

# **EZE Technologies**

## **RDA-56**

### **Specifications**



***EZE Technologies, Inc.***

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#### **1.1 Description**

The RDA-56 Accelerometer is the lightest, most accurate and fully featured stress gauge on the market today. Not only is it much lighter than its mechanical counterpart, but its discrete, solid-state, microcomputer controlled construction enables it to be more accurate, sensitive, and durable. EZE Instruments, Inc. is based in the USA and its products are developed and manufactured in the USA.

## 2.1 Features

- The bulky mechanical measuring components used by other acceleration gauges on the market can sag with age requiring periodic recalibrations. The RDA-56's discrete electronic sensor is much more resilient with age not requiring periodic recalibration to correct for age effects. The RDA-56 is also less affected by environmental variables (with the exception of acceleration, of course).
- Small size. Fits in a standard 2-1/4" aircraft instrument mounting hole.
- Lightweight. Less than 5.5 ounces.
- Low power. No more than 110 mA with the LCD illumination on, and less than 50 mA with the LCD illumination off.
- Versatile. As long as the supplied power stays within 7.0 - 35.0 volts DC, the RDA-56 will operate. A version of the RDA-56 is available that can operate over the supply range of 7.0 - 40.0 volts DC.
- The RDA-56 utilizes active voltage dropout memory protection system to prevent partial writes and corrupt data.
- The RDA-56 is also a voltmeter measuring the voltage of the power supplied to the instrument. One touch of a button on the instrument or an optional external button toggles between displaying the current acceleration reading or the current voltage reading. The minimum and maximum voltages measured since the last power up or user reset can also be viewed.
- Measures acceleration up to +14.22 G's, and down to -14.22 G's.
- Measures and stores values with a precision of 1/10th of a G or volt. During normal operation, for faster and easier readability, values are displayed rounded to the nearest tenth of a G or volt.

- For both acceleration and voltage, the RDA-56 allows the regular user to view the most extremely positive and most extremely negative readings detected since the last reset of those readings. The most extreme readings for acceleration are retained when power goes off then back on. The most extreme readings for voltage are reset when power goes off then back on. The regular user can manually reset these readings.
- The RDA-56 has separate regular user's mode and supervisor's settings mode with secure, supervisor programmable pass code system.
- To filter out normal background vibrations, the RDA-56 uses an initial electronic analog 2nd order low pass filter and then it uses a supervisor programmable digital filter. The digital filter can be set to any of 256 possible levels that range from no digital filtering which is very sensitive to fast changes to very heavy digital filtering which smoothes the reading out so much that it shows just a general long term trend where short duration jolts and vibrations have very little effect.
- To control alarms and to control recording of data while efficiently using memory, the whole measurable range for the acceleration is divided into five ranges. These five ranges are defined by four boundary levels which are each supervisor programmable to any level within the measurable range (and beyond in which case the corresponding alarm and recording function are disabled). The middle range is the normal range in which no alarms are shown or sounded. The most extreme values (peaks and troughs) that happen *inside* this range *are not* recorded. The most extreme values that happen *outside* this range *are* recorded. The ranges that are next to the normal range on the positive side and on the negative side are the warning ranges. When the acceleration is in one of these ranges, visual and aural (via intercom) warnings are given. The most extreme ranges on the positive side and on the negative side are the full violation ranges. When the acceleration is in one of these ranges, stronger visual and aural alarms are given. Whenever the acceleration value crosses a boundary level, the reading just before the crossing, and the reading just after the crossing are recorded.
- For each incident of an extreme reading that happens outside the programmed normal range, 5 values are recorded: first, just before the initial boundary crossing;

second, just after the initial boundary crossing;  
third, the most extreme reading observed;  
fourth, just before the following boundary crossing;  
and fifth, just after the following boundary crossing.  
If the most extreme reading is in full violation rather than just the warning range, since two different boundary levels are crossed, 4 additional readings are stored. Each stored reading is time stamped to 1/100th of a second so a shape of the load can be observed.

- Data storage system "revolves" so there is no worry that data will fail to be recorded due to "memory full". The data storage system holds over 8000 readings of acceleration along with the date and time of the reading.
- Internally, time is always kept in Universal Time (UT) to keep data recorded in different time zones consistent but you can select which time zone you want the time displayed in.
- Hierarchical menu based user interface helps make the RDA-56 easy use with a short learning curve. Once you are accustomed to using it, you will not too often have to refer to the manual.
- RS-232 interface so that stored readings can be copied to and stored on a personal computer. The data may also then be used in spreadsheet and graphing software.
- All of the stored readings' data are also viewable on the instrument itself (in the supervisor's mode). The data is organized spreadsheet style. The "Enter" button toggles between horizontal and vertical scrolling. When vertically scrolling through stored readings, holding the "+" or the "-" button automatically scans for and stops on the full violation most extreme readings.

### **3.1 Environmental and Power Requirements**

The RDA-56 can be mounted in any standard 2-1/4" mounting hole.

Because the unit contains an acceleration sensor that measures in a particular dimension, it must be mounted in a hole that is perpendicular to the aircraft's natural flying horizon. Other than that, the unit can be mounted just like any other instrument.

The unit can be used on any DC electrical system with a voltage range from 7.0 - 35.0 volts. A version is available which can operate from 7.0 - 40.0 volts DC. The unit draws no more than 110 mA with the LCD illumination on, and less than 50 mA with the LCD illumination off.

#### **4.1 User Interface**

The RDA-56 uses a hierarchically structured menu based user interface. This interface makes possible a wide variety of features and customizability while remaining reasonably easy to work with. The user interface utilizes a custom 40 segment liquid crystal display, 4 separate LED indicators and 4 buttons. The functions of the 4 buttons remain very consistent throughout the operations of the menu based interface. The right-most button is "Exit" which simply takes you out of a sub-menu or selected item to a menu at a higher level. The left-most button is "Enter" which activates the displayed choice in a menu or switches modes in items in the menu system where information can be scrolled through or changed. The 2 center buttons are "+" on the left and "-" on the right. When data is changeable, "+" increments the value and "-" decrements the value. When information can be navigated through, such as: scrolling through choices in a menu; moving a cursor or scrolling through data in a table, the "+" button functions as up or left and the "-" button functions as down or right. When more than one function or mode is available, the "Enter" button switches the mode. A chart is included that completely maps out the menu system.

#### **4.2 Normal Mode: Viewing Live Readings**

When power is first applied to the unit, a four second self-diagnostics and display test will be initiated followed by the current G load.

While viewing a current reading, pressing the “Enter” button toggles between viewing the current acceleration reading and the current voltage reading. While viewing a current reading, pressing the “Enter” button toggles between viewing the current acceleration reading and the current voltage reading.

When viewing the readings, the positive-most and negative-most readings detected can be viewed by pressing the “+” and “-” buttons. An up arrow is displayed when the value is the positive-most reading and a down arrow is displayed when the value is the negative-most reading. Both the positive-most and the negative-most readings for a particular type of measurement (acceleration or voltage) are reset by pressing the “Enter” button while the positive-most or negative-most reading is displayed. The extremes for voltage are reset when power is shut down and restored. The extremes for acceleration, however, are retained even when supplied power is shut off and restored.

While viewing a reading, pressing the “Exit” button takes you to the main user's menu.

### **4.3 Tips for using the voltmeter:**

(1.) Since it is typical for the supplied voltage to be unstable for a brief time when first powered up, the most extreme voltages will most likely be recorded during this brief period. You may want to see these values but you also may want to know what the extremes are for a period after this. It is advised that once power is up and stable, to check the voltage extremes then reset them. Otherwise you will not likely see any extremes that occur during the main period of operation.

(2.) Since extreme readings for voltage are lost when power goes off, be sure to check them before shutting down the power.

(3.) Check both positive-most and negative-most readings before resetting.

### **4.5 Audio Alarms**

The instrument has four audio alarms, which can be set by the supervisor. The purpose of this feature is to alert the pilot whether or not they are approaching or exceeding a limit. The approach to a full violation is alerted by brief tone pulses. When acceleration is in the positive side or

negative side full violation, the audio alarm is a siren-like dual tone oscillation. The instrument has a line level output to be connected to a line level input of an onboard intercom system. The instrument does not have its own power amplifier or speaker.

The audio alarms can be shut off by the pilot but when power goes off then back on, the audio alarms will be turned back on.

#### **4.6 Display Illumination**

The RDA-56's custom liquid crystal display is illuminated by an array of light emitting diodes. It may be desirable to have the display illumination turned off. One reason would be to conserve power when electrical resources need to be conserved as much as possible e.g. gliders. The RDA-56 allows the user to turn off the display illumination. The display illumination can also be controlled by an external trigger for use with instrument panel dimmer systems. This setting is retained when power goes off then back on.

#### **5.1 Supervisor's Settings**

Similar to a combination lock, you have to enter a four character code before you can enter the supervisor's settings. The default code is "0000". Once in the supervisor's settings, you can change the code to whatever you want but you will have to make sure that you don't forget what your code is. You can use both numerical and alphabetical characters. There are 1,697,616 possible codes making it fruitless to go through trying one at a time to break in.

In the supervisor's settings, the supervisor can access: the clock; the viewing of records on the instrument's display; the outputting of records to a personal computer; the acceleration boundary levels that control alarms and recording; the supervisor's programmable access code; custom calibration; and the digital filter.

#### **6.1 OEM Version**

For aircraft manufacturers, a version of the RDA-56 is available that will count the number of times an aircraft has exceeded a particular preset value. Aircraft owners, supervisors, operators, etc. will not be able to alter

the recorded counts. The counts can only be accessed by authorized personnel. The standard values for these boundary levels are  $-2.33\text{G}$ ,  $+0.17\text{G}$ ,  $+2.33\text{G}$  and  $+6.33\text{G}$  but the unit can be manufactured to use values according to an aircraft manufacturer's specifications.

## **7.1 Migrating from the DA-55**

The following is to help those who have used EZE Instruments' previous model DA-55 migrate to using the RDA-56:

The most critical difference is that the connector on the RDA-56 has different connections than the DA-55. Please follow the RDA-56 connector information carefully when connecting to the RDA-56 particularly if you are replacing a DA-55 with an RDA-56.

The biggest difference for the operator is the user interface. The RDA-56 uses a hierarchically structured menu based user interface with the buttons having more consistent functions throughout the menu system. The buttons are now, from left to right: "Exit", "+", "-", and "Enter". Note that the "+" button and the "-" have traded places from the DA-55 to the RDA-56. This helps the menu system to be more consistent. Think up is positive and down is negative then remember that English and other European languages are read starting at the top left working from left(+) to right(-) and top(+) to bottom(-).

The RDA-56 has a custom display with both the decimal point and the colon now located in the middle. A segment has been added to the main characters to make characters that more complete and more resemble the english alphabet. An up arrow and down arrow have been added on the left to indicate whether the user is viewing the positive-most value (up arrow on), the negative-most value (down arrow on), the current value (no arrow) or if a value is changeable (both arrows blinking). A special letter "G" and a special letter "V" have been added on the right to indicate if the value displayed is an acceleration reading or a voltage reading or neither. On the DA-55 these were indicated by the "G" and "V" LEDs. The RDA-56 uses the "V" LED to communicate at all times the basic status of the power supply. Continuously illuminated indicates that the power supply voltage is sufficient for the instrument to operate properly. The "V" LED has also been moved to the left-most position so that it looks more normal when it is continuously illuminated. The "G" LED is now in the second from the left position. At all

times except in supervisor's setting's mode the “G” LED indicates the basic status of the acceleration level. Quick flashes indicate acceleration is in the warning range. Longer duration flashes indicate acceleration is in full violation. The “MEM” (may be labeled differently) LED acts much like the hard drive busy light on a personal computer. It illuminates whenever nonvolatile data storage memory is accessed. The “SET/DATE” (may be labeled differently) is now an LED to indicate that the instrument is in supervisor's settings mode in which acceleration is not monitored.

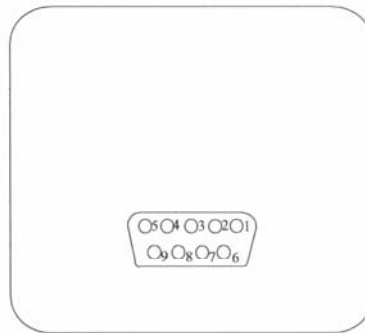
The word “mode” has a very different meaning with the newer instrument. The menu system is divided into two separate sections: the regular user's menu or mode and the supervisor's settings menu or mode. The two sections can be considered two different modes since the instrument functions a bit differently depending on which section it is operating in. Most importantly, the the monitoring of acceleration occurs at all times in user mode but does not occur in the supervisor's settings mode. The supervisor's settings mode is indicated by the right-most LED. In the newer instrument, the word “mode” may be used to describe what the “+” and “-” buttons are functioning as since their function may be changed depending on what part of the menu it is in.

The newer instrument combines some of the older instruments modes of operation so that as much of the modes' functions as possible can be functioning simultaneously rather than having some functions cease in order to use another function.

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# ACCELEROMETER

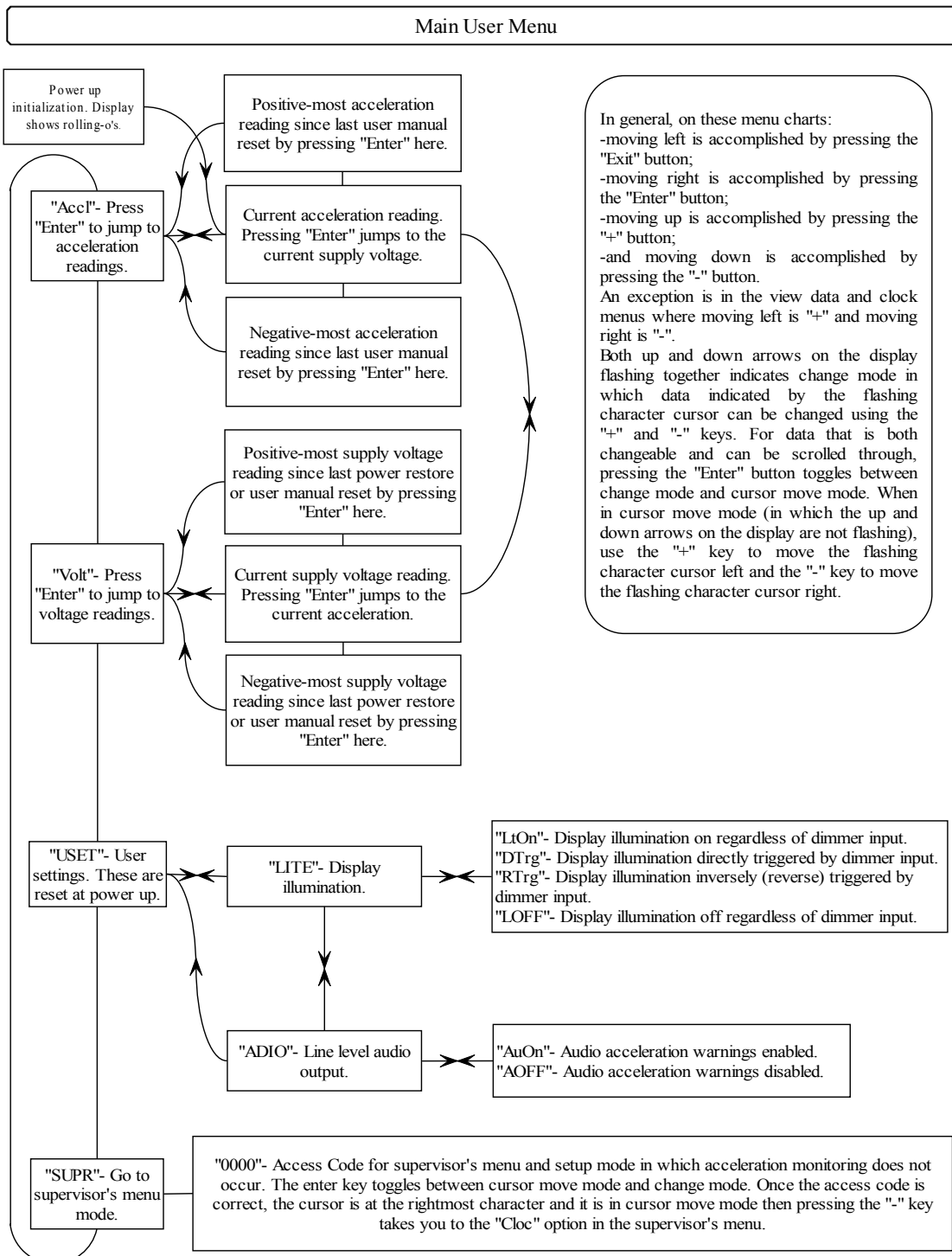
## External Wiring Diagram



Model RDA-56

Rear view of accelerometer enclosure.

1. Ground. Connect to aircraft instrument panel ground.
2. RS-232 Transmit. Connect accelerometer transmit to PC receive.
3. RS-232 Receive. Connect accelerometer receive to PC transmit.
4. Audio Line Out. Connect to aircraft intercom system input using ground shielded cable.
5. Signal Ground. Connect to PC Signal Ground.
6. 7 to 40Volt DC power input. Connect to instrument panel power.
7. Remote "Enter" button - Use ground shielded cable.
8. Reserved. No connection.
9. Panel dimmer control input.



### View Data Format

Think of the data as being organized in a two dimensional table or spreadsheet with the **most recent** record data in the **top** line and the second most recent record data in the line second from the top and so on.

Use the "Enter" key to toggle between Z mode, cursor move mode (horizontal) and change mode (vertical).

Z mode is named for the pattern it traces through the described table and is indicated by the up and down arrows flashing in an alternating pattern. Z mode is a convenient way scan through data points. Z mode automatically scans for the positive-most readings in the positive-most range and the negative most readings in the negative-most range. If viewing G's and "-" is pressed, the display will first jump to the hours and minutes in the next older record then if that record was not an extreme reading, it automatically scans to the next older record and so on. If viewing hours and minutes and "+" is pressed, the display first jumps to the next more recent record then if that record is not an extreme reading, it scans to the next more recent record and so on. While scanning, pressing "Enter" will stop where it is at.

Use the other modes to get more information by moving through all the data fields, or to follow just one data field by selectively jumping from record to record:

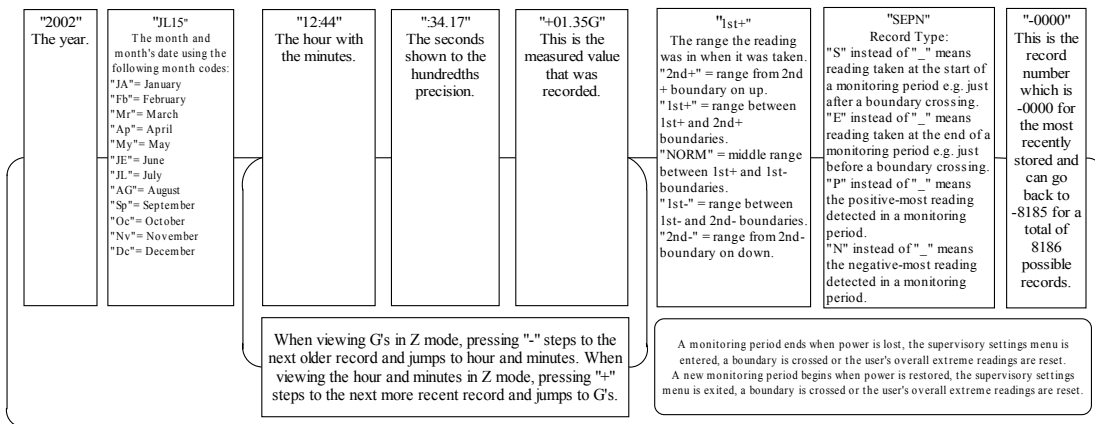
When in cursor move mode, in which the up and down arrows are not flashing, use the "+" key to move left and the "-" key to move right through the different data fields on the display. This is useful to get the full data about the record.

When in change mode, in which the up and down arrows are flashing together, use the "-" key to step chronologically back (down) and the "+" key to step chronologically forward (up) through the records. There are two ways to change which record you are viewing:

When viewing any data field other than the record number, you can step through the records in order. This is useful to follow one type of data.

When viewing the record number, you can directly change the record number which makes it possible to jump back and forward in increments of 1, 10, 100 or 1000.

Note: When stepping through records, each record is also sent out the RS-232 serial port. Records are automatically scanned through by entering the "DUMP" option in the supervisor's menu (pressing "Exit" stops the automatic scan).

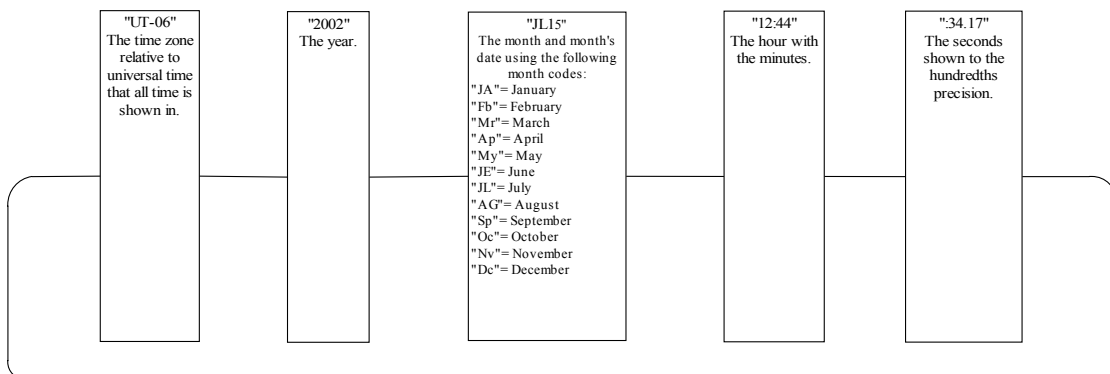


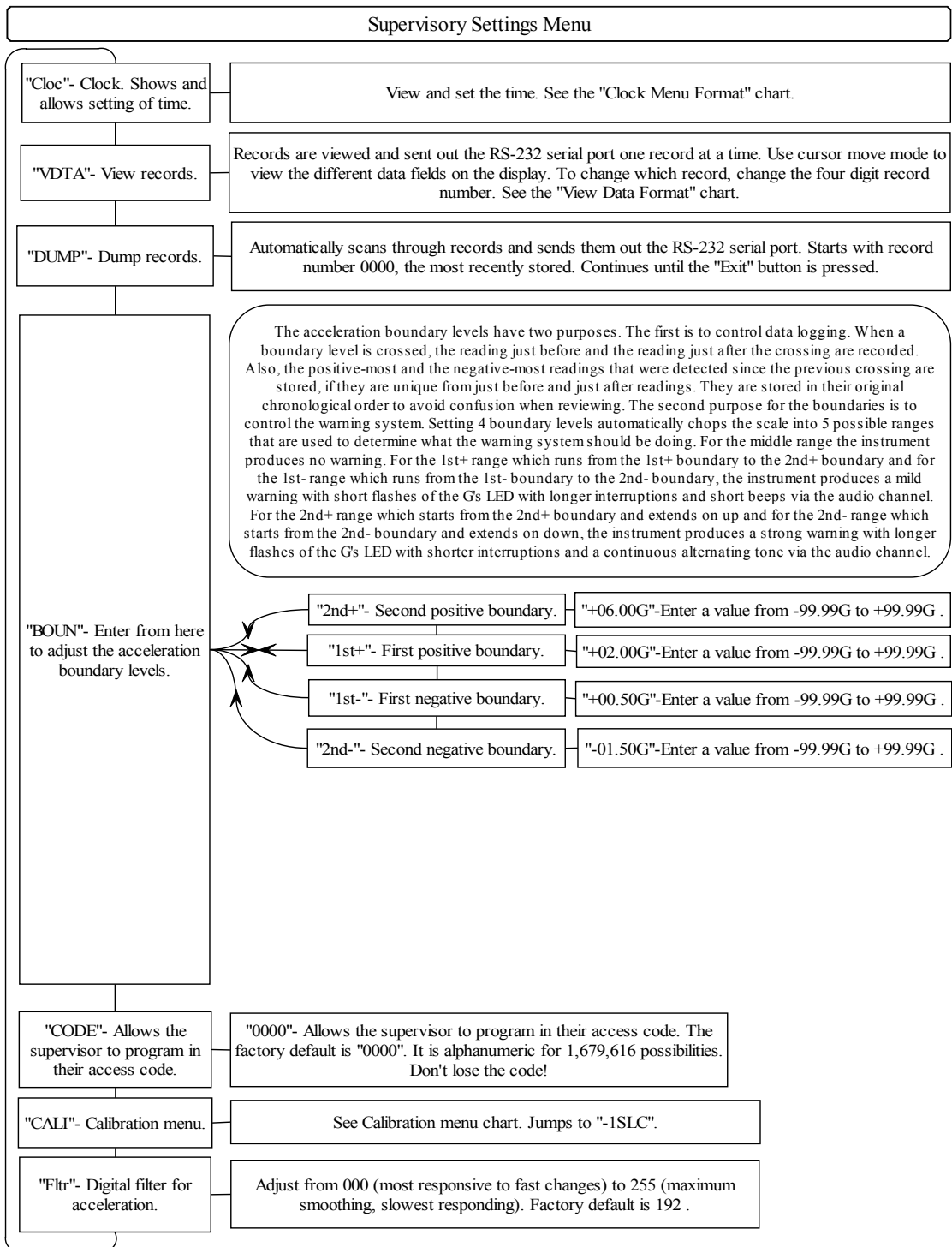
### Clock Menu Format

Use the "Enter" key to toggle between cursor move mode and change mode.

When in cursor move mode, in which the up and down arrows are not flashing, use the "+" key to move left and the "-" key to move right through the different data fields on the display.

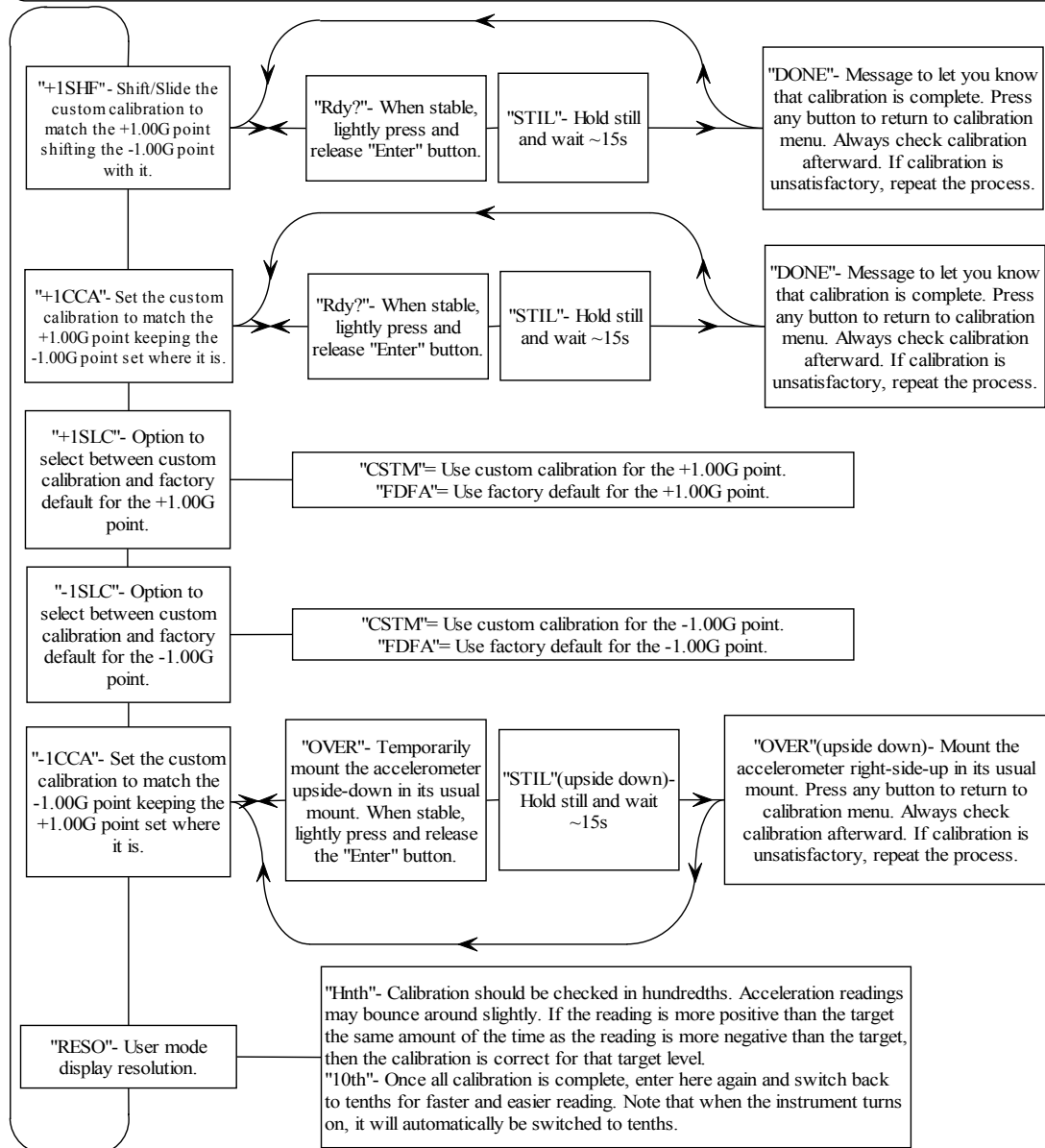
When in change mode, in which the up and down arrows are flashing, use the "+" and "-" keys to change the data that is indicated by the blinking cursor.





## Calibration Menu

Tips: Calibration is controlled by two data points: one at +1.00G and one at -1.00G. By default the instrument uses factory settings. Mounting styles and other environmental factors can have a small effect on the readings, so the instrument allows you to switch between factory and custom calibration and has easy methods for custom calibrating. Even if you plan on using factory calibration you should still perform a custom calibration for -1.00G when installing since it requires temporarily mounting the instrument upside-down. You can, of course, just use the factory setting once installation is complete. Calibrating both points independently gives the best results. Since it may be inconvenient to calibrate the -1.00G point after installation you also have the option of a scale "shift" calibration. Once you have performed a scale shift calibration, you should only use that method when calibrating until you have a chance to perform the -1.00G independent calibration.



### **One Year Limited Warranty**

*EZE* Technologies, Inc. warrants to the original purchaser that its DA-55 Accelerometer product, and the components parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

*EZE* will, without charge, repair or replace, at its option, defective product or component parts upon delivery, accompanied by proof of the purchase date in the form of a sales receipt, postage paid, to :

EZE Technologies  
3701 Washington Blvd.  
Ogden Utah 84403

Exclusions: this warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. Void if unit has been opened or tampered with, improperly wired or installed.