BLUETOOTH® COMMUNICATIONS
APPLICABLE INSTRUMENT MODELS: 9565, 7575, TA465, EBT730, PH730, 8715

The instrument features Bluetooth wireless communications for use with a Bluetooth-enabled computer or 8934 wireless printer. A computer can command the instrument to:

- Reply with model and serial numbers of the instrument and the currently attached probe.
- Reply with current values for all measurements to be logged.
- Reply with logged data either for a particular TestID or all TestIDs.
- Change the names of TestIDs used to log data.

Bluetooth Communications Requirements

Bluetooth communications between a TSI instrument and computer require Bluetooth communications and use of a terminal emulation program, such as HyperTerminal, be installed on the computer. This application note assumes that you already have Bluetooth communications installed on your computer. If your computer does not have Bluetooth communications, purchase and install a Bluetooth dongle or another means of Bluetooth communications. HyperTerminal is included in Windows® XP and earlier operating systems, but not in Windows Vista® or Windows® 7 operating systems.

- For Windows® XP operating system or earlier, you can find HyperTerminal by clicking on the **Start** button, then **All Programs**, **Accessories** and finally **Communications**.

  If HyperTerminal is not installed on your computer, install it by opening the **Control Panel**, selecting **Add or Remove Programs**, selecting **Add/Remove Windows Components**, and choosing **HyperTerminal**.

- For Windows Vista® and Windows® 7 operating systems, obtain and install a terminal emulation program. Purchase HyperTerminal from Hilgraeve or obtain another terminal emulation program.

Bluetooth Setup

Bluetooth data transfers occur over a Bluetooth Serial Port. To determine the COM Port of the Bluetooth Serial Port:

1. Right-click the Bluetooth icon in the lower right-hand corner of the screen.

2. Select "Bluetooth Configuration" as shown in Figure 1.

3. Determine the COM port used for Bluetooth communications. Depending on the drivers on your computer, the COM Port used may be on the **Communications Port** tab, **Local Services** tab, or elsewhere. Take note of the COM port for later use.

4. Select the **Start up automatically** checkbox, which may be found by double-clicking the **Bluetooth Serial Port** in the **Local Services** tab as shown in Figure 2, to allow the TSI instrument to connect in the future without going through this process.

5. Ensure that the TSI Instrument can find your computer by selecting **Let other Bluetooth devices discover this computer**, on the Accessibility tab as shown in Figure 3.

6. Select the **OK** button to save changes and exit.

   *Note: You may have to press the **OK** button on more than one window.*

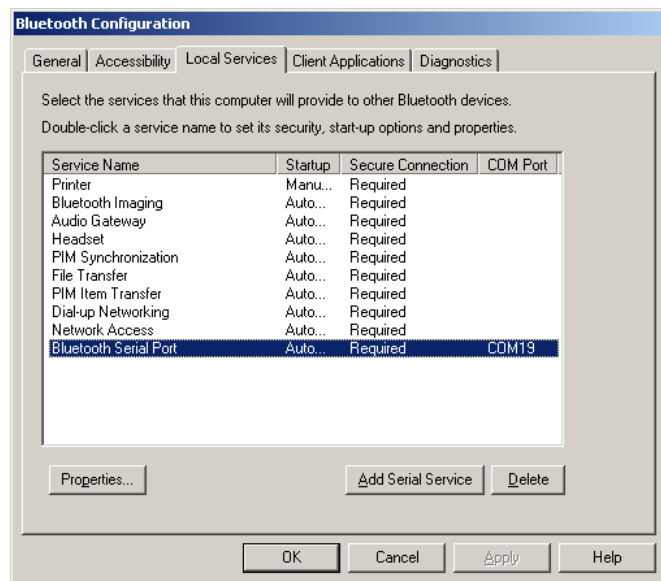**Figure 1. Selecting Bluetooth Configuration.**

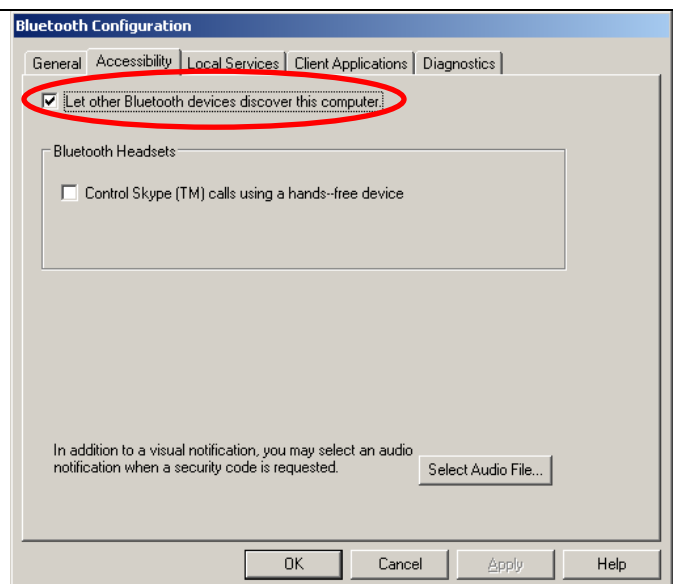**Figure 2. Selecting Bluetooth Serial Port.**

Figure 3. Enabling Bluetooth Discovery.

Configuring the Terminal Emulation Program

You must configure your terminal emulator program for Bluetooth communications. This application note assumes you are using HyperTerminal, although other terminal emulation programs may be similar. The steps to configure HyperTerminal to work with the TSI instrument are:

1. Run the HyperTerminal program.

2. If this is the first time you run the HyperTerminal program, it may prompt you to enter details such as area code, carrier code, or a number to access an outside line. You can hit the **CANCEL** button without entering these details as they are not used for Bluetooth communications.

3. On the "Connection Description" window, enter a name for your HyperTerminal configuration, such as "TSI Comm" and select an icon to use. Click **OK**.

4. On the "Connect to" window, select the COM port used by your computer's Bluetooth communications from the "Connect Using:" drop down box. This is the COM port noted in Step 3 of the Bluetooth Setup section. Click **OK**.

5. The "COMxx Properties" window will open, baud rate, data bits, parity, stop bits, and flow control are not used with Bluetooth communications. Select the **OK** button to continue.

6. Select the **File** menu and the **Properties** item. Then select the **Settings** tab and the **ASCII Setup** button as shown in Figure 4.

7. Select the check boxes **Send line ends with line feeds** and **Echo typed characters locally**. Also, configure a line delay of **150** milliseconds. These settings are shown in Figure 5. Press the **OK** button twice to save changes and exit the menus.

8. Save these configuration settings using the **File** menu and **Save** command within HyperTerminal to avoid re-entering them when communicating with a TSI instrument in the future.
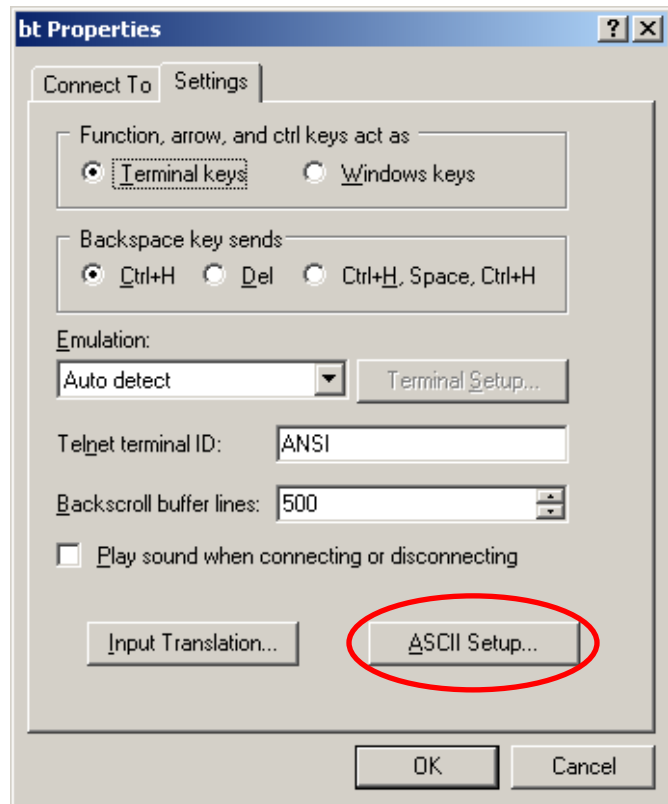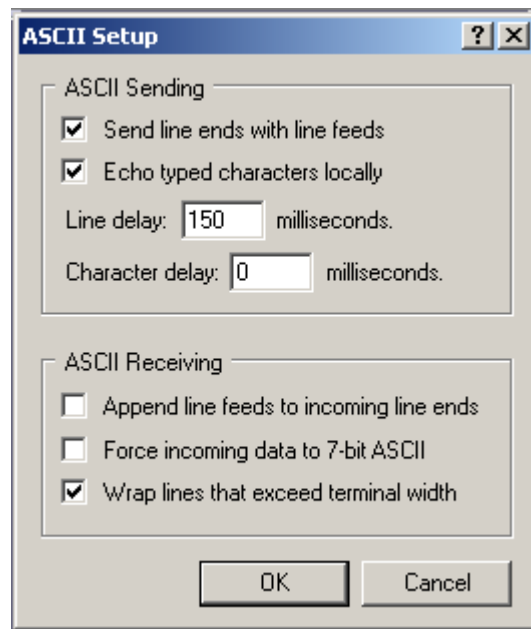
Figure 4. Selecting ASCII Setup.

Figure 5. Recommended Settings in ASCII Setup.

Bluetooth Functions Menu

The instrument contains a Bluetooth Functions menu which is used to adjust parameters to assist with wireless connections to other Bluetooth capable devices.

Discover Devices

Starts the Bluetooth process of finding other devices from the instrument.

Discoverability

Describes whether another device can discover the instrument. Options include:

Disable	The instrument is not discoverable by other devices.
Temporary	Allows the instrument to be discoverable until another device pairs with it or until the instrument power is turned off and back on.
Enable	Makes the instrument discoverable indefinitely.

```
BLUETOOTH FUNCT. |||||

Discover Devices
Discoverability    Enable
PINcode            0000
# AutoConnects     1
```

PINcode

A security key to be entered into the computer if prompted. The factory default PINcode is **0000**.

NOTE
PINcode must be set to **0000** in order to use 8934 printer.

AutoConnects

Specifies how many times the instrument will attempt to reattach to a paired device after the power is turned on. For this option, the instrument Discoverability setting must be Enabled. Settings are 0 to 5 times.

Pairing the Instrument to your Computer

Once the HyperTerminal program is configured and running on your computer, you can pair (or connect) the instrument to your computer by following these steps:

1. Press the **MENU** soft key on the instrument.

2. Select the **Bluetooth Functions** menu.

3. Verify **Discoverability** is set to **Enable** or **Temporary**.

4. Select **Discover Devices.**

5. The instrument will display a progress bar as it searches for available Bluetooth devices. When the progress bar is complete (which may take several seconds), the instrument will display found devices either by their configured names or by their Bluetooth addresses. Highlight the computer you wish to connect to and press the ↵ key on the instrument.

6. Your computer may open a window prompting you to enter a Bluetooth PINcode, which is a security key, into your computer. The factory default PINcode is **0000**. Enter the PINcode and press the **FINISH** button.

C A U T I O N
You can set the Bluetooth PINcode to a different value with the Bluetooth PINcode item in the Bluetooth Functions menu. Changing the PINcode will prevent use of the Model 8934 printer with your instrument.

You have approximately 30 seconds to enter the Bluetooth PINcode into your computer. If time runs out before you enter the PINcode, you may have to re-connect Bluetooth communications on your computer and start the pairing process over.

7. The instrument will prompt you to select "Printer" or "Computer". Select **Computer** and press the ↵ key.

8. The instrument will return to the Bluetooth Functions menu. Press the **ESC** key twice to return to the running screen to enable communications. The TSI instrument display will now indicate a Bluetooth logo, as shown in Figure 6, in the upper right to indicate successful Bluetooth communications.

Figure 6. Bluetooth Logo on TSI Meter to Indicate Pairing.

NOTE
Once the instrument has been successfully paired with a computer, the meter will attempt to reconnect whenever it is turned on and **Discoverability** is set to **Enable**. If the connection fails, you can manually attempt to reconnect by pressing the **PRINT** softkey or repeating the Pairing process. The instrument can only be paired with 1 device at a time.

Pairing the Instrument the TSI Model 8934 Printer

1. Press the **MENU** softkey on the instrument.

2. Select the **Bluetooth Functions** item.

3. Verify **Discoverability** is set to **Enable** or **Temporary**.

4. Select **Discover Devices**.

5. The instrument will display a progress bar as it searches for available Bluetooth devices. When the progress bar is complete (which may take several seconds), the instrument will display found devices either by their configured names or by their Bluetooth addresses. Highlight **HANDY700** and press the ↵ key on the instrument.

6. The instrument will prompt you to select "Printer" or "Computer". Select **Printer** and press the ↵ key.

7. The instrument will return to the **Bluetooth Functions** menu. Press the **ESC** key to return to the main menu, press **ESC** again to return to the running screen to enable communications. The instrument display will now indicate a Bluetooth logo, as shown in Figure 6, in the upper right to indicate successful Bluetooth communications.

NOTE
Once the instrument has been successfully paired with the 8934 printer, the meter will attempt to reconnect whenever it is turned on and **Discoverability** is set to **Enable**. If the connection fails, you can manually attempt to reconnect by pressing the **PRINT** softkey or repeating the Pairing process. The instrument can only be paired with one device at a time.

Sending Commands to the Instrument

C A U T I O N
Before sending commands to the VelociCalc meter or Q-Trak monitor, make sure the meter is in the main running screen with measurements displayed. If the meter is in the menu system, press the **ESC** key until you reach the running screen.

The instrument uses Serial Port Protocol, or SPP, with four available commands:
- Identify
- Values
- Change TESTID Name
- Logged Data

NOTE
After sending each command, the instrument must receive a Carriage Return character. This character is sent when you press the **<Enter>** key on your computer. If you create a program to automatically request data, use the ASCII character 13, hexadecimal value 0x0D.

Identify

Send the command **I** to the meter to command it to identify itself. The meter will respond with:
- Meter model number
- Meter serial number
- Meter calibration date
- Meter firmware revision

If a probe is attached to the meter, the meter will also respond with:
- Probe model number
- Probe serial number
- Probe calibration date

Values

Send the **V** command to the meter to command it to respond with:
- Current date and time
- Displayed measurements

To select the measurements to be sent over Bluetooth communications, choose to display them through the **Display Setup** menu on the meter.

NOTE
Using the **Display Setup** menu, you can select more measurements than the instrument can display on its screen. The meter will give the message "Error: Maximum of four secondary measurements can be displayed. Turn OFF measurement." All selected measurements will print via Bluetooth even if they do not appear on the instrument's screen.

Change TESTID Name

You can upload TESTID names to your instrument instead of entering them in through the keypad. To do this, use the command **TIDnnn   xxxxxxxx**

where   nnn is the number of the TestID
xxxxxxxx is the new TestID name

The TID command to change the TestID Name has a number of constraints:

- The number of the TestID, nnn, must be 3 digits long. The first Test ID is then TID001.

- There must be a [tab] character between TIDnnn and xxxxxxxx. If you write a program to automate naming TestIDs, use the character \t (ASCII character 09).

- The new TestID name, xxxxxxxx, can be a maximum of 8 characters long.

- The new TestID name, xxxxxxxx, can only be comprised of the characters: !”#$%&’()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ [\]^_`abcdefghijklmnopqrstuvwxyz{|}~. Using other characters will either cause the new name to be rejected or result in incorrect characters in the new name.

- If a TestID has already been renamed, you must still refer to it by its number. For example, assume that you renamed Test 001 to "TEST1". If you now want to change the name to "NewTest", you would use the command "TID001   NewTest".

- To delete TestID Names, select the **Data Logging** menu on the meter. Then select **Delete Data** and **Delete All**.

C A U T I O N
Deleting all data will delete TestID Names and all logged data. Download saved data before selecting **Delete All** data.

If you have many TestID names to upload, you can create a file to change the names in batch mode. To create this file:

C A U T I O N
Set HyperTerminal or your terminal emulation program to include a 150 msec delay between lines. If no delay is present or the delay is too short, the TSI meter may skip some commands. If you encounter errors with a 150 msec delay, lengthen the delay.

1. In Microsoft Excel® or another spreadsheet program, enter the TID command and TestID# in the first column of cells. Enter the new TestID Names in the second column of cells. The spreadsheet should appear similar to **Figure 7**.

2. Save the file as a tab-delimited text file. Your spreadsheet program may warn that functionality may be lost, but this is acceptable.

TID001	TSITEST1
TID002	TSITEST2
TID003	TSITEST3
TID004	TSITEST4
TID005	TSITEST5
TID006	TSITEST6

Figure 7. Sample Spreadsheet to Rename TestIDs 1 to 6.

3. In your terminal emulation program, transfer this file to the VELOCICALC meter or Q-TRAK monitor. In HyperTerminal, you can do this by selecting **Transfer**, then **Send Text File**. This opens a window to select the text file you just created. Opening this text file sends the commands to the TSI meter.

NOTE
If not all the new Test ID names are received by the meter, check and verify the line delay is set to 150 msecs. Refer to Figure 8: *Recommended Settings in ASCII Setup.*

View Logged Data

Sending the command **L** will command the instrument to respond with logged data. You have two options when commanding the meter to return logged data:

- If the command is **Lxxx**, only data for one TestID will be returned. xxx can be 1 to 100. For example, sending the command L12 will command the instrument to send back data from the 12th TestID but no other TestIDs.

- If the command is **L**, without a TestID specified, all data will be sent.

When the instrument returns logged data, it will first send a header with:

- Meter model number

- Meter serial number

- Meter calibration date

- Meter firmware revision

If a probe is attached to the meter, the meter will also respond with:

- Probe model number

- Probe serial number

- Probe calibration date

The header will also include the date and time of the first sample.

After the header, the meter will provide statistics (average, minimum reading, maximum reading and number of samples) for each measurement type (such as temperature or velocity). The meter will then provide all samples. Each measurement of a sample will be on its own line, preceded by the time the measurement was taken. For example, if a sample has four measurements then the sample will appear on four lines.

Troubleshooting

Symptom	Possible Cause	Corrective Action
Intermittent Communications	Instrument too far from computer.	Move instrument closer to computer.
	Bluetooth dongle driver	Uninstall Bluetooth drivers then re-install updated drivers.
	Radio interference	Disable communications from other devices or move to a new location.

TSI® UNDERSTANDING, ACCELERATED