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HART Field Communicator
HPC401
Guide

HART®
Fieldbus
Profibus
Intrinsic Safety
Configuration Tools
Semiconductors
Training
Custom Design

Congratulations!

You have purchased one of the most powerful and versatile HART configuration packages on the market, the HPC401. This guide will provide you with detailed instructions on the setup and initialization of HPC401 as well as cover the basics of navigating through the software. Please be sure to read this manual as well as the accompanying Palm documentation before using.

Thank you for choosing Smar!

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Contents

1. General Overview

1.1 General Principles

The HPC401 HART Field Communicator provides a complete solution for configuring and monitoring HART devices in the palm of your hand. The HPC401 is comprised of three main components plus accessories. These parts consist of the Palm handheld, the HPC401 HART interface hardware, and the HPC Suite of Palm applications. This trio of hardware and software comprises a complete HART field communicator that can be powerful, multi-faceted and portable all in one.

Using the familiar Palm operating system as a basis for the HPC401 has many distinct advantages. Palm handhelds are widely used across the world, enabling the HPC401 to be used with an already installed base of hundreds of thousands of Palm owners who are familiar with the Palm operating system. Using the large screen and graphical interface of the Palm lends itself to easy configuration of even the most complex transmitters. In addition, the Palm can be detached from the HPC401 interface and used for all the traditional Palm features for personal organization.

The HPC401 is ready to go right out of the box. The Palm has been pre-installed with the HPC Suite of HART configuration software and is ready to communicate with HART devices. The user needs only to attach the HPC401 HART interface to the Palm, connect the pinch connectors to the HART network and launch the HPC401 application.

For more detailed information on the installation setup and operation of HPC401, refer to the proceeding sections of this document.

1.2 Hardware Overview

The HPC401 HART interface is designed to interface to the Palm multi connector located on the bottom of the Palm handheld, allowing communication between the Palm and the HART network. The included pinch connectors easily connect to any HART network for instant communication. The HPC401 HART interface requires no batteries, running solely off the handhelds internal power supply. Its compact size and low power consumption makes the HPC401 interface an ideal solution for portability.

1.3 Software Overview

The HPC Suite of software includes 4 distinct applications: HPC401, HPCGraph, HPCLogger and HPC301. Each of these applications is preloaded onto the handheld and designed for a particular function. A summary of each application can be seen on the following pages. For detailed information about the features and operation of each application, refer to their respective sections in this manual.

HPC401
The main application of the HPC Suite, HPC401, allows communication, monitoring and configuration of HART devices. The HPC401 software is based upon manufacturer device description files (DDL) and thus allows access to all menus and parameters as designed by the manufacturer.

HPCGraph
This graphing application allows device variables to be trended over time in an easy to view graphical format. Device parameters can be simultaneously graphed in various colors for easy identification.

HPCLogger
This software application allows for the logging of device variable values over time. A wide range of variables can be logged automatically at a user selectable sample time, or manually one by one. These logs can be saved and transferred to a PC for further analysis.

HPC301
The HPC301 software is the predecessor of the HPC401 software. It allows for the configuration and monitoring of HART devices but is not DDL derived. This application has been included as an alternative to using the DDL based menu and parameter structures of HPC401 for those whom have grown accustomed to the HPC301 layout for devices such as the Smar line of transmitters.

2. Setup & Installation

2.1 Box Contents

Before setting up your HPC401, please verify that all box contents are included. The HPC401 box contents can be seen below in Figure 1.

1. **Palm PDA** - The included Palm is pre loaded with the HPC Suite of software. The battery of the Palm may require charging. Please read the Palm documentation before using.

2. **HPC401 Interface** - The HPC401 hardware interface attaches to the bottom of the Palm and connects to the HART network. See the following section on how to correctly use this interface.

3. **Product Documentation & Software** - Contains the Smar/Palm documentation and software. Note: The HPC401 Suite of software is already pre-loaded onto the Palm PDA.

4. **Power Supply** - Connects to the Palm or the HPC401 HART interface to recharge the Palm.

5. **Palm USB Hotsync Cable** - Connects the Palm to your PC to Hotsync via USB. Please read the Palm documentation for more information.

Figure 1 - HPC401 Box Contents

2.2 Hardware Setup & Usage

Before using the HPC401 to communicate you may wish to fully charge the Palm. This can be done by connecting the Palm power supply to the Palm. For additional details on charging the Palm, please refer to the Palm documentation that was supplied with your HPC401.

Connecting/Disconnecting the HPC401 Interface
Insert the HPC401 Interface into the multi-connector of the Palm handheld as shown in Figure 2 below, pushing the HPC401 Interface connector into the multi-connector slot until locked in. Connect the pinch connectors to the HART line as shown in Figure 3 below. Communication requires a minimum load of 250 Ohms on the HART line. The Palm is now ready to communicate. Tap the HPC401 icon on the Palm screen to load the software and begin communicating.

To disconnect the HPC401 Interface, pull the interface away from the Palm handheld firmly, avoiding any twisting or sideways force.

Figure 2 - HPC401 Interface Connection

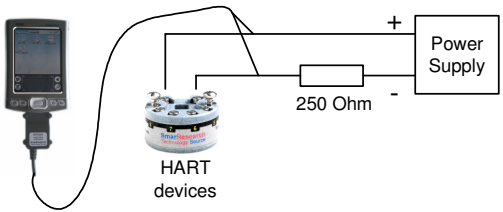

Figure 3 - Connection to the HART network

Charging the Palm handheld via the HPC401 Interface

The Palm handheld can be charged with the HPC401 Interface still connected. This is possible due to the inclusion of a passthrough power supply connector on the bottom of the HPC401 Interface. To charge the Palm with the HPC401 Interface connected, simply insert the connector of the included power supply into the HPC401 power supply connector as shown in Figure 4 below. The Palm handheld will indicate it is being charged. The HPC401 hardware and software can be used as normal while the Palm is charging.

Note: The HPC401 Interface is powered from the Palm battery and requires no additional power supply to function.

For instructions on charging the Palm without the HPC401 Interface attached, or any other non HPC401 related functions of the Palm, please refer to the included Palm documentation.

Figure 4 - Connecting Power Supply to HPC401 Interface

2.3 Software Setup & Installation

The entire HPC Suite is pre-loaded onto the included Palm handheld and is ready to be used. It is recommended to install the Palm software onto your PC in order to enable Hotsyncing and to backup the files contained on your Palm. This will ensure that the HPC Suite along with your Palm settings will be recoverable if your Palm should lose its memory. In this case a simple Hotsync will restore these files and settings automatically.

For instructions on installing the Palm software, please refer to the Palm documentation provided with your HPC401.

Reinstalling the HPC Suite software with Hotsync backup from PC
If you have installed the Palm software onto your PC and completed at least one Hotsync, your PC will contain a backup of the HPC Suite software and any other Palm data since your last Hotsync. In this case all you must do is connect the Palm to your PC and Hotsync. This procedure is explained in detail in the Palm documentation.

Reinstalling the HPC Suite software without Hotsync backup from PC
If you have not installed the Palm software onto your PC and completed at least one hotsync, you will need to install both the Palm software and the HPC Suite onto your PC. For directions on the installation of the Palm software, please refer to the documentation included with the Palm.

A copy of the HPC Suite software is contained on the included Smar Research Product CD. When a complete re-installation is necessary, this CD can be used to re-install all the HPC Suite applications onto the Palm handheld. Simply insert the CD into the CD-ROM drive of your PC and follow the on screen instructions to install the desired applications. Please note: the Palm software must already be installed on your PC in order to sucessfully re-install any HPC Suite software.

3. Using the HPC Suite Software

3.1 Opening the HPC Suite

The HPC Suite of applications, HPC401, HPCGraph, HPCLogger and HPC301 can be found under the HART category. Select “HART” from the dropdown list located at the upper right corner of the Palm screen. This will display the various HPC Suite applications as shown in Figure 5. Opening any of the HPC Suite appliactions is as simple as selecting it on the screen.

The following sections will discuss the general usage of each of these programs.

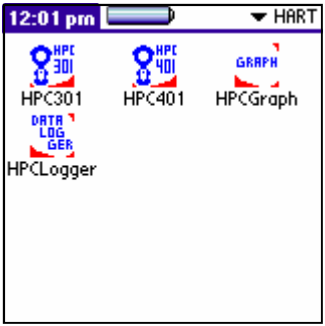

Figure 5 - HPC Suite

3.2 HPC401

HPC401 is the primary application of the HPC Suite. HPC401 allows the user to poll for devices on the HART network, communicate with them and configure thier various parameters. Because HPC401 is based upon Device Description files (DDL), all the menus, variables and methods are supported as defined by the manufacturer DDL.

The HPC401 is already loaded with support for devices from a range of maufacturers. In addition, new device drivers can be downloaded from the Smar Research website and added into HPC401. For more information on adding or requesting new device drivers, see the device drivers section.

After selecting HPC401 from the HART category of the applications screen, an “About HPC401” screen will appear. This screen identifies the Version number of the software you are running along with important copyright information. To continue the main application, select “OK”, or select “Cancel” to retun to the application selection screen.

3.2.1 Registering the HPC401

The HPC401 software must be registered. An HPC401 Registration screen will appear each and everytime the HPC401 is launched until the software is properly registered. Unregistered software will prompt you to fill out the registration form and input your registration code. Please fill out the included HPC401 registration form and agree to the terms and conditions of the agreement. This form should be faxed to Smar Research Corp. You will receive your registration code shortly via email or fax.

Enter the registration code you have received at the registration code prompt. A sucessfull code will notify the user, at which point the registration screen will no longer appear at the startup of HPC401. A unsucessfull code will inform the user of such, and allow the user to re-input the code.

Note: The HPC401 software will still function while you are waiting for your registration code. This is accomplished by selecting “Skip” on the HPC401 Registration screen.

3.2.2 Polling for Devices

HPC401 can locate HART devices via the polling screen. The polling screen is automatically opened at the start of HPC401. As seen in Figure 6, the polling screen allows the user a choice of polling by device address, address range (0-15) or by tag. The details of each method are explained on the following pages. After HPC401 polls the network, all found devices will be listed in the live list. To open a particular device, simply select it from the list.

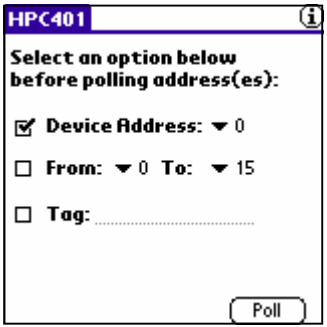

Figure 6 - Polling Screen

Polling for a Single Device

To poll for a single online device by address:

1. Select the checkbox next to the “Device Address” option.
2. Choose the address of the device by selecting it from the drop-down menu located next to “Device Address”.
3. Select the “Poll” button.

Polling for Multiple Devices

To poll for multiple online devices within an address range:

1. Select the checkbox next to the “From/To” option.
2. Choose the start and end search addresses from the corresponding drop-down menus located next to the “From” and “To” options respectively.
3. Select the “Poll” button.

Polling by Tag

To poll for an online device by tag:

1. Select the checkbox next to the “Tag” option.
2. Enter the tag of the device you are looking for in the field located next to “Tag”.
3. Select the “Poll” button.

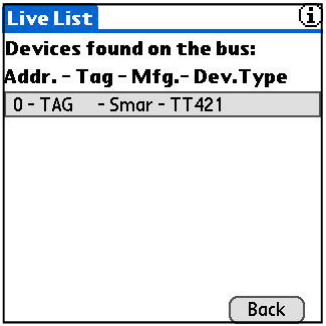

Figure 7 - Live List Screen

3.2.3 Navigating Device Parameters

Devices listed in the Live List can be opened by selecting them from the list. Once a device is selected, the main menu of the device will be opened. The contents of the main menu and subsequent screens will vary dependant on the device manufacturer and model. However, the general layout and navigation of these screens is common to all devices. Below is an example of a typical device.

The main menu of most devices will consist of a number of buttons which lead to various sub-menus, parameters and methods. Menus and Methods are represented by buttons. Selecting a menu button will open the corresponding sub-menu. Selecting a method button will execute the corresponding action.

User editable fields are available for changing various parameters of the device. Editable variables will include either a text field denoted by a dotted underline or a drop-down list denoted by an arrow. Examples of this can be seen in the figure below. These variables can be edited by the user and sent to the device by selecting the "Send" button at the bottom of the screen.

At the bottom of every sub-menu there is three buttons: "Send", "Back", and "Done". The Send button will send any changes you have made to the editable fields of the current menu to the device. Once the send is complete, the values have been successfully sent to the device. The Back button will return you to the previous menu. The Done button will return you to the main menu of the device.

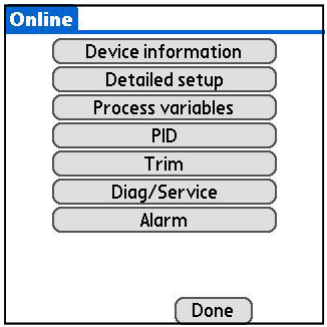

Figure 8 - Typical Device Main Menu

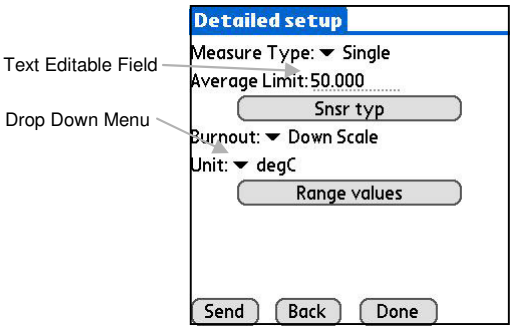

Figure 9 - Various Editable Fields

3.2.4 Device Drivers

The HPC401 software is based on the Device Description Language (DDL). This language was created to offer a standardized method of detailing all the variables, commands and parameters of a specific device as well as to describe the basic menu structure and layout that the end user should see when communicating with a manufacturers device. Device description files are created by the device manufacturer and allow the device parameters and menus to be displayed and structured as the manufacturer intended. The HPC401 software builds on these DDL's to offer compatibility with a range of HART devices directly from your Palm PDA.

HPC401 is preloaded with all supported devices at the time of purchase. Accessing supported devices is as simple as selecting them from the Live List (for more information on polling for devices, see section 3.2.2). The various device parameters, menus and methods can then be accessed as designed by the manufacturer.

Uninstalled or Unsupported Devices
Occasionally a device may be found on the HART network that is either not installed on your Palm or is currently unsupported. When an uninstalled or unsupported device is found by HPC401, the software will display a message explaining such. An example of this message can be seen below in Figure 10. The message includes a device driver number. Devices may be requested to be added by sending this device driver number along with your full contact information to HPC401@smarresearch.com. Devices for which the device driver is not installed may still be accessed in generic mode via the HPC301 software. Please note, before requesting the addition of a device, check the HPC401 Device Driver Library located at www.smarresearch.com for the most up to date device drivers.

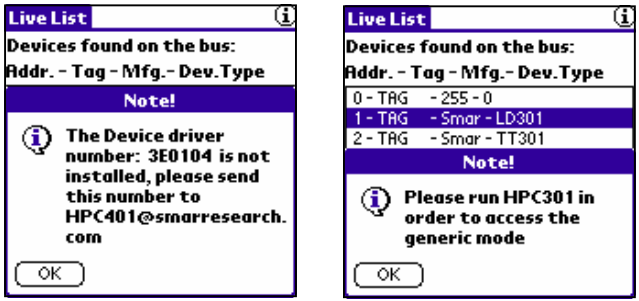

Figure 10 - Uninstalled Device Screens

Adding a Device Driver to HPC401
Device drivers may be added to the HPC401 in order to quickly and easily support new devices. To add a device driver to your HPC401, follow the steps below:

To add a device driver to HPC401:

1. Download the device driver file “mmddrr.prc” from the www.smarresearch.com HPC401 device driver library (or email) and save it to a location on your computer.
2. Double click the *prc file to have it added to your Palm Hotsync list.
   Note: The Palm desktop software must be installed on the computer.
3. Connect your Palm to your computer to Hotsync.
4. The new device driver is now downloaded to your Palm and available for use in HPC401.

NOTE:
The HPC401 Device Driver files follow a naming convention of “mmddrr.prc” where: mm = HART Manufacturer Code dd = Device Code rr = Hardware Revision Code

3.3 HPCLogger

The HPCLogger application adds the additional functionality of data logging to the HPC Suite. HPCLogger enables the user to log variables over time automatically or manually and store these variables for later trending or processing. The stored logs can be transferred easily to your PC for further processing.

3.3.1 Starting HPCLogger

To start HPCLogger, follow the steps below:

1. Select the HPCLogger icon from the Palm application menu. This will open the application and bring you to the polling screen.
2. The polling screen is common to all HPC Suite applications. Simply select the address, address range or tag of the device(s) you wish to poll for and select “Poll” (see section 3.2.2 for additional details regarding polling).
3. After execution of the Poll, the list of devices found on the bus will be displayed.

3.3.2 Selecting Logged Variables

By default, the device variables that will be logged are the PV (primary device variable), PV%, Out (mA), and SV (secondary device variable). If the device supports command 33 of the HART specification, you alternatively have the option to log different variables.

After you have started HPCLogger and polled for devices (see section 3.3.1) follow these steps to select non-default variables:

1. Select a device from the Live List.
2. Select the desired 4 variables to log from the 4 drop down menus on the Specific Monitor screen (Figure 11).
3. Select “Done”.

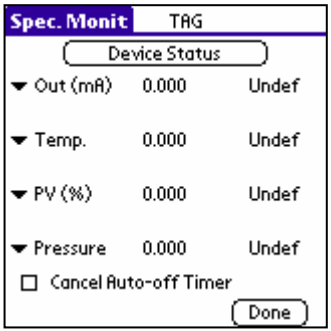

Figure 11 - Specific Monitor Screen

NOTE:

Only devices which support command 33 of the HART specification will support custom selection of logging variables. Devices which do not support this command will only log the default variables as described above and will not have access to the Specific Monitor screen.

3.3.3 Starting a Log

To start logging:

1. From the Live List screen, enter the desired sample time in minutes (Figure 12) . The default value is 1.
2. Select the “Start Logging” button to go to the logging screen (Figure 13).
3. From the logging screen you may select to automatically log or manually log the selected variables. Automatic logging will log the variables at the interval entered on the Live List screen, while manual logging requires the user to select each time the variables should be logged.

   To automatically log:

4. Select the “Auto Log” button.
5. Select the “Done” button when finished.

   To manually log:

4. Select the “Manual Log” button.
5. Select the “Log Now” button repeatedly as desired (Figure 14).
6. Select “Done” when finished.

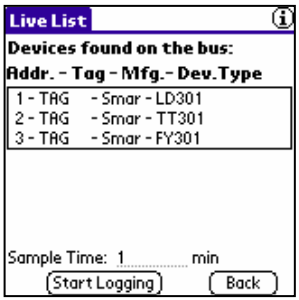

Figure 12 - Live List Screen

Figure 13 - Logging Screen

Figure 14 - Manual Logging

3.3.4 Transferring Logs to a PC

Once device variable data has been logged, this data can be transferred to your PC for further analysis. To transfer logs to a PC and view them, follow these steps:

1. Install the Smar Conduit software onto your PC with the Palm Desktop software. The Conduit software is included on the Product CD and can also be downloaded from www.smarresearch.com.
2. Execute a Hotsync between your Palm and your PC.
3. The newly created data files will be located in the <palm folder>\<user name>\Datalogger directory of the PC. The naming convention for these log files are d**MMDDXXXXXX**.txt where:
   MM is the device manufacturer code in hexadecimal format (for example, 3e for Smar)
   DD is the devices type code in hexadecimal format (for example, 01 for the LD301)
   XXXXXX is the devices serial number in hexadecimal format.
4. Open the text file in your preferred text editor.

3.4 HPCGraph

The HPCGraph application allows for the graphical trending of up to 4 variables simultaneously from any HART device. Graphs can be customized and saved for offline viewing. For instructions on how to use the various functions of HPCGraph, see the following sections.

3.4.1 Starting HPCGraph

To start HPCGraph, follow the steps below:

1. Select the HPCGraph icon from the Palm application menu. This will open the application and bring you to the polling screen.
2. The polling screen is common to all HPC Suite applications. Simply select the address, address range or tag of the device(s) you wish to poll for and select “Poll” (see section 3.2.2 for additional details regarding polling).
3. After execution of the Poll, the list of devices found on the bus will be displayed.

3.4.2 Selecting Variables to Graph

By default, the device variables that will be graphed are the Current, PV (primary variable), SV (secondary variable), and TV (tertiary variable). If the device supports command 33 of the HART specification, the option to alternatively log different variables is available.

After you have started HPCLogger and polled for devices (see section 3.3.1) follow these steps to select which variables will be graphed:

1. Select a device from the Live List.
2. Select the check boxes next to the variables you wish to graph. The color underneath each check box corresponds to the line color of the graph (Figure 15).
   If the device supports command 33 of the HART specification, variables other than the default may be graphed by selecting the “Spec Monit” button. From the specific monitor screen, 4 variables may be selected from the 4 drop down lists. Check the boxes for the variables you wish to graph (Figure 16).
3. Select the “Graph” button when you are finished selecting the variables.

NOTE:

Only devices which support command 33 of the HART specification will support custom selection of graphing variables. Devices which do not support this command will only log the default variables as described above and will not have access to the Specific Monitor screen.

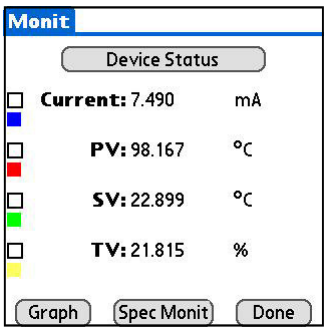

Figure 15 - Variable Selection

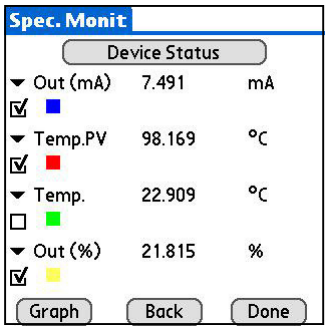

Figure 16 - Specific Monitor

NOTE:

At any time during the variable selection, the “Device Status” button may be selected to view the current device status information.

3.4.3 Using Graphs

Once the graphing variables have been chosen and the “Graph” button has been selected, the graphing will proceed. An example of the graphing screen can be seen in Figure 17 along with descriptions of its various fields.

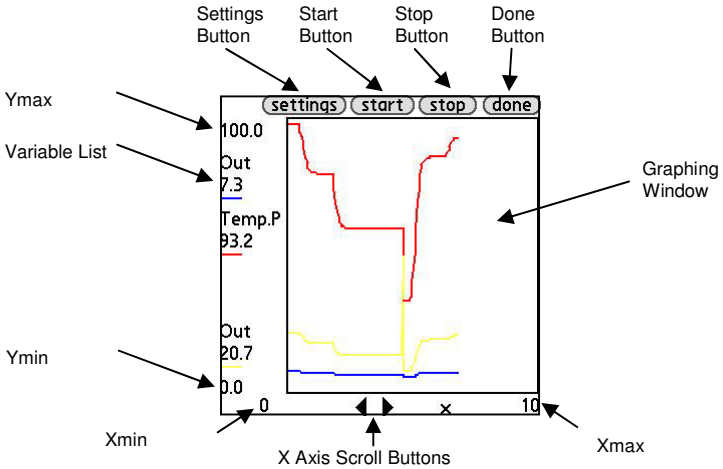

Figure 17 - Graphing Screen

Variable List - Located on the left side column, the variable list provides information for each of the 4 graphed variables. The variable name, current value and line color is shown for each variable.

Graph Window - This is the area where the 4 variables will be graphed. Each color corresponds to the appropriate variable in the Variable List.

Ymax,Ymin,Xmax,Xmin - The X & Y scale for the Graph Window is based upon the minimum and maximum values as shown by Ymax, Ymin, Xmax and Xmin respectively. To change the scale of the graph, select the “Settings” button.

Settings Button - This button opens the setting screen where the scale of the graph can be changed (Figure 18). The values for the vertical scale (Ymax, Ymin) and the horizontal scale (Xmax, Xmin) can be edited here simply by entering a new value into the corresponding fields. Once you have entered the desired values, select “Done” to return to the graph screen. The graph will now reflect the scale that was entered.

Start Button - This button will stop the graphing of the selected variables.

Stop Button - This button will stop the graphing of the selected variables.

Done Button - To stop the graphing and exit the graphing screen, select this button. The graphed data will automatically be saved to the palm.

X Axis Scroll Buttons - These two arrow shaped buttons will scroll the X axis in the corresponding direction. This is useful for graphs which have a large amount of trending data.

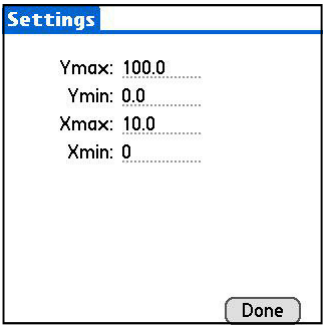

Figure 18 - Settings Screen

3.4.4 Offline Graphing

Graphing data which has been previously graphed is automatically stored to the Palm for later review. These “offline” graphs can be accessed from the polling screen. Follow these steps to open and view an offline graph:

1. From the main polling screen of HPCGraph, select the “Offline Graphics” button.
2. A list of all currently available offline graphs will be displayed (Figure 19). Select a file and it will be loaded (Figure 20). The offline graph files follow the following naming convention:
   d**MMDDXXXXXX**gf where:
   MM is the devices manufacturer code in hexadecimal format (for example, 3e for Smar)
   DD is the devices type code in hexadecimal format (for example, 01 for the LD301)
   XXXXXX is the devices serial number in hexadecimal format.

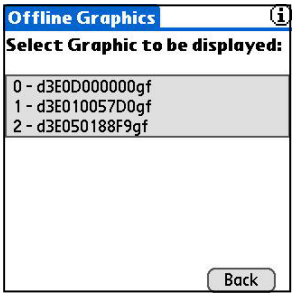

Figure 19 - Offline Graphics File Selection

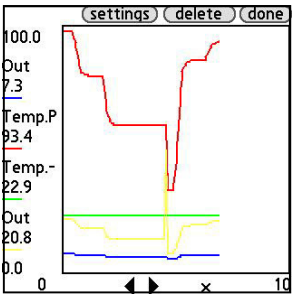

Figure 20 - Offline Graphics

3.5 HPC301

The HPC301 software is a legacy piece of software which has been included in the HPC Suite for users whom have grown accustomed to the layout and structure of the HPC301 software. In addition, the HPC301 software can be used to access devices in generic mode which do not currently have a loaded Device Driver in HPC401. The usage of HPC301 is similar to HPC401. Simply poll for devices from the polling screen and navigate the device parameters. HPC301 can access any HART device in generic mode as well as fully support a collection of specific HART devices including the full line of Smar HART devices. For more information on the operation of the HPC301, refer to the HPC301 manual. To download a copy, visit www.smarresearch.com.

Problem	Possible Cause	Possible Solution
No Communication or Intermittent Communication	Excessive noise or ripple. Low level signal.	Place the HPC401 Interface leads across the resistor and check if communication is working. Verify field-wiring shield is grounded at one end only. Normally, the shield is grounded at the power supply side only.
	Insufficient loop resistance.	Add an additional 250-ohm resistor in series to the current loop.
	Interface is not connected.	Refer to the ***Hardware Setup & Usage*** section of this manual.
	Field device is not powered or polarity is reversed or insufficient loop current and voltage at the field device terminal.	Verify power supply and field device.
	The Palm battery has been discharged past the normal range.	Recharge the Palm battery.
	More than one device using the same address.	Poll for device by TAG name rather than address. Disconnect one device, change the connected device address and reconnect the first device.
	Field device configured in multi-drop mode. It is using an address other than zero.	Execute polling address operation scanning from address 1 to 15.

Troubleshooting

Problem	Possible Cause	Possible Solution
Palm no longer contains HPC401 software	Palm lost internal memory and reset. Battery fully drained.	If you have Hotsynced with your PC, Hotsync to restore the HPC Suite software. If you have never Hotsynced your Palm, use the included Product CD to reinstall.

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