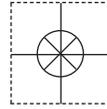


1 YEAR  
WARRANTY



# User's Guide

*Shop online at*

**omega.com<sup>®</sup>**

Ω OMEGA<sup>®</sup>

*omega.com*

*e-mail: info@omega.com*

*For latest product manuals:  
omegamanual.info*

ISO 9001  
CERTIFIED  
CORPORATE QUALITY

STAMFORD, CT

ISO 9001  
CERTIFIED  
CORPORATE QUALITY

MANCHESTER, UK

MADE IN CANADA



# FOB Fiber Optic Thermometer Systems



**OMEGAnet® Online Service**  
**omega.com**

**Internet e-mail**  
**info@omega.com**

### **Servicing North America:**

**U.S.A.:**  
ISO 9001 Certified

Omega Engineering, Inc., One Omega Drive, P.O. Box 4047  
Stamford, CT 06907-0047 USA  
Toll Free: 1-800-826-6342                      TEL: (203) 359-1660  
FAX: (203) 359-7700                                e-mail: info@omega.com

**Canada:**

976 Bergar  
Laval (Quebec), Canada H7L 5A1  
Toll-Free: 1-800-826-6342                      TEL: (514) 856-6928  
FAX: (514) 856-6886                                e-mail: info@omega.ca

### **For immediate technical or application assistance:**

**U.S.A. and Canada:** Sales Service: 1-800-826-6342/1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378/1-800-622-BEST®  
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

**Mexico:**

En Español: 001 (203) 359-7803                      FAX: (001) 203-359-7807  
info@omega.com.mx                                      e-mail: espanol@omega.com

### **Servicing Europe:**

**Benelux:**

Managed by the United Kingdom Office  
Toll-Free: 0800 099 3344                      TEL: +31 20 347 21 21  
FAX: +31 20 643 46 43                                e-mail: sales@omega.nl

**Czech Republic:**

Frystatska 184  
733 01 Karviná, Czech Republic  
Toll-Free: 0800-1-66342                      TEL: +420-59-6311899  
FAX: +420-59-6311114                                e-mail: info@omegashop.cz

**France:**

Managed by the United Kingdom Office  
Toll-Free: 0800 466 342                      TEL: +33 (0) 161 37 29 00  
FAX: +33 (0) 130 57 54 27                                e-mail: sales@omega.fr

**Germany/Austria:**

Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0 800 6397678                      TEL: +49 (0) 7059 9398-0  
FAX: +49 (0) 7056 9398-29                                e-mail: info@omega.de

**United Kingdom:**  
ISO 9001 Certified

OMEGA Engineering Ltd.  
One Omega Drive, River Bend Technology Centre, Northbank  
Irlam, Manchester M44 5BD England  
Toll-Free: 0800-488-488                      TEL: +44 (0)161 777-6611  
FAX: +44 (0)161 777-6622                                e-mail: sales@omega.co.uk

---

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>4</b>
1.1	FOB100 PRODUCT SPECIFICATIONS.....	4
1.2	CALIBRATION.....	5
<b>2</b>	<b>UNPACKING.....</b>	<b>6</b>
<b>3</b>	<b>FOB100 SERIES THERMOMETER HARDWARE REFERENCE.....</b>	<b>7</b>
<b>4</b>	<b>USING THE TEMPERATURE PROBES.....</b>	<b>10</b>
4.1	CAUTION.....	10
4.2	DESCRIPTION.....	10
4.3	WARNING.....	11
<b>5</b>	<b>SERIAL COMMUNICATION DESCRIPTION.....</b>	<b>12</b>
5.1	USING HYPER TERMINAL IN WINDOWS.....	12
5.2	RS-232 HELP MENU.....	12
5.3	DETAILED DESCRIPTION OF RS-232 COMMANDS.....	13
5.4	TYPICAL TEMPERATURE READING SEQUENCE.....	16
<b>6</b>	<b>ERROR CODES.....</b>	<b>17</b>
<b>7</b>	<b>FOB100-SOFT SOFTWARE PACKAGE.....</b>	<b>18</b>
7.1	GETTING STARTED WITH FOB100-SOFT.....	18
7.1.1	<i>Hardware and software requirements.....</i>	<i>18</i>
7.1.2	<i>Installing FOB100-SOFT.....</i>	<i>18</i>
7.2	A QUICK TOUR OF FOB100-SOFT.....	18
7.2.1	<i>Working with the Configuration Window.....</i>	<i>19</i>
7.3	ACQUIRING AND VIEWING TEMPERATURE DATA.....	21
7.3.1	<i>Logging temperature data to a file.....</i>	<i>21</i>
7.3.2	<i>Viewing temperature data.....</i>	<i>23</i>
7.4	THE FOB100 CONSOLE.....	25
7.4.1	<i>Console help menu.....</i>	<i>26</i>
7.5	FOB100-SOFT FUNCTIONS.....	26
7.5.1	<i>The File menu.....</i>	<i>26</i>
7.5.2	<i>The Window menu.....</i>	<i>27</i>
7.5.3	<i>The Help Menu.....</i>	<i>27</i>

### Warning

Permanent damage may be done to the thermometer if the power supply connections are not done correctly. In particular, do not connect the power input (18-24VDC) to any of the analog output connectors. Note that the 20 mA analog output options are self-powered interfaces (by opposition to loop-powered interfaces), and thus do not require any external supply.

Fiber optic probes are fragile, and will break if the bending radius becomes less than ~1cm, even temporarily. Probe breakages are not covered under the standard Omega warranty.

# 1 INTRODUCTION

**Congratulations** on the purchase of your FOB100 Series thermometer product! Your new temperature sensing system will soon allow you to take full advantage of the benefits inherent to fiber optic sensing technology. It offers accurate and reliable temperature measurements, combined with extraordinary insensitivity to EMI/RFI, high voltage insulation and disturbance free sensing due to the non-electrical nature of the sensor element used.

Not only does the FOB100 Series of products gives users' access to reliable measurements, but it also offers a simple user interface that makes the technology easy to use. Moreover, no special calibration is required when changing the fiber optic sensor elements.

The thermometer is packaged in a small splash proof package, which is ideally suited for industrial and laboratory applications.

The standard configuration is offered with an RS-232 interface as well as an analog output feature (1, 2 or 4 channels) that can be used for remote interfacing purposes. In addition, a green fluorescent display makes it easy to see the temperature for up to 4 channels, either in Celsius (°C) or in Fahrenheit (°F), even in dark areas; it also includes a simple 3-key keypad that gives the user access to all built-in features; these standard features are great for laboratory applications.

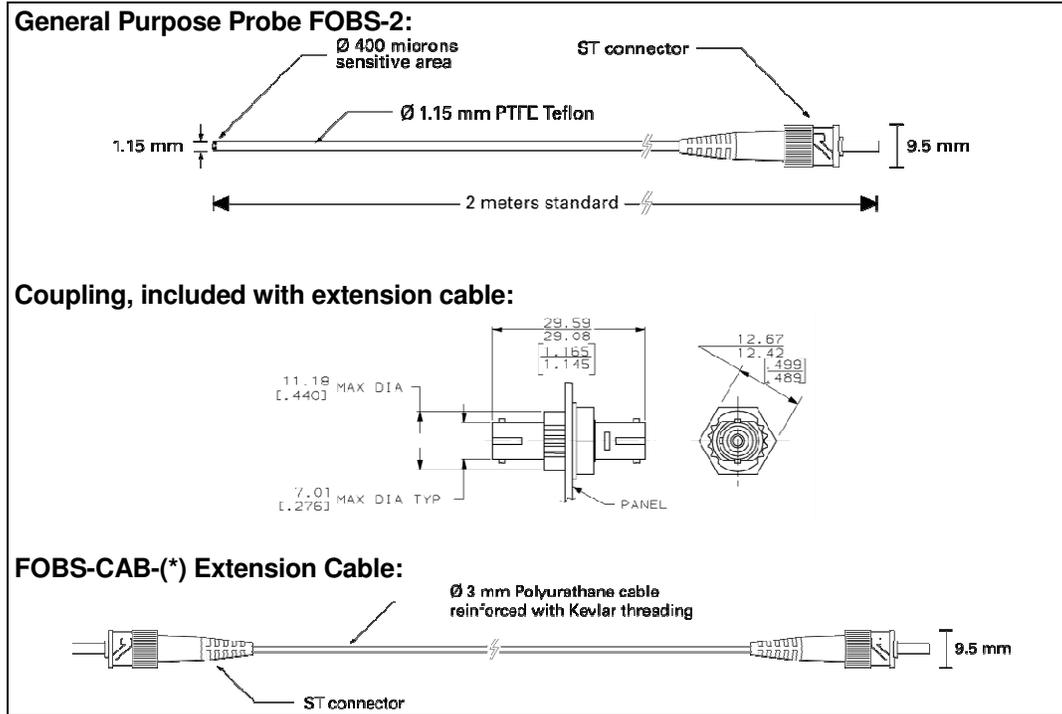
An optional software package, FOB100-SOFT, makes your thermometer even more useful. It is easy to use, and allows the user to easily monitor even multiple thermometers at the same time, and to perform easy data logging. PC compatible.

## 1.1 FOB100 product specifications

Resolution	0.1°C
Accuracy	The greater of 1°C or 1% of reading
Calibrated Temperature Range	-40° to 200°C
Usable Temperature Range	-80° to 250°C
Number of channels*	1, 2 or 4
Probe length	1 to 300 meters
Response time	Typically 0.4 to 1 second per channel (probe configuration dependent)
Unit	User selection of °C or °F
Operating temperature	0° to 45°C, non-condensing
Storage temperature	-30° to 60°C
Local display	Display of channel number and temperature readings as well as other user information.
Power	14 to 28 VDC (see note below, front panel item #10)
Size	228L x 140W x 65D mm
Weight	1.0 kg
Standard interface	RS-232C Analog output* (0-10V standard or 4-20mA option)
Sensor (FOBS-XX)	Dielectric silicone tipped optical fiber

\*: Selection must be specified at time of order.

The following figure gives a description of the various probe configurations that are optionally available from Omega.



Other options and configurations are also possible; contact Omega for more information.

## 1.2 Calibration

Your FOB thermometer comes factory-calibrated. An annual re-calibration is recommended every 12 months or whenever performance verification indicates that calibration is necessary; NIST traceable calibration certificates are available. All calibrations are performed at the factory. Contact your Omega representative for further information.

## 2 UNPACKING

Before using your FOB100 thermometer, check the box content to be sure all items have been included. Your package should normally contain:

- FOB100 series signal conditioner unit
- Power supply module (universal input: 100-240VAC, 50/60Hz)
- RS-232C interface cable
- User manual (this manual)
- Calibration Certificate.

*Options:*

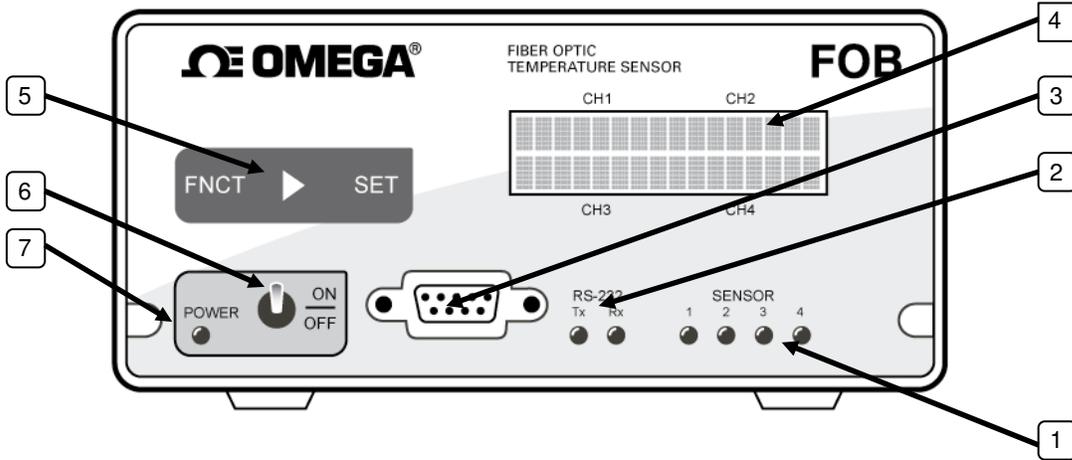
- Fiber optic temperature sensor probes
- Fiber optic extension cables
- Fiber optic coupling
- FOB100-SOFT software (CD).

Make sure all listed items have been received and are in good condition. Note any evidence of rough handling in transit; immediately report any damage to the shipping agent. Should a part be missing or damaged, please contact your distributor immediately. Returns must be made with the original packaging, accompanied by an authorization number (RMA). Omega Customer Service Department will provide you with information concerning the return of merchandise; you can contact Omega at (800) 622-2378 or (203) 359-1660.

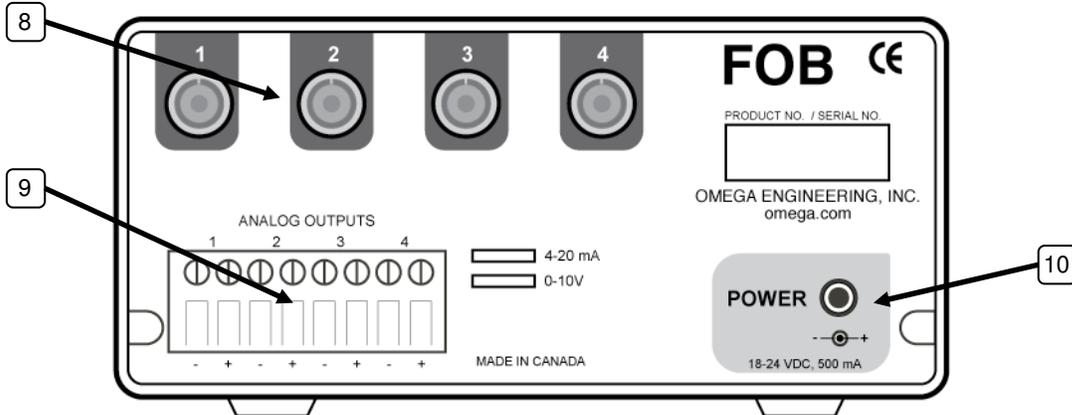
The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment becomes necessary.

### 3 FOB100 SERIES THERMOMETER HARDWARE REFERENCE

The following figure shows the thermometer front panel:



The FOB100 back panel is as follows:



The following presents a full description of the user interface as well as detailed instructions on how to use the thermometer.

**1) Sensor status light(s):** There is a total of up to 4 lights for this, one for each channel. These indicators inform you about the system status, as applicable to each channel. If any remains off, this indicates that either that channel is disabled or there is a problem with that sensor (or with the optional patch cord connected to it). Check if all optical connectors are correctly mated or if the sensor fiber (or patch cord) is not broken.

**2) Serial communication status light:** These indicators are directly connected to the Tx and Rx lines of the RS-232 interface. This is useful to confirm a good communication link with your PC when the FOB100-SOFT software package is used.

**3) RS-232 communication interface:** This port is used to configure and extract information for the instrument. This DB-9 connector uses the same pin-out as a COM port on a PC computer. Use a simple pin-to-pin wired cable (not a null modem cable) to connect to a computer. See below for a complete description of the serial commands that are available.

**4) 2 x 16 Display:** Under normal use, the display will show the temperature readings for the user selected channels; the temperatures are displayed in either °C or °F. However, when the FNCT key is used, information is displayed to guide the user in making the selections (see item 5 below).

**5) FNCT and SET keys:** When the FNCT key is not activated; the display will show the temperatures for the requested channels. The FNCT key allows the user to scroll through the menu items. All settings are kept in permanent memory, until changed again by the user, using either the keypad or a RS232 command.

 This key allows users to scroll through the different options.

 This key allows users to browse from field to another, for options that have many fields.

 This key allows users to set a value to the selected field.

The description of each of the menu items is:

- 1- Sampling rate: Adjust the resolution of the display. In Fast mode, the instrument focuses on faster response time. In Slow mode, the focus is on higher resolution; this is achieved by averaging the last 4 temperature measurements, which tends to reduce the noise, but to increase the effective response time. In Slow mode, the display shows gives temperatures in hundredths of degrees, while in Fast mode the display is in tenths of degrees.
- 2- Ch Enable Scan: Enable or disable the reading of a channel. Channels that are turned off are not read, thus allowing the “on” channels to be read faster.
- 3- Temp. Unit: Enable users to change the temperature unit of the instrument. The thermometer will continue to display temperatures using the newly selected unit.

**6) Power switch.** Make sure the FOB100 power supply module is connected and powered. At power on, a series of messages are displayed (actual information may differ):

```
FOB100
Single Channel

www.omega.com
Ver: 0.2.25
cal: 06/11/141
```

Then temperatures should then be displayed, assuming they are correctly connected, and so forth. If temperatures are unreadable, - - - - - will be displayed.

**7) Power status light.**

**8) Sensor connector(s):** These are ST type connectors, mating to each of the 4 optical temperature sensors. If you need to extend a sensor fiber, you should use optional patch cords that are available from Omega. For thermometers that have 1 or 2 channel(s), only 1 or 2 sensor connectors are used.

---

<sup>1</sup> This is the calibration date (format YY/MM/DD).

**Warning:** The fiber type that is used with your thermometer is of a special type, and it is recommended that you get ALL of your patch cords (also called extension cables) from Omega.

**9) Analog output connector(s):** There are a total of 1, 2 or 4 such connectors, one for each channel. Prior to shipment, your FOB100 thermometer was factory set to one of the following configurations: 4-20mA or 0-10V output. The minimum analog output value corresponds to minus 100°C and the maximum analog output value corresponds to 300°C. The thermometer normal range is from minus 80°C to 250°C, so a minimum value indicates an under-range error; likewise, a maximum value indicates an over-range error condition. If there is a sensor problem for a given channel, the analog output may take one of the following 3 states (refer to the RS-232 “o” command, Section 5.3):

- a) It will toggle between the minimum and maximum values, at approximately 0.5 Hz, this indicates a sensor problem for that channel (o0). This is the default setting; to change it, you will need to use the RS-232 “o1” or “o2” command.
- b) The analog output is forced to its maximum value (o1); this would indicate a “too-hot” situation.
- c) The analog output is forced to its minimum value (o2); this would indicate a “too-cold” situation.

**Warning:** Do not connect any external voltages to these outputs; this may cause permanent damage to the thermometer unit.

Note: If the unit is in “sleep” mode, the analog outputs will keep their values until the FOB100 acquires new temperature values.

**10) 18 Volts DC power connector:** You can use a DC power supply from 14V to 28V; note that at 15V or less, you will be unable to use more than one (1) 500Ω load at the analog output, for all current output configurations. There is an internal fuse, to protect the system in case of electrical problems; this fuse is not user changeable.

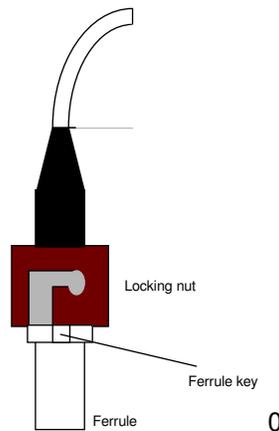
## 4 USING THE TEMPERATURE PROBES

### 4.1 Caution

Each time you connect a temperature probe to the unit, the probe **optical connector should be cleaned beforehand**. Otherwise, particles of grease or dirt may obstruct the device internal connector and affect the measurements by completely blocking the signal or by generating too much attenuation when using a long fiber length.

Never use a cloth other than the type recommended for fiber optic cleaning. Dampening the cloth with pure isopropyl alcohol ensures good cleaning.

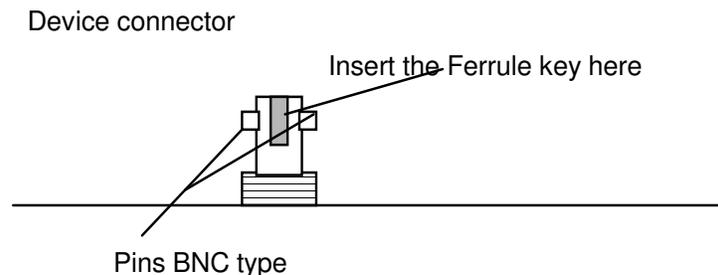
Occasionally, clean the inside of the bulkhead connector (attached to the thermometer) with a wipe or cotton swab dipped in alcohol (2.5 mm mini foam swabs work best).



For very dirty connectors, acetone can also be used, but should be used very carefully, as it is a very strong solvent. Care should be exercised so you do not apply any on plastic materials, etc.

### 4.2 Description

The optical connector used is a standard ST type connector.



To install the connector,  
Slide the ferrule key gently into the above key.  
Then, turning, insert the two BNC pins into  
The appropriate slots on the ST connector.

### **4.3 Warning**

The FOBS-XX probe is quite fragile and it must be handled carefully. Please note that any probe damages are not covered by the standard warranty.

The probe tip is made of silicone rubber. Although silicone is resistant to a large number of chemical aggressors, strong acids or alkali may damage it, especially at high temperature and/or if used for extended periods of time. Warning: Solvents and fuel oils can cause problems for silicone rubber.

Omega also manufactures probes that have their tips made of epoxy. Just like silicone, epoxy resin is resistant to a large number of chemical aggressors, strong acids or alkali may damage it, especially at high temperature and/or if used for extended periods of time.

Contact your distributor for additional chemical compatibility information.

Do not expose your probes to temperatures that are higher than specified. Permanent damage can be caused to probes that have been exposed to temperatures that are higher than their limits.

## 5 SERIAL COMMUNICATION DESCRIPTION

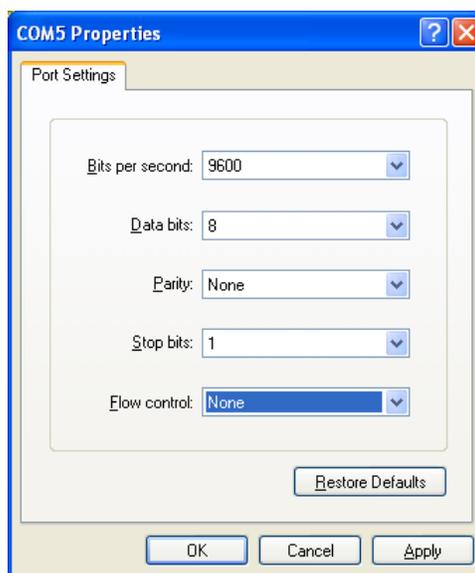
You can communicate with your thermometer via the standard RS-232 link. A description of the cable requirements is given above, under front panel item # 3.

RS-232 functions (or commands) can be accessed with a simple terminal, with the FOB100-SOFT software package or simply with a computer and communication software (such as Windows Hyper Terminal). Your software should be set at 9600 Baud, 1 Stop-Bit and No-Parity.

### 5.1 Using Hyper Terminal in Windows

Hyper Terminal<sup>2</sup> is a standard Windows program that can be easily used to exercise your FOB100 thermometer. To use Hyper Terminal you first set its properties as follows:

- 1- In the “Connection Description” window, enter a name that suits you, such as “Omega-FOB100”. Click OK.
- 2- In the next window, “Connect To”, select COM1 (or another COM port, if you are planning to use another port than COM1) in the box called “Connect using”. Click OK.
- 3- Then the COM1 Properties window will come up. As indicated above and as shown in the figure at right, set the port parameters to 9600 Baud, 1 Stop-Bit and No-Parity. Click OK.
- 4- You are ready to go. Type “h ” to test your setup (see below). Warning: the characters that you enter are not echoed to you!



### 5.2 RS-232 help menu

The following is the menu as displayed by the instrument when sending the “h” command. Note that the RS232 interface can also be used to upgrade the thermometer controlling firmware, without opening the thermometer case or changing any memory IC’s. Instructions to perform an upgrade are normally sent with the upgrade program; a PC compatible computer will be required to perform such firmware upgrade.

<sup>2</sup> Vista users: HyperTerminal is not included with Vista. However, an equivalent program (HTPE) can be downloaded (free for personal use) at the following website: <http://www.hilgraeve.com/hpte/download.html>.

FOB101	FOB102 or 104	Description
b	b	Return enclosure temperature
N/A	e[1;2; ... ;n]	Enable channels to scan (if no argument, scan all)
f[j]	f[i;j]	Set point adjustment on channel [i] to [j]
h	h	Help menu (this screen)
i	i	Get factory and status information
l[i]	l[i]	Lock the keypad (l+ to lock, l- to unlock)
o[i]	o[i]	Analog out, if error (0:Max-Min 1Hz, 1:Max level, 2: Min level)
p[i]	p[i]	Sleep mode (p+ to sleep, p- for continuous scanning)
q	q	Scanning rate (q+ for fast/quick, q- for slow)
s[j]	s[i;j]	Specify analog output Span [j] for channel [i]
t	t[i]	Get Temperature reading channel [i]
ta[i]	ta[i]	Auto temperature output to serial port (+ to enable, - to disable)
u[i]	u[i]	Unit (c = °Celsius, f = °Fahrenheit)
y	y	Quality index
z[j]	z[i;j]	Temperature [j] for analog output Zero on channel [i].

### 5.3 Detailed description of RS-232 commands

All commands must be terminated by a carriage return character (  ). When more than one argument are required, each argument must be separated from the next one by a blank or space character. Characters are not echoed back to your controlling device.

Every time a command is executed successfully by the thermometer, the "\*" prompt character is automatically sent, except in case of failures when the "Errx" error code is sent instead. Do not send your next command before receiving either the "\*" or the "Errx" prompt. The "[" and "]" characters must not be typed in; they are used here for ease of reading only.

Most commands are applicable to all FOB100 models (different number of channels). When using one-channel model, the channel number [i] must not be typed in.

**"b"** This command returns the internal temperature of the enclosure. The temperature is returned in °C or °F unit, as specified by the "u" command.

ex: "b:32.2 

**"e[-]1 [-]2 ... [-]n"** This command is not recognized by the one-channel model. Specify which channels are enabled and read by your thermometer. Preceding a channel number with the minus sign "-" will disable that particular channel. This command is useful to ignore channels that are not currently used. Enter the channel numbers that you would like to use, each one separated by a blank character.

ex: "e-1 2 3 , to enable only channels 2 and 3 and at the same time to deactivate channel 1.

“f[j]” or “f[i j]” This command forces an actual temperature reading (j) for channel # i; any resulting offset will be applied to all future measurements for that channel. This is useful to compensate for small temperature deviations that may occur between sensors. A maximum offset of +/-5°C is recommended; if it is required for you to force a larger offset, your thermometer probably requires a new factory calibration; consult your distributor or factory for more information. This command alters the internal calibration of the instrument. Always follow the recommended procedure, as given below.

**Force temperature procedure:**

- I. Apply a stable and known temperature to the sensor tip
- II. Check the display reading for abnormal deviation from the known temperature
- III. Send the “f” command followed by channel number, a blank character and the reference temperature value (example “f2 27.0 ”). Temperatures must be entered in units as specified by the “u” command
- IV. Wait a few seconds
- V. Confirm that the readings correspond to the known temperature.

Note: You can revert at any time to the factory calibration using the “f” (or “f[i]”) command (ex: “f2 ”).

Note: Always make sure you are reading a valid temperature value before using the “f” command; otherwise, your thermometer may display a random value for a channel where the “f” command has been used.

“h” Displays a help menu screen (see above).

“i” Returns general information regarding the instrument, as well as some parameters that have been programmed previously in the thermometer (either by RS-232 commands or via the keypad):

```

Ex:  Model:          FOB100
      Option:        NB Channel: 4
      Mode:          Continuous Scanning Mode
      Scanning rate: Fast
      Serial:        FOB111A
      Internal Software: V1.21
      Last Factory Calibration*: 05/02/04 (YY/MM/DD)
      Unit           °C
      Analog out, if error Toggle Max-Min 1Hz
      Keyboard Status:  Unlock

Channel  Zero   Span  Enabled  Temperature offset*
1        xxx.x  xxx.x  Yes/No   ±xxxx.x
2**      xxx.x  xxx.x  Yes/No   ±xxxx.x
3**      xxx.x  xxx.x  Yes/No   ±xxxx.x
4**      xxx.x  xxx.x  Yes/No   ±xxxx.x
  
```

\*: Temperature differential that is a consequence of the “f” command.

\*\* : Only for multi-channel models.

“l[i]” This command is useful to prevent a local user from configuring the thermometer using the keypad. “i” can take two values: “+” or “-”; entering “l+” will lock the keypad, while “l-” will unlock it, thus enabling a user to make local changes. If a user attempts to use a locked keypad, the message “LOC” is briefly displayed and the command is rejected. A locked keypad can only be unlocked using the “l-” RS-232 command.

“o[i]” This command can be used to change the behavior of the analog output(s) when the FOB100 thermometer cannot read a temperature for this channel. “i” can take one of three values:

- a) i=0. With this setting, the analog output will oscillate between its maximum and its minimum value at a rate of approximately 1Hz.

- b) i=1. In case of a probe problem, the analog output for this channel will be forced to its maximum possible value (e.g., 10V or 20mA).
- c) i=2. In case of a probe problem, the analog output will be forced to its minimum possible value (e.g., 0V or 4mA).

“**p[i]**” This command allows the user to force the thermometer to enter in sleep mode (p+) or to exit it (p-). Once in sleep mode, the thermometer will acquire new temperature values ONLY when the “t” or “t[i]” command is received; when the t command is received, the thermometer will immediately scan all enabled channels, and the new temperature values will be displayed and sent through the RS-232 link, after which it will return again in sleep mode (there is no need to resend the p+ command again).

- a) When the thermometer is powered on, the sleep mode is always disabled.
- b) When new temperature values are acquired, these new values will be shown on the display (if present) for about 40 seconds, after which “Sleep mode” will be displayed.
- c) The analog outputs will keep the last temperature readings, until new ones become available.
- d) The front panel led status lights will keep their values until new readings are acquired.

“**q**” “q” allows for selecting the fast (q+) or the slow (q-) acquisition mode. This is equivalent to the Sampling Rate selection that is available on the FOB100 keypad. In slow mode, the last 4 temperatures are averaged before being displayed or sent to the RS-232 port; this provides a better reading at the expense of being slower.

“**s[j]**” or “**s[i j]**” This command will set the analog output span for the analog channel # i (if using a multi-channel thermometer, the “i” parameter specifies the channel to which the command is addressed). The “j” parameter specifies the span that can range from 1.0 to 1000.0, in temperature units that are defined by the last “u” command.

“**t**” or “**t[i]**” Returns the current temperature reading for channel # i. “---.” is displayed if the specified channel number is not currently enabled or when no valid temperature is available for the requested channel. However, during the initial warm-up time, the error “Err1” is sent in response to the “t” command. For multi-channel instruments, if the “t” command is received without parameter, the temperatures for all channels are returned. All temperatures are returned in °C or °F unit, as specified by the “u” command.

ex: “t4 ” will return the temperature for channel # 4.

“t ”, with the FOB104 thermometer, will return:

```
+24.3<CR>
+24.5<CR>
+24.7<CR>
+24.4<CR>
*
```

The “t” command is also available in a special “**ta**” version, that can be useful for continuously and automatically monitoring all enabled channels. This special mode is recommended when automatically acquiring temperature readings with a suitable data-logging software, and can be activated by issuing the “ta+” command, or deactivated with the “ta-” command. Once activated, the following information is automatically sent when the temperature on a channel has been acquired:

“C: I; T: ±xxx.x<CR>”

where i is the channel number, and xxx.x is the temperature reading (signed number). For the FOB101 model, i is always 1.

“**u[i]**” Set units of measurements to either Celsius (i=c) or Fahrenheit (i=f). Note that this unit selection is the same as the temperature unit selection made from the keypad (if the display option is installed).

ex: “uc ”, to select °C (Celsius).

“**y**” The “y” command can be used to confirm the “signal strength” of a probe and/or its connection. It can be used as a diagnostic tool to confirm the good operation of a probe and its patch cord (if applicable) connected to a channel. The returned value can be between 0.3 to approximately 3.00; a higher value is better. A minimum of 1.25 is required for a channel to return a temperature.

ex: “y ”, with the FOB104 thermometer, will return:  
CH1: power:2.61, lamp attenuation: 250, CCD time: 50ms (fixed)<CR>  
CH2: power:2.51, lamp attenuation: 250, CCD time: 50ms (fixed)<CR>  
CH3: power:2.38, lamp attenuation: 125, CCD time: 50ms (fixed)<CR>  
CH4: power:1.09\*, lamp attenuation: 125, CCD time: 50ms (fixed)<CR>

\*: 0.3 to 1.1 indicates that no probe is detected for this channel.

“z[j]” or “z[i;j]” This command is used in conjunction with the “s” command, as it sets the temperature that corresponds to the analog zero (minimum value of analog output). For multi-channel models, the “i” parameter specifies the channel to which the command is addressed; valid values are 1, 2, 3 and 4. The “j” parameter specifies the zero temperature value, and can range from -100.0 to 1000.0, in units that are defined by the last “u” command. Factory default is -100.0.

#### **5.4 Typical temperature reading sequence**

Once all parameters have been set, the following sequence should normally be followed to extract temperature information from your FOB100 thermometer. 2 procedures can be used for this purpose. The first method consists in using the “ta” command (preferred), while the second sequence would be:

- d) The host computer should send the “t” (or “t[i]”) command, followed by a  character.
- e) The thermometer responds by echoing the requested temperature values, as indicated above; the transmission is terminated by a “\*” character.
- f) When the “\*” character is received, it is suggested to immediately terminate the dialog session by having the host computer issue the “r” command followed by a  character.

## 6 ERROR CODES

The following error messages are displayed under certain error conditions:

RS-232	Display	Analog Out	Description
Err2	Err2		Internal memory checksum error. Memory corruption. Contact Omega.
“- . . .”	“- - - - -”	Hi-Lo, 0.5 Hz*	Temperature out of maximum instrument limits or no signal
Err5			Argument out of range
Err6			Unrecognized command

\*: The exact analog output behavior is a function of the command “o”; see previous Chapter.

Note that these error codes are not applicable when using the FOB100-SOFT software package. This high-level software package is programmed to automatically handle all types of errors, as outlined in the next section.

## 7 FOB100-SOFT SOFTWARE PACKAGE

The FOB100-SOFT software package option allows using your thermometer system in a highly flexible manner. The built-in functions allow for temperature displaying and data logging, as well as exporting to a variety of standard spreadsheet packages. This software supports both the FOB100 series and HHTFO101 fiber optic thermometers.

### 7.1 Getting started with FOB100-SOFT

FOB100-SOFT was designed to acquire temperature readings from all models of the Omega FOB100 thermometer family. This versatile software package is designed to work with Microsoft Windows operating system; to fully exploit the capabilities of FOB100-SOFT, it is recommended to use it in conjunction to commercial spreadsheet software, such as Microsoft Excel.

#### 7.1.1 Hardware and software requirements

The following list includes the minimum requirements for running the FOB100 software:

- A Pentium class or higher CPU
- SVGA or higher resolution display system supported by Windows
- 128 MB of RAM memory (operating system dependent)
- At least 20 MB of hard disk space
- A CD disk drive (to load software) (if requested, the software can be supplied on diskettes)
- A mouse or other Windows pointing device
- A RS-232 interface (COM1 to COM32). Up to 4 thermometer units are supported, each one requiring its own COM port
- Windows 2000 or later.

#### 7.1.2 Installing FOB100-SOFT

You must have at least one, or more, properly installed FOB100 or HHTFO thermometer unit(s).

- 1- Start Windows, and make sure you are not running any other Windows program.
- 2- By inserting the CD in your computer, the SETUP application should automatically start; if not, manually start it.
- 3- Follow the instructions that are displayed.
- 4- Restart your computer.

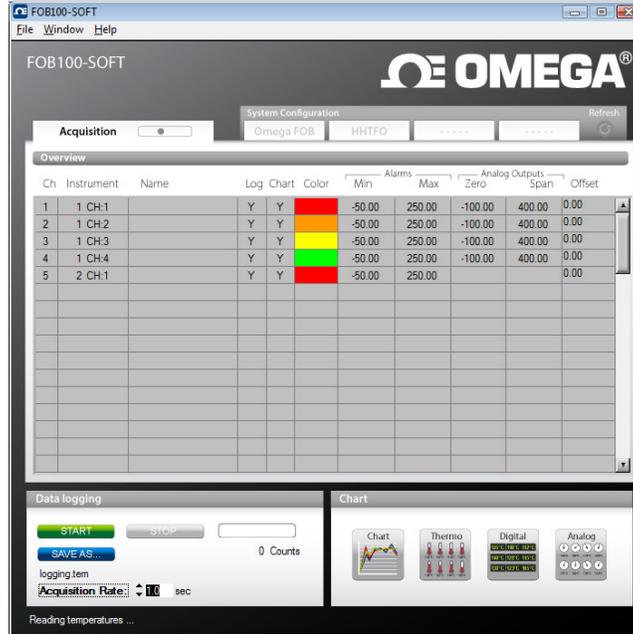
### 7.2 A quick tour of FOB100-SOFT

- 1- Connect your FOB100 and HHTFO unit(s) to free COM port(s).
- 2- Start FOB100-SOFT if not already running.
- 3- The thermometers that are turned on and connected to your PC through a proper RS-232 connection should normally be automatically detected by FOB100-SOFT<sup>3</sup> (this process takes a few seconds, for a typical installation).
- 4- If a thermometer is connected after FOB100-SOFT is started, you should click the "Refresh" button so the software rescans the COM ports (1 to 32). If a thermometer is not automatically detected, make sure your RS-232 port and cable is correctly configured and that the unit is turned on.

**NOTE:** Some RS-232C connections may cause transmission failures. Particularly, we have experienced problems with the use of DB09 to DB25 converters and other similar so-called gender changers. Also, some USB to RS232 converter/adaptor are known to cause problems; Omega offers excellent converters. Limit your cable lengths to 10 meters.

<sup>3</sup> If the automatic COM port scanning is causing problems with some of your other programs, specific COM ports can be excluded from being scanned. Refer to Section 7.5.1.3 for more information.

You should normally see a window similar to this:

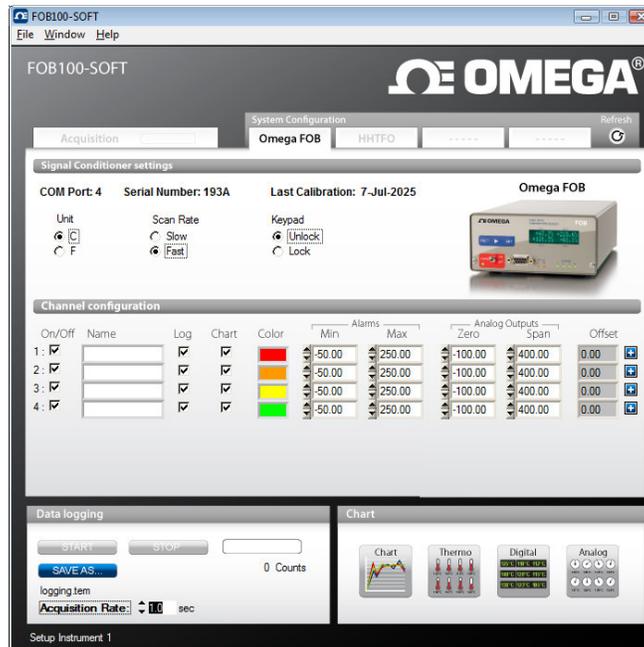


In this example, we see that FOB100-SOFT has detected 2 thermometers: a FOB104 and a HHTFO instruments.

FOB100-SOFT is now properly installed and ready to use!

## 7.2.1 Working with the Configuration Window

FOB100-SOFT starts with the “Acquisition” window active, as shown in the figure above. To switch to the “System Configuration” window, you need to click on one of the instrument names that have been detected; for example, by clicking on “Omega FOB”, you will get the following window:



For each instrument, this configuration window gives some information about this particular information and allows you to set some parameters.

The top portion of the window gives information about the specifics of the thermometer, such as:

- COM Port number
- Serial Number
- Calibration date.

Description of the parameters that can be set:

- Unit: You can select °C or °F.
- Scan Rate: Fast (recommended for most application) or Slow.
- Lock / Unlock Keypad (FOB100 series only): Can be selected to lock the keypad on the thermometer unit. Warning: once locked, the keypad can only be unlocked through the use of FOB100-SOFT or with the "l-" serial command.

Furthermore, for each channel, you can set the following parameters:

- On / Off: You can turn on or off the temperature for each channel.
- Name: Up to 16 characters. You can enter a probe name here that suits your application.
- Log: If checked, the temperature data for this channel will be logged, when data logging is active.
- Chart: If checked, the temperature data for this channel will be displayed when one of the 4 chart windows is open.
- Color: This is the color of the curve that will be used when the Chart window is open.
- Alarms, Min and Max: Allows setting alarm limits. When one of more alarms are detected, a message is given at the bottom of the main window (must be in Acquisition mode). For a given channel, alarms are monitored only when its corresponding "Chart" or "Log" checkbox is checked, in the Configuration window pane. Alarms are monitored only when Acquisition is active.
- Analog Outputs (FOB100 series only): Allows configuring the analog output parameters, Zero and Span. See Section 5.3 for a complete description of these parameters.
- Offset: Allows adding an offset to this channel. See below.

#### ***7.2.1.1 Adjusting a temperature offset***

FOB100-SOFT allows you to add an offset to the temperature readings that are returned by a thermometer. This feature is equivalent to the "f" serial command, as described in Section 5.3, although its implementation in FOB100-SOFT is somewhat different than it is for the serial command.

An offset can be useful for the following two cases:

- 1- To temporarily change the reading of a probe that is believed to be in error (one-point calibration procedure). This usually requires that a good temperature reference be available.
- 2- To force an offset to a reading, for example may want to monitor a temperature variation from a given set temperature. In this case, you can simply enter the "0" value as a forced temperature setting, and the resulting reading will give you a + or - deviation from the set temperature point.

**Warning:** Doing a temperature offset adjustment on a channel will alter its reading. In effect, it alters the thermometer own calibration. It must be used with care!

To perform an offset adjustment, follow these instructions:

- 1- Click the “Offset Adjust” button (  ) that is just next to the channel number you want to calibrate. The following menu window is available:



- 2- Type in the “Set Point” box the actual temperature that you would like to force for this channel (this temperature is normally obtained using an accurate NIST-certified primary temperature reference).
- 3- Press the “OK” button to activate the reference temperature. The “Offset” value will reset to its new value, as a result of your new forced temperature; this new offset is now displayed in the main window.
- 4- To reset this forced temperature setting, go back to the “Channel Offset” window, and click the Clear button.
- 5- Repeat the same procedure for the other channels that you want to modify.

### 7.3 Acquiring and viewing temperature data

Once all your thermometers are properly connected and configured, you may want to log data to a file, or to display their values on screen. A number of tools are available for that.

To view or acquire data, the “Acquisition” pane must be active.

#### 7.3.1 Logging temperature data to a file

FOB100-SOFT offers the possibility to log temperature values to an Excel compatible file. The default file extension is .tem; this file can be subsequently open using Excel, which should open it and automatically recognize as an Excel compatible file (tab delimited).

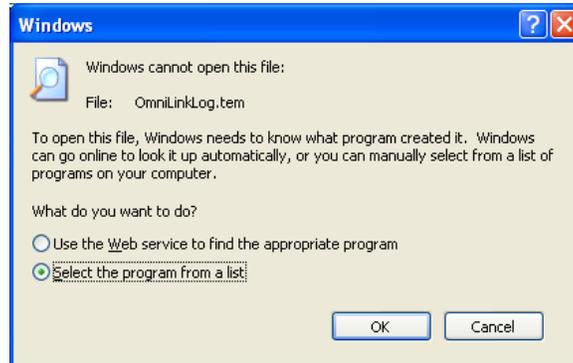
The parameters that are useful to control the logging are shown in the lower left portion of the window, as shown here:



- To set the logging filename, click on “SAVE AS...”; this allows you to enter a file name. For information, the current filename is displayed just below this button.
- To set the acquisition rate, enter a number, in seconds, in the appropriate text box. Rate can be set from 0.2 to 3600 seconds.

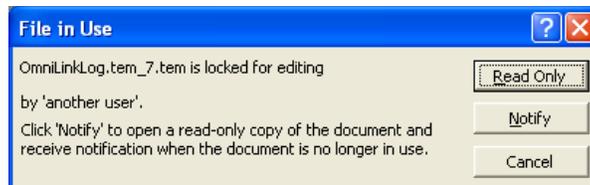
- To start acquiring data, click the “START” button. Conversely, to stop the acquisition, click the “STOP” button.

When subsequently trying to opening the \*.tem file, it is possible that you may get the following message:

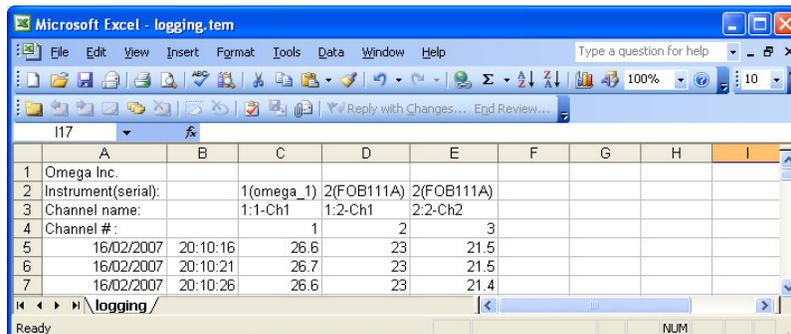


Select “Select the program from a list”, and click OK. In the next window, you should instruct Windows to always open this type of file with Microsoft Excel.

If you get the following message, you should select “Read Only”.



In Excel, the data file should look like this:



- Notes:
- 1) If a column shows “#####”, this means that this column is too narrow to display the data; use your mouse to widen this column.
  - 2) If you open a logging file during acquisition, the Excel window is not refreshed as the acquisition is taking place. To get a more recent version of the file, close the Excel program, and start Excel again.
  - 3) A value of -999.xx indicates that no reading is available for this channel. Check the probe connection.

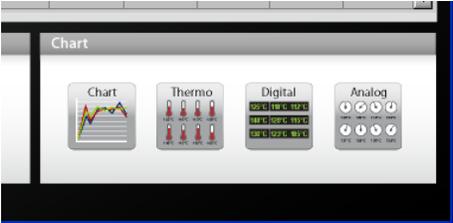
If you stop the acquisition, and start it again with the same file name, the new values will simply be appended to the existing file content. However, a new 4-line header is inserted first, as shown here:

	A	B	C	D	E	F	G	H	I
23	16/02/2007	20:11:46	26.6	23	21.5				
24	16/02/2007	20:11:51	26.7	23	21.5				
25	Omega Inc.								
26	Instrument(serial):		1(omega_1)	2(FOB111A)	2(FOB111A)				
27	Channel name:		1:1-Ch1	1:2-Ch1	2:2-Ch2				
28	Channel # :		1	2	3				
29	16/02/2007	20:12:04	26.7	23	21.5				
30	16/02/2007	20:12:09	26.7	23	21.5				
31	16/02/2007	20:12:14	26.8	23	21.5				

When logging temperatures for a very long time, one needs to note that a standard Excel sheet is limited to 65535 lines. If this limit is reached (65000 lines), the logging process will close the current data-logging file, and will open a new one, with the same name but with “\_1” appended to the file name, and so on (“\_2” ...), until the application is stopped or your disk becomes full.

### 7.3.2 Viewing temperature data

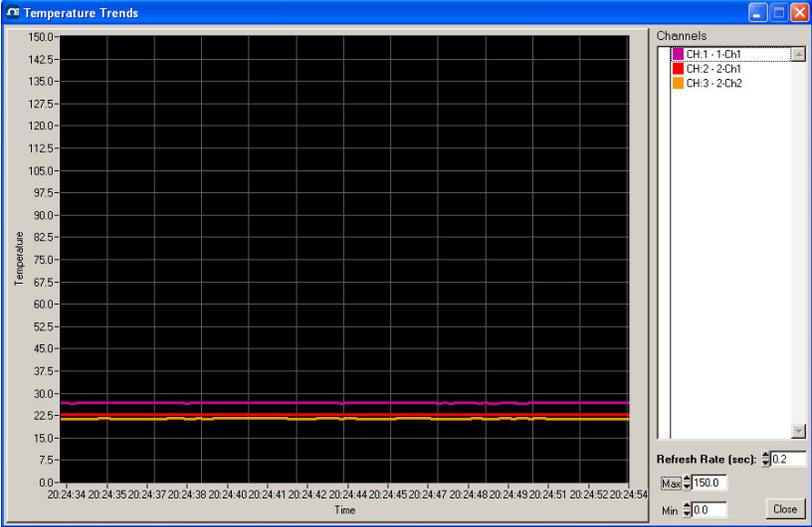
Temperature values can be displayed on your computer screen in a number of ways. Click one of the four “Chart” button to active one or more of these windows.



Note that more than one window type can be displayed simultaneously; in addition, you can log temperatures to a file independently from these display windows. Note that each of these 2 modes have each then own acquisition time base.

#### 7.3.2.1 Displaying temperature trends

Click the “Chart” button to get the following window.

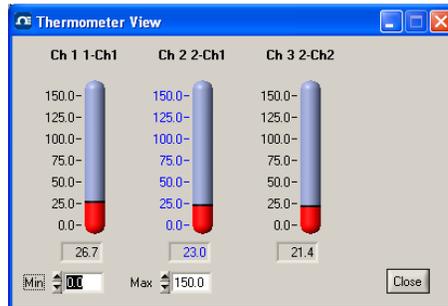


Adjust the “Refresh Rate” (minimum is 0.2 sec) and Min / Max to suit your viewing needs.

Note that the setting of curve colors and other parameters must be done in the “System Configuration” window pane. Up to 64 trends can be displayed.

### 7.3.2.2 *Displaying analog thermometers*

Click the “Thermo” button; the following window will appear.



All thermometers share the same Min / Max reading setting. Refresh rate is fixed at 1.0 sec. The size of this window will change depending on the number of channels to display. Up to 16 thermometers can be shown; if you want to display more than 16 channels, only the first 16 detected channels will be shown (note that any channel that has its “Chart” checkbox unchecked, in the main window, will not be shown).

If an alarm is active for a channel, the corresponding thermometer numbers will change color: blue for a low temperature alarm, or red for a high temperature alarm.

### 7.3.2.3 *Displaying digital values*

To display digital temperatures, click on the “Digital” button. The following window will appear.

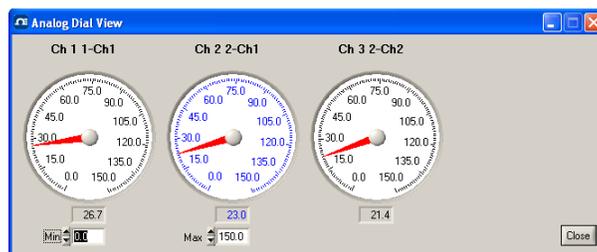


The size of this window will adapt to the number of channels to display. Up to 32 values can be shown. Refresh rate is always 1.0 sec. This window is re-scalable.

If an alarm is active for a channel, the corresponding display will change color: blue for a low temperature alarm, or red for a high temperature alarm.

### 7.3.2.4 *Displaying analog values (dials)*

To display analog temperatures (using dials), click on the “Analog” button. The active window becomes this:



All dials share the same Min / Max reading setting. Refresh rate is always 1.0 sec. The size of this window will adapt to the number of displayed channels. Up to 16 dials can be shown; if you want to display more than 16 channels, only the first 16 detected channels will be shown (note that any channel that has its "Chart" checkbox unchecked, in the main window, will not be shown).

If an alarm is active for a channel, the corresponding dial numbers will change color: blue for a low temperature alarm, or red for a high temperature alarm.

## 7.4 The FOB100 Console

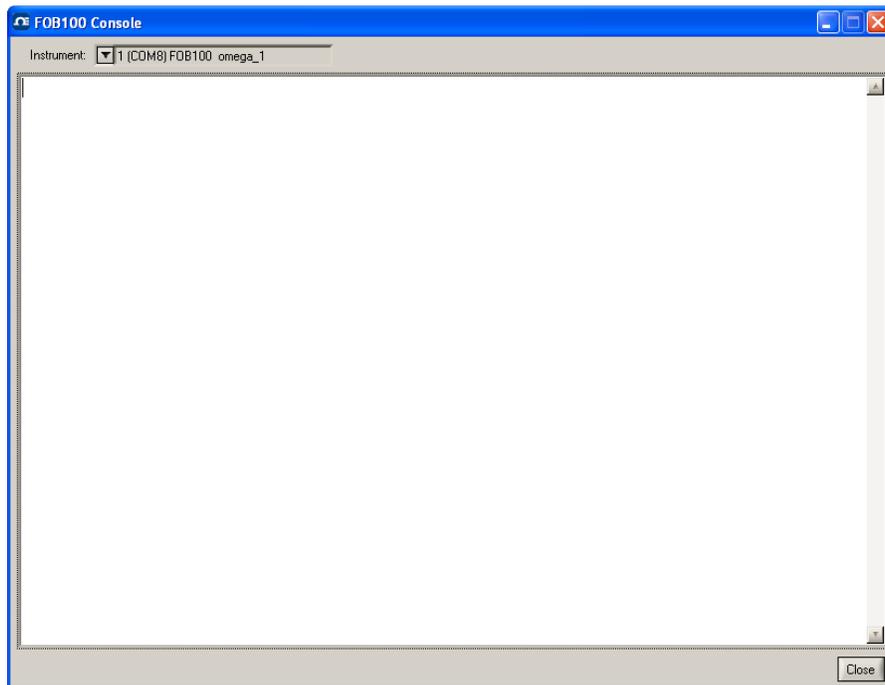
You must be in "System Configuration" mode to use the console. The Console should be used only by experienced users.

The console, which can be invoked through the Window and then Open Console from FOB100-SOFT main window menu bar, is useful to manage each Omega thermometer in details. Take note that the console can only be open when no temperature acquisition is taking place. It can be useful also to understand problems and malfunctions that a module may exhibit. It operates in a similar fashion as Windows HyperTerminal.

The console can be used to get information such as:

- Information on calibration date, serial number, etc.
- Enable / disable channels
- Set the analog output parameters (zero and span)
- Control operational features, such as fast/slow scanning more, etc.
- And so forth.

The following illustrates the FOB100 Console:

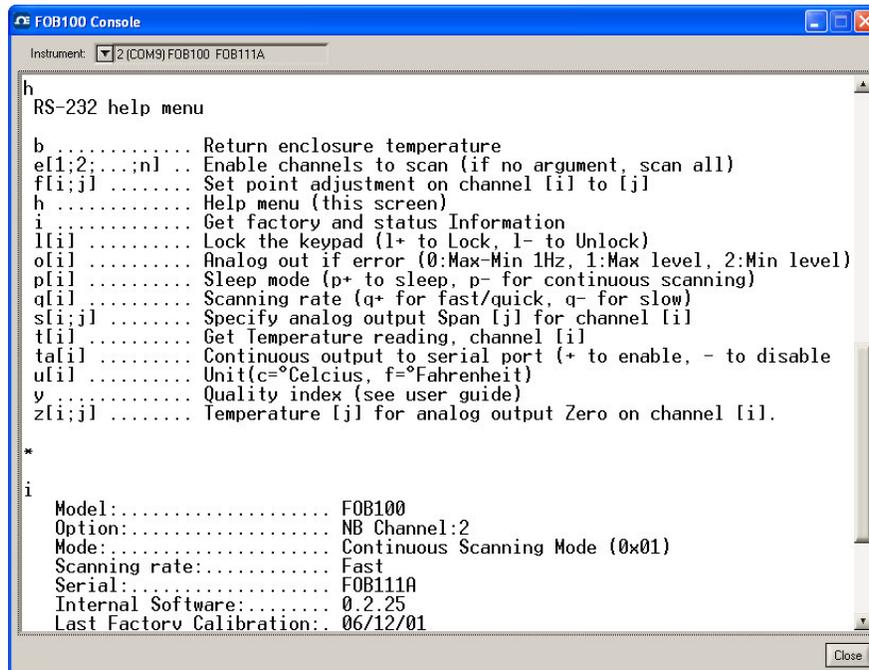


Before sending commands and receiving information from a specific module, it is necessary to select the instrument you want to interrogate. Please note that only ONE instrument can be selected at a time; if the same command is to be sent to all thermometers, then, it is necessary to repeat the command for each individual module.

You can use “Copy and Paste” Windows commands (such as the following shortcuts: `ctl-c` and `ctl-v`) to copy selected content of the console content to other Windows programs, such as Notepad, etc.

### 7.4.1 Console help menu

The following is the menu as displayed by the instrument when sending the “h” command. This help menu can be used as a reminder of all available commands, for this specific instruments.



For a complete description of all commands, refer to Section 5.3 above.

## 7.5 FOB100-SOFT functions

This section explains in details each one of the functions provided by the menus of the FOB100-SOFT software package. This Section only gives a brief overview of the commands that are possible; for operational details, please refer to the above Sections.

### 7.5.1 The File menu

The *File* menu provides the user with basic functions to handle Configuration files.

#### 7.5.1.1 Find Instruments (Refresh)

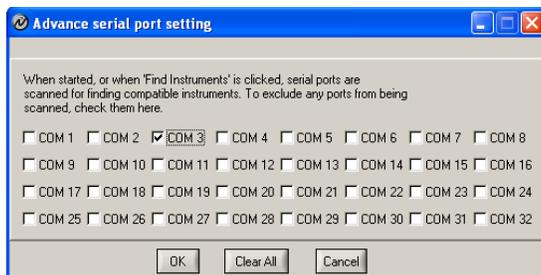
This is equivalent to the “Refresh” button, found on the main window.

#### 7.5.1.2 Disconnect Instruments

This will release all COM ports, select this menu item. FOB100-SOFT becomes idle, and to bring it to life again requires you to click the “Refresh” button (or to select the Find Instruments (Refresh)” menu item

### 7.5.1.3 Advance serial port setting

This command allows the user to force the exclusion of one or more COM ports from being scanned when clicking the “Refresh” button. This may be useful when one finds that the automatic COM port refresh feature of FOB100-SOFT is interfering with equipment that are using defined COM ports. You can check all ports that you want to exclude from the automatic scanning process. This window looks like this:



### 7.5.1.4 Quit

Select *Quit* from the *File* menu to exit FOB100-SOFT. Any configuration or setting that you might have done to any parameters is automatically saved, so the same configuration will be available the next time you open FOB100-SOFT.

## 7.5.2 The Window menu

From this menu, you can open the following 5 windows:

- Console view
- Trend view
- Thermometer view
- Digital view
- Analog (dial) view.

### 7.5.2.1 Open Console

Open Console can be very useful for developers and other users who want to interrogate the “internal” parameters of an Omega thermometer. It should be used only by experienced users.

### 7.5.2.2 View Trends

Select this menu item to open a window that gives you a graphical representation of your temperature readings, as a function of time. Up to 64 curves can be simultaneously displayed. The sampling time base is adjustable.

### 7.5.2.3 View Thermometers

Select this menu item to display thermometers that will give you temperature data on up to 16 channels. Sampling rate is fixed at one reading per second.

### 7.5.2.4 View Digital meters

Select this menu item to display digital readouts that will give you temperature data on up to 32 channels. Sampling rate is fixed at one reading per second.

### 7.5.2.5 View Analog Dial meters

Select this menu item to display analog dials that will give you temperature data on up to 16 channels. Sampling rate is fixed at one reading per second.

## 7.5.3 The Help Menu

This is a standard Windows Help menu.

Blank.

## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2008 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!** *Shop online at [omega.com](http://omega.com)<sup>SM</sup>*

## **TEMPERATURE**

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

## **PRESSURE, STRAIN AND FORCE**

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

## **FLOW/LEVEL**

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

## **HEATERS**

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments