Reflex™

Fiber Optic Thermometer System

1-, 2- & 4-Channel Systems (version 2.0)

OptiLink Software Release 1.53

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Proprietary notice:

Part number: G1000R09 (March 2014)

TABLE OF CONTENTS

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 (18-24 VDC) 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. Maximum loop impedance should be kept at 400 Ω; internal impedance is approximately 0.7Ω.

With 0-10 volt analog outputs, avoid shorting output leads together; as this may destroy the electronic drivers inside the unit; external impedance must be kept at all-time at 10 kΩ or more. Unit must be returned to Neoptix for repair, not field repairable.

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

To assure cleanliness of optical connectors, keep caps on unused connectors at all time. This is also required during operation, as parasitic light entering via unused connectors into the Reflex module may cause false temperature readings, even on other channels.

The Neoptix Reflex products are CE marking certified.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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1.1 Reflex Family and Neoptix Probe Warranty Notice

Your *Reflex* unit is guaranteed (Parts and Workmanship) for one full year from the date of purchase. Upon written notification of any defect, Neoptix will either repair or replace any faulty product or components thereof. A Return Authorization Number (RMA) must be obtained from Neoptix Canada LP or authorized distributor prior to any merchandise return.

Due to the unique nature of the fiber optic probes that are used with the Neoptix Conditioner system, probes are not warranted.

When using any electrical appliance, basic safety precautions should be followed, including the following:
- Do not operate in wet / damp environments
- Do not operate in explosive atmospheres
- Keep product surface dry and clean.

Always make sure all electrical installations are made in accordance with local authorities' regulations and laws.

2 INTRODUCTION

Congratulations on the purchase of your Reflex™ 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 Reflex family of products gives consumers' 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 applications. If desired, the package can easily be mounted in standard rack configurations (a mounting kit is offered as an option).

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.

The "Lite" version of the newly upgraded OptiLink software package is now shipped standard with all Reflex systems. A Pro version (with all "Lite" limitations removed) is available as an option. Windows XP or later is required, as well as one RS-232 serial port for each thermometer. OptiLink has been tested for use with Windows 7.

This version includes support for double-calibration Reflex systems (optimized for both Neoptix and older Nortech-Fibronic Inc. probes); the keypad can be used to toggle calibration type, or the selection can be made from OptiLink.

Important information: this new and improved version of the Reflex does not require a user reference adjustment procedure for operation. In addition, some RS-232 commands have changed, to exploit the additional capabilities included in this new version; for the most part, these changes should have minimal impact on software compatibility; see Section 6.4.

2.1 Reflex product specifications

Resolution	0.1°C
Accuracy	The Greater of 1°C
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 0.25 to 1 second per channel (probe configuration dependent)
Unit	User selection of °C or °F
Calibration type	Compatible with both Neoptix or Nortech-Fibronic Inc. type probes
Operating temperature	0° to 50°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* (4-20mA or 0-10V)
Sensor	Dielectric epoxy or 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 Neoptix.
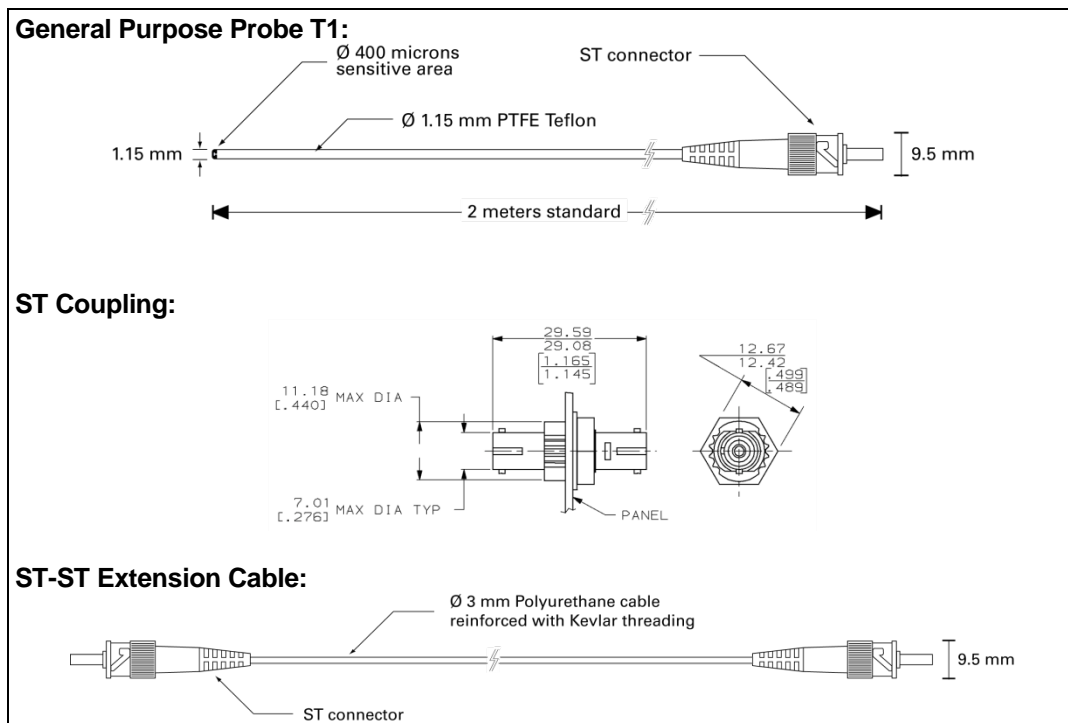
Other options and configurations are also possible; contact Neoptix for more information.

2.2 Calibration

Your Reflex 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 Neoptix Representative for further information.

3 UNPACKING

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

- Reflex signal conditioner unit
- Power supply module (18VDC; universal input: 100-240VAC, 50/60Hz)
- RS-232C interface cable
- User manual (this manual) (paper copy not included, supplied as a PDF document on CD)
- CD, with OptiLink-Lite, user guide, etc.
- Calibration Certificate.

Options:
- Fiber optic temperature sensor probes
- Fiber optic extension cables
- Fiber optic coupling
- CD, OptiLink-Pro™, with software key
- Carrying case & accessories.

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). Your distributor will provide you with information concerning the return of merchandise.

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.

4 REFLEX™ THERMOMETER HARDWARE REFERENCE

The following figure shows the thermometer front panel:
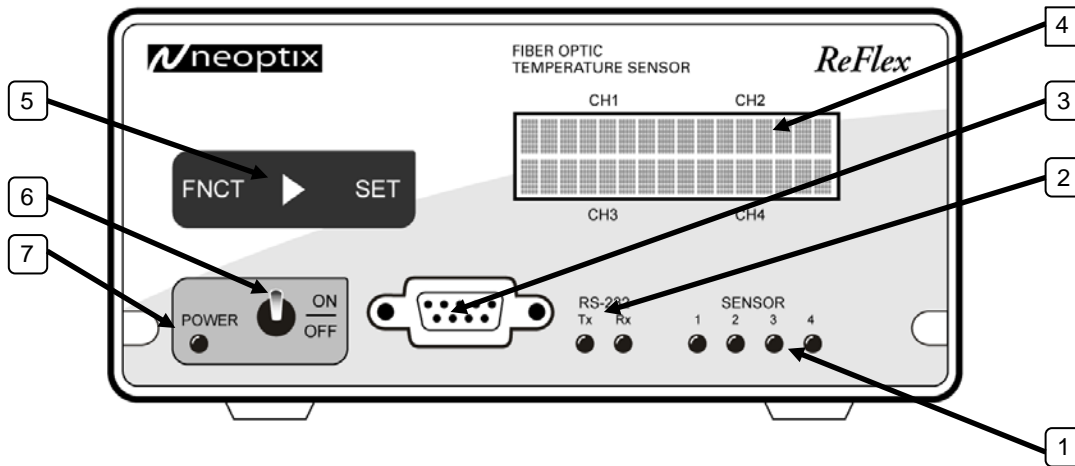
The Reflex back panel is as follows:
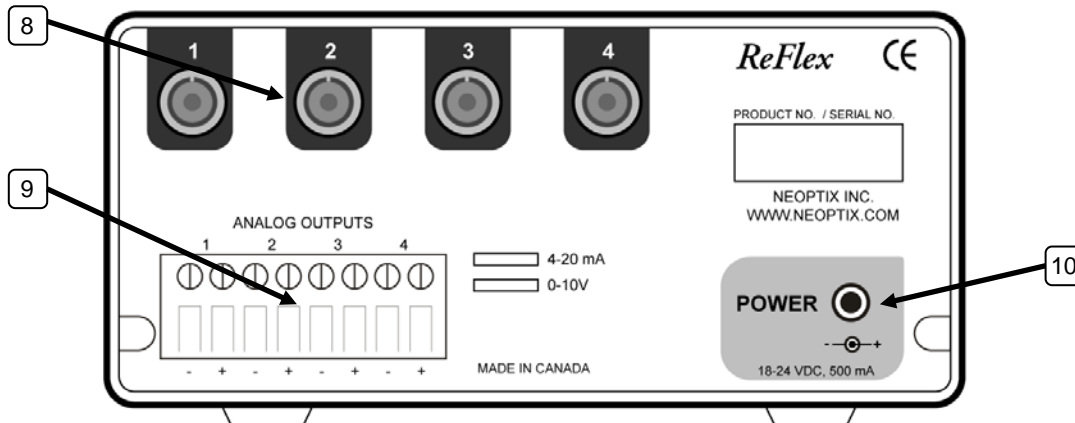
The following presents a full description of the user interface as well as detailed instructions on how to use the thermometer.

1) Sensor status light(s): There are 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.

A quickly flashing light indicates that the calibration table applicable to this channel is corrupted. If this happens, the integrity of the temperature readings for this channel is not guaranteed; please use precaution. Contact Neoptix for further information on how to resolve this issue.

2) Serial communication status lights: These indicators are directly connected to the Tx and Rx lines of the RS-232 interface. Useful for monitoring activity on the serial line.

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 $^{\circ}$C or $^{\circ}$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.

FNCT 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.

SET 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 smoothing the last few 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. The display refresh speed is the same for both settings.

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.

4- Calibration type: You have the choice between "Neoptix probe" and "Nortech Fibronic Inc. probe".

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

```
REFLEX
4 CHANNEL

WWW.NEOPTIX.COM
VER: 0.2.25
CAL: 06/11/14 NE[1]
```

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[1] This is the calibration date (format YY/MM/DD). "NE" indicates that the calibration for Neoptix probes is currently active; alternatively, "NO" will be displayed when the Nortech-Fibronic Inc. calibration has been chosen.

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 your Neoptix supplier. For thermometers that have 1 or 2 channel(s), only 1 or 2 sensor connectors are used.

> **Warning:** The fiber type that is used with your Reflex thermometer is of a special type, and it is recommended that you get ALL of your patch cords from Neoptix or a Neoptix authorized distributor.

9) Analog output connector(s): There are a total of 1, 2 or 4 such connectors, one for each channel. Prior to shipment, your Reflex 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. Note: Reflex thermometers that have extended range, such as cryogenic version, may differ; contact Neoptix for more information. 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 6.4):
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:** 1- Do not connect any external voltages to these outputs; this may cause permanent damage to the thermometer unit. 2- Avoid shorting output leads together, as this may destroy the electronic drivers inside the unit.

Note: If the Reflex unit is in "sleep" mode, the analog outputs will keep their values until the Reflex 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.

5 USING THE TEMPERATURE PROBES

5.1 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. OptiPrep pads can also be very useful (available from any fiber optic component reseller).

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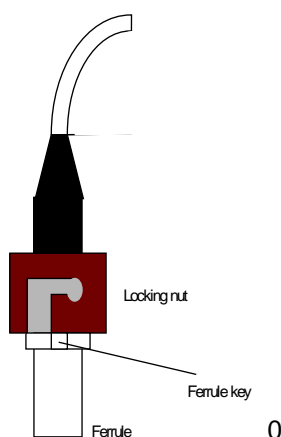
For very dirty connectors, acetone can also be used, but should be used very carefully, as it is a very strong solvent. Care should be exercised so you do not apply any on plastic materials, etc.

5.2 Description

The optical connector used is a standard ST type connector.
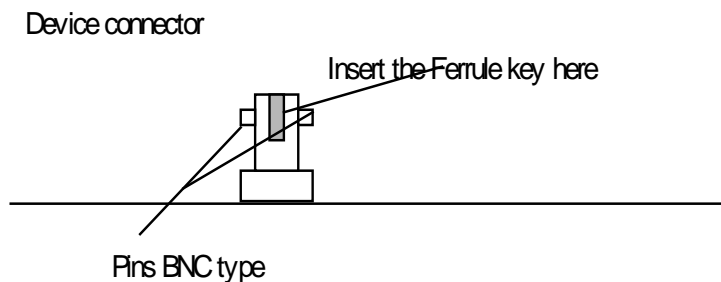
To install the connector,
Slide the ferrule key gently into the above key.
Then, turning, insert the two BNC pins into
The appropriate slots on the ST connector.

5.3 Warning

The T1 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.

Neoptix 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.

5.4 Working with long probes

This note is important when using probes or extensions that have a combined length of 100 meters or more. Working with long probes or extensions presents special problems. To limit the amount of back reflection caused by the fiber optic connector located on the thermometer unit, you may have to use a matching gel optical couplant in the connector. This gel is a grease-like compound with high clarity, good resolution properties and a refractive index close to quartz. Apply the gel onto connector end faces.

Avoid disconnecting the connectors for which gel has been used. In other words, it is recommended to use the gel only for permanent installations. If the connectors are disconnected many times, you may have to clean entirely the connector assemblies that have had the gel; this may require opening the instrument enclosure to remove the excess gel.

Note that it is not required to use this gel with connectors that are far away from the thermometer electronic unit.

5.5 Working with cryogenic probes.

The use of a cryogenic probe required special attention. In particular, the probes become more brittle at very low temperatures. Avoid cycling the probes quickly between cryogenic temp and ambient temperatures, as this may cause material fatigue at the probe tips.

Warning

Always wear protective gloves and clothing when working with cryogenic material.

Never use general purpose probes at cryogenic temperatures. Neoptix sells special probes that can be used at cryogenic temperatures.

Please note that your Reflex thermometer will require a special factory calibration to be used at cryogenic temperatures (below -80°C). Consult Neoptix for more information.

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6 SERIAL COMMUNICATION DESCRIPTION

You can communicate with your Reflex 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, or using OptiLink 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.

6.1 Using OptiLink Console

The New OptiLink software package now includes a convenient console option that can be used to "exercise" your Reflex serial communication protocol. With this console, there are almost no more reasons to use HyperTerminal or equivalent to use the serial commands that are described in this Section.

Refer to the next Chapter for instructions on how to use OptiLink.

6.2 Using HyperTerminal in Windows

Hyper Terminal is a standard Windows program (XP and previous versions[2]) that can be easily used to exercise your Reflex 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 "Neoptix-Reflex". 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 E   " to test your setup (see below). Warning: the characters that you enter are not echoed back to you!

---
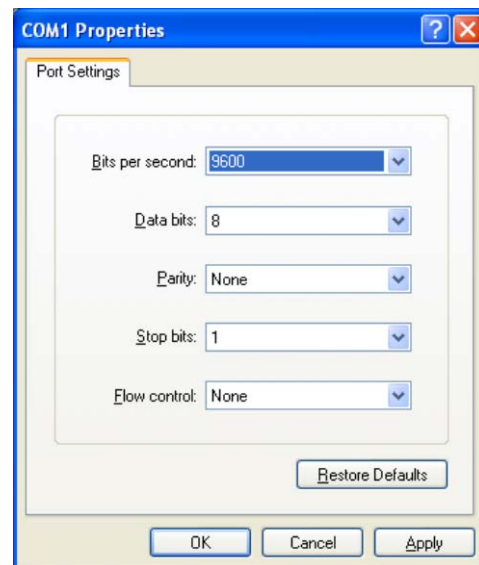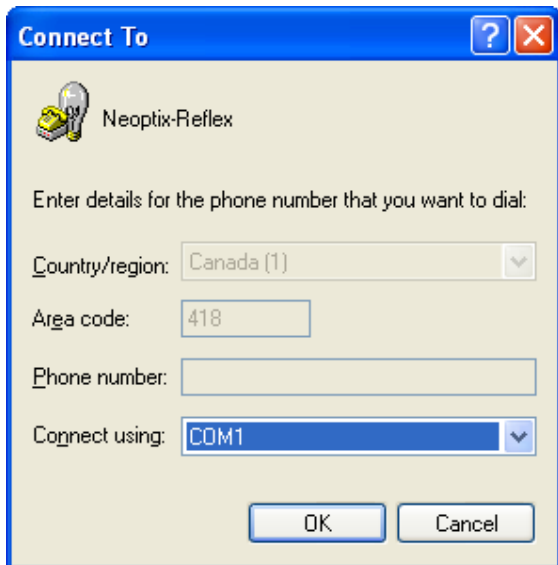
[2] Vista, Win-7 and Win-8 users: HyperTerminal is not included with Vista and subsequent Windows versions. However, an equivalent program (HTPE) can be downloaded (for a fee) at the following website: http://www.hilgraeve.com/htpe/download.html. Tera Term (freeware) has also given good results; see http://ttssh2.sourceforge.jp/ .

6.3 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.

Reflex-1	Reflex-2 or –4	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]
gskip[i]	gskip[i]	Skip up to i marginal read cycles
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)
n+o *or* n+e	n+o *or* n+e	To toggle between Neoptix (e) or Nortech-Fibronic (o) calibration
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)
tb[nnnn]	tb[nnnn]	Ignore
u[i]	u[i]	Unit (c = ^{o}Celcius, f = ^{o}Fahrenheit)
wtune[i]	wtune[i]	Optimize CCD read time (wtune+ to enable, wtune- to disable)
Y	Y	Signal strength
z[j]	z[i;j]	Temperature [j] for analog output Zero on channel [i].

6.4 Detailed description of RS-232 commands

All commands must be terminated by a carriage return character (E). When more than one argument is 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. Command are case sensitive.

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 Reflex 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 ^{o}C or ^{o}F unit, as specified by the "u" command.
Ex: "b:32.2 E   "

"e[[-]1 [-]2 ... [-]n]" This command is not recognized by the one-channel model. Specify which channels are enabled and read by your Reflex. 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 E   ", 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. This is also called a one-point calibration correction. 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 can also be used to force older Nortech Fibronic inc. probes to read similar temperatures as the newer Neoptix probes. 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 E   "). 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 E   "). This will in effect clear any offset that you may have entered.

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.

"gskip[i]" This command is useful to eliminate annoying dropouts that can happen when using "weak" probes. The parameter "i" indicates the number of scans that the Reflex system will perform before actually indicating that it cannot read the probe on a specific channel. The range of i is from 0 to 9; a value of 0 indicates that the Reflex makes no attempt at removing dropouts. A value of 3 to 5 is recommended, especially for transformer applications. This command is active even when the sleep command is valid, but is limited to a timeout of 2 minutes.

"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:                        Reflex
      Option:                       NB Channel: 4
      Mode:                         Continuous Scanning Mode
      Scanning rate:                Fast
      Serial:                       RFX32A
      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.

"n+o" or "n+e" This command can be used to change the calibration type that is active at any given time. "n+o" should be used to enable the Nortech-Fibronic, Inc. calibration, while "n+e" should be used for Neoptix probes.

"o[i]" This command can be used to change the behavior of the analog output(s) when the Reflex thermometer cannot read a temperature for this channel. "i" can take one of three values:
a)   i=0. This is the default value, to assure compatibility with older Nortech Fibronic inc. Reflex thermometers. 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 Reflex 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 Reflex keypad. In slow mode, the last 4 temperatures are averaged (smoothed) 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 ^{o}C or ^{o}F unit, as specified by the "u" command.

Ex: "t4 E   " will return the temperature for channel # 4.

 "t E   ", with the Reflex-4 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 Reflex-1 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 E   ", to select ^{o}C (Celsius).

"wtune[i]" This command can be used to increase the optical integration time of each channel (each of the 1 to 8 channels are treated independently) to force the Reflex system to read temperatures when the optical signal is weak, at the expense of a slower response (slower temperature update frequency or rate). This command (wtune+) enables this feature for all channels (individual channel cannot be enabled or disabled). It should be noted that in general the scanning rate of the system would slow down when this command is enabled. It is highly recommended for power transformer applications.

Warning: When wtune is enabled, and that a probe is inserted, or removed, it may take some time (several seconds), when multiple channels are being optimized at the same time) for the Reflex to detect the probe, due to the optimization process that takes place.

"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 1.00 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 E   ", with the T/Guard-4 thermometer, will return:

 CH1 power: 2.61, lamp attenuation: 250, CCD time: 250ms (auto*)<CR>
 CH2 power: 2.51, lamp attenuation: 250, CCD time: 100ms (auto)<CR>
 CH3 power: 2.38, lamp attenuation: 125, CCD time: 500ms (auto)<CR>
 CH4 power: 1.09**, lamp attenuation: 125, CCD time: 500ms (auto)<CR>

*: Value: Auto (when wtune+ is active) or Fixed (when the wtune command is disabled).
**: 1.0 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; Reflex thermometers that have been factory calibrated for cryogenic temperatures have a lower setting.

6.5 Typical temperature reading sequence

Once all parameters have been set, the following sequence should normally be followed to extract temperature information from your Neoptix 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 E 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 E character.

7 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. When a channel has its calibration table corrupted, the corresponding front panel LED will continuously flash to indicate the corruption problem. Contact Neoptix.
"- - . -"	"- - - - -"	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 OptiLink software package. This high-level software package is programmed to automatically handle all types of errors, as outlined in the next section.

8   OPTILINK SOFTWARE PACKAGE

The OptiLink™ 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.

8.1   The "Lite" vs. "Pro" version

OptiLink is now offered in two versions. The "Lite" version ships as a standard item with every Reflex instrument. The "Pro" version includes more features and support more instruments and/or channels simultaneously. Contact your Neoptix Representative or the Neoptix factory to buy an unlocking code.

8.1.1   Differences between the 2 versions

The "Lite" version exhibits the following limitations:

- Only one instrument is supported (when scanning the COM ports (going from 1 to 32), the first instrument that is detected by OptiLink becomes the active instrument).
- Only 1 channel is supported.
- No DDE temperature data logging is supported.

The remaining of this Chapter describes the "Pro" version.

8.2   Getting started with OptiLink

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

8.2.1   Hardware and software requirements

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

- A Pentium class or higher CPU
- SVGA or higher resolution display system supported by Windows
- 512 MB of RAM memory (operating system dependent)
- At least 40 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 XP or later, including Windows-7 and -8 (Vista not recommended.

OptiLink works correctly with both half-duplex and full-duplex Neoptix thermometers. OptiLink is *not* compatible with older Nortech-Fibronic thermometers and with Neoptix thermometers that have been manufactured before August 2005.

8.2.2   Installing OptiLink

Before opening the CD and installing the software, please refer to the **License and Limited Warranty Agreement** at the beginning of this manual.

You must have at least one, or more, properly installed Reflex thermometer unit(s). OptiLink should as well detect other Neoptix thermometers, such as the Nomad, the T/Guard and even the T/Guard+ (in non-OPC mode).

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.

8.3 A quick tour of OptiLink

1- Connect your Reflex unit(s) to free COM port(s).
2- Start OptiLink, 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 OptiLink[3] (this process takes a few seconds, for a typical installation).
4- If a thermometer is connected after OptiLink is started, you should click the "Refresh" button so OptiLink 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 RS-232 converters/adapters are known to cause problems; Neoptix recommends B&B converters (http://www.bb-elec.com/Products/USB-Connectivity/USB-to-Serial-Converter/In-line.aspx); they are available from Neoptix. Limit your cable length to 10 meters.

You should normally see a window similar to this (acquisition window):
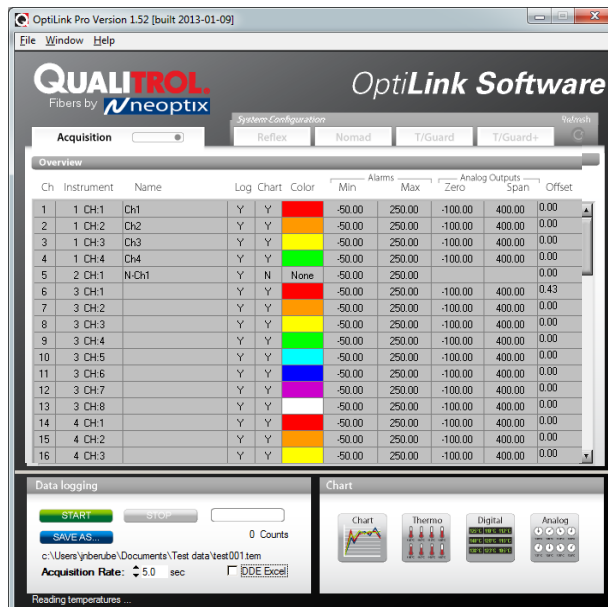
In this example, we see that OptiLink has detected 4 thermometers: a Reflex, a Nomad, a T/Guard, a T/Guard-408, etc. (non-Modbus mode only, Modbus is not supported by OptiLink) and a T/Guard+ (in test mode only; OPC mode is not supported by OptiLink).

OptiLink is now properly installed and ready to use!

---

[3] If the automatic COM port scanning is causing problems with some of your other programs, specific COM port can be excluded from being scanned. Refer to Section 8.6.1.3 for more information.

8.3.1 Working with the Configuration Window

OptiLink starts with the "Acquisition" window (or pane) 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 "Reflex", you will get the following window:
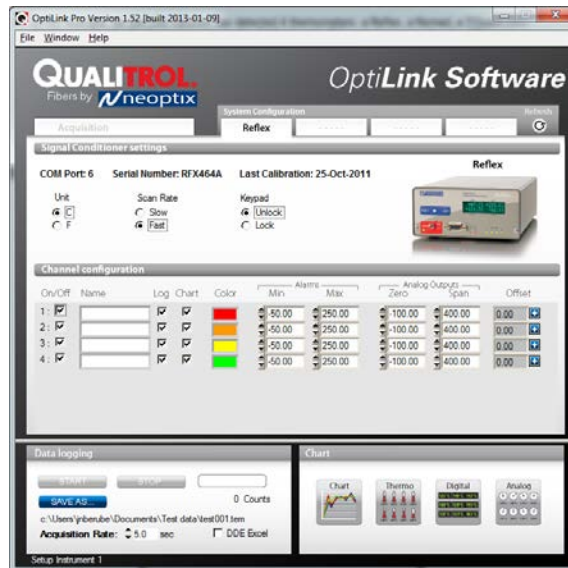
For each instrument, this configuration window gives some information about this particular information and allows you to set some parameters.

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 ^{o}C or ^{o}F.

- Scan Rate: Fast (recommended for most application) or Slow. .

- Lock / Unlock Keypad: Can be selected to lock the keypad on the thermometer unit. Warning: once locked, the keypad can only be unlocked through the use of OptiLink 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: Allows configuring the analog output parameters, Zero and Span. See Section 6.4 for a complete description of these parameters.

- Offset: Allows adding an offset to this channel. See below.

8.3.1.1   *Adjusting a temperature offset*

OptiLink 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 6.4, although it implementation in OptiLink 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:
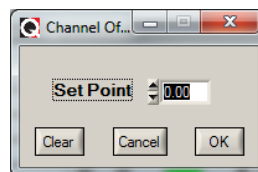
2- Type in the "Set Point" box the actual temperature that you would like to force for this channel (this temperature is normally obtained using an accurate NIST-certified primary temperature reference).

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.

8.4   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.

8.4.1 Logging temperature data to a file

OptiLink 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).

Furthermore, OptiLink Pro offers the possibility to log directly to an .xls Excel file, using the Microsoft DDE data transfer protocol. This is described in Section 8.4.1.2 below.

The parameters that are useful to control the logging are shown in the lower left portion of the window, as shown here:
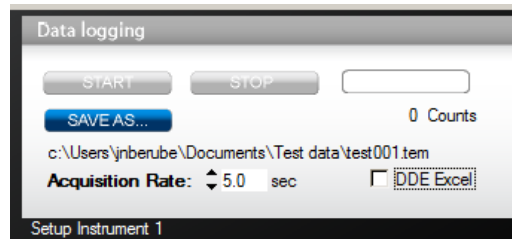
- To set the logging filename, click on "SAVE AS…"; this allows you to enter a file name. For information, the current filename is displayed just below this button. Default file location is "My Documents", for Windows 7 and above.

- 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 (1.0 to 3600 seconds if logging to an Excel file).

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

A convenient record counter is provided, confirming that logging is actually active.

8.4.1.1   Logging to a .tem file

When subsequently trying to opening the *.tem file, it is possible that you may get the following message:
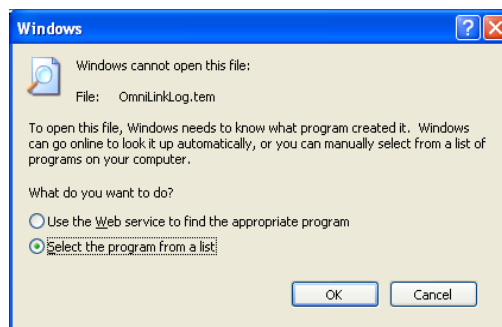
Select "Select the program from a list", and click OK. In the next window, you should instruct Windows to always open this type of file with Microsoft Excel.

If you get the following message, you should select "Read Only".
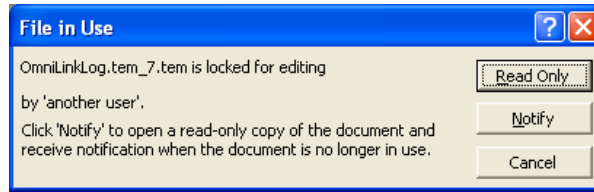
In Excel, the data file should look like this:

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 5-line header is inserted first, as shown here:

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, 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.

8.4.1.2   Logging to a .xls (or.xlsx) file

This logging method requires the Microsoft Excel application, which must be already installed. This logging method has some advantages over the previously described logging method, namely:
- Temperatures are directly stored in a genuine .xls file; no intermediary file is used.
- It allows the user the look at the data as it is written in real time in the .xls file.

- It allows the user to write comments directly in the .xls file, as the data is being acquired.

Warning: An English language Excel is required; logging using Excel in other languages may work, but is not guaranteed by Neoptix. Furthermore, it is highly recommended that you do not use Excel for other purposes when DDE data logging is taking place; failure to respect this may result in lost data (your data or temperature data).

Before you can use this logging method, you must set it up on your PC. This needs to be done only once.

DDE logging setup

Click the DDE Excel checkbox, as illustrated here.
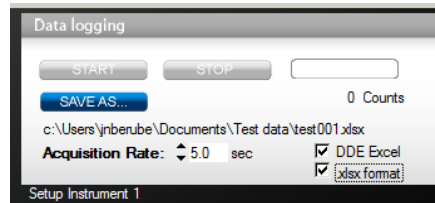
Then, you will get an invitation to specify the location of your Excel application (excel.exe). Once the Excel location and language selection[4] are confirmed (look into "C:\Program files\Microsoft Office\OfficeXX"), logging will start as described below.

If you are using Office 2007 or later, make sure to check the box ".xlsx format". With Office 2007 or later, files can be saved only in the new format .xlsx.

DDE logging

Click the START button to start the logging process. The Excel application will open, and you will be able to see the data being written to the file. **Do not close this Excel sheet**; however you may minimize it without any problem.

To stop logging, click the STOP button in OptiLink; this will automatically close the Excel sheet and application. Do not close the Excel application yourself!

Otherwise, the DDE logging is very similar to logging to a .tem file, as described above. Acquisition rate is limited to 1 second.

8.4.2 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.

---
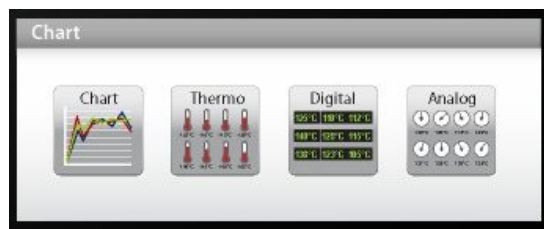
[4] You have two choices: English or French. If you are using Excel in another language, you must select English.

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.

8.4.2.1   Displaying temperature trends

Click the "Chart" button to get the following window.
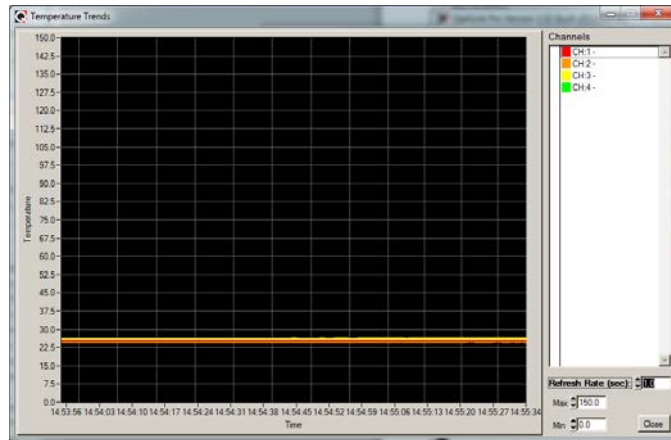
Adjust the "Refresh Rate" (minimum is 0.2 sec) and Min / Max to suit your viewing needs.

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.

8.4.2.2   Displaying analog thermometers

Click the "Thermo" button; the following window will appear.
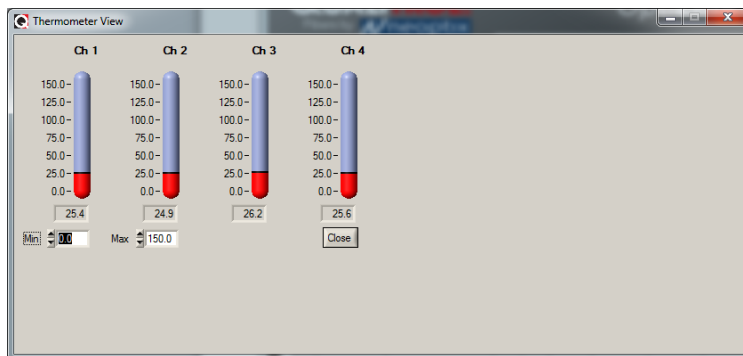
All thermometers share the same Min / Max reading setting. Refresh rate is fixed at 1.0 sec. The size of this window will change depending on the number of channels to display. Up to 16 thermometers can be shown; if you want to display more than 16 channels, only the first 16 detected channels will be 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.

8.4.2.3   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.

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.

8.4.2.4   Displaying analog values (dials)

To display analog temperatures (using dials), click on the "Analog" button. The active window becomes this:
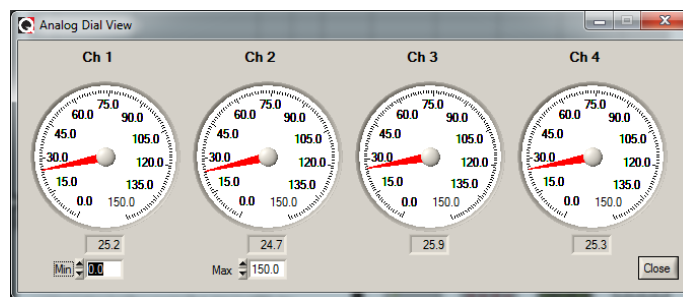
All dials share the same Min / Max reading setting. Refresh rate is always 1.0 sec. The size of this window will adapt to the number of displayed channels. Up to 16 dials can be shown; if you want to display more than 16 channels, only the first 16 detected channels will be shown (note that any channel 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.

8.5   The OptiLink Console

You must be in "System Configuration" mode to use the console.

The console, which can be invoked through the Window and then Open Console from OptiLink main window menu bar, is useful to manage each Neoptix 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, which Neoptix suggests to use with all thermometer models (such as the Reflex or T/Guard).

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, wtune, etc.

• Calibration type, Neoptix or Nortech Fibronic, Inc.

- And so forth.

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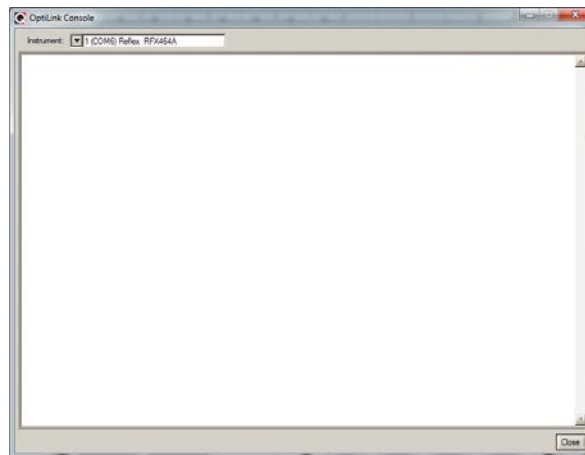
Before sending commands and receiving information from a specific module, it is necessary to select the instrument you want to interrogate. Please note that only ONE instrument can be selected at a time; if the same command is to be sent to all thermometers, then, it is necessary to repeat the command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

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, or e-mail program, etc.

8.5.1 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.
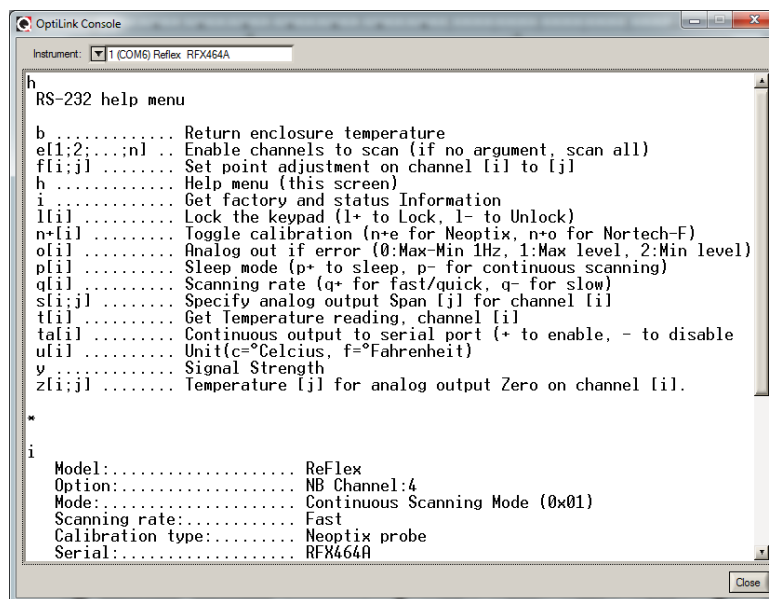
For a complete description of all commands, refer to Section 6.4 above.

8.6 OptiLink functions

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

8.6.1 The File menu

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

8.6.1.1 Find Instruments (Refresh)

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

8.6.1.2 Disconnect Instruments

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

8.6.1.3 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 OptiLink 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:
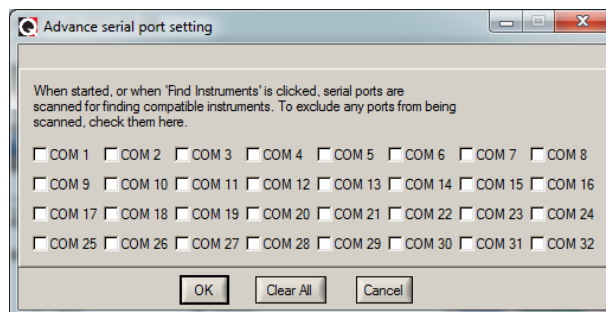
8.6.1.4 Quit

Select *Quit* from the *File* menu to exit OptiLink. 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 OptiLink.

8.6.2 The Window menu

From this menu, you can open the following 5 windows:
- Console view
- Trend view
- Thermometer view
- Digital view
- Analog (dial) view

8.6.2.1 Open Console

Open Console can be very useful for developers and other users who want to interrogate the "internal" parameters of a Neoptix thermometer. It should be used only by experienced users.

8.6.2.2 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.

8.6.2.3 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.

8.6.2.4 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.

8.6.2.5 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.

8.6.3 The Help Menu

This is a standard Windows Help menu.

From this menu, you can also enter an unlocking code to convert OptiLink from a "Lite" version to the "Pro" version.

9 INDEX

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