MD INSTRUMENTS, INC.

EZ READER SPECIFICATIONS

Hardware: Microprocessor based, fully programmable digital temperature readout system. Unit is factory programmed ready to use or it can be easily modified for operator preferences.

Displays: Large 3" high seven segment LED main display. Program screen is a high performance 4 x 40 LCD display. Both displays protected by replaceable Lexan windows.

Keypad: Totally sealed, one piece, solid metal construction with no moving parts. Sixteen key patented piezoelectric design.

Thermocouple calibration: Types R, S, and B. Field changeable. Internally compensated. Type K also available.

Measurement range:

IPTS-48 or IPTS-1968

Type S and R: 500-3300°f (260-1815°c)

Type B: 1000-3400°F (538-1871°c)

Type K: 500-2500°F

Accuracy: +/-3°F over measurement range.

Operating temperature: 40-130°F

Outputs: EIA std. RS-232, for data transfer. Optional external lights and horn outputs (fuse protected). 0-5V scalable output. RS485 port for plant wide data acquisition or remote display.

Enclosure: Custom design, dust proof, sealed enclosure. 8.75" high x 17.45" wide x 7.25" deep. Optional 19" rack mount.

Data logging: Up to 1500 readings can be stored. Each reading consists of date, time, peak temperature, reading number, and user programmed alphanumeric heat number (8 char. max.). Readings can be recalled from memory and displayed on 4x40 LCD display, and or sent to the RS232 port.

Power requirements: 85-130VAC 50 or 60Hz. 5 year lithium battery backed memory.

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Equipment Description

The EZ Reader is a microprocessor-based instrument designed to read disposable thermocouples used for measuring the temperature of molten metals.

Operation:

1) Power unit from a 120 VAC 60 HZ power source.

2) Place unit in an area that is as cool and clean as possible.

3) Green light: Indicates a good thermocouple is installed. When the tip is removed or burns open the display will show 'POLE', upon replacing the tip, the large display will re-display the prior test value if the test criteria were met.

4) Yellow light: Indicates that a test is in progress. This light comes on at temperatures at or above 'MIN DISPLAY TEMP' and lower than the 'MAX TEMP' entered under setup options. This light will remain on after the test is complete, until the tip is changed or the reusable tip temperature falls below the 'MIN DISPLAY TEMP'. At that time the instrument mode will be reset and available for the next test sequence.

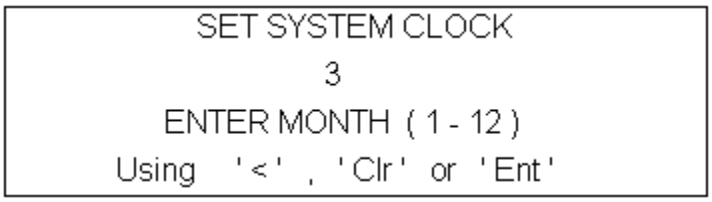
5) Red light: Indicates that testing is complete. When this light comes on the analog output will hold the test value for a period of five seconds then return to a 'real-time' value. If the test fails the specified setup criteria, the large display will show 'FAIL' the red light will flash for five seconds then the display will show zero. The prior test value isn't re-displayed after a failed test to avoid confusion. Test failure will result form a tip timeout or the temperature falling below the MIN DISPLAY value before the PLATEAU stability is reached. Depending upon the operators choice of setup features, the held reading may hold between tests, (the default), or hold for a user specified number of seconds and then return to the real time temperature display.

Description of EZ Reader Screens

In general all screens or data entry fields may be exited or accepted by pressing either 0 or ‘Ent’ from the keypad.

Upon powering the EZ Reader, the system will load and run the program stored in EEPROM memory. Depending upon the initial condition of the system, different opening screens may appear. These are listed below as well as the conditions leading to their display.

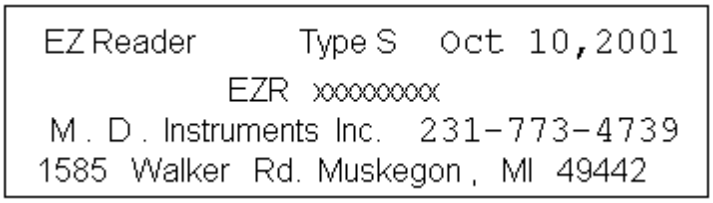
1. A newly built and powered unit after loading the initial setup program, will force the operator to set the units date and time by displaying the SET SYSTEM CLOCK screen shown below.



The screen scrolls from month to day to year, then to the time setting of hours and minutes. All entries are checked for valid ranges before writing to hardware and will redisplay any entry screen if entered data is beyond normal limits. This screen is also accessible through a utilities screen described later. Any entry that displays a correct field of data may retain this data by pressing the 'Ent' key to advance to the next parameter.

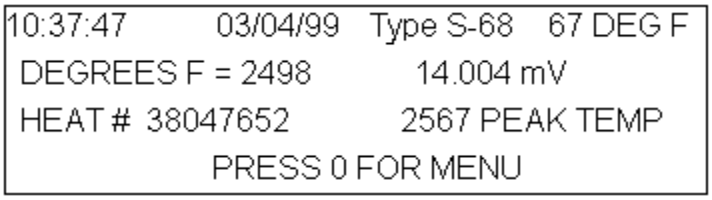
2. On units that have not been calibrated, or have calibration parameters that are beyond "normal " expected values, a warning screen will appear displaying the calibration slope or intercept if values indicate that questionable data may be obtained from using the instrument. Press 0 to advance beyond the warning and recalibrate the instrument before running production tests.

3. Units will normally bypass the first two screens under normal operation and display an opening screen showing the company name, address, phone number, program revision date and model number if entered.



After approximately three seconds, the normal operating screen for production testing will replace this screen.

4. The normal operating screen is shown below;



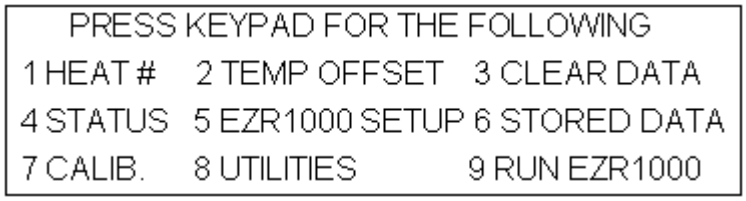
The current time, date, thermocouple type and internal instrument temperature are shown on the top line. The second line shows the real-time temperature and millivolt output of the thermocouple. The third line indicates the entered heat number and the last test's peak or plateau test temperature. The peak or plateau test value is also displayed on the three-inch display. The bottom line of most screens is used for calling or returning from additional options. In the above screen, pressing the keypad 0 will advance the display to the instrument main option menu.

During normal testing the large display will hold the last test peak or plateau test reading until the tip is removed or the next test minimum temperature is exceeded. Should the tip be removed the display will show POLE. After the new tip is attached, the last peak temperature is again displayed until the next test begins. The green test light being out indicates an open probe tip. A non-open tip, below the minimum test threshold temperature, will display the green light and the red light if a prior test has been completed. A test in progress will be indicated by the yellow light being on and red being off. Test completion is indicated by the red light and the horn on. When the tip is withdrawn from the metal and has cooled below the minimum test threshold, the yellow light goes out. Heat data is saved to battery backed RAM upon successful test completion. Data is

stored for future recall until cleared or the stored number exceeds 1828 tests. If data storage becomes full, a warning screen will appear and ask if a data download is desired. A keypad response of 0 is required to continue. If data is not downloaded, the next test will 'wrap around' and overwrite stored heat data. The sample number will be reset to number one and display of original the data will be prohibited.

A shortcut key to enter a heat number is provided by pressing the right arrow key from the main operating screen. Heat numbers may also be entered by using the main menu screen described below.

5. Pressing 0 from the main operating screen will display the main option menu shown below;



Pressing 1 from the keypad 'HEAT #' will allow entry of the test heat number using the keypad. This ID number can be up to eight characters in length. Alpha and keyboard characters are accessed by scrolling through groups using the up and down arrow keys and pressing the key number below the character desired. The backspace key erases one character and the forward arrow enters a space. Press enter when finished.

Selecting main menu option 2 'TEMP OFFSET" allows for a user temperature offset entry. Units are of integer values of degrees F or degrees C depending on the user preferences in EZR1000 setup.

Selecting main menu option 3 'CLEAR DATA' will prompt for an operator password to prevent accidental data erasure. The password 1234 is the same as the password for equipment calibration. Upon entering this number, data in memory will be cleared and a confirmation screen displayed.

Selecting main menu option 4 'STATUS' displays a screen similar to the main operating screen, except that the heat number and the test temperature are not shown. Other differences include no operation of the test lights, data storage, latched large display or minimum test threshold temperature. This screen is useful for calibration verification of the instrument without affecting stored data.

Selecting main menu option 5 'EZR1000 SETUP' allows the user to configure the main test parameters on options ordered. These include;

a. Temperature display units

b. Minimum large display update threshold temperature

c. Maximum open TC temperature for loss of green light and no data storage

d. Test temperature stability in degree change per second, to prolong tip life

e. Tip time-out, beginning at minimum display temp, in seconds. Similar to d. above.

f. Test mode, peak reading mode or plateau mode.

g. Plateau Window Degrees. This will only appear if the Plateau test mode was selected. This specifies the plus and minus window height that consecutive samples must remain in if a test is considered valid. A window specified at 2, will require the sample readings to be within 4 degrees of one another.

h. Plateau Window Samples. This will only appear if the Plateau test mode was selected. This is the number of consecutive samples within the window, taken at 0.5 second intervals, required before the Pole Temp Time Secs has been reached.

i. Averaged number of analog to digital conversions. Default value is 50. Each temperature reading is the average of the specified number of analog to digital conversions. Fifty conversions take approximately 0.4 seconds. This allows software filtering in electrically noisy environments.

j. Low temperature representing 0 volts out. This is available with the analog output option, and useful for chart recorder input.

k. Upper temperature representing 5 volts out. Similar to g. above.

l. Clear or not clear heat # after test.

m. Entry of a heat temperature above which and alarm sounds until silenced by the operator. The stored data is also tagged as ALARM in the heat number field. Upon acknowledgment by the operator, the original heat number is displayed for the next test, if the option to not clear was chosen.

n. Enable Horn Alarm will sound the audible alarm when the test is complete.

o. Warn if storage is full will display a screen in the event that the data ram is full. This allows the user to download the data to another system for permanent archiving.

p. An analog filtering % value, default value is 10. This represents 10% of the last temperature reading added to 90% of the newest temperature reading.

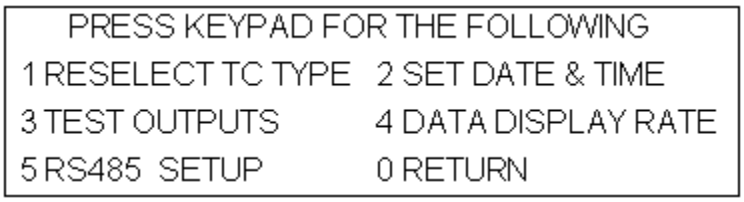
q. Clear display during test, operator selects if the large LED display reads real time test values or clears to zero and displays test temperature at the end of the stability period.

p. Test display hold time in seconds. The default value of zero will hold the last passing tests' temperature until the next test temperature rises above the minimum display temperature. Any value between 1 and 255 seconds can be entered by the operator. In the event that a test fails, "FAIL" will be displayed and the alarm horn sounded for five seconds. After this time the display will be cleared to zero.

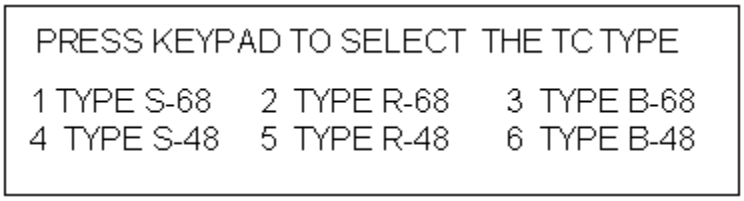
Selecting main menu option 6 ‘STORED DATA’ will start the stored data display screen scrolling from the last test to the first test stored. This display can be stopped, forwarded and reversed by keypad. The automatic display-scrolling rate is normally two seconds but can be changed in the UTILITIES menu described later.

Selecting main menu option 7 ‘CALIB.’ is used to calibrate the instrument. A warning that a millivolt source is required is displayed and a password prompt follows. An invalid password returns the operator to the main menu. A password of 1234 will begin the process, which is self explanatory (see the end of this document for a step by step procedure). The signal source required is an IPTS-68 standard. Should a calibration be so far off as to not be allowed, entering 8604678 for the password will reset the calibration slope and offset. Normal calibration can then be attempted using 1234.

Selecting main menu option 8 ‘UTILITIES’ displays the following screen;



Selecting utilities menu option 1 ‘RESELECT TC TYPE’ displays the following screen. Press a key to change the thermocouple type used in the test.



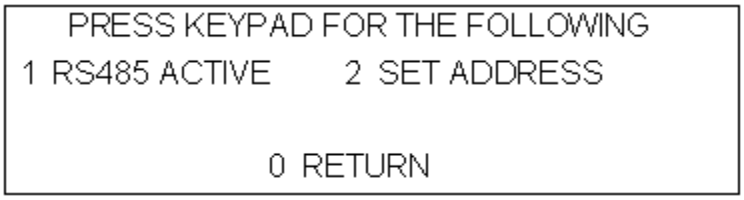
Selecting utilities menu option 2 ‘SET DATE & TIME’ allows setting of the instrument real-time clock. Procedure was discussed under system startup.

Selecting utilities menu option 3 ‘TEST OUTPUTS’ runs a utility that activates the large display digits 0 through 9 to check for bad elements or driver chips. Upon completion of the display test, the indicating lights and horn are pulsed to allow detection of defective bulbs, output relays or blown fuses.

Selecting utilities menu option 4 ‘DATA DISPLAY RATE’ allows the operator to change the auto scrolling stored data delay time. Setting this to zero before downloading stored data will output stored ASCII data out the RS232 port as fast as possible. Communication parameters are 9600 baud, 8 data bits, no parity, 1 stop bit. The startup default display rate value is two seconds between tests displayed. This number if changed is not stored and will go back to its default value if power is cycled. Data is sent to the RS232 connector anytime the stored data is viewed. This is a standard equipment feature.

Utilities menu option 5 ‘RS485 SETUP’ allows plant wide networking of all similar units to a host computer for the purpose of remotely downloading, clearing and archiving stored data. Host computer utility software is included to facilitate automatic scheduling of the operations above. File storage to disk, allows data to be analyzed by commonly used business programs.

The RS485 SETUP display follows;



Selecting RS485 menu option 1 ‘RS485 ACTIVE’ toggles between active and inactive. This must be set to active in order to respond to network requests from the host computer. If this option is not being used, set to inactive.

Selecting RS485 menu option 2 ‘SET ADDRESS’ is used by the network to identify the instrument on the network. Each EZ Reader must be set to a different address to avoid simultaneous responses to host computer commands. Addresses are limited to numbers one to 32. Host computer utility software can detect and display active nodes on the network, both manually and automatically through the scheduler feature.

EZ READER COMMUNICATIONS

The EZ Reader is equipped with an RS232 communication port on the rear of the unit. This document details the use of this port. The purpose of this port is to allow the user to download test data from the EZ Reader to a computer. The EZ reader can store 1800 readings before it starts to overwrite the oldest readings.

The cable required is a standard straight through 9-pin D-sub male-female serial cable.

In Windows under Programs and Accessories, select Hyper Terminal. Click on the "HYPERTRM" icon. Give the program a name and select an icon for your program. Click on the "OK".

In the next window under "connect using:" select the comm port that the cable is connected to. Click on the "OK". Under the comm port properties, select the following settings:

Bits per second: 9600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

Click on the "OK", then save your changes.

Use the icon just created each time you want to download from the EZ Reader. To transfer the data, select "Transfer" from the hyper terminal menu bar and select the "capture text" option. Fill-in the file path and file name. Press "start". At the EZ Reader, press "0" for the menu, then "#6- Stored Data". After data has been transferred, go to "transfer" on the menu bar and select "capture text" push "stop".

Once the data has been transferred to the .TXT file it can be imported into other software, and or printed.

COMMUNICATION CABLES

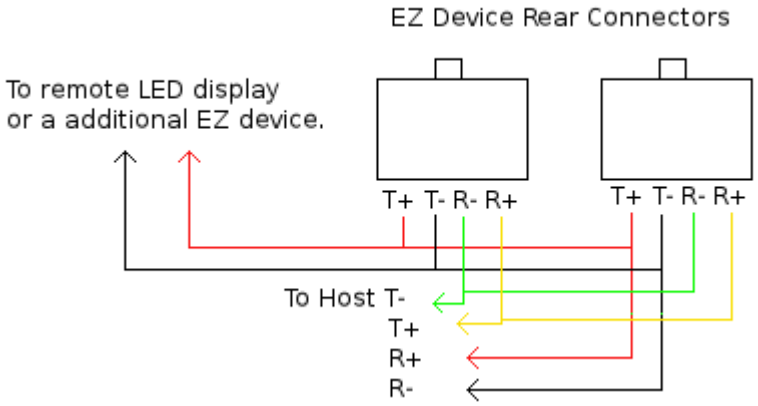
Internal Programming Cable IDC-10 socket to 9 Pin D-Sub Socket

IDC-10 Socket Pins	9 Pin D-Sub Socket Pins
2	2
3	3
5	5
8	8
9	9

RS485 Connection RJ11 connector Dual 8 position Shielded Cat 5

Siemon Part # CTS-SG-T4-T4-01

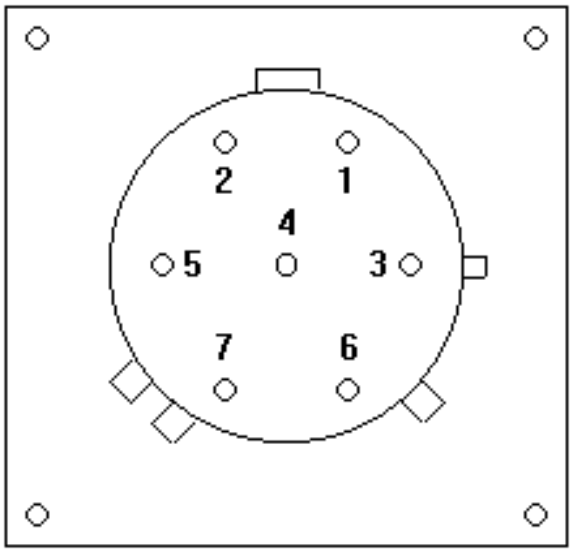
EZ READER CABLE WIRING CONNECTIONS



FOR EXTERNAL LIGHT OPTION

7 PIN SOCKET

Light Connection	Pin Number	Wire Color
Neutral	1	White
Green Light Hot	2	Green
Amber Light Hot	3	Yellow
Not Used	4	
Red Light Hot	5	Red
Horn Hot	6	Black
Not Used	7	



Socket Front View

EZ READER CALIBRATION

1. With the EZ-Reader in the normal run mode, press zero on the keypad to display the operator menu.

2. Select “Calibrate System” by pressing number 7 on the keypad.

3. A message will appear on the display stating that this procedure requires a millivolt source (Thermocouple simulator).

4. After a few seconds the following message will appear “Enter Security Number”. Enter the number 1234 from the keypad and press enter.

5. A prompt to “Input 32 deg F” appears. Using an IPTS-68 type S thermocouple simulator connected to the black connector on the side of the EZ-Reader, input 32 degrees F.

6. Press the up or down arrow keys to adjust the internal offset until the displayed temperature value on the LCD display indicates 32 +/- 1 degrees. Press the zero key to continue.

7 A prompt to “Input 2450 deg F” appears. Again, with a type S thermocouple simulator input 2450 degrees F. The LCD display will begin the gain correction. This is complete when the displayed value flashes between 2450 and 2449, press the zero key.

8. Calibration is complete.

AVAILABLE REPLACEMENT PARTS

Part Number	Description
MD1010	Large LED Display Lens
MD1009	LCD Display Lens
MD1062	Alarm Horn
MD1050	Green Lamp Lens
MD1051	Red Lamp Lens
MD1052	Amber Lamp Lens
MD1053	Lamp Bulbs
MD1045	Stainless Keypad
MD1004	Instrument Face Plate