



User's Guide

XR5-SE Data Logger™ and LogXR Software™

February 5, 2018

Copyright © 2018 Pace Scientific Inc.
All rights reserved.

Disclaimer

The following warranty and liability disclaimers apply to this product.

PACE SCIENTIFIC INC ("PACE") MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE REGARDING ITS HARDWARE AND SOFTWARE PRODUCTS. PACE DOES NOT WARRANT, GUARANTEE OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF ITS HARDWARE AND SOFTWARE PRODUCTS IN TERMS OF THEIR CORRECTNESS OR OTHERWISE. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF ITS HARDWARE AND SOFTWARE PRODUCTS IS ASSUMED BY YOU. THE EXCLUSION OF IMPLIED WARRANTIES IS NOT PERMITTED BY SOME STATES. THE EXCLUSION MAY NOT APPLY TO YOU

IN NO EVENT WILL PACE, ITS OFFICERS, EMPLOYEES OR AGENTS BE LIABLE TO YOU FOR ANY CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES (INCLUDING DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION AND THE LIKE) ARISING OUT OF THE USE OR THE INABILITY TO USE ITS HARDWARE AND SOFTWARE PRODUCTS EVEN IF PACE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL DAMAGES, THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

PACE PROVIDES THIS DOCUMENTATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This documentation could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in later editions. Pace Scientific Inc. may make improvements and/or changes in the product(s) and/or program(s) described in this documentation at any time without notice.

Excel is a registered trademark of Microsoft Corp.

XR5 Data Logger, LogXR and LogXR Software are trademarks of Pace Scientific Inc

Software / Firmware Versions

LogXR Software works with all XR5 Data Loggers and is a [free download](#) from the Pace website. This manual is updated to LogXR Software Version 1.01.90

XR5 Firmware is periodically updated and is a [free download](#) from the Pace website. This manual is updated to XR5 Firmware version 1.01.06. Update instructions are on page 62.

Contents

Introduction	7
LogXR Software Installation	9
Windows	9
Mac OS X	10
Linux (including Raspberry Pi)	12
Hardware Setup	14
Installing the USB-A Serial Adapter	14
Wireless Link	15
Sensor and Signal Connections	16
Overview: Using the XR5 Data Logger	17
LogXR Software	18
File menu	18
Preferences	19
Status menu	22
Status, Summary tab	22
Status, Main tab	25
Setup menu	26
Setup, Main tab	28
Sensor Excitation	29
Estimated Battery Life	30
Setup, Logging modes	31
Slow Logging Modes	32

Fast Logging Modes	34
Setup, Other tab	36
Setup, Ch1-Ch8 tabs	40
Setup, Pulse Channels tab	44
Sending a Setup to the XR5	46
Transfer Data	47
Transfer Data / Auto-Name	47
Transfer Scheduler	48
Real Time Text	52
Real Time Text and write to File	53
Real Time Graph	54
RealTime Graph and write to file	56
Logging Start	57
Logging Stop	57
Logging Erase	57
Port Select	58
Port Options	58
Port Network	59
Configure Ethernet Communications	59
XR5 Ethernet Communications	60
Utilities Verify Data	61
Utilities Change Unit ID	61
Utilities Change XR5 Password	61
Utilities Convert Binary File	61
Appendix	
Updating your XR5's Firmware	62
Screw Terminal Assignments	63
LED Functions	63

Available Models	64
Specifications	65
Battery Replacement	69
External Power Supply	69

Pace Sensors

Temperature Probes	70
TRH-100 Temperature / Humidity Probe	71
TRH-160 Temperature / Humidity Probe	72
Pressure Sensors	
P1600 Pressure Sensors	73
P300 Pressure Sensors	75
P350 Pressure Sensors	76
P400 Pressure Sensors	77
P450 Pressure Sensors	78
P500 Barometric Pressure	79
Accelerometers	80
AC Current Sensors	81
DC Current Sensors	82
AC Voltage Sensors	83
DC Voltage Sensors	84
LS-100 Light Sensor	85
Pace Sensors with separate manuals	86
<ul style="list-style-type: none"> ● Soil Moisture Sensors ● Rainfall Sensor ● Solar Radiation Sensor ● Wind Speed and Direction Sensor 	
Contact Closures	87

<u>Additional Voltage Ranges</u>	88
<u>External Scaling Cables</u>	88
<u>Potentiometer Applications</u>	89
<u>Pulse Output Sensors</u>	91
<u>Non-PACE Sensor Requirements</u>	91
<u>Current Loop Applications</u>	93
<u>ES-1 External Switch</u>	95
<u>Using a different Pressure Scale</u>	96
<u>Millivolt / Thermocouple Option</u>	97
<u>Thermocouple Accuracy Tables</u>	98
<u>LogXR Graph</u>	102
<u>Dial-up Scheduler & Modem setup</u>	105
<u>Scaling XR440 Sensors</u>	111
<u>Cables, Internal Wiring</u>	112
<u>XR5-8 models compared to XR5-SE models</u>	113
<u>Pace Humidity Probe Differences</u>	114
<u>Using the TRH-100 Probe without LogXR Software</u>	114
<u>Electrically Noisy Environments</u>	115
<u>Alternate Batteries for the XR5-SE</u>	115
<u>Limited Warranty</u>	116
<u>Service</u>	117
<u>Product and Accessories List</u>	118

Data Logging Simplified - the Pace XR5-SE Data Logger

This small but powerful stand-alone recorder has eight (8) multi-range analog inputs, three (3) pulse / frequency inputs, and the following features:

Large Sensor Selection

The XR5-SE is compatible with many sensors: Temperature, Relative Humidity, Pressure, Acceleration, Current, Voltage, Light, Solar Radiation, Wind Speed, Rainfall and others – all require no external power and are stocked at Pace. Many 3rd party sensors are also compatible.

Versatile

Mix and match sensors, contact closures, resistances, 0-2.5v and 0-5v signals. An internal amplifier option (page 97) adds two additional millivolt range selections for each analog input. Accessory scaling cables provide additional dc input voltage ranges, including 4-20ma (page 88).

Free Multi-OS Software

Pace provides LogXR Software™ for Windows, Mac OS X and Linux based computers (including the Raspberry Pi 3). The software handles XR5 setup, data transfer, graphing and data export. A real-time “strip-chart” display is included. Download the software at www.pace-sci.com/LogXR.htm.

Long Battery Life

Battery life depends on the selected setup, and is typically 2 or more years. For example, estimated battery life is 3.6 years for four (4) P1600 Series Pressure Sensors and any four (4) Pace Temperature Probes logging continuously every 30 seconds. LogXR Software displays estimated battery life based on the selected setup.

High Accuracy

Using Pace PT900 series thermistor probes, temperature data is accurate to $\pm 0.15^{\circ}\text{C}$ from 10 to 40°C (50 to 104°F) with no calibration. Voltage input accuracy is $\pm 0.25\%$ of full scale.

Large Memory

The XR5-SE's non-volatile memory can store up to 260,250 readings (-M models).

Free Lifetime Updates

Pace provides free lifetime software updates. Software is periodically enhanced with new features. The latest software and firmware files are posted on the Pace website.

Selectable Logging Rates

Log at any interval between 1 second and 12 hours, or fast log from 2 Hz to 1000 Hz. Pulse/frequency inputs function with logging intervals of 1 second or slower. Logging rates above 100Hz limits the channel count. Details on page 34.

Versatile Recording Modes

Logging may be triggered, stopped and re-triggered based on a sensor reading or by a dedicated trigger input. The Stop trigger includes an adjustable Stop delay. Sampling modes include Standard, Average and Peak. Logging may run until memory is full, or continuously in wrap-around mode. Channel pairs may be logged as differential readings (Channel A – Channel B).

Cycle Logging

Custom logging “cycles” may be selected. For example: Log for 10 seconds at 100 Hz, then pause for 59 minutes and 50 seconds, and then repeat. Another example: Log every minute from 8AM until 5PM, pause 16 hours, and then repeat.

Automated Data Collection

LogXR includes a built-in Scheduler. The Scheduler allows one or many XR5 Data Loggers to have their data automatically collected at preset time intervals. Collection intervals include hourly, daily, weekly, monthly and more.

Ethernet and Modem Connectivity

LogXR supports communications with one or more XR5s connected to an Ethernet LAN or land-line modems. Ethernet connectivity requires a Pace DS100 Ethernet module (see page 59). Required hardware for modem communications is discussed on page 105.

Excel Compatible Data

Transferred data is formatted as a readable, Excel compatible text file. Once opened in Excel, data may be saved as an Excel workbook. Using LogXR Software, data may be viewed as a zoomable graph, with individual channel selection features.

Secure Data

The XR5's rugged EEPROM memory retains data for over 100 years with no power. Data is securely transferred via the industry-standard Xmodem-CRC protocol. Users can confirm that data files have not been manually altered. A two-level password system may be utilized to prevent unauthorized access.

Individual Alarms

All analog inputs have individual high and low alarm limits. Alarm activity can trigger a variety of responses, including logging data, setting an external alarm output, and blinking the XR5's Alarm LED. A relay module is available to switch external loads.

Real Time Graph Display

When an XR5 Data Logger is connected to a computer running LogXR Software, a real time “strip chart” display is available. When selected, sensor/signal readings are updated every 2 seconds. The Real Time Display can function while simultaneously logging data at intervals of 1 second or slower. Real Time readings may be output to an external file, independent of the XR5's selected logging configuration.

Switch Closures

Up to eight unpowered switch closures or relay contacts can be logged by the XR5. If desired, a contact can be logged as the percentage of time the switch or contact is open with a one second resolution. See page 87 for details.

Pulse Logging

Each of 3 pulse inputs on the XR5 can log pulse counts or frequencies over the selected log interval. Channels set to “Totalize” will accumulate pulse counts over the entire logging session. For Wind Speed logging, both peak and average pulse rates may be logged.

Sensor "Front End"

The XR5 Data Logger can output a readable text string of the readings of all connected sensors in response to receiving a simple "read command" - LogXR software is not required. See the [XR5-SE Text Interface User's Guide](#) for details.

LogXR Software™

Windows Installation

LogXR Software for Windows is distributed as a single executable file and is compatible with Windows 10, Windows 8, Windows 7, Windows Vista and Windows XP.

Two ways to install LogXR:

From the included CD-ROM

Locate the CD labeled "Pace Scientific LogXR". Load this CD into your computer's CD-Rom drive, and using Windows Explorer (hold down the "Windows" key and press E), navigate to the installation file on the CD drive and double click it. The installation file name begins with "LogXR-Install" and includes the current version number.

From the Pace website

The current version of LogXR Software is posted on the LogXR Software web page at www.pace-sci.com/LogXR.htm. Follow the instructions to download the file, and then navigate to the installation file and double click it.

Installation

The installer displays a "default" directory for LogXR near the beginning of the install process. You may enter a different directory name at this point. If the directory name you enter does not exist, the installer will create the directory and install LogXR into it.

LogXR may be installed to a new directory or "on top of" an existing LogXR directory. If an existing LogXR directory is used for a new installation, the older version of LogXR installed into this directory will be lost, but all data and setup files will be retained.

Any prior setup, data, and configuration files are retained whenever a new version of LogXR is installed. File "pointers" used by LogXR to open the directories last used for setup and data transfers are also retained.

To launch LogXR

Click Start | All Programs | LogXR

LogXR Software™

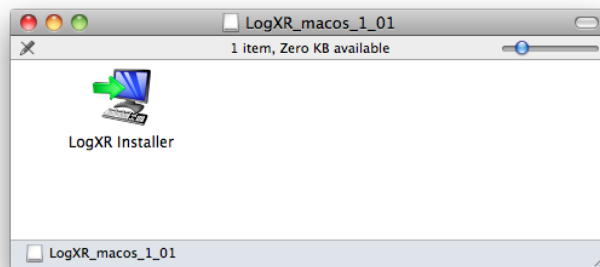
Mac OS X Installation

LogXR Software for Mac OS X is distributed in a dmg file.

LogXR Software for the Mac is posted at www.pace-sci.com/mac-data-logger-software.htm and runs on OSX 10.5 and higher.

From the LogXR Mac page (link above), press the Option key (Safari or Chrome browser) and click the linked LogXR-Mac-[x].dmg file ([x] is the current version number).

Once the file is downloaded to your computer, double click the dmg file and the LogXR Installer icon appears. Double click the LogXR Installer icon (below) to launch the Setup Wizard.

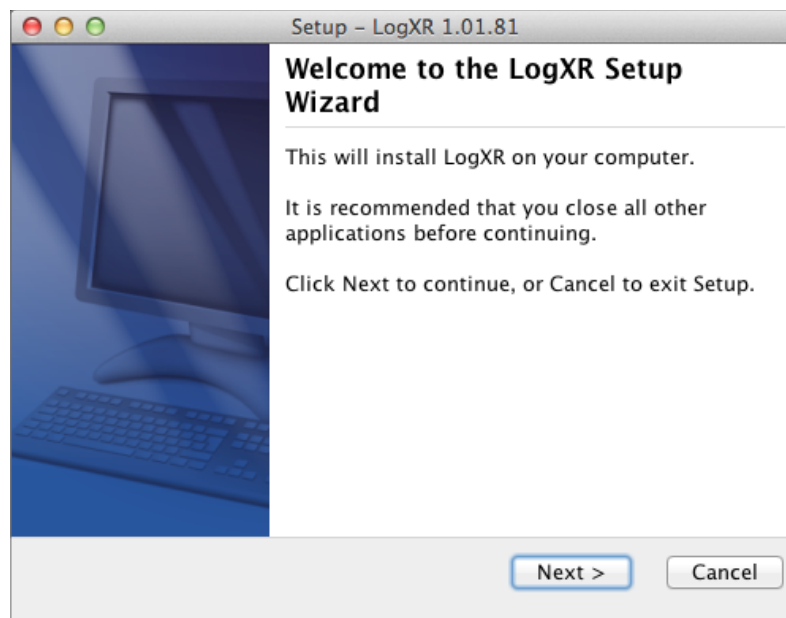


The Setup Wizard appears as shown below:

Click Next

Click Next to accept the /Applications folder as the destination directory.

Click Finish to complete the installation.

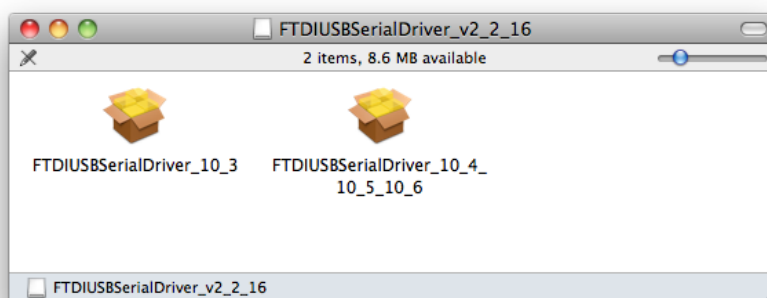


Mac OS X Installation (cont.)

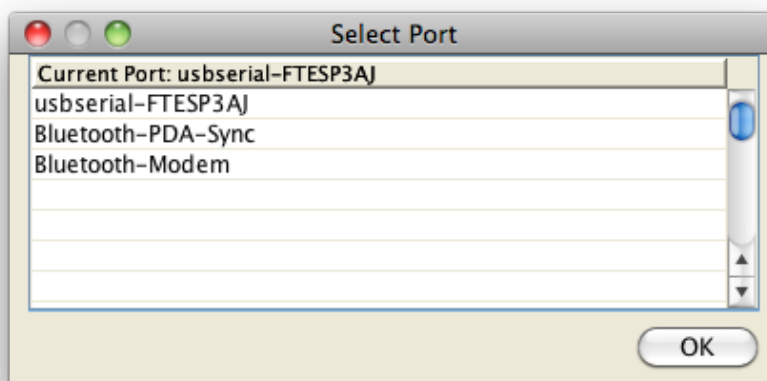
Pace USB-A Driver Installation for Mac OS X

The Mac driver for the USB-A is posted at www.pace-sci.com/mac-data-logger-software.htm.

1. With the USB-A serial adapter disconnected from your Mac, download the driver to your computer and double click the driver file. The following window appears:



2. Double click the icon ending "10_5_10_6".
3. After the Installer window appears, click "Continue" twice and then "Install".
4. Plug the USB-A into a USB port.
5. Launch LogXR (double click the LogXR icon in your Applications folder), and click Port | Select. The Select Port window lists the USB-A adapter as "usbserial-" plus a serial number. Make sure "usbserial-" is selected as the Current Port (if it is not, click to select it) and click OK.



6. If a "usbserial" selection does not appear in Select Port: a) Make sure the USB-A adapter is inserted into a USB Port *before* launching LogXR. b) If an older version of the Driver was previously installed, a Restart of your computer may be required.

LogXR Software™

Linux Installation

LogXR Software for Linux is posted at www.pace-sci.com/linux-data-logger-software.htm. Three install files are available.

deb file (tested on Raspberry Pi 3 and Linux Mint):

Note: LogXR runs only on the Raspberry Pi model 3 (ARM-v8-A processor core).

Raspberry Pi 3 running Raspbian GUI (tested on Stretch):

- 1) Download the LogXR .deb file and double click it to install. After the installation completes, in the **opt/LogXR** directory, copy the file LogXR.desktop to your desktop if a startup icon on your desktop is desired.
- 2) Launch LogXR, and the Pace folder and its associated subfolders and files will be created if they do not exist. If this is the first time LogXR has launched, follow step 3.
- 3) Open the text file **home/[user]/Pace/System/cplist.xsf** in a text editor and add the line: **/dev/ttyUSB0** Save cplist.xsf Click Ports | Select and select the serial port. See Serial Ports on the next page for more details.

Linux Mint: LogXR installs on using the Gdebi package manager. After the installation completes, follow the “Serial Ports” section on the next page to enable LogXR to recognize your computer’s serial port(s).

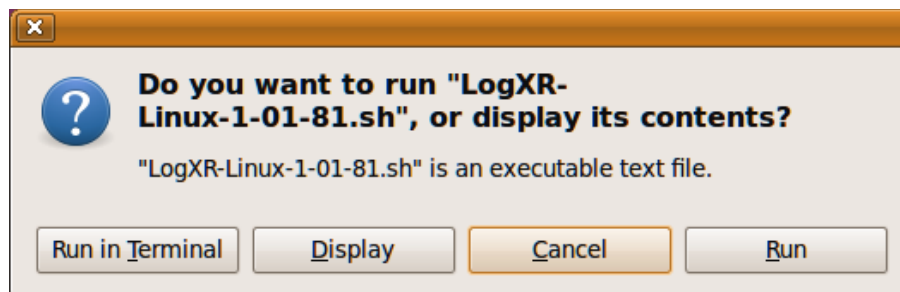
GUI installer (.sh) file

Download the LogXR ".sh" file from the above link. Once the file is downloaded to your computer, double click the file and click Run (screenshot below) to install LogXR.

Note: If the window below does not appear:

If double clicking the “.sh” file does not display the window below, but attempts to open the file in an editor (like gedit), click Cancel on the displayed message.

Right click the “.sh” file, select Properties, then Permissions, and check “Allow executing file as a program”. Then close the Properties window, double click the “.sh” file and click the Run button.



The installer displays a "default" directory for the LogXR installation near the beginning of the install process. You may enter a different directory name at this point. If the directory name you enter does not exist, the installer will create the directory and install LogXR into it.

LogXR can be installed to a new directory or "over" an existing LogXR directory. If an existing LogXR directory is used for a new installation, the older version of LogXR that was previously installed into this directory will be lost, but previous data and setup files will remain, including the Pace folder and its subfolders and files.

Note: Existing setup, data, and configuration files are retained whenever a new version of LogXR is installed. File "pointers" used by LogXR to open the directories last used for your setup and data files are also retained.

Serial Ports

LogXR is initially set to use serial port **/dev/ttyS0**. In order to choose a different serial port, you must edit the text file "cplist.xsf" located in the **Home/[user]/Pace/System** folder. cplist is not created until LogXR is initially launched. Add a new line (example: **/dev/ttyS1**) to "cplist.xsf" for each hardware serial port.

Pace USB-A USB Serial Adapter

The Pace USB-A Serial Adapter is typically recognized as **ttyUSB0**, so the text file "cplist.xsf" would be edited to include the line: **/dev/ttyUSB0**

The serial port(s) assigned to any attached USB Adapters can be determined as follows: Launch a Terminal window and enter **dmesg | grep tty**. All attached USB-A devices will be listed. For example: "FTDI USB Serial Device converter now attached to **ttyUSB0**". Then edit the text file cplist.xsf, adding the line: **/dev/ttyUSB0** (add a line for each attached USB adapter).

Serial Port Permissions

If you get an error message similar to "Unable to Open Port" or "Port in Use" when you try to select the Serial Port using Port | Select, the problem is likely permissions. From the Terminal, enter **id -Gn** and if the response back does not include **dialout**, then the permissions for the serial ports need to be changed. In the Terminal, enter **sudo usermod -a -G dialout [your user name]** then restart the computer and launch LogXR and any valid serial ports should be accessible.

RPM file for Fedora and other RPM based Linux distributions

To install:

1. Log in as user (not root).
2. Download the above file into your user home directory.
3. Double-click the LogXR RPM file to launch the RPM Installer.

After the installation is complete:

4. Log in as root.
5. Change permissions associated with **/dev/ttyS0** and any other serial port that LogXR will use to allow LogXR, running under any user, to execute the file.

When launching LogXR, you must be logged in as user (not root).

Serial Ports: see Serial Ports section (above).

XR5 Hardware Setup

A computer running LogXR Software is used to set up the XR5 Data Logger. Once set up, the XR5 can log data without being connected to a computer. While the XR5 is connected to a computer, you may send a setup, transfer logged data, view current status conditions, display readings in real time, and perform other functions.

Required Hardware

Pace XR5 Data Logger (any model).

IC209 Interface Cable.

Windows 10, 8, 7, Vista, XP, Linux or Mac OS X (10.5 or higher) computer running LogXR Software.

Minimum computer hardware specs:

500MHz processor, 256Mb RAM, 1024 x 768 monitor resolution (lower monitor resolutions OK except when displaying LogXR Graphs with high channel counts).

IC209 Interface Cable

Connect the 9 pin end to an unused Com Port on your computer (ie: Com1; Com2). Plug the other end of the interface cable into the XR5.

USB Serial Adapter

Computers not equipped with a serial (com) port require a USB to Serial Adapter.

For Windows, Mac and Linux computers, Pace stocks a USB/Serial Adapter: Pace part # USB-A.

Installing the USB-A Serial Adapter

Mac OS X users see page 11.

Linux users see page 13.

Windows users see below and the following page.

Other USB to Serial Adapters may work with the XR5, but Pace provides support only for the USB-A Serial Adapter. Some USB to Serial Adapters fail to work with any device that has a 3-wire communications interface (like the XR5 and some GPS devices).

Notes on IC209 Cable

It is OK to maintain a permanent connection from an XR5 to a powered or unpowered computer, if desired. Maintaining a permanent connection has no effect on the XR5's battery life.

The IC209 Cable's internal wiring is listed (for reference) on page 112.

USB-A Serial Adapter Installation on Windows XP

1. Disconnect (physically remove) the USB-A Adapter from your computer.
2. Using the supplied Pace Scientific CD-ROM*, click on the USB-A folder, and then double click the file "USB-A-Driver-Installer.exe" to install the USB-A Driver.
3. Insert the USB-A Adapter into a USB port on your computer (after installing the driver).
4. Launch LogXR and click Port | Select. A new serial port will be listed. Click on the port to select it.

USB-A Serial Adapter Installation on Windows 10, Windows 8, Windows 7 and Vista

1. Make sure your computer is connected to the Internet.
2. Insert the USB-A into a USB port on your computer. Driver installation will proceed automatically.
3. Launch LogXR and click Port | Select. A new serial port will be listed. Click on the port to select it.

Note:

LogXR identifies serial ports when it is first launched. If LogXR was running when you installed the driver, terminate LogXR (File | Exit) and restart it to have the new port listed in Port | Select.

* Driver may also be downloaded at www.pace-sci.com/usb-a-xr5.htm

Discontinued Pace USB-01 Serial Adapter

Please go to www.pace-sci.com/usb-01-xr5.htm for instructions to install the discontinued USB-01 Serial Adapter (the USB-01 is blue, the USB-A is white).

USB Wireless Link

The Pace WTP-100 consists of two miniature wireless modules. One module inserts into a computer's USB port and requires no external power. A second module plugs into the Pace IC209 Cable which connects to the XR5. The module on the XR5 side is powered from a battery cable or AC power adapter (both included); the module requires 4 to 12vdc. The WTP-100 has a range of up to 300 ft (100 meters) outdoors, and up to 100 ft (30 meters) indoors. Operating frequency is 2.4 GHz for world-wide compatibility. No software installation required. No setup required.

Part # WTP-100

Includes Battery cable and AC power adapter for XR5 side.

Overseas customers use part # WTP-100-exp

Includes Battery cable and AC power adapter with plugs for UK, EU and Australia.

Dimensions:

Computer side: 2.2" x 1.0" x 0.3" (56 x 24 x 8 millimeters).

XR5 side: 2.9" x 1.2" x 0.7" (72 x 31 x 16 millimeters)

No software installation required. No setup required. Just plug and go.

See [website](http://www.pace-sci.com) for more details.

Battery Options

The battery cable included with the WTP-100 connects to a 9V battery or battery pack with a 9v snap type connector and voltage between 4 and 12 volts. Pace offers weatherproof enclosures pre-configured for an XR5, WTP-100 and a multi-cell battery holder.

Sensor and Signal Connections

The XR5-SE has a removable screw-type terminal block for connecting sensors and signals. Wiring connections and software setup for all Pace sensors are listed in the Appendix of this User's Guide.

Terminal:	Function
1,2,3,4,5,6,7,8	Input terminals for analog channels 1-8.
C	Common (shared ground for all signals). Five "C" terminals are available.
D	Precision 2.5v sensor excitation, 40 ma maximum recommended current *
E	Precision 5.0v sensor excitation, 30 ma maximum current *
X	External Trigger input or Pulse / Frequency input
Y	Pulse / Frequency input
Z	Pulse / Frequency input or alarm output (voltage signal).
Q	External dc power input

* Total current from D and E terminals should not exceed 40ma. If the E terminal is not used, total current drawn from the D terminal can be up to 60 ma.

Multiple leads may be connected to a single terminal, in which case stranded type wires should be used. Multiple solid core wires, especially of different gage sizes, may result in a faulty connection. Maximum recommended wire size is 16 gage (AWG) stranded or solid.

Strain relief

If leads at the terminal block are flexed repeatedly, lead breakage is possible. If repeated lead flexure is possible, we suggest bundling all screw terminal leads with a plastic cable tie about 1" to 2" from the terminal block (25 - 50 mm) to provide some strain relief. Or mount the XR5 in an enclosure equipped with strain relief fittings, such as the [Pace EC24](#), [Pace EC45](#) or [Pace EC55](#) Weatherproof Enclosure.

Extension Cable

To reduce signal noise, shielded cable is recommended for cable lengths longer than twenty feet (6 meters). We recommend using 20-24 AWG shielded copper cable with stranded conductors. 24 AWG cable is acceptable for runs of up to 100 feet (30 meters). Sensor leads can be spliced to extension cable using wire nuts, crimp connectors or solder.

Outdoor Use

The XR5 Data Logger is not waterproof. Use outdoors requires a weatherproof housing such as the [Pace EC24](#), [Pace EC45](#) or [Pace EC55](#) Weatherproof Enclosure.

Grounding

If the XR5's sensor cables are longer than thirty feet (9 meters), we recommend grounding the XR5 for maximum noise immunity. Connect a short stranded copper wire from a "C" screw terminal to a good earth ground. Please see page 115 for additional suggestions if high levels of electrical noise may be present.

Overview: Using the XR5 Data Logger

(First time or typical user)

1. Launch LogXR Software (click Start | Programs | LogXR).
2. Connect the XR5 Data Logger to a USB port on your computer using the USB-A Adapter and IC209 Interface Cable. Alternately, the IC209 Cable can connect to a physical COM port if one exists on your computer.

From the main menu:

3. Click **Port | Select** and select the com port number assigned to the USB Adapter by your computer's Operating System.
4. Click **Setup | Extract** and then edit the Setup for your logging session.
5. Send the Setup to the XR5 (Click **Send | Send Setup** from the Setup menu).
6. Click **Status | Extract** to confirm that the XR5 is operating as intended.

While the XR5 Data Logger is connected to a computer running LogXR Software, you can initiate the following actions from the main menu:

Setup Extract	Create or Modify a Setup for a new logging session.
Real Time Text	Display sensor readings updated every two seconds.
Real Time Text and write to file	Similar to Real Time Text , but also writes sensor readings to a text file every two seconds. This is done while simultaneously logging data to the XR5's internal memory if logging is active.
Status Extract	The XR5's time clock, setup and current conditions are displayed.
Transfer Data	All logged data is saved to a text file.

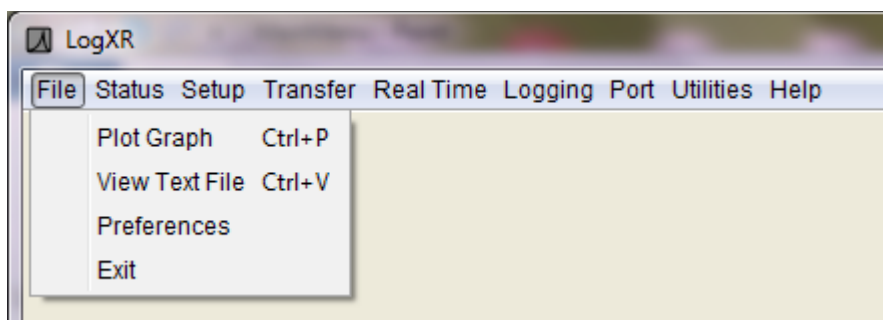
XR5 data files (created from **Transfer | Data**) may be plotted as a Graph (select **File | Plot Graph**) or viewed as tabular data (select **File | View Text File**). XR5 data files may also be opened with an external text editor (like Windows Notepad) or spreadsheet program (like Excel).

The next section explains the Main Menu selections available in LogXR.

LogXR Menu Selections

The following pages describe the Main Menu selections (from left to right). Some menu choices have keyboard accelerators (shown beside the menu selection). For example, on a Windows computer, the menu choice **File | Plot Graph** displays a keyboard accelerator of "Ctrl+P", which means that Plot Graph can also be invoked by holding down the Ctrl key (located at the bottom left on the keyboard) and pressing P.

File menu



Plot Graph

Graph an existing XR5 data file.

Zoom function

When a graph is displayed, you can use the zoom function to expand any portion of the graph. To zoom, place the mouse cursor on one corner of the area you wish to zoom, click the left mouse button, drag the mouse to the opposite corner of the area you wish to zoom, and release the mouse button. This operation can be repeated any number of times until you reach "Maximum zoom" (less than 4 points per channel). The "Back" button allows you to re-display your previous zoom operations. Please see page 102 for additional information on graphing.

View Text File

View an existing XR5 data file (or any readable text file). XR5 data files are readable text files.

Notes

You may also view XR5 data files by opening them in an external program such as Windows Notepad or Excel.

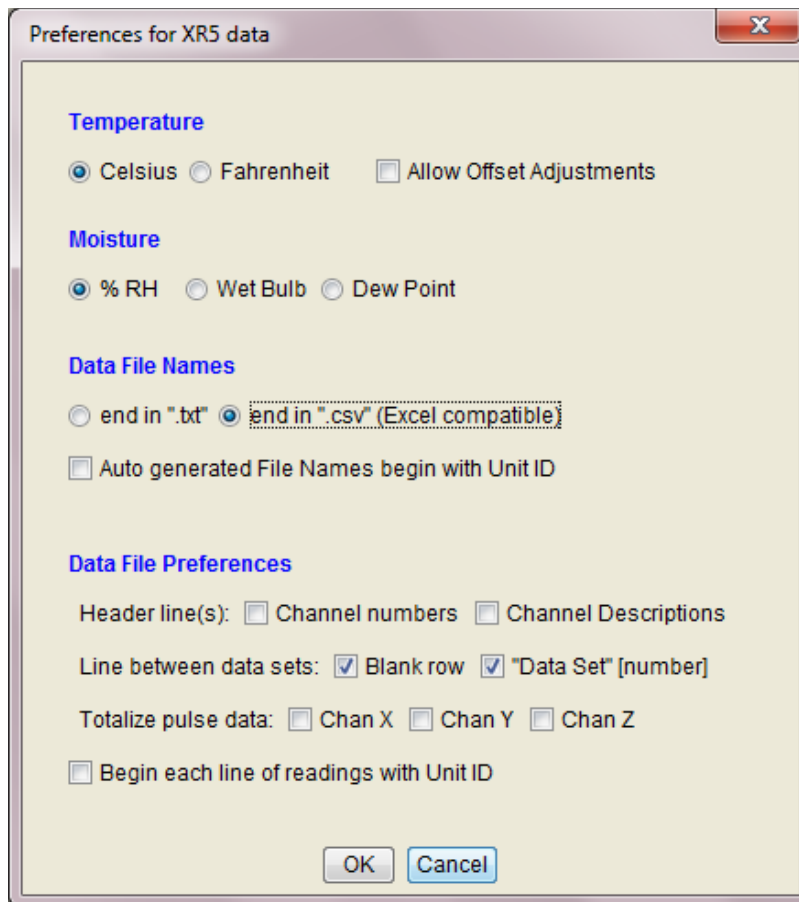
To open an XR5 data file with a ".txt" extension in Excel:

In Excel, select File | Open, change Files of Type: to "Text Files" and then navigate (using "Look in:") to your XR5 Data File. Select the desired XR5 file and click Open. In the Text Import Wizard check "Delimited" (step 1) and then check "comma" (step 2).

Data files with a ".csv" file extension open directly in Excel; Excel's Text Import Wizard is not used.

Preferences

Note: on Mac OS X, select Preferences by choosing **LogXR | Preferences**.



Preferences affect all data files created via **Transfer | Data**, or **Transfer | Data / Auto Name**. They also apply to XR5 ".binary" files converted to readable files using **Utilities | Convert Binary File**.

Temperature

The temperature scale (**Celsius / Fahrenheit**) for all Pace temperature probes and 3rd party 10k and 30k NTC thermistor probes.

Allow Offset Adjustments - check to manually adjust the offset term of temperature sensors and probes. Note: the unchecked setting is recommended for most users.

Moisture

The moisture scale (**%RH / Wet Bulb / Dew Point**) pertains to the Pace TRH-100 and TRH-160 Temperature/RH Probes.

Notes:

Changing "Temperature Scale" or "Moisture Scale" has no effect on existing XR5 data files. It affects the Real Time display, and new files created using **Transfer | Data**, **Transfer | Data / Auto Name** or **Utilities | Convert Binary File**.

To change the Temperature or Moisture Scale of an existing data file, select **Utilities | Convert Binary File** and select the ".binary" version of the file. Then click Convert. The new data file will conform to the current Moisture and Temperature selections.

Dew Point and Wet Bulb calculations are valid for temperatures from 0 to 85°C (32 to 185°F). Wet Bulb temperatures are approximate.

When using a Real Time display mode (Text or Graph), Humidity Probe readings display %RH regardless of the Moisture Scale selection.

Data File Names

end in ".txt"

Appends a ".txt" extension to the data file's name.

end in ".csv" (Excel compatible)

Appends a ".csv" extension to the data file's name. Opens in Excel and other programs that recognize the ".csv" file format (comma separated values).

Note: The contents of the data file is identical with either setting.

Auto generated File Names begin with Unit ID

If checked, the XR5's Unit ID is added to the beginning of all auto-generated file names.

Data File Preferences

Header line(s):

Channel numbers

If checked, a header row of channel numbers is inserted immediately above the first row of readings (labels each column of data with its associated channel number).

Channel Descriptions

If checked, a header row of channel descriptions is inserted immediately above the first row of readings (labels each column of data with the setup's Channel Descriptions).

Channel Number and Channel "Description" headers can both be checked (both headers are inserted in the data file).

Line between data sets:

Blank row

If checked, a blank row is inserted between multiple data sets in the same data file. Visually separates multiple data sets within a single Data File.

"Data Set" [number]

If checked, a row is inserted at the start of each data set labeled "Data Set" followed by the data set number (1, 2, 3, etc.). We recommend checking this selection (see next paragraph).

LogXR Graph Display

If multiple data sets occur in a data file and "Data Set..." is not checked, then the graph display will include continuation lines plotted from the last data value of each active channels data to the first data value of the next data set. If "Data Set..." is checked, visible "gaps" will appear in the graph, showing the time that logging was not active. For this reason, **"Data Set" [xx] between data sets** is the default setting.

Multiple data sets can occur using the following Logging modes: "Log on Ext. Trigger", "Cycle", "Log on Alarm" and, if logging is manually stopped and restarted, "Manual (Slow)".

Data File Preferences (continued)

Totalize pulse data:

Chan X Chan Y Chan Z

For each pulse channel checked, accumulated pulses of prior readings (for the logging session) are added to the current reading.

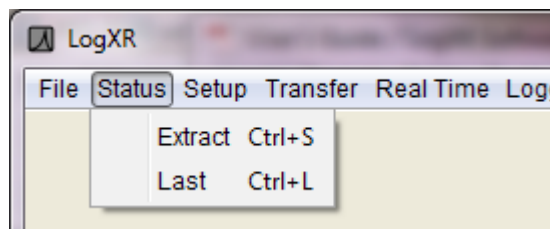
Begin each line of readings with Unit ID:

If checked, each line of readings data in the data file is prefaced with the XR5's unit ID.

Exit

Terminates LogXR Software (**LogXR** | **Quit LogXR** on Mac OS X).

Status menu



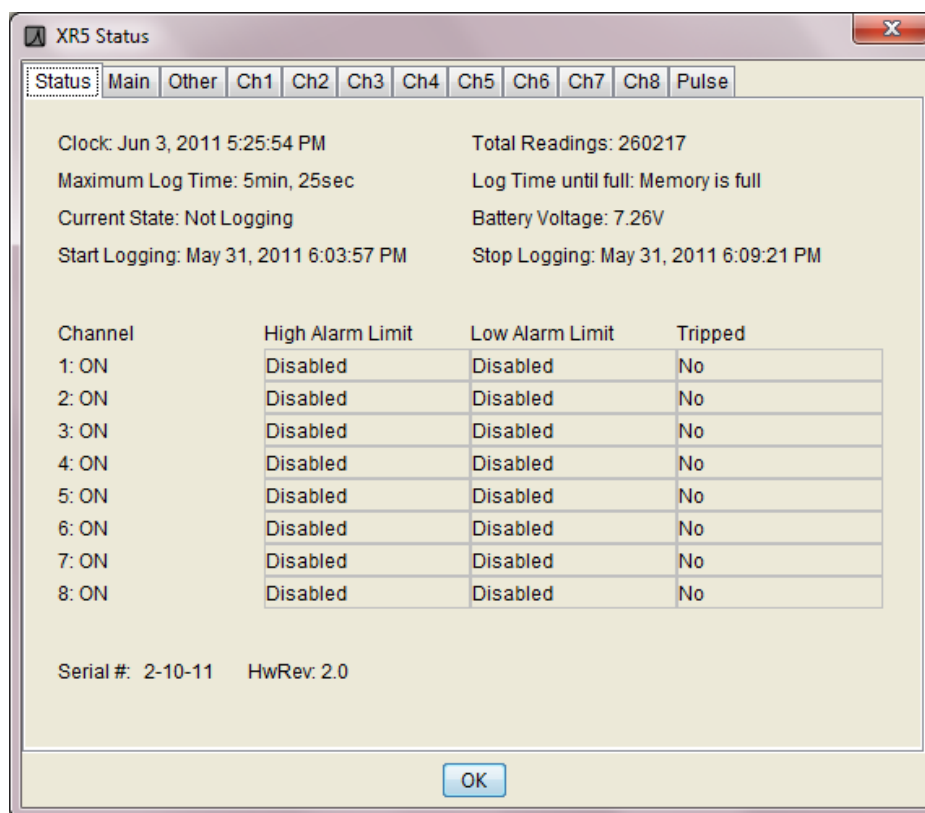
Extract

Extract and view current XR5 Status. The XR5 Data Logger must be connected to the selected port (click **Port | Select** to view the selected port).

Last

View the last extracted Status.

Status screen



The Status screen is a read-only screen that displays the conditions existing in the connected XR5 when **Status | Extract** was selected. It is similar to the Setup screen, but also has a Summary tab (details on next page). Please see the Setup section (starting at page 26) for information on the other Status tabs.

Status, “Sum” tab (Summary)

Clock: The XR5’s Time Clock (at the time **Status | Extract** was selected).

Total Readings: The total readings (from all active channels) currently logged in memory.

Maximum Log Time: The time span of the data when the memory is full.

“Maximum Log Time” Notes

If the Logging Mode is “Log on Ext. Trigger”, the Maximum Log Time is approximate: if many triggering cycles occur during the logging session, memory will be consumed logging additional timestamps, and the maximum log time will be less than the displayed value.

If the Logging Mode is “Log on Alarm”, the Maximum Log Time is approximate: if many alarm-driven data segments are logged during the logging session, memory will be consumed logging additional timestamps, and the maximum log time will be less than the displayed value.

If the Logging Mode is “Cycle Logging” the Maximum Log Time includes the pause time of each cycle, and therefore the Maximum Log Time represents the maximum duration of the logging session (from start, until the memory is full), as it does for the other logging modes except “Log on Ext. Trigger” and “Log on Alarm”.

Log Time until full: The logging time remaining until the memory is full (and logging stops).

Current State:

Not Logging: Logging is stopped indefinitely – user action is required to start logging.

Logging: Data is being logged at the selected Log Interval.

Waiting on Preset Time: Logging will start upon reaching the user selected Preset Time.

Waiting: Not logging; the condition which will cause logging to start depends on the current Log Mode:

<u>Log Mode</u>	<u>Logging will become active when</u>
Cycle Logging:	the ‘Pause’ time has elapsed.
Log on Ext. Trigger:	a valid trigger exists.
Log on Alarm:	an alarm condition exists.

Note:

For the Logging Mode “Log on Ext. Trigger”: If the Stop Delay is greater than 0 seconds, “Waiting” will be displayed if Trigger state is inactive, but Logging will continue until the Stop Delay has timed out.

Battery Voltage / Ext. Power:	The total voltage of the two internal batteries, or the external power voltage (Q terminal) if it is higher than the battery voltage. The reading is updated every time a setup is sent to the XR5, and at one hour intervals from the time that the setup is initially sent (it is not updated when Status Extract is selected). The batteries should be replaced when the Battery Voltage reads below 6.0 V. See page 69 for details. The Battery Voltage is also written to the header section of all XR5 data files.
Start Logging:	The time the first data value was logged (or will be logged, if the Log mode has a Preset Start Time which has not yet been reached). <u>Exception for Wrap modes:</u> For Manual/Wrap or Preset/Wrap logging modes, if the memory is full and the XR5 is currently logging, then although "Start Logging" indicates when logging began, the stored dataset begins at a later time, equal to the current time minus the Maximum Log Time (the earliest readings are overwritten in Wrap mode once the memory is full).
Stop Logging:	The calculated time that logging will end (when the memory becomes full). This time cannot be calculated if the Log Mode is 'Log on Ext. Trigger' or 'Log on Alarm'.
Alarm summary:	Displays user selected alarm limits. The 'Tripped' column displays 'Yes' if an alarm condition has occurred anytime since the start of the logging session.
Serial #:	Displays the unit's serial number. The serial number is factory set and cannot be changed. A label on the side of the battery holder inside the XR5 also displays the serial number.
HwRev:	Displays the hardware revision number (2.0 for all XR5-SE models).

Status, “Main” tab

The screenshot shows the 'XR5 Status' window with the 'Main' tab selected. The window contains the following information:

- Model:** XR5-SE-M
- Firmware:** 1.01.03
- Unit ID:** 12345678
- Label:** (empty text field)
- Logging Mode:** Manual (Fast) (dropdown menu)
- Frequency:** 100 (dropdown menu) hertz
- Excitation Time:** 30 ms (dropdown menu)
- Buttons:** OK

Like all Status tabs, the Main tab is read-only and displays the current configuration of the connected XR5. It is similar to the Setup, Main tab, but also displays the XR5's Firmware Revision and Unit ID.

Firmware:

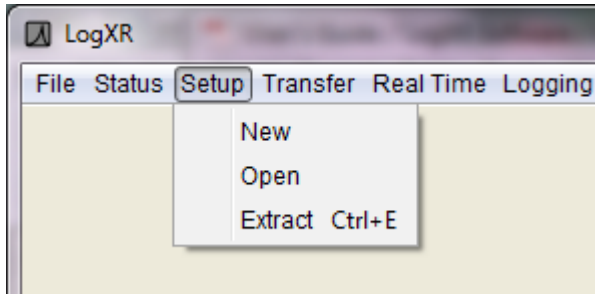
The XR5 Data Logger's current Firmware revision. XR5 Firmware is periodically updated and posted on the [Pace XR5 Firmware web page](#). The XR5's firmware may be updated by selecting **Utilities | Update Firmware**. See page 62 for details.

Unit ID:

The Unit ID is a semi-permanent identification number or label assigned by the user to a specific XR5. It may only be changed by selecting **Utilities | Change Unit ID**. See page 61 for details.

Please see the Setup section on the following pages for details on fields in the Status screen which have not been covered above.

Setup menu



New

Create a new Setup, starting with the “factory default” settings.

Open

Open a previously saved Setup file.

XR5 Setups are model specific. A setup for one XR5 model type cannot be sent to a different XR5 model type unless the difference is just the XR5 model's memory size. For example, a setup for the XR5-SE can also be sent to an XR5-SE-M.

To Open an existing setup file for a different XR5 model, click on the drop-down bar at the bottom of the file selection dialog and select the model. Previously saved setup files for the selected model will then be listed.

Extract

Extracts the Setup from the currently connected XR5. This is an easy way to modify the current setup in an XR5.

Setup, “Main” tab

XR5 Setup: C:\Users\Joe\Pace\Setup\information.8SE

File Send

Main Other Ch1 Ch2 Ch3 Ch4 Ch5 Ch6 Ch7 Ch8 Pulse

Model: XR5-SE-M

Label:

Logging Mode

Manual (Fast)

Logging Interval

0 hr 0 min 1 sec

Frequency: 100 hertz

Maximum Log Time: 5min, 25sec For model: XR5-SE-M

Sensor Excitation

30 ms Estimated milliamps: 0 Estimated battery life: 7385 sessions

The Setup screen consists of multiple pages. If a page Tab has focus (is clicked on), the arrow keys or Tab key may be used to select other pages. Click **Send | Send Setup** to send the Setup to the XR5. Click **File | Save As...** to save a Setup for future use.

Model:

The XR5 model which is compatible with the current setup. Saved XR5 Setup files are model specific. If you attempt to send a setup file to a different model type, LogXR will display a warning screen and the operation will be halted.

Note:

Setups for the listed model can also be sent to the "-M" (extended memory) version of the same model. For example, a setup for the XR5-SE-20mv can also be sent to the XR5-SE-M-20mv.

Label:

You may enter an optional label describing the logging session. This label appears in the header portion of all transferred data files, as well as at the top of any displayed LogXR graphs.

Logging Mode

See page 31 for a detailed description of the logging modes available for the XR5.

Logging Interval

Channels set to ON will log data at the interval selected. Depending on the current Logging Mode selected, either the fast logging rate or the Slow Logging Interval will be grayed out. The fast logging Frequency is specified in Hertz, and defines the number of times *per second* that data is logged on each ON channel.

Maximum Log Time (read only)

The maximum log time, based on the number of channels set to ON and the selected Logging Interval.

If the Logging Mode is “Log on Ext. Trigger” or “Log on Alarm”, the Maximum Log Time is approximate: if many triggering cycles or alarm-driven data segments occur during the logging session, additional memory will be consumed due to the overhead of storing each data "segment", resulting in an maximum log time that is less than the displayed value.

If the Logging Mode is “Cycle Logging” the Maximum Log Time includes the pause time for each cycle, so that the Maximum Log Time represents the total time span of the logging session (from the Start Time until either: 1) the memory is full, or 2) the Stop Time has been reached).

For model:

Used to show the Maximum Log Time for the XR5's memory size (standard or -M). This selection has no effect on an XR5 data logger when the setup is sent; it is used only to display the Maximum Log Time for the two XR5 memory sizes. Millivolt model names are not listed here, but the "base" models (XR5-SE and XR5-SE-M) have the same Maximum Log Time as the millivolt models.

Sensor Excitation

The time period just prior to sampling its analog channels that power is pulsed to the XR5's D and E excitation terminals. Pace Sensors that require power connect to one of these excitation terminals.

Select the longest Sensor Excitation required among all the connected sensors. For example, if you connect a P1600 Pressure sensor (30ms excitation) and a TRH-100 Temperature/RH Probe (150ms excitation), then you would need to select 150 ms for the Sensor Excitation (the highest of all the connected sensors).

The following Pace Sensors require an excitation time longer than the 30ms default setting:

<u>Pace Sensor</u>	<u>Excitation Time</u>
TRH-100 Temperature / Humidity Probe	150 ms
TRH-160 Temperature / Humidity Probe	150 ms

P1500 / P1510 Series Pressure Sensor 150 ms (P1500 / P1510 series are discontinued)

If any of the above sensors are wired to the XR5, set the excitation time to 150ms.

All other Pace Sensors (including P300, P350, P400, P500, P1600 and P1650 Pressure sensors) require only 30ms of excitation time.

For any sensor in this manual, if the excitation time is not specified, it needs only the minimum Sensor Excitation of 30ms.

Excitation Current Limits:

D terminal (2.50 volts): 40 ma recommended maximum; up to 60 ma maximum if 0 current is drawn from E terminals.
(2 ma max. for earlier generation [XR5-8 series](#))

E terminals (5.00 volts): 30 ma maximum, current limited.
(27 ma max for the XR5-8 series)

Sensor Excitation (cont.)

Excitation Time selections: 30 milliseconds, 150 milliseconds, 1 second, 5 seconds, and 10 seconds.

Notes:

Total excitation current draw from all connected sensors (D and E terminals) should be limited to a maximum of 40ma unless: if E terminals are not used, up to 60ma may be drawn from the D terminal.

Sensor excitation time will be ON continuously (overriding the Excitation Time selected) if any of the following conditions are true:

1. The selected Excitation Time is greater than or equal to the selected Log Interval.
2. Fast Logging is active.
3. The Real Time Mode is active and the selected Excitation Time is equal to or greater than the Real Time Mode update interval (the Real Time Mode update interval is 2 seconds unless "When Logging" is selected).

If any of the 3 conditions listed above are true for an extended period of time, the battery life displayed in the "Estimated battery life" field (see next page) could be significantly reduced.

Estimated milliamps

This field enables LogXR Software to more accurately calculate the Estimated battery life of the current Setup. You can specify the total Estimated milliamps drawn from the D and E terminals. "Estimated milliamps" defaults to 0. It can be increased or decreased by clicking on the up/down arrows.

If no sensors connect to the D or E terminals, leave Estimated milliamps at 0. See the next page for a list of all Pace sensors that connect to the D or E terminals.

Sensor Excitation (cont.)

Pace sensors which require power (excitation) are listed below.

2.5v excitation: Screw terminal D

5v excitation: Screw terminal E (two terminals provided)

Sensor	Current draw (in milliamps) from E terminal unless specified
P300 Pressure, inch H2O ranges	5 (units shipped before Jan 2012: 6 ma)
P300 0-30 psia range	3.5
P350 Pressure (all models)	2
P400 and P450 Pressure (all models)	3.5
P500-Baro Pressure	9
P1600 and P1650 Pressure (all models)	3.5
DC Current Sensor (all Pace models)	11 (units shipped before Jan 2010: 10 ma)
DC Voltage Sensors (all models)	6
TRH-100 Temperature / RH Probe (all models)	0.4
WSD-100 Wind Speed and Direction Sensor	0.2 (D terminal)
SRS-100 Solar Radiation Sensor	1 (units shipped before April 2008: 3 ma)
SRS-200 Solar Radiation Sensor	0.3
EC5 Soil Moisture Sensor	10 (D terminal), 27 ma using E terminal
ES-1 External Switch	4
DISCONTINUED SENSORS	
EC10 and EC20 Soil Moisture Sensor	2 (D terminal, 7 ma using E terminal)
P1000, P1500 Pressure (all models)	3 (P1510 & P1520, 4 ma)
Maximum Current draw from Power Terminals D and E Current draw from the E terminals must be 30 ma or less. Combined current draw (D and E terminals) should be 40 ma or less. Current draw on the D terminal may be up to 60 ma if no current is drawn from the E terminals.	

Add up the total milliamps for all connected sensors and set the "Estimated milliamps" field to this value. Any non-Pace sensor requiring XR5 excitation power should be included as well.

Note: Figuring estimated battery life is optional - it has no effect on the XR5 or LogXR Setups. Currently "Estimated milliamps" is not saved when the Setup is saved.

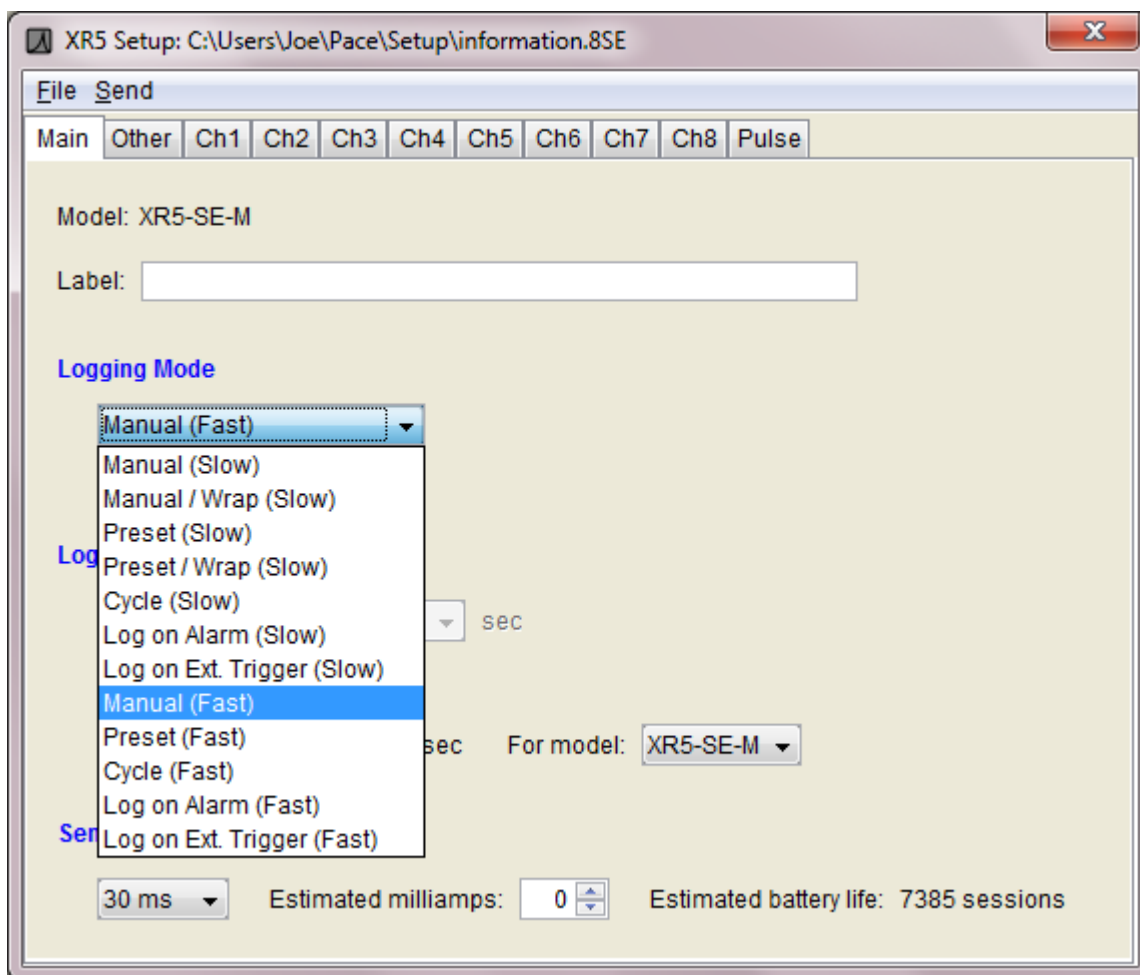
Estimated battery life

Provides a battery life estimate for the selected Setup *and assumes fresh batteries*. Also shows how changes to the Setup affect battery life.

Main factors which determine battery life:

Logging Interval, Excitation milliamps, Excitation time, Channel mode (Standard, Average, Peak), and number of ON channels. "Estimated battery life" does not account for XR5 communication time (Real Time display, Transfer Data, etc.). For typical applications, communication time will not appreciably affect battery life. Constant use (24/7) of the Real Time Graph will greatly reduce battery life. Contact Pace for details.

Logging Mode



Logging modes are available for Slow Logging (1 sec – 12 hr) or Fast Logging (2Hz - 1000Hz).

While a Slow Logging mode is active, all communication functions are available. For example, while logging is active, you may Extract the XR5's Status, display Real Time data or transfer logged data without affecting the ongoing logging session.

For all Fast Logging modes, once logging has started, the XR5 will not respond to any communication requests except **Logging | Stop**.

'Log Ambient' check box

Visible only if the current setup is for an XR5-SE with a millivolt (-mv) option.

Automatically checked if a Thermocouple Type has been selected for one or more channels. Check 'Log Ambient' if you wish to log ambient temperature on a millivolt model's additional (ninth) analog channel (an on-board precision temperature sensor). Only available for XR5-SE models with a millivolt option.

Slow Logging Modes (1 sec – 12 hr logging interval)

Manual (Slow)

Logging will continue until the memory is full, or may be stopped using the **Logging | Stop** selection. Logging may be re-started (**Logging | Start**) and stopped (**Logging | Stop**) any number of times, until the memory is full. Multiple, non-contiguous data sets may be logged to memory using this mode.

Status LEDs

Green: Blinks continuously while logging.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Manual /Wrap (Slow)

Logging will continue indefinitely in a wrap-around mode. Once memory is full, oldest readings will be overwritten by new readings. Logging is stopped using the **Logging | Stop** selection.

Status LEDs

Green: Blinks continuously while logging.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Preset (Slow)

A future Start Time and optional Stop Time is entered. If the Stop Time is already past, it is ignored. Logging will continue until the memory is full or the Stop Time is reached. Logging may be manually stopped by selecting **Logging | Stop**.

Status LEDs

Green: Blinks continuously while logging.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Preset Start /Wrap (Slow)

Logging begins at a selected future Start time. If the Stop Time is already past, it is ignored. Logging will continue indefinitely in a wrap-around mode unless a future Stop Time was selected, in which case logging will stop with the Stop Time is reached. Once memory is full, oldest readings will be overwritten by new readings. Logging may also be stopped using the **Logging | Stop** selection.

Status LEDs

Green: Blinks continuously while logging.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Cycle (Slow)

Select a future “Start” time, “Active” logging time, “Pause” time and a “Stop” time. If the “Stop” time is past, Cycle logging continues until the memory is full. Cycle logging can be manually stopped by selecting **Logging | Stop**. The Active time and then the Pause time continuously repeat until the Stop time is reached or the memory becomes full.

Status LEDs

Green: Blinks during “Active” Logging interval, OFF during “Pause” interval.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Log On Alarm (Slow)

Data is logged (on all ON channels) only while one or more alarms are active. Alarm conditions are monitored at the selected Log Interval, so an alarm condition must be maintained for one Log Interval to insure that it will be logged. High and/or Low Alarm limits may be individually set on any number of analog channels. An alarm becomes active when a channel's sensor or signal value is above an enabled High Alarm level or below an enabled Low Alarm level. Logging stops when no alarm conditions exist or when the memory becomes full or by selecting **Logging | Stop**. Logging may be retriggered (any number of times) by one or more recurring alarm conditions until the memory becomes full.

Status LEDs

Green: Blinks continuously once setup is sent, even if alarm condition is not present.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Log on Ext. Trigger (Slow)

Data is logged only while the external trigger (screw terminal X) is in the selected state. The trigger state is selected using the "Type" selection for Channel X in the "Pulse" tab. When the trigger state is selected on Channel X, a Stop Delay may be selected, which causes logging to continue after the selected trigger condition is no longer present for the duration of the Stop Delay time.

The trigger input is polled every second, so data logging will begin within one second after the trigger becomes active. Controlled by the trigger input, any number of separate data sets may be logged in this mode until the memory is full. The logging session continues until the memory is full or **Logging | Stop** is selected.

Status LEDs

Green: Blinks continuously once setup is sent, even if the trigger condition is not present.

Red: Blinks continuously once an alarm condition has occurred during the logging session.

Stop Delay

A Stop Delay is available for **Log on Ext. Trigger (Slow)**. Immediately after a 'stop logging' trigger state occurs, logging will continue for the duration of the Stop Delay time. Click on the Stop Delay time field to set the Stop Delay. The Stop Delay can be set for any time between 1 second and 18 hours.

A 'start logging' trigger state which occurs and is maintained for at least one second while the Stop Delay is active will clear the Stop Delay timer and cause logging to resume.

A Stop Delay of all zeros disables the Stop Delay.

The Stop Delay is only available for **Log on Ext. Trigger (Slow)**.

Fast Logging Modes (2 Hz – 1000 Hz)

While Fast Logging is active, the Pulse inputs, Real Time Mode and Data Transfers are disabled. Alarm generation is disabled unless logging mode “Log on Alarm (Fast)” is selected. A Fast Logging session is terminated in one of three ways: the XR5’s memory becomes full, the Stop Time has been reached (Preset and Cycle logging modes), or by selecting **Logging | Stop**.

The four fastest logging rates only work with a limited number of ON channels:

Fast Logging Rate	Maximum ON Channels
1000 Hz	1
500 Hz	2
250 Hz	4
200 Hz	6
2 Hz - 100 Hz	8

Manual (Fast)

Logging stops when the memory becomes full or by selecting **Logging | Stop**.

Status LEDs

Green: Blinks continuously once Logging is manually started. Off when Logging is manually stopped or memory becomes full.

Red: Off (alarm generation is disabled).

Preset (Fast)

Logging begins at a future selected Start Time. If the selected Stop Time is already past, it is ignored.

Logging stops when the memory becomes full, or the selected Stop Time is reached, or by selecting **Logging | Stop**.

Status LEDs

Green: Blinks continuously once Preset time is reached. Off when Logging is manually stopped or the memory becomes full, or the Stop Time is reached.

Red: Off (alarm generation is disabled).

Cycle (Fast)

Enter a future “Start” time, “Active” logging time duration, “Pause” time duration and “Stop” time. If the “Stop” time is already past, it is ignored. Cycle logging continues until the memory is full, or the Stop Time is reached, or by selecting **Logging | Stop**. Note: When a setup is send with this logging mode, communication is available (**Status | Extract, Real Time | Text**, etc.), until the Preset Time is reached. Once the preset time is reached, Fast Logging becomes active. The only communication command that the XR5 will respond to while Fast Logging is active is **Logging | Stop**.

Status LEDs

Green: Blinks continuously once Preset time is reached. Continues to blink during Pause time. Off when Logging is manually stopped, memory becomes full, or Stop Time is reached.

Red: Off (alarm generation is disabled).

Log on Alarm (Fast)

Fast Log (on all ON channels) only while one or more alarms are active. Alarm conditions are monitored at the selected logging rate (2Hz – 1000Hz). High and/or Low Alarm limits may be individually set on any number of analog channels. An alarm becomes active when a channel's sensor or signal value is above an enabled High Alarm level or below an enabled Low Alarm level. Logging stops if no alarms are active. Logging also stops when the memory becomes full or by selecting **Logging | Stop**. Logging may be re-triggered any number of times by one or more alarms until the memory is full.

Status LEDs

Green: Blinks continuously once setup is sent, even if alarm condition is not present.

Red: On while logging (one or more alarms active).

Notes:

When a Log on Alarm (Fast) setup is sent, fast sampling commences immediately, and the XR5 will not respond to any communications except **Logging | Stop**. Communications remain disabled until the user selects **Logging | Stop**, or when logging automatically stops because the memory is full.

Rapid cycling (for example: logging starts, then stops, then starts, then stops, over a total time of less than 1 second) can result in loss of data.

If Channel Z is set to Alarm Output, the Z terminal is high when logging is active, and low when not logging (the Z terminal has no drive current; a relay module is available from Pace).

Battery Life

Fast Logging uses up to 30 times more power than Slow Logging modes. Log an Alarm (Fast) and Log on Ext. Trigger (Fast) have the possibility of "waiting" indefinitely (while consuming high power). In this case, the XR5's batteries could discharge quickly (for example, in 1 month) while waiting for an Alarm. Using a Pace PS-9V Power Supply eliminates battery drain.

Log on Ext. Trigger (Fast)

Data is logged only while the external trigger (Screw terminal X) is in the logging state (selected using the "Type" selection for Channel X in the "Pulse Channels" tab). The trigger input is polled at the selected logging rate (2Hz – 1000Hz), and logging starts within one logging interval after the trigger becomes active. For example, if 100Hz is selected, logging will begin within 10 milliseconds after the trigger input changes to the logging state. Controlled by the trigger input, any number of data sets may be logged until memory is full. Logging continues until memory is full or **Logging | Stop** from the main menu is selected.

Status LEDs

Green: Blinks continuously once setup is sent, even if valid trigger condition is not present.

Red: On if actively logging data (trigger is in the "logging" state);

Notes:

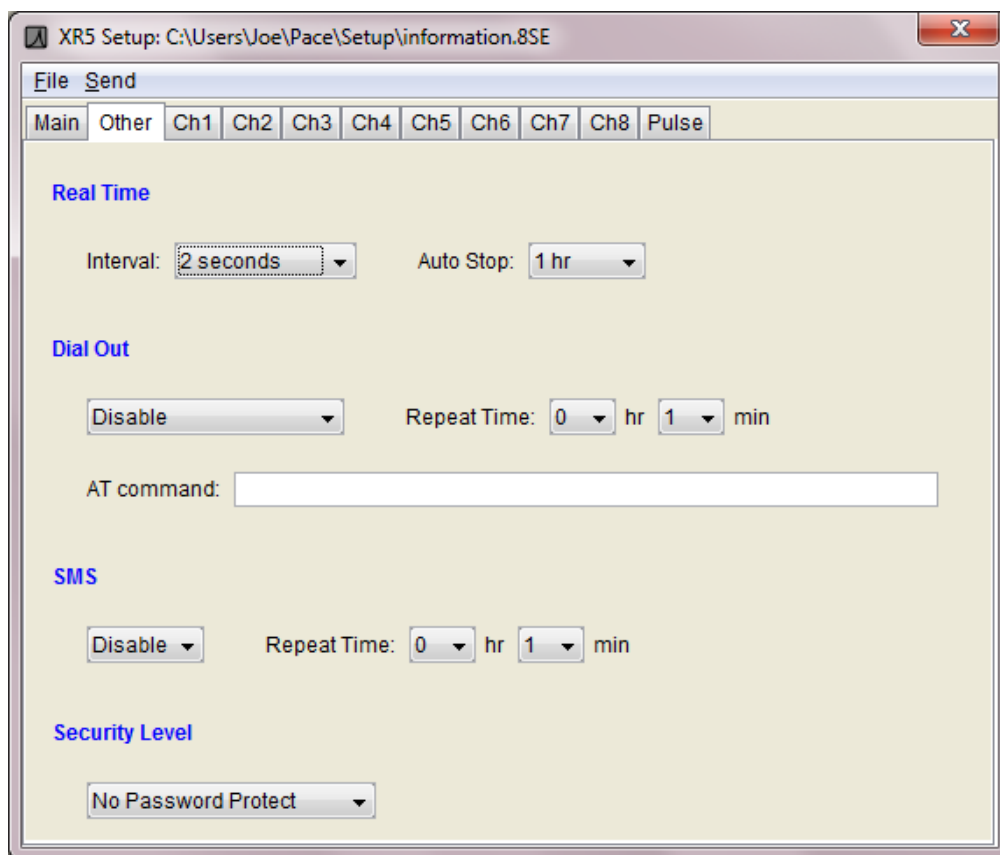
The XR5 will not respond to communications for the duration of the logging session, except for the menu selection **Logging | Stop**. Until **Logging | Stop** is selected, or the logging session terminates due to a full memory, the XR5 will not respond to any other menu command.

Rapid cycling (for example: logging starts, then stops, then starts, then stops, over a total time of less than 1 second) can result in loss of data.

Battery Life

Fast Logging uses up to 30 times more power than Slow Logging modes. Log an Alarm (Fast) and Log on Ext. Trigger (Fast) have the possibility of "waiting" indefinitely (while consuming high power). In this case, the XR5's batteries could discharge quickly (for example, in 1 month) while waiting for a Trigger. Using a Pace PS-9V Power Supply eliminates battery drain.

Setup, Other tab



Real Time Settings

Update mode

2 seconds

Real Time display (Text or Graph) updates every 2 seconds
(**recommended setting**).

When Logging

Real Time display updates whenever readings are logged to XR5's memory (controlled by the Logging Interval selected in the Main tab of the Setup).

Log Stream

Special mode, currently undocumented, for future use.

Auto Stop

The Real Time mode (if active) automatically terminates after Auto Stop hours has elapsed. Select Disable for no Auto Stop.

Purpose of Auto Stop

Auto Stop prevents unintended power consumption when using the Real Time mode. For example, after using the Real Time mode at a logging site, the IC209 Cable is detached before exiting out of LogXR's Real Time screen. As a result, Real Time data transmissions will continue until communication is re-established with the XR5, or the Auto Stop time has elapsed. Average power consumption is about 20 times higher when the Real Time mode is active.

Dial Out

Note: this feature is not currently implemented in LogXR Software.

When the selected dial-out condition is met, the XR5 signals the connected modem to dial-out and connect to a modem-equipped central computer.

Dial Out Condition

Disable	Disables all dial out functions.
Upon Alarm	Enables Alarm dial out.
Upon Time*	Enables Timed dial out and specifies a Timed dial out Interval.
Upon Time and Alarm*	Enables both Timed dial out and Alarm dial out.
Upon Memory 75% Full	Dial out occurs when XR5's memory is 75% full.

*Dial Out Time

Interval	Specify the time and the number of days between dial outs
Daily	Specify the daily dial out time.
Monthly	Specify the day of the month and the time of the dial out.

Repeat Time

Specifies the retry time delay if a Timed dial out is unsuccessful.

AT Command

Enter the AT command string to dial the phone number of the central "Host" computer. This string begins with "ATDT" and is followed by the phone number of the central computer's modem. For example, if the remote site needs to dial 111-222-3333 to reach the central computer, the AT command string would be "ATDT-111-222-3333" (Dash characters are ignored).

SMS

Disable /Enable

Enable: Turns on SMS alarm message generation. See page 43 for details.

Repeat Time

Specifies how often an SMS is sent if the alarm condition remains active.

Password Settings

Security Level

No Password Protect

Password not required.

Password Protect Setup

Password is required to send an XR5 Setup.

Password Protect System

Password is required for all XR5 communication.

The XR5's password is set from the main menu by clicking **Utilities | Change XR5 Password**. In order to change the XR5's password, you must know its current password. The XR5 ships from the factory with a password of "password".

If a Setup with the Security Level set for **Password Protect System** is sent to an XR5, then the XR5's password will have to be entered for any additional communications.

If a Setup with the Security Level set for **Password Protect Setup** is sent to an XR5, then the XR5's password will have to be entered in order to send a Setup.

Setup, Ch1-Ch8 Tabs

The screenshot shows the 'XR5 Setup' window with the 'Ch1' tab selected. The window title is 'XR5 Setup: C:\Users\Joe\Pace\Setup\information.8SE'. The 'Main' tab is also visible. The 'Ch1' tab contains the following fields and controls:

- Ch1:** A button labeled 'ON'.
- Description:** A text input field.
- Type:** A dropdown menu currently showing 'Temperature PT9xx (C.rvt)'.
- Mode:** A dropdown menu currently showing 'Standard'.
- Slope:** A text input field with the value '1.0'.
- Offset:** A text input field with the value '0.0'.
- Calculate Slope/Offset:** A button.
- Alarm Limits:** A section with two checkboxes:
 - ☐ High: 77.00
 - ☐ Low: 65.20
- SMS Alarm:** A section with two text input fields:
 - Phone #:
 - Message:

Channel ON/OFF button

Click to set channel ON or OFF. ON channels will log readings to memory when logging is active. OFF channels will not log readings to memory.

Description

Channel description (up to 24 characters).

Type

The following channel Type selections are available for each analog channel (1-8).

Temperature (A.rvt)	YSI 10k Thermistor (H mix)
Temperature (B.rvt)	YSI 10k Thermistor (B mix)
Temperature PT9xx (C.rvt)	Pace PT9xx Series Temperature Probe.
Temperature PT510 (P.rvt)	Pace PT510 or PT520 Platinum 10k RTD
Light Sensor LS100 (L.rvt)	Pace LS100 Light Sensor
Switch or Contact Closure	Unpowered Switch Closure
Resistance	Two-wire resistance (range midpoint is 30k ohm)
0- 2.5V	0-2.5v input (impedance >10M ohm)
0- 5V	0-5v input (impedance >10M ohm)

The following selections are available on even numbered channels only :

TRH-100 Humidity Probe Pace TRH-100 Temperature / Humidity Probe
see page 71 for details.

TRH-160 Humidity Probe Pace TRH-160 Temperature / Humidity Probe
see page 72 for details.

For models with a millivolt option, additional channel Type selections are available for each analog channel (1-8):

Millivolt Millivolt input; Millivolt range is determined by the XR5's millivolt option and the Full Range / Half Range selection (see table below).

B Type	B Type Thermocouple
C Type	C Type Thermocouple
E Type	E Type Thermocouple
J Type	J Type Thermocouple
K Type	K Type Thermocouple
N Type	N Type Thermocouple
R Type	R Type Thermocouple
S Type	S Type Thermocouple
T Type	T Type Thermocouple
E Type Cold	E Type Thermocouple, cold temperature range
J Type Cold	J Type Thermocouple, cold temperature range
K Type Cold	K Type Thermocouple, cold temperature range
N Type Cold	N Type Thermocouple, cold temperature range
T Type Cold	T Type Thermocouple, cold temperature range

A thermocouple's temperature range is set by the channel Type selection (above) and the millivolt input range (see tables starting on page 98). The XR5 model and Full Range / Half Range selection determines the millivolt input range.

Full Range / Half Range millivolt range selection

Full Range / Half Range selection is visible only if the XR5-SE has a millivolt option. The selection is enabled if the channel Type is set to 'millivolt' or if a thermocouple is selected. The Full Range / Half Range selection sets the millivolt range for the selected channel. Select 'Half Range' if the resulting range is within the span of the signal to be measured (see table below). Half Range provides 2X higher measurement resolution compared to Full Range.

Model number	'Full Range' selected		'Half Range' selected	
	range	resolution	range	resolution
XR5-SE-20mv	0-20 mv	4.8 μ V	0-10 mv	2.4 μ V
XR5-SE-50mv	0-50 mv	12 μ V	0-25 mv	6 μ V
XR5-SE-100mv	0-100 mv	24 μ V	0-50 mv	12 μ V
XR5-SE-250mv	0-250 mv	61 μ V	0-125 mv	30 μ V
XR5-SE-500mv	0-500 mv	122 μ V	0-250 mv	61 μ V
XR5-SE-1000mv	0-1000 mv	244 μ V	0-500 mv	122 μ V

For Thermocouples, select 'Full Range' or 'Half Range' using the Thermocouple tables beginning on page 98. Use 'Half Range' if your Thermocouple's temperature range will be within the smaller millivolt range listed in the Thermocouple table for your XR5 model.

Mode

The following Channel Mode selections are available for the analog channels (1-8).

Standard

Store reading at selected Logging Interval.

Average*

Accumulate readings every second, store Average value at selected Logging Interval.

Peak*

Acquire readings every second, store Peak reading at selected Logging Interval.

Differential

Subtract reading of immediately lower channel number from reading of selected channel, and store this differential value at the selected Logging Interval.

The Differential selection is available on even numbered channels

<u>Channel</u>	<u>Log value of</u>
2	Channel 1 - Channel 2
4	Channel 3 - Channel 4
6	Channel 5 - Channel 6
8	Channel 7 - Channel 8

** Average and Peak channel modes only function in the following Slow Logging modes: Manual, Manual/Wrap, Preset, Preset/Wrap and Cycle.*

Slope / Offset

Editable only if channel Type is 0-2.5v, 0-5v or optional 'Millivolt' range.

Slope and Offset values for all PACE Sensors are listed in the Appendix.
For 4-20ma applications, see pages 92-93.

To scale data in actual volts for 0-2.5v or 0-5v ranges, or in millivolts for optional millivolt ranges, use Slope = 1, Offset = 0

For "raw" unscaled 12 bit data (displayed as values from 0 to 4095) enter the following:

<u>Range</u>	<u>Slope</u>	<u>Offset</u>
0-2.5v	1638	0
0-5v	819	0

Slope / Offset values for External Scaling Cables (for direct voltage readings) are listed on page 88.

For channels 1 through 8, slope and offset values can range from 16383 to -16383 if whole numbers are entered. Decimal values can range from 163.83 to -163.83 (a maximum of 2 digits after the decimal point; additional digits are ignored).

Pulse channels X, Y, and Z accept a wider range of slope and offset values.

Non-Pace Transducers

For scaling non-Pace, voltage output transducers, see page 91-92.

For 4-20ma signals, click "Current Loop" and see pages 93-94 for additional details.

Alarm High / Alarm Low

High and Low alarms may be enabled for each channel. If an Alarm for a channel is Enabled, and an alarm condition occurs after a Logging session has begun, the Red LED will blink every 5 seconds (slow logging modes only). The Red LED will continue to blink until a new logging session is started (a new Setup is sent to the XR5 or **Logging | Start** is selected).

Notes:

1. A Channel Alarm may be enabled even if the channel itself is set to OFF. In this case, an Alarm will be generated if the channel input exceeds its Alarm limits even though no data is being logged for the OFF channel.
2. Channels are checked for alarms only at the selected Log Interval. If a channel exceeds its alarm limit between log intervals, and at log time the channel no longer exceeds its alarm limit, then no alarm will be generated.
3. Alarm conditions can only be generated if Logging is active. Once Logging has stopped (by selecting **Logging | Stop**, or because a stop condition determined by the logging mode has occurred (for example: memory is full, or the Preset Stop time was reached)), then Alarm conditions can no longer be generated.

Alarm Limitations:

1. Differential Temperature Alarm: Only Pace PT9xx series precision 30K thermistor probes (or equivalent) may be used to generate XR5 differential temperature alarms. Type: "Temperature PT9xx (C.rvt)" must be selected for both differential channels.
2. Channel alarms are disabled for all Fast Logging modes except "Log on Alarm".
3. Thermocouple temperature data is calculated in LogXR Software using the logged XR5 ambient temperature values for thermocouple cold-junction compensation. XR5 thermocouple alarm limits are not temperature-compensated but use a fixed cold-junction temperature of 25°C. Therefore thermocouple alarm limits must be considered as approximate values. Ambient temperature variation of the XR5 from 25°C will alter any thermocouple alarm limit by the same amount.

Alarm Limits

Enter High and/or Low alarm limits for the selected channel. The Allowable Range is based on the selected channel Type and current Slope and Offset values. The "Actual value" is calculated from your entered value based on the 12 bit resolution of the XR5.

For Temperatures, the Allowable range is based on the temperature scale selected in File | Preferences (LogXR | Preferences on Mac OS X).

Thermocouple alarms (millivolt models): Thermocouple alarm limits are approximate values (see next paragraph).

Thermocouple Alarm limitation

Thermocouple Alarm processing in the XR5 presently uses a fixed cold junction temperature of 25°C (77°F). The XR5's ambient temperature difference from 25°C (77°F) shifts all Thermocouple Alarm Limits by the same amount.

For example, if a Thermocouple Alarm Limit is set to 400 deg. C, and the XR5 ambient temperature is 15°C, then the actual Alarm Limit will be 390°C. If the XR5's ambient temperature then rises to 35°C, the actual Alarm Limit becomes 410°C.

The above limitation only affects Thermocouple alarm limits.

Thermocouple temperature readings are accurate over the full ambient temperature range of the XR5.

SMS Alarm

This function is available when the XR5 is connected to a Pace approved GSM data modem operating on circuit switched data service (see page 105 for details).

Note to USA customers:

Before purchasing cellular modem hardware (see page 105) to implement SMS Alarming, first contact Pace at 704-799-0688 for cellular service details, in order to verify that the necessary service is available in your area.

Phone

Enter a cell phone number that will receive the channel alarm in the form of an SMS text message when an alarm condition on the current channel is active.

Message:

Enter a descriptive text message that will make up a portion of the alarm message that will be sent when an alarm condition on the current channel is active. The alarm message will also include the channel number that is causing the alarm, and the current, scaled reading of the channel.

For SMS Alarms to function, SMS must be set to "Enable" in the **Setup | Other** tab, and a High and/or Low Alarm Limit must be checked and the Alarm value entered. SMS Alarms will only function when a GSM modem, set up for "circuit switched" data/fax service by your local GSM cellular carrier, is connected to the XR5 using the Pace ICW-15 Cable. Please see page 105 for additional details.

Sensor limitation for SMS Alarm readings:

The XR5 can output scaled SMS alarm readings for any sensor or signal with slope/offset scaling, or any PT9xx series Temperature Probe. All other sensors or signals not using slope/offset scaling will output a voltage value and not scaled readings. The XR5 can be user-configured to output scaled SMS Alarm readings for other resistive sensors (like the PT510 Temperature Sensor or LS100 Light Sensor). Please contact Pace for details.

Setup, Pulse Channels tab

The screenshot shows the 'XR5 Setup' dialog box with the 'Pulse' tab selected. The dialog has a menu bar with 'File' and 'Send'. Below the menu bar are tabs for 'Main', 'Other', 'Ch1', 'Ch2', 'Ch3', 'Ch4', 'Ch5', 'Ch6', 'Ch7', 'Ch8', and 'Pulse'. The 'Pulse' tab is active, showing settings for three channels: ChX, ChY, and ChZ.

- ChX:** ON. Description: Wind Speed, Avg. Type: Solid State Switch. Frequency: ☒. Slope: 2.25. Offset: 0.
- ChY:** ON. Description: Wind Speed, Peak. Type: Mechanical Switch. Frequency: ☒. Peak (2 secs): ☒. Slope: 2.25. Offset: 0.
- ChZ:** OFF. Description: (empty). Type: Mechanical Switch. Frequency: ☐. Slope: 1. Offset: 0.

Ch ON/OFF

Sets the individual Pulse channel [X,Y or Z] to ON (enabled) or OFF (disabled).

Description

Enter a channel description of up to 16 characters.

Type

Select a Pulse type:

Mechanical Switch

Solid State Switch

Count pulses and store the pulse count at the selected Logging Interval. Reset the pulse count to 0 at start of each log interval. All pulse counting channels are disabled if Fast Logging is active. Select **Mechanical Switch** for pulse signals from 0 to 15 Hz. Select **Solid State Switch** for pulse signals having a maximum rate of 900 Hz.

Note: The above two selections set the XR5's switch debounce timer. The debounce time for **Mechanical Switch** is 30 ms; the debounce time for **Solid State Switch** is 0.5 ms.

Trigger: Log if ChX High (Switch Open)

Trigger: Log if ChX Low (Switch Closed)

Available on ChX only. Use with Log mode **Log on Ext. Trigger** (Slow or Fast). Specifies the active trigger state:

Log if ChX High (Switch Open): Voltage (2.3v to 18v) or unpowered switch.

Log if ChX Low (Switch Closed): Voltage (-18v to 0.5v) or unpowered switch.

Stop Delay

A Stop Delay is available if **Log on Ext. Trigger (Slow)** has been selected in the Main Setup tab and a Trigger mode is selected for ChX. If the Stop Delay is enabled, then after a "stop logging" trigger state occurs, logging will continue for the duration of the Stop Delay time. The Stop Delay can be set for any time between 1 second and 18 hours. See page 33 for more details.

Alarm Output

Available on Channel Z only; Output must be externally buffered. A driver module for a solid state relay (AC or DC) is available, contact Pace for details.

If a 100k resistor is connected from Z to ground, the Z terminal will read about 0.2 vdc if no alarm, and about 1.6vdc if one or more alarms are active AND logging is active.

Frequency check box

Checking "Frequency" converts the accumulated pulse count to average frequency in Hertz (average frequency of each log interval) in any transferred data files. The XR5's upper frequency limit is about 900Hz. If Frequency is checked, the Slope and Offset values are applied to the calculated Frequency before being written to the data file.

Peak check box

Available for channel Y only; If checked, the highest pulse count over a 2 second interval is stored for the selected log interval. Use to log Peak Wind Speed using the Pace WSD-100 Wind Speed and Direction sensor.

Slope and Offset

Slope and Offset edit boxes allow the pulse channel's count to be scaled to display the desired unit of measure. The raw pulse count is multiplied by the current slope and then the offset value is added to the result. The slope can be used either as a multiplier or a divider. For example, if the slope is set to 0.001, the raw pulse count will be divided by 1000. Setting the Slope to 1 and the Offset to 0 results in the actual "raw" pulse count with no scaling applied. Slope and Offset values can range from 21474.8 to -21474.8. Up to 6 digits may be entered plus an optional minus sign and a decimal point. The smallest fractional slope or offset value is +/-0.00001.

Pulse inputs and the Real Time display

With XR5 Firmware version 1.01.04 and higher, Real Time readings are scaled using the corresponding Slope and Offset values. If Frequency is checked (in the Setup), the Pulse Frequency is calculated (averaged over the 2 second update interval) and then Slope and Offset scaling applied.

Prior to XR5 Firmware 1.01.04, Slope, Offset, and Frequency settings for the pulse channels were applied only to the XR5 data files (**Transfer | All Data**).

Notes

1. Selecting a trigger mode on ChX automatically disables Channel X for pulse counting.
2. Selecting Alarm Output on ChZ automatically disables Channel Z for pulse counting.
3. The Alarm Output follows the current alarm conditions while logging is active. If an alarm condition goes away, the Alarm Output will go low, if an alarm condition once again becomes active, the Alarm Output will go high. When logging stops the Alarm Output will go low, even if the alarm condition remains.
4. The Alarm Output has no drive capability. A relay module is available; contact Pace for details.
5. The Alarm Output functions with all slow logging modes, and with Log on Alarm (Fast).
6. The Peak function requires firmware 1.01.00 or higher.

Sending a Setup to the XR5

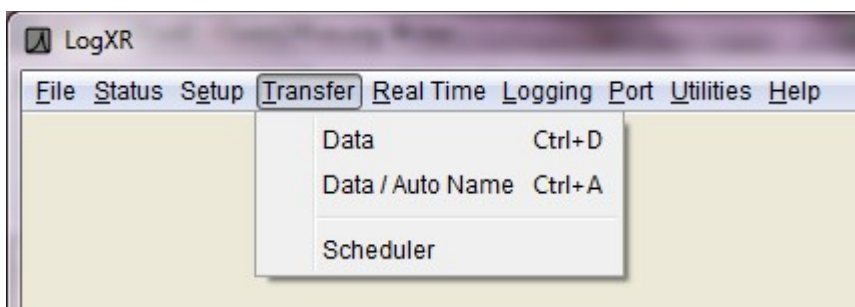
Once you have configured a Setup for your intended logging session, the Setup must be sent to the XR5 to take effect. From the Setup menu, select **Send | Send Setup**. If your setup has invalid selections a warning screen will appear. Unless your selected logging mode is "Log on Ext. Trigger" or has a Preset Start Time, you will be asked if you want to start logging immediately. You can choose to start logging immediately, or you can start logging at a later time (by selecting **Logging | Start** from the Main Menu).

Saving a Setup for future use

You may save any Setup as a named file by selecting **File | Save As...** from the Setup menu. All Setup files are saved with the indicated file extension for the currently selected model.

Loading a saved Setup file

From the Main Menu, select **Setup | Open**. In the Open Setup File dialog, click on the 'Files of Type' drop down box and select your XR5 model. All previously saved files for your model will be listed. Selecting a Setup file loads the file's parameters into the Setup screen. The Setup can then be Sent to the XR5 by selecting **Send | Send Setup** from the Setup menu.



Transfer | Data

Enter a file name for the transferred data. Data is transferred as a binary file. After the transfer is complete, LogXR creates a readable text file from the binary file. The text file consists of a “header” portion (information pertaining to the XR5’s setup during the logging session) followed by all of the logged data. The file has a “.txt” or “.csv” file name extension (determined by a **File | Preferences** selection, see pages 19-20). After the transfer is complete, data can be viewed graphically, or as text file. The file may also be opened in another program such as Notepad or Excel. Please see page 102 for details on using LogXR Graph.

Data Integrity

To verify that a LogXR Data File has not been modified or manually altered, select **Utilities | Verify Data**. After selecting the data file you wish to check, LogXR will display the status of the file. Manually adding (or editing) text at the very end of a LogXR data file (after the data portion) does not alter the file’s data integrity. Manually altering any other part of the file (data or header) will cause **Utilities | Verify Data** to display a “Modified” status.

Transfer | Data / Auto-Name

A faster way to transfer data from an XR5. Same as **Transfer | Data** except the transferred data file is automatically named by LogXR Software. The file name is constructed as follows:

The first part of the file name consist of the XR5’s factory embedded serial number (8 digits) followed by a “-” character *. The final 5 characters of the filename consist of a LogXR generated 5 digit auto-incrementing number starting with 00000. Each time another data file is transferred using **Transfer | Data / Auto-Name** this number is incremented by one. The filename ends with the standard LogXR Data File extensions: “.binary” for the binary file and “.txt” or “.csv” for the text file (see next page).

* In addition, the 8 digit user editable Unit ID field is appended to auto generated file names if this function is checked in the **File | Preferences** screen (Mac: **LogXR | Preferences**)

Transfer | Scheduler

Displays the LogXR Scheduler*. The Scheduler facilitates automatic data collection from any number of XR5 Data Loggers connected to a computer via USB (or Com ports) or a Local Area Network**.

* LogXR includes a separate Dial-up Scheduler to automatically collect data from remote XR5 units over phone lines. See page 105 for details.

** A Pace DS100 Ethernet Module is required to connect an XR5 to a LAN (details on page 59).

The Scheduler is arranged in a series of "rows". Each row defines a Project Folder name for storing the collected data, a "Location" which also defines the physical connection (Ethernet LAN, USB or Com Port), and the desired collection time. The left side of the Scheduler is divided into two panes (upper and lower). The upper pane lists the collected data files for the currently selected row. The bottom pane displays the Setup file (if present) for the currently selected row (details on the next page).

You create a schedule by clicking on the first available row under "Project Folder" and enter a folder name, then select the Location (Port) and finally the Collection time. These selections are explained below.

Project Folder

Choose a folder name that will become the "parent" folder for the collected data. Each row can have a different Project Folder name, or a combination of the same or different folder names may be used. If multiple remote sites belong to the same group or logging project, we suggest you use the same folder name for each logger in a given group, to help organize your collected data. Alternately, all data files can be transferred to the same folder selected in Transfer | Data from the main menu (see Options selection, below).

Location (Port)

Choose a Port from the list. Any Ethernet port you intend to use must have been previously created using a Pace DS100 module and main menu **Port | Network | New Network Port** selection (see page 59).

Collection Time

Choose a collection interval of Hourly, Daily, Weekly, or Monthly.

Hourly:

Select the minute after the hour. Data will be collected every hour at the specified minute.

Note: If you wish to collect data multiple times each hour, create multiple rows for the same XR5 and select a different minute value for each row.

Daily:

Select the time each day that the collection will occur. The hour selection is in 24 hour time format (for example, 10 AM = 10, 2 PM = 14, 5 PM = 17, etc).

Note: If you wish to collect data twice daily, create two rows for the same XR5 and set the Daily collection times 12 hours apart.

Weekly:

Select the day of the week and the time that the collection will occur.

Monthly:

Select the day of the month and the time that the collection will occur.

(Optional) Sending a Setup to reset the XR5

Immediately after successfully collecting data from an XR5, the Scheduler can send a Setup to clear the XR5's memory, resynchronize its time clock, and re-start logging. Each completed row in the Scheduler has a corresponding Setup folder. When a row is selected (clicked) the Setup pane (lower left pane) lists the Setup file, if it is present, for the selected row.

The presence of a Setup file in the Setup pane determines if a Setup will be sent after collecting data. If no Setup file is present (the default state), a setup is not sent after data has been collected. The directory path to locate the Setup folder for the selected row is listed directly above the Setup pane.

To copy an XR5 Setup file into this folder, use a file navigation program (on Windows systems, hold down the Window button (beside the Alt Key) and press E to launch Windows Explorer). Then navigate to and select a previously saved Setup file, select Copy, then navigate to the selected row's Setup folder (directory path listed above the Setup pane) and select Paste.

Setup file requirements

1. A Setup file used with the Scheduler must not have preset time fields (for example, a setup with logging mode "Preset (Slow)"). Preset time fields will be invalid after their preset time has been reached.
2. The Setup file must be a setup that was created for your particular XR5 model, otherwise it will not be sent. For example, use **Setup | Extract** to create the setup file.

Existing Setup files can be modified by double clicking the Setup File in the Setup pane. Once you have modified the Setup file, click File | Exit in the Setup window. If you have made changes to the Setup file, the prompt "Do you wish to save changes?" appears. Click Yes, and then click Save. Your modified Setup file is now available to be used by the Scheduler.

Starting the Scheduler

Once one or more rows have been filled, the Scheduler is activated by the menu selection **Contact | Activate List**. See Scheduler menu selections below for details.

Scheduler menu selections:

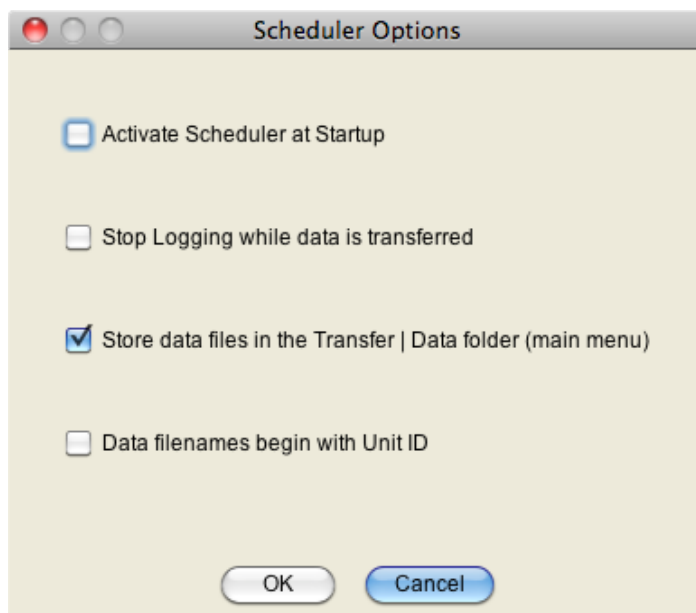
File Options	Display the Options window (see next page)
File Exit	Exit the Scheduler
Edit Modify	Modify the currently selected position on a row (Project Folder, Port, or Collection Time).
Edit Delete	Deletes the currently selected row.

Contact | Contact Selected Unit Now

Brings up a new screen similar to LogXR's Main Menu that allows you to manually communicate with the selected XR5.

Contact | Activate List

Activates the Scheduler. Displays a dialog box to specify a name for the Scheduler's log file. All Scheduler activity will be logged to this file. The same log will be displayed in the Scheduler Activity box that appears when you click the Create button. Clicking "Create" activates the Scheduler. Once the Scheduler is activated, LogXR can not be used for other functions. Clicking Stop on the Scheduler Activity box terminates the Scheduler.

Scheduler Options (File | Options)

Scheduler Options (image from LogXR running on Mac OS X)

Activate Scheduler at Startup

When LogXR is launched, the Scheduler is automatically invoked and activated.

Stop Logging while data is transferred

Allows transfers to occur while Fast Logging is active. Logging restarts after transfer is complete.

Store data files in the Transfer | Data folder (main menu)

All transferred data files (from all projects and ports) are stored in a single common folder (the same folder that data files are stored in when selecting **Transfer | Data** from the main menu). This folder can be changed from **Transfer | Data** by navigating to a new folder before clicking "Begin Transfer".

Data filenames begin with Unit ID

Unit ID is appended to the beginning of all collected data files.

Scheduler limitations:

1. Each Row must list a unique Collection Time. If two rows list the same Collection Time, the second row with the same Collection Time will be ignored by the Scheduler.
2. If data collection is active and "overlaps" a Collection Time listed for another row, that row will be ignored by the Scheduler. Therefore, space each row's Collection Time so that there is sufficient time to transfer data before any other listed Collection Time occurs.

Scheduler notes and tips:

1. The vertical bar that separates the Scheduler rows from the Setup and Data file panes can be dragged with the mouse to provide more viewing area for the Setup and Data panes.
2. The number of USB ports on a computer can be expanded using a "USB Hub" available at computer or office supply outlets. Using the Pace IC209 Cable and USB-A Adapter connected to a USB Hub, any number of XR5 Data Loggers can be "hard wired" to a computer and used with the Scheduler.
3. The number of ports accessible to the Scheduler can also be expanded using Pace DS100 Modules connected to a LAN – see page 59 and following for details.
4. Data files are named as follows: Each data file name begins with the XR5's eight digit Serial Number, followed by a dash "-" character and an auto-incrementing 5 digit number, and a file extension of .txt or .csv based on the main menu's **File | Preferences** selection (Mac: **LogXR | Preferences**). If "**Data filenames begin with Unit ID**" is checked in the Scheduler's **File | Options** window, the XR5's Unit ID is added to the beginning of the filename.

Real Time | Text

The screenshot shows a window titled "Real Time Display" with a close button (X) in the top right corner. The window contains status information at the top and a table of channel readings below.

Status Information:

- Model: XR5-SE-M
- State: Logging
- Update Interval: 2 sec
- Serial #: 2-10-11
- Rev: 1.01.03
- Manual (Slow)
- Last update: 0 sec
- ID: 12345678
- 2 sec
- Scale: F

Chan	Reading	Description	Type	Mode	Slope	Offset	Alarm High	Alarm Low
1: ON	78.40		Temperature PT9xx	Std				
2: ON	76.96		Temperature PT9xx	Std				
3: ON	79.76		Temperature PT9xx	Std				
4: ON	77.08		Temperature PT9xx	Std				
5: ON	79.39		Temperature PT9xx	Std				
6: OFF	1.663		0-5V	Std	1.00	0.00		
7: OFF	0.0012		0-5V	Std	1.00	0.00		
8: OFF	0.1661		0-5V	Std	1.00	0.00		
X: OFF	0.0		Solid State Switch		1	0		
Y: OFF	0.0		Mechanical Switch		1	0		
Z: OFF	0.0		Mechanical Switch		1	0		

At the bottom center of the window is a blue button labeled "STOP".

Displays real time readings for all channels. The update rate (selected in the Setup / Other tab), is either every 2 seconds, or when the XR5 logs data (see page 36 for details).

The upper section displays a subset of the logger's Status information, including Model name and firmware Revision, unit ID, logging State, mode, and interval.

'State:' is the logging state active when the Real Time mode is *first* selected. If a change occurs to the logging state while the Real Time display is active, it will not be updated. For example, if the Log Mode is "Log on Ext. Trigger", and the trigger state changes while the Real Time display is active, so that logging stops, this new State is not displayed. The XR5's real time "data packet" only includes analog and pulse channel data.

Also displayed in the upper section is the Update Interval ("2 sec" or "When Logging"), elapsed time since the Last real time update, temperature Scale, and the logger's Serial number. Models with a Millivolt option also display the current ambient temperature below the Serial number.

Real time data displays in RED if its value exceeds the displayed Alarm limit and has a gray background if its channel is set to OFF.

Only Alarm limits that have been enabled (via the Setup | Channel tab) display in the Alarm High / Alarm Low columns.

" / Half Range" displays in the Type column for a Millivolt or Thermocouple Type if "Half Range" was selected in Setup.

The Real Time Display is not available when Fast Logging (2Hz – 1000Hz) is active.

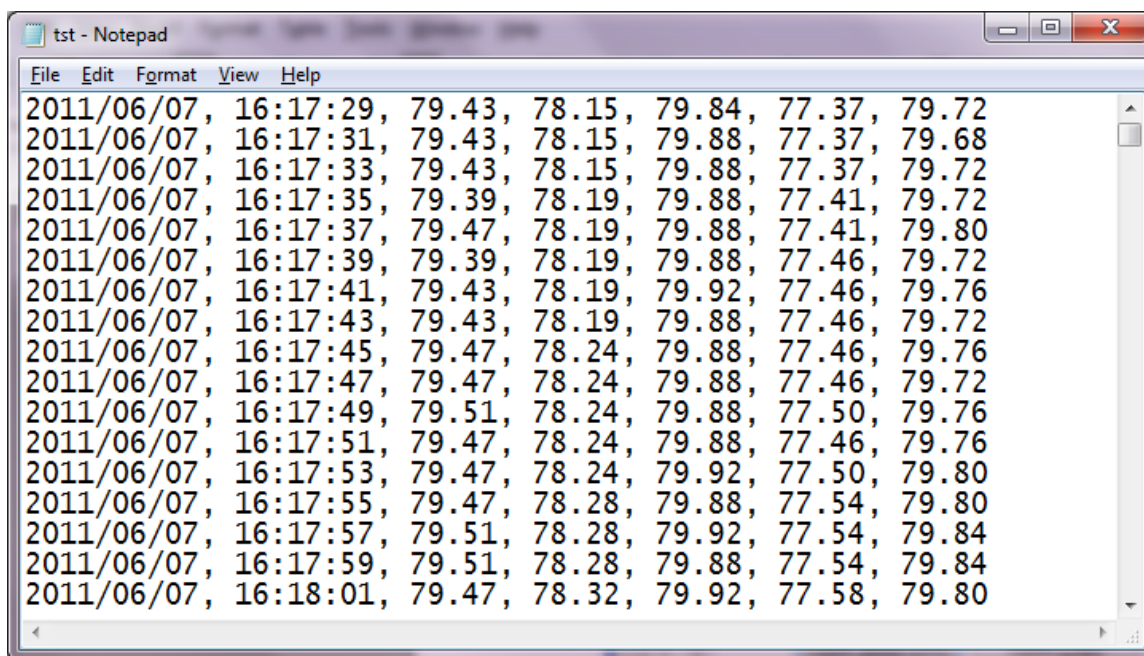
Real Time | Text and write to file

Same display screen as **Real Time | Text**, but real time data is simultaneously written to a text file. You are prompted to enter a file name for the file. A new line of data will be written to the text file whenever the Real Time Display is updated. The file can be opened in a Text Editor like Notepad (see below).

Please Note:

Data files created using **Real Time | Text and write to file** do not contain header information and are therefore currently unviewable in LogXR Graph. They may be graphed using a program such as Excel. If data logging is active while the Real Time Display is active, logged data may be transferred and graphed using LogXR after exiting the Real Time Display.

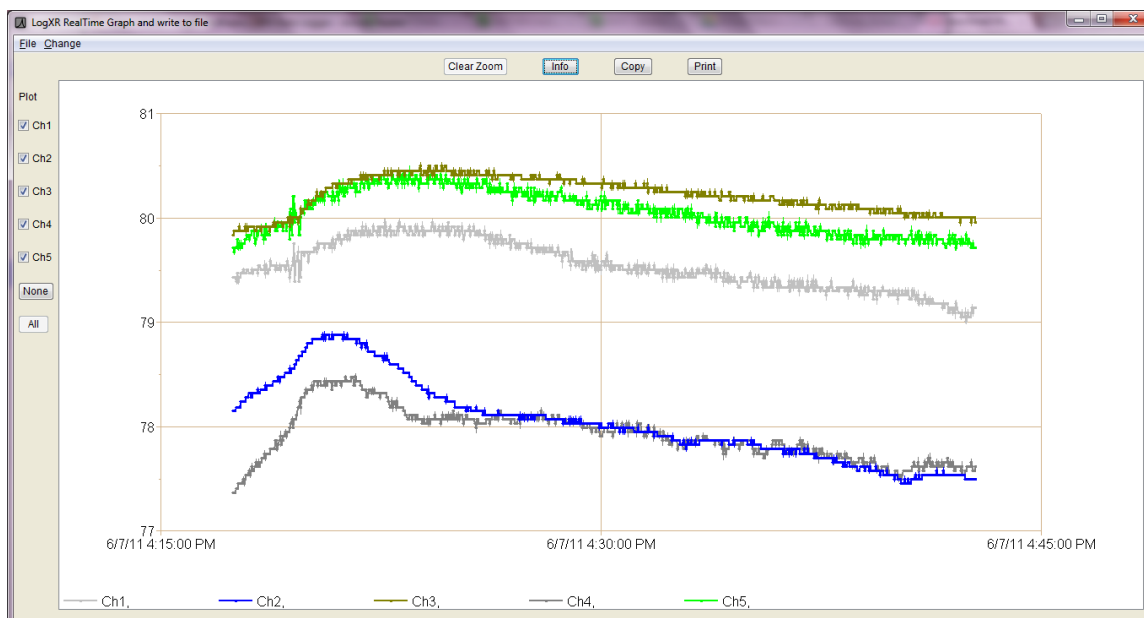
Real Time data is not available when Fast Logging (2Hz – 1000Hz) is active.



View of text file created using **Real Time | Text and write to file** (from Windows Notepad). Only readings of channels set to ON are written to the file.

Real Time | Graph

Displays real time data graphically for all sensors/channels previously set to ON in LogXR's Setup. The update rate (selected in the Setup / Other tab), is either every 2 seconds (recommended setting), or when the XR5 logs data (see page 36 for details). With the standard update rate (2 seconds), once 45 minutes of readings appear on the screen, oldest readings will scroll off as fresh readings are added. Thereafter, the Real Time Graph will continue to dynamically display all readings acquired over the past 45 minutes.



Currently all channels plot on a single "viewport" (and share a single vertical scale). Use the Zoom function (see table below) to expand one or more plots vertically (amplitude) and/or horizontally (time scale). When an area of the Real Time Graph is zoomed that includes the right hand edge of the graph, the zoomed portion will continue to update with fresh readings. When an area of the Real Time Graph is zoomed that does not include the right hand edge, the zoomed portion is static and does not change. Click "Clear Zoom" to display all data points read within the last 45 minutes*.

"Invisible" channels

When a data set has multiple channels with large and small values (for example, a 0-10,000 psi Pressure Sensor and a 0-1 volt signal), the plots of the small values appear missing or barely visible. Use the mouse to create a zoom rectangle along the bottom horizontal border of the graph. The small values can then expand to fill the screen. You can zoom additional times to "fine tune" the bounds of a particular plot or group of plots.

* Time Span of Real Time Graph

Using the recommended Real Time Interval of "2 seconds" selected in the Setup | Other tab, the Real Time Graph will display up to 45 minutes of readings. If "When Logging" is selected, the maximum time span equals the selected Logging Interval times 1350 (Logging Interval * 1350). For example, if "When Logging" and a Logging Interval of 10 seconds are selected, the Real Time Graph will display a maximum of 3.75 hours (13500 seconds) of past readings.

The following controls are available for the Real Time Graph.

Graph control	Description
Plot channel #'s (check box)	Uncheck to “hide” individual channel plots.
None (button)	Hides all channel plots
All (button)	Displays all channels (the default setting)
Zoom (mouse function)	To Zoom, press and hold the left mouse button and drag the mouse across the graph to create a “Zoom rectangle”. When the mouse button is released, the data within the zoom rectangle will fill the entire graph. The Zoom operation may be repeated any number of times.
Clear Zoom (button)	Resets the graph to display up to the last 45 minutes of readings (or all readings if the Real Time Graph display has been active for less than 45 minutes).
Info (button)	Displays the model, serial #, Log Interval and Logging Mode of the XR5 Data Logger currently displaying real time data.
Copy (button)	Copies the current graph to the system clipboard. The graph can then be pasted into a word processing or graphics program, typically by clicking Edit Paste within the other program.
Print (button)	Prints the current graph to the computer's default printer.

Changing colors and plot widths

Select **Change | Settings** on the real time graph menu to change plot colors, plot widths and other parameters. Please see page 104 for details.

Using the Real Time Graph for an extended duration

Constant use (24/7) of the Real Time Graph is possible, but XR5 battery drain is substantially higher. If the Real Time Graph will be in constant use for extended periods of time (a week or more), and connected sensors are wired to the E or D terminals (drawing power), an external power supply is recommended: Pace PS-9V or equivalent, see page 69 for details.

Real Time | Graph and write to file

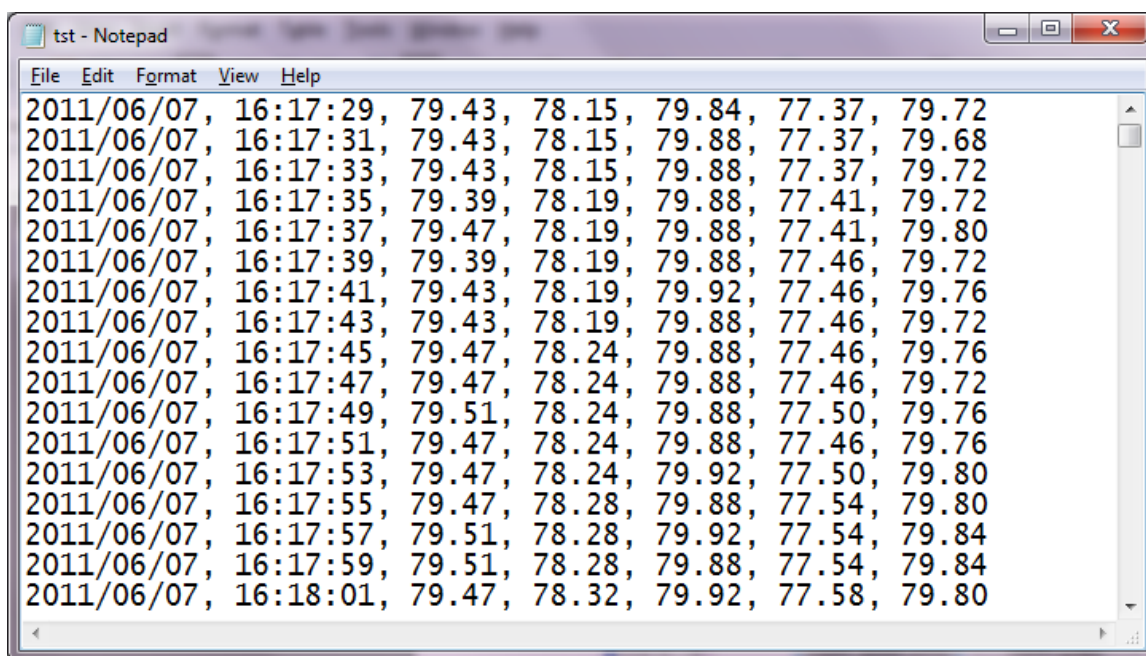
Same as **Real Time | Graph**, but real time display data is simultaneously written to a text file (".txt" or ".csv" file extension, based on the **File | Preferences** selection). You are prompted to enter a file name for the file. A new line of data is written to the text file whenever the Real Time Graph is updated with fresh readings. The file can be opened in a Text Editor like Notepad or a spreadsheet program like Excel.

Please Note:

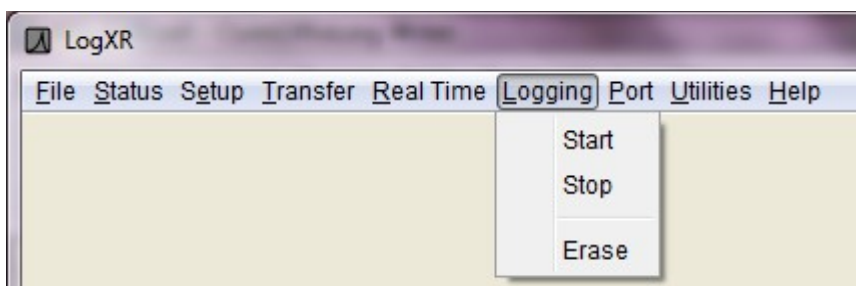
Data files created using **Real Time | Graph and write to file** do not contain header information and are currently unviewable by LogXR Graph (**File | Plot Graph**). They may be graphed using a program such as Excel. If data logging is active while the Real Time Graph is active, logged data may be transferred and graphed by LogXR after exiting Real Time Graph.

The date and time format of the data file uses the following fixed (non-regional) format:
Year / Month / Day Hour : Minute : Second. (Hour field is 24 hour format [0..23]).

Real Time data is not available when Fast Logging (2Hz – 1000Hz) is active.



Typical text file created using **Real Time | Graph and write to file**



Logging | Start

Commands the XR5 to start logging. This selection has no effect if the XR5 is set to a Preset or Cycle Logging mode, or if the XR5 is currently logging. Logging can also start immediately after a setup is sent (a prompt appears) in some Logging modes. If you elect (at the prompt) to not start logging when a setup is sent, use this selection to start logging at a later time.

Note:

Logging | Start does not erase previously logged data if: 1) Manual (Slow) is the logging mode and 2) the XR5's memory is not full.

Logging | Stop

Commands the XR5 to stop logging. This is the only menu selection that the XR5 responds when Fast Logging (2Hz – 1000Hz) is active. In all logging modes except Manual (Slow), this selection ends the logging session. In Manual (Slow), the logging session may be started and stopped any number of times as desired (subject to available memory), in which case the XR5 will store multiple data sets.

Logging | Erase

Commands the XR5 to erase all logged readings. Useful only in special cases. For example: at the completion of a logging session in Manual (Slow) mode, after transferring data (**Transfer | Data**), you can use **Logging | Erase** to permanently delete all existing readings and then re-start logging by selecting **Logging | Start**.

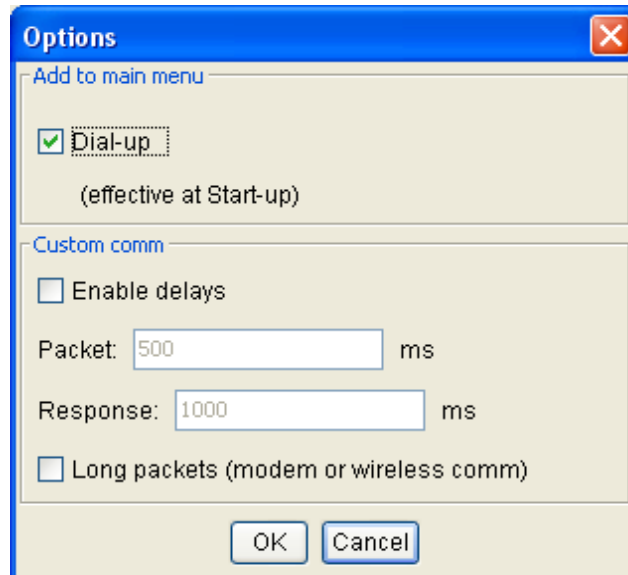
Note:

Sending a Setup to the XR5 is another way to erase all logged readings.

Port | Select

Displays the currently selected Port and a list of available ports. The port list includes all existing com ports, and all Ethernet ports that were previously set up using **Port | Network | New Network Port** (see next page). Select a port for XR5 communication. Click on a port name to select the port.

Port | Options



Port | Options (image from LogXR running on Win XP)

Add to Main Menu

Dial-up

Enables the inclusion of the Dial-up menu selection in the main LogXR menu. After the checkbox is changed, the main menu will not reflect the change until LogXR is terminated and then re-started. Documentation for the Dial-up Menu is in the Appendix, beginning on page 105.

Custom comm

Enable Delays

For cellular communication. Allows the user to specify a custom Packet Delay and Response Timeout. Check only if communicating using a GSM cellular modem.

Packet

We suggest using 2000 ms for cellular communications. If you experience communication failures, increase this value to 3000 or higher (1000 ms = 1 second).

Response

We suggest using 2000 ms for cellular communications. If you experience communication failures, increase this value to 3000 or higher (1000 ms = 1 second).

Long packets

Results in faster data transfers, especially if communicating via the Pace WTP-100 Wireless Link or a modem. Data files are transferred in longer blocks (1024 bytes vs 128 bytes). Requires LogXR 1.01.81 or higher, and XR5 Firmware 1.01.06 or higher.

Port | Network

Configures XR5 Ethernet communications.

New Network Port

Create an Ethernet port to enable XR5 communications over an Ethernet LAN (Local Area Network).

For XR5 Ethernet communications to function, 1) your computer must be connected to an Ethernet LAN (wired or wireless connection), and 2) a Pace DS100 Ethernet Module is connected to the same LAN (a DS100 connection to a Wireless Access Point is also supported).

The **New Network Port** selection sets up an Ethernet port (socket) on your computer for communicating with a specific DS100 Ethernet Module. At the same time, LogXR Software will configure the DS100 Ethernet Module while it is temporarily connected to a serial port on your computer. Once the DS100 Module has been configured, it is then disconnected from your computer's serial port and connected to the LAN. An XR5 is connected to the DS100 Module using the Pace IC209 Interface Cable, thereby connecting the XR5 to the LAN.

Other computers on the same LAN may also communicate with a previously set up XR5 / DS100 Module. In this case, each user launches LogXR Software and selects **Port | Network | New Network Port** to create an Ethernet port that can access the same XR5 / DS100 Module. In this case, after completing steps 1-4 (below), click OK and then click NO when asked if you want to set up a DS100 Module. Steps 5-10 (below) are omitted, since the DS100 Module connected to the XR5 has already been configured.

The following steps enable an XR5 to communicate over an Ethernet LAN:

1. From LogXR Software, select **Port | Network | New Network Port**.
2. Enter a Port Name. The Port Name identifies the location where you intend to connect the DS100 Module to your LAN. The Port Name will be included in the list of ports displayed when **Port | Select** is chosen from the main menu.
3. Enter a compatible IP Address that does not conflict with any other IP Addresses on your LAN (request an IP Address from the System Administrator at your facility).

If you do not have a system administrator, and have a small LAN of Windows XP computers, an IP Address can be obtained as follows: click Start | Control Panel | Network Connections. Then double click your network connection icon, click the Support tab and write down the IP Address shown (this is the IP address for your computer's network connection). Repeat this for all the computers on your network, and then, looking at all the IP address numbers you have written down, you should find that the first 3 numbers of all the IP Addresses are the same, and the last number is different for each computer. Select an IP address for the DS100 that uses these same first three numbers, and select a different 4th number that is not used by any other computer or device on the LAN.

Later, if additional XR5 / DS100 Modules are added to the LAN, select **Port | Network | New Network Port**, and use these same initial 3 numbers for the first 3 numbers of the IP Address, and select a 4th number that is different from all the other IP Addresses on the LAN.

4. Use the default port number of 2048, or any higher number. We strongly suggest you settle on one port number and use this same number consistently when configuring any additional DS100 Modules.
5. Power up the DS100 Module (using the provided power adapter or using a powered Ethernet Cable if the DS100 has the Power Over Ethernet option).
6. Connect a null modem cable (Pace # IC-ES), from the DS100 Module to your currently selected com port (click **Port | Select** from the main menu to see the currently selected com port).
7. Place the DS100 Module into program mode by pushing the button beside the Ethernet jack (two LEDs on top of DS100 will blink alternately). Then click OK and then click YES. The module is now programed with the selected IP Address and Port Number, and then the LEDs will stop blinking.
8. Detach the IC-ES Cable (this cable is only used to configure a DS100).
9. Connect the DS100 to your LAN using a Cat5 patch cable. This cable is not stocked at Pace, but is widely available in assorted lengths at retail computer supply outlets.
10. Connect an XR5 to the DS100 Module using the Pace IC209 Interface Cable.
11. From LogXR's main menu, click **Port | Select**, click the Ethernet port name and click OK.

Now, all LogXR communications (for example: **Status | Extract, Setup | Extract, Transfer | Data, Real Time | Text**, etc) will be directed to the XR5 / DS100 Module that is selected in **Port | Select**.

Modify Network Port

Modify an exiting Ethernet port created by LogXR. In order to propagate the changes to the associated DS100 Module, the module must be connected to a serial port on your computer using the Pace IC-ES cable, and the same serial port must be selected using **Port | Select** just prior to selecting **Port | Network | Modify Network Port**. For instructions, please refer to **New Network Port** (above), as the procedure to modify an existing Ethernet port is the same as creating a new Ethernet port.

Delete Network Port

Delete an Ethernet port previously configured using LogXR. Select the port you wish to delete.

XR5 Ethernet Communications

Communicating with one or more XR5's over an Ethernet LAN functions the same as communicating over a serial port. The Ethernet port is first selected using **Port | Select**.^{*} All menu commands involving communications operate just as if you were connected to a serial com port.

^{*} Listed Ethernet ports are first created using the **Port | Network | New Network Port** menu selection, detailed on the previous page.

Multiple users, all using LogXR Software, can communicate with multiple (different) XR5's on the same LAN simultaneously. However, an XR5 can only communicate with one user at a time. If two users attempt to communicate with the same XR5, only the first user will be successful. The second user will receive a message that the command was not successful. Once the first user has finished communicating with the XR5, the second user will be able to communicate successfully.

Utilities | Verify Data

Use this selection to determine if a readable XR5 data file (".txt" or ".csv" file extension) has been altered or modified from its original state. User comments added to the very end of an XR5 data file (manually edited using a text editor) do not affect the file's data integrity status.

Utilities | Change Unit ID

The Unit ID is a user editable field of up to 8 alphanumeric characters. It can be changed as desired using this menu selection. The Unit ID is intended to function as a unique, user-specified identifier for each XR5 Data Logger. Each XR5's Unit ID appears in the Main tab of the Status screen (select **Status | Extract**) and on line 4 of all readable (.csv or .txt) XR5 data files.

Note: Each XR5 also has a factory assigned serial number that appears on the Status tab of the Status screen (select **Status | Extract**) and on the first line of all readable XR5 data files.

Utilities | Change XR5 Password

Use to change the XR5's Password. A two-level Password system is available to prevent unauthorized users from accessing the XR5.

<u>Password Level</u>	<u>Effect</u>
None	No password protection
Setup	Altering the XR5's Setup requires a password. No password is required to transfer data, status, or use the Real Time Display.
System	A password is required in order to access the XR5 in any way.

The password protection level is selected in the Setup, Other tab. The XR5 factory default password (required to change to a new password) is "password". An XR5 password must be 8 characters.

Utilities | Convert Binary File

Converts an XR5 binary file into a readable XR5 data file. Every readable XR5 data file has a corresponding ".binary" file. LogXR automatically creates a readable text file from the binary file when a file transfer is completed. The readable text file has a ".csv" or ".txt" file extension, depending on the **File | Preferences** selection. This text file can be graphed in LogXR (**File | Plot Graph**), or opened in Excel or a text editor (for example: Window's Notepad, or LogXR's **File | View Text File**).

If a text file is ever lost, modified, or corrupted, it can be restored by selecting its associated binary file using **Utilities | Convert Binary File**.

Utilities | Update Firmware

Please see the next page.

Appendix

Updating your XR5's Firmware

Updated XR5 firmware is periodically posted on the Pace website. Firmware updates may include enhancements, bug fixes, or entirely new features. *Updating firmware erases any logged data stored in the XR5, so be sure to transfer existing data to your computer before updating firmware.* Follow these steps to update an XR5's firmware:

Note: If the XR5 was setup to require a password, you will have to disable password protection in order to update the XR5's firmware: select **Setup | Extract**, click the **Other** tab, change **Security Level** to "No Password Protect" and in the setup window click **Send | Send Setup**.

1. Click **Help | About** to view your current LogXR version and then see if a higher version is posted at www.pace-sci.com/data-loggers-xr5.htm. LogXR Software downloads for Windows, Mac OS X and Linux platforms are linked from this page. If a higher version of LogXR is posted, we recommend that you first download and install the new version before proceeding.
2. The latest XR5 firmware is posted at www.pace-sci.com/XR5-firmware.htm. Download the firmware file to your computer.
3. Connect your XR5 to your computer using the IC209 Cable.
4. Select **Utilities | Update Firmware**.
5. Navigate to the XR5 firmware file (.zip) that you downloaded and select it.
6. The firmware update process takes about 2 minutes.

After updating the firmware, you will be prompted to send a new Setup to initialize the XR5, which will synchronize its time clock to your computer's current time. You can select **Setup | Extract** and then (from the Setup screen) **Setup | Send Setup** which will retain the logger's previous setup. Or select **Setup | New** if you do not need the previous setup.

XR5 Data Logger

Screw Terminal Assignments

Q Regulated 9vdc or 12vdc Power Input (not required). Powers the XR5 if present, otherwise power is supplied from internal batteries.

Warning: Voltage levels higher than 14v on terminal Q can damage the XR5.

Do not use an unregulated 9vdc or 12vdc Power Supply.

Use PACE part # PS-9V (international versions available) to externally power the XR5.

C Ground

X Channel X Pulse / Frequency input or External Trigger input (user selectable).

Y Channel Y Pulse / Frequency input

Z Channel Z Pulse / Frequency input or External Alarm output (user selectable).

D 2.5 vdc precision excitation

E 5.0 vdc precision excitation (two terminals provided).

1 Channel 1 input

C Ground

2 Channel 2 input

3 Channel 3 input

C Ground

4 Channel 4 input

5 Channel 5 input

C Ground

6 Channel 6 input

7 Channel 7 input

C Ground

8 Channel 8 input

Screw Terminal use

Before inserting a wire into a terminal, use a screwdriver to rotate the terminal screw counter-clockwise until the terminal's clamp cage is fully open.

Use stranded wires if more than one wire must be terminated in a screw terminal. Mixing solid and stranded wires, or using multiple solid wires in a single terminal can result in faulty connections.

LED Functions

GREEN (Logging is Active).

If Slow Logging is active, blinks every 5 seconds.

Cycle Logging Slow: Blinks when logging, OFF during Pause time.

If Fast Logging is active, blink rate varies with logging rate, ranging from once per 10 seconds for the 2 Hz rate, to many times per second for the fastest rates

RED (Alarm).

If Slow Logging is active, blinks every 5 seconds if an alarm becomes active and continues blinking (even if alarm condition ends) until a new Logging session is started.

For Log On Alarm (Fast) or Log on Ext. Trigger (Fast), Red LED is ON steady while actively logging readings. For all other Fast Logging modes, Red LED is always OFF.

If an alarm becomes active and external power was connected to the XR5's Q terminal at the beginning of the logging session, the Red LED will display steady ON until a new logging session is started.

Available models

The XR5-SE Data Logger is available in two basic models:

XR5-SE Up to 63,642 twelve bit readings.

XR5-SE-M Up to 260,250 twelve bit readings.

Both models have eight multi-range analog inputs and three pulse inputs.
Each analog input (channels 1-8) is user selectable for any of the following:

Temperature (A.rvt): YSI 10k Thermistor 'H mix' or equivalent.
 Temperature (B.rvt): YSI 10k Thermistor 'B mix' or equivalent.
 Temperature PT9xx: Pace PT9xx series Temperature Probe.
 Temperature PT510: Pace PT510 or PT520 Platinum RTD (10k ohm element)
 Light Sensor LS100: Pace LS100 Light Sensor
 Switch or Contact: Non-powered contact closure or dc voltage (5v max).
 Resistance: 2-wire resistance (midpoint = 30k ohms, best resolution is from 1k to 300k ohms).

0-2.5v: 0 to 2.5v input, >10Mohm input impedance.
All DC Voltage Sensors

0-5v: 0 to 5v input, >10Mohm input impedance.
Use for the following Pace sensors:
All Pressure Sensors
All AC Current Sensors
All AC Voltage Sensors
All DC Current Sensors

TRH-160 Probe: TRH-160 Temperature/Humidity Probe
 TRH-100 Probe: TRH-100 Temperature/Humidity Probe

4-20ma signals: Use the 0-2.5v input selection with a shunt resistor (part# INP-124ohm). When monitoring multiple 4-20ma signals, all shunt resistors connect to a shared common and all 4-20ma transducers should be powered by a single power supply (typically 24vdc).

Additionally, the XR5-SE may be factory equipped with two additional millivolt ranges allowing the direct connection of ground-referenced millivolt signals and thermocouples. See page 97 for details.

Millivolt model numbers (delete -M for standard memory size)	Millivolt Range A		Millivolt Range B	
	range	resolution	range	resolution
XR5-SE-M-20mv*	0-20mv	4.8µV	0-10mv	2.4 µV
XR5-SE-M-50mv*	0-50mv	12µV	0-25mv	6µV
XR5-SE-M-100mv	0-100mv	24µV	0-50mv	12µV
XR5-SE-M-250mv	0-250mv	61µV	0-125mv	30µV
XR5-SE-M-500mv	0-500mv	122µV	0-250mv	61µV
XR5-SE-M-1000mv	0-1000mv	244µV	0-500mv	122µV

* Best models for thermocouples. Please see page 97 for more details.

Specifications

ANALOG INPUTS

Resolution: 12 bits (1 part in 4095, 0.024% F.S.)

Temperature Accuracy:¹ +/- 0.15°C from 10 to 40°C

+/- 0.3°C from -25 to 85°C

Temperature Resolution:¹ 0.02°C at 25°C (12 bits)

0.06°C or better from -25 to 75°C

Temperature Range:¹ -40 to 150°C

¹ Temperature accuracy is valid over the full operating temperature range of the XR5 Data Logger (-40 to 78°C) and assumes use of Pace PT9xx series Temperature Probes.

0-5v and 0-2.5v ranges

Accuracy (0-2.5v range): +/- 0.15% F.S. (10-40°C)

+/- 0.20% F.S. (0-60°C)

Accuracy (0-5v range): +/- 0.35% F.S. (10-40°C)

+/- 0.40% F.S. (0-60°C)

Repeatability: +/- 0.05% F.S. for <10°C ambient temperature change.

Input impedance: >10Mohm (for all logging modes and when inactive or not logging).

Resistance range

(2 wire resistance)

Resolution at 30k ohms: Better than 0.1% of reading.

Accuracy at 30k ohms: ±0.15% of reading.

Approx. useable range: 100 ohms to 1.5 Mohms.

(measurements near 30k midpoint have highest resolution)

Optional Millivolt ranges

Accuracy (low range): +/- 0.45% F.S. (10-40°C)

+/- 0.50% F.S. (0-60°C)

Accuracy (high range): +/- 0.65% F.S. (10-40°C)

+/- 0.70% F.S. (0-60°C)

Input impedance: >10Mohm (for all logging modes and when inactive or not logging).

Input offset: 5uV max. at 25°C, 10uV max. from -40 to 60°C.

Offset voltage drift: 0.02uV/°C max.

Millivolt resolution: Listed by millivolt range on page 97.

Thermocouple accuracy: See tables starting on page 98.

Switch closure:

Unpowered contact: Open = 100, Closed = 0

Voltage signal: 2v to 5v = 100, 0v to 1v = 0

PULSE INPUTS

Three Pulse inputs (X, Y and Z) accept voltage pulses or unpowered contact closures. Alternate functions: Ch X: External Trigger, Ch Y: Peak Count (2 second window), Ch Z: Alarm Output.

Pulse Inputs are disabled during Fast Logging.

Pulse Type (selected in setup)	Maximum Rate	Minimum Hold Time	Debounce Time
Mechanical Switch	15 Hz	30ms	30ms
Solid State Switch	900 Hz	0.5ms	0.5ms

Maximum count per Log Interval: 16,777,215

Active edge: Falling edge

Input Type: Schmitt Trigger

Dry contact: Bias voltage (from XR5): 3.3 v

Current when contact is closed: 3.3 microamps

Voltage pulse:	Positive range:	2.3 to 18 v
	Negative range:	-18 to 0.8 v

Alarm Output (select on Ch Z): ~0.2 vdc inactive, ~1.6 vdc active (100k resistor from C to Z)

INPUT PROTECTION

All analog and pulse inputs meet the following surge protection requirements:

IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)

IEC 61000-4-4 (EFT) 40 Amps (5/50ns)

Maximum continuous fault voltage:

Analog inputs (channel 1-8): +/-24 vdc

Pulse inputs (channels X, Y, Z) +/-24 vdc

Note:

An analog input (channel 1-8) fault voltage is any voltage above 5.6v or below -0.25v (with respect to a C terminal). A fault voltage within +/-24vdc on one or more analog inputs will not damage the XR5, but may saturate the input multiplexer and cause erroneous readings on all analog channels.

GENERAL SPECIFICATIONS

Overall dimensions: 4.88" length, 2.21" width, 1.28" height. (124mm x 56.2mm x 32.5mm).
Length includes mounting ears, width includes detachable terminal block.

Weight (with batteries): 4.2 ounces; 120 grams

Mounting: Two 0.187" dia. mounting holes on enclosure centerline, spaced 4.5" (114.3mm) apart.

Input termination: Detachable 20 position screw terminal block.

Screw terminals (20): Recommended wire size: 16 to 28 awg, solid or stranded.
Use stranded wire if multiple wires are terminated in a single terminal block.

Operating limits: -40 to 78°C (-40 to 172°F); 5-90% R.H. non-condensing

Altitude: No limitations, the XR5 is suitable for use in a vacuum environment.

Case material: Tough, flame retardant ABS plastic; Flammability rating UL94V-0

IP Protection rating: IP50

Communication interface: Serial, 3 wire, EIA/TIA-562 signal levels (RS232 compatible), 9600 bps. (8 data bits, 1 stop bit, no parity, no flow control)

Memory capacity: XR5-SE: up to 63,642 analog readings
XR5-SE-M: up to 260,200 analog readings
*One pulse reading equals two analog readings in memory capacity.
LogXR displays the Total Log Time on the Main tab of the Setup screen based on the current Setup.*

LED indicators (2)	Green:	Flash every 5 seconds:	Slow logging active
		Flash every 1 second (or faster):	Fast logging active
	Red:	<u>For all Slow Logging modes</u>	
		Flash every 5 seconds:	Alarm tripped
		<u>For Log on Ext. Trigger (Fast) and Log on Alarm (Fast)</u>	
		Steady ON	Actively logging
		<u>For all other Fast Logging modes</u>	
		OFF (alarms disabled)	
	<i>If external power is applied to the Q terminal, the Red LED stays ON steady (does not flash) when an Alarm is tripped. See page 63 for details.</i>		
Number of channels:	11 or 12:	8 analog input channels, 3 pulse input channels; (Millivolt option adds ambient temperature channel)	
Logging modes:	Manual, Pre-set, Log on Alarm, Cycle Logging (start time, active period, pause period, stop time), Log on Ext. Trigger, Manual/Wrap, Preset/Wrap.		
	<i>Manual (slow), Log on Alarm, Log on External Trigger and Cycle Logging may have any number of individual data segments, limited only by available memory.</i>		
	<i>Log on Ext. Trigger (Slow) includes a selectable Stop Delay time that causes logging to continue after a Stop trigger occurs, for the duration of the selected Stop Delay time.</i>		
Sampling modes:	Standard, Average (1 second internal sampling), Peak (1 second internal sampling), Differential (Ch1-Ch2, Ch3-Ch4, Ch5-Ch6, Ch7-Ch8).		
	<i>Peak and Average sampling are only available when using the following Slow Logging modes: Manual, Preset, Manual/Wrap Preset/Wrap and Cycle.</i>		
Data retention:	Logged data and Setup data: Over 100 years with no power.		
Logging interval:	Any time interval from 1 second to 24 hours, plus 2 Hz to 1000 Hz for Fast Logging modes. During Fast Logging, Real Time display, and data transfers are not available and pulse count inputs are disabled. <i>Fast Logging above 100 Hz results in reduced channel count (see page 34 for details).</i>		
Alarming capabilities:	All eight analog channels have individually adjustable high and low alarm limits. Configurable alarm responses for all slow logging modes include activate Alarm output, dial out to a host computer (modem required), send a descriptive SMS alarm message to a cell phone (GSM modem required). <i>Alarms are disabled for all fast logging modes except 'Log on Alarm'.</i>		
Real Time display:	Displays current readings and alarm conditions of all active channels. Updated every 2 seconds or when readings are logged to XR5 memory		

(selectable). Can be active while any slow logging mode is active with no effect on the logging session.

- Real Time write to file: Logs real time data to a text file every 2 seconds or when readings are logged to XR5 memory (selectable). When active, Real Time display is also active. Can be active while any slow logging mode is active with no effect on the logging session.
- Data transfer: Binary Xmodem transfer, converted to readable text file. Data may be transferred while any Slow Logging mode is active with no effect on the logging session. All data is transferred at 9600 bps.
- Clock accuracy: +/- 1 minute per month at 25°C.
+/- 2.5 minutes per month from -10 to 60°C.
Clock accuracy is also Time Stamp accuracy for all logging modes and logging intervals.
- Battery life: Battery life is dependent on logging rate, channel Type (standard, Average, or Peak), Real Time Mode use, external sensors powered by the D and E terminals and selected excitation time.

LogXR Software displays the "Estimated battery life" on the Main tab based on the current setup and the Estimated Sensor milliamps (if any). See pages 28 and 29 for details.
- Battery type: Lithium, AA size, 3.6 volt; 2 required (Tadiran TL-5903/S or equiv.)
- External power input: Voltage range: 8.0 – 14.0 vdc (9vdc or 12vdc Linear Regulated Supply)
Warning! A voltage higher than 14vdc on the External Power Input may damage the unit.
- Current requirements: Average current for slow logging intervals is approximately 30 microamps (0.030 milliamps) plus periodic excitation current (if any) from the D and E terminals.
- Excitation terminals: E: 5vdc; maximum current: 30 ma. (current limited).

D: 2.5vdc; recommended maximum current: 40 ma., or 60ma if 0 power is drawn from the E terminal.

Power from the excitation terminals is pulsed for the duration of the selected Excitation Time, just prior to logging readings or reading Real Time data. If Fast Logging (2 Hz – 1000 Hz), excitation terminals are continuously powered ON for the duration of the Logging Session.
- Sensor Excitation Time: User selectable for any of the following times:
30 milliseconds, 150 milliseconds, 1 second, 5 seconds, 10 seconds.

Specifications subject to change without notice.

Battery Replacement

The XR5 uses two AA size, 3.6v lithium batteries. When the XR5's battery voltage reads below 6.6v, the batteries should be replaced. The battery voltage displays on the Status screen's Summary tab [**Status | Receive**].

Battery replacement clears the XR5's time clock. All other configuration settings and logged data are retained after battery replacement. The XR5's time clock is set to your computer's time whenever a Setup is sent to the XR5 from LogXR.

1. Remove the 4 screws from the underside of the XR5.
2. Place the unit "right side up" on a flat surface.
3. Starting at the end opposite the round communication jack, carefully lift off the top of the enclosure.
4. Remove the two batteries by pulling each one straight up using thumb and forefinger.
5. Install 2 new batteries (follow the polarity markings on the battery holder).
6. Align one end of the cover on the communication jack, and then bring the opposite end down so that it gently "snaps" over the end of the 20 position terminal block.
7. Re-install the 4 screws – **do not to over-tighten**.
8. After replacing the batteries, the XR5's Time Clock is set by sending a Setup.

External Power Supply

Pace Scientific offers a regulated 9vdc power supply for the XR5 Data Logger, part # PS-9V.

Wiring:

Color	Function	XR5 Terminal
Black	Ground	'C' terminal
White/Black	+9 volts	'Q' terminal

The external power voltage displays in the Status Screen's Summary tab if it is higher than the XR5's internal battery voltage (see note below). Although not recommended, the XR5 will run on external power if the internal batteries are discharged or not present. When external power is present, the internal batteries are not used. The internal batteries power the XR5 upon loss of external power.

WARNING!

Voltages above 14v on the Q terminal could damage the XR5.

Using an unregulated 9 vdc or 12 vdc power supply may expose the Q terminal to voltages above 14vdc and damage the XR5.

If the XR5 Data Logger is externally powered at all times, its batteries will remain in good condition for 10+ years.

Status screen's Battery/External Power reading

The XR5's battery and external power voltage is read hourly and stored in XR5 memory. The Status screen Summary tab displays the higher of these recorded values. From the time external power is initially connected to the XR5, it will be up to 1 hour before this new voltage level is displayed in the Status screen / Summary tab. One exception: The battery and external power voltage is also read and stored in the XR5 whenever a new Setup is sent. Selecting **Status | Extract** immediately after a Setup is sent will display the current Battery or External Power voltage (whichever is higher will be displayed).

Temperature Probes

All [Pace Temperature Probes](#) may be directly connected to the XR5-SE. Using Pace PT9xx Series Temperature Probes, system accuracy is $\pm 0.15^{\circ}\text{C}$ and resolution is 0.02°C at 25°C . Additional accuracy and resolution specs are on page 65. See www.pace-sci.com/thermistor.htm for available models.

Thermistor probes which conform to the Pace PT9xx Series resistance vs temperature table may also be used – contact Pace for details. The XR5-SE also accepts Pace PT510 and PT520 Platinum RTD Sensor and industry standard 10k Thermistor Probes (YSI mix H or mix B).

Compatibility

Model	Maximum # of Pace (or compatible) Temperature Probes
XR5-SE	8

Thermocouples

Only XR5-SE models with a Millivolt option support thermocouples. See page 98 for model-specific thermocouple temperature ranges. Thermocouple Types J, K, E, T, R, S, N, B, and C are supported. Functionality is limited to monitoring temperatures either above or below the XR5's ambient temperature.

LogXR Setup

The 'Type' selection in the channel tab must specify the Temperature Probe which will be (or is) connected to the selected channel. See page 39: Setup, "Channel" tab for details.

Thermocouples

For thermocouples, if you wish to monitor thermocouple temperatures below the ambient temperature of the XR5, select a thermocouple type which includes the word "Cold". For reading thermocouple temperatures above the ambient temperature of the XR5, select the thermocouple Type that does not include the word "Cold".

Wiring

All Pace PT9xx and PT5xx series

Connect one lead of the temperature probe to the Channel #. Connect the other lead to a 'C' terminal. Leads are not polarity sensitive.

Thermocouples

Thermocouples are polarity sensitive; if the reading is incorrect, reverse the thermocouple lead connections. Thermocouples can monitor temperatures either above or below the XR5's ambient temperature. See the Thermocouple tables starting on page 98 for thermocouple wiring connections by lead wire color.

Temperature probe recommendations

For monitoring temperatures from -40 to 105°C (-40 to 221°F) Pace [PT9xx series Temperature Probes](#) are recommended for best accuracy.

For higher temperature applications, Pace stocks special RTD sensors:

Pace PT510 sensor: -40 to 200°C (392°F) temperature range.

Pace PT520 sensor: -40 to 260°C (500°F) temperature range.

See www.pace-sci.com/rtd.htm for details.

For very cold or very hot temperatures, thermocouples are a good choice, but require an XR5-SE Millivolt option (see page 97).

TRH-100 Temperature / RH Probe

The [TRH-100 Temperature / Humidity Probe](#) connects directly to the XR5-SE. Up to four TRH-100 Probes may be connected to the XR5-SE. Accuracy is +/-3% RH and +/-0.15°C at 25°C.

[Identifying a Pace Humidity Probe](#) (see next page).

LogXR Setup

Select Type: 'Temperature PT9xx' on an odd numbered channel (1,3,5,7).

Select Type: 'TRH-100 Humidity Probe' on the channel one higher than the selected temperature channel.

Note: The temperature channel for the RH probe must be odd numbered, and the humidity channel must be exactly one higher.

Examples: Channel 1: Temperature PT9xx, Channel 2: TRH-100 Humidity Probe;
Channel 5: Temperature PT9xx, Channel 6: TRH-100 Humidity Probe;

Wiring (XR5-SE)

Lead	XR5 Terminal	Function
Red	1, 3, 5, or 7	Temperature
Black	C	Ground
Green	See note below	Relative Humidity
White	E	5v Excitation for RH Sensor.

IMPORTANT!

The Red lead (temperature) must be wired to an odd numbered channel, and the Green lead (humidity) must be wired to the channel one higher than the temperature channel.

For example, if the red lead (temperature) is connected to channel 3, the green lead (humidity) must be connected to channel 4.

Scaling Values

In the Channel tab representing the channel you have selected for Humidity, enter the Slope and Offset values listed on the TRH-100 Probe.

Excitation Time

The TRH-100 requires 150ms Excitation time (the Excitation Time is selected in the Setup, Main tab).

Temperature Compensation

LogXR automatically temperature compensates the TRH-100's humidity readings to achieve +/-3% accuracy over the probe's full operating temperature range of -40 to 85 deg. C (-40 to 185 deg. F).

Installation Orientation

In moist environments, the TRH-100 Probe should be mounted with the stainless steel filter pointing down. This will allow any water condensate to drain out of the sensor.

Like most humidity sensors, if condensate forms on the sensor it will output an erroneous reading (typically above 100% RH).

TRH-160 Temperature / RH Probe

Follow the instructions on the previous page to connect a TRH-160 to an XR5-SE Data Logger, except select Type: "TRH-160 Humidity Probe".

Please Note

The TRH-160 Probe is compatible with all XR5 models.

The TRH-160 Probe is not compatible with the Pace XR440.

The TRH-100 Probe is compatible with all XR5-SE series and the XR440.

Make sure the [Excitation Time](#) is set to 150ms (see page 28)

Identifying older, non-serialized Pace Humidity Probes

The label on the probe's cable displays the probe model number and serial number.

Note:

Older non-serialized probes can be identified by their scaling values. The label on the probe's cable contains two scaling values, a positive value and a negative value. If the positive value is above 100, the probe is a TRH-100. If the positive value is below 100, the probe is a TRH-160.

Pressure Sensors

All Pace Pressure Sensors for the XR5 Data Logger require no external power and can read in any pressure scale (psi, bar, kPa, Mpa, etc.).

P1600 Pressure Sensors



Connect directly to an XR5-SE analog input channel; no external power required. Stainless steel pressure port. Applications include HVAC, hot and cold water, air, gas, oil and steam pressure. Stocked ranges listed on next page. Up to eight (8) P1600 Sensors can be powered from one XR5-SE Data Logger.

Wiring

P1600, P1650

Wire Color	XR5 Terminal	Function
Black	C	Ground
Red	E	Excitation
White	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

Wiring for discontinued Pressure Sensor model P1520

P1520

Wire Color	XR5 Terminal	Function
Black	C	Ground
Red	E	Excitation
Green	1 – 8	Pressure Signal

LogXR Software Setup

Excitation Time*	P1600, P1650:	30ms
	P1520:	30ms

* Select in Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v

In Setup Screen, click the Channel tab of corresponding channel and select Type: 0-5v.

Scaling Values

Enter the Slope and Offset scaling values from the list below to read pressure in psi (pounds per square inch).

To use different pressure measurement units

Simply convert the slope and offset to the desired measurement units (bar, kPa, etc). Use the Pace [calculator](#) webpage or convert the values manually (see page 96 for an example).

Range	Slope	Offset
0 – 5 psig	1.25	-0.62
0 – 15 psig (or psia)	3.75	-1.87
0 – 25 psig *	6.25	-3.12
0 – 30 psig (or psia)	7.5	-3.75
0 – 50 psig	12.5	-6.25
0 – 100 psig	25.0	-12.5
0 – 200 psig	50.0	-25.0
0 – 250 psig	62.5	-31.5
0 – 500 psig	125	-62.5
0 – 1000 psig	250	-125
0 – 1500 psig	375	-187.5
0 – 2000 psig	500	-250
0 – 2500 psig *	625	-312
0 – 3000 psig	750	-375
0 – 5000 psig	1250	-625
0 – 7500 psig	1875	-937.5
0 – 10,000 psig	2500	-1250
0 – 14,500 psig	3626	-1813
0 – 20,000 psig	5000	-2500
Vacuum - 0 psig	3.67	-16.54
Vacuum - 15 psig	7.42	-18.41
Vacuum - 30 psig	11.18	-20.29
Vacuum - 120 psig *	33.75	-31.87
Vacuum - 150 psig	41.18	-35.29
Vacuum - 300 psig	78.68	-54.04
Vacuum - 600 psig *	153.75	-91.87

* Discontinued model

Stocked ranges

Model	Range (psig)	Model	Range (psig)
P1650-5	0 - 5	P1600-5000	0 - 5000
P1650-15	0 – 15	P1600-7500	0 - 7500
P1600-30	0 - 30	P1600-10000	0 - 10,000
P1600-50	0 - 50	P1600-14500	0 - 14,500
P1600-100	0 - 100	P1600-20000	0 - 20,000
P1600-200	0 - 200	P1650-Vac-15	Vacuum - 0
P1600-500	0 - 500	P1650-Vac-15	Vacuum - 15
P1600-1000	0 - 1000	P1600-Vac-30	Vacuum - 30
P1600-1500	0 - 1500	P1600-Vac-150	Vacuum - 150
P1600-2000	0 - 2000	P1600-Vac-300	Vacuum - 300
P1600-3000	0 - 3000		
Model	Range (psia)		
P1650-15	0 – 15 Absolute		
P1650-30	0 – 30 Absolute		

P300 Series Pressure

Note: Most P300 ranges listed below have been discontinued and replaced by the P350 and P400 series (see next 2 pages). Only one P300 range is now available from stock: 0-30 psia (Absolute).

For indoor air applications requiring absolute pressure measurements.

Pressure media: dry air and inert gases.



Compatibility

Model	Maximum # of Pace P300 Sensors, when powered by an XR5-SE
XR5-SE	6

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	Excitation
Green	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Excitation Time: 30ms Select from Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-5v.

Scaling Values

Enter the Slope and Offset scaling values from the list below (list includes models now discontinued).

To use different pressure measurement units

Convert the sensor's slope and offset values (below) to the desired measurement units (bar, kPa, etc). Use a web page [calculator](#), or convert the values manually (see page 96 for an example).

Model	Pressure Range	Slope	Offset
P300	±0.4 inch H ₂ O diff. (±1mbar)		
	To read in inch H ₂ O	0.2	-0.45
	To read in millibar	0.5	-1.12
	0 - 5 inch H ₂ O gage	1.25	-0.31
	± 1 inch H ₂ O differential	0.5	-1.12
	± 5 inch H ₂ O differential	2.5	-5.62
	± 10 inch H ₂ O differential	5.0	-11.25
	± 30 inch H ₂ O differential	15.0	-33.75
	0 - 1 psig	0.22	-0.06
	0 - 5 psig	1.11	-0.28
	0 - 15 psig or psia (White case)	3.33	-0.83
	0 - 30 psig or psia (White case)	6.67	-1.67
	0 - 15 psig or psia (Black case)	3.75	-1.88
	0 - 30 psig or psia (Black case)	7.5	-3.75
	Barometric (600 - 1100 millibar)		
	To read in millibar:	125	569 (range: 600 – 1100 millibar)
	To read in inHg:	3.36	16.8 (range: 17.72 - 32.48 inHg)

P350 Pressure Sensors



Applications include Lab/Clean Room Pressurization, Filter Differential Pressure and Fan Static Pressure.

Pressure media: dry air and inert gases.

Ports accept 3/32" I.D. or 2.4 mm I.D. tubing.

Tubing Adapters (included) accept 1/8" I.D. or 3.2 mm tubing.

See www.pace-sci.com/pressure-350.htm for specifications.

Maximum # of Pace P350 Sensors powered by one XR5-SE: 8

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	Excitation
Green	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Sensor Excitation: 30ms Select from Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-5v.

Scaling Values

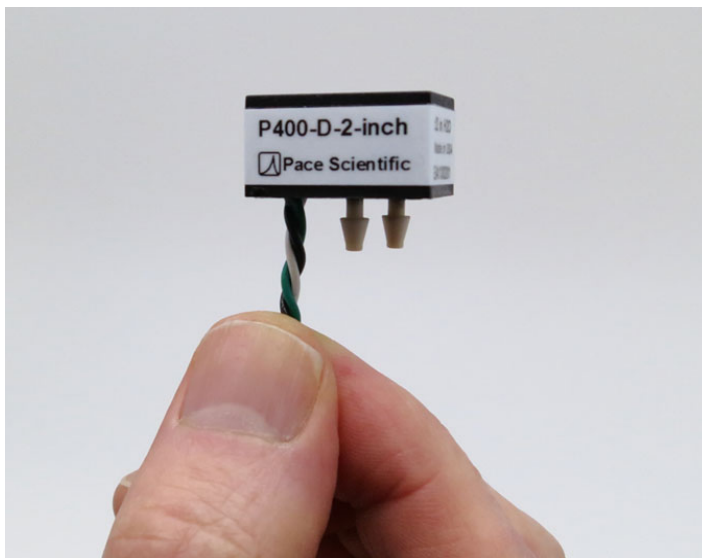
Enter the Slope and Offset scaling values from the list below.

To use different pressure measurement units

Convert the sensor's slope and offset values (below) to the desired measurement units (bar, kPa, etc). Use a web page [calculator](#), or convert the values manually (see page 96 for an example).

Model	Pressure Range	Slope	Offset
P350	± 0.1 inch H2O differential	0.05	-0.12
	± 0.5 inch H2O differential	0.25	-0.62
	± 1 inch H2O differential	0.5	-1.25
	± 5 inch H2O differential	2.5	-6.25
	± 10 inch H2O differential	5.0	-12.5

P400 Pressure Sensors



Applications include Lab/Clean Room Pressurization, Filter Differential Pressure, Fan Static Pressure and Absolute Pressure.

Pressure media: dry air and inert gases.

Ports accept 3/32" or 2.4 mm I.D. Tubing.

Tubing Adapter (included) accepts 1/8" or 3.2 mm I.D. Tubing.

See www.pace-sci.com/pressure-400.htm for specifications and accessories.

Maximum # of Pace P400 Sensors powered by one XR5-SE: 8

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	Excitation
Green	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Sensor Excitation: 30ms Select from Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-5v.

Scaling Values

Enter the Slope and Offset scaling values from the list below.

To use different pressure measurement units

Convert the sensor's slope and offset values (below) to the desired measurement units (bar, kPa, etc). Use a web page [calculator](http://www.pace-sci.com/calculator), or convert the values manually (see page 96 for an example).

Model	Pressure Range	Slope	Offset	
P400	± 2 inch H2O differential	1.0	-2.5	
	± 20 inch H2O differential *	10.0	-25.0	*Model Discontinued
	± 1 psi	0.5	-1.25	
	scale for ±27.7 inch H2O	13.85	-34.64	
	± 15 psi	7.5	-18.75	
	± 30 psi	15.0	-37.5	
	0 - 15 psia	3.75	-1.88	

P450 Pressure Sensors



Applications include Lab/Clean Room Pressurization and Fan Static Pressure.

Pressure media: dry air and inert gases.

Ports accept 3/32" or 3 mm I.D. Tubing.

Tubing Adapter (included) accepts 1/8" I.D. Tubing.

See www.pace-sci.com/pressure-450.htm for specifications.

Maximum # of Pace P450 Sensors powered by one XR5-SE: 8

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	Excitation
Green	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Sensor Excitation: 30ms Select from Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-5v.

Scaling Values

Enter the Slope and Offset scaling values from the list below.

To use different pressure measurement units

Convert the sensor's slope and offset values (below) to the desired measurement units (bar, kPa, etc). Use a web page [calculator](http://www.pace-sci.com/calculator), or convert the values manually (see page 96 for an example).

Model	Pressure Range	Slope	Offset	
P450	0-5 inch H2O Gauge	1.25	-0.62	
	0-20 inch H2O Gauge*	5.0	-2.5	*Model Discontinued
	0-1 psig	0.25	-1.25	
	scale for 0-27.7 inch H2O	6.92	-3.46	
	0-5 psig	1.25	-0.62	
	0-30 psig	7.5	-3.75	

P500 Barometric Pressure Sensor



Applications include atmospheric and absolute pressure monitoring, weather stations, etc.

Pressure media: Humid or dry air and inert gases.

Ports accept 3/32" or 2.4 mm I.D. tubing, included adapter accepts 1/8" or 3.2 mm I.D. Tubing.

See www.pace-sci.com/barometric-pressure-sensor.htm for specifications and accessories.

Maximum # of Pace P500 Sensors powered by one XR5-SE: 3

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	Excitation
Green	1 – 8	Pressure Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Sensor Excitation: 30ms Select from Main tab of Setup screen; see page 28 for details.

Channel Type selection: 0-5v In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-5v.

Scaling Values

Enter the Slope and Offset scaling values from the list below. Scaling values can be entered from the list below for measuring pressure in a variety of measurement units.

Model	Measurement Units	Pressure Range	Slope	Offset
P500-BARO	kPa	15 to 130 kPa	25.56	9.89
	psia	2.176 to 18.85 psia	3.71	1.44
	inHg	4.43 to 38.39 inHg	7.55	2.92
	Bar	0.15 to 1.30 Bar	0.26	0.1
	milliBar	150 to 1300 milliBar	256	98.89
	mmHg	112.5 to 975.1	192	74.16

Accelerometers



Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
Red	E	Power
Brown	analog input (ch1 – 8)	X Axis
Green	analog input (ch1 – 8)	Y Axis
White	analog input (ch1 – 8)	Z Axis
Blue	analog input (ch1 – 8)	Temperature (-T models only)

LogXR Software Setup

For each X, Y and Z axis, select Type: 0-5v input.

Enter the Slope/Offset values listed on the back-side of the sensor.

Model	Range	Resolution	Nominal Slope*	Nominal Offset*
SA-03	± 3 g	0.004 g	-3.03	5.0
SA-16	± 16 g	0.02 g	-16.0	26.4

*Use the Slope and Offset values listed on the back side of the sensor.

For each of the three accelerometer signals (the channels connected to the Brown, Green, and White leads) enter the Slope and Offset values listed on the back of the Accelerometer. If these values become illegible, they are archived at Pace. Call or email support@pace-sci.com and provide the serial number etched on the sensor, and we can provide the scaling values.

The scaling values listed on the sensor provide readings in units of g (g-force acceleration).

-T option

Model numbers with -T include a precision internal temperature sensor (Blue wire). Select Type: "Temperature PT9xx" for the channel tab number that the Blue wire is connected to.

VIBRATION APPLICATION LIMITATION

Using Logging Mode: LogOnAlarm (Fast) with an Accelerometer can result in loss of data. All other logging modes may be used for vibration applications.

Cycle Logging (Fast) is recommended for long term vibration logging. For example, Log readings at 100 Hz for 1 second, and repeat on a 2 minute cycle.

AC Current Sensors

Connect directly to an XR5 input channel; no external power required.

Self powered, split core design in a rugged plastic housing.

See www.pace-sci.com/ac-current.htm for complete specifications.

Maximum AC Current Sensors
XR5-SE: 8



Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
Red	1 – 8	Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Pace Current Sensors may be connected to either 0-5v input or a 0-2.5v input. Using a 0-2.5v input causes the AC amps full-scale range to be reduced by 1/2. Enter the Slope and Offset scaling values listed below.

Using a 0-2.5v input:*

Model	Range (ac amps)	Slope	Offset	Resolution
SC10A	0-5	2	0	0.001 amps
SC20A	0-10	4	0	0.002 amps
SC50A	0-25	10	0	0.005 amps
SC100A	0-50	20	0	0.01 amps
SC200A	0-100	40	0	0.02 amps
SC500A	0-250	100	0	0.06 amps
SC1000A	0-500	200	0	0.12 amps
SC1500A	0-750	300	0	0.18 amps

Using a 0-5v input:*

Model	Range (ac amps)	Slope	Offset	Resolution
SC10A	0-10	2	0	0.002 amps
SC20A	0-20	4	0	0.004 amps
SC50A	0-50	10	0	0.01 amps
SC100A	0-100	20	0	0.02 amps
SC200A	0-200	40	0	0.05 amps
SC500A	0-500	100	0	0.12 amps
SC1000A	0-1000	200	0	0.24 amps
SC1500A	0-1500	300	0	0.36 amps

*input range is selected via the Type selection on the individual Channel tab of the Setup screen.

DC Current Sensors



Connect directly to an XR5 input channel; no external power required.
Rugged, epoxy potted sensor.

See www.pace-sci.com/dc-current.htm for complete specifications.

Compatibility

The XR5-SE can power up to two Pace DC Current Sensors (30ma of 5v power is available from the XR5-SE's E terminal; Pace DC Current Sensors consume up to 13ma)

Wiring

Lead Color	XR5 Terminal	Function
Black	C	Ground
White	E	5v power
Green	1 – 8	Signal (connect to any analog channel 1 - 8)

LogXR Software Setup

Pace DC Current Sensor connects to a Type: 0-5v input.

Enter the Slope and Offset scaling values listed below.

Model	Range (dc amps)	Slope	Offset	Resolution
DC05A	±5	5.41	-13.51	0.007 amps
DC20A	±20	10	-25	0.01 amps
DC50A	±50	25	-62.5	0.03 amps
DC100A	±100	50	-125	0.06 amps
DC150A	±150	75	-187	0.09 amps
DC200A	±200	100	-250	0.12 amps

AC Voltage Sensors

Connects directly to an XR5 input channel; no external power required.
Self powered design in a rugged plastic housing.

See www.pace-sci.com/ac-voltage.htm for complete specifications.

WARNING - SHOCK HAZARD!! - Disconnect AC Power BEFORE connecting sensor to AC Voltage Source.

IMPORTANT! AC Voltage Sensor(s) must be mounted in a box, panel or suitable enclosure.



Compatibility

Model	Maximum # of AC Voltage Sensors
XR5-SE	8

Wiring

Connect the AC Voltage Sensor to any analog input channel (1 – 8).
Follow the wiring instructions printed on sensor.

Special notes for SV600 AC Voltage Sensor:

The SV600 AC Voltage Sensor must be wired to the included potential transformer. Follow the wiring diagram on the sensor. Sensor and transformer must be mounted in a box or suitable enclosure.

IMPORTANT!

The potential transformer's serial number must match the serial number on the AC Voltage Sensor.
The transformer and sensor are calibrated as a pair.

Once wired, the potential transformer's input leads can be connected to AC voltages within the range of 0 to 600vac.

LogXR Software Setup

In the LogXR Setup screen, select the channel the sensor is connected to, and select the 0-5V range (Type selection).

Enter the Slope and Offset scaling values listed below.

Model	Range (ac volts)	Slope	Offset	Resolution	XR5 input
SV300	0-300	60	0	0.07 volt	0-5v
SV600	0-600	120	0	0.15 volt	0-5v

Pace AC Voltage Sensors may alternately be connected to an XR5 0-2.5v input.

Model	Range (ac volts)	Slope	Offset	Resolution	XR5 input
SV300	0-150	60	0	0.04 volt	0-2.5v
SV600	0-300	120	0	0.08 volt	0-2.5v

DC Voltage Sensors

Connects directly to an XR5 input channel; no external power required. Power is supplied by the XR5-SE's E terminal.

See www.pace-sci.com/isolated-dc-voltage-sensors.htm for complete specifications.

Compatibility

Model	Maximum # of DC Voltage Sensors*
XR5-SE	5



Wiring Output Side

Sensor Terminal	XR5 Terminal	Function
C	C	Ground
S	1 – 8	Signal (connect to any analog channel 1 - 8)
E	E	5 Vdc power

Wiring Input Side

Sensor Terminal	Signal Function
+	DC Voltage +
-	DC Voltage -

LogXR Software Setup

Sensor Excitation:	30ms	Select from Main tab of Setup screen; see page 28 for details. Longer Excitation time is fine but more power is used.
Channel Type selection:	0-2.5v	In the Setup screen, click the Channel tab of the corresponding channel and select Type: 0-2.5v.
Scaling Values:		Enter the Slope and Offset scaling values shown on label on top of sensor.

* Maximum of 5 DC Voltage Sensors assumes that the XR5 Data Logger is powering the sensors via the E terminal (5 Vdc). If an external power supply (3.3 Vdc – 5 Vdc) is used to power the sensors, up to 8 sensors may be connected to the XR5-SE Data Logger.

LS-100 Light Sensor



The [LS-100 Light Sensor](#) connects directly to any XR5 Data Logger analog input channel. No external power required. The sensor features a wide dynamic range and low cost. Not designed for applications that require precise light readings. For logging solar irradiance, we recommend the Pace [SRS-200 Solar Radiation Sensor](#).

See www.pace-sci.com/light.htm for complete specifications.

Compatibility

Model	Maximum # of Pace LS-100 Light Sensors
XR5-SE	8

LogXR Setup

Select "Light Sensor LS-100" for the 'Type' selection of the particular channel that will be connected to the Light Sensor. See page 39: Setup, "Channel" tab for details. Real time and logged readings are in units of footcandles.

Wiring

Connect one lead of the Light Sensor to the Channel #. Connect the other lead to a 'C' terminal.

Pace Sensors with separate Manuals:

- EC5 Soil Moisture Sensor
- RS-110 Rainfall Sensor
- SRS-100 and SRS-200 Solar Radiation Sensors
- WSD-100 Wind Speed and Direction Sensor

Manuals for these sensors may be downloaded from the Internet (links below).

Pace Sensors for the XR5-SE not included in this manual	
Sensor Manual (pdf file)	Web page
EC5 Soil Moisture Sensor	www.pace-sci.com/soil-moisture.htm
RS-110 Rainfall Sensor	www.pace-sci.com/rainfall.htm
SRS-100 Solar Radiation Sensor	www.pace-sci.com/solar-radiation-srs100.htm
SRS-200 Solar Radiation Sensor	www.pace-sci.com/solar-radiation.htm
WSD-100 Wind Speed and Direction Sensor	www.pace-sci.com/wind-speed.htm

Contact Closures

Any XR5 analog input can be used to log the state of a relay, switch, or contact closure. The contact must be unpowered, and not wired to anything else. An unused, isolated contact in a multi-pole switch or relay can be used.

Compatibility

Model	Max # of contact closures
XR5 (any model)	8

Wiring

Connect two wires to log a contact closure:

1. Connect one wire from one side of the contact closure to an XR5 "C" terminal.
2. Connect one wire from the other side of the contact closure to an unused analog terminal (any terminal number 1 - 8).

LogXR Software Setup

Display the LogXR Setup Screen (details page 26 and following).

Click the Channel tab number the contact closure is wired to.
Click the Channel button to ON.

Set the following:

Type: 'Switch or Contact Closure'
Mode: (see below)

Mode selection:

Standard: Contact state is sampled and stored at the selected Log Interval.
Logged Data will display as 0.0 if the contact is closed.
Logged Data will display as 100.0 if the contact is open.

Average: Contact state is sampled and added to an accumulator every one second. Data is stored at the selected Log Interval as the percentage of time that the contact was open, with 1 second resolution.

For example, if the selected Log Interval is 1 hour, and the contact was open for a total of 15 minutes during the last hour, the data for that hour will be stored as 25.0 (25.0%)

Using contact Note:

Up to 3 contact closures can be connected to the XR5's pulse inputs. This would log the "pulse count", the number of times during each log interval that the contact opened and closed (the pulse count is incremented when the contact closes). Do not wire a contact closure to a pulse input if you desire to know the time the contact changes state. To log when a contact changes state, it must be wired to an XR5 analog input and the Type set to "Switch or Contact Closure" as explained from the beginning of this page.

Additional DC Voltage Ranges

Isolated DC Voltage Sensors are available (page 84). External Scaling Cables (below) implement additional ranges. Optional millivolt ranges are also available (page 97).

External Scaling Cables

Pace offers external 'INP Cables' which provide alternate input ranges for the XR5-SE. Each INP Cable (except the 4-20ma cable) has an input impedance of approximately 100k ohms and each can implement multiple additional voltage ranges as detailed in the following table:

Part #	For input range of	Select channel Type	Connect black wire to XR5 Terminal #	Enter scaling values:	
INP/2	+/-2.5vdc	0-2.5v	D	2	-2.5
	+/-5vdc	0-5v	E	2	-5.0
	0-10vdc	0-5v	C	2	0
	-2.5 to 7.5vdc	0-5v	D	2	-2.5
INP/4	0-10vdc	0-2.5v	C	4	0
	0-20vdc	0-5v	C	4	0
	-7.5 to 12.5vdc	0-5v	D	4	-7.5
INP/6	0-15vdc	0-2.5v	C	6	0
	0-30vdc	0-5v	C	6	0
	-12.5 to 17.5vdc	0-5v	D	6	-12.5
INP/12	0-30vdc	0-2.5v	C	12	0
	0-60vdc	0-5v	C	12	0
	-27.5 to 32.5vdc	0-5v	D	12	-27.5
INP/24	0-60vdc	0-2.5v	C	24.05	0
	-57.6 to 62.6vdc	0-5v	D	24.05	-57.62
INP-124	4-20ma	0-2.5v	See pages 88 and 89 for current loop wiring and Slope / Offset values.		

Wiring

Wire color

Yellow	Connect to voltage to be logged
Green	Connect to an XR5 input channel (1,2,3,4,5,6,7 or 8)
Black	see fourth column above

Additional wire for all Scaling Cables

Connect a wire from the monitored signal's common (or signal return) to an XR5 'C' terminal.

For 4-20ma current loops

Please see page 93 for wiring the INP-124 (for 4-20ma current loop applications).

LogXR Software Setup

Select the Channel tab the scaling cable's green wire is connected to. Select the voltage range Type from the third column of the above table, and enter the Slope and Offset scaling values listed.

For 4-20ma current loops, please see page 93 and 94.

Potentiometer Applications

The XR5 Data Logger can log analog readings from potentiometric devices. Potentiometric devices include wind direction vanes, inclinometers and linear displacement sensors.

Potentiometers less than 1k ohms may be used but are not recommended. The D Terminal can supply a maximum of 50ma. A 1k ohm potentiometer will draw 2.5ma from the D Terminal. Higher resistance potentiometers (10k - 100k) will draw much less power and extend the XR5's battery life.

Important: Wires should be kept as short as possible. The D terminal is the internal 2.5v reference for the XR5's A/D converter. Noise conducted on wires connected to the D terminal could result in reading instability and measurement errors.

Compatibility

Model	Maximum # of Potentiometric Sensors (1k or higher resistance)
XR5-SE	8

LogXR Software Setup

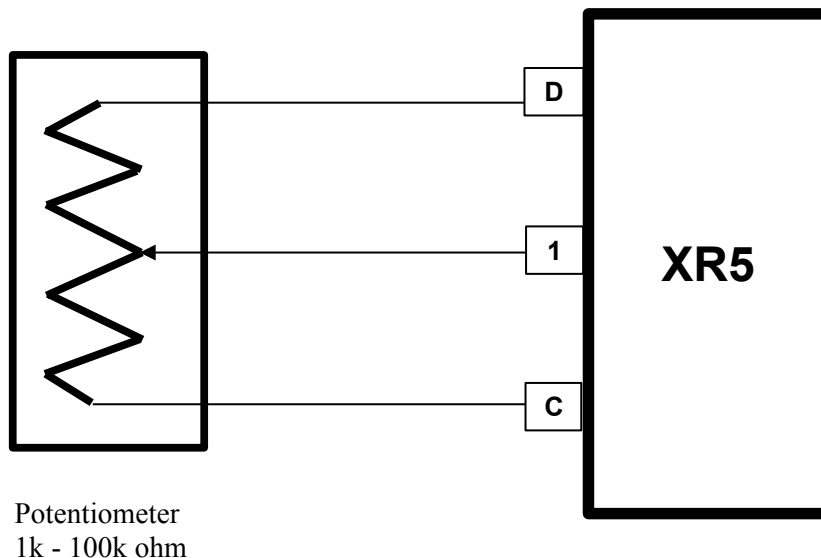
Use a 0-2.5v input range for the channel that will log the potentiometer.

Scaling

Depends on the application. To log potentiometer readings as % of full scale [0 to 100] use a Slope of 40 and an Offset of 0.

Wiring

Drawing shows potentiometer connected to channel 1, but any channel can be used.



Pulse Output Sensors

All XR5 SE Data Loggers have 3 pulse inputs. Select Mechanical Switch or Solid State Switch depending on the characteristics of the pulse.

Mechanical Switch:	Maximum Rate	15 Hz
	Debounce & Min. Hold Time	30 ms
Solid State Switch:	Maximum Rate	900 Hz
	Debounce & Min. Hold Time	0.5 ms

Pulses can originate from a “dry” unpowered contact closure, or an active voltage signal.

Active Voltage Signal:	Positive amplitude range:	2.3 to 18 v
	Positive-going input threshold:	2.3 v
	Negative-going input threshold	-18 to 0.8 v
Unpowered Contact:	Bias (pull-up) voltage	3.3 v
	Bias resistance	1 Mohm

Pulse data can be presented as total accumulated pulses per log interval or as average Frequency over the log interval (check the Frequency box in the Setup screens Pulse tab).

Pulse data can be scaled to read in any unit of measure by editing the Slope and Offset scaling fields. The actual pulse count is scaled as follows:

$$\text{Pulse channel reading} = (\text{pulse count} * \text{Slope}) + \text{Offset}.$$

If Slope = 1 and Offset = 0, then the Pulse channel reading will be the "raw" pulse count.

Guidelines for compatible devices:

For remote installations, a device which employs an unpowered magnetic reed switch to generate pulses is preferred because no power is required. A magnetic reed switch is used in tipping bucket rain gages and many gas and water meters. A device which outputs an electrical pulse is compatible if the pulse signal (with respect to ground) is between +/-18 volts.

Non-PACE Sensor Requirements

The XR5 Data Logger will accept a variety of sensors from other manufacturers. Sensors must meet the following requirements:

Sensors powered by XR5's internal batteries

Sensors powered with 5v

XR5 Excitation terminal	E
Maximum current draw	30 ma (total draw for all sensors powered from the E terminals)
Maximum warm-up time	10 seconds
Signal Output	A voltage within the range of 0-5vdc. Examples: 0-1v, 0.5-4.5v, 0-5v.
Output Signal Load	10M for XR5 0-5v input range. 10M for XR5 0-2.5v input range.

Sensors powered with 2.5v

XR5 Excitation terminal	D
Maximum current draw	40 ma (total draw for all sensors powered from the D and E terminals) Exception: Current draw from the D terminal may be up to 60 ma if the E terminals are not used (no sensors connected to the E terminals).
Maximum warm-up time	10 seconds
Signal Output	A voltage within the range of 0-2.5vdc. Examples: 0-1v, 1-2v, 0-2.5v
Output Signal Loading	10M for XR5 0-5v input range. 10M for XR5 0-2.5v input range.

See the next page for more details and scaling instructions for voltage output sensors.

Voltage output sensors, externally powered

Excitation voltage	Any, user provides necessary power supply.
Maximum current draw	Any, user provides necessary power supply.
Warm-up time	Any, if power is applied to sensor for duration of logging session.
Signal Output	A voltage output within the selected input range. Examples for 0-5v input: 1 to 3v; 0.5 to 4.5v, 0.25 to 4.75v. Examples for 0-2.5v input: 0-1v, 0-2.5v.
Output Signal Loading	10M ohm for 0-5v or 0-2.5v input range.

See the next page for more details and scaling instructions for voltage output sensors.

4-20ma sensors, externally powered

Excitation voltage	User provides current loop power supply (typically 24vdc).
Warm-up time	Any, if power is applied to sensor for duration of logging session.
Signal Output	4-20ma
Output Signal Load	124 ohms (XR5 0-2.5v input range using PACE # INP-124 resistor).

See pages 93-94 for more details and scaling instructions for 4-20ma sensors.

IMPORTANT:

XR5 inputs are not isolated; multiple 4-20ma signals share a common ground. In some cases, 4-20ma isolators may be required.

Non-Pace sensors, continued

Sensors with a voltage output

The XR5 is compatible with many non-Pace voltage-output sensors. However, in most cases, the user will have to provide an external power source to power the sensor. To determine if your non-Pace sensor can be powered by the XR5, see "Sensors powered by XR5's internal batteries" on the previous page.

Compatible sensors

Sensors with an output voltage that ranges from within 0-1Vdc to 0-5Vdc are a good fit for the XR5-SE and can be directly connected to any analog channel.

Sensors that output a ground referenced millivolt signal are compatible with an XR5-SE equipped with a millivolt range option. For example: Thermocouples used in an application where one lead of each thermocouple is connected to a shared ground.

Incompatible Sensors

Most sensors with a differential millivolt signal (such as a strain gage or a millivolt output pressure sensor) are not compatible with the XR5, even if it is equipped with a millivolt option. This is because the XR5's inputs are all single ended; each signal's return must be connected to the XR5's shared common ground. Sensors that output a differential millivolt signal and require external power (like a strain gage or millivolt output pressure sensor) have two output leads, and each has a voltage potential of approximately $\frac{1}{2}$ of the supply voltage. Connecting one of these output leads to ground will short out the signal.

Scaling the Sensor

In the XR5's Setup screen, click on the Channel tab that the sensor is connected to.

If the sensor's maximum output voltage is 2.5v or less, select "0-2.5v" for the Type. Otherwise, if the sensor's maximum output voltage is 5v or less, select "0-5v" for the Type. If the output voltage can go above 5v (for example, 0-10v), a Pace Scaling Cable is required, see page 88 for details.

Click "Calculate Slope/Offset" and then click "Linear Transducer".

Enter the Minimum DC Voltage and Maximum DC Voltage of the sensor's output signal.

For example, if the sensor has an output signal of 0.5v to 4.5v, enter 0.5 for the Minimum DC Voltage, and enter 4.5 for the Maximum DC Voltage.

Enter the Minimum and Maximum Reading of the sensor.

For example, if the sensor is a pressure transducer that reads from 0-300 psi, enter 0 for the Minimum Reading and 300 for the Maximum Reading.

Click "Calculate" and the Slope and Offset values will appear that correspond to the entered values. Then click "OK".

Current Loop Applications

The XR5 Data Logger's 0-2.5v input can be configured to directly monitor a current loop if a Pace INP-124 resistor is wired to the XR5's terminal block.

PACE offers a precision, low temperature coefficient, 124 ohm resistor for current loop applications; part number INP-124.

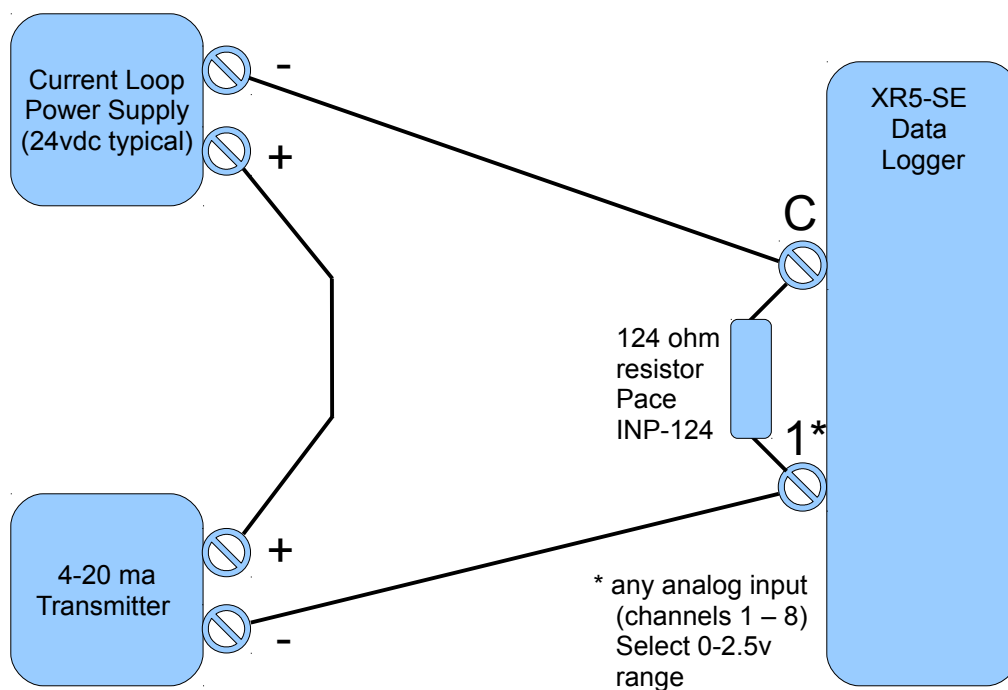
CAUTION

XR5 inputs are not isolated; all inputs share a common ground, which is also the XR5's RS232 ground. The Data Logger's 'C' terminal should be wired to the negative terminal of the Current Loop power supply. If this cannot be done, do not communicate with the XR5 using a grounded computer. If you must communicate to the XR5 using a grounded computer and the negative terminal of the current loop power supply is not at earth ground, use an RS232 isolator between your grounded computer and the XR5. Call Pace technical support for a recommended model.

Compatibility

Model	Maximum # of Current Loops
XR5-SE	8

Wiring



Multiple Current Loops

Logging multiple current loops with an XR5 is possible, provided all 4-20ma transmitters share a common Loop power supply. The same cautions detailed in the paragraph above apply.

In applications with multiple Current Loop power supplies, or transmitters having "active" 4-20ma signals (no Loop Power supply is used), adding one or more loop isolators (not stocked at Pace) may be required. For more details and assistance, please contact Pace technical support.

LogXR Software Setup

In the Channel tab Select Type: 0-2.5v.

Scaling

Click 'Calculate Slope/Offset'. Then click 'Current Loop'. The following screen appears.

The 'Current Loop' dialog box contains the following fields and controls:

- Low Milliamps:** Input field with value 4
- High Milliamps:** Input field with value 20
- Low Reading:** Empty input field
- High Reading:** Empty input field
- Resistor Ohms:** Input field with value 124
- Calculate:** Button to perform calculations
- Slope:** Empty output field
- Offset:** Empty output field
- OK:** Button to confirm settings
- Cancel:** Button to dismiss the dialog

To scale the 4-20ma transducer to the desired engineering units, enter the transducer reading that represents a 4ma output in "Low Reading:", and enter the transducer reading that represents a 20ma output in "High Reading".

'Resistor Ohms' is set to 124 and assumes the use of a Pace precision resistor (# INP-124).

Using an alternate Resistor

If you are using a non-Pace resistor, enter the actual resistance in the Resistor Ohms box. For best resolution, we recommend using a resistor between 100 and 125 ohms.

WARNING

Using a resistor above 125 ohms with a 0-2.5v input range will result in the upper range of a 4-20ma transducer being clipped and logged as a lower value.

Click 'Calculate', and the Slope and Offset values are displayed. Then click 'OK'.

ES-1 External Switch

The ES-1 is a miniature isolated solid state switch designed to reduce the power requirement for a current loop powered by a battery. The ES-1 is wired in series with the current loop. Control wires from the ES-1 connect to the XR5's C and E terminals. In this way the external battery (the current loop power supply) is switched on only for the duration of the XR5's selected Excitation Time (powering the current loop and up to eight 4-20ma transducers). When the selected Excitation Time ends, the ES-1 switches off the current loop. With the ES-1, readings can be logged from 4-20 ma transmitters for extended periods of time using a relatively small external battery to power the loop.

The table below shows some examples of how the life of a battery powering a current loop can be extended using the ES-1.

Selected Log Interval	Selected Excitation Time	Loop Battery Life extended
5 seconds	5 seconds	None (always ON)
1 minute	5 seconds	12 times
5 minutes	5 seconds	60 times
15 minutes	5 seconds	900 times
1 hour	5 seconds	3,600 times

The above table does not account for inrush current that may occur each time the ES-1 switches loop power on. Inrush current will vary depending the 4-20 ma transducer's internal circuitry. Inrush current typically occurs in the first 5 to 20 milliseconds that power is applied to a transducer, and may be 4 to 10 times higher than its "normal" state. Inrush will be a more significant factor with shorter excitation times (30 ms or 150 ms), and should not significantly reduce the "Loop Battery Life" shown in the above table for excitation times of 5 seconds or longer.

Using LogXR Software, the Excitation Time selected should satisfy the 4-20ma transducer's "warm up time" specification. For example, if two transducers are to be powered by the loop, and one has a 1 sec warm-up specification and the other requires a 2 second warm up time, select an Excitation Time of 2 seconds.

Wiring

Yellow wires:

The two yellow wires connect "in series" at a place in the loop that is common to all transducers. For example, between the C terminal of the XR5 and the "-" terminal of the Loop Power Supply. In other words, remove the wire that goes from the "-" terminal of the Loop Power Supply to the "C" terminal of the XR5. Then connect one Yellow wire from the ES-1 to the "-" terminal of the Loop Power Supply, and connect the other Yellow wire to a "C" terminal of the XR5.

The two yellow wires are connected to each side of a bi-directional SPST switch inside the ES-1.

Black wire: Connect to an XR5 "C" terminal (ES-1 control return)

White wire: Connect to an XR5 "E" terminal (ES-1 control)

The ES-1 incorporates a Resettable "Fuse" that opens if the current through the switch exceeds about 500 ma. After the condition that caused the excessive current is removed, the fuse will automatically reset, allowing the ES-1 to function normally.

Using a different Pressure Scale

To convert a pressure sensor to read in a different pressure unit, simply convert the slope and offset values from the existing pressure scale to the new pressure scale.

Click [here](#)* for a pressure converter on the Pace website which will provide the slope and offset values for a different unit of pressure.

If an Internet connection is not available, and you have a pressure conversion table or reference, you can do the conversion manually. For example:

Convert a P1600-200 Pressure Sensor scaled for psi to read in kPa (kilopascal).

The scaling values listed in this manual for the P1600-200 for psi:

Slope = 50.0

Offset = -25.0

Convert these values from psi to kPa using a pressure converter* or a pressure conversion table:

50.0 psi = 344.74 kPa

-25.0 psi = -172.37 kPa

Use the following scaling to read the P1500-200 in kPa:

Slope = 344.74

Offset = -172.37

* A web-based pressure converter is available at www.pace-sci.com/pressure-converter.htm

Millivolt / Thermocouple Option

The XR5-SE may be factory-configured with one of six millivolt options. Any millivolt option adds two selectable millivolt ranges to each analog input, and all existing XR5-SE input ranges are retained.

Model number (also applies to -M models)	Millivolt Range A		Millivolt Range B	
	range	resolution	range	resolution
XR5-SE-20mv	0-10mv	2.4 μ V	0-20mv	4.8 μ V
XR5-SE-50mv	0-25mv	6 μ V	0-50mv	12 μ V
XR5-SE-100mv	0-50mv	12 μ V	0-100mv	24 μ V
XR5-SE-250mv	0-125mv	30 μ V	0-250mv	61 μ V
XR5-SE-500mv	0-250mv	61 μ V	0-500mv	122 μ V
XR5-SE-1000mv	0-500mv	122 μ V	0-1000mv	244 μ V

For each analog channel, the millivolt ranges may be mixed and matched along with the XR5's existing range selections and input types. An on-board precision thermistor sensor provides cold junction compensation for thermocouples, and can be used to log ambient temperature (as a 9th analog input).

Compatible millivolt signals

The XR5-SE's millivolt ranges are suitable for ground referenced uni-polar millivolt signals, thermocouples, pyranometers, and other millivolt signals that can have a grounded return. Millivolt signals connected to the XR5 have one lead connected to XR5-SE common (ground).

Not suitable for Strain Gages

XR5-SE's millivolt ranges are not suitable for monitoring strain gages or other bridge type millivolt sensors. Bridge type sensors require a differential input.

Thermocouple temperature range limitation

Only thermocouple temperatures either above or below the XR5-SE's ambient temperature may be logged. In many cases this is not a significant limitation, because logging temperatures near ambient is better suited for thermistor-based temperature sensors like the Pace PT9xx series. For thermocouple applications that require monitoring temperatures above and below the ambient temperature of the XR5, two thermocouples could be utilized to monitor the same physical location: one thermocouple wired for high temperatures and one thermocouple wired for cold temperatures (using two XR5 channels).

Thermocouple temperature alarm limitation

User-entered thermocouple alarm limits are approximate values. See page 42 for details.

Thermocouple electrical limitations

The XR5-SE does not have isolated inputs; therefore a grounded thermocouple (exposed or bare type) in contact with a non-zero voltage (with respect to XR5 ground) is not suitable for temperature measurement with the XR5-SE.

A thermocouple in contact with metal which has a non-zero voltage must be an ungrounded type, like the Pace PT450. If multiple thermocouples will be in electrical contact with a metal object, ungrounded thermocouples must be used.

SHOCK HAZARD!

A bare or exposed thermocouple (grounded type) in contact with metal which has an elevated voltage creates a dangerous shock hazard when connected to an XR5 Data Logger.

NOTE: The above limitations pertain only to thermocouples. Pace PT9xx and PT5xx temperature sensors and probes do not have the above limitations.

Minimizing thermocouple noise pickup

XR5-SE inputs have limited filtering. If possible, use thermocouples with relatively short lead length to minimize noise pickup. We suggest using thermocouples with leads of about 10 FT (3 meters) or less. Do not run thermocouple leads parallel to AC power wiring. If noise pickup is evident, it may be reduced by connecting a good earth ground to an XR5 C Terminal.

Selecting a millivolt option for thermocouple application

- 20mv option: Highest accuracy and resolution for all thermocouples (see tables that follow).
Additional range selections for each channel: Full Range: 0-20mv, Half Range: 0-10mv
Reduced temperature range for J, K, E, N and C thermocouples.
- 50mv option: Highest temperature ranges for J, K, N and C thermocouples (see tables that follow).
Additional range selections for each channel: Full Range: 0-50mv, Half Range: 0-25mv
Compared to the 20mv option, lower thermocouple accuracy.

Thermocouple Accuracy Specifications

Temperature measurement error and resolution for J, K, N, E, T, S, R, B and C type thermocouples are listed in the following tables. A precision thermistor for cold junction compensation is located at the right end of the terminal block, beside screw terminal #8 (inside the case). The 'Max Error' specification assumes a stable temperature along the terminal block, free from sudden variations and gradients. One way to maintain uniform terminal block temperature is to house the XR5 in a [Pace Weatherproof Enclosure](#).

NOTE: 'Max Error' is XR5 measurement error but does not include inherent thermocouple error *. 'Max Error' is worst case, over an ambient temperature range of 0 to 60°C (32 to 140°F); 'Typical Error' is significantly less.

* Thermocouple error is dependent on thermocouple wire purity and thermocouple temperature. ASTM standard wire error for the J Type thermocouple is $\pm 2.2^{\circ}\text{C}$ (4.0°F) from 0 to 277 °C (32 to 531°F) and increases linearly to $\pm 5.7^{\circ}\text{C}$ (10.3°F) at 760°C (1400°F).

J Type Thermocouple				
<i>Temperatures Above XR5 ambient</i>				
Thermocouple Lead Connections: Red: C terminal; White: Channel #				
Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	165°C (329°F)	1.1°C (2.0°F)	0.05°C (0.1°F)
	0-20mv	350°C (662°F)	2.7°C (4.9°F)	0.1°C (0.2°F)
XR5-SE-50mv	0-25mv	435°C (815°F)	2.4°C (4.3°F)	0.1°C (0.2°F)
	0-50mv	760°C (1400°F)	6.6°C (12°F)	0.2°C (0.4°F)
<i>Temperatures Below XR5 ambient</i>				
Thermocouple Lead Connections: Red: Channel #; White: C terminal				
Model	Range	Minimum Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	-130°C (-202°F)	1.1°C (2.0°F)	0.05°C (0.1°F)
	0-20mv	-130°C (-202°F)	use 0-10mv range	
XR5-SE-50mv	0-25mv	-130°C (-202°F)	2.4°C (4.3°F)	0.1°C (0.2°F)
	0-50mv	-130°C (-202°F)	use 0-25mv range	

K Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Red: C terminal; Yellow: Channel #

Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	235°C (455°F)	1.4°C (2.6°F)	0.05°C (0.10°F)
	0-20mv	475°C (887°F)	3.6°C (6.4°F)	0.11°C (0.20°F)
XR5-SE-50mv	0-25mv	590°C (1094°F)	3.2°C (5.8°F)	0.14°C (0.25°F)
	0-50mv	1220°C (2228°F)	8.8°C (16°F)	0.30°C (0.50°F)

Temperatures Below XR5 ambient

Thermocouple Lead Connections: Red: Channel #; Yellow: C terminal

Model	Range	Minimum Temp.	Accuracy	Approx. resolution
XR5-SE-20mv	0-10mv	-50°C (-58°F)	1.4°C (2.6°F)	0.05°C (0.10°F)
	0-20mv	-50°C (-58°F)	use 0-10mv range	
XR5-SE-50mv	0-25mv	-50°C (-58°F)	3.2°C (5.8°F)	0.14°C (0.25°F)
	0-50mv	-50°C (-58°F)	use 0-25mv range	

T Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Blue: C terminal; Red: Channel #

Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	200°C (392°F)	1.4°C (2.4°F)	0.05°C (0.1°F)
	0-20mv	400°C (752°F)	3.3°C (6.4°F)	0.10°C (0.2°F)
XR5-SE-50mv	0-25mv	400°C (752°F)	3.2°C (5.8°F)	0.10°C (0.2°F)
	0-50mv	400°C (752°F)	use 0-25mv range	

Temperatures Below XR5 ambient

Thermocouple Lead Connections: Blue: Channel #; Red: C terminal

Model	Range	Minimum Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	-190°C (-310°F)	1.4°C (2.4°F)	0.05°C (0.1°F)
	0-20mv	-190°C (-310°F)	use 0-10mv range	
XR5-SE-50mv	0-25mv	-190°C (-310°F)	3.2°C (5.8°F)	0.10°C (0.2°F)
	0-50mv	-190°C (-310°F)	use 0-25mv range	

E Type Thermocouple				
<i>Temperatures Above XR5 ambient</i>				
Thermocouple Lead Connections: Red: C terminal; Purple: Channel #				
Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	155°C (311°F)	1.0°C (1.8°F)	0.04°C (0.07°F)
	0-20mv	285°C (545°F)	2.2°C (4.0°F)	0.07°C (0.12°F)
XR5-SE-50mv	0-25mv	350°C (662°F)	2.0°C (3.6°F)	0.09°C (0.15°F)
	0-50mv	660°C (1220°F)	4.9°C (8.8°F)	0.15°C (0.25°F)
<i>Temperatures Below XR5 ambient</i>				
Thermocouple Lead Connections: Red: Channel #; Purple: C terminal				
Model	Range	Minimum Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	-100°C (-148°F)	1.0°C (1.8°F)	0.04°C (0.07°F)
	0-20mv	-100°C (-148°F)	use 0-10mv range	
XR5-SE-50mv	0-25mv	-100°C (-148°F)	2.0°C (3.6°F)	0.09°C (0.15°F)
	0-50mv	-100°C (-148°F)	use 0-25mv range	

N Type Thermocouple				
<i>Temperatures Above XR5 ambient</i>				
Thermocouple Lead Connections: Red: C terminal; Orange: Channel #				
Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	300°C (572°F)	1.8°C (3.2°F)	0.07°C (0.125°F)
	0-20mv	570°C (1058°F)	4.2°C (7.6°F)	0.14°C (0.25°F)
XR5-SE-50mv	0-25mv	700°C (1292°F)	3.8°C (6.8°F)	0.17°C (0.3°F)
	0-50mv	1300°C (2372°F)	9.4°C (17°F)	0.33°C (0.6°F)
<i>Temperatures Below XR5 ambient</i>				
Thermocouple Lead Connections: Red: Channel #; Orange: C terminal				
Model	Range	Minimum Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	-50°C (-58°F)	1.8°C (3.2°F)	0.07°C (0.125°F)
	0-20mv	-50°C (-58°F)	use 0-10mv range	
XR5-SE-50mv	0-25mv	-50°C (-58°F)	3.8°C (6.8°F)	0.17°C (0.3°F)
	0-50mv	-50°C (-58°F)	use 0-25mv range	

B Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Red: C terminal; Gray: Channel #

Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	1500°C (2732°F)	8°C (14°F)	0.36°C (0.66°F)
	0-20mv	1700°C (3092°F)	21°C (38°F)	0.73°C (1.3°F)
XR5-SE-50mv	0-25mv	1700°C (3092°F)	19°C (34°F)	0.9°C (1.6°F)
	0-50mv	1700°C (3092°F)	use 0-25mv range	

C Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Red: C terminal; White: Channel #

Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	550°C (1022°F)	3°C (5°F)	0.13°C (0.25°F)
	0-20mv	1070°C (1958°F)	8°C (14°F)	0.26°C (0.5°F)
XR5-SE-50mv	0-25mv	1370°C (2498°F)	7°C (13°F)	0.33°C (0.6°F)
	0-50mv	2320°C (4208°F)	20°C (35°F)	0.7°C (1.2°F)

R Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Red: C terminal; Black: Channel #

Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	950°C (1742°F)	5°C (9°F)	0.25°C (0.45°F)
	0-20mv	1670°C (3038°F)	12°C (21°F)	0.5°C (0.9°F)
XR5-SE-50mv	0-25mv	1760°C (3200°F)	11°C (19°F)	0.7°C (1.2°F)
	0-50mv	1760°C (3200°F)	use 0-25mv range	

S Type Thermocouple*Temperatures Above XR5 ambient*

Thermocouple Lead Connections: Red: C terminal; Black: Channel #

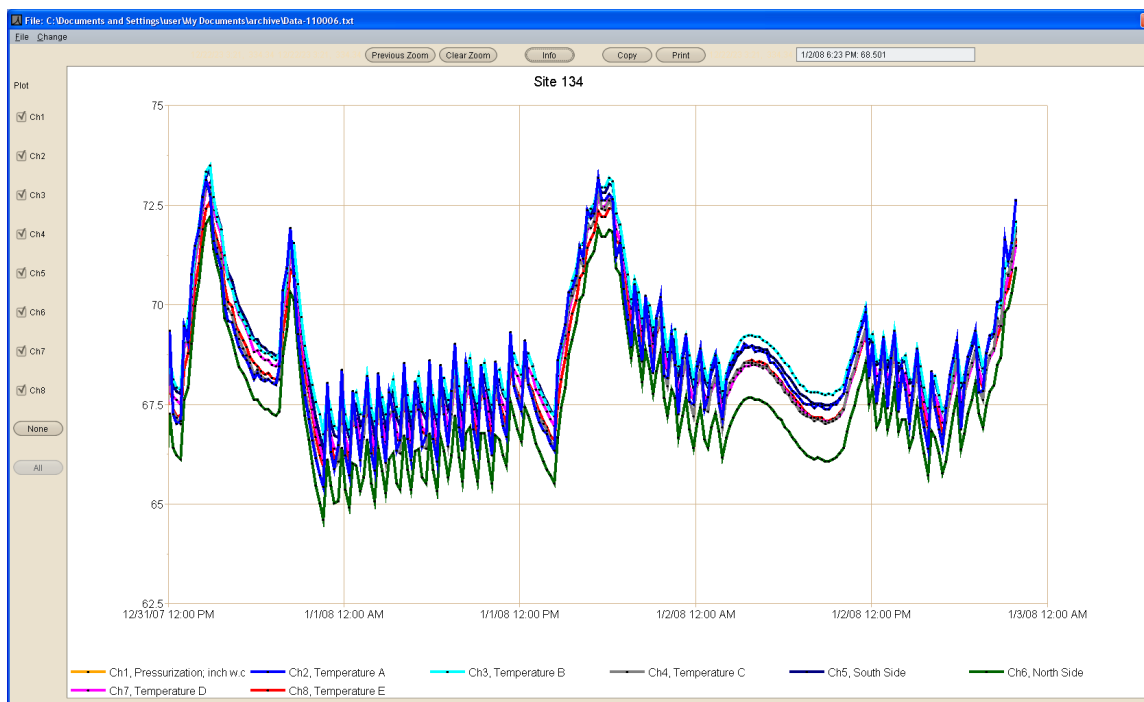
Model	Range	~ Max. Temp.	Max. Error	Approx. resolution
XR5-SE-20mv	0-10mv	1020°C (1868°F)	5°C (10°F)	0.25°C (0.45°F)
	0-20mv	1760°C (3200°F)	13°C (24°F)	0.5°C (0.9°F)
XR5-SE-50mv	0-25mv	1760°C (3200°F)	12°C (22°F)	0.7°C (1.2°F)
	0-50mv	1760°C (3200°F)	use 0-25mv range	

LogXR Graph

This section applies to both LogXR Graphs and LogXR Real Time Graphs.

Graphs of XR5 data are viewed by clicking 'Graph' after a data file has been transferred (**Transfer | Data** or **Transfer | Data / Auto Name**), or an existing data file may be selected from the File menu (**File | Plot Graph**).

A Real Time Graph is viewed by selecting **Real Time | Graph** or **Real Time | Graph and write to file**.



Menu and control buttons are provided to display and manipulate the graph.

Menu selection	Description
File Plot Graph	Plot new graph of selected data file
File View Text File	View selected data file in its text format (default selection is the currently graphed file)
File Exit	Exit the graph display
Change Settings	Displays the "Graph Settings" window for changing graph colors and other parameters (see page 104).

The following graph controls are currently available (additional features are in development).

Graph control	Description
Plot channel #'s (check box)	Uncheck to "hide" individual channel plots.
None (button)	Hides all channel plots
All (button)	Plots all logged channels (the default setting)

Zoom (mouse function)	To Zoom, press and hold the left mouse button and drag the mouse across the graph to create a "Zoom rectangle". When the mouse button is released, the data within the zoom rectangle will fill the entire graph. The Zoom operation may be repeated any number of times.
Previous Zoom (button)	Each click of the 'Previous Zoom' button displays the prior Zoom. (not present in the Real Time Graph display)
Clear Zoom (button)	"Unzooms" the graph to display the entire data set.
Info (button)	Displays information pertaining to the data file being graphed.
Copy (button)	Copies the current graph to the system clipboard. The graph can then be copied to a word processing or graphics program, typically by clicking Edit Paste within the other program.
Print (button)	Prints the current graph to the computer's default printer.
Date/Time & Value (text box)	Displays the time and value of the current mouse position on the graph.

"Hidden" channels

When a data set has multiple channels with large and small values (for example, a 0-10,000 psi Pressure Sensor and a 0-1 volt signal), the plots of the small values can appear to be missing. Use the mouse to create a zoom rectangle along the bottom horizontal border of the graph. The small values will now be visible.

Files with multiple data sets

In order to visibly display "time gaps" in data files with multiple data sets*, "**Data Set x" between data sets** must be checked in **File | Preferences**. Otherwise, channel plot lines will be continuous, and will not show an unplotted "time gap" from the end of one data set to the beginning of the next data set.

* Logging Modes that can generate multiple (non-contiguous) data sets:
Manual (Slow), 'Log on Ext. Trigger', 'Cycle Logging' and 'Log on Alarm'.

Date/Time Format

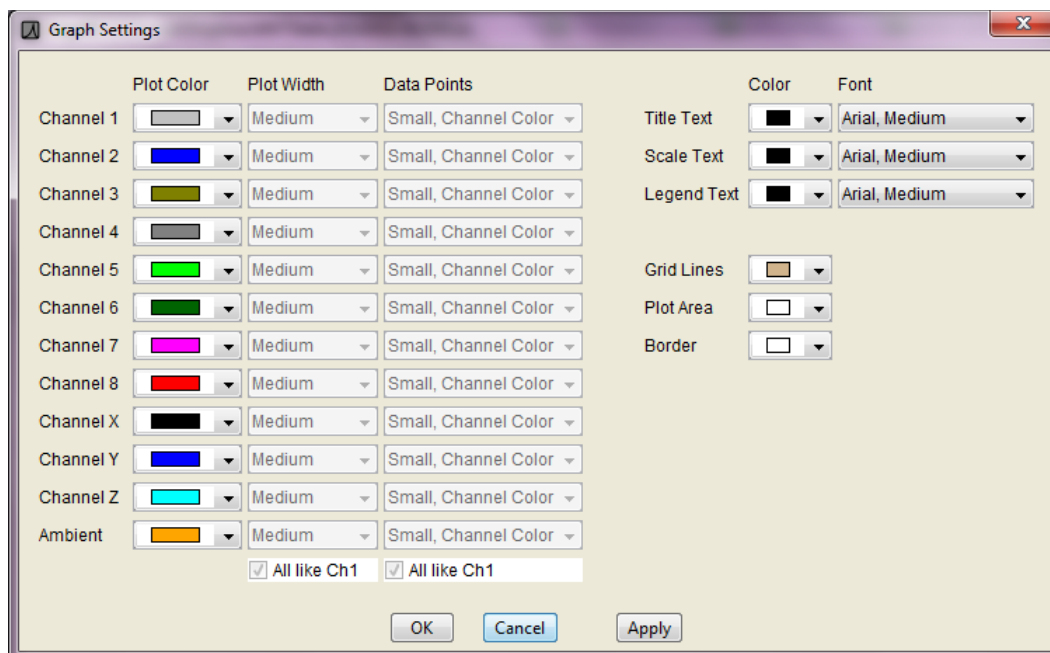
The date/time values at the bottom of the graph display (x-axis) conform to the regional date and time format of the user's computer (short format).

The date and time format in the data portion of an XR5 data file (.txt or .csv file) uses the following fixed (non-regional) format:

Year / Month / Day Hour : Minute : Second. (Hour field is 24 hour format [0..23]).

Graph Settings

Displayed by selecting **Change | Settings** on the graph menu.



The Graph Settings screen can be displayed both from the Graph and the Real Time Graph display.

Plot Color

Click on a color box to display the color pallet. Click on a color to select it.

Plot Width

Select Thin, Medium, or Thick for each individual channel. If "All like Ch1" is checked (at the bottom of the Plot Width column), all plot widths replicate the Channel 1 selection.

Note

If the current data file has over 100,000 readings, LogXR overrides the Plot Width selections and plots thin lines to insure acceptable plotting times. Files with less than 100,000 readings may also plot thin lines until only a portion of the file is displayed using the Zoom feature. The Real Time Graph always utilizes the current Plot Width selections.

Data Point Style

Select a data point style for each channel. If "All like Ch1" is checked (at the bottom of the Data Points column), data point style selections for all channels replicate the Channel 1 selection.

Note

If the current data file has over 100,000 readings, LogXR overrides the Data Point selections with "Don't Show" to insure acceptable plotting times. Files with less than 100,000 readings may not display the selected style until only a portion of the file is displayed using the Zoom feature. The Real Time Graph always utilizes the current Data Point selections.

Dial-up Scheduler & Modem setup

LogXR supports XR5 communications over telephone lines using additional modem hardware. Click the main menu selection **Dial-up*** to display the Dial-up Scheduler screen*

* The **Dial-up** menu selection does not appear by default in LogXR. First, select **Port | Options** and click the Dial-up checkbox. Then click OK and exit out of LogXR (**File | Exit**). Now, whenever LogXR is started, the **Dial-up** selection will appear in the Main menu.

Dial-Up Scheduler

The Scheduler enables automatic data collection from any number of modem-equipped XR5 Data Loggers. Individual modem-equipped XR5's may also be accessed manually using the Dial-up Scheduler.

Required hardware

Listed below is the hardware required for either a Land-line or Cellular based system. A Land-line system provides reliable performance. A cellular based system is affected by signal strength, antenna position, interference and other factors, so reliability is more installation dependent.

LAND LINE SYSTEM

Modem:	Zoom 2949 External Fax Modem, Serial RS-232.	
	Available from various vendors such as www.amazon.com .	
Required quantity:	One at user's computer and one at each remote XR5.	
	Note: In many cases a computer's internal modem or other external data/fax modem can be used. However, Pace can not provide troubleshooting support for a customer's system that uses a non-Zoom modem. Please see the next page for details.	
Modem cables:	Pace part # IC211	One required for each remote XR5.
	Modem Serial Cable	One required. Connects "Local" Zoom modem to your computer. Available at retail computer outlets.
Telephone line:	One at user's computer, one at each remote site.	

CELLULAR SYSTEM

GSM cellular modem:	Multi-Tech model MTCBA-G-F4 (for all countries with GSM/GPRS service) Available from www.amazon.com and other vendors.	
	The Wavecom Fastrack 1206B GSM cellular modem is equivalent to the above Multi-Tech model.	
	Note: Additional hardware is required for operation in North America, contact Pace for details.	
GSM cellular modem cable:	Pace part # ICW-15 (Connects Multi-Tech modem to XR5).	

Setting up a Land line system

Configuring the Remote Modem

The remote modem connects to the XR5 at the remote site. The remote modem must be a Zoom model 2949. Other modems may work, but we will not be able provide support if you use a different modem and have problems. The Zoom 2949 includes lightning protection and some other features that make it especially suitable for use at unattended remote sites. The remote modem must first be configured (initialized) before it is deployed at the remote site. This can be done using LogXR Software by following the steps below:

1. Connect the Modem Serial Cable to the Zoom modem, and to your computer's 9 pin com port. The same com port must be selected in LogXR (**Port | Select**).
2. Make sure the modem is powered ON. The PWR and TR (Terminal Ready) lights should be illuminated.
3. Select the **Dial-up** main-menu selection, and then select **Edit | Initialize Remote Modem**
4. The Dialog box should show the following Setup String: AT&FE&D&KS0=1&W0
If it does not, change the contents to the above string.
5. Click the "Send to Modem" button. A message box should appear: "Modem response: OK". If you get a different message, try a second time, and make sure your modem is connected to the port listed in the **Port | Select** screen. The modem's AA light should now be illuminated. (AA means Auto-Answer). Click OK. A message box appears: "Modem successfully initialized." Click OK.
6. The modem can now be disconnected from your computer and connected to the XR5 using the Pace IC211 Cable.

NOTES:

We strongly recommend that you test the system using two phone lines locally (ideally in the same office or building) before installing the XR5 and modem at the remote site.

Each Zoom modem should be powered up AFTER its serial cable is properly connected.

Once the Zoom modem is connected to a com port and is powered up, a Windows operating system "Wizard" may appear to install the Zoom modem. Although it is OK to allow the Wizard to proceed, it is not necessary if the modem will only be used with LogXR. In that case, you can click Cancel to terminate the Wizard.

Installing the Local Modem

We recommend using the same Zoom 2949 modem at your computer. Other modems may work, but if you have problems, Pace can only provide limited support because of the subtle and not-so-subtle variations found in other modems, especially when used in the non-mainstream application of communicating with a remote device like the Pace XR5.

Connect the local modem to your computer using the same cable that was used to set up the "remote" modem. Make sure that the local modem is connected to the same com port selected in the **Port | Select** screen. Select **Edit | Local Modem Setup** to view or change the Local modem setup string. For the Zoom 2949 modem, the string should be as follows: AT&FE&D

The Setup String is automatically sent to the local modem whenever the Scheduler is activated or a remote site is manually contacted from the **Contact** menu selection. See page 109 for details.

Setting up a Cellular-based System

The supported cellular system uses a Zoom 2949 modem (or equivalent) at the "local" computer end, and a cellular modem at the XR5. Please contact Pace for setup instructions for the remote cellular modem. Use the instructions [Installing the Local Modem](#) in the paragraph above to install the local modem.

Customers in North America: Contact Pace for hardware requirements.

Setting up the Dial-up Scheduler

The Dial-up Scheduler supports XR5 Data Loggers connected to phone lines via a Zoom 2949 modem. The Scheduler is arranged in a series of "rows". Each row contains three cells which define a "Project Folder" name, a Location (and the phone number of the remote modem), and the desired collection time. The left side of the Scheduler is divided into two panes (upper and lower). The upper pane lists the collected data files for the currently selected row. The bottom pane displays the Setup file (if present) for the currently selected row (details on the next page).

You create a schedule by clicking on the first available row under "Project Folder" to name a Folder, then select the Location and finally the Collection time. You can also select the cell you wish to edit and click **Edit | Modify** from the Scheduler menu to edit a new cell or to make a change to an existing cell. The three "cells" in each row are explained below.

Project Folder

A master folder for the collected data. Each row can have a different Project Folder name, or if you have a group of remote loggers that are being used for a particular logging project, you could give each row the same Project Folder name. Then, data from all the remote sites in this group would be stored in the same "Data" subdirectory of your Project Folder.

Location (phone number)

Enter a descriptive location name for the remote site. Then enter the phone number of the telephone line at the remote site. Enter a number as you would dial it. You can add multiple "-" characters if desired to make the phone number more readable.

Collection Time

Choose a collection Interval of Hourly, Daily, Weekly, or Monthly.

Hourly:

Select the minute after the hour. Data will be collected every hour at the specified minute.

Daily:

Select the time each day that the collection will occur. The hour selection is in 24 hour time format (for example, 10 AM = 10, 2 PM = 14, 5 PM = 17, etc).

Note: If you wish to collect data twice daily, create two rows for the same remote site (same Project Folder and Location/phone number for each row) and set the Daily collection times 12 hours apart.

Weekly:

Select the day of the week and the time that the collection will occur.

Monthly:

Select the day of the month and the time that the collection will occur.

(Optional) Sending a Setup to reset the XR5

Immediately after collecting data from an XR5, the Scheduler can send a Setup to clear the XR5's memory, resynchronize its time clock, and re-start logging. Each completed row in the Scheduler has a corresponding Setup folder. When a row is selected (clicked) the Setup pane (lower left pane) lists the Setup file, if it is present, for the selected row.

The presence of a Setup file in the Setup pane determines if a Setup will be sent after collecting data. If no Setup file is present (the default state), a setup is not sent after data has been collected. The directory path to locate this Setup folder is listed directly above the Setup pane.

To copy an XR5 Setup file into this folder, use a file navigation program (on Windows systems, hold down the Window button (beside the Alt Key) and press E to launch Windows Explorer). Then navigate to and select a previously saved Setup file, select Copy, and then navigate to the selected row's Setup folder (the directory path is listed above the Setup pane) and select Paste.

Setup file requirements

A Setup file used with the Scheduler must not have preset time fields, because these fields will become invalid after their initial use. For example, a setup with logging mode "Preset / (Slow)" will have invalid time fields after its initial use.

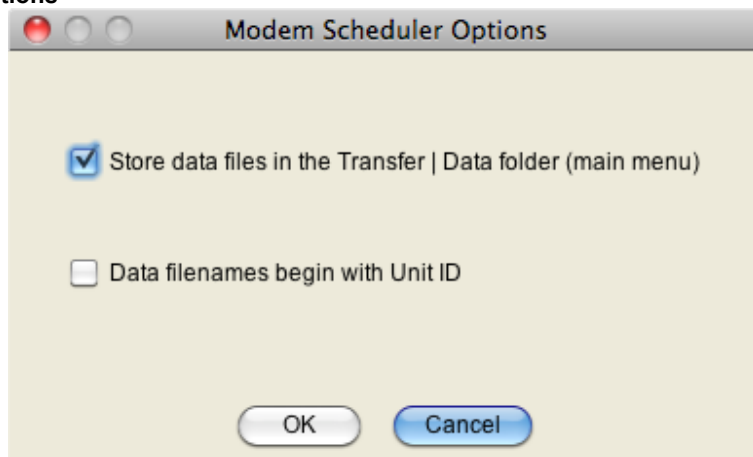
The Setup file must be a setup that was created for your particular XR5 model. Setups for std memory models can be used with -M models of the same model type, for example, a setup file for a XR5-SE-20mv is also valid for an XR5-SE-M-20mv).

Starting the Scheduler

Once one or more rows have been filled, the Scheduler is activated by the menu selection **Contact | Activate Dial-up Scheduler**. Alternately, if the scheduler is not active (running), you can communicate with individual remote sites manually by selecting **Contact | Contact Selected Unit Now**. See the Scheduler menu selections on the next page for more details.

Scheduler menu selections:

File | Options



Store data files in the Transfer | Data folder (main menu)

If checked, data files collected by the Scheduler are stored in the same folder used for Transfer | Data from the main menu. Enables all collected data files to be stored in a single common folder.

Data filenames begin with Unit ID

If checked, collected data files have a name that includes the XR5's Unit ID appended to the beginning of the filename.

Scheduler menu selections (continued):**File | View Phone Numbers**

Display all current Locations and their associated Phone Numbers.

File | Exit

Exit the Scheduler.

Edit | Modify

Modify the selected cell (Project Folder, Location, or Collection Time).

Edit | Delete

Delete the selected row.

Edit | Initialize Remote Modem

Configures a modem for remote use. See [Configuring the Remote Modem](#) on page 106

Edit | Local Modem Setup

Edit the Local modem's initialization (setup) string. This string is sent to the local modem when the Scheduler is activated, or when a remote site is manually contacted. See page 106 for details.

Contact | Contact Selected Unit Now

After successfully connecting with the selected remote site, a screen appears similar to LogXR's Main Menu that allows you to manually communicate over phone lines with the selected XR5. The remote modem must have previously been configured (see page 106) and the local modem connected to the currently selected Com port (**Port | Select** from the main menu).

Contact | Activate Dial-up Scheduler

Activates the Scheduler. First brings up a dialog box that allows you to specify a name for the Scheduler's log file. All Scheduler activity will be logged to this file (the same activity log displays in the Scheduler Activity box that appears when the Scheduler is activated). Clicking "Create" activates the Scheduler. Once the Scheduler is activated, LogXR can not be used for other functions. Clicking "Stop" on the Scheduler Activity box terminates the Scheduler.

Scheduler Activity box

Provides a scrollable listing of all the Scheduler's actions. The Scheduler Activity box should initially contain 3 lines of information:

Line 1: Date and time the Scheduler was started.

Line 2: Name and location of the log file (a text file listing all of all the Scheduler's actions).

Line 3: Modem initialization status.

If the modem did not successfully initialize, it is likely that the modem is either not powered ON, is not correctly cabled to the computer, or the incorrect COM port has been selected (**Port | Select** from the main menu). In this case, click Stop on the Activity box to terminate the Scheduler. Once you have taken action to resolve the problem, activate the Scheduler again by selecting **Contact | Activate Dial-up Scheduler** and make sure that the Activity box lists the modem as having been successfully initialized.

Scheduler Notes and Tips:

1. Data transfer times are about 2.5 times faster if **Long packets** is checked in LogXR's **Port | Options**.
2. Each Row must list a unique Collection Time minutes. If two or more rows list the same Collection Time minutes, these additional rows will be ignored by the Scheduler.
3. If data collection is active and "overlaps" a Collection Time listed for another row, this other row will be ignored by the Scheduler. Therefore, space each row's Collection Time so that there is sufficient time to transfer data before any other listed collection time occurs.
4. The vertical bar that separates the Scheduler rows from the Setup and Data file panes can be dragged with the mouse to provide more viewing area for the Setup and Data panes.
5. To insure against the possibility that a modem dial-out is unsuccessful, we suggest setting the collection time interval to represent no more than $\frac{1}{2}$ of the time it will take for the logger's memory to fill. Then, if a dial-out is unsuccessful, all data will be recovered the next time the Scheduler contacts the XR5.
6. Data files are named as follows: Each data file name begins with the XR5's eight digit serial number, followed by a dash "-" character and an auto-incrementing 5 digit number, followed by a ".txt" or ".csv" as selected in the main menu's **File | Preferences** (Mac: **LogXR | Preferences**).

If **Data filenames begin with Unit ID** is checked in the Scheduler's **File | Options**, then data file names begin with the XR5's 8 digit Unit ID (user editable), followed by a dash "-" and followed by the rest of the file name described in # 5 above.

Scaling XR440 sensors

The XR5 uses Slope/Offset scaling for linear sensors. Linear sensors for the [Pace XR440 Data Logger](#) are compatible with the XR5 but require Slope/Offset scaling values.

Pace sensors for the XR440 are listed in this manual with Slope/Offset scaling values, except for the TRH-100 Temp/RH Probe. For the TRH-100, LogXR Software accepts the Low/High scaling printed on the TRH-100 Probe and converts these values to Slope and Offset values. See page 72 for details.

Using XR440 linear sensors with the XR5

Slope and Offset scaling values for most "XR440" Sensors are listed in this manual in the sensor section from pages 71-83.

High/Low scaling values can also be converted to Slope/Offset Scaling values as follows:

$$\text{Slope} = (|\text{Low scaling value}| + \text{High scaling value}) / 5$$

$$\text{Offset} = \text{Low value}$$

Note:

|Low scaling value| is the absolute value of the Low scaling value; if the value is negative, simply remove the negative sign, if the value is positive, use the number as it is. (If $x < 0$ then $x = x * -1$).

Example: A P1500-100 Sensor has scaling values of Low: -12.5, High: 112.5

$$\text{Slope} = (12.5 + 112.5) / 5 = 25$$

$$\text{Offset} = -12.5$$

Using XR5 linear sensors with the Pace XR440 Pocket Logger

If a customer has an XR5 sensor that he wishes to use with the XR440, he can obtain the Low/High scaling values required by the XR440 with Pocket Logger Software's* Help. For example: To find the Low/High scaling for a P1600 Pressure Sensor, in Pocket Logger Software click Help | Contents | Index, type P1600 and click on the topic "P1600 Pressure Sensor".

Or, convert the XR5's Slope/Offset scaling to the XR440's Low/High scaling as follows:

$$\text{Low Value} = \text{Offset}$$

$$\text{High Value} = (\text{Slope} * 5) + \text{Offset}$$

* [Pocket Logger Software](#) is free software for the XR440 available from the Pace website.

IC209 Interface Cable, Internal Wiring

<u>9 Pin Connector</u>	<u>3.5mm Stereo Plug</u>
Pin 2	Tip
Pin 3	Middle
Pin 5	Ground (opposite tip)

Pin 7

Pin 8

Add a jumper wire from pin 7 to pin 8 on the 9 pin connector

Pin numbers are legible on the 9 pin connector (a magnifying glass may be needed).

Data Flow:

Data is transmitted from XR5 to computer on Pin 2.

Data is transmitted from computer to XR5 on Pin 3.

IC211 Modem Cable, Internal Wiring

<u>25 Pin Connector</u>	<u>3.5mm Stereo Plug</u>
Pin 2	Tip
Pin 3	Middle
Pin 7	Ground (opposite tip)

Pin 4

Pin 5

Add a jumper wire from pin 4 to pin 5 on the 25 pin connector.

Pin 6

Pin 20

Add a jumper wire from pin 6 to pin 20 on the 25 pin connector.

Pin numbers are legible on the 25 pin connector (a magnifying glass may be needed).

Data Flow:

Data is transmitted from XR5 to Modem on Pin 2.

Data is transmitted from Modem to XR5 on Pin 3

XR5-SE models compared to earlier generation XR5-8 models

The [XR5-8 series](#) consists of the following models:

XR5-8A-SE
 XR5-8B-SE
 XR5-8X-SE
 XR5-8A-SE-M
 XR5-8B-SE-M
 XR5-8X-SE-M

Differences between XR5-SE series and XR5-8 series are summarized below:

	XR5-8 series	XR5-SE series
D terminal excitation	5 ma max	40 ma max (D + E terminals)
E terminal excitation	25 ma (29 ma D + E terminals)	30 ma max
Batteries	Two ½ AA-size Lithium	Two AA size Lithium
Battery amp-hours	0.95 amps	2.4 amps
Internal circuit board(s)	Main and Daughter board	Single PCB
Optional millivolt input ranges	No	Yes
External Power Input	9 Vdc (10 Vdc max)	9 Vdc - 12 Vdc (14 Vdc Max)
Pulse input voltage range	0 - 3.6 Vdc	+/- 18 Vdc
Pace multi-range analog inputs*	No	Yes

*XR5-8 models have fixed combinations of 0-2.5v inputs (which also read 2-wire resistances) and/or 0-5v inputs. Please see the section “Model Selection Guide” in the [XR5-8 User's Guide](#) for details.

Pace Humidity Probe Differences

TRH-100

Nominal 1 to 4v output (optimized for the 0-5v input of the XR440)
Use with XR440 and the XR5-SE

TRH-160

Nominal 0.5 to 2v output (optimized for a 0-2.5v XR5 input)
Use with XR5-SE and earlier generation XR5-8 models.

Using Pace Humidity Probe without LogXR Software

For customers using the TRH-100 or TRH-160 Probe to acquire humidity data via the [XR5 Text Interface's](#) read command, or with other (non-Pace) data acquisition systems, the following compensation formula should be applied to the humidity data for best accuracy:

$$RH_c = RH / (1.0546 - 0.00216 * T)$$

Where: RH = %RH (not temperature compensated).

T = Temperature of TRH-160's temperature sensor (in °C).

RH_c = %RH (compensated for TRH-160 Probe temperature).

If the TRH-100 or TRH-160 Probe is used in a conditioned environment (indoor climate controlled space) temperature compensation will be less than 1% RH, and the above formula could be omitted. In outdoor environments, or in applications with large ambient temperature swings, the above formula should be used.

Electrically Noisy Environments

For optimum accuracy and performance, the following steps are recommended when using the XR5 in electrically noisy environments*.

*For example, mounting the XR5 in an electrical panel containing relay contactors.

1. Do not locate the XR5 in close proximity to relay contactors or similar inductive devices.
2. Ground the XR5. Connect a heavy wire from a C terminal to a good earth ground. Use as short a wire as is practical.
3. Use shielded cable for long signal leads (leads longer than 20 ft). Ground the shield at one end only.

Examples of problem installations and solutions:

A Pace Data Logger located outdoors logged temperatures using long sensor leads. Data corruption sometimes occurred during lightning storms. Driving a ground rod into the soil and connecting a short wire from the ground rod to the C terminal permanently solved the problem.

A Pace Data Logger, cellular transceiver, antenna and battery were housed in a compact plastic case. RF energy radiating from the antenna caused communication errors when transferring data. Enclosing the data logger within a small metal box (shielding it from the RF energy) eliminated the errors.

Alternate batteries for the XR5-SE

Any true cross to the Tadiran TL-5903 will work fine in the XR5-SE. Compatible batteries are listed below.

Manufacturer	Part Number	Website
GM Battery	ER14505H	www.gmbattery.com
Saft	LS14500	www.saftbatteries.com
Xeno Energy	XL-060F	www.xenousa.com/product/xl-060f/
Fanso	ER14505H	www.fansobattery.com

Pertinent specifications:

AA size, approx 2.4 amp hour (less is OK, but battery life will be proportionally shorter)

3.6v (3.7 is OK)

Pulse current: 50ma or higher.

Limited Warranty

All XR5 Data Loggers are warranted against defects in materials and workmanship for three years from date of shipment. All other Pace Scientific products are warranted against defects in materials and workmanship for one year from date of shipment. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you return the product, shipping prepaid, to Pace Scientific Inc.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

This warranty does not apply if the product has been damaged by accident or misuse or as the result of modifications or repair by anyone other than Pace Scientific Inc. No other express warranty is given. The repair or replacement of a product is your exclusive remedy. ANY OTHER IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. IN NO EVENT SHALL PACE SCIENTIFIC INC. BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE SUCH PRODUCT, EVEN IF PACE SCIENTIFIC OR AN APPROVED RESELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Products are sold on the basis of specifications applicable at the time of manufacture. Pace Scientific Inc. shall have no obligation to modify or update products once sold.

Service

Technical Support

Call Pace Scientific at (704) 799-0688, Monday - Friday between 8AM and 5PM Eastern Standard Time.
Or email support@pace-sci.com

Repair

Contact technical support to confirm that the product is not functioning properly. If repair is needed, Technical Support will issue an RMA number and a shipping address.

XR5-SE and Accessories

XR5 Data Loggers	Description
XR5-SE	8 analog (multi-range) and 3 pulse inputs, up to 63,642 readings
XR5-SE-M	8 analog (multi-range) and 3 pulse inputs, up to 260,250 readings

Millivolt option: Adds two additional millivolt range selections and one internal precision temperature sensor (12th channel). **All existing features and input capabilities of the XR5 are retained.** See page 97-98 for details.

To specify:

<u>Add to model</u>	<u>Additional range selections for each analog input</u>
20mv	0-10mv and 0-20mv
50mv	0-25mv and 0-50mv
100mv	0-50mv and 0-100mv
250mv	0-125mv and 0-250mv
500mv	0-250mv and 0-500mv
1000mv	0-500mv and 0-1000mv

Cables

IC209	Interface Cable (required), 5 ft length. For logger setup and data transfers.
USB-A	USB Adapter (recommended) Connects Interface Cable to USB port.
ICE-12ft	Extension Cable, 12 ft (3.6 meters)

Wireless Link

[WTP-100](#) Wireless Communications Link (range of up to 30 meters indoors, 100 meters outdoors) Includes Battery cable and AC power adapter for XR5 side; see page 15 for details. [EC24](#), [EC45](#) and [EC55](#) Enclosures are available configured to house an XR5 and a battery powered WTP-100 (enclosure includes internal battery holder and short version of IC209 Interface Cable).

Temperature

[Temperature Probes](#), 0.1°C interchangeability

PT907	Epoxy body	0.127" dia. x 0.37" length	4 ft cable
PT916-4	SS sheath	1/8" dia. x 4" length	3 ft Teflon leads
PT916-6	SS sheath	1/8" dia. x 6" length	3 ft Teflon leads
PT916-12	SS sheath	1/8" dia. x 12" length	3 ft Teflon leads
CF916-1/8	SS compression fitting for any PT916 probe, 1/8 NPT male threads		
PT960	SS sheath	0.236" dia. x 2" length, immersible, 20 ft cable	

[High temperature sensors](#), size: 0.2" x 0.6" x 0.08" for air or surface temperature applications

PT510	Max. Continuous Temperature: 200°C (392°F)	40" Teflon leads
PT520	Max. Continuous Temperature: 260°C (500°F)	40" Teflon leads

[Thermocouple Probe](#) (requires XR5-SE with -20mv, -50mv or -100mv millivolt option)

PT450	J type; Stainless Steel sheath 1/8" dia. by 6" length, with 10 ft Teflon Cable
-------	--

XR5-SE Accessories

Relative Humidity

[Relative Humidity & Temperature Probes](#), 3% RH accuracy, 0.1°C interchangeability

TRH-100	1 ft leads
TRH-100-10FT	10 ft shielded cable
TRH-100-20FT	20 ft shielded cable
TRH-100-50FT	50 ft shielded cable

Electrical / Power

[DC Current Sensors](#) (linear dc voltage output, accepts ring terminals for two ¼-20 studs, 10 ft signal cable)

DC05A	±5 dc amps
DC20A	±20 dc amps
DC50A	±50 dc amps
DC100A	±100 dc amps
DC150A	±150 dc amps
DC200A	±200 dc amps

[DC Voltage Sensors](#)

DC-36V	4-36 V dc
DC-72V	4-72 V dc
DIN-120	120 mm (4.72") DIN Rail for mounting up to 6 DC Voltage Sensors

[AC Current Sensors](#) (split core, 0-5vdc output, 8 ft twisted leads)

SC10A	0-10 ac amps	Conductor clearance: 0.5" square (12.7mm)
SC20A	0-20 ac amps	Conductor clearance: 0.5" square (12.7mm)
SC50A	0-50 ac amps	Conductor clearance: 0.5" square (12.7mm)
SC100A	0-100 ac amps	Conductor clearance: 0.5" square (12.7mm)
SC200A	0-200 ac amps	Conductor clearance: 1.0" square (25.4mm)
SC500A	0-500 ac amps	Conductor clearance: 2.0" square (51mm)
SC1000A	0-1000 ac amps	Conductor clearance: 4.0" square (101mm)
SC1500A	0-1500 ac amps	Conductor clearance: 2.5" square (63mm)

[AC Voltage Sensors](#)

SV300	0-300 ac volts	One-piece din-rail type module
SV600	0-600 ac volts	Din-rail type module with external matching transformer

External Scaling Cables - page 88

INP/2	Configurable Ranges: ±2.5vdc, ±5vdc, 0-10vdc, -2.5 to 7.5vdc
INP/4	Configurable Ranges: 0-10vdc, 0-20vdc, -7.5 to 12.5vdc
INP/6	Configurable Ranges: 0-15vdc, 0-30vdc, -12.5 to 17.5vdc
INP/12	Configurable Ranges: 0-30vdc, 0-60vdc, -27.5 to 32.5vdc
INP/24	Configurable Ranges: 0-60vdc, -57.6 to 62.6vdc

Current Loop Accessories - page 93

INP-124	Precision Series Resistor for 4-20ma current loop
ES-1	External Switch, 1500 Vac isolation, potted housing (see page 95)

Watt Hour Sensors – Single or 3 phase loads. *Contact Pace for separate catalog and price list.*

XR5-SE Accessories

Pressure

<u>Pressure Sensors – P1600 Series</u>		Stainless Steel ¼ NPT male connection, 10 ft cable	
Model	Range	Accuracy over temp.	Accuracy over temp.
P1600-vac-30	Vac-30 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-vac-150	Vac-150 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-vac-300	Vac-300 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-30	0-30 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-50	0-50 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-100	0-100 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-200	0-200 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-500	0-500 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-1000	0-1000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-1500	0-1500 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-2000	0-2000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-3000	0-3000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-5000	0-5000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-7500	0-7500 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-10000	0-10,000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-14500	0-14,500 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C
P1600-20000	0-20,000 psig	±1% FS, -20 to 85°C	±1.5% FS, -40 to 125°C

<u>Pressure Sensors - P1650 Series</u>		Stainless Steel ¼ NPT male connection, 10 ft cable	
Model	Range	Accuracy over temp.	Accuracy over temp.
P1650-5	0-5 psig (0-138 inches H ₂ O)	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C
P1650-15	0-15 psig	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C
P1650-15-A	0-15 psia (absolute pressure)	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C
P1650-30-A	0-30 psia (absolute pressure)	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C
P1650-vac-0	Vac-0 psig	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C
P1650-vac-15	Vac-15 psig	±1.5% FS, -20 to 85°C	±2.0% FS, -40 to 125°C

<u>Pressure Sensor – P300</u> Pressure Media: Dry air or inert gases			
Model	Range	Accuracy over temp.	Oper. Temp.
P300-30-psi-A	0-30 psia	±2% FS, -20 to 85°C	-40 to 85°C

<u>Pressure Sensors – P350 Series</u> Pressure Media: Dry air or inert gases				
Model	Range	Accuracy over temp.	Oper. Temp.	Equiv. Range
P350-0.1-inch-D	±0.1 inch H ₂ O	±2% FS, 5 to 45°C	-20 to 60°C	±0.25 millibar
P350-0.5-inch-D	±0.5 inch H ₂ O	±2% FS, 5 to 45°C	-20 to 60°C	±1.25 millibar
P350-1-inch-D	±1 inch H ₂ O	±2% FS, 5 to 45°C	-20 to 60°C	±2.5 millibar
P350-5-inch-D	±5 inch H ₂ O	±2% FS, 5 to 45°C	-20 to 60°C	±12.5 millibar
P350-10-inch-D	±10 inch H ₂ O	±2% FS, 5 to 45°C	-20 to 60°C	±25 millibar

<u>Pressure Sensors – P400 Series</u> Pressure Media: Dry air or inert gases				
Model	Range	Accuracy over temp.	Oper. Temp.	Equiv. Range
P400-D-2-inch	±2 inch H ₂ O	±2% FS, 0 to 60°C	-10 to 85°C	±5 millibar
P400-D-1-psi	±1 psig	±1% FS, -10 to 85°C	-25 to 90°C	±27.7 inch H ₂ O
P400-D-15-psi	±15 psig	±1% FS, -10 to 85°C	-25 to 90°C	
P400-D-30-psi	±30 psig	±1% FS, -10 to 85°C	-25 to 90°C	
P400-A-15-psi	0-15 PSIA	±1% FS, -10 to 85°C	-25 to 90°C	

XR5-SE Accessories

Pressure

Gage Pressure - P450 Series

Model	Range	Accuracy over temp.	Oper. Temp.	Equiv. Range
P450-G-5-inch	0-5 inch H ₂ O	±1% FS, 0 to 60°C	-10 to 82°C	0-27.7 inch H ₂ O
P450-G-1-psi	0-1 psig	±1% FS, -10 to 85°C	-25 to 82°C	
P450-G-5-psi	0-5 psig	±1% FS, -10 to 85°C	-25 to 82°C	
P450-G-30-psi	0-30 psig	±1% FS, -10 to 85°C	-25 to 82°C	

Pressure Media: Dry air or inert gases

P500 Barometric Pressure Sensor

Model	Range	Accuracy over temp	Oper. Temp.	Equiv. Range
P500-Baro	15-130 kPa	±1.5% FS, 0 to 85°C	-40 to 93°C	2.2 – 18.9 psia

Pressure Media: Moist or dry air or inert gases

MB-4500 P400 / P500 Mounting Base (optional)

T-332-25FT 3/32" I.D. Tubing, 25 ft (7.6 meter) roll for P400 / P450 / P500 sensors (optional)

Environmental

Soil Moisture Sensor

EC5 5 cm active length, 16.4 ft (5 m) cable

Solar Radiation Sensor

SRS-200 Output: 0-2.5v (0-1250 Watts / Square Meter); 16.4 ft (5 m) cable

Rainfall Sensor

RS-110 Pulse output, 0.2 mm (0.00787") rainfall per pulse; 40 ft (12 m) cable

Wind Speed and Direction Sensor

WSD-100 Wind speed: pulse output; wind direction: analog output; 40 ft (12 m) cable

Extension Cables (extends the RS-110 or WSD-100 cable)

WE-40 40 ft (12 m) extension cable with weatherproof splice kit.

WE-100 100 ft (30 m) extension cable with weatherproof splice kit.

Light Sensor (not recommended for high accuracy applications)

LS100-4FT 4 ft (1.2 m) cable

LS100-15FT 15 ft (4.5 m) cable

XR5-SE Accessories

Acceleration / Vibration

[SA series Accelerometers](#)

Model	Range	Cable Length	Internal Temperature Sensor
SA-03	±3 g	8 ft (2.4 m)	No
SA-03-30FT	±3 g	30 ft (9.1 m)	No
SA-03-T	±3 g	8 ft (2.4 m)	Yes
SA-03-T-30FT	±3 g	30 ft (9.1 m)	Yes
SA-16	±16 g	8 ft (2.4 m)	No
SA-16-30FT	±16 g	30 ft (9.1 m)	No
SA-16-T	±16 g	8 ft (2.4 m)	Yes
SA-16-T-30FT	±16 g	30 ft (9.1 m)	Yes

Weatherproof Cases

EC24 Low Profile Case: Two (2) cable glands, overall size: 8.1" x 3.9" x 2.5" (206 x 99 x 63 mm)

[EC24 web page](#)

EC24-YEL Standard EC24 case, color: Yellow
 EC24-YEL-IC with built-in communication cable (1 cable gland available for sensors)
 EC24-YEL-BP with battery holder for AA cells and short comm. cable for Wireless Link

EC24-BLK Standard EC24 case, color: Black
 EC24-BLK-IC with built-in communication cable (1 cable gland available for sensors)
 EC24-BLK-BP with battery holder for AA cells and short comm. cable for Wireless Link

EC45 Compact Case: Nine (9) cable glands, overall size: 6.5" x 5" x 3.3" (165 x 127 x 83 mm)

[EC45 web page](#)

EC45 Standard EC45 case, color: Blue
 EC45-IC with built-in communications cable (8 cable glands available for sensors)
 EC45-BP with battery holder for C cells and short comm. cable for Wireless Link

EC55 Heavy Duty Case: Six (6) cable glands, overall size: 8.2" x 6.5" x 3.5" (210 x 168 x 92 mm)

[EC55 web page](#)

EC55 Standard EC55 case, color: Blue
 EC55-IC with built-in communications cable (5 cable glands available for sensors)
 EC55-BP with battery holder for D cells and short comm. cable for Wireless Link

XR5-SE Accessories

Connectivity: Ethernet / Land Line / Cellular

Ethernet Connectivity – see pages 59-60

Each XR5 connected to an Ethernet LAN requires one DS100 and one IC209 Interface Cable

[DS100](#) Ethernet Module

[DS100-POE](#) Ethernet Module with Power over Ethernet option

PS-12V Plug-in power supply adapter for 120vac (US plug)

Power supply adapters for other countries are available, contact Pace for details

IC-ES Setup Cable (6 ft) for DS100 Ethernet Module (required for initial setup only)

IC209 Interface Cable, 5 ft length

*A Cat5 cable to connect DS100 to Ethernet LAN is not included with DS100;
Cat5 cables are available in assorted lengths from retail office suppliers.*

Modem Cables - see page 105

IC211 Connects XR5 to Zoom 2949 Data/Fax modem

ICW-15 Connects XR5 to Multi-Tech MTCBA-G-F4 or Wavecom 1206B cellular modem*

**requires GSM circuit switched data service*

Note: The above modems are not stocked at Pace

External Power Supply

For all XR5 Data Loggers

PS-9V 9 volt regulated power supply, 120vac input (US plug)

PS-9V-EU 9 volt regulated power supply, 90-260vac input, European plug

PS-9V-UK 9 volt regulated power supply, 90-260vac input, UK plug

PS-9V-AU 9 volt regulated power supply, 90-260vac input, Australian plug

Spare Parts

TB-20 XR5 Terminal Block, 20 position

Replacement Batteries for XR5-SE Data Loggers, two required

U3.6V-AA-E Battery, Lithium AA size, 3.6v

Replacement Batteries for earlier generation XR5-8 Data Loggers, two required

U3.6V-1/2AA-E Battery, Lithium 1/2AA size, 3.6v

Updated February 5, 2018

USA Price List: www.pace-sci.com/XR5-SE-Domestic.pdf

Export Price List: www.pace-sci.com/XR5-SE-Export.pdf