

GSI AUDIOSTAR PRO™



INSTRUMENT SERVICES MANUAL



Part Number D-0100795 B

Setting The Clinical Standard

www.grason-stadler.com

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 **gsi**
Grason-Stadler

Title: GSI Instrument Services Manual

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Introduction

It is possible to extract the data from the GSI AudioStar Pro for direct integration of audiologic results into third party software programs (Electronic Medical Records (EMR) and Electronic Healthcare Records (EHR)). It is also possible to import a list of patients into the AudioStar Pro. GSI provides data integration with a computer using the GSI Instrument Service software.

This software component resides on a connected computer and facilitates the electronic transmission of test parameter information from the instrument to a PC application. In the event that the user has both AudioStar Pro audiometers, as well as GSI 61 audiometers, backwards compatibility functionality is available.

Two programming interfaces for PC applications are provided to communicate with the AudioStar Pro audiometer. The Data Port interface provide a (virtual) serial communications port that is backwards compatible with the GSI 61 data stream. This allows existing PC programs that can read data from the GSI 61 to also read similar data from the AudioStar Pro audiometer. The AudioStar Public Interface is a programmatic interface using XML to communicate all of the available data that the instrument collects to be read out to a PC application.

Intended Use

GSI Instrument Services provides access to the data created by the GSI AudioStar Pro audiometer for the transfer of audiometric data electronically. Independent software programming engineers may implement the Instrument Services software provided by GSI into their proprietary software in order to manage patient data directly. The direct transfer of data gives the physician immediate access to the audiometric data in the electronic record. This manual describes the functionality and data that is available from the GSI Instrument Services.

Installation

Minimum System Requirements

- CPU: 1.6 GHz
- RAM: 1 GB
- Hard Disk: 3 GB
- USB Port: 1 for each connected GSI instrument
- CD-ROM Drive

Supported Operating systems

- Microsoft Windows™ 8
- Microsoft Windows™ 7 Professional
- Microsoft Windows™ Vista Professional (Service Pack 2)
- Microsoft Windows XP Professional

Software requirements

- Microsoft .NET Framework version 4.0

Installation instructions

1. Insert the CD into the computer.
2. Browse the contents of the CD to the “GSI Instrument Services” folder.
3. Double-click on the setup.exe.
4. Follow the on-screen instructions to properly install the selected software.

When installation is complete, the GSI Instrument Services will be an icon in the system tray.



NOTE: You will need administrative rights to install the GSI Instrument Services software. If you install GSI Suite V2.2, it will also install the GSI Instrument Services.

Compatibility and Restrictions

The GSI Instrument Service may be used at the same time as the GSI Suite and AudioStar Configuration Application. The GSI Suite will utilize the Instrument Service for communications to the instrument. If the Instrument Service is not running, the GSI Suite will start it.

The GSI Instrument Service must be closed when using the AudioStar calibration application. It can be restarted from the Windows Start menu.

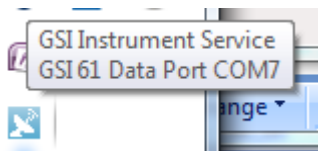
The GSI Instrument Services V1.1 is not compatible with an AudioStar Pro running V1.0, or GSI Suite V2.1 or earlier. Versions are displayed in the GSI Instrument Services About dialog.

Remote Computer

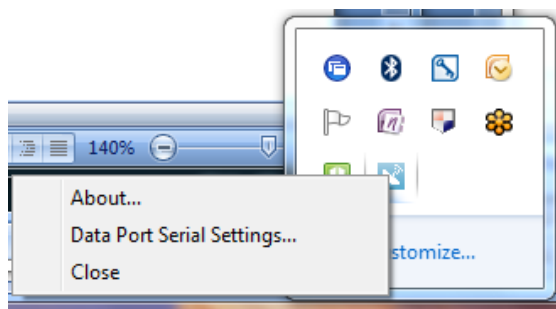
When installed on a PC, the GSI Instrument Services icon will appear in the Windows system tray.



If you place your mouse pointer over the top of the icon, you will get the following tooltip.

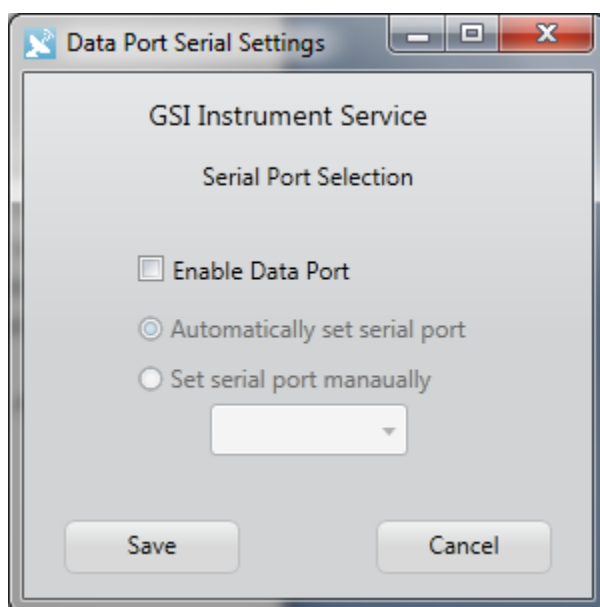


Context Menu



1. Close Option: This selection will close the application.

Data Port Serial Settings (dialog)



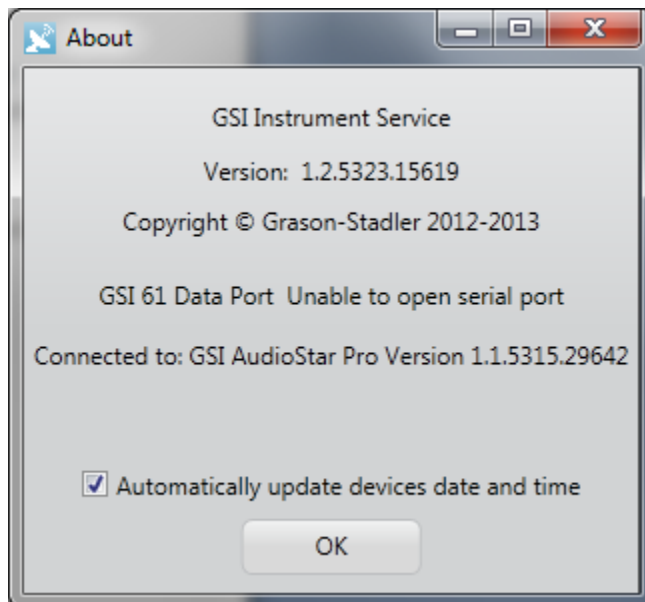
1. Enable Data Port: The Data Port is used with programs that require backward compatibility with the GSI 61 data stream. Check the box to enable this backward compatibility. GSI Suite does not require this backward compatibility and there is no need to enable the Data Port when using GSI Suite.
2. Automatic: GSI Instrument Service will automatically search for a serial communication port that is not already being utilized by another application. The user must configure the PC application to the same serial port as the data port for seamless communication with the GSI Instrument Service/AudioStar Pro.

NOTE: When the GSI Instrument Service starts, it will first try to use the serial port that is previously used. If this is not available, it will automatically search for the next open serial port. It will assign itself to the next unassigned serial port. The user must ensure the serial ports are the same.

3. Manual: The GSI Instrument Service will use the configured serial communication port even if it is already being utilized by another application. In this case, it would be the user's responsibility to troubleshoot serial port conflicts.

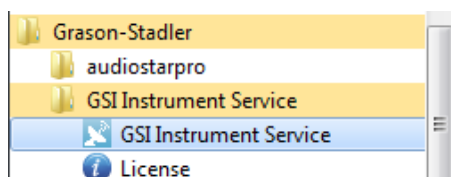
About (dialog)

The about dialog shows the current version, copyright and connected instrument information. The selected serial port for the Data Port, if enabled, is displayed. The connection status to an AudioStar Pro is displayed along with the version of the connected AudioStar Pro.



Windows Start menu

The Instrument Service Software may be initiated from the Windows Start menu.



USB Ports

During idle periods, some operating systems will force USB connections into a “sleep” mode. This causes an interruption in USB connectivity between the AudioStar Pro and the PC.

In order to ensure consistent communication to the audiometer, it is recommended that the USB sleep mode is disabled.

These settings may be changed from the computer's control panel. Typical location is found under advanced settings of the power options.

Data Port Interface

The Data Port interface allows the AudioStar Pro data transfer function to be backwards compatible with the GSI 61 data stream. This interface is for GSI 61 users who are currently transferring data to a 3rd Party PC application such as an EMR system and wish to maintain that transfer function with the AudioStar Pro. The GSI Instrument Service will alter the GSI AudioStar Pro data stream, to mimic that of the GSI 61.

The default settings are 9600 baud rate, no parity, 8 data bits, 1 stop bit, and hardware flow control.

When the GSI Instrument Service is initiated, the Data Port Interface will always try to use the serial ports it used before. If it cannot reuse the serial port it used before, it will choose another available serial port if it is configured to automatic serial port selection.

NOTE: In Windows Device Manager, the Data Port will be displayed as the “GSI 61 data port (COM X), where “X” is the currently assigned serial port.

Data Transfer

Record and Field Formatting

Communication with the remote audiometer is performed by sending a request and receiving information in *records*. Each type of information has its own record format. Each record is divided into *fields* which contain specific information. All records are formatted with a predefined, fixed length format.

The record prefix consists of a “.” character and denotes the start of a record. Input records do not contain a checksum. The record terminator consists of a “CR,” “LF” sequence. Each record consists of fixed length data fields with any unused or Zero data fields filled with a “0.” All records consist of a sequence of printable ASCII characters from the set of “0” to “9,” “A” to “G,” “-,” “:,” “.”, “_,” “CR” and “LF.” All multiple character ASCII fields will be right justified with unused character positions filled with “_” characters. Positive numeric values will not contain a “+” sign; this will be implied. Negative values contain a “-” sign in any character position to the left of the most significant digit of the number. Unless specified, the decimal point for non-integer numbers will not be included in the character sequence.

Checksums

Checksums will be calculated to maintain compatibility with the GSI 61 as the mod 256 sum of all preceding characters on the record, including the “.” prefix, and stored as two HEX ASCII characters.

Input Operation

Validation

When a complete input record is received, the record is validated and processed. If the record is invalid, an error record is transmitted back to the remote device. All input records are validated in the following manner:

- Must begin with a “:,” and end with a carriage return, line feed sequence.
- Must contain all valid ASCII characters.
- Must contain a valid record type.
- Must contain a valid function code.
- Must contain a valid function subcode when required.

Acknowledgment

The GSI AudioStar Pro will acknowledge the correct reception and processing of all input records by transmitting back the requested information.

Input Record Type

These records are sent by the remote device to control its functions.

Input Record Type 5 - Pushbutton Code Record

This record type provides the ability to remotely simulate the operation of selected user controls. The record specifies the control operation using a function code which defines the group of controls and a sub-function code which defines the specific parameter to select the function to perform. Control operations are processed in the same manner as if they had been manually entered. All parameter or functional defaults and restrictions will still apply.

Function Codes

The following are function codes that describe the commands sent and the response you can expect to see when transferring data from the AudioStar Pro to a computer using the Data Port Software.

Function Code	Function Group	Function Subgroup	Sub Code	Pushbutton Function
43	Transmit Unit ID Record	“0”		
47	Data Transfer	“3”		Test Battery Data Record

Output Record Type 4 - Error Record

This type of error record contains information on each type of error that has occurred. The types of errors which would result in an Error Record are:

- System errors.
- Input record which has an incorrect format or is invalid for the current operating mode.
- Push button operation commands which are invalid.

Character Offset	Number of Characters	Field Name	Field Description
0	1	Record Prefix	“.”
1	1	Record Type	“4”
2	2	Error Code	See next table: Error Codes
4	2	Checksum	See prior section concerning checksums.
6	2	Record Terminator	“CR” & “LF”

Error Record Codes

Error Code	Error Description
10	Generic NACK in response to an invalid input (negative acknowledgement)

Output Record Type - Test Battery Data Record

Record Prefix

Character Offset	Number of Characters	Data Type	Field Name	Field Description
0	1	ASCII	Record Prefix	“.”
1	1	ASCII	Record Type	“6”

Left Ear Test Data - Pure Tone

2	4	slnt	Pure Tone Test - 125 Hz Air Conduction Threshold - Test Ear	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
6	4	slnt	Pure Tone Test - 125 Hz Air Conduction Threshold - Masking Ear	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
10	4	slnt	Pure Tone Test - 125 Hz Bone Conduction Threshold - Test Ear	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
14	4	slnt	Pure Tone Test - 125 Hz Bone Conduction Threshold - Masking Ear	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
18	4	slnt	Pure Tone Test - 125 Hz Sound Field	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
22	20		Pure Tone Test - 250 Hz	See Pure Tone Test - 125 Hz fields
42	20		Pure Tone Test - 500 Hz	See Pure Tone Test - 125 Hz fields
62	20		Pure Tone Test - 750 Hz	See Pure Tone Test - 125 Hz fields
82	20		Pure Tone Test - 1 kHz	See Pure Tone Test - 125 Hz fields
102	20		Pure Tone Test - 1.5 kHz	See Pure Tone Test - 125 Hz fields
122	20		Pure Tone Test - 2 kHz	See Pure Tone Test - 125 Hz fields
142	20		Pure Tone Test - 3 kHz	See Pure Tone Test - 125 Hz fields
162	20		Pure Tone Test - 4 kHz	See Pure Tone Test - 125 Hz fields

182	20		Pure Tone Test - 6 kHz	See Pure Tone Test - 125 Hz fields
202	20		Pure Tone Test - 8 kHz Low Freq.	See Pure Tone Test - 125 Hz fields
222	20		Pure Tone Test - 12 kHz	See Pure Tone Test - 125 Hz fields
242	20		Pure Tone Test - 8 kHz High Freq.	See Pure Tone Test - 125 Hz fields
262	20		Pure Tone Test - 9 kHz	See Pure Tone Test - 125 Hz fields
282	20		Pure Tone Test - 10 kHz	See Pure Tone Test - 125 Hz fields
302	20		Pure Tone Test - 11.2 kHz	See Pure Tone Test - 125 Hz fields
322	20		Pure Tone Test - 12.5 kHz	See Pure Tone Test - 125 Hz fields
342	20		Pure Tone Test - 14 kHz	See Pure Tone Test - 125 Hz fields
362	20		Pure Tone Test - 16 kHz	See Pure Tone Test - 125 Hz fields
382	20		Pure Tone Test - 18 kHz	See Pure Tone Test - 125 Hz fields
402	20		Pure Tone Test - 20 kHz	See Pure Tone Test - 125 Hz fields
422	2	uChar	Bone Vibrator Calibration	“_0” = Forehead “_1” = Mastoid

Speech Test

Character Offset	Number of Characters	Data Type	Field Name	Field Description
424	4	slnt	Speech Test - Test Ear Threshold	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
428	4	slnt	Speech Test - Masking Threshold	-20 to 120 dB x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
432	2	uChar	Speech Test - Masking Type	“_0” = None “_1” = White Noise “_2” = Speech Noise “_3” = Ext. A “_4” = Ext. B
434	2	uChar	Speech Test - Number Presented	_0 to 100
436	2	uChar	Speech Test - Number Correct	_0 to 100

SISI Test

Character Offset	Number of Characters	Data Type	Field Name	Field Description
438	4	sInt	SISI Test - 125 Hz Test Ear Threshold	_-20 to 120 dB HL x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
442	2	uChar	SISI Test - 125 Hz Pulse Height	“_0” = 5 dB “_1” = 2 dB “_2” = 1 dB
444	2	uChar	SISI Test - 125 Hz Number Presented	_0 to 100
446	2	uChar	SISI Test - 125 Hz Number Correct	_0 to 100
448	10		SISI Test - 250 Hz	See SISI Test - 125 Hz Fields
458	10		SISI Test - 500 Hz	See SISI Test - 125 Hz Fields
468	10		SISI Test - 750 Hz	See SISI Test - 125 Hz Fields
478	10		SISI Test - 1 kHz	See SISI Test - 125 Hz Fields
488	10		SISI Test - 1.5 kHz	See SISI Test - 125 Hz Fields
498	10		SISI Test - 2 kHz	See SISI Test - 125 Hz Fields
508	10		SISI Test - 3 kHz	See SISI Test - 125 Hz Fields
518	10		SISI Test - 4 kHz	See SISI Test - 125 Hz Fields
528	10		SISI Test - 6 kHz	See SISI Test - 125 Hz Fields
538	10		SISI Test - 8 kHz Low Frequency	See SISI Test - 125 Hz Fields
548	10		SISI Test - 12 kHz	See SISI Test - 125 Hz Fields
558	10		SISI Test - 8 kHz High Frequency	See SISI Test - 125 Hz Fields
568	10		SISI Test - 9 kHz	See SISI Test - 125 Hz Fields
578	10		SISI Test - 10 kHz	See SISI Test - 125 Hz Fields
588	10		SISI Test - 11.2 kHz	See SISI Test - 125 Hz Fields

598	10		SISI Test - 12.5 kHz	See SISI Test - 125 Hz Fields
608	10		SISI Test - 14 kHz	See SISI Test - 125 Hz Fields
618	10		SISI Test - 16 kHz	See SISI Test - 125 Hz Fields
628	10		SISI Test - 18 kHz	See SISI Test - 125 Hz Fields
638	10		SISI Test - 20 kHz	See SISI Test - 125 Hz Fields

Alternate (ABLB)

Character Offset	Number of Characters	Data Type	Field Name	Field Description
648	4	slnt	Alternate Test - 125 Hz Test Ear Threshold	_ -20 to 120 dB HL x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
658	4	slnt	Alternate Test - 125 Hz Masking Ear Threshold	_ -20 to 120 dB HL x 2 NR = 260 to 540 NT = 32768 (0 x 8000)
656	8		Alternate Test - 250 Hz	See Alternate Test - 125 Hz Fields
664	8		Alternate Test - 500 Hz	See Alternate Test - 125 Hz Fields
672	8		Alternate Test - 750 Hz	See Alternate Test - 125 Hz Fields
680	8		Alternate Test - 1 kHz	See Alternate Test - 125 Hz Fields
688	8		Alternate Test - 1.5 kHz	See Alternate Test - 125 Hz Fields
696	8		Alternate Test - 2 kHz	See Alternate Test - 125 Hz Fields
704	8		Alternate Test - 3 kHz	See Alternate Test - 125 Hz Fields
712	8		Alternate Test - 4 kHz	See Alternate Test - 125 Hz Fields
720	8		Alternate Test - 6 kHz	See Alternate Test - 125 Hz Fields
728	8		Alternate Test - 8 kHz Low Freq.	See Alternate Test - 125 Hz Fields
736	8		Alternate Test - 12 kHz	See Alternate Test - 125 Hz Fields
744	8		Alternate Test - 8 kHz High Freq.	See Alternate Test - 125 Hz Fields
752	8		Alternate Test - 9 kHz	See Alternate Test - 125 Hz Fields

760	8		Alternate Test - 10 kHz	See Alternate Test - 125 Hz Fields
768	8		Alternate Test - 11.2 kHz	See Alternate Test - 125 Hz Fields
776	8		Alternate Test - 12.5 kHz	See Alternate Test - 125 Hz Fields
784	8		Alternate Test - 14 kHz	See Alternate Test - 125 Hz Fields
792	8		Alternate Test - 16 kHz	See Alternate Test - 125 Hz Fields
800	8		Alternate Test - 18 kHz	See Alternate Test - 125 Hz Fields
808	8		Alternate Test - 20 kHz	See Alternate Test - 125 Hz Fields

Right Ear Test Data

Character Offset	Number of Characters	Data Type	Field Name	Field Description
816	814			See Left Ear Fields

Record Terminator

Character Offset	Number of Characters	Data Type	Field Name	Field Description
1630	2	uChar	Checksum	See prior section concerning checksums.
1632	2	ASCII	Record Terminator	“CR” & “LF”

NOTE: HL threshold values are transmitted as hexadecimal values scaled by 2.

NR values are calculated by subtracting 300 from the returned value (260 to 540) and dividing by 2

Output Record Type 7 – Instrument Type

This type of error record contains the instrument type and software version information.

Character Offset	Number of Characters	Field Name	Field Description
0	1	Record Prefix	“.”
1	1	Record Type	“7”
2	2	Instrument Type	“04”
4	5	Software Revision	“xx.xx”
9	2	Checksum	See prior section concerning checksums.
11	2	Record Terminator	“CR” & “LF”

AudioStar Pro Public Interface

The Public Interface allows users to electronically transfer data to a Third Party PC application such as an EMR system.

The following information describes the programmatic interface and XML data that is exported. It is intended to be used by experienced computer programmers familiar with Windows Communications Foundation (WCF) to write the interface between the AudioStar Pro and a PC software application.

WCF Interface

The Public Interface is implemented using Windows Communication Foundation. There are two interfaces to implement `IPublicInterfaceService` and `IPublic Interface Callbacks`. Namespace `Grason Stadler. Audiometry Public Interface`. Only the documented interfaces are supported.

Calls to the host

1. **Register:** Registers a GUID the client creates with the host. This will give the host the ID of the client for event messages.
2. **Unregister:** Removes the client from the host.
3. **GetSerialNumber:** Retrieve the serial number of the device.
4. **GetInstrumentType:** Retrieve the instrument type, for example, the AudioStar Pro will return “GSI AudioStar Pro.”
5. **IsConnected:** Returns true if an instrument is connected.

```
public interface IPublicInterfaceService
{
    /// <summary>
    /// Get the Serial Number of the connected device
    /// </summary>
    /// <returns></returns>
    [OperationContract]
    string GetSerialNumber();

    /// <summary>
    /// Always returns true. Can be used to verify the Instrument Service is
running
    /// </summary>
    /// <returns></returns>
    [OperationContract]
    bool ServerReady();

    /// <summary>
    /// Gets the type of the instrument
    /// </summary>
    /// <returns></returns>
    [OperationContract]
    string GetInstrumentType();

    /// <summary>
    /// Returns true if a device is connected to the computer
    /// </summary>
    /// <returns></returns>
    [OperationContract]
    bool IsConnected();

    /// <summary>
    /// Gives the Instrument Service the ID of the client so that events can be
directed
    /// directly to the client.
    /// </summary>
    /// <param name="clientID"></param>
    [OperationContract(IsOneWay = true)]
    void Register(Guid clientID);

    /// <summary>
    /// Tells the Instrument Service not to send events directly to the client
    /// </summary>
    /// <param name="clientID"></param>
    [OperationContract(IsOneWay = true)]
    void Unregister(Guid clientID);

    /// <summary>
    /// Request the current session from the device.
    /// </summary>
    /// <param name="clientID"></param>
    [OperationContract(IsOneWay = true)]
    void RequestData(Guid clientID);

    /// <summary>
    /// Request that the current session data be discarded.
    /// </summary>
    [OperationContract(IsOneWay = true)]
    void ClearSession();
}
```

Callbacks

1. **OnDeviceConnected - Callback:** Broadcast to all registered clients when an AudioStar Pro connects to the computer.
2. **OnDeviceDisconnected - Callback:** Broadcast to all registered clients when an AudioStar Pro disconnects from the computer.
3. **OnNewData - Callback:** Broadcast to all registered clients when the Transfer button is pressed on the instrument.
4. **OnServerShuttingDown - Callback:** When the server is shut down, which normally should not happen, the server will notify the registered clients of this state change.

```
public interface IPublicInterfaceCallbacks
{
    /// <summary>
    /// New session data arrived from instrument, this is called on each of the
Registered Clients
    /// </summary>
    /// <param name="xmlData"></param>
    [OperationContract]
    void OnNewData(string xmlData);

    /// <summary>
    /// Called when a device is connected to the computer
    /// </summary>
    /// <param name="serialNumber"></param>
    /// <param name="deviceType"></param>
    [OperationContract]
    void OnDeviceConnected(string serialNumber, string deviceType);

    /// <summary>
    /// Called when a device is disconnected from the computer
    /// </summary>
    [OperationContract]
    void OnDeviceDisconnected();

    /// <summary>
    /// If the Instrument Service is closed, this is called on each of the
Registered Clients
    /// </summary>
    [OperationContract]
    void OnServerShuttingDown();
}
```

WCF Bindings

Below are examples of configuring the client and connecting to the host.

Defining WCF bindings with the app.config settings

```
<?xml version="1.0"?>
<configuration>
  <startup>
    <supportedRuntime version="v4.0" sku=".NETFramework,Version=v4.0"/>
  </startup>

  <system.serviceModel>

    <bindings>
      <netNamedPipeBinding>
        <binding name="BindingSettings"
          maxBufferPoolSize="524288000"
          maxReceivedMessageSize="655360000"
          maxBufferSize="655360000" >
          <readerQuotas maxStringLength="655360000"
            maxArrayLength="2000001"
            maxBytesPerRead="2000001"
            maxNameTableCharCount="2000001" />
        </binding>
      </netNamedPipeBinding>
    </bindings>

  </system.serviceModel>
</configuration>
```

Creating the connection to the Instrument Service

The client creates a GUID, this is used as part of the endpoint name and passed to the host through the Register command. This GUID is used by the host to send events to the client.

The endpoint name must be 'net.pipe://localhost/GsiInstrumentService/Client_' appended with a GUID, for example:
'net.pipe://localhost/GsiInstrumentService/Client_B088C677-92F9-42B1-B370-89883822C203'

```
clientId = Guid.NewGuid();

clientHost = new ServiceHost(this);
binding = new NetNamedPipeBinding("BindingSettings");

clientHost.AddServiceEndpoint((typeof(IPublicInterfaceCallbacks)),
binding, "net.pipe://localhost/GsiInstrumentService/Client_" + clientId);

clientHost.Open();

factory = new ChannelFactory<IPublicInterfaceService>(binding, new
EndpointAddress("net.pipe://localhost/GsiInstrumentService/Server"));

var clientToServerChannel = factory.CreateChannel();
clientToServerChannel.Register(client);
```

Defining WCF bindings programmatically

```
binding = new NetNamedPipeBinding
{
    MaxBufferSize = 655360000,
    MaxBufferPoolSize = 524288000,
    MaxReceivedMessageSize = 655360000,
    ReaderQuotas =
    {
        MaxStringContentLength = 655360000,
        MaxArrayLength = 2000001,
        MaxBytesPerRead = 2000001,
        MaxNameTableCharCount = 2000001
    }
};

clientId = Guid.NewGuid();

clientHost = new ServiceHost(this);
binding = new NetNamedPipeBinding("BindingSettings");

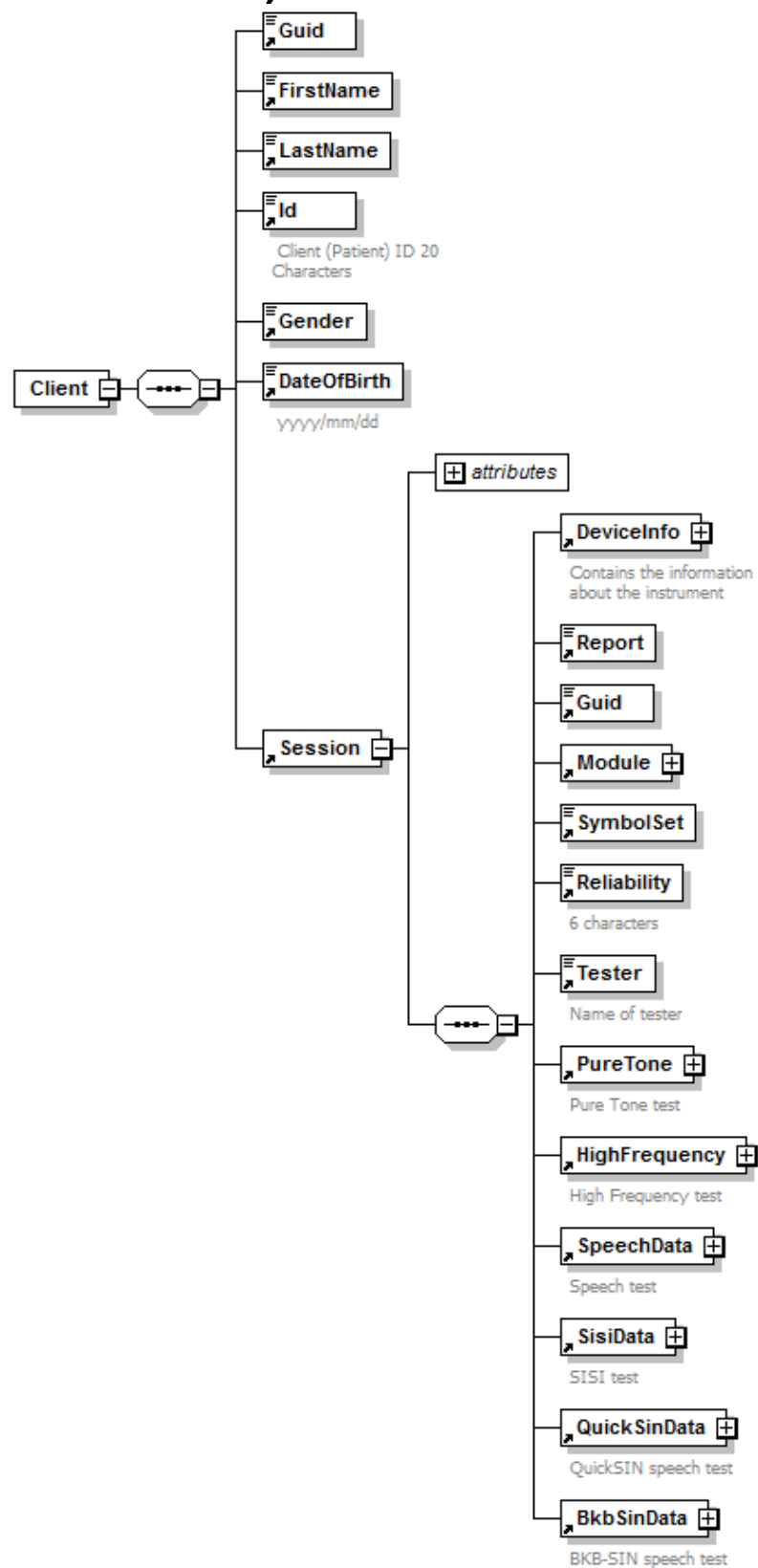
clientHost.AddServiceEndpoint((typeof(IPublicInterfaceCallbacks)),
binding, "net.pipe://localhost/GsiInstrumentService/Client_" + clientId);

clientHost.Open();

factory = new ChannelFactory<IPublicInterfaceService>(binding, new
EndpointAddress("net.pipe://localhost/GsiInstrumentService/Server"));

var clientToServerChannel = factory.CreateChannel();
clientToServerChannel.Register(client);
```


Schema (Public Interface)



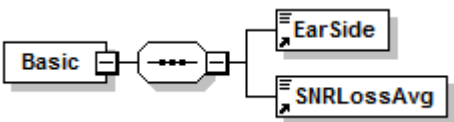
Schema Description

The details of the scheme can be understood by browsing the file ASP_11.xsd file which can be found on the CD with the install for the GSI Instrument Services. Additional information can be found below.

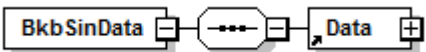
element **AgeGroup**

diagram	
type	restriction of xs:string
used by	Settings
Description	Adult, Child56, Child710, Child1114

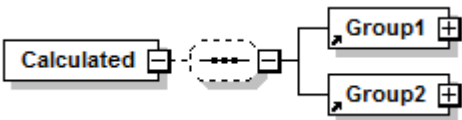
element **Basic**

diagram	
children	EarSide SNRLossAvg
used by	Group1 Group2
Description	

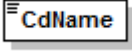
element **BkbSinData**

diagram	
children	Data
used by	Session
Description	BKB-SIN speech test

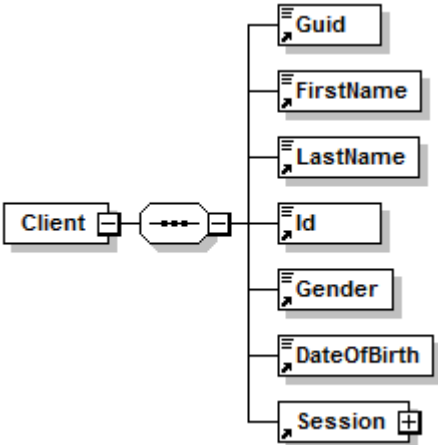
element **Calculated**

diagram	
children	Group1 Group2
used by	RecordedData
Description	

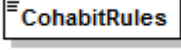
element **CdName**

diagram	
type	restriction of xs:string
used by	Track
Description	The name of the CD used for a speech test.


element **Client**

diagram	
children	Guid FirstName LastName Id Gender DateOfBirth Session
Description	

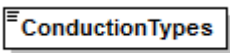
element **CohabitRules**

diagram	
type	restriction of xs:string
used by	Tone
Description	Enum: CohabitMaskedAndUnmasked, // typical curve rules: curve can have masked and unmasked data MaskedOnly, // (UK only so far): curve will have only masked data UnmaskedOnly, // (UK only so far): curve will have only unmasked data


element **Comment**

diagram	
type	xs:string
used by	SpeechPoint TonePoint
Description	Unused.

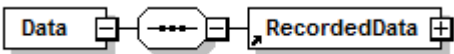
element **ConductionTypes**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: AC, BC, FF, IP, None, BCForehead, HiFreqPhone

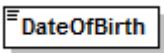
element **CorrectRepeated**

diagram	
type	restriction of xs:byte
used by	Sentence
Description	The number of word correctly repeated for a sentence.


element **Data**

diagram	
children	RecordedData
used by	BkbSinData HighFrequency PureTone QuickSinData SisiData SpeechData
Description	Contains the data for a test

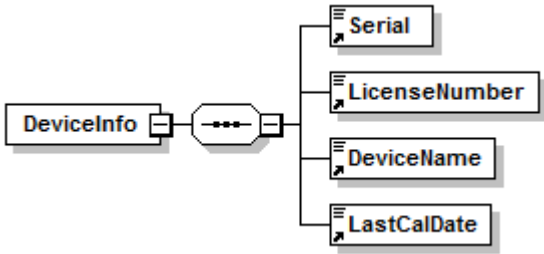
element **DateOfBirth**

diagram	
type	restriction of xs:int
used by	Client
Description	String: yyyy/mm/dd


element **DefaultSignalToNoise**

diagram	
type	restriction of xs:byte
used by	Sentence
Description	For a given Bkb-Sin or QuickSin sentence the default signal to noise ratio at which the sentence should be presented.

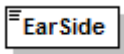
element **DeviceInfo**

diagram	
children	Serial LicenseNumber DeviceName LastCalDate
used by	Session
Description	Contains the information about the instrument

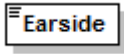
element **DeviceName**

diagram	
type	restriction of xs:string
used by	DeviceInfo
Description	


element **EarSide**

diagram	
type	restriction of xs:string
used by	Basic Hfe HfeLp Measured SISI Group1 Group2
Description	Enum: Right, Left, Both


element **Earside**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: Right, Left, Both


element **EarSideCH1**

diagram	
type	restriction of xs:string
used by	Speech
Description	Enum: Right, Left, Both, Undefined

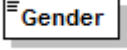
element **FirstName**

diagram	
type	restriction of xs:string
used by	Client
Description	String; unlimited

element **Frequency**

diagram	
type	restriction of xs:short
used by	SISI TonePoint
Description	Integer: 125-20000 Units: Hz

element **Gender**

diagram	
type	restriction of xs:string
used by	Client
Description	Enum: Male, Female


element **Group1**

diagram	
children	(for QuickSinData path) Basic Hfe HfeLp (for BkbSinData path) EarSide SNRLossAvg
used by	Calculated
Description	The content of the Group1 element is dependent on if it is contained in a QuickSinData or BkbSinData element . A Group1 element will exist only if there is at least one child exists.


element **Group2**

diagram	
children	(for QuickSinData path) Basic Hfe HfeLp (for BkbSinData path) EarSide SNRLossAvg
used by	Calculated
Description	The content of the Group2 element is dependent on if it is contained in a QuickSinData or BkbSinData element . A Group2 element will exist only if there is at least one child exists.


element **GroupID**

diagram	
type	restriction of xs:byte
used by	Measured
Description	1, 2

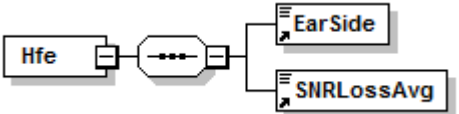
element **Guid**

diagram	
type	restriction of xs:string
used by	Client Session
Description	

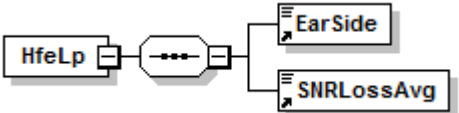
element **HasSecondaryACSymbols**

diagram	
type	xs:boolean
used by	Tone
Description	True: The current Symbol Set allows an unmasked AC data point to be represented by 1 of 2 different symbols depending on the presence of a masked AC data point for the same ear on the same frequency. Example: UK Symbol Set .

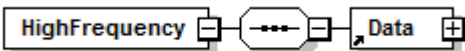
element **Hfe**

diagram	
children	EarSide SNRLossAvg
used by	Group1 Group2
Description	

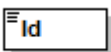
element **HfeLp**

diagram	
children	EarSide SNRLossAvg
used by	Group1 Group2
Description	


element **HighFrequency**

diagram	
children	Data
used by	Session
Description	High Frequency test


element **Id**

diagram	
type	restriction of xs:string
used by	Client
Description	String; 20 characters

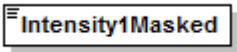
element **Intensity**

diagram	
type	restriction of xs:int
used by	SISI
Description	Integer: -10 to 120, -2147483648 when not used Units: dB

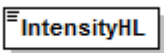
element **Intensity1**

diagram	
type	restriction of xs:byte
used by	SpeechPoint
Description	Integer: -10 to 120 Units: dB

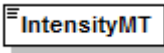
element **Intensity1Masked**

diagram	
type	restriction of xs:int
used by	SpeechPoint
Description	Integer: -10 to 120 Units: dB


element **IntensityHL**

diagram	
type	restriction of xs:byte
used by	Measured
Description	Integer: -10 to 120 Units: dB

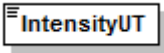
element **IntensityMT**

diagram	
type	restriction of xs:int
used by	TonePoint
Description	Type: Double Units: dB


element **IntensityMTMasked**

diagram	
type	restriction of xs:int
used by	TonePoint
Description	Type: Double Units: dB


element **IntensityUT**

diagram	
type	restriction of xs:byte
used by	TonePoint
Description	Type: Double Units: dB

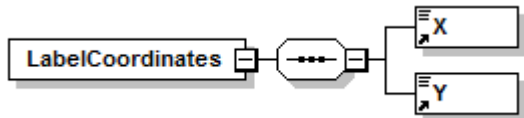
element **ISF440ListName**

diagram	
type	restriction of xs:string
used by	SpeechPoint
Description	

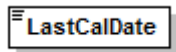
element **IsStandardFineHzFreq**

diagram	
type	restriction of xs:string
used by	TonePoint
Description	True/False: If the tone point's frequency is a standard frequency, and not generated solely by the Fine Hz Res (partial octave) functionality.

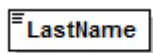
element **LabelCoordinates**

diagram	
children	X Y
used by	Speech
Description	Unused.

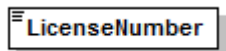
element **LastCalDate**

diagram	
type	restriction of xs:string
used by	DeviceInfo
Description	Date: mm/dd/yyyy

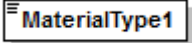
element **LastName**

diagram	
type	restriction of xs:string
used by	Client
Description	Patient last name


element **LicenseNumber**

diagram	
type	restriction of xs:int
used by	DeviceInfo
Description	

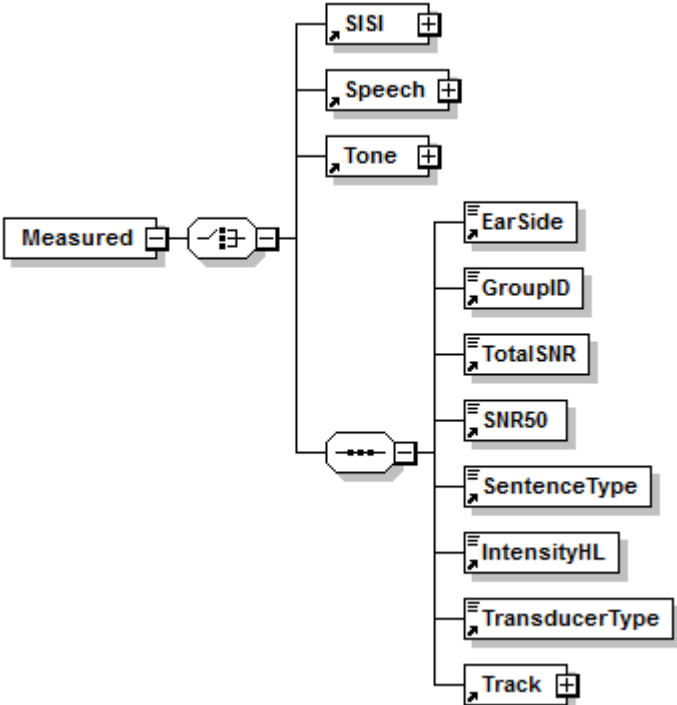
element **MaterialType1**

diagram	
type	restriction of xs:string
used by	Speech
Description	Enum: Numbers, Words, Sentences, QuickSIN, BkbSIN

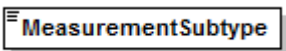
element **MaterialType2**

diagram	
type	restriction of xs:string
used by	Speech
Description	Enum: Multi or Single

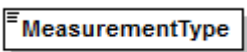
element **Measured**

diagram	
children	SISI Speech Tone EarSide GroupID TotalSNR SNR50 SentenceType IntensityHL TransducerType Track
used by	RecordedData
Description	Note: SentenceType will only be part of the structure when contained in the QuickSinData element.

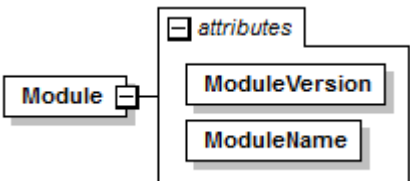
element **MeasurementSubtype**

diagram	
type	restriction of xs:string
used by	Speech
Description	Enum: HL, MCL, UCL, TT, TENNoise, MCLBlack, UCLBlack, HISpeakerBilateral, Tinn, TinnBlack

element **MeasurementType**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: HL, MCL,SDT,SRS, SRSA, SRT, Tinn, UCL, WRS, WRSM, WRSS

element **Module**

diagram	
used by	Session
Description	


attribute **Module/@ModuleVersion**

type	restriction of xs:string
Description	String; xx.xx.xxxx.xxxx

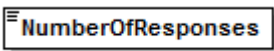
attribute **Module/@ModuleName**

type	restriction of xs:string
Description	

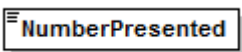
element **Name**

diagram	
type	restriction of xs:string
used by	Track
Description	

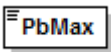
element **NumberOfResponses**

diagram	
type	restriction of xs:byte
used by	SISI
Description	Integer: 0-20

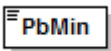
element **NumberPresented**

diagram	
type	restriction of xs:byte
used by	SISI
Description	Integer: 0-20


element **PbMax**

diagram	
type	restriction of xs:byte
used by	Speech
Description	Type: Double Units: dB

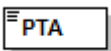
element **PbMin**

diagram	
type	restriction of xs:byte
used by	Speech
Description	Type: Double Units: %


element **PresentationType**

diagram	
type	restriction of xs:string
used by	Tone
Description	Enum: Multi, Single, Continuous


element **PTA**

diagram	
type	restriction of xs:string
used by	Speech
Description	Type: Double Units: dB

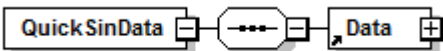
element **PTAValue**

diagram	
type	xs:string
used by	Tone
Description	Type: Double Units: dB

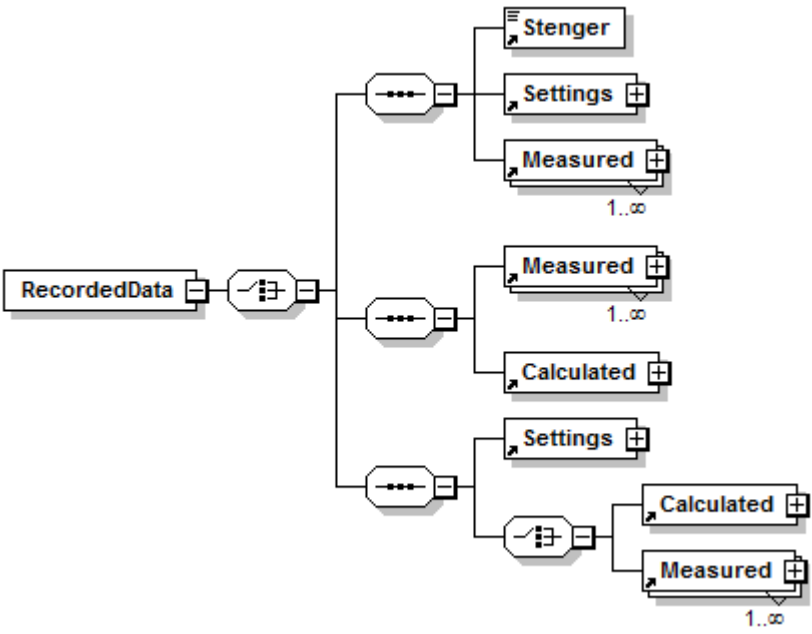
element **PureTone**

diagram	
children	Data
used by	Session
Description	Pure Tone Test

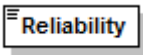
element **QuickSinData**

diagram	
children	Data
used by	Session
Description	QuickSIN speech test


element **RecordedData**

diagram	 <p>The diagram shows the structure of the RecordedData element. It is a container element (rectangle with a small square icon) that contains a choice element (octagon with a dashed line). This choice element has three branches, each starting with an ellipsis icon (three dots in a circle). The first branch contains a sequence of three elements: Stenger (rectangle with a list icon), Settings (rectangle with a plus icon), and Measured (rectangle with a plus icon). The second branch contains a sequence of two elements: Measured (rectangle with a plus icon) and Calculated (rectangle with a plus icon). The third branch contains a sequence of three elements: Settings (rectangle with a plus icon), Calculated (rectangle with a plus icon), and Measured (rectangle with a plus icon). Each Measured element has a cardinality of 1..∞ indicated below it.</p>
children	Stenger Settings Measured Calculated
used by	Data
Description	Contains all the data for a specific test type

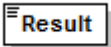
element **Reliability**

diagram	 <p>The diagram shows the Reliability element as a simple container element (rectangle with a small square icon).</p>
type	restriction of xs:string
used by	Session
Description	String; 6 characters


element **Report**

diagram	 <p>The diagram shows the Report element as a simple container element (rectangle with a small square icon).</p>
type	xs:string
used by	Session
Description	

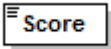
element **Result**

diagram	
type	restriction of xs:byte
used by	SISI
Description	Percent of correct responses Units: %

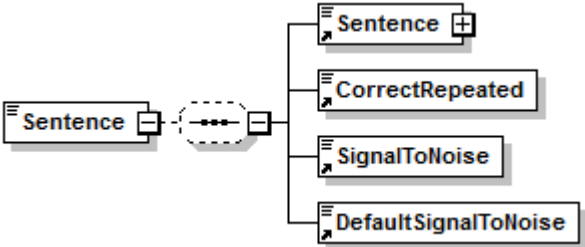
element **RollOverIndex**

diagram	
type	restriction of xs:byte
used by	Speech
Description	Calculated value

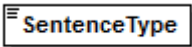
element **Score**

diagram	
type	restriction of xs:byte
used by	SpeechPoint SpeechWord
Description	Units: %

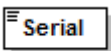
element **Sentence**

diagram	
children	Sentence CorrectRepeated SignalToNoise DefaultSignalToNoise
used by	Sentence Track
Description	

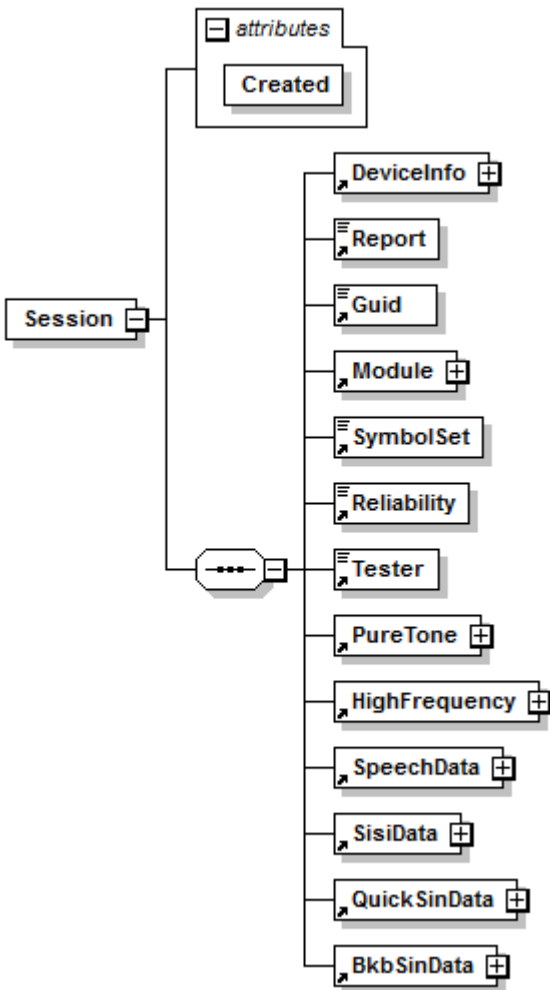
element **SentenceType**

diagram	
type	restriction of xs:string
used by	Measured
Description	Values: Basic, Hfe, or HfeLp. Identifies the type of elements that will be contained in the Calculated portion of the QuickSinData.

element **Serial**

diagram	
type	restriction of xs:string
used by	DeviceInfo
Description	Serial number


element **Session**

diagram	
children	DeviceInfo Report Guid Module SymbolSet Reliability Tester PureTone HighFrequency SpeechData SisiData QuickSinData BkbSinData
used by	Client


attribute **Session/@Created**

type	restriction of xs:dateTime
Description	String date and time yyyy-mm-dd hh:mm:ss
Description	


element **Settings**

diagram	
children	AgeGroup
used by	RecordedData
Description	

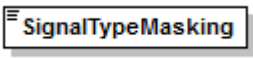
element **SignalToNoise**

diagram	
type	restriction of xs:byte
used by	Sentence
Description	

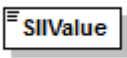
element **SignalType**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: Tone, WarbleTone, NB, WN, SN, CD, MIC, WaveFile, TEN_Noise, PediatricNoise

element **SignalTypeMasking**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: Tone, WarbleTone, NB, WN, SN, CD, MIC, Wavefile, TEN_Noise, PediatricNoise

element **SIIValue**

diagram	
type	xs:string
used by	Tone
Description	Speech intelligibility index Double between 0-1 Units: %

element **SISI**

diagram	
children	EarSide Frequency SISISStep Intensity NumberOfResponses NumberPresented Result
used by	Measured
Description	

element **SisiData**

diagram	
children	Data
used by	Session
Description	SISI test

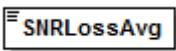
element **SISISStep**

diagram	
type	restriction of xs:byte
used by	SISI
Description	SISI increment (dB) 1, 2 or 5

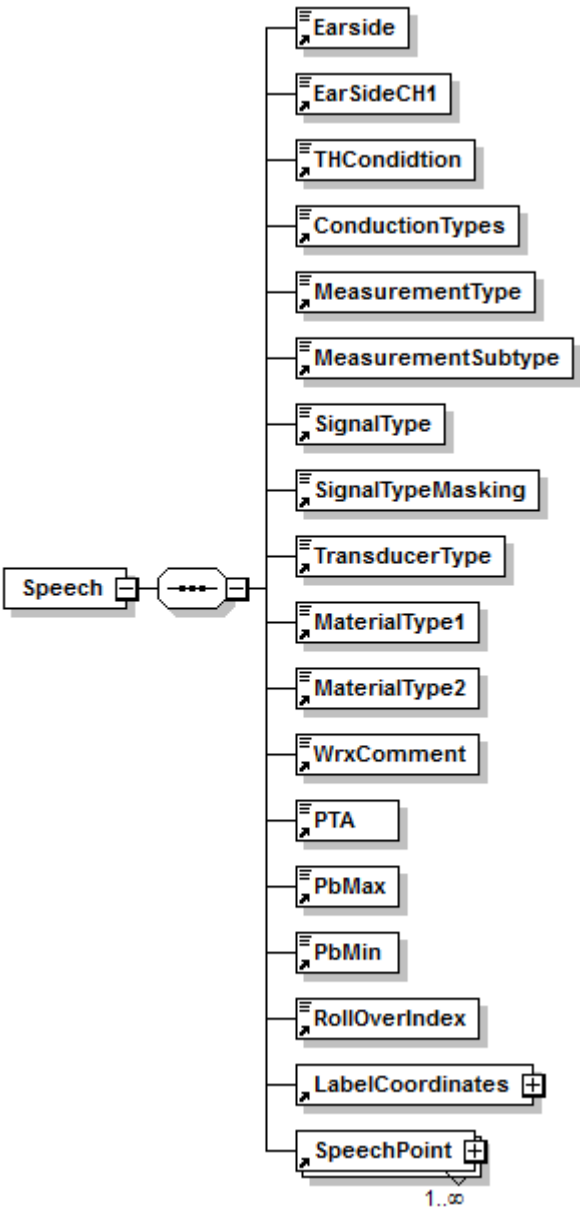
element **SNR50**

diagram	
type	restriction of xs:Double
used by	Measured
Description	Calculated value for Bkb-SIN and Quicksin tests.

element **SNRLossAvg**

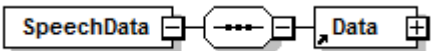
diagram	
type	restriction of xs:double
used by	Basic Hfe HfeLp Group1 Group2
Description	

element **Speech**

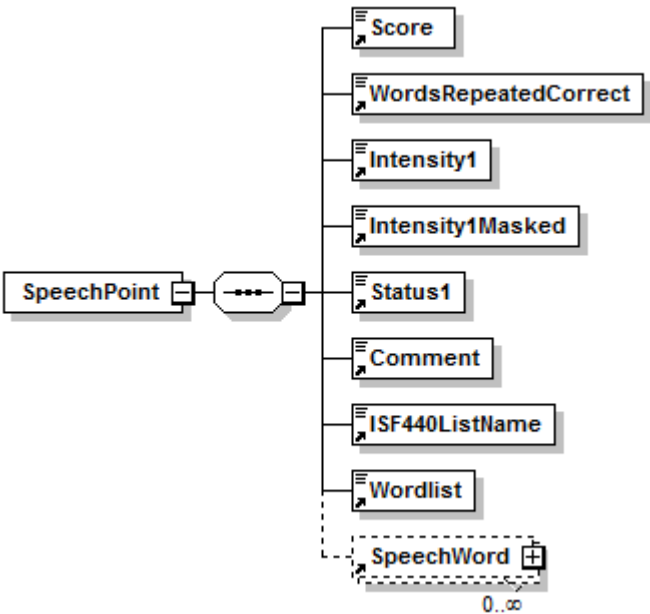
diagram	
children	Earside EarSideCH1 THConditdion ConductionTypes MeasurementType MeasurementSubtype SignalType SignalTypeMasking TransducerType MaterialType1 MaterialType2 WrxComment PTA PbMax PbMin RollOverIndex LabelCoordinates SpeechPoint
used by	Measured

Description	
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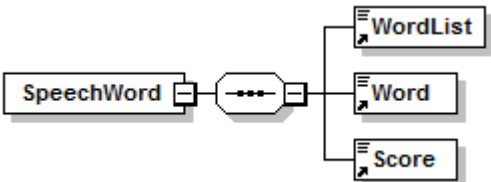
element **SpeechData**

diagram	
children	Data
used by	Session
Description	Speech test


element **SpeechPoint**

diagram	
children	Score WordsRepeatedCorrect Intensity1 Intensity1Masked Status1 Comment ISF440ListName Wordlist SpeechWord
used by	Speech
Description	Speech Test data point


element **SpeechWord**

diagram	
children	WordList Word Score
used by	SpeechPoint
Description	

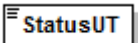
element **Status1**

diagram	
type	restriction of xs:string
used by	SpeechPoint
Description	Enum: Heard, NotHeard


element **StatusMT**

diagram	
type	restriction of xs:string
used by	TonePoint
Description	Enum: Undefined, Heard, NotHeard, NoReaction, HeardCenter, HeardRight, HeardLeft, CouldNotTest

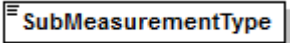
element **StatusUT**

diagram	
type	restriction of xs:string
used by	TonePoint
Description	Enum: Undefined, Heard, NotHeard, NoReaction, HeardCenter, HeardRight, HeardLeft, CouldNotTest

element **Stenger**

diagram	
type	xs:string
used by	RecordedData
Description	Off, Plus, Minus


element **SubMeasurementType**

diagram	
type	restriction of xs:string
used by	Tone
Description	Enum: HL, HISpeakerBilateral, MCL, MCLBlack, TENNoise, Tinn, TinnBlack, UCL, UCLBlack

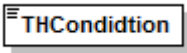
element **SymbolSet**

diagram	
type	restriction of xs:string
used by	Session
Description	String: Australia, China, Hong Kong, UK, USA

element **Tester**

diagram	
type	restriction of xs:string
used by	Session
Description	Name of tester

element **THCondition**

diagram	
type	restriction of xs:string
used by	Speech Tone
Description	Enum: CochlearImplant, HearingAid, Unaided

element **Tone**

diagram	<pre> classDiagram class Tone class Earside class THCondidtion class ConductionTypes class MeasurementType class SubMeasurementType class SignalType class SignalTypeMasking class PresentationType class CohabitRules class HasSecondaryAC_Symbols["HasSecondaryAC Symbols"] class PTAValue class SIIValue class TonePoint Tone --> Earside Tone --> THCondidtion Tone --> ConductionTypes Tone --> MeasurementType Tone --> SubMeasurementType Tone --> SignalType Tone --> SignalTypeMasking Tone --> PresentationType Tone --> CohabitRules Tone --> HasSecondaryAC_Symbols Tone --> PTAValue Tone --> SIIValue Tone --> TonePoint TonePoint .. > Tone </pre>
children	Earside THCondidtion ConductionTypes MeasurementType SubMeasurementType SignalType SignalTypeMasking PresentationType CohabitRules HasSecondaryAC Symbols PTAValue SIIValue TonePoint
used by	Measured
Description	Contains data about a tone test

element **TonePoint**

diagram	
children	Frequency IsStandardFineHzFreq IntensityMT IntensityMTMasked StatusMT IntensityUT StatusUT UseSecondarySymbol Comment Transducer
used by	Tone
Description	Tone Point test data

element **TotalSNR**

diagram	
type	restriction of xs:double
used by	Measured
Description	The SNL Loss for a given data point. For points on the BkbSinData this field will be blank when Age is undefined.

element **Track**

diagram	
children	Name CdName Sentence
used by	Measured
Description	

element **Transducer**

diagram	
type	restriction of xs:string
used by	TonePoint
Description	Enum: TDH50, HDA200, EAR3A, FreeFieldPower, FreeFieldLine, B71HighImpedance

element **TransducerType**

diagram	
type	restriction of xs:string
used by	Measured Speech
Description	Enum: TDH50, HDA200, EAR3A, FreeFieldPower, FreeFieldLine, B71HighImpedance

element **UseSecondarySymbol**

diagram	
type	restriction of xs:string
used by	TonePoint
Description	<p>enum:</p> <p>UseSecondary = With Symbol Sets where HasSecondaryACSymbols = true, the current data point should use the secondary symbol instead of the primary. Example: UK Symbol Set allows an unmasked AC data point to be represented by 1 of 2 different symbols depending on the presence of a masked AC data point for the same ear on the same frequency.</p> <p>DontUseSecondary = Current data point should use the primary symbol. (A secondary symbol may or may not be defined for this data point.)</p> <p>UsingSecondaryButHideIt = Current data point normally should use the secondary symbol, but is actually hidden because of close proximity (2 dB or less) of opposite-masking, similar-conduction symbol. Example: UK Symbol Set has AC unmasked data point at 10 dB and AC masked data point at 12 dB, in which case the 10 dB unmasked point is hidden. [NOTE: Software programs may wish to customize their own hiding preferences, perhaps by effectively redefining the proximity.]</p>

element **Word**

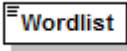
diagram	
type	restriction of xs:string
used by	SpeechWord
Description	

element **WordList**

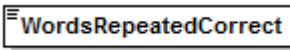
diagram	
---------	--

type	restriction of xs:string
used by	SpeechWord
Description	

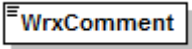
element Wordlist

diagram	
type	restriction of xs:string
used by	SpeechPoint
Description	Enum: Words, Numbers, Sentences


element WordsRepeatedCorrect

diagram	
type	restriction of xs:byte
used by	SpeechPoint
Description	


element WrxComment

diagram	
type	xs:string
used by	Speech
Description	

element X

diagram	
type	restriction of xs:string
used by	LabelCoordinates
Description	

element Y

diagram	
type	restriction of xs:string
used by	LabelCoordinates
facets	

Patient List

The GSI Instrument Service provides a way to download a list of patients and their demographics into the GSI AudioStar Pro. Patient Lists can be in a XML or CSV file. GSI Suite can be used to create a patient list from the patients defined in GSI Suite. The format of the CSV file is the same as NOAH's patient demographics export; this allows importing of the demographics from the patients defined in NOAH.

The patient list must be placed in %ProgramData%\Grason-Stadler\GSI Instrument Service\PatientList, the file name must be PatientList.xml or PatientList.csv. The file will be deleted after importing.

Windows XP: C:\Documents and Settings\All Users\Application Data\ Grason-Stadler\GSI Instrument Service\PatientList

Windows 7 and 8.1: C:\ProgramData\Grason-Stadler\GSI Instrument Service\PatientList

Patient List XML Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="PatientList">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Patient" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>

  <xs:element name="Patient">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Guid"/>
        <xs:element ref="FirstName"/>
        <xs:element ref="MiddleName"/>
        <xs:element ref="LastName"/>
        <xs:element ref="Id"/>
        <xs:element ref="Gender"/>
        <xs:element ref="DateOfBirth"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>

  <xs:element name="FirstName">
    <xs:simpleType>
      <xs:restriction base="xs:string"/>
    </xs:simpleType>
  </xs:element>

  <xs:element name="MiddleName">
    <xs:simpleType>
      <xs:restriction base="xs:string"/>
    </xs:simpleType>
  </xs:element>
</xs:schema>
```

```

<xs:element name="LastName">
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="Id">
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="Guid">
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="Gender">
  <xs:simpleType>
    <xs:restriction base="xs:string"/>
  </xs:simpleType>
</xs:element>
<xs:element name="DateOfBirth">
  <xs:simpleType>
    <xs:restriction base="xs:date"/>
  </xs:simpleType>
</xs:element>
</xs:schema>

```

Graphical Representation of the Schema

Elements

[DateOfBirth](#)

[FirstName](#)

[Gender](#)

[Guid](#)

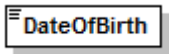
[Id](#)

[LastName](#)

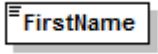
[Patient](#)

[PatientList.xml](#)


element **DateOfBirth**

diagram	
used by	element Patient


element **FirstName**

diagram	
used by	element Patient


element **Gender**

diagram	
used by	element Patient


element **Guid**

diagram	
used by	element Patient

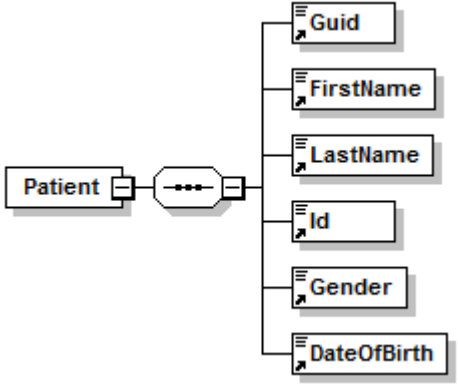
element **Id**

diagram	
used by	element Patient

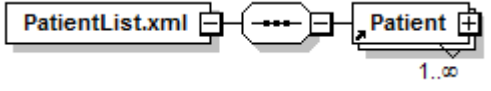
element **LastName**

diagram	
used by	element Patient

element **Patient**

diagram	
children	Guid FirstName LastName Id Gender DateOfBirth
used by	element PatientList.xml

element **PatientList.xml**

diagram	
children	Patient

Patient List CSV

The CSV format of the Patient List file is based on the patient export from NOAH.

NOAH Field	Suite
PatientGUID	This field can be blank
PatientNo	
FirstName	
LastName	
MiddleName	
Gender	
BirthDate	yyyy-mm-dd
Address1	Not Used
Address2	Not Used
Address3	Not Used
CreateDate	Not Used
UserID	Not Used
Salutation	Not Used
ZipCode	Not Used
City	Not Used
CreatedBy	Not Used
Title	Not Used
Province	Not Used
Country	Not Used
HomeTelephone	Not Used
WorkTelephone	Not Used
SSNumber	Not Used
EMail	Not Used
Insurance1	Not Used
Insurance2	Not Used
Referral	Not Used
Physician	Not Used
MobileTelephone	Not Used
Other1	Not Used
Other2	Not Used

Log Files

The Instrument Services generates log files that contain information for troubleshooting. These logs can be found in the following folder.

C:\ProgramData\Grason-Stadler\GSI Instrument Service\Logs