If the current digit is the right most, pressing **INCR/ABS** moves the (flashing) pointer to the left-most digit.
8. If an error is made, clear the current value by pressing the appropriate measurement key. The mistake may also be fixed by reselecting and changing the appropriate digits.
9. Press the **ZERO** key to halt the numeric entry mode and set the current display as the parameter entry. This stops the numeric entry mode and moves to the next step of the parameter entry program. The **DISPLAY ON** key must be pressed to end numeric entry, halt additional parameter entry and save current settings.

FEATURE DESCRIPTION

EXTERNAL FEATURES

The combined size of one master and one slave unit is approximately 6-7/8" wide x 4-3/4" high x 10" long. A single "master" unit is approximately 6-7/8" wide x 2-3/4" high x 10" long while a single slave is approximately 6-7/8" wide x 2" high x 10" long.

A master unit consists of a single axis display and push buttons, ribbon connector port, footswitch jack, serial communications port, edge detector connector, ground screw, axis connector, On/Off switch, power outlet and fuse compartment. The Slave unit has the individual axis display, ribbon connector port and axis connector.

A multiple-axis system of up to five axis may be constructed using one master and four slave units. When a multiple-axis system is configured the slave units must be securely fastened to the master and other slave units making a single integral package.

The "ON/OFF" power switch is located on the back of the master unit near the IEC style power cord receptacle. The front-mounted **DISPLAY ON** and **DISPLAY OFF** buttons control the DC power to the display.

INTERNAL FEATURES

SYSTEM CONFIGURATION

There are three categories of variables retained within the QC-1000 Quick-Chek software.

1. Current values
2. System parameters affecting individual axes
3. System parameters affecting overall operation (including communication) plus accessory and option settings.

The current variables are the operating values that are displayed and affected by the front panel keys. They are transitory in nature and of immediate interest to the operator. These values include the measurement being displayed, measuring mode, units of measurement, REF status, power-out indications, and encoder error indications. The current values are generally retained during a display-off condition but not after a loss of power (such as a power loss or turning "OFF" the switch). Current values change as the unit is being operated i.e. by front panel keys, encoder movements.

System parameters are values that are changed by making selections within a set-up program or by values from an external source. Each parameter has a value pre-set by the factory that is in effect when power is first applied to the unit. System parameters that must be set for individual axes include axis type, encoder resolution, encoder counting direction, pre-scale factor, linear error compensation. Parameters that affect the overall operation include RS-232 and edge. These parameters must be set to match the configuration of the option before operation begins.

Communication parameters affecting the operation of the RS-232 port include: baud rate, end-of-line-character, identification character for each axis, and whether each axis is to be printed when the PRINT key is pressed. Settings for accessories and options include printing and/or updating on detection of an edge. If no accessory is attached to the unit the setting is not important.

Once all the system and communication parameters have been set they will not be effected by a power loss.

REFERENCE

DISPLAY OPERATION

The QC-1000 is a digital measuring device that displays measurements corresponding to the movement of a machine table equipped with one or more encoders. For linear measuring the display shows a maximum measurement of seven digits the actual measurement will depend on the resolution of the encoders. There are seven active digits, the eighth, the left-most, is reserved for a minus sign (-) when used.

The message "o *FLo*" is displayed for linear axis display overflows or numbers beyond the seven digit range. When the overflow condition no longer exists the number is displayed. An extreme overflow produces unpredictable results but a correct measurement is retained internally for a reasonable over flow values.

Linear measuring displays are always be right-justified, including minus sign. The display includes a leading zero positioned immediately to the left of the decimal point when the measurement is less than 1.

The QC-1000 displays angular measuring systems readings that correspond to either decimal degrees (DEG) or degrees-minutes-seconds (DMS). After the ZERO key is pressed the angular display begins at zero and count in a positive direction either clockwise or counter-clockwise. With angular measurements the maximum measurement that can be displayed is 360.0000 or 360.00.00 One more count starts over again and is the same as the first count. Display overflow cannot occur with angular displays.

Note that decimal points are used to separate the portions of the DMS display. Angular displays require no minus sign and up to seven digits are displayed beginning with the left-most position. The right-most display position is reserved for a degree symbol.

With angular displays the decimal points that mark the display stay in the same position (000.000) for decimal degrees displays and (000.00.00) for DMS displays and are always shown, regardless of resolution. If less than one degree, a leading zero will be displayed. Trailing zeros are not suppressed but full displays are used only when necessary. The number of digits to the right of the decimal point is dependant on the display resolution.

When activated for a particular axes, the current measuring selection (INCH, MM, DEG or DMS) is indicated in message area at the bottom of each display . If the axis is linear only the linear measurement unit messages light. For an angular measuring axis, the angular messages light, and will switch when the DEG/DMS key is pressed. Only one measuring unit is shown at a time for linear and angular axes. If the current units are inches and decimal degrees, all axes show one unit or the other.

REFERENCE

The unit shows INCH and INCR at initial power-up with current measuring choices indicated in message areas at the bottom of each display. Corresponding messages change each time the INCR/ABS key is pressed. Subsequent power-up messages are the result of changes to parameters.

Encoder Reference Arming is indicated by a lighted message area in all displays. After sensing on individual axes the messages on those axes goes out.

Errors are indicated by error messages on the display. The loss of power is indicated by displaying a constant "SFt_X.XX" software message. Encoder signal compression errors are indicated by a flashing ERR message below the specific axis display area. The display also provides operator information messages about the system status and for setup.

Most display messages are not lit when the system is in the setup mode. Only the measurement unit parameters for the setup mode and the unit message indicators (such as encoder resolution) are lit. When setup is completed the appropriate messages return.

Following a loss of power all parameters revert to the parameters selected in the setup program. Note: all current display messages and measuring information is lost.

The display read-out may be turned On or Off by pressing the DISPLAY ON or DISPLAY OFF keys. All the descriptions of display operation pertain to the display "On" condition. When the display is "Off" the left-most decimal point remains lit to indicate that the display counter is "Off" but power is still supplied to the unit.

DISPLAY RESOLUTION

Display resolutions provided for Quick-Chek units are consistent with the display resolutions for the other Metronics products. Display resolutions permit you to specify how the encoder results are to be displayed and rounded. This ability allows a metric encoder to appear as English plus reduce the apparent resolution of the encoder.

After entering a display resolution, the unit's display *snaps* to the nearest display resolution factor. For Example, if you enter a display resolution of .002, the display will read 3 decimal places with the last digit always being even. After the unit calculates the reading (including err comp and prescale) it will show the answer to the nearest display resolution multiplier. If you enter a display resolution of .005 the answer will always end in zero or 5.

Display resolutions are provided for all measuring modes. If the axis is set to the linear mode, the Quick-Chek permits the setting of both an inch display resolution and a metric display resolution. If the axis is set to angular, the unit allows setting a decimal degrees and a DMS display resolution. Each parameter is entered as a numerical entry; pressing the units button does not change the units designation.

DISPLAY ZEROING

Display Zeroing is a "current" mode operation. The displays must be zeroed periodically to enable a new measurement sequence. The ABS and INCR measuring modes display independent measurements and are zeroed independently. Each axis may be zeroed at any time by pressing its ZERO key. The display can only be zeroed in the current measuring mode. If both modes are to be zeroed, the current mode can be zeroed first, then switch to the opposite mode and zero that.

Note the special cases of display zeroing that involve incremental mode offsets, reference operations, clearing encoder errors and power loss errors.

This system parameter is unique because it is set from the current mode and can only be observed indirectly by:

1. Moving the encoder so that the absolute mode display reads zero then switching to the incremental mode.
2. Zeroing the absolute mode display by using the encoder reference feature then switching to the incremental mode.

ENCODER REFERENCE SIGNAL AXIS ZEROING FUNCTION

The "current" mode parameter is relevant while working with the unit and is not active at initial power-up or after a power loss. This function zeros the absolute measuring mode and resets the incremental measuring mode to the last offset value when a reference signal is received from an encoder.

The reference function is enabled for all axes by pressing the REF key. Activation is indicated by a steady REF display message in each axis. A second REF key press turns off all remaining REF messages and deactivates the reference function.

When an encoder reference signal is received and REF is enabled, the axis absolute measuring mode zeros, the incremental measuring mode display resets to the last offset value and the REF message switches off. The display then counts from that zero point for the encoder movements.

When all axes have been reset by moving their encoders across each respective reference mark, the reference function may be disabled for the remaining axes by pressing REF again.

Reference operations cancel an existing encoder counting error if the ERR indicator below the display is blinking.

DISPLAY MODIFYING COUNTER CHARACTERISTICS

Error Compensation

Error compensation is provided with a known linear single-value compensation to correct Abbe error and machine wear problems. Error compensation is accomplished by adding or subtracting counting pulses.

Error compensation applies to either linear or angular measuring axis. For an angular axis, error compensation should be used only when maximum rotations are less than one full revolution because the encoder must return to the same point each full revolution and does not require compensation.

Scaling Factors

Scaling factors are dimensionless multipliers that are utilized to scale the measurement to a more useful unit for display. The counter permits entry of up to 7 value digits and the result is displayed in up to seven digits.

DATA RETENTION DURING DISPLAY "OFF" CONDITIONS

Current data is to be retained when the display has been turned off using the front panel DISPLAY OFF key. This data is being updated constantly while the display is off especially if an encoder is moved. However, no indication of operation is given until the unit is turned on again. A single lighted dot on the left hand side of each display is the only indication that the unit is in the "display off" not "power off" mode. All "current" settings in effect when the DISPLAY OFF key is pressed will be in effect when the DISPLAY ON key is pressed (unless a loss-of-power occurs first).

LOSS-OF-POWER INDICATION AND RECOVERY

If the loss-of-power message "*SFt-H.HH*" is displayed on all axes and in both measuring modes displays, press the DISPLAY ON key to return the unit to normal operation. All axes will display zeros in both measuring mode displays and all settings made during the last setup session will be the default parameters. All current mode operations or settings in effect will be halted, reset or cancelled.

ENCODER ERROR INDICATION AND RECOVERY

Encoder counting errors are indicated in the display of the axis experiencing the problem. The current measuring and display information is shown but a flashing error (ERR) message is seen below the affected axis. Press the DISPLAY ON key to clear the error condition.

The error is cleared from the measuring mode by performing a reference zeroing operation or by pressing DISPLAY ON.

MULTIPLE ENCODER RESOLUTION

All currently available resolutions for standard Acu-Rite digital signal encoders plus common angular (rotary) encoders are supported. Heidenhain analog signal encoders using optional signal-processing circuitry are also supported.

All axes resolutions are factory set to 2um (linear encoders) and may be changed as part of the set up program. The resolution is reset through a numeric entry routine and will be retained during display off or loss-of-power conditions.

DISPLAY COUNTING VS ENCODER MOVEMENT

The counter provides a means to switch counting sense or direction with a given directional encoder movement. This parameter does not apply to angular axes which count in a positive direction from a zeroing point with rotations in either direction

If a machine assumes a positive direction or right-to-left movement, the display shows increasingly positive measurements. The counting direction for each linear axis is assigned as a part of a setup program and is retained during display off or loss-of-power conditions. All axes are factory set for a positive sense.

The standard positive sense of encoder movement vs output, quoted From Acu-Rite AR-III Q.A. specifications, is defined as:

"When quadrature square waves are such that the signal available on pin B of the connector (B-channel signal) lags the signal on pin A of the connector, a positive number show in the display should be incrimnted in the positive direction (should increase). A negative number would decrease, becoming less negative."

PRESCALE FACTOR

A scale factor is provided for encoders with odd resolutions. This factor is applicable to a linear measuring system which has a rotary encoder and an odd pitched lead screw, neither of which can be independently measured. The mounting table movement can be measured and resulting display compared to determine the resolution. Note, this is a multiplication factor. Without prescaling this parameter has a value of 1. The factor is dimensionless.

The value for any prescale factor for each axis is assigned as part of a set-up program and is retained during display "Off" or loss-of-power conditions.

LINEAR ERROR COMPENSATION

The term "linear" refers to the compensation factor applied in a linear (single value) manner and not to linear measuring axes. Linear error compensation operates similar to LEC for other Metronics counters. Compensation factors can be used with either linear or angular measuring axes or independently of each axis. Compensation factors operate on both absolute and incremental measurements.

The actual measurement is modified by a factor which compensates for system inaccuracies i.e., table geometry errors or wear. The modifier uses encoder-produced measurements to provide a displayed measurement that reflects the actual movement of the system components. The correction is applied as: $display = measurement + measurement \times PPM$.

For small values of PPM and measured movement the total error is quite small and likely beyond the range display capabilities. When the compensated measurement can be rounded to the least-significant-digit, other than the measured distance, *the display is modified*. The factory setting for this parameter is 0 PPM or no compensation.

In addition to the "correction" technique the compensation factor may be entered by using a manual technique. Here the operator moves the table while measuring the standard and observes any difference in the measurement shown on the display vs. the know standard length. The operator uses the manual error correction routine to enter the standard length via the numeric entry routine and enters the measured length. The Quick Check computes the correct PPM error plus direction and stores the data with other parameter changes when the setup program is exited.

Using this method the operator can examine several points along the standard, compute the best-fit line, and generate factors of standard and measured lengths to entry. This technique is more accurate than setting a compensation factor based on a single measurement.

REFERENCE

LINEAR ERROR COMPENSATION(CONTD)

Note that with the entry method no prior compensation factor setting should be set. Prior settings for the actual and observed measurements are shown as they are observed. This is because the operator is instructed to enter measurements while the internal representation for the compensation factor is a PPM error. Displaying this error is confusing and cannot be modified in the digit-by-digit method that normal numeric entries are made.

To reset the parameter to zero, the operator must set equal values for both the observed and actual measurements. The manual entry method is accomplished in a similar way by entering the same values for both observed and actual measurements.

This factor is used with angular encoders only when the system rotation produces less than a full revolution of the encoder. There is no error if after completing a full revolution the zero point is at the same point as the 360 degrees position. There may be an error at intermediate points in the rotation but this is periodic and not constantly increasing or decreasing.

PRINT KEY

The PRINT key function may be set to print current information for a selected axes if a printer or an external computer is connected to the RS-232 port. If not pressing the PRINT key will cause no action.

The print program includes axis identifier character, current measurement and units of measurement. The current measurement requires up to ten digits: seven digits for numbers, the minus sign, and two for decimal points. If a message is displayed the message will be printed. If an axis has ASCII character identification the character will be printed as follows.

X	0.0000 inch
Y	0.000 mm
Z	0.000 deg
Q	0.00.00 dms

When the print request is received, all axes display measuring information is "frozen" at the current measurement. The measurement information is transmitted, one axis at a time, to the RS-232 port. When the printing for each axis is completed the display becomes active again. If no axis is set to print, the PRINT key generates a blank line.

Note, the print-out reflects information that is current at the time the print cycle was initiated. This fact becomes most evident when the encoders are moving rapidly and a second print request initiated immediately after the first may show significant encoder movement. This is not unique but is typical with relatively high-speed computerized measurement and control systems.

REFERENCE

SELT-TEST

A self-test routine is available as a setup menu selection. These tests perform a keyboard test and internal circuitry check. None of the display message areas are lit during testing.

The repeating test consists of checking the operation of the ICs in each axis, returning to the top axis and repeating the test. A test message "*ic tEst*" is shown in the axis display under test the other displays show minus signs.

Test failures are indicated by a "*FAiL u ##*", where "##" indicates a specific chip number.

Press and hold any key for at least 10 seconds to halt the test and return control to the operator at the next program step. Pressing the PRINT key moves the program to the next step.

The "*rEPEAt*" test is chosen from the setup program. This tests starts in the top-most axis and proceeds downward. Testing continues until an error is detected or until the PRINT is pressed to stop the test and return to the program step where the program began.

The Once Test key testing begins with a "-----" display in all axes. Each key press is confirmed by a display message corresponding to the key and remains on the display until the next key press. The master's keys are confirmed on the unit's display. Each ZERO key is confirmed on the individual axes. No test failure message is provided. Key-confirming messages are:

<u>Key</u>	<u>Message</u>	<u>Location</u>
PRINT	Print	Main display,
REF	REF	others have
DEG/DMS	dEG d-s	dashes
INCH/MM	inch-Eur	"
INCR/ABS	incr-Abs	"
DISPLAY ON	diSP oN	"
DISPLAY OFF	diSP oFF	"
ZERO	2Ero	Axis displays, others have dashes

The key test is ended by simultaneously pressing the **ON** and **PRINT** keys. The program moves to the internal circuitry tests.

NUMERIC ENTRY

Numeric Entry is an item in the setup menu provided for number entry during setup. If the number is an axis-specific parameter it will be shown in that axis display. System parameters are shown in the master display.

When starting numeric entry, the display shows the last entry made for the parameter and the units of measurement for the parameter. The number is left-justified and shown in the current display format. The left-most available digit flashes indicating the "current" digit. The display may be edited one digit at a time.

Notes about the numeric entry subroutine

- * The system parameter entry shows in the lower display. The other displays show dashes. If the entry is made in a specific axis, the other displays have dashes.
- * The display starts up with the previous parameter.
- * The current (flashing) digit is left-most.
- * Clear the current display by pressing current unit keys. If the parameter has no units either key may be used.
- * Change the measuring units by a press of current unit key. If there no units neither key affects the parameter.
- * The PRINT key scrolls the current digit from 0-9 starting with the present numeral.
- * The REF key sets the decimal point after the current digit. The previous decimal is deleted. The key has no effect upon DEG/DMS entries because the decimal locations are fixed.
- * The INCR/ABS key sets current digit and moves the current flashing digit to the right. If it is in the right-most position, moves to the left-most.
- * The DISPLAY OFF key halts parameter entry and deletes the changes. The current parameters are retained.
- * The ZERO key stores the parameter as shown and advances to the next program step. Pressing SAVE/EXIT (DISPLAY ON key) stores the parameter, stops the program, and saves all parameter changes.

REFERENCE

NUMERIC ENTRY (CONTD)

The display formats include:

<u>Axis type</u>	<u>Parameter display</u>	<u>Cleared display</u>
Linear, Inch	YYYYYYYX	0.00000X
Linear, MM	YYYYYYYX	0.00000X
Angular, DEG	YYY.YYYY°	000.0000X
Angular, DMS	YYY.YY.YY°	000.00.00X
Dimensionless parameters	YYYYYYYX	0.00000X

Where:

Y denotes a numerical digit, if a digit is required. A decimal point is included following one of the digits for linear displays. Angular displays have fixed decimal positions as shown.

x denotes a blank space.

- * Numeric entry routine defaults: the first parameter value shown is the factory default or the last value set. Where dimensioned entries are required a lighted message is displayed (INCH, MM, DEG, or DMS).
- * Dimensioned parameters set by numeric entry are defaulted to units selected via the system unit settings and the axis declaration (linear or angular). The last parameter entry is always displayed.
- * A single current unit key press clears the the previous setting and moves the current digit marker (flashing digit) to the left-most digit and sets the opposing unit of measure. Numeric entry parameter displays are similar to encoder displays.

SETUP ERRORS

It may be possible to incorrectly set parameters especially when using the numeric entry routine or when using an external computer. Incorrect entries can produce unexpected results and in some cases may cause the unit to malfunction. An example would be where the encoder resolution was inadvertently set to zero.

All numeric entries are checked to assure that a zero value is not entered. If a zero was entered, a message "no 2Ero" (no zero) will be shown in the active display temporarily. The unit will then change to the "cleared" display for that parameter.

AXIS IDENTIFICATION CHARACTER

SETTING UP THE AXES

Each axis is identified by a character for use during printing operations. When information relating to a specific axis is passed across the communication port, the axis identifier is used to specify the axis for which the information is printed. All other axis-specific internal and external operations are referenced by an axis number.

When using the setup program to set identification characters note that they are axis specific and are displayed and chosen in the axis of interest.

Specific identification characters may be assigned to an axis via the character assignment routine which is similar to the numeric entry routine. ASCII characters with decimal values 33 through 126 are allowed and may be printed.

These other characters are set in a manner analogous to the numeric entry routine and are identified by a number representing the ASCII designation. When selected the axis displays the current value. The number must be set the same as a numeric entry, changing the flashing digit from 0 through 9 using the PRINT key. Set the number using the INCR/ABS key and set the current value using the ZERO key. Like numeric entry, the INCH/MM or DEG/DMS key clears the current value on the display, and shows all zeros. The number must be entered in proper decimal format (x88.0000 not x008.8000). Only two or three digits may be used to fix the ASCII value.

Axis identification characters may be set via the RS-232 port from an external computer which mimics front-panel key programming.

1. Hold down the DISP ON button and press the PRINT button. Release the DISP ON button. (The display should read "code".)
2. Press PRINT, DEG/DMS ZERO, PRINT, ZERO, & REF.
3. Press PRINT. The word OPTIONS appears in display.
4. Press ZERO. RS-232 now appears.
5. Press ZERO. BAUD appears in display.
6. Press PRINT(Enter) twice. AXIS OPS should now be displayed.
7. Press ZERO three(3) times. Digits should now appear with the first digit flashing.
8. Using the ASCII code chart, choose the value you wish to be printed.

EXAMPLE: You wish to have one axis print out as X and the other as Y. Looking at the chart you can see that X = 88 and Y = 89. These are the numbers you will have to enter.

9. Change the current (flashing) digit by pressing PRINT button.
10. Move to the next digit by pressing the INC/ABS button, and press PRINT to change the number.
11. Press the DISPLAY ON button.

REFERENCE

ASCII CODES

8	backspace	46	.	84	T
9	horiz. tab	47	/	85	U
10	line feed	48	0	86	V
11	vert. tab	49	1	87	W
12	form feed	50	2	88	X
13	carr. ret.	51	3	89	Y
14	so	52	4	90	Z
15	si	53	5	91	[
16	dle	54	6	92	\
17	dcl	55	7	93]
18	dc2	56	8	94	^
19	dc3	57	9	95	_
20	dc4	58	:	96	`
21	nak	59	;	97	a
22	syn	60	<	98	b
23	etb	61	=	99	c
24	can	62	>	100	d
25	em	63	?	101	e
26	sub	64	@	102	f
27	esc	65	A	103	g
28	fs	66	B	104	h
29	gs	67	C	105	i
30	rs	68	D	106	j
31	us	69	E	107	k
32	space	70	F	108	l
33	!	71	G	109	m
34	"	72	H	110	n
35	#	73	I	111	o
36	\$	74	J	112	p
37	%	75	K	113	q
38	&	76	L	114	r
39	'	77	M	115	s
40	(78	N	116	t
41)	79	O	117	u
42	*	80	P	118	v
43	+	81	Q	119	w
44	,	82	R	120	x
45	-	83	S	121	y
				122	z

REFERENCE

RS-232 COMMUNICATIONS

The counter provides bi-directional communications via an RS-232 serial port for current measurements, reading of the data by an external computer, or sending new parameters from external computer.

The PRINT key can be used to transfer information to an external unit if the system is connected to a printer or computer. The type of information passed depends on the internal settings.

The computer can send control signals which are the same as pressing front panel keys. These include settings for normal operation, set-up information, power-up defaults and system parameters not available in normal operation. All operations are reflected in the unit's displays. If the unit is in the setup mode, all menu selections that appear in normal front panel operation, appear as specific key inputs during computer control. Additional control signals that can not be made by front panel key presses are available plus axis-specified control signals required to identify axes to be addressed.

SERIAL PORT RS-232 PIN OUT

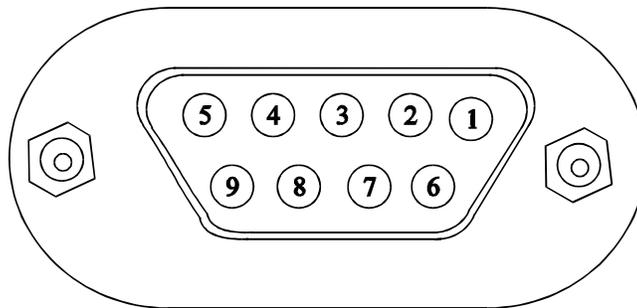


Figure 3 - 1 (Serial Port Pin Out)

<u>PIN NO.</u>	<u>LABEL</u>	<u>DESCRIPTION</u>	<u>DIRECTION</u>
1	GND	Signal GND	Common
4	TXDA1	Data Out	Output
5	RTSA1	Handshake	Output
7	CTSA1	Handshake	Input
8	RXDA1	Data In	Input

The Serial Port is a bi-directional port. When the input buffer is full, Pin 5 will go to low voltage. If the sender does not stop transmitting data to the serial port when Pin 5 is in the low voltage mode the data transmitted will be lost.

Note: Pin 7 Handshake In must be high for the serial port to transmit.

RS232 DATA STREAM

Transmitting

When the PRINT button on the front of the QC 1000 is pressed, it will cause the current data to be transmitted. The data will come across as 1 line of data per axis. When the last line is complete, a blank line will be transmitted. The END-OF-LINE will follow the format specified in the RS232 setup of the unit. (CR/CR-LF) The format of the data will be 1 of 4 depending on the mode of the axis that is transmitting. (DEG, DMS, INCH or MM). In the drawings below, each square represents 1 character of transmitted data. The first square will contain the assigned axis letter for that axis. "X" is shown.

Inch:

X					0	.	0	0	0	0		i	n	c	h
---	--	--	--	--	---	---	---	---	---	---	--	---	---	---	---

In this mode, the location of the decimal point, and the number of places following the decimal point, will depend on the inch display resolution specified in setup.

Metric:

x					0	.	0	0	0		m	m
---	--	--	--	--	---	---	---	---	---	--	---	---

In this mode, the location of the decimal point, and the number of places following the decimal point, will depend on the metric display resolution specified in setup.

Degrees:

x					0	.	0	0	0		d	e	g
---	--	--	--	--	---	---	---	---	---	--	---	---	---

In This mode, the number of places following the decimal point will depend on the degree display resolution specified in setup.

Degrees, Minutes, Seconds:

x					0	.	0	0	.	0	0		d	m	s
---	--	--	--	--	---	---	---	---	---	---	---	--	---	---	---

In this mode, the number of places following the decimal points will depend on the dms display resolution specified in setup.

REFERENCE

Receiving

The QC 1000 is capable of receiving control signals via RS232 as well. Each signal will simulate a keypress on the QC 1000 front panel. Each signal must be terminated with a CR. Note that the Z command must be followed with an axis number for the command to apply to.

The assigned axis numbers are: the bottom is 0, the next axis is 1, and so on. Control signals are sent in ASCII code. Axes requiring identification are indicated by "#" in the following list.

- A- Same as pressing the ABS/INCR key.
- D- Same as pressing DEG/DMS key.
- R- Same as pressing REF key.
- I- Same as pressing the INCH/MM key.
- N- Same as pressing the DISP ON key.
- O- Same as pressing the DISPLAY OFF key.
- P- Same as pressing the PRINT key.
- Z#- Same as pressing the ZERO key for that axis.

Note: Codes using capital letters mimic front panel key presses. Codes using lower case letters are unique and are intended for communication with an external computer.

Responses from the unit include:

- h#- High speed print. Commands the unit to issue a "h#=" response. Communicated as four bytes representing the display in IEEE floating point format.
- s- This process is the same as pressing the DISPLAY ON and PRINT keys simultaneously. This code is provided because there is no way to simultaneously issue both commands from an external computer.
- i- Report current system settings for linear/angular units of measurement and reference operations status. Commands the unit to issue an "i =" response.

REFERENCE

The report format is as follows:

```
QUICK-CHEK
Number of axes in system:
  1 axis
  2 axes
  3 axes
  4 axes
  5 axes
Measuring mode:
  ABS (absolute)
  INCR (incremental)
```

The report also includes axis specific reports in the following format:

```
Axis identification:
  Axis 1
  Axis 2
  Axis 3
  Axis 4
  Axis 5
Software version: Software Rev 1.00
Axis reference arming status:
  REF armed
  REF disarmed
Encoder counting error status:
  error OFF
  error ON
```

An example of an axis status report is:

```
Quick-Chek
2 axes
Abs mode

Axis 1
Software Rev 1.00
REF disarmed
Error OFF

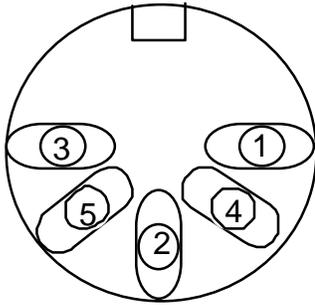
Axis 0
Software Rev 1.00
REF disarmed
Error OFF
```

REFERENCE

QC 1000 PROBE INPUT

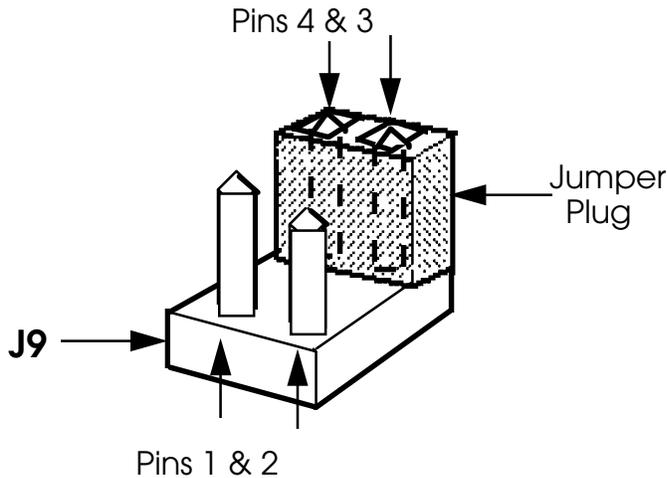
The QC 1000 is equipped with a 5 pin din jack that is intended for connection to an external edge sensor. When connected, the QC 1000 will latch the axis data when an appropriate signal is received. Then, depending on the setup of the QC 1000, it will either print that data, update the display with that data, or both.

VIEW FROM BACK OF UNIT



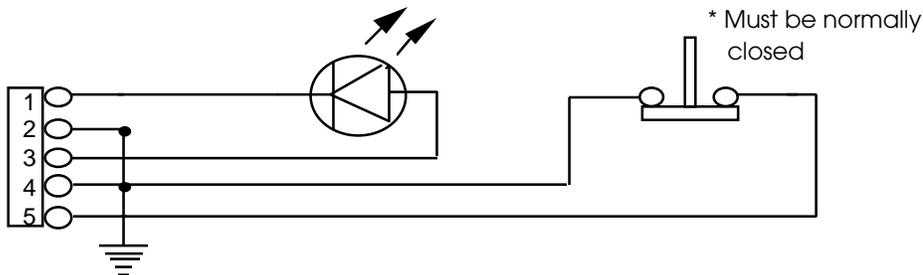
<u>PIN</u>	<u>DESCRIPTION</u>
1	LED CATHODE
2	GROUND
3	LED ANODE
4	GROUND
5	PROBE INPUT (see note 1)

NOTE 1: The QC 1000 Probe Input has the ability to be changed from the Debounce circuit for Probe Inputs, (Factory setting) to a Direct TTL input (Not Debounce) by positioning the jumper plug on J9 over the appropriate pins. (Refer to Table and drawing below.)



Location	Jumper Pins	For Inputs
J9	1 & 2	Debounce
J9	3 & 4	Direct TTL

TYPICAL APPLICATION OF HOW TO CONNECT SWITCH AND LED TO PROBE INPUT



SETTING PARAMETER PROTECTION

The first step in establishing a protection program is to require an access code be entered before any settings can be changed. An access code is a sequence of specific key presses. The current code sequence is: PRINT, DEG/DMS, ZERO PRINT, ZERO, REF. If an incorrect code is given the unit reverts to normal operation.

POWER-OFF SETTING RETENTION

These control settings govern the operation of the unit at initial power-up. They also control each axis, overall system operation, communications and operation of options. These parameters have been factory set and can be changed in the setup mode to suit the needs of the operator. All parameters may be reset to the factory default values by using the factory reset step in the setup mode. Special routines are provided to assist in setting some parameters. A numeric entry routine is provided to permit a specific number to be entered as a parameter.

The operator may press the DISPLAY ON key any time during setup to save existing parameters and return to the operating mode. Pressing the DISPLAY OFF key will abandon changes made.

FACTORY DEFAULT PARAMETERS

All parameters may be reset to the factory settings. This provides a known point that is used when setting up a unit for a applications or troubleshooting an installation. The factory settings is reset by selecting that option within the setup program.

**QUICK-CHEK
QC-1000**

SECTION IV

SETUP INSTRUCTIONS

SETUP

Use the following instructions to guide you through the QC-1000 Setup Menu and setup the system for your operation.

Partial setup may be accomplished if only some parameters need be changed. These changes can be selected within the setup mode and saved by pressing the **DISPLAY ON** key. The unit will revert to normal operation, and the new settings will be in effect. This method does not require the operator to continue through the whole program.

The setup mode may be aborted at any time by pressing the **DISPLAY OFF** key and any changes made to the program will not be saved.

SETUP INSTRUCTIONS

1. To enter the Setup mode, hold down the DISPLAY ON key and press the PRINT key . "codE" message shows in the master axis window.
2. Enter the code using the following key sequence: PRINT, DEG/DMS, ZERO, PRINT, ZERO, REF.
3. To scroll through the major program steps (Set Axis, Options, Self Test, and Factory Set (indicated by bold letters), press the PRINT key. See the setup menu.
4. To enter the program steps of the menu subroutine levels, press the ZERO key. See the setup menu.
5. To change the default settings, enter the appropriate subroutine:
 - a) scroll to the desired submenu entry, press the PRINT key to change the entry and press the **ZERO** key to save it.
 - b) follow the instructions provided in the Numeric Entry paragraph for a numeric entry.
6. To reset the QC-1000 to the factory default settings, select Factory Reset from the setup menu then press the Zero key.
7. Press the DISPLAY ON key anytime to exit the program and save the setting.
8. Press the DISPLAY OFF key anytime to abort the program, keep the previous settings and turn off the display.

FRONT PANEL KEYS, SETUP FUNCTION

Some front panel keys have secondary functions, indicated by [brackets], which are used during setup operations.

- PRINT** [NEXT]
The **PRINT** key is used to move to the next menu item of the program.
- DISPLAY ON** [SAVE / EXIT]
Pressing the **DISPLAY ON** key saves the parameters that were entered and exits the setup mode at the current program location.
- DISPLAY OFF** [ABORT PROGRAM]
The **DISPLAY OFF** key is used during setup to delete changes made and return to the OFF mode. When the display is turned "On" again the "old" parameters remain in effect.
- ZERO** [AXIS SELECT] [PARAMETER ENTER]
The ZERO key is used in the setup mode as an "ENTER" key to select options or move to other lower-level program areas. The ZERO key is also used as the AXIS SELECT key when selecting axes.

SETUP INSTRUCTIONS

SETUP MENU

To Enter Setup Mode:

1. Hold down the **Disp ON** Button and press the **PRINT** button. Release the **Disp ON** button.
2. The display should say "**Code**"
3. Enter the code. **PRINT, DEG/DMS, ZERO, PRINT, ZERO, REF.**

Setup Instructions:

- * Setup is Hierarchical. (See map on right.) To move down the Hierarchy, press the **PRINT** button. To move into the Hierarchy, press the **ZERO** button.
- * To select a specific axis, press the **ZERO** button in response to **Axis Sel.**
- * To enter selections, press **ZERO**
- * At any time, to save changes and exit setup, press the **Disp ON** button.
- * At any time, to abort all changes and exit setup, press the **Disp OFF** button.

Setup Buttons:

Press this button:	To perform this function:
PRINT	Next - Use to move to next function during function select. Use to move to next option during option select.
DISP ON	Save - Use to save all current settings and return to normal operation.
DISP OFF	Abort - Use to delete all current changes and return to off state.
ZERO	Enter - Use to move into function during function select. Use to select option during option select.

Numerical Entry Instructions

1. Change the current (flashing) digit by pressing the print button.
2. Move to the next digit by pressing the Inc/Abs button.
3. Set the decimal point with the ref button.
4. Change the units with the units buttons.
5. Finish with the Zero button or the Display On button.

Numerical Entry Buttons:

Press this button	To perform this function:
PRINT	Next - Increments current digit.
REF	Dec. Pt. - Use to enter decimal point.
DEG/ DMS	Units - Use to change current units and clear display.
IN/ MM	Units - Use to change current units and clear display.
INC/ ABS	Set Digit - Use to set current digit and move to next digit.
ZERO	Enter - Use to finish entering number.

Set Ax

Axis Select

Encoder

- linear (D)
 - Res**
Numerical Entry (D=0.002 mm)
 - Direct**
Pos
Neg
 - Disp MM**
Numerical Entry (D=0.002 mm)
 - Disp INCH**
Numerical Entry (D=0.0001 in)
- angular
 - Res**
Numerical Entry (D=0.001 Deg)
 - Disp Deg**
Numerical Entry (D=0.001 Deg)
 - Disp DMS**
Numerical Entry (D=0.00.01 DMS)

Prescale
Numerical Entry (D=1.0)

LEC

- Observed**
Numerical Entry (D=1 mm)
- Actual**
Numerical Entry (D=1 mm)

Options

RS-232

Baud

- 150
- 300
- 600 (D)
- 1200
- 2400
- 4800
- 9600

End Line

- CR (D)
- CR-LF

Axis Ops

Axis Select

Axis ID

Numerical Entry (D=88)

Print ax

- on (D)
- off

Edge

Print

- on
- off (D)

Update

- on
- off (D)

Reset

- on
- off (D)

Selftest

Once

Repeat

Factory Reset

Legend:

Bold Face	Indicates function select prompt. Press print to move to next function. Press zero to enter the function.
Option Option	Indicates group of functions. Select one to move on
Axis.Select	Indicates axis select function. All menus within are on the selected axis.
Numerical Entry	Indicates numerical entry. Shows current value and permits editing.
D=	Factory default setting

Warning - Factory Reset will reset the unit to original factory setup. You can lose all of you current setup information with this.

NUMERIC ENTRY

Numeric entry is a setup menu selection provided for number enter during setup. If the number is an axis-specific parameter it is shown in that axis display. If it is a system parameter it is shown in the master unit display.

The first setting shown is the factory default or last value set. Some entries are dimensioned. Where a dimension is required a lighted message is displayed (INCH, MM, DEG, or DMS) and the current units key can be used to change the units.

Numeric Entry Steps

1. Select the digit to change using the INCR/ABS key, the flashing digit moves to the right.
2. Change the number by using the PRINT key.
3. Enter the decimal point behind the current digit using the REF key.
4. Press the INCR/ABS key to set the number.
5. Repeat steps 1-4 to change a parameter. If you press the INCR/ABS key while the flashing digit is the right-most the next current (flashing) digit will be the in left-most position.
6. Press the current axis ZERO key to set the parameter.

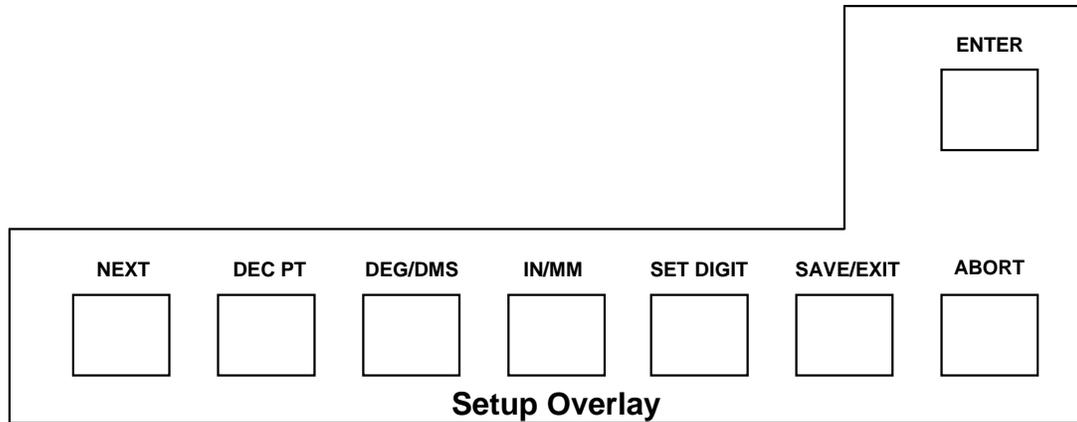
FRONT PANEL KEYS, NUMERIC ENTRY

Some front panel keys have a third function, indicated by [brackets], which are used during numeric entry setup.

PRINT	[NEXT] Increments selected (flashing) digit by one.
INCR/ABS to right and	[SET DIGIT] Accepts current digit in flashing display. Moves pointer to next digit begins flashing
REF	[DECIMAL POINT] Enters decimal point behind current (flashing) digit. If a decimal existed in another location it is removed.
DISPLAY OFF	[ABORT] Stops entry of parameter, ends program mode, discards all previous entries and changes, turns display off. When the unit is turned ON again, unit will be in operating mode with the "old " settings in effect.
DISPLAY ON	[SAVE/EXIT] Save all changes made and exit the programming mode. Return to normal operation with new settings in effect.
ZERO	[ENTER] Accepts the current parameter as a new value; ends numeric entry routine. Program continues at the next step.
INCH/MM DEG/DMS	[CLEAR] [CHANGE UNITS] A single key press of the active key clears the display and switches to the opposite units. If there are no units either key will clear the display.

SETUP TEMPLATE

This template is a master panel overlay for the setup mode.
It may be copied and cut out for use when performing system setup.



**QUICK-CHEK
QC-1000**

**SECTION V
APPENDIX**

Replacing the Fuse

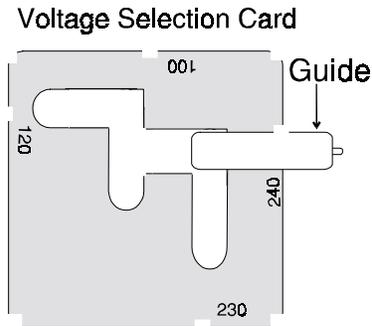
The Quadra-Chek 1000 is designed to be operated from international power sources. The primary power module on the rear of the master unit provides connection for the power cord plus a housing for the fuse, and switching capability to allow operation from various power sources.

Replacing the Fuse

- Remove the power cord.
- Remove the Fuse Draw by inserting a small regular screw driver or facsimile into the notch on the left hand side of the draw and carefully prying it open.
- Remove the fuse.
- Replace the fuse with a 250v 1/2A Slo-Blow fuse.
- Slide fuse draw back into the QC-1000.
- Insert the power cord.
- The unit is now ready for operation.

Changing Voltage Selection

- Remove the power cord.
- Remove the Fuse Draw by inserting a small regular screw driver or facsimile into the notch on the left hand side of the draw and carefully prying it open.
- Carefully remove the voltage selection card using small, needle nose pliers.



Voltage Set at 120V

- To change the voltage selection, move the plastic guide to the opposite side of the desired voltage and re-install the card with the correct voltage facing in.
- Slide fuse draw back into the QC-1000.
- Insert the power cord.
- The unit is now ready for operation.

Note: The voltage that is currently selected is the one that reads correctly while looking at the primary power module. (For example, If you wanted to set voltage at 240 -- move the guide over to the 120 notch, and insert the voltage selection card into the slot with 240 facing in.)

Seven Segment Display

Program Selection Steps	Seven Segment Display	Comments
Set axis	[SEt AH]	
Axis select	[Axis SeL]	Axis Selection Routine
Encoder	[Encoder]	
Linear	[Linear]	Select using PRINT key. Must select either Linear or Angular mode.
Scale resolution	[rES]	xxx.xxxx (Numeric Entry Routine)
Direct	[Direct]	Count Direction
	*pos	Positive Count Direction
	*neg	Negative Count Direction
Disp mm	[Disp mm]	Display in Millimeters
Disp in	[Disp in]	Display in Inches
Angular	[Angular]	(Select using PRINT key. Must select either Linear or Angular mode.)
Scale resolution	[rES]	
Disp deg	[Disp Deg]	Display numbers in Decimal Degrees 0.000
Disp dms	[Disp D_S]	Display numbers in Degrees Minutes Seconds 00.00.00
Prescale	[Prescale]	Numeric Entry Routine
Lec	[Lin cAL]	Linear Error Correction
Observed	[Obser_ed]	Enter observed measurement
Actual	[Actual]	Enter actual number
Options	[oPt ions]	
RS-232	[RS-232]	RS-232 options
Baud	[Baud]	Choose Baud Rate
End line	[End Line]	End of Line character
	CR	Carriage Return
	CR - LF	Carriage Return - Line Feed
Axis ops	[Axis Ops]	(for RS-232 specifics)
Axis select	[Axis SeL]	Axis Selection Routine
	Axis ID	Enter ASCII character to name each axis
	Print Ax	Enables/disables axis print function
Edge	[Edge]	External Edge only
Print	[Print]	Enable/Disables print function
Update	[Update]	enable/displays display update with external edge
Reset	[Reset]	Enable/Disable Zero Reset function
Self test	[SELF tEst]	(Hold down any button to exit test.)
Once	[once]	
Repeat	[repeat]	
Factory set	[FAcSEt]	

INDEX

A

Angular, 3-3
ASCII codes, 3-18
Axis I.D. Characters, 1-7
Axis identification character, 3-17
Axis type, 1-6

B

Baud rate, 1-7

C

Changing voltage selection, 5-2
Code, 3-4

D

Data retention during display “off” conditions, 3-10
Debounce, 3- 23
Deg/DMS, 2-3, 3-4
Dimensions:, 1-1
Display counting vs encoder movement, 3-11
Display modifying counter characteristics, 3-10
Display off key, 2-2, 2-3, 3-10, 4-2
Display on key, 2-1, 2-3, 3-2, 4-2
Display operation, 3-7
Display resolutions, 1-6, 3-8
Display zeroing, 3-9

E

Edge detector, 1-7
Encoder direction, 1-6
Encoder error indication and recovery, 3-11
Encoder reference signal axis zeroing function, 3-9
Encoder resolution, 1-6
End-of-line character, 1-7
Error compensation, 3-3, 3-10
External features, 3-5

F

Factory default parameters, 3-24
Factory defaults, 1-7
Feature description, 3-5
Front panel keys, setup function, 4-2
Functional description, 3-1

I

Inch/mm, 2-3, 3-4
Incr/abs, 2-3
Incremental offset, 1-6
Initial power-up, 3-2
Input, 1-1
Installation instructions, 3-1
Internal features, 3-6

L

Linear error compensation factor, 1-6
Linear error compensation, 3-12
Linear, 3-3
Loss-of-power indication and recovery, 3-10

M

Multiple encoder resolution, 3-11

N

Numeric entry, 3-15

O

Operating temperature, 1-1
Operating, 1-1
Operator setup, 3-4
Output, 1-1

P

Parameters, 1-6
Parity, 1-7
Power, 1-1
Power-off setting retention, 3-24
Pre-scale factor, 1-6, 3-3, 3-12
Print key, 3-13
Print, 1-7, 2-3, 3-3, 3-4, 4-2
Protocol, 1-

Q

QC 1000 probe input, 3-23

R

Receiving, 3-21
Ref key, 2-1
Ref , 2-3, 3-5
Replacing the fuse, 5-1
Resolution, 1-1
RS-232 communications, 3-19
RS-232 port, 1-7
RS 232 data stream, 3-20

S

Scaling factors, 3-10
Self-test, 3-14
Serial port RS-232 pin out, 3-19
Set-up parameters, 3-3
Setting parameter protection, 3-24
Setting up the axes, 3-17
Setup errors, 3-16
Setup instructions, 4-1
Setup menu, 4-3
Setup, 4-1

S

INDEX

Seven segment display, 5-3
Stopbits, 1-7
System check-out, 3-1
System configuration, 3-6

T

Transmitting, 3-20

W

Wordlength, 1-7

Z

Zero key, 2-1
Zero, 2-3, 3-3, 3-4, 4-2