Serial Device Setup Guide

**Objective**: to configure an RS232- or Tibbo-connected instrument with NuGenesis 8’s Serial Device Support option.

**Compatibility**: Serial Device Support 2.0; NuGenesis 8 ELN or LMS, or Vision Publisher 7.1

Most small, benchtop instruments offer an RS232 port through which it can send and receive data. Newer instruments may use USB or Ethernet ports to connect to a computer or network, but there is a large installed base of instruments with Serial-only RS232C ports, making those models much more common than newer models. These instruments can be connected to the serial port of a nearby PC, or, with a Tibbo serial-to-Ethernet device, to the network. The latter option is useful for connecting multiple instruments to one PC, as there is a limit to the number of serial ports available on PCs, or if the PCs are physically distant from the balance, as is the case with VP hosted on a Citrix server. Some desktop computers may eliminate serial ports altogether, as they are seen as “legacy” ports. This document will assume one instrument connected to a PC via a serial DB9 cable or via a Tibbo device.

One of the most important things to do when connecting a balance to SDS is to get the instrument’s Manufacturer, model Number, and Serial Number. Those pieces of information will help locate the device’s documentation on the manufacturer’s website (see below for a list of manufacturers, and their websites). The document will reveal how to configure the balance’s RS232 settings, which are necessary to configure the balance in SDS.

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**Links to device manufacturer websites**

Acculab U.S. website: <http://www.acculab.com/US/us/downloads.htm>

Adam Equipment U.S. website: <http://www.adamequipment.com/am/user_manuals>

Anton-Paar website (must request manuals): [http://www.anton-paar.com/](http://www.anton-paar.com/Download-Finder/68_USA_en)

Hach website: [http://www.hach.com/](http://www.hach.com/hc/browse.product.documentation/FILCAT_INSTRUMENT_MANUALS_DOWNLOAD_MAIN/NewLinkLabel%3DProduct%2BManuals%2Band%2BTechnical%2BReferences/SESSIONID%7CCXpJeU5qTXpKbWQxWlhOMFVFeFlSa3d4TWc9PUJ6ZzVPRE0yTQ%3D%3D%7C)

Metrohm USA website: <http://www.metrohmusa.com/support/default_B.asp>

Mettler-Toledo U.S. website: <http://us.mt.com/> (registration required)

Oakton Instruments website: <http://www.4oakton.com/manuals.asp>

Ohaus U.S. website: <http://www.ohaus.com/support/product_info.asp>

Optek website (must request manuals): <http://www.optek.com/Products.asp>

Pinnacle (Nova Analytics) pH meters website: <http://www.pinncalce-ph.com/>

Sartorius website: <http://www.sartorius-mechatronics.com/index.php?id=10878>

Scientech, Inc. website: <http://scientech-inc.com/support.phtml>

Spectrum Technologies website: <http://www.specmeters.com/manuals.html#ph>

Thermo pH meters: [http://www.thermo.com/com/cda/landingpage/0,10255,1363,00.html](http://www.thermo.com/com/cda/landingpage/0%2C10255%2C1363%2C00.html)

Tibbo, Inc.: <http://www.tibbo.com>

Hardware and Software Pre-requisites

Serial RS232 cables

Benchtop instruments typically have an RS232 serial port on the back of the hardware, for connecting the unit to a printer or a PC. Verify that the instrument(s) in question have a DB9 port, usually labeled “RS232” or “serial” on the unit. A typical DB9 port has a D-shaped metal shield around nine pins arranged in two rows: one row of five pins and one row of four pins. The device manufacturer(s) may supply a serial DB9 cable for connecting the unit to an external device; if such cable is not present, then use an off-the-shelf serial cable, with a male DB9 connector on one end and a female DB9 connector on the other end. Connect one end of the cable to the serial port on the serial device, and the other end to a serial port on a nearby PC or a Tibbo device.

Some serial devices have non-standard serial ports, such as a DB-25 port (similar in appearance to a parallel printer port) or vendor-specific proprietary designs. In these cases, a straight-through DB9-DB9 serial cable cannot connect the device to a PC or Tibbo. If the device has a DB25 port, a DB25 to DB9 cable may work; otherwise, contact the device vendor for an appropriate cable.

Some vendors supply Y-shaped serial cables, which have three connectors: one “common” end and two separate ends. This type of cable can connect an instrument to a PC and a Tibbo device at the same time. Y-cables can help troubleshoot issues with SDS and serial instruments, but since they allow two connections to one instrument, they should not be used in production. Replace y-cables with a two-connector serial cable when moving a serial instrument to production.

Most serial devices in the lab are specified by the manufacturer as DCEs, or “Data Carrier Equipment” according to the RS232C standard. The name refers to the traditional role of DCEs as communications equipment, such as a modem. The other half of the connection (as specified by the RS232C standard) is the DTE, or “Data Terminal Equipment”, meaning a terminal interface or a PC. Some devices are DTEs, too, and therefore cannot communicate directly with PCs without some sort of crossover solution. For serial devices, the solution is a Null Modem cable or adapter. Null Modem cables and adapters have two “female” ends to distinguish themselves from normal “straight” cables. DTE serial devices usually have a “male” serial port in place of the typical “female” port. Such devices will also list “DTE” or “Data Terminal Equipent” in the operator’s manual. If in doubt about a device’s DCE/DTE status, contact the device vendor’s tech support for help.

Tibbo boxes, power cables, and Ethernet cables

The Serial-to-Ethernet (or Serial-to-IP) converters from Tibbo allow a greater degree of freedom when connecting balances to NuGenesis LMS and Smart Builder, as the balance need not be located near the client PC, nor does the balance have to be connected to a PC. Tibbo model numbers DS202, DS203, DS1000, and DS1100 are the only Tibbo devices currently supported by Waters for use with SDS. The DS20x and DS1100 devices have one male RS232 port on one side, for connecting to the balance, and an Ethernet port on the other, for connecting to the network. The DS1000 device has four serial ports and one Ethernet port. In addition to the serial cable(s), a Tibbo connection requires one Ethernet patch cable, at least Category 5. Crossover cables are compatible, but not required. The Ethernet controller in the Tibbo device auto-negotiates between 10/100 Mb and crossover/straight patch cables. Tibbo recommends against the use of a network switch when connecting the device to the network, as the switch may block TCP/UDP broadcast traffic, which may make the device difficult to configure.

The DS20x and DS1000 devices require an external power adapter; without the adapter, the devices will not function. The devices do not draw power from the network, nor do they draw power through the serial port. *Ensure that the correct power supply for the Tibbo device is available before configuring the balance*. If necessary, order a power supply for the unit through the Tibbo website. The DS202 and -203 models use 9-18 VDC, 0.5-Ampere power. The DS1000 model uses 9-18 VDC, 1.0-Ampere power.

Tibbo's replacement for the DS203, the DS1100 supports input power through a power supply, through Power over Ethernet, or via the DB9 connector. Waters recommends the use of a power supply with a DS1100 device. Power over Ethernet is an optional feature in the DS1100 and requires a compatible network; the customer's Ethernet switches must support Power over Ethernet or a mid-span device must "inject" power into the network. If the network meets these requirements, the PoE can be used, otherwise use a power cable for the Tibbo device. Most benchtop devices do not supply power through the DB9 port, which means that this method of powering the Tibbo device is not a viable option. The DS1100's power operating range is 9-18 VDC, minimum 0.5 amps.

Device Firmware

Most serial devices will work with SDS without any firmware modifications, assuming the presence of a serial port on the device. Occasionally, a device will have out-of-date firmware that prevents it from fully communicating over the serial port. Such devices typically work in SDS’ Passive mode, but not in Active mode. If this is the case, then check the device’s current firmware version number and check the manufacturer’s website for an updated firmware. Contact the manufacturer’s tech support if the firmware isn’t available through the website.

Software

All Tibbo devices require the Tibbo Device Server Toolkit (TDST) software, available from [www.tibbo.com](http://www.tibbo.com), in order to discover the device’s IP address and port number. Tibbo Tech, Inc. requires an account registration in order to download the software. Registering an account with Tibbo is free. DS1000 and -1100 devices require some additional software, the Tibbo Device Explorer, also available from [www.tibbo.com](http://www.tibbo.com). Waters recommends the latest versions of TDST and the Device Explorer for use with SDS.

Installation

As of 2017, the current release of SDS is version 2.0 hotfix 7. There are several hotfixes available for SDS. This document primarily covers SDS 2.0, with differences noted where applicable for changes in the various hotfixes.

1. Load the SDS installation media into the PC.
2. Follow the prompts to install SDS into the default installation directory.

64-bit Support

SDS 2.0 (up to hotfix 3) is not supported and does not work when installed on 64-bit Windows OSs. The software will install, but is not functional. SDS 2.0 Hotfix 4 and later is supported on 32- and 64-bit Windows OS.

.NET Framework support

SDS 2.0 up through hotfix 6 uses the .NET 2.0 framework, or the compatible versions 3.0 and 3.5. SDS 2.0 hotfix 7 uses version 4 of the .NET framework (though the installer still checks for .NET 2.0). Clients and servers where SDS will be installed must have at least .NET 4.0 installed, or the latest release of .NET 4.x. Make sure that the .NET 3.5 Framework is also installed, so that the SDS software can be installed, or use the following procedure if the v3.5 framework cannot be installed:

1. Copy clr.dll from C:\Windows\Microsoft.NET\Framework\v4.0.30319 to the \v2.0.50727 folder. Create the v2.0.50727 folder.

2. Delete the v2.0.50727 folder, and it's copy of clr.dll, after installing SDS.

Tibbo Device Server Toolkit

Download the Device Server Toolkit software from the Tibbo website as described in the “Hardware and Software Pre-requisites” section. Install the software. When prompted by the installation software, choose either the Full install, or, at least the Core files and Tibbo Monitor options, if using a custom install.

Tibbo Device Explorer

DS1000 devices do not come pre-installed with any software, unlike the DS20x devices, so they will not work with the DS Manager out-of-the-box. Tibbo calls this mode “BASIC-programmable” mode, and in order to make the device a serial device server, it requires a copy of the Serial Over IP software. The Tibbo Device Explorer software makes it possible to upload the SOI software to the DS1000 and -1100. DS1100 devices do come pre-loaded with the SOI application and should work with the DS Manager software out-of-the-box. Download the Device Explorer software, the TiOS firmware, and the SOI application file for the DS1000 from Tibbo's website. Install the Device Explorer software. *This software is required for DS1000 devices, and optional for DS20x and DS1100 devices.*

Hardware installation

For Direct RS232 devices, connect one end of the serial cable to the device, and the other to a PC. Connect the instrument’s power cable. Press the On button to ensure that the instrument has power. For Tibbo devices, connect one end of the serial cable to the instrument, and the other end to the Tibbo device. Connect the device power cable to the Tibbo device; lights will turn on if the device has power. *The DS20x and DS1000 devices will not operate without an external power source; it does not draw power from the network*. Plug an Ethernet cable into an available port on the wall or hub, and plug the other end into the Tibbo device’s Ethernet port. If all is working, then lights will flash on the device, indicating a successful network connection. DS1100P models can get power from the network, but only if the network supplies power with a power injector. It's better to use a power cable with the DS1100 devices even if it supports Power over Ethernet.

Balance setup

Many balances have an auto-shutoff option as a power-saving feature. This feature may reduce the device’s power consumption, but it will interfere with the SDS-Tibbo-instrument connection. Waters recommends disabling the auto-off feature, if the instrument has one. Refer to the instrument’s manual for detailed instructions.

Overview of SDS Components

Serial Device Support includes three programs for configuring and interacting with serial devices:

* Diagnosis Terminal, an interface for sending raw commands to the balance and for troubleshooting serial device configurations;
* SDS Configurator, a program for creating and editing logical serial device configurations;
* SDS 2.0, a UI that allows the user to receive data from the balance.

The first stop is the Diagnosis Terminal, where one can test and tune the serial RS232 interface with the balance until data is successfully sent from the device and displayed in the terminal window. For direct-connected devices, please continue reading at the “SDS Diagnosis Terminal” section; for Tibbo-connected instruments, please read the next section.

**Configuring the Tibbo box: Tibbo Device Explorer**

*This section is required for DS1000 devices, and optional for all other Tibbo devices.*

Start the application from the Tibbo > Tibbo IDE > Device Explorer link on the Start menu. Initially, the device will have a MAC address, an IP address of 0.0.0.0, 0.0.0.1, or 1.0.0.1, and a firmware version. Select the device from the list and click “Upload > Load Firmware through the Network”. Select the TiOS firmware file as downloaded from Tibbo's website, and click OK. The Device Explorer will upload the firmware and reboot the device. After the reboot, refresh the Device Explorer window; the device should reappear after two refreshes, with the updated firmware. Select the device in the list and click “Upload > Load Firmware from the Network”. Select the Serial Over IP application file as downloaded from Tibbo and click OK. The device will emit a beep sound when it is ready. Refresh the Device Explorer window. The device should now appear twice in the window: once as “programmable TiOS” device, and once as a “fixed-function Device Server”. Now the Tibbo DS Manager can control the DS1000.



*Fig. 1: DS1000 configured as a Serial Device Server*

**Configuring the Tibbo box: Tibbo DS Manager**

*This section is required for all Tibbo devices.*

Start the Tibbo DS Manager software on a PC “near” (meaning on the same LAN switch) the Tibbo device. The DS Manager software will send broadcast packets out on the network, and if the device is a) powered; b) connected to the network, then the device will appear in the software’s list of devices. Initially, the device will have an unreachable IP address of 0.0.0.1, so the first priority is to give the device a valid IP address. Select the device and click the Settings button.

DS202, DS203, and DS1100

The "Network" tab controls the Network settings for the Tibbo device (layer 2 and layer 3, Ethernet and IP). Note the Port number and MAC-address of the device. DHCP is disabled by default. Waters recommends the use of a statically-configured IP address for Tibbo devices, as the IP address can change for devices that make use of DHCP. Obtain a static IP address, gateway IP address, and a subnet mask from a network administrator, or choose DHCP, as desired.



*Fig. 2: DS202 settings in Tibbo DS Manager*

Click OK to save the configuration to the Tibbo device. The software will reset and re-discover the device. It may require multiple refreshes to re-discover the device.

Select the Connection tab. This page controls all of the TCP (layer 4) settings for the device. Change the Transport protocol from UDP to TCP (the default is UDP). Set “Accept connections from” to “0- Any IP-address”. Click OK to save the changes, reboot, and re-discover the device.

Select the Serial port tab. This is where the software configures the serial port half of the Tibbo device. It will automatically configure most of the parameters, but make sure that the Baud rate, Parity, and Data bits settings match those set within the instrument. Use the instrument’s menu to query the current baud rate and record it for use later; for help with this step, refer to the instrument’s manual or instruction booklet.

DS1000

The four-port Tibbo device has nearly all of the functionality of the single-port device, but the TCP and serial port settings are grouped into channels, one for each serial port. Select the General tab to change the device’s IP settings, the owner & device names, and the number of active serial ports. The advice for IP settings on the DS20x device applies here. Set the number of ports to “3-Four ports” for maximum expandability.

Set the Connection timeout and Transport protocol to 1 minute and “1 – TCP”, respectively, for each channel. Set the serial port settings appropriately for each connected instrument. Take note of the port number for each channel. By default, port 1001 connects to channel 1, port 1002 connects to channel 2, and so on.

SDS Diagnosis Terminal

Securely connect the serial cable to both the instrument and the PC. Turn on the instrument. Out-of-the-box, most instruments have their internal RS232 port disabled. Follow the manufacturer’s instructions for enabling the port. Set it to the “host” or “PC” setting, as specified by the manufacturer. If the instrument has a send mode option, choose the option for “Send next stable value” instead of the “continuous” or “automatic” modes. For Mettler-Toledo balances, choose the “SICS” or “MT-SICS” send format, rather than the “PM” format; the first two options allow for bidirectional transfers of data, meaning that the PC can send commands to the balance, whereas with the PM mode the balance cannot receive commands from the PC. Do not set the RS232 port to the “printer” setting, as this option is incompatible with PC connections in general and SDS in particular.

***Tibbo-connected devices: it may be beneficial to temporarily connect the instrument to a PC with a direct serial cable connection. Such a connection allows for some trial-and-error while testing the device’s commands and its serial port configuration.***

Serial RS232 connections require at least three parameters in order to ensure a successful data transfer: baud rate, the number of character and parity bits, and the handshaking option.

Baud rate

Roughly, a device’s baud rate is the speed at which it transfers data along the serial connection. A baud rate of 9600 is common among serial devices; 600, 1200, 2400, 4800, and 19200-baud rates are available in many devices. Use the balance’s menu to query its current baud rate and record it for use later. *Support recommends the use of a baud rate in the range of 1200 – 9600*; based on experience, rates in this range have proven to be more compatible with serial instruments than higher rates.

Character & parity bits

RS232 serial connections can send only 8 bits of data at one time. If the instrument uses all 8 bits to represent character data, then there is no parity bit. Sometimes the eighth bit will be used as a parity bit, or a check digit. In theory, the receiving PC or device can use the parity/check bit to verify the integrity of the other 7 bits. Eight character bits with no parity bit is common in many devices. As with the Baud Rate, use the device’s menu to query its current character & parity bits setting. Record this setting for use later.

Handshaking

The handshaking option controls how the PC and balance initiate a data transfer connection. Set both ends of the connection to the same setting. Common options are “none” (no initial handshaking), “software” (also known as “XON/XOFF”), and “hardware” (a.k.a. “RTS/CTS”). Query for and record the balance’s current handshake setting.

Using the Diagnosis Terminal

With all three parameters recorded, open the SDS Diagnosis Terminal to test the connection. A shortcut to the Diagnosis Terminal is on the Start menu. The Terminal will start in the offline state. Click the Settings button to display the basic RS232 settings. If there is only one Serial port on the PC, then choose COM1; if there is more than one serial port, then selecting the correct one may involve some trial-and-error. Select the Baud, DataBits, and Parity settings to match what was recorded from the balance. Select the Defaults menu and choose “No handshaking”, “Xon / Xoff”, or “CTS / RTS”, as appropriate, for the balance. These menu options set the correct advanced options for any handshaking mode. Click the close button to close the settings window.

Turn the balance on, and then click the Offline button to set the Terminal to Online mode. The two drop-down boxes above the main text area allow the user to send commands to the balance. The left-most drop-down is where the use types in commands. The second drop-down controls the line terminator symbols; by default, the Terminal appends each command with a Carriage Return and Linefeed (<CR><LF>). This is the default for Mettler-Toledo instruments. If the incorrect terminator is used, then the balance will typically return an error code, which looks like “ES<CR><LF>” which means “error-syntax”. Try all of the standard terminators to see which one works best for the balance. If each of the standard terminators - <CR><LF>, <CR>, and <LF> - returns an error code from the balance, then consult the balance’s documentation to find the correct terminator sequence. Take note of the characters at the end of the instrument output – these characters will become the Escape Sequence (Receive) in the SDS Configurator. Typically, these characters are “<CR><LF>”.

Starting in SDS 2.0 Hotfix 1, the Diagnosis terminal hides the <CR><LF> characters by default. This makes it somewhat difficult to determine the best Escape Sequence (receive) string. With these versions, it’s best to enable the “Show New Line as <CR><LF>” checkbox in order to see the full data output from the instrument.

Mettler-Toledo instruments will generally follow a uniform command set, called “MT-SICS” or “SICS”. Type I2 into the leftmost drop-down, select <CR><LF> from the next drop-down, and click send; the instrument should return its model name, which should appear in the main text area. Type S and click Send to get the current stable weight. Other common MT-SICS commands:

* Z – Zero the balance
* @ - Reset balance
* T – Tare the balance
* I4 – returns the balance’s serial number
* SU – returns the current stable weight with the currently displayed unit of measurement. This is the preferred command for the Measure button, as it always returns the exact reading on the balance, unlike the S command, which may return the current value converted into grams.

Some instruments have the option to power off automatically after a period of inactivity. Send a command to a balance through the Diagnosis Terminal while the Terminal is Online, but the balance has shut itself off, will typically return the error code “EL<CR><LF>”. Disable the instrument’s auto off option, if possible. Consult the instrument’s documentation for information on disabling the auto-off feature.

SDS Configurator

When the instrument successfully returns data to the Diagnosis Terminal, then enough information is available to create a new logical device for the balance within SDS. Run the SDS Configurator from the Start menu. On the Device Setup screen, choose New Device. On the Device Types window, choose “Direct RS232 Device” or “TibboTech RS232” as appropriate, and click OK.

The “Direct RS232 Device” window has three required parameters: Name, Escape Sequence (send), and Escape Sequence (Receive). The Name can be any descriptive Name for the device; it will appear within the SDS 2.0 and Configurator windows, along with the names of the other built-in device configurations. The escape sequences are the “<CR><LF>” patterns from in the Diagnosis Terminal. For the Send sequence, use the device’s end-of-line character sequence, which is typically defined in the device’s documentation. For the Receive sequence, type the character pattern observed in the Diagnosis Terminal, at the end of the device’s output strings. SDS will send the values typed in here for the Measure, Tare, and Reset commands to the balance when the user clicks the respective buttons in the SDS 2.0 window, so enter the correct commands for the balance.

Tibbo-connected devices have two additional required parameters: Tibbo Host and Tibbo Port. Use the Tibbo DS Manager software (Start > Programs > Tibbo > Tibbo Device Server Toolkit > Tibbo DS Manager) to get the Host and Port information from the device itself. The DS Manager program will try to find any Tibbo devices on the network; *plug in the Ethernet cable, the serial cable, and the power cable before running the DS Manager*. If the auto-discovery search does not find any devices, then make sure that the device is not plugged into a switch, or if it is, then plug a PC into the same switch. Switches as a rule do not transmit TCP/UDP broadcast packets, which is how the DS Manager finds Tibbo devices.

Active vs. Passive Modes

The “Use Active Mode” checkbox in the device configuration controls whether SDS will actively send commands to the balance. If Active mode is enabled, then the Measure button will be enabled in the SDS 2.0 interface. The Measure button will send the configured “measure” command to the instrument, which will return the current measurement from the device. In Passive Mode, SDS will not send any commands to the instrument, and instead passively receive and display any data sent by the balance, usually when the user presses a “send” or “print” key on the balance’s physical UI. Both modes work with SDS 2.0, and the correct choice depends on the application scenario.

Sometimes, a serial device needs to receive a command before it switches between active and passive modes. If that is the case, then type the appropriate command into the “Passive Mode On” or “Passive Mode Off” fields in the SDS configuration. SDS will send these commands to the serial device before it waits for a measurement. It will send the “On” command before the “Off” command, so if the device configuration contains both commands, then the net effect will be to return the device to Active mode. In most cases, these commands are not necessary.

Parsing and Unit Expressions

By default, SDS uses Regular Expressions in order to extract the data from the instrument’s response to the Measure command. By default, each new logical SDS device gets one output parameter, called Weight, to represent the output of the instrument. The Parsing Expression extracts the raw data from the output stream (by default, the Regex matches decimal numbers). The Unit Expression extracts the unit of measurement from the output stream (the default Regex matches the non-digit characters in the stream). The combination of the two becomes the value of the parameter. SDS supports more than one output parameter, if the instrument includes more data points in its output stream. Add or subtract these parameters from the Display Pattern, the value of which becomes the output in the SDS Runtime applet or in Form Designer.

The default parsing expressions can extract the weight value and measurement unit from many common balances. Other instruments may offer different data points, such as pH or mV values, which may require custom regular expressions. SDS provides a regular expressions test tool, which can greatly simplify the process of building regular expressions. First, obtain a copy of the instrument’s output through the SDS Diagnostic Terminal. Navigate to the SDS installation directory (C:\Program Files\Waters\Serial Device Support), open the RegExpTest directory, and run the re.bat batch file. Copy the output text from the instrument into the “String” text box. Type the regular expression into the “Regular expression” box. The utility will evaluate the expression and apply it to the text string. The lower-left-hand box displays the internal workings of the Regex parser. The lower-right-hand box displays any matches found in the text string.

Regular expressions have a very complex syntax that can be confusing to first-time users. SDS includes a short reference document (RegularExpressionReference.doc) in the RegExpTest folder. The reference document is also in the SDMS Data Adapters Instrument Agents Reference Guide, on the SDMS Data Adapters R5 media. The following are some common regular expressions:

* Signed decimal: \-?\s\*[\d\.]+
* Unsigned decimal: [\d\.]+
* Date: \d+[/|\-|\\]\d+[/|\-|\\]\d+
* Time: \d{1,2}:\d{2}:?\d?\d?\s\*[ap]?m?
* To view the complete data stream: (\S|\s)\*

RS232 Configuration (Direct RS232 Devices only)

The SDS Configurator condenses the volume of RS232 configuration parameters down to a configuration file (\*.rcf). Select the RS232 tab to choose the correct file for the balance. The built-in files are named according to their parameters; the pattern is “SerialPort\_BaudRate\_Handshaking.rcf”; ex: COM3\_4800\_xon.rcf uses Serial Port COM3, baud rate 4800, and Xon/Xoff handshaking. If none of the built-in configuration files fit the balance, then click the New button, configure the parameters as in the Diagnosis Terminal, and close the configuration window to bring up the Save dialog; type a descriptive name for the file and click OK. Click OK to save the new device.

SDS saves the RS232 configuration files as XML files with the extension \*.rcf, in the following folder (assumes the default SDS installation path):

* C:\Program Files (x86)\Waters\Waters Serial Device Support\RS232Config

The Serial device configuration files are stored as XML files with the extension \*.SDC, in the following folder:

* C:\Program Files (x86)\Waters\Waters Serial Device Support\Devices

Starting in SDS 2.0 Hotfix 3, the serial device configuration files are stored in the user’s profile path instead of the program files folder. This change makes the application more compatible with multi-user Citrix environments. The default path is:

* %USERPROFILE%\Application Data\Waters\Waters Serial Device Support\Devices

Data Export (Tickets)

In addition to the normal SDS runtime display, SDS can export data from serial devices to “ticket” files. Tickets are the computer equivalent of a serial printer attached to the device. The ticket contains the device name, serial number, location, date/time of the measurement, and the measurement data itself. SDS exports the data into two formats: a image file, for a visual representation of the data, and a text file. SDS creates one of each file type per measurement. By default, the image type is bitmap, though GIF, JPG, and PNG file types are available.

To enable this option, click on the Export tab in the SDS Configurator window. Enable the “Create Ticket” option. Click the Browse button to locate a folder for the ticket files, or make a new folder if necessary. SDS automatically names the files with a randomly-generated number. Support recommends storing ticket files from only one instrument in a folder.

Each SDS installation folder has a “default” folder, which holds two files: logo.gif and TicketConf.xml. These two files define the parameters for the look-and-feel of the tickets. SDS automatically copies the files into a separate folder for each instrument at runtime. Logo.gif holds the company logo (Mettler-Toledo by default). To change the default image type, open TicketConf.xml and in the ImageType tag, change BMP to GIF, PNG, or JPG. The logo file must be in the same directory as the TicketConf.xml file.

SDS Runtime

The main SDS 2.0 program is the “runtime” UI for interacting with the balance. Run SDS 2.0 from the start menu. Select the device created in the earlier steps from the drop-down list. If the device is in Active mode, then the main display will change to display “Ready”; if the device is in Passive mode, it will display “Waiting…” Place an object on the balance’s weighing pan. For Active mode devices, click the Measure button in the SDS 2.0 UI; for Passive mode devices, click the “Send” or “Print” key on the device’s physical UI. In either case, the balance’s current reading should be displayed in SDS 2.0. If the current reading matches that displayed on the device, then the balance has been successfully connected to SDS 2.0.

**Common serial devices**

SDS configurations for specific serial devices are stored in the “FAQ INTEGRATION TEAM” database on the domino2/creonlabcontrol/de server. Keep in mind that some of these configurations are intended for streaming electronic tickets, while others are best used with Form Designer. Carefully review any configurations imported from this database to ensure appropriateness for the intended use of the serial device.

* Fisher Scientific Accumet AR15 pH meters (and possibly the AR series): this device works best with a baud rate of 1200.
* Fisher Scientific Accumet AB15 pH meters (and possibly the AB series): this device works best with a baud rate of 4800.
* Mettler Toledo SevenEasy pH meters (whole product line, including the S20 and S30 models): per the manufacturer, these devices cannot work in Active mode. If a customer wants to connect a SevenEasy meter with SDS, then the device configuration must not use Active mode.
* Mettler Toledo SevenMulti pH meters (whole product line): these devices can work in Active mode.

Troubleshooting

If the display changes to “ERROR”, then close SDS 2.0 and run the Diagnosis Terminal again to verify the RS232 configuration. Use the device’s physical UI to verify its internal settings, and check those settings against the RS232 configuration in the Diagnosis Terminal. Close the SDS Configurator and the Diagnosis Terminal before running SDS 2.0, to ensure that the configuration XML files are not in use by another process. Lastly, check the SDS 2.0 log files, which the software stores in the following folder, by default:

* %APPDATA%\Waters\Waters Serial Device Support\

Each program creates a separate log file. Log files are stamped with the current date, in YYYY-MM-DD format. By default, the log files are set to the “DEBUG” logging level; that can be changed by editing the \*.exe.config XML files in the SDS 2.0 installation folder:

* C:\Program Files\Waters\Waters Serial Device Support\Configurator.exe.config
* C:\Program Files\Waters\Waters Serial Device Support\DiagTerminal.exe.config
* C:\Program Files\Waters\Waters Serial Device Support\SDS.exe.config

Look for the following line in each file:

 <level value="DEBUG" />

Change “DEBUG” to “WARN” or “ERROR” to reduce the volume of messages written to the log files. Save the files with UTF-8 encoding. The new logging level will take effect the next time the applications are restarted.

Launching SDS programs from the Start Menu

The shortcuts in the start Menu for SDS Runtime, SDS Configurator, and SDS Diagnostics Terminal all check for the presence of the sample \*.sdc files in the Devices folder, and restore those files if they are missing. This behavior will prevent the customer from controlling the devices available in SDS Runtime. To correct this issue, delete the pre-installed shortcuts from the Start Menu and create new shortcuts in their place. See the “Installation” section on page 3 for instructions on replacing the shortcuts.

Network Power Management

Many enterprise network switches come with power-management features that turn off power to unused ports, in an effort to reduce the switch’s total power consumption. This feature will impact Tibbo-connected devices. PCs typically send packets out on the network all the time, which means that their ports never appear to be idle, and thus the switch never shuts off those ports. Tibbo devices, however, do not send anything on the network unless requested by an application. A network switch with power management turned on will turn off power to the Tibbo’s port after a period of inactivity (that period is determined by the switch’s power management settings). If the first measurement command from SDS, or the first Ping packet sent to the Tibbo device, reliably returns an error, but subsequent packets/commands go through, then the switch may have power management features. Check with the customer’s IT or Network group to see if the switch(es) in question have power management features, whether such features are enabled, and whether such features can be turned off. Alternatively, since the second connection reliably works, instruct the users to click the Measure button twice, and to ignore the first error message.

Auto-Discovery of Tibbo devices

The Tibbo DS Manager can automatically discover any Tibbo devices on the network by sending UDP broadcast packets out on the network. Most routers and switches will not forward broadcast packets, so the Auto-Discover function is good only for those Tibbo devices on the same network segment as the DS Manager software. To find Tibbos in other network segments, first use a PC on the same segment as the device to connect to it and assign a static IP, then use the Address Book feature in DS Manager to record the device’s IP address. VLANs (Virtual LANs) can also interfere with the Auto-Discovery process. VLAN tagging is an Ethernet standard that affixes a tag to each Ethernet frame sent on the network. Each tag identifies the logial network segment to which the frame belongs. VLAN-compliant routers and switches will forward packets only to those hosts with a matching VLAN tag; thus, if the Tibbo device(s) and the DS Manager host PC(s) are in separate VLANs, then the auto-discovery feature will not work.

Timeout

By default, SDS Runtime will wait 30,000 milliseconds (30 seconds) in Passive mode for data from the instrument. If users do not send data from the instrument to SDS within that time window, then SDS will display “ERROR” in the main window, which can be distracting. To minimize the risk, increase the timeout from the default up to the maximum 600,000 milliseconds (600 seconds, or 10 minutes). The minimum timeout is 10,000 milliseconds (10 seconds).

Baud rate

Many serial instruments support a variety of baud rates for serial communication. If the baud rate is a high number, above 9600, then some serial instruments may work in the Diagnostics Terminal, but not in the SDS runtime module. In this scenario, if SDS reports “ERROR” in the runtime module, then lower the baud rate to 1200 and retest. Lower the baud rate on all parts of the connection: serial device, the Tibbo device (if applicable), and the SDS device configuration.

Data Parsing

Regular Expressions can be difficult to master. If the default expressions do not capture the data correctly, then erase the expressions and type “.\*”, without quotes, into the Parsing Expression field for one of the parameters, then use the Measure command in the SDS Runtime. This Regex will return the exact output string from this device. With this in mind, formulate a regular expression to capture the data and the unit of measure. The SDMS Data Adapters Instrument Agents Release 5 guide has a short reference on Regular Expressions. Refer to this manual for help with Regular Expressions. Contact Waters Tech Support for a copy of this manual if one is not immediately available.

Tibbo-connected instruments

Tibbo devices make the troubleshooting process more complicated than for direct-connected devices, because the problem must first be located: between the SDS software and the Tibbo’s Ethernet port, between the Tibbo’s Ethernet and serial ports, or in the device configuration in SDS. Tibbo devices will respond to ping packets, so if the device has a valid IP address on the network, then ping the IP address from the SDS machine. Use the Tibbo DS Manager software to verify the device’s IP address, port number, Gateway IP-address, and subnet mask. Verify that the device’s transport protocol is TCP, not UDP, that its Routing mode is “Server (Slave)”, and that it accepts connections from any IP address.

Citrix/multiple-user support

SDS will function as a Shared Application in Citrix. Since Citrix is inherently multi-user software, multiple users may try to access the instrument at any given time. Tibbo does not allow more than one connection to an instrument at a time, so the first user to make use of the instrument through SDS and Tibbo will succeed, while any subsequent attempts to use the instrument through SDS and Tibbo will fail, until the first user completely closes SDS. To minimize the issue, use the Tibbo DS Manager software to set the device’s connection timeout to 1 minute.

Share the Vision Publisher client application (eln.exe) in order to use SDS and Tibbo devices with Forms Designer. If the devices will be used outside of Forms Designer, but with VP or another application, then share the main SDS application (SDS.exe). Share the SDS Configurator (Configurator.exe), Tibbo DS Manager (tdsman.exe), and Tibbo Device Explorer (tdevexplore.exe) applications for troubleshooting purposes, but lock down their permissions so that only Administrators can run these programs.

Auto Navigation for SDS Operations in Forms

The Auto Navigation feature in Form Designer – which allows the form to change the active cell after receiving data from SDS – does not work in Form Designer v2.1. There is a bug report for this issue, # D\_300055\_03786. This bug is fixed in Form Designer v2.1 Hotfix 1.

Output streaming – Capture serial device output in a File

SDS may not work properly if the Regex parsing strings do not match the device output. If this is the case, then enable the Streaming option in the SDS Configurator. Edit the device configuration, click the Streaming tab, and enable “Stream data to text file”. Click the Browse button to select an empty directory. SDS will automatically generate the file names. The device’s output will be in <randomly-generated-number>.txt. Paste the contents of this file and the parsing expression into the RegExpTest utility (see [*Parsing and Unit Expressions*](#Regex), page 11). The RegExpTest utility will reveal whether the parsing expression is a match for the output.

Attached file(s):

[Tibbo Device Server application for DS-1000](http://basic.tibbo.com/resources/ds.html)

[Tibbo Integrated Development Environment](http://tibbo.com/downloads/basic/software.html) – Always use the latest version of TIDE

[Tibbo Device Server Toolkit](http://tibbo.com/downloads/soi/tdst.html) – Always use the latest version of TDST

[Tibbo TiOS Firmware](http://tibbo.com/downloads/basic/firmware.html) – Use the correct firmware for the device (DS-10xx or DS-1100)

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