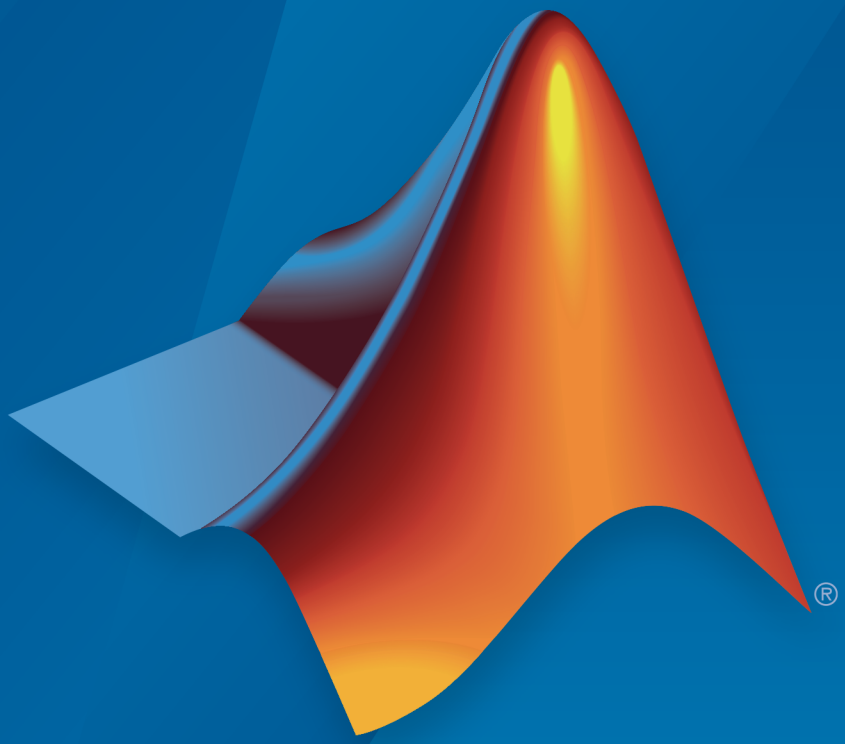
Data Acquisition Toolbox™

Reference



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Data Acquisition Toolbox™ Reference

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Base Properties — Alphabetical List

ActiveEdge

Rising or falling edges of EdgeCount signals

Description

When working with the session-based interface, use the `ActiveEdge` property to represent rising or falling edges of a EdgeCount signal.

Values

You can set the Active edge of a counter input channel to `Rising` or `Falling`.

Examples

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5', 0, 'EdgeCount')
```

```
ch =

Data acquisition counter input edge count channel 'ctr0' on device 'Dev2':

      ActiveEdge: Rising
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

Change the `Active Edge` property to `'Falling'`:

```
ch.ActiveEdge = 'Falling'
```

```
ch =

Data acquisition counter input edge count channel 'ctr0' on device 'Dev2':

      ActiveEdge: Falling
```

```
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

See Also

Functions

`addCounterInputChannel`, `addCounterOutputChannel`

ActivePulse

Active pulse measurement of PulseWidth counter channel

Description

When working with the session-based interface , the `ActivePulse` property displays the pulse width measurement in seconds of your counter channel, with `PulseWidth` measurement type.

Values

Active pulse measurement values include:

- `'High'`
- `'Low'`

Examples

Create a session object, add a counter input channel, with the `'EdgeCount'` `MeasurementType`.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5', 0, 'PulseWidth')
```

```
ch =

Data acquisition counter input pulse width channel 'ctr0' on device 'cDAQ1Mod5':

       ActivePulse: High
        Terminal: 'PFI4'
            Name: empty
              ID: 'ctr1'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'PulseWidth
```

Change the `ActiveEdge` property to `Low`.

```
ch.ActivePulse = 'Low'
```

```
ch =
```

```
Data acquisition counter input pulse width channel 'ctr0' on device 'cDAQ1Mod5':

     ActivePulse: Low
        Terminal: 'PFI4'
            Name: empty
              ID: 'ctr1'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'PulseWidth'
```

See Also

addCounterInputChannel

ADCTimingMode

Set channel timing mode

Description

When working with the session-based interface, use the `ADCTimingMode` property to specify if the timing mode in of all channels in the device is high resolution or high speed.

Note: The `ADCTimingMode` must be the same for all channels on the device.

Values

You can set the `ADCTimingMode` to:

- `'HighResolution'`
- `'HighSpeed'`
- `'Best50HzRejection'`
- `'Best60HzRejection'`

Examples

Create a session and add an analog input channel:

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod1','ai1','Voltage');

ch

ans =

Data acquisition analog input voltage channel 'ai1' on device 'cDAQ1Mod1':

       Coupling: DC
 TerminalConfig: SingleEnded
```

```
          Range: -10 to +10 Volts
           Name: ''
             ID: 'ai1'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Voltage'
  ADCTimingMode: ''
```

Set the `ADCTimingMode` property to `'HighResolution'`:

```
ch.ADCTimingMode = 'HighResolution';
```

See Also

`addAnalogInputChannel`

AutoSyncDSA

Automatically Synchronize DSA devices

Description

Use this property to enable or disable automatic synchronization between DSA (PXI or PCI) devices in the same session. By default the sessions automatic synchronization capability is disabled.

Examples

To enable automatic synchronization, create a session and add channels from a DSA device:

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'PXI1Slot2',0,'Voltage');
addAnalogInputChannel(s,'PXI1Slot3',1,'Voltage');
```

Enable automatic synchronization and acquire data”

```
s.AutoSyncDSA = true;
startForeground(s);
```

See Also

`addAnalogInputChannel`

BitsPerSample

Display bits per sample

Description

This property displays the maximum value of bits per sample of the device, based on the device specifications. By default this read-only value is 24.

Example

View BitsPerSample Property

Create an audio input session and display session properties.

```
s = daq.createSession('directsound')
```

```
s =

Data acquisition session using DirectSound hardware:
   Will run for 1 second (44100 scans) at 44100 scans/second.
   No channels have been added.

Properties, Methods, Events
```

Click on the **Properties** link.

```
 UseStandardSampleRates: true
                   BitsPerSample: 24
              StandardSampleRates: [1x15 double]
                   NumberOfScans: 44100
                DurationInSeconds: 1
                             Rate: 44100
                     IsContinuous: false
      NotifyWhenDataAvailableExceeds: 4410
IsNotifyWhenDataAvailableExceedsAuto: true
          NotifyWhenScansQueuedBelow: 22050
    IsNotifyWhenScansQueuedBelowAuto: true
             ExternalTriggerTimeout: 10
```

```
                TriggersPerRun: 1
                        Vendor: DirectSound
                      Channels: ''
                   Connections: ''
                     IsRunning: false
                     IsLogging: false
                        IsDone: false
IsWaitingForExternalTrigger: false
           TriggersRemaining: 1
                     RateLimit: ''
                   ScansQueued: 0
         ScansOutputByHardware: 0
                 ScansAcquired: 0
```

See Also

`StandardSampleRates` | `UseStandardSampleRate` | `addAudioInputChannel` | `addAudioOutputChannel`

BridgeMode

Specify analog input device bridge mode

Description

Use this property in the session-based interface to specify the bridge mode, which represents the active gauge of the analog input channel.

The bridge mode is `'Unknown'` when you add a bridge channel to the session. Change this value to a valid mode to use the channel. Valid bridge modes are:

- `'Full'` — All four gauges are active.
- `'Half'`— Only two bridges are active.
- `'Quarter'`— Only one bridge is active.

Examples

Set BridgeMode Property

Set the BridgeMode property of a analog input Bridge measurement type channel.

Create a session and add an analog input `Bridge` channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7', 0, 'Bridge');
```

Set the `BridgeMode` property to `'Full'` and view the channel properties.

```
ch.BridgeMode = 'Full'
```

```
ch =

Data acquisition analog input channel 'ai0' on device 'cDAQ1Mod7':

             BridgeMode: Full
       ExcitationSource: Internal
      ExcitationVoltage: 2.5
NominalBridgeResistance: 'Unknown'
```

```
                Range: -0.063 to +0.063 VoltsPerVolt
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
      MeasurementType: 'Bridge'
        ADCTimingMode: HighResolution
```

See Also

`addAnalogInputChannel`

Channels

Array of channel objects associated with session object

Description

This session object property contains and displays an array of channels added to the session. For more information on the session-based interface, see “Hardware Discovery and Session Setup”.

Tip You cannot directly add or remove channels using the `Channels` object properties. Use `addAnalogInputChannel` and `addAnalogOutputChannel` to add channels. Use `removeChannel` to remove channels.

Values

The value is determined by the channels you add to the session object.

Example

Access Channels Property

Create both analog and digital channels in a session and display the `Channels` property.

Create a session object, add an analog input channel, and display the session `Channels` property.

```
s = daq.createSession('ni');
aich = addAnalogInputChannel(s,'cDAQ1Mod7', 0, 'Bridge');
```

```
aich =

Data acquisition analog input channel 'ai0' on device 'cDAQ1Mod7':
```

```
             BridgeMode: Unknown
       ExcitationSource: Internal
      ExcitationVoltage: 2.5
NominalBridgeResistance: 'Unknown'
                  Range: -0.025 to +0.025 VoltsPerVolt
                   Name: ''
                     ID: 'ai0'
                 Device: [1x1 daq.ni.CompactDAQModule]
        MeasurementType: 'Bridge'
          ADCTimingMode: HighResolution


Properties, Methods, Events
```

Add an analog output channel and view the `Channels` property.

```
aoch = addAnalogOutputChannel(s,'cDAQ1Mod2', 'ao1', 'Voltage')

aoch =

Data acquisition analog output voltage channel 'ao1' on device 'cDAQ1Mod2':

 TerminalConfig: SingleEnded
          Range: -10 to +10 Volts
           Name: ''
             ID: 'ao1'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Voltage'
```

Add a digital channel with `'InputOnly'`

```
dich = addDigitalChannel(s,'dev1', 'Port0/Line0:1', 'InputOnly')

dich =

Number of channels: 2
   index Type Device   Channel   MeasurementType Range Name
   ----- ---- ------ ----------- --------------- ----- ----
   1     dio  Dev1   port0/line0 InputOnly       n/a
   2     dio  Dev1   port0/line1 InputOnly       n/a
```

Change the `InputType` property of the input channel to `SingleEnded`.

```
aich.InputType = 'SingleEnded';
```

You can use the channel object to access and edit the `Channels` property.

See Also

Functions

`addAnalogInputChannel`, `addAnalogOutputChannel`

Connections

Array of connections in session

Description

This session property contains and displays all connections added to the session.

Tip You cannot directly add or remove connections using the `Connections` object properties. Use `addTriggerConnection` and `addClockConnection` to add connections. Use `removeConnection` to remove connections.

Values

The value is determined by the connections you add to the session.

Examples

Remove Synchronization Connection

This example shows you how to remove a synchronization connection.

Create a session and add analog input channels and trigger and clock connections.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1', 0, 'voltage');
addAnalogInputChannel(s,'Dev2', 0, 'voltage');
addAnalogInputChannel(s,'Dev3', 0, 'voltage');
addTriggerConnection(s,'Dev1/PFI4','Dev2/PFI0','StartTrigger');
addTriggerConnection(s,'Dev1/PFI4','Dev3/PFI0','StartTrigger');
addClockConnection(s,'Dev1/PFI5','Dev2/PFI1','ScanClock');
```

Examine the session Connections property.

```
s.Connections
```

```
ans =
```

```
Start Trigger is provided by 'Dev1' at 'PFI4' and will be received by:
         'Dev2' at terminal 'PFI0'
         'Dev3' at terminal 'PFI0'
Scan Clock is provided by 'Dev1' at 'PFI5' and will be received by:
         'Dev2' at terminal 'PFI1'
         'Dev3' at terminal 'PFI1'

   index     Type      Source   Destination
   ----- ------------ --------- -----------
   1     StartTrigger Dev1/PFI4 Dev2/PFI0
   2     StartTrigger Dev1/PFI4 Dev3/PFI0
   3     ScanClock    Dev1/PFI5 Dev2/PFI1
   4     ScanClock    Dev1/PFI5 Dev3/PFI1
```

Remove the last clock connection at index 4 and display the session connections.

```
removeConnection(s,4)
s.Connections

ans =


Start Trigger is provided by 'Dev1' at 'PFI4' and will be received by:
         'Dev2' at terminal 'PFI0'
         'Dev3' at terminal 'PFI0'
Scan Clock is provided by 'Dev1' at 'PFI5' and will be received by 'Dev2' at terminal

   index     Type      Source   Destination
   ----- ------------ --------- -----------
   1     StartTrigger Dev1/PFI4 Dev2/PFI0
   2     StartTrigger Dev1/PFI4 Dev3/PFI0
   3     ScanClock    Dev1/PFI5 Dev2/PFI1
```

See Also

Function

`addTriggerConnection`, `addClockConnection`,

CountDirection

Specify direction of counter channel

Description

When working with the session-based interface, use the `CountDirection` property to set the direction of the counter. Count direction can be 'Increment', in which case the counter operates in incremental order, or 'Decrement', in which the counter operates in decrements.

Examples

Create a session object, add a counter input channel, and change the `CountDirection`.

```
s = daq.createSession('ni');
ch = addCounterInputChannel (s,'cDAQ1Mod5', 0, 'EdgeCount')

ch =

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

Change `CountDirection` to `'Decrement'`:

```
ch.CountDirection = 'Decrement'

ch =

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Decrement
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
```

```
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

See Also

addCounterInputChannel

Destination

Indicates trigger destination terminal

Description

When working with the session-based interface, the `Destination` property indicates the device and terminal to which you connect a trigger.

Example

Examine a Trigger Connection Destination

Create a session with a trigger connection and examine the connection properties.

Create a session and add 2 analog input channels form different devices.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'Dev1', 0, 'voltage');
addAnalogInputChannel(s,'Dev2', 0, 'voltage');
```

Add a trigger connection and examine the connection properties.

```
addTriggerConnection(s,'Dev1/PFI4','Dev2/PFI0','StartTrigger')
```

```
ans =


Start Trigger is provided by 'Dev1' at 'PFI4' and will be received by 'Dev2' at termina

     TriggerType: 'Digital'
TriggerCondition: RisingEdge
          Source: 'Dev1/PFI4'
     Destination: 'Dev2/PFI0'
            Type: StartTrigger
```

See Also

`Source`, `addTriggerConnection`

Device

Channel device information

Description

When working with the session-based interface, the read-only `Device` property displays device information for the channel.

Examples

Create a session object, add a counter input channel, and view the `Device` property.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5', 0, 'EdgeCount');
ch.Device

ans =

ni cDAQ1Mod5: National Instruments NI 9402
   Counter input subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      2 channels
      'EdgeCount','PulseWidth','Frequency','Position' measurement types

   Counter output subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      3 channels
      'PulseGeneration' measurement type

This module is in chassis 'cDAQ1', slot 5
```

See Also

`addCounterInputChannel`, `addCounterOutputChannel`

Direction

Specify digital channel direction

Description

When you add a digital channel or a group to a session, you can specify the measurement type to be:

- `Input`
- `Output`
- `Unknown`

When you specify the `MeasurementType` as `Bidirectional`, you can use the channel to input and output messages. By default the channel is set to `Unknown`. Change the direction to output signal on the channel.

Example

To change the direction of a bidirectional signal on a digital channel in the session `s`, type:

```
s.Channels(1).Direction='Output';
```

Change the Direction of a Digital Channel

Change the direction of a bidirectional digital channel to `Input`.

Create a session and add a bidirectional digital channel.

```
s = daq.createSession('ni')
ch = addDigitalChannel(s,'dev6', 'Port0/Line0', 'Bidirectional')
```

```
ch =

Data acquisition digital bidirectional (unknown) channel 'port0/line0' on device 'Dev6

      Direction: Unknown
```

```
           Name: ''
             ID: 'port0/line0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Bidirectional (Unknown)'
```

Change the channels direction to `'Input'`.

```
ch.Direction = 'Input'
```

```
ch =

Data acquisition digital bidirectional (input) channel 'port0/line0' on device 'Dev6':

      Direction: Input
           Name: ''
             ID: 'port0/line0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Bidirectional (Input)'


Properties, Methods, Events
```

DurationInSeconds

Specify duration of acquisition

Description

When working with the session-based interface, use the `DurationInSeconds` property to change the duration of an acquisition.

When the session contains analog, digital, or audio output channels, `DurationInSeconds` is a read-only property whose value is determined by $\frac{s.ScansQueued}{s.Rate}$.

If the session contains only counter output channels with PulseGeneration measurement type, then `DurationInSeconds` represents the duration of the pulse train signal generation.

Values

In a session with only input channels or counter output channels, you can enter a value in seconds for the length of the acquisition. Changing the duration changes the number of scans accordingly. By default, `DurationInSeconds` is set to 1 second.

Examples

Create a session object, add an analog input channel, and change the duration:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','voltage');
s.DurationInSeconds = 2

s =

Data acquisition session using National Instruments hardware:
   Will run for 2 seconds (2000 scans) at 1000 scans/second.
   Operation starts immediately.
      Number of channels: 1
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
```

```
     1     ai   cDAQ1Mod1 ai0     Diff      -10 to +10 Volts
```

See Also

Properties

`NumberOfScans`, `Rate`

Functions

`addCounterInputChannel`

DutyCycle

Duty cycle of output channel

Description

When working with the session-based interface, use the `DutyCycle` property to specify the fraction of time that the generated pulse is in active state.

Duty cycle is the ratio between the duration of the pulse and the pulse period. For example, if a pulse duration is 1 microsecond and the pulse period is 4 microseconds, the duty cycle is 0.25. In a square wave, you will see that the time the signal is high is equal to the time the signal is low.

For function generation channels using Digilent devices, each waveform adopts the duty cycle

Examples

Specify Duty Cycle

Create a session object and add a `'PulseGeneration'` counter output channel:

```
s = daq.createSession('ni');
ch = addCounterOutputChannel(s,'cDAQ1Mod5', 'ctr0', 'PulseGeneration')
```

```
ch =

Data acquisition counter output pulse generation channel 'ctr0' on device 'cDAQ1Mod5':

      IdleState: Low
   InitialDelay: 2.5e-08
      Frequency: 100
      DutyCycle: 0.5
       Terminal: 'PFI0'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'PulseGeneration'
```

Change the `DutyCycle` to `0.25` and display the channel:

```
ch.DutyCycle
```

```
ch =

Data acquisition counter output pulse generation channel 'ctr0' on device 'cDAQ1Mod5':

      IdleState: Low
   InitialDelay: 2.5e-08
      Frequency: 100
      DutyCycle: 0.25
       Terminal: 'PFI0'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'PulseGeneration'
```

You can change the channel duty cycle while the session is running when using counter output channels.

See Also

Class

`addCounterOutputChannel`

EncoderType

Encoding type of counter channel

Description

When working with the session-based interface, use the `EncoderType` property to specify the encoding type of the counter input `'Position'` channel.

Encoder types include:

- `'X1'`
- `'X2'`
- `'X4'`
- `'TwoPulse'`

Example

Change Encoder Type Property

Change the EncodeType property of a counter input channel with a `Position` measurement type.

Create a session and add a counter input channel with `Position` measurement type.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5', 'ctr0', 'Position')
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
```

```
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

Change the channels encoder type to X2.

```
ch.EncoderType='X2'
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X2
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position
```

See Also

`addCounterInputChannel`

EnhancedAliasRejectionEnable

Set enhanced alias rejection mode

Description

Enable or disable the enhanced alias rejection on your DSA device's analog channel. See "Synchronize DSA Devices" for more information. Enhanced alias reject is disabled by default. This property only takes logical values.

```
s.Channels(1).EnhancedAliasRejectionEnable = 1
```

You cannot modify enhanced rejection mode if you are synchronizing your DSA device using `AutoSyncDSA`.

Example

Enable Enhanced Alias Rejection

Enable enhanced alias rejection on a DSA device.

Create a session and add an analog input voltage channel using a DSA device.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'PXI1Slot2', 0, 'Voltage')
```

```
ch =

Data acquisition analog input voltage channel 'ai0' on device 'PXI1Slot2':

                    Coupling: DC
               TerminalConfig: PseudoDifferential
                        Range: -42 to +42 Volts
                         Name: ''
                           ID: 'ai0'
                       Device: [1x1 daq.ni.PXIDSAModule]
              MeasurementType: 'Voltage'
EnhancedAliasRejectionEnable: 0
```

Enable enhanced alias rejection.

```
ch.EnhancedAliasRejectionEnable = 1

ch =

Data acquisition analog input voltage channel 'ai0' on device 'PXI1Slot2':

                    Coupling: DC
                TerminalConfig: PseudoDifferential
                         Range: -42 to +42 Volts
                          Name: ''
                            ID: 'ai0'
                        Device: [1x1 daq.ni.PXIDSAModule]
                MeasurementType: 'Voltage'
EnhancedAliasRejectionEnable: 1
```

See Also

AutoSyncDSA

ExcitationCurrent

Voltage of external source of excitation

Description

When working with the session-based interface, the `ExcitationCurrent` property indicates the current in amps that you use to excite an IEPE accelerometer, IEPE microphone, generic IEPE sensors, and RTDs.

The default `ExcitationCurrent` is typically determined by the device. If the device supports an range of excitation currents, the default will be the lowest available value in the range.

Example

Change Excitation Current Value

Change the excitation current value of a microphone channel.

Create a session and add an analog input `microphone` channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod3', 0, 'Microphone')
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

          Sensitivity: 'Unknown'
MaxSoundPressureLevel: 'Unknown'
    ExcitationCurrent: 0.002
     ExcitationSource: Internal
             Coupling: AC
       TerminalConfig: PseudoDifferential
                Range: -5.0 to +5.0 Volts
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
```

```
      MeasurementType: 'Microphone'
        ADCTimingMode: ''
```

Change the excitation current value to `0.0040`.

```
ch.ExcitationCurrent = .0040
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

          Sensitivity: 'Unknown'
MaxSoundPressureLevel: 'Unknown'
    ExcitationCurrent: 0.004
     ExcitationSource: Internal
             Coupling: AC
       TerminalConfig: PseudoDifferential
                Range: -5.0 to +5.0 Volts
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
      MeasurementType: 'Microphone'
        ADCTimingMode: ''
```

See Also

Properties

`ExcitationSource`

Functions

`addAnalogInputChannel`

ExcitationSource

External source of excitation

Description

When working with the session-based interface, the `ExcitationSource` property indicates the source of `ExcitationVoltage` for bridge measurements or `ExcitationCurrent` for IEPE sensors and RTDs. Excitation source can be:

- `Internal`
- `External`
- `None`
- `Unknown`

By default, `ExcitationSource` is set to `Unknown`.

Example

Change Excitation Source

Change the excitation source of a microphone channel.

Create a session and add an analog input `microphone` channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod3',0,'Microphone')
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

          Sensitivity: 'Unknown'
MaxSoundPressureLevel: 'Unknown'
    ExcitationCurrent: 0.004
     ExcitationSource: Unknown
             Coupling: AC
```

```
       TerminalConfig: PseudoDifferential
                Range: -5.0 to +5.0 Volts
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
      MeasurementType: 'Microphone'
        ADCTimingMode: ''
```

Change the excitation source value to `'Internal'`.

```
ch.ExcitationSource = 'Internal'
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

          Sensitivity: 'Unknown'
MaxSoundPressureLevel: 'Unknown'
    ExcitationCurrent: 0.004
     ExcitationSource: Internal
             Coupling: AC
       TerminalConfig: PseudoDifferential
                Range: -5.0 to +5.0 Volts
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
      MeasurementType: 'Microphone'
        ADCTimingMode: ''
```

See Also

Properties

`ExcitationCurrent`

`ExcitationVoltage`

Functions

`addAnalogInputChannel`

ExcitationVoltage

Voltage of excitation source

Description

When working with RTD measurements in the session-based interface, the `ExcitationVoltage` property indicates the excitation voltage value to apply to bridge measurements.

The default `ExcitationVoltage` is typically determined by the device. If the device supports a range of excitation voltages, the default will be the lowest available value in the range.

See Also

Properties

`ExcitationSource`

ExternalTriggerTimeout

Indicate if external trigger timed out

Description

When working with the session-based interface, the `ExternalTriggerTimeout` property indicates time the session waits before an external trigger times out.

Example

Specify External Trigger Timeout

Specify how long the session waits for an external trigger before timing out.

Create a session and click on the `Properties` link to display session properties.

```
s = daq.createSession('ni')
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.

Properties, Methods, Events

                        AutoSyncDSA: false
                      NumberOfScans: 1000
                 DurationInSeconds: 1
                               Rate: 1000
                      IsContinuous: false
      NotifyWhenDataAvailableExceeds: 100
IsNotifyWhenDataAvailableExceedsAuto: true
          NotifyWhenScansQueuedBelow: 500
    IsNotifyWhenScansQueuedBelowAuto: true
              ExternalTriggerTimeout: 10
                       TriggersPerRun: 1
                              Vendor: National Instruments
```

```
                          Channels: ''
                       Connections: ''
                         IsRunning: false
                         IsLogging: false
                            IsDone: false
IsWaitingForExternalTrigger: false
                 TriggersRemaining: 1
                         RateLimit: ''
                       ScansQueued: 0
             ScansOutputByHardware: 0
                     ScansAcquired: 0
```

Change the timeout to 15 seconds.

```
s.ExternalTriggerTimeout = 15
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.
```

See Also

`addTriggerConnection`

Frequency

Frequency of generated output

Description

When working with counter input channels, use the `Frequency` property to set the pulse repetition rate of a counter input channel .

When working with function generation channel, data acquisition sessions, the rate of a waveform is controlled by the channel's `Frequency` property. To synchronize all operation sin the session, set each channel's generation rate individually, and change the session `Rate` to match the channel's generation rate.

The frequency value must fall within the specified `FrequencyLimit` values.

Values

Specify the frequency in hertz.

Examples

Set the Frequency of a Counter Input Channel

Create a session object and add a `'PulseGeneration'` counter output channel:

```
s = daq.createSession('ni');
ch = addCounterOutputChannel(s,'cDAQ1Mod5', 'ctr0', 'PulseGeneration')
```

Change the `Frequency` to `200` and display the channel:

```
ch.Frequency = 200;

ch
```

```
ans =

Data acquisition counter output pulse generation channel 'ctr0' on device 'cDAQ1Mod5':

       IdleState: Low
    InitialDelay: 2.5e-008
       Frequency: 200
       DutyCycle: 0.5
        Terminal: 'PFI12'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'PulseGeneration'
```

Set the Frequency of a Function Generator Channel

Create a waveform generation channel, and change the generation rate to 20000 scans per second.

```
s = daq.createSession('digilent'):
fgenCh = addFunctionGeneratorChannel(s, 'AD1', 1, 'Sine'
fgenCh.Frequency = 20000

fgenCh =

Data acquisition sine waveform generator '1' on device 'AD1':

              Phase: 0
              Range: -5.0 to +5.0 Volts
     TerminalConfig: SingleEnded
               Gain: 1
             Offset: 0
          Frequency: 20000
       WaveformType: Sine
     FrequencyLimit: [0.0 25000000.0]
               Name: ''
                 ID: '1'
             Device: [1x1 daq.di.DeviceInfo]
    MeasurementType: 'Voltage'
```

Tip You can change the channel frequency while the session is running when using counter output channels.

See Also

Properties

`FrequencyLimit`

Functions

`addCounterInputChanneladdFunctionGeneratorChannel`

Gain

Waveform output gain

Description

When using waveform function generation channels, `Gain` represents the value by which the scaled waveform data is multiplied to get the output data.

Values

The waveform gain can be between `–5` and `5`. Ensure that `Gain x Voltage + Offset` falls within the valid rages of output voltage of the device.

Example

Change the gain of the waveform function generation channel to 2 volts.

```
s = daq.createSession('digilent');
fgenCh = addFunctionGeneratorChannel(s, 'AD1', 1, 'Sine');
fgenCh.Gain = 2
```

```
fgenCh =

Data acquisition sine waveform generator '1' on device 'AD1':

               Phase: 0
               Range: -5.0 to +5.0 Volts
     TerminalConfig: SingleEnded
               Gain: 2
             Offset: 0
          Frequency: 4096
      WaveformType: Sine
     FrequencyLimit: [0.0 25000000.0]
               Name: ''
                 ID: '1'
             Device: [1x1 daq.di.DeviceInfo]
    MeasurementType: 'Voltage'
```

See Also

Properties

`OffsetPhaseDutyCycle`

Functions

`addFunctionGeneratorChannel`

FrequencyLimit

Limit of rate of operation based on hardware configuration

Description

In the session-based interface, the read-only `FrequencyLimit` property displays the minimum and maximum rates that the function generation channel supports.

Tip `FrequencyLimit` changes dynamically as the channel configuration changes.

Example

View waveform function generation channel's generation rate limit.

```
s = daq.createSession('digilent')
fgenCh = addFunctionGeneratorChannel(s, 'AD1', 1, 'Sine')
fgenCh.FrequencyLimit
```

```
ans =

[0.0 25000000.0]
```

See Also

Properties

`Frequency`

ID

ID of channel in session

Description

When working with the session-based interface, the `ID` property displays the ID of the channel. You set the channel ID when you add the channel to a session object.

Examples

Create a session object, and add a counter input channel with the ID `'ctr0'`.

```
s = daq.createSession('ni');
ch = addCounterInputChannel (s,'cDAQ1Mod5', 'ctr0', 'EdgeCount')
```

```
ch=

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

Change `CountDirection` to `'Decrement'`:

```
ch.CountDirection = 'Decrement'
```

```
ch=

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Decrement
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

See Also

`addCounterInputChannel`

IdleState

Default state of counter output channel

Description

When working with the session-based interface, the `IdleState` property indicates the default state of the counter output channel with a `'PulseGeneration'` measurement type when the counter is not running.

Values

IdleState is either 'High' or 'Low'.

Examples

Create a session object and add a `'PulseGeneration'` counter output channel:

```
s = daq.createSession('ni');
s.addCounterOutputChannel('cDAQ1Mod5', 'ctr0', 'PulseGeneration');
```

Change the `IdleState` property to `'High'` and display the channel:

```
s.Channels.IdleState = 'High';
```

```
s.Channels
```

```
ans =

Data acquisition counter output pulse generation channel 'ctr0' on device 'cDAQ1Mod5':

       IdleState: High
    InitialDelay: 2.5e-008
       Frequency: 100
       DutyCycle: 0.5
        Terminal: 'PFI12'
            Name: empty
              ID: 'ctr0'
```

```
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'PulseGeneration'
```

See Also

addCounterOutputChannel

InitialDelay

Delay until output channel generates pulses

Description

When working with the session-based interface, use the `InitialDelay` property to set an initial delay on the counter output channel in which the counter is running but does not generate any pulse.

Example

Specify Initial Delay

Set the initial delay on a counter output channel to 3.

Create a session and add a counter input channel.

```
s = daq.createSession('ni');
ch = addCounterOutputChannel(s,'cDAQ1Mod5', 'ctr0', 'PulseGeneration');
```

Set the initial delay.

```
ch.InitialDelay = 3
```

```
ch =

Data acquisition counter output pulse generation channel 'ctr0' on device 'cDAQ1Mod5':

      IdleState: Low
   InitialDelay: 3
      Frequency: 100
      DutyCycle: 0.5
       Terminal: 'PFI0'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
```

```
MeasurementType: 'PulseGeneration'
```

See Also

addCounterOutputChannel

InitialCount

Specify initial count point

Description

When working with the session-based interface, use the `InitialCount` property to set the point from which the device starts the counter.

Values

Examples

Create a session object, add counter input channel, and change the `InitialCount`.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5', 0, 'EdgeCount')
```

```
ch =

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

Change `InitalCount` to `15`:

```
ch.InitialCount = 15
```

```
ch =

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
   CountDirection: Increment
    InitialCount: 15
```

```
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

See Also

`addCounterInputChannel`

IsContinuous

Specify if operation continues until manually stopped

Description

When working with the session-based interface, use `IsContinuous` to specify that the session operation runs until you execute `stop`. When set to `true`, the session will run continuously, acquiring or generating data until stopped.

Values

{`false`}

Set the `IsContinuous` property to `false` to make the session operation stop automatically. This property is set to `false` by default.

`true`

Set the `IsContinuous` property to `true` to make the session operation run until you execute `stop`.

Examples

Create a session object, add an analog input channel, and set the session to run until manually stopped:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','voltage');
s.IsContinuous = true

s =

Data acquisition session using National Instruments hardware:
   Will run continuously at 1000 scans/second until stopped.
   Operation starts immediately.
      Number of channels: 1
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
      1     ai   cDAQ1Mod1 ai0     Diff      -10 to +10 Volts
```

See Also

Properties

`IsDone`

Functions

`stop`,`startBackground`

IsDone

Indicate if operation is complete

Description

When working with the session-based interface, the read-only `IsDone` property indicates if the session operation is complete.

Tip `IsDone` indicates if the session object has completed acquiring or generating data. `IsRunning` indicates if the operation is in progress, but the hardware may not be acquiring or generating data. `IsLogging` indicates that the hardware is acquiring or generating data.

Values

`true`

Value is `true` if the operation is complete.

`false`

Value is `false` if the operation is not complete.

Examples

Create an acquisition session and see if the operation is complete:

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 'ao1', 'vVoltage');
s.queueOutputData(linspace(-1, 1, 1000)');
s.startBackground();
s.IsDone
```

```
ans =

     0
```

Issue a wait and see if the operation is complete:

```
wait(s)
s.IsDone

ans =

     1
```

See Also

`startBackground`

IsLogging

Indicate if hardware is acquiring or generating data

Description

When working with the session-based interface, the status of the read-only `IsLogging` property indicates if the hardware is acquiring or generating data.

Tip `IsLogging` indicates that the hardware is acquiring or generating data. `IsRunning` indicates if the operation is in progress, but the hardware might not be acquiring or generating data. `IsDone` indicates if the session object has completed acquiring or generating data.

Values

`true`

Value is `true` if the device is acquiring or generating data.

`false`

Value is `false` if the device is not acquiring or generating data.

Examples

Create a session and see if the operation is logging:

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 'ao1', 'Voltage');
s.queueOutputData(linspace(-1, 1, 1000)');
startBackground(s);
s.IsLogging
```

```
ans =

     1
```

Wait until the operation is complete:

```
wait(s)
s.IsLogging

ans =

     0
```

See Also

Properties

`IsRunning`, `IsDone`

Functions

`startBackground`

IsNotifyWhenDataAvailableExceedsAuto

Control if `NotifyWhenDataAvailableExceeds` is set automatically

Description

When working with the session-based interface, the `IsNotifyWhenDataAvailableExceedsAuto` property indicates if the `NotifyWhenDataAvailableExceeds` property is set automatically, or you have set a specific value.

Tip This property is typically used to set `NotifyWhenDataAvailableExceeds` back to its default behavior.

Values

`{true}`

When the value is `true`, then the `NotifyWhenDataAvailableExceeds` property is set automatically.

`false`

When the value is `false`, when you have set the `NotifyWhenDataAvailableExceeds` property to a specific value.

Example

Enable Data Exceeds Notification

Change the `IsNotifyWhenDataAvailableExceedsAuto` to be able to set the `NotifyWhenDataAvailableExceeds` property to a specific value.

Create a session and display the properties by clicking the `Properties` link.

```
s = daq.createSession('ni')
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.

Properties, Methods, Events

                        AutoSyncDSA: false
                      NumberOfScans: 1000
                  DurationInSeconds: 1
                               Rate: 1000
                      IsContinuous: false
      NotifyWhenDataAvailableExceeds: 100
IsNotifyWhenDataAvailableExceedsAuto: true
          NotifyWhenScansQueuedBelow: 500
    IsNotifyWhenScansQueuedBelowAuto: true
             ExternalTriggerTimeout: 10
                      TriggersPerRun: 1
                              Vendor: National Instruments
                            Channels: ''
                         Connections: ''
                           IsRunning: false
                           IsLogging: false
                              IsDone: false
         IsWaitingForExternalTrigger: false
                   TriggersRemaining: 1
                           RateLimit: ''
                         ScansQueued: 0
                ScansOutputByHardware: 0
                        ScansAcquired: 0
```

Change the `IsNotifyWhenDataAvailableExceedsAuto` to

```
s.IsNotifyWhenDataAvailableExceedsAuto = false

s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
```

```
No channels have been added.
```

See Also

Properties

NotifyWhenDataAvailableExceeds

Events

DataAvailable

IsNotifyWhenScansQueuedBelowAuto

Control if `NotifyWhenScansQueuedBelow` is set automatically

Description

When working with the session-based interface, the `IsNotifyWhenScansQueuedBelowAuto` property indicates if the `NotifyWhenScansQueuedBelow` property is set automatically, or you have set a specific value.

Values

`{true}`

When the value is `true`, then `NotifyWhenScansQueuedBelow` is set automatically.

`false`

When the value is `false`, you have set `NotifyWhenScansQueuedBelow` property to a specific value.

Example

Enable Notification When Scans Reach Below Specified Range

Change the `IsNotifyWhenScansQueuedBelowAuto` to be able to set the `NotifyWhenScansQueuedBelow` property to a specific value.

Create a session and display the properties by clicking the `Properties` link.

```
s = daq.createSession('ni')
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.
```

```
Properties, Methods, Events

                        AutoSyncDSA: false
                      NumberOfScans: 1000
                  DurationInSeconds: 1
                               Rate: 1000
                      IsContinuous: false
      NotifyWhenDataAvailableExceeds: 100
IsNotifyWhenDataAvailableExceedsAuto: true
          NotifyWhenScansQueuedBelow: 500
    IsNotifyWhenScansQueuedBelowAuto: true
            ExternalTriggerTimeout: 10
                    TriggersPerRun: 1
                            Vendor: National Instruments
                          Channels: ''
                       Connections: ''
                         IsRunning: false
                         IsLogging: false
                            IsDone: false
         IsWaitingForExternalTrigger: false
                  TriggersRemaining: 1
                          RateLimit: ''
                       ScansQueued: 0
             ScansOutputByHardware: 0
                     ScansAcquired: 0
```

Change the `IsNotifyWhenDataAvailableExceedsAuto` to

```
s.IsNotifyWhenScansQueuedBelowAuto = false
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.
```

See Also

Properties

`NotifyWhenScansQueuedBelow`, `ScansQueued`

Events

`DataRequired`

IsRunning

Indicate if operation is still in progress

Description

When working with the session-based interface, the `IsRunning` status indicates if the operation is still in progress.

Tip `IsRunning` indicates if the operation is in progress, but the hardware may not be acquiring or generating data. `IsLogging` indicates if the hardware is acquiring or generating data. `IsDone` indicates if the session object has completed acquiring or generating.

Values

`true`

When the value is `true` if the operation is in progress.

`false`

When the value is `false` if the operation is not in progress.

Examples

Create an acquisition session, add a `DataAvailable` event listener and start the acquisition.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','voltage');
lh = s.addlistener('DataAvailable', @plotData);

function plotData(src,event)
         plot(event.TimeStamps, event.Data)
end
```

```
startBackground(s);
```

See if the session is in progress.

```
s.IsRunning
```

```
ans =

    1
```

Wait until operation completes and see if session is in progress:

```
wait(s)
s.IsRunning
```

```
ans =

     0
```

See Also

Properties

`IsLogging`, `IsDone`

Functions

`startBackground`

IsSimulated

Indicate if device is simulated

Description

When working with the session-based interface, the `IsSimulated` property indicates if the session is using a simulated device.

Values

`true`

When the value is `true` if the operation is in progress.

`false`

When the value is `false` if the operation is not in progress.

Examples

Discover available devices.

```
d = daq.getDevices
```

```
d =

Data acquisition devices:

index Vendor Device ID          Description
----- ------ --------- ----------------------------
1     ni     cDAQ1Mod1 National Instruments NI 9201
2     ni     cDAQ2Mod1 National Instruments NI 9201
3     ni     Dev1      National Instruments USB-6211
4     ni     Dev2      National Instruments USB-6218
5     ni     Dev3      National Instruments USB-6255
6     ni     Dev4      National Instruments USB-6363
7     ni     PXI1Slot2 National Instruments PXI-4461
```

```
8     ni     PXI1Slot3 National Instruments PXI-4461
```

Examine properties of NI 9201, with the device id cDAQ1Mod1 with the index 1.

```
d(1)

ans =

ni: National Instruments NI 9201 (Device ID: 'cDAQ1Mod1')
   Analog input subsystem supports:
      -10 to +10 Volts range
      Rates from 0.1 to 800000.0 scans/sec
      8 channels ('ai0','ai1','ai2','ai3','ai4','ai5','ai6','ai7')
      'Voltage' measurement type

This module is in slot 4 of the 'cDAQ-9178' chassis with the name 'cDAQ1'.

Properties, Methods, Events
```

Click the `Properties` link to see the properties of the device.

```
  ChassisName: 'cDAQ1'
    ChassisModel: 'cDAQ-9178'
      SlotNumber: 4
     IsSimulated: true
       Terminals: [48x1 cell]
          Vendor: National Instruments
              ID: 'cDAQ1Mod1'
           Model: 'NI 9201'
      Subsystems: [1x1 daq.ni.AnalogInputInfo]
     Description: 'National Instruments NI 9201'
RecognizedDevice: true
```

Note that the `IsSimulated` value is `true`, indicating that this device is simulated.

See Also

Properties

`IsLogging`, `IsDone`

Functions

`startBackground`

IsWaitingForExternalTrigger

Indicates if synchronization is waiting for an external trigger

Description

When working with the session-based interface, the read-only`IsWaitingForExternalTrigger` property indicates if the acquisition or generation session is waiting for a trigger from an external device. If you have added an external trigger, this property displays `true`, if not, it displays `false`.

See Also

`addTriggerConnection`

MaxSoundPressureLevel

Sound pressure level for microphone channels

Description

When working with the session-based interface, use the `MaxSoundPressureLevel` set the maximum sound pressure of the microphone channel in decibels.

Values

The maximum sound pressure level is based on the sensitivity and the voltage range of your device. When you sent your device `Sensitivity`, the `MaxSoundPressureLevel` value is automatically corrected to match the specified sensitivity value and the device voltage range. You can also specify any acceptable pressure level in decibels. Refer to your microphone specifications for more information.

Example

Change Maximum Sound Pressure of Microphone

Change the Sensitivity of a microphone channel and set the maximum sound pressure level to 10.

Create a session and add a microphone channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod3', 0, 'Microphone')
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

          Sensitivity: 'Unknown'
MaxSoundPressureLevel: 'Unknown'
    ExcitationCurrent: 0.002
     ExcitationSource: Internal
```

```
            Coupling: AC
      TerminalConfig: PseudoDifferential
               Range: -5.0 to +5.0 Volts
                Name: ''
                  ID: 'ai0'
              Device: [1x1 daq.ni.CompactDAQModule]
     MeasurementType: 'Microphone'
       ADCTimingMode: ''
```

Set the channel's sensitivity to 3 `0.037`.

```
ch.Sensitivity = 0.037
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

         Sensitivity: 0.037
MaxSoundPressureLevel: 136
    ExcitationCurrent: 0.002
     ExcitationSource: Internal
             Coupling: AC
       TerminalConfig: PseudoDifferential
                Range: -135 to +135 Pascals
                 Name: ''
                   ID: 'ai0'
               Device: [1x1 daq.ni.CompactDAQModule]
      MeasurementType: 'Microphone'
        ADCTimingMode: ''
```

Set the channel's maximum sound pressure to 10 dbs.

```
ch.MaxSoundPressureLevel = 10
```

```
ch =

Data acquisition analog input microphone channel 'ai0' on device 'cDAQ1Mod3':

         Sensitivity: 0.037
MaxSoundPressureLevel: 10
    ExcitationCurrent: 0.002
     ExcitationSource: Internal
             Coupling: AC
       TerminalConfig: PseudoDifferential
                Range: -135 to +135 Pascals
```

```
            Name: ''
              ID: 'ai0'
          Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Microphone'
  ADCTimingMode: ''
```

MeasurementType

Channel measurement type

Description

When working with the session-based interface, the `MeasurementType` property displays the selected measurement type for your channel.

Values

You can only use `Audio` measurement type with multichannel audio devices.

Counter measurement types include:

- `'EdgeCount'` (input)
- `'PulseWidth'` (input)
- `'Frequency'`(input)
- `'Position'`(input)
- `'PulseGeneration'` (output)

Analog measurement types include:

- `'Voltage'` (input and output)
- `'Thermocouple'` (input)
- `'Current'` (input and output)
- `'Accelerometer'` (input)
- `'RTD'` (input)
- `'Bridge'` (input)
- `'Microphone'` (input)
- `'IEPE'` (input)

Examples

Create a session object, add a counter input channel, with the `'EdgeCount'` `MeasurementType`.

```
s = daq.createSession('ni');
ch = addCounterInputChannel (s,'cDAQ1Mod5', 0, 'EdgeCount')
```

```
ch =

Data acquisition counter input edge count channel 'ctr0' on device 'cDAQ1Mod5':

      ActiveEdge: Rising
  CountDirection: Increment
    InitialCount: 0
        Terminal: 'PFI8'
            Name: empty
              ID: 'ctr0'
          Device: [1x1 daq.ni.DeviceInfo]
 MeasurementType: 'EdgeCount'
```

See Also

`addAnalogInputChannel`, `addAnalogOutputChannel`, `addCounterInputChannel`, `addCounterOutputChannel`,

Name

Specify descriptive name for the channel

Description

When you add a channel , a descriptive name is stored in `Name`. By default there is no name assigned to the channel. You can change the value of `Name` at any time.

Values

You can specify a string value for the name.

Examples

Change the name of an analog input channel

Create a session and add an analog input channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'Dev1', 0, 'Voltage')
```

```
ch =

Data acquisition analog input voltage channel 'ai0' on device 'Dev1':

       Coupling: DC
 TerminalConfig: Differential
          Range: -10 to +10 Volts
           Name: ''
             ID: 'ai0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Voltage'
```

Change `Name` to `'AI-Voltage'`.

```
ch.Name = 'AI-Voltage'
```

```
ch =

Data acquisition analog input voltage channel 'ai0' on device 'Dev1':

       Coupling: DC
 TerminalConfig: Differential
          Range: -10 to +10 Volts
           Name: 'AI-Voltage'
             ID: 'ai0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Voltage'
```

See Also

addAnalogInputChannel

NominalBridgeResistance

Resistance of sensor

Description

When working with the session-based interface, the `NominalBridgeResistance` property displays the resistance of a bridge– based sensor in ohms. This value is used to calculate voltage.

You can specify any accepted positive value in ohms. The default value is `0` until you change it. You must set the resistance to use the channel.

See Also

`addAnalogInputChannel`

NotifyWhenDataAvailableExceeds

Control firing of `DataAvailable` event

Description

When working with the session-based interface the `DataAvailable` event is fired when the scans available to the session object exceeds the value specified in the `NotifyWhenDataAvailableExceeds` property.

Values

By default the `DataAvailable` event fires when 1/10 second worth of data is available for analysis. To specify a different threshold change this property to control when `DataAvailable` fires.

Examples

Control Firing of Data Available Event

Add an event listener to display the total number of scans acquired and fire the event when the data available exceeds specified amount.

Create the session and add an analog input voltage channel.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'Dev4', 1, 'Voltage');
lh = addlistener(s,'DataAvailable', ...
   @(src, event) disp(s.ScansAcquired));
```

The default the Rate is 1000 scans per second. The session is automatically configured to fire the `DataAvailable` notification 10 times per second.

Increase the Rate to 800,000 scans per second and the `DataAvailable` notification automatically fires 10 times per second.

```
s.Rate=800000;
```

```
s.NotifyWhenDataAvailableExceeds

ans =
        80000
```

Running the acquisition causes the number of scans acquired to be displayed by the callback 10 times.

```
data = startForeground(s);

               80000

               160000

               240000

               320000

               400000

               480000

               560000

               640000

               720000

               800000
```

Increase `NotifyWhenDataAvailableExceeds` to `160,000`. `NotifyWhenDataAvailableExceeds` is no longer configured automatically when the Rate changes.

```
s.NotifyWhenDataAvailableExceeds = 160000;
s.IsNotifyWhenDataAvailableExceedsAuto

ans =

     0
```

Start the acquisition. The `DataAvailable` event is fired only five times per second.

```
data = startForeground(s);
```

```
                160000

                320000

                480000

                640000

                800000
```

Set `IsNotifyWhenDataAvailableExceedsAuto` back to `true`.

```
s.IsNotifyWhenDataAvailableExceedsAuto = true;
s.NotifyWhenDataAvailableExceeds

ans =
                80000
```

This causes `NotifyWhenDataAvailableExceeds` to set automatically when `Rate` changes.

```
s.Rate = 50000;
s.NotifyWhenDataAvailableExceeds

ans =
                5000
```

See Also

Properties

`IsNotifyWhenDataAvailableExceedsAuto`

Events

`DataAvailable`

Functions

`addlistener`, `startBackground`

NotifyWhenScansQueuedBelow

Control firing of `DataRequired` event

Description

When working with the session-based interface to generate output signals continuously, the `DataRequired` event is fired when you need to queue more data. This occurs when the `ScansQueued` property drops below the value specified in the `NotifyWhenScansQueuedBelow` property.

Values

By default the `DataRequired` event fires when 1/2 second worth of data remains in the queue. To specify a different threshold, change the this property to control when `DataRequired` is fired.

Example

Control When DataRequired Event is Fired

Specify a threshold below which the DataRequired event fires.

Create a session and add an analog output channel.

```
s = daq.createSession('ni')
addAnalogOutputChannel(s,'cDAQ1Mod2', 0, 'Voltage')
```

Queue some output data.

```
outputData = (linspace(-1, 1, 1000))';
s.queueOutputData(outputData);
```

Set the threshold of scans queued to 100.

```
s.NotifyWhenScansQueuedBelow = 100;
```

Add an anonymous listener and generate the signal in the background:

```
lh = s.addlistener('DataRequired', ...
@(src,event) src.queueOutputData(outputData));

startBackground(s);
```

See Also

Properties

`ScansQueued`, `IsNotifyWhenScansQueuedBelowAuto`

Events

`DataRequired`

NumberOfScans

Number of scans for operation when starting

Description

When working with the session-based interface, use the `NumberOfScans` property to specify the number of scans the session will acquire during the operation. Changing the number of scans changes the duration of an acquisition. When the session contains output channels, `NumberOfScans` becomes a read only property and the number of scans in a session is determined by the amount of data queued.

Tips

- To specify length of the acquisition, use `DurationInSeconds`.
- To control length of the output operation, use `queueOutputData`.

Values

You can change the value only when you use input channels.

Example

Change Number of Scans

Create an acquisition session, add an analog input channel, and display the `NumberOfScans`.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','Voltage');
s.NumberOfScans
```

```
ans =
```

```
                1000
```

Change the `NumberOfScans` property.

```
s.NumberOfScans = 2000

s =

Data acquisition session using National Instruments hardware:
   Will run for 2000 scans (2 seconds) at 1000 scans/second.
   Operation starts immediately.
      Number of channels: 1
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
      1     ai   cDAQ1Mod1 ai0     Diff      -10 to +10 Volts
```

See Also

Properties

`ScansQueued`, `DurationInSeconds`

Functions

`startForeground`, `startBackground`, `queueOutputData`

Offset

Specify DC offset of waveform

Description

When using waveform function generation channels, `Offset` represents offsetting of a signal from zero, or the mean value of the waveform.

Values

The waveform offset can be between –5 and 5. Ensure that `Gain x Voltage + Offset` falls within the valid rages of output voltage of the device.

Example

Change the offset of the waveform function generation channel to 2 volts.

```
s = daq.createSession('digilent');
fgenCh = addFunctionGeneratorChannel(s, 'AD1', 1, 'Sine');
fgenCh.Offset = 2
```

```
fgenCh =

Data acquisition sine waveform generator '1' on device 'AD1':

              Phase: 0
              Range: -5.0 to +5.0 Volts
     TerminalConfig: SingleEnded
               Gain: 0
             Offset: 2
          Frequency: 4096
      WaveformType: Sine
     FrequencyLimit: [0.0 25000000.0]
               Name: ''
                 ID: '1'
             Device: [1x1 daq.di.DeviceInfo]
    MeasurementType: 'Voltage'
```

See Also

Properties

`GainPhaseDutyCycle`

Functions

`addFunctionGeneratorChannel`

Phase

Waveform phase

Description

In a function generation channel, the `Phase` property specifies the period of waveform cycle from its point of origin. Specify the values for Phase in time units.

Example

Set the phase of a waveform function generation channel to 33.

```
s = daq.createSession('digilent')
fgenCh = addFunctionGeneratorChannel(s, 'AD1', 1, 'Sine')
fgenCh.Phase = 33
```

```
fgenCh =

Data acquisition sine waveform generator '1' on device 'AD1':

              Phase: 33
              Range: -5.0 to +5.0 Volts
     TerminalConfig: SingleEnded
               Gain: 1
             Offset: 0
          Frequency: 4096
       WaveformType: Sine
     FrequencyLimit: [0.0 25000000.0]
               Name: ''
                 ID: '1'
             Device: [1x1 daq.di.DeviceInfo]
    MeasurementType: 'Voltage'
```

R0

Specify resistance value

Description

Use this property to specify the resistance of the device.

You can specify any acceptable value in ohms. When you add an RTD Channel, the resistance is unknown and the R0 property displays Unknown. You must change this value to set the resistance of this device to the temperature you want.

Example

Set RTD Channels Resistance

Create a session and add an RTD channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7',3, 'RTD');
```

Change the channels resistance to 100°C.

```
ch.R0 = 100
```

```
ch =

Data acquisition analog input RTD channel 'ai3' on device 'cDAQ1Mod7':

            Units: Celsius
          RTDType: Unknown
 RTDConfiguration: Unknown
               R0: 100
ExcitationCurrent: 0.0005
 ExcitationSource: Internal
         Coupling: DC
   TerminalConfig: Differential
            Range: -200 to +660 Celsius
             Name: ''
```

```
                ID: 'ai3'
            Device: [1x1 daq.ni.CompactDAQModule]
  MeasurementType: 'RTD'
    ADCTimingMode: HighResolution
```

See Also

Properties

`RTDConfiguration`, `RTDType`

Range

Specify channel measurement range

Description

When working with the session-based interface, use the `Range` property to indicate the measurement range of a channel.

Values

Range is not applicable for counter channels. For analog channels, value is dependent on the measurement type. This property is read-only for all measurement types except `'Voltage'`. You can specify a range in volts for analog channels.

Examples

Set Channel Range

Specify the range of an analog input voltage channel.

Create a session and add an analog input channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7',3,'voltage');
```

Set a range of -60 to +60 volts.

```
ch.Range = [-60,60];
```

Display Ranges Available

See what ranges your channel supports before you set the channel range.

Create a session and add an analog input channel.

```
s = daq.createSession('ni');
```

```
ch = addAnalogInputChannel(s,'Dev1',3,'voltage');
```

Display channel device.

```
ch.Device
```

```
ans =

ni: National Instruments USB-6211 (Device ID: 'Dev1')
   Analog input subsystem supports:
      4 ranges supported
      Rates from 0.1 to 250000.0 scans/sec
      16 channels ('ai0' - 'ai15')
      'Voltage' measurement type

   Analog output subsystem supports:
      -10 to +10 Volts range
      Rates from 0.1 to 250000.0 scans/sec
      2 channels ('ao0','ao1')
      'Voltage' measurement type

   Digital subsystem supports:
      8 channels ('port0/line0' - 'port1/line3')
      'InputOnly','OutputOnly' measurement types

   Counter input subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      2 channels ('ctr0','ctr1')
      'EdgeCount','PulseWidth','Frequency','Position' measurement types

   Counter output subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      2 channels ('ctr0','ctr1')
      'PulseGeneration' measurement type
```

Create a subsystems object.

```
sub = ch.Device.Subsystems
```

```
sub =

Analog input subsystem supports:
   4 ranges supported
   Rates from 0.1 to 250000.0 scans/sec
   16 channels ('ai0' - 'ai15')
```

```
   'Voltage' measurement type
Properties, Methods, Events

Analog output subsystem supports:
   -10 to +10 Volts range
   Rates from 0.1 to 250000.0 scans/sec
   2 channels ('ao0','ao1')
   'Voltage' measurement type
Properties, Methods, Events

Digital subsystem supports:
   8 channels ('port0/line0' - 'port1/line3')
   'InputOnly','OutputOnly' measurement types
Properties, Methods, Events

Counter input subsystem supports:
   Rates from 0.1 to 80000000.0 scans/sec
   2 channels ('ctr0','ctr1')
   'EdgeCount','PulseWidth','Frequency','Position' measurement types
Properties, Methods, Events

Counter output subsystem supports:
   Rates from 0.1 to 80000000.0 scans/sec
   2 channels ('ctr0','ctr1')
   'PulseGeneration' measurement type
Properties, Methods, Events
```

Display the ranges available on the analog input subsystem.

```
sub(1).RangesAvailable
```

```
ans =

-0.20 to +0.20 Volts,-1.0 to +1.0 Volts,-5.0 to +5.0 Volts,-10 to +10 Volts
```

See Also

`daq.createSession`,`addAnalogInputChannel`

Rate

Rate of operation in scans per second

Description

When working with the session-based interface, use the `Rate` property to set the number of scans per second.

Note: Many hardware devices accept fractional rates.

Tip On most devices, the hardware limits the exact rates that you can set. When you set the rate, Data Acquisition Toolbox sets the rate to the next higher rate supported by the hardware. If the exact rate affects your analysis of the acquired data, obtain the actual rate after you set it, and then use that in your analysis.

Values

You can set the rate to any positive nonzero scalar value supported by the hardware in its current configuration.

Examples

Change Session Rate

Create a session and add an analog input channel.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai1','Voltage');
```

Change the rate to 10000.

```
s.Rate = 10000
```

```
s =
```

```
Data acquisition session using National Instruments hardware:
   Will run for 1 second (10000 scans) at 10000 scans/second.
   Operation starts immediately.
      Number of channels: 1
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
      1     ai   cDAQ1Mod1 ai1     Diff      -10 to +10 Volts

Properties, Methods, Events
```

See Also

Properties

DurationInSeconds, NumberOfScans, RateLimit

RateLimit

Limit of rate of operation based on hardware configuration

Description

In the session-based interface, the read-only `RateLimit` property displays the minimum and maximum rates that the session supports, based on the device configuration for the session.

Tip `RateLimit` changes dynamically as the session configuration changes.

Example

Display Sessions Rate Limit

Create session and add an analog input channel.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai1','Voltage');
```

Examine the session's rate limit.

```
s.RateLimit
```

```
ans =

   1.0e+05 *

    0.0000    2.5000
```

See Also

Properties

`Rate`

RTDConfiguration

Specify wiring configuration of RTD device

Description

Use this property to specify the wiring configuration for measuring resistance.

When you create an RTD channel, the wiring configuration is unknown and the `RTDConfiguration` property displays `Unknown`. You must change this to one of the following valid configurations:

- `TwoWire`
- `ThreeWire`
- `FourWire`

Example

Specify Channel's RTD Configuration

Specify an RTD channels wiring configuration.

Create a session and add an RTD channel to it.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7',3, 'RTD');
```

Change the `RTDConfiguration` to `ThreeWire`.

```
ch.RTDConfiguration = 'ThreeWire'
```

```
ch =

Data acquisition analog input RTD channel 'ai3' on device 'cDAQ1Mod7':

            Units: Celsius
          RTDType: Unknown
 RTDConfiguration: ThreeWire
```

```
              RO: 'Unknown'
ExcitationCurrent: 0.0005
 ExcitationSource: Internal
         Coupling: DC
   TerminalConfig: Differential
            Range: -200 to +660 Celsius
             Name: ''
               ID: 'ai3'
           Device: [1x1 daq.ni.CompactDAQModule]
  MeasurementType: 'RTD'
    ADCTimingMode: HighResolution
```

See Also

Properties

RO, RTDType

RTDType

Specify sensor sensitivity

Description

Use this property to specify the sensitivity of a standard RTD sensor in the session-based interface. A standard RTD sensor is defined as a 100–ohm platinum sensor.

When you create an RTD channel, the sensitivity is unknown and the `RTDType` property displays `Unknown`. You must change this to one of these valid values:

- `Pt3750`
- `Pt3851`
- `Pt3911`
- `Pt3916`
- `Pt3920`
- `Pt3928`

Example

Set RTD Sensor Type

Set an RTD sensor's sensitivity type.

Create a session and add an RTD channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7',3, 'RTD');
```

Set the `RTDType` to `Pt3851`.

```
ch.RTDType = 'Pt3851'
```

```
ch =

Data acquisition analog input RTD channel 'ai3' on device 'cDAQ1Mod7':
```

```
           Units: Celsius
         RTDType: Pt3851
 RTDConfiguration: ThreeWire
              RO: 'Unknown'
ExcitationCurrent: 0.0005
 ExcitationSource: Internal
        Coupling: DC
   TerminalConfig: Differential
           Range: -200 to +660 Celsius
            Name: ''
              ID: 'ai3'
          Device: [1x1 daq.ni.CompactDAQModule]
  MeasurementType: 'RTD'
    ADCTimingMode: HighResolution
```

See Also

`addAnalogInputChannel`

Properties

`RTDConfiguration`, `RTDType`

ScansAcquired

Number of scans acquired during operation

Description

In the session-based interface, the `ScansAcquired` property displays the number of scans acquired after you start the operation using `startBackground`.

Values

The read-only value represents the number of scans acquired by the hardware. This value is reset each time you call `startBackground`.

Example

Display Number of Scans Acquired

Acquire analog input data and display the number of scans acquired.

Create a session, add an analog input channel,

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'Dev1','ai1','voltage');
```

See how many scan the session had acquired.

```
s.ScansAcquired
```

```
ans =

                     0
```

Start the acquisition and see how many scans the session has acquired

```
startForeground(s);
s.ScansAcquired
```

```
ans =

                1000
```

See Also

Properties

`NumberOfScans`, `ScansOutputByHardware`

Functions

`startBackground`

ScansOutputByHardware

Indicate number of scans output by hardware

Description

In the session-based interface, the `ScansOutputByHardware` property displays the number of scans output by the hardware after you start the operation using `startBackground`.

Tip The value depends on information from the hardware.

Values

This read-only value is based on the output of the hardware configured for your session.

Example

Display Scans Output by Hardware

Generate data on an analog output channel and to see how many scans are output by the hardware.

Create a session and add an analog output channel.

```
s = daq.createSession('ni');
ch = addAnalogOutputChannel(s,'Dev1','ao1','voltage');
```

Queue some output data and start the generation.

```
s.queueOutputData(linspace(-1, 1, 1000)');
startForeground(s);
```

Examine the `ScansOutputByHardware` property.

```
s.ScansOutputByHardware
```

```
ans =

                1000
```

See Also

Properties

`ScansAcquired`, `ScansQueued`

Functions

`queueOutputData`, `startBackground`

ScansQueued

Indicate number of scans queued for output

Description

In the session-based interface, the `ScansQueued` property displays the number of scans queued for output `queueOutputData`. The `ScansQueued` property increases when you successfully call `queueOutputData`. The `ScansQueued` property decreases when the hardware reports that it has successfully output data.

Values

This read-only value is based on the number of scans queued.

Example

Display Scans Queued

Queue some output data to an analog output channel and examine the session properties to see how many scans are queued.

Create a session and add an analog output channel.

```
s = daq.createSession('ni');
ch = addAnalogOutputChannel(s,'Dev1','ao1','voltage');
```

Queue some output data and call the `ScansQueued` property to see number of data queued.

```
s.queueOutputData(linspace(-1, 1, 1000)');
s.ScansQueued
```

```
s.ScansQueued
```

```
ans =
```

1000

See Also

Properties

ScansOutputByHardware

Functions

queueOutputData

Sensitivity

Sensitivity of an analog channel

Description

When working with the session-based interface, the `Sensitivity` property to set the accelerometer or microphone sensor channel.

Sensitivity in an accelerometer channel is expressed as $\frac{v}{g}$, or volts per gravity.

Sensitivity in a microphone channel is expressed as $\frac{v}{pa}$, or volts per pascal.

Examples

Create a session object, add an analog input channel, with the `'accelerometer'` `MeasurementType`.

```
s = daq.createSession('ni');
s.addAnalogInputChannel('Dev4', 'ai0', 'accelerometer')

Data acquisition session using National Instruments hardware:
   Will run for 1 second (2000 scans) at 2000 scans/second.
   Number of channels: 1
      index Type Device Channel      MeasurementType             Range        Name
      ----- ---- ------ ------- -------------------------- ------------------ ----
      1     ai   Dev4   ai0     Accelerometer (PseudoDiff) -5.0 to +5.0 Volts
```

Change the `Sensitivity` to 10.2e-3 V/G:

```
ch1 = s.Channels(1)
ch1.Sensitivity = 10.2e-3

s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (2000 scans) at 2000 scans/second.
   Number of channels: 1
      index Type Device Channel      MeasurementType               Range          Name
      ----- ---- ------ ------- -------------------------- ---------------------- ----
      1     ai   Dev4   ai0     Accelerometer (PseudoDiff) -490 to +490 Gravities
```

See Also

`addAnalogInputChannel`

ShuntLocation

Indicate location of channel's shunt resistor

Description

When working with the session-based interface, `ShuntLocation` on the analog input current channel indicates if the shunt resistor is located internally on the device or externally. Values are:

- `'Internal'`: when the shunt resistor is located internally.
- `'External'`: when the shunt resistor is located externally.

If your device supports an internal shunt resistor, this property is set to `Internal` by default. If the shunt location is external, you must specify the shunt resistance value.

Example

Specify Shunt Location

Set the shunt location of an analog input current channel.

Create a session and add an analog input current channel.

```
s = daq.createSession('ni')
ch = addAnalogInputChannel(s,'cDAQ1Mod7',0,'Current');
```

Set the `ShuntLocation` to `Internal`.

```
ch.ShuntLocation = 'Internal'
```

```
ch =

Data acquisition analog input current channel 'ai0' on device 'cDAQ1Mod7':

  ShuntLocation: Internal
ShuntResistance: 20
       Coupling: DC
 TerminalConfig: Differential
```

```
          Range: -0.025 to +0.025 A
           Name: ''
             ID: 'ai0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Current'
  ADCTimingMode: HighResolution
```

See Also

ShuntResistance

ShuntResistance

Resistance value of channel's shunt resistor

Description

When working with the session-based interface, the analog input current channel's `ShuntResistance` property indicates resistance in ohms. This value is automatically set if the shunt resistor is located internally on the device and is read only.

Note: Before starting an analog output channel with an external shunt resistor, specify the shunt resistance value.

Example

Specify Shunt Resistance

Set the shunt resistance of an analog input current channel.

Create a session and add an analog input current channel.

```
s = daq.createSession('ni')
ch = addAnalogInputChannel(s,'cDAQ1Mod7',0,'Current');
```

Set the `ShuntLocation` to `External` and the `ShuntResistance` to `20`.

```
ch.ShuntLocation = 'External';
ch.ShuntResistance = 20
```

```
ch =

Data acquisition analog input current channel 'ai0' on device 'cDAQ1Mod7':

  ShuntLocation: External
ShuntResistance: 20
       Coupling: DC
 TerminalConfig: Differential
          Range: -0.025 to +0.025 A
```

```
           Name: ''
             ID: 'ai0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Current'
  ADCTimingMode: HighResolution
```

See Also

ShuntLocation

Source

Indicates trigger source terminal

Description

When working with the session-based interface, the `Source` property indicates the device and terminal to which you added a trigger.

Example

View Clock Connection Source

Create an clock external clock connection and view the connection properties.

Create a session and add a digital input channel.

```
s = daq.createSession('ni');
ch = addDigitalChannel(s,'Dev1','Port0/Line2','InputOnly');
```

Add an external scan clock connection.

```
s.addClockConnection('External','Dev1/PFI0','ScanClock')
```

```
ans =


Scan Clock is provided externally and will be received by 'Dev1' at terminal 'PFI0'.

       Source: 'External'
  Destination: 'Dev1/PFI0'
         Type: ScanClock
```

See Also

`Destination`addTriggerConnection

StandardSampleRates

Display standard rates of sampling

Description

This property displays the standard sample rates supported by your audio device. You can choose to use the standard rates or use values within the given range. See `UseStandardSampleRate` for more information.

Standard sample rates for DirectSound audio devices are:

- 8000
- 8192
- 11025
- 16000
- 22050
- 32000
- 44100
- 47250
- 48000
- 50000
- 88200
- 96000
- 176400
- 192000
- 352800

Example

Set Rate of an Audio Session

Specify a non standard sample rate for a session with multichannel audio devices.

Create a session and add an audio channel.

```
s = daq.createSession('directsound')
ch = addAudioInputChannel(s,'Audio1',1);
```

Specify the session to use nonstandard sample rates.

```
s.UseStandardSampleRates = false
```

```
Data acquisition session using DirectSound hardware:
   Will run for 1 second (44100 scans) at 44100 scans/second.
   Number of channels: 1
      index Type Device Channel MeasurementType     Range     Name
      ----- ---- ------ ------- --------------- ------------- ----
      1     audi Audio1 1       Audio           -1.0 to +1.0
```

Change the session rate to 85000.

```
s.Rate = 85000
```

```
s =

Data acquisition session using DirectSound hardware:
   Will run for 1 second (85000 scans) at 85000 scans/second.
   Number of channels: 1
      index Type Device Channel MeasurementType     Range     Name
      ----- ---- ------ ------- --------------- ------------- ----
      1     audi Audio1 1       Audio           -1.0 to +1.0
```

See Also

`UseStandardSampleRate` | `BitsPerSample` | `addAudioInputChannel` | `addAudioOutputChannel`

Terminal

PFI terminal of counter subsystem

Description

The `Terminal` property indicates the counter subsystem's corresponding PFI terminal.

Example

Determine Counter Input Channel Terminal

Determine the terminal on the counter channel connected to your input signal.

Create a session and add a counter input channel.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5','ctr0','PulseWidth');
```

Examine the `Terminal` property of the channel.

```
ch.Terminal
```

```
ans =

PFI1
```

See Also

`addCounterInputChannel`, `addCounterOutputChannel`

TerminalConfig

Specify terminal configuration

Description

Use the `TerminalConfig` to change the configuration of your analog channel. The property displays the hardware default configuration. You can change this to

- `SingleEnded`
- `SingleEndedNonReferenced`
- `Differential`
- `PseudoDifferential`

Example

Change Analog Channel Terminal Configuration

Change the terminal configuration of an analog input channel.

Create a session and add an analog input voltage channel.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'dev5',0,'voltage')
```

```
ch =

Data acquisition analog input voltage channel 'ai0' on device 'Dev5':

       Coupling: DC
 TerminalConfig: Differential
          Range: -10 to +10 Volts
           Name: ''
             ID: 'ai0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Voltage'
```

Change the `TerminalConfig` of the channel to `SingleEnded`.

```
ch.TerminalConfig = 'SingleEnded'

ch =

Data acquisition analog input voltage channel 'ai0' on device 'Dev5':

       Coupling: DC
 TerminalConfig: SingleEnded
          Range: -10 to +10 Volts
           Name: ''
             ID: 'ai0'
         Device: [1x1 daq.ni.DeviceInfo]
MeasurementType: 'Voltage'
```

See Also

addAnalogInputChannel | addAnalogOutputChannel

Terminals

Terminals available on device or CompactDAQ chassis

Description

When working with the session-based interface, the `Terminals` on the device or the CompactDAQ chassis lists all available terminals. The list includes terminals available for trigger and clock connections. When you access the `Terminals` property on modules on a CompactDAQ chassis, the terminals are on the chassis, not on the module.

Examples

Display Device Terminals

Discover available devices.

```
d = daq.getDevices
```

```
d =

Data acquisition devices:

index Vendor Device ID          Description
----- ------ --------- ------------------------------
1     ni     cDAQ1Mod1 National Instruments NI 9205
2     ni     cDAQ1Mod2 National Instruments NI 9263
3     ni     cDAQ1Mod3 National Instruments NI 9234
4     ni     cDAQ1Mod4 National Instruments NI 9201
5     ni     cDAQ1Mod5 National Instruments NI 9402
6     ni     cDAQ1Mod6 National Instruments NI 9213
7     ni     cDAQ1Mod7 National Instruments NI 9219
8     ni     cDAQ1Mod8 National Instruments NI 9265
```

Access the `Terminals` property of NI 9205 with index `1`.

```
d(1).Terminals
```

```
ans =
```

```
    'cDAQ1/PFI0'
    'cDAQ1/PFI1'
    'cDAQ1/20MHzTimebase'
    'cDAQ1/80MHzTimebase'
    'cDAQ1/ChangeDetectionEvent'
    'cDAQ1/AnalogComparisonEvent'
    'cDAQ1/100kHzTimebase'
    'cDAQ1/SyncPulse0'
    'cDAQ1/SyncPulse1'
  .
  .
  .
```

See Also

Functions

`daq.getDevices`, `addTriggerConnection`,`addClockConnection`

ThermocoupleType

Select thermocouple type

Description

When working with the session-based interface, use the `ThermocoupleType` property to select the type of thermocouple you will use to make your measurements. Select the type based on the temperature range and sensitivity you need.

Values

You can set the `ThermocoupleType` to:

- `'J'`
- `'K'`
- `'N'`
- `'R'`
- `'S'`
- `'T'`
- `'B'`
- `'E'`

By default the thermocouple type is `'Unknown'`.

Example

Specify Thermocouple Type

Create a session and add an analog input channel with `'Thermocouple'` measurement type.

```
s = daq.createSession('ni');
```

```
ch = addAnalogInputChannel(s,'cDAQ1Mod6','ai1','Thermocouple')

ch =

Data acquisition analog input thermocouple channel 'ai1' on device 'cDAQ1Mod6':

           Units: Celsius
ThermocoupleType: Unknown
           Range: 0 to +750 Celsius
            Name: ''
              ID: 'ai1'
          Device: [1x1 daq.ni.CompactDAQModule]
 MeasurementType: 'Thermocouple'
   ADCTimingMode: HighResolution
```

Set the `ThermocoupleType` property to `'J'`.

```
ch.Thermocoupletype = 'J'

ch =

Data acquisition analog input thermocouple channel 'ai1' on device 'cDAQ1Mod6':

           Units: Celsius
ThermocoupleType: J
           Range: 0 to +750 Celsius
            Name: ''
              ID: 'ai1'
          Device: [1x1 daq.ni.CompactDAQModule]
 MeasurementType: 'Thermocouple'
   ADCTimingMode: HighResolution
```

See Also

`addAnalogInputChannel`

TriggerCondition

Specify condition that must be satisfied before trigger executes

Description

When working with the session-based interface, use the `TriggerCondition` property to specify the signal condition that executes the trigger, which synchronizes operations on devices in a session. For more information, see “Synchronization”.

Values

Set the trigger condition to `RisingEdge` or `FallingEdge`.

Examples

Specify Session Connection Trigger Condition

Create a session and add channels and trigger to the session.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'Dev1', 0, 'voltage');
addAnalogInputChannel(s,'Dev2', 0, 'voltage');
addTriggerConnection(s,'Dev1/PFI4','Dev2/PFI0','StartTrigger');
```

Change the trigger condition to `FallingEdge`.

```
connection = s.Connections(1)
connection.TriggerCondition = 'FallingEdge'

s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.

   Trigger Connection added. (Details)
```

```
   Number of channels: 2
      index Type Device Channel MeasurementType      Range       Name
      ----- ---- ------ ------- --------------- ---------------- ----
      1     ai   Dev1   ai0     Voltage (Diff)  -10 to +10 Volts
      2     ai   Dev2   ai0     Voltage (Diff)  -10 to +10 Volts
```

Click on `(Details)` to see the connection details.

```
Start Trigger is provided by 'Dev1' at 'PFI4' and will be received by 'Dev2' at termina

     TriggerType: 'Digital'
TriggerCondition: FallingEdge
          Source: 'Dev1/PFI4'
     Destination: 'Dev2/PFI0'
            Type: StartTrigger
```

See Also

`addTriggerConnection`

Properties

`TriggerType`

TriggersPerRun

Indicate the number of times the trigger executes in an operation

Description

When working with the session-based interface, the `TriggersPerRun` property indicates the number of times the specified trigger executes for one acquisition or generation session.

Examples

Specify Number of Triggers Per Operation

Create a session and add channels and trigger to the session.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'Dev1', 0, 'voltage');
addAnalogInputChannel(s,'Dev2', 0, 'voltage');
addTriggerConnection(s,'Dev1/PFI4','Dev2/PFI0','StartTrigger');
```

Display Session's `TriggersPerRun` Property.

```
s.TriggersPerRun
```

```
ans =

     1
```

Set the trigger to run twice during the operation.

```
s.TriggersPerRun = 2
```

```
s =

Data acquisition session using National Instruments hardware:
   Will run 2 times for 1 second (1000 scans) at 1000 scans/second.

   Trigger Connection added. (Details)
```

```
Number of channels: 2
   index Type Device Channel MeasurementType      Range       Name
   ----- ---- ------ ------- --------------- ---------------- ----
   1     ai   Dev1   ai0     Voltage (Diff)  -10 to +10 Volts
   2     ai   Dev2   ai0     Voltage (Diff)  -10 to +10 Volts
```

See Also

`addTriggerConnection`

TriggersRemaining

Indicates the number of trigger to execute in an operation

Description

When working with the session-based interface, the `TriggersRemaining` property indicates the number of trigger remaining for this acquisition or generation session. This value depends on the number of triggers set using `TriggersPerRun`.

Examples

Display Number of Triggers Remaining in Operation

Create a session and add channels and trigger to the session.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'Dev1', 0, 'voltage');
addAnalogInputChannel(s,'Dev2', 0, 'voltage');
addTriggerConnection(s,'Dev1/PFI4','Dev2/PFI0','StartTrigger');
```

Display Session's `TriggersRemaining` Property.

```
s.TriggersRemaining
```

```
ans =

     1
```

See Also

`addTriggerConnection`

TriggerType

Type of trigger executed

Description

This read-only property displays the type of trigger that the source device executes to synchronize operations in the session. Currently all trigger types are `digital`.

See Also

Functions

`addTriggerConnection`

Properties

`TriggerCondition`

Type

Display synchronization trigger type

Description

When working with the session-based interface, this property displays the trigger type

Characteristics

Usage	AI, AO, common to all channels and per channel; DIO, common to all lines and per line
Access	Read-only
Data type	String
Read-only when running	N/A

Values

Device Objects

For device objects, `Type` has these possible values:

`Analog Input`	The device object type is analog input.
`Analog Output`	The device object type is analog output.
`Digital IO`	The device object type is digital I/O.

The value is automatically defined after the device object is created.

Channels and Lines

For channels, the only value of `Type` is `Channel`. For lines, the only value of `Type` is `Line`. The value is automatically defined when channels or lines are added to the device object.

Units

Specify unit of RTD measurement

Description

Use this property to specify the temperature unit of the analog input channel with RTD measurement type in the session-based interface.

You can specify temperature values as:

- `Celsius` (Default)
- `Fahrenheit`
- `Kelvin`
- `Rankine`

Example

Change RTD Unit

Change the unit of an RTD channel.

Create a session, add an analog input RTD channel, and display channel properties.

```
s = daq.createSession('ni');
ch = addAnalogInputChannel(s,'cDAQ1Mod7', 0, 'RTD')
```

```
ch =

Data acquisition analog input RTD channel 'ai0' on device 'cDAQ1Mod7':

            Units: Celsius
          RTDType: Unknown
 RTDConfiguration: Unknown
               R0: 'Unknown'
ExcitationCurrent: 0.0005
 ExcitationSource: Internal
         Coupling: DC
```

```
   TerminalConfig: Differential
            Range: -200 to +660 Celsius
             Name: ''
               ID: 'ai0'
           Device: [1x1 daq.ni.CompactDAQModule]
  MeasurementType: 'RTD'
    ADCTimingMode: HighResolution
```

Change the Units property from `Celsius` to `Fahrenheit`.

```
ch.Units = 'Fahrenheit'
```

```
ch =

Data acquisition analog input RTD channel 'ai0' on device 'cDAQ1Mod7':

            Units: Fahrenheit
          RTDType: Unknown
 RTDConfiguration: Unknown
               R0: 'Unknown'
ExcitationCurrent: 0.0005
 ExcitationSource: Internal
         Coupling: DC
   TerminalConfig: Differential
            Range: -328 to +1220 Fahrenheit
             Name: ''
               ID: 'ai0'
           Device: [1x1 daq.ni.CompactDAQModule]
  MeasurementType: 'RTD'
    ADCTimingMode: HighResolution
```

See Also

Class

`addAnalogInputChannel`

UseStandardSampleRate

Configure session to use standard sample rates

Description

Use this property to specify if your audio channel uses standard sample rates supported by your device or a user-specified value. To use non-standard sample rates, set the value to `false` and set the sessions's `Rate` to the desired value.

Example

Change Acquisition Rate

Add an audio channel to a session and change the `UseStandardSampleRates` property.

```
s = daq.createSession('directsound');
addAudioInputChannel(s,Audio1,1);
s.UseStandardSampleRates = false
```

```
s =

Data acquisition session using DirectSound hardware:
   Will run for 1 second (44100 scans) at 44100 scans/second.
   Number of channels: 1
      index Type Device Channel MeasurementType     Range     Name
      ----- ---- ------ ------- --------------- ------------- ----
      1     audi Audio1 1       Audio           -1.0 to +1.0
```

Specify a different scan rate.

```
s.Rate = 8500
```

```
s =

Data acquisition session using DirectSound hardware:
   Will run for 1 second (8500 scans) at 8500 scans/second.
   Number of channels: 1
      index Type Device Channel MeasurementType     Range     Name
```

```
----- ---- ------ ------- --------------- ------------- ----
1     audi Audio3 1       Audio           -1.0 to +1.0
```

See Also

`StandardSampleRates` | `Rate` | `addAudioInputChannel` | `addAudioOutputChannel`

Vendor

Vendor information associated with session object

Description

In the session-based interface, the `Vendor` property displays information about the vendor.

Values

a `daq.Vendor` object that represents the vendor associated with the session.

Examples

Use the `daq.getVendors` to get information about vendors.

```
s = daq.createSession('ni');
v = s.Vendor
```

```
v =

Data acquisition vendor 'National Instruments':

            ID: 'ni'
      FullName: 'National Instruments'
AdaptorVersion: '3.3 (R2013a)'
 DriverVersion: '9.2.3 NI-DAQmx'
 IsOperational: true


Properties, Methods, Events

Additional data acquisition vendors may be available as downloadable support packages.
Open the Support Package Installer to install additional vendors.
```

See Also

`daq.createSession`

WaveformType

Function generator channel waveform type

Description

This read-only property displays the channel waveform type that you specified while creating a function generator channel in a session. Supported waveform types are:

- `'Sine'`
- `'Square'`
- `'Triangle'`
- `'RampUp'`
- `'RampDown'`
- `'DC'`
- `'Arbitrary'`

Example

Display the channel's waveform type.

```
fgenCh.WaveformType
```

```
ans =

    Sine
```

ZResetCondition

Reset condition for Z-indexing

Description

When working with the session-based interface, use the `ZResetCondition` property to specify reset conditions for Z-indexing of counter Input `'Position'` channels. Accepted values are:

- `'BothHigh'`
- `'BothLow'`
- `'AHigh'`
- `'BHigh'`

Example

Change Counter Channel Z Reset Condition

Create a session and add a counter input `Position` channel.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5',0,'Position')
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
```

```
MeasurementType: 'Position'
```

Change the `ZResetCondition` to `BothLow`.

```
ch.ZResetCondition = 'BothLow'
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothLow
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

See Also

`addCounterInputChannel`

ZResetEnable

Enable reset for Z-indexing

Description

When working with the session-based interface, use the `ZResetEnable` property to specify if you will allow the Z-indexing to be reset on a counter input `'Position'` channel.

Example

Reset Z Indexing on Counter Channel

Create a session and add a counter input `Position` channel.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5',0,'Position')
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

Change the `ZResetEnable` to `1`.

```
ch.ZResetEnable = 'BothLow'
```

```
ch =
```

```
Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 1
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

See Also

Class

`addCounterInputChannel`

ZResetValue

Reset value for Z-indexing

Description

When working with the session-based interface, use the `ZResetValue` property to specify the reset value for Z-indexing on a counter input `'Position'` channel.

Example

Specify Z Indexing Value

Create a session and add a counter input `Position` channel.

```
s = daq.createSession('ni');
ch = addCounterInputChannel(s,'cDAQ1Mod5',0,'Position')
```

```
ch =

Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 0
    ZResetValue: 0
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

Change the `ZResetValue` to `62`.

```
ch.ZResetValue = 62
```

```
ch =
```

```
Data acquisition counter input position channel 'ctr0' on device 'cDAQ1Mod5':

    EncoderType: X1
   ZResetEnable: 1
    ZResetValue: 62
ZResetCondition: BothHigh
      TerminalA: 'PFI0'
      TerminalB: 'PFI2'
      TerminalZ: 'PFI1'
           Name: ''
             ID: 'ctr0'
         Device: [1x1 daq.ni.CompactDAQModule]
MeasurementType: 'Position'
```

See Also

Class

`addCounterInputChannel`

2

Device-Specific Properties — Alphabetical List

Coupling

Specify input coupling mode

Description

The `Coupling` property is visible only if the device you are using supports coupling and the value can be changed. `Coupling` can be `DC` or `AC`. If `Coupling` is `DC`, the input is connected directly to the amplifier. If `Coupling` is `AC`, a series capacitor is inserted between the input connector and the amplifier.

When AC coupling is selected, the DC bias component of the measured signal is filtered out of the waveform by the hardware. This is typically used with dynamic signals such as audio. When DC coupling is selected, the complete signal including the DC bias component is measured. This is typically used with slowly changing signals such as temperature or voltage readings.

Values

`AC`	A series capacitor is inserted between the input connector and the amplifier.
`DC`	The input is connected directly to the amplifier.

The default is set to `AC` for

- National Instruments® devices that use the NI-DAQmx interface and support AC coupling
- National Instruments DSA cards using the Traditional NI-DAQ interface

In all other cards, the default is set to `DC`.

Examples

Create a session and add an analog input channel.

```
s = daq.createSession('ni');
```

```
ch = addAnalogInputChannel(s,'Dev4','ai1','Voltage')
```

Change the coupling type to DC:

```
ch.Coupling = 'DC';
```

3

Block Reference

Functions — Alphabetical List

binvec2dec

Convert digital input and output binary vector to decimal value

Syntax

```
out = binvec2dec(bin)
```

Arguments

`bin`	A binary vector.
`out`	A double array.

Description

`out = binvec2dec(bin)` converts the binary vector `bin` to the equivalent decimal number and assigns the result to `out`. All nonzero binary vector elements are interpreted as a 1.

Examples

To convert the binvec value [1 1 1 0 1] to a decimal value:

```
binvec2dec([1 1 1 0 1])
```

```
ans =
    23
```

More About

Tips

A binary vector (binvec) is constructed with the least significant bit (LSB) in the first column and the most significant bit (MSB) in the last column. For example, the decimal number 23 is written as the binvec value [1 1 1 0 1].

Note The binary vector cannot exceed 52 values.

See Also

`dec2binvec`

daqhelp

Help for toolbox interface

Syntax

```
daqhelp
daqhelp('functionname')
out = daqhelp('functionname')
```

Description

`daqhelp` displays a comprehensive listing of Data Acquisition Toolbox functions and properties along with a brief description of each. Links in the output provide access to more detailed help.

`daqhelp('functionname')` returns help for the specified function.

`out = daqhelp('functionname')` assign the help text output to `out`.

daqreset

Reset Data Acquisition Toolbox

Syntax

```
daqreset
```

Description

`daqreset` resets Data Acquisition Toolbox and removes all device objects.

See Also

Functions

`daq.createSession`

dec2binvec

Convert digital input and output decimal value to binary vector

Syntax

```
out = dec2binvec(dec)
out = dec2binvec(dec,bits)
```

Arguments

`dec`	A decimal value. `dec` must be nonnegative.
`bits`	Number of bits used to represent the decimal number.
`out`	A logical array containing the binary vector.

Description

`out = dec2binvec(dec)` converts the decimal value `dec` to an equivalent binary vector and stores the result as a logical array in `out`.

`out = dec2binvec(dec,bits)` converts the decimal value `dec` to an equivalent binary vector consisting of at least the number of bits specified by `bits`.

Examples

To convert the decimal value 23 to a binvec value:

```
dec2binvec(23)
```

```
ans =
     1     1     1     0     1
```

To convert the decimal value 23 to a binvec value using six bits:

```
dec2binvec(23,6)
```

```
ans =
     1     1     1     0     1     0
```

To convert the decimal value 23 to a binvec value using four bits, then the result uses five bits. This is the minimum number of bits required to represent the number.

```
dec2binvec(23,4)
```

```
ans =
     1     1     1     0     1
```

More About

Tips

More About Binary Vectors

A binary vector (binvec) is constructed with the least significant bit (LSB) in the first column and the most significant bit (MSB) in the last column. For example, the decimal number 23 is written as the binvec value [1 1 1 0 1].

More About Specifying the Number of Bits

- If `bits` is greater than the minimum number of bits required to represent the decimal value, then the result is padded with zeros.
- If `bits` is less than the minimum number of bits required to represent the decimal value, then the minimum number of required bits is used.
- If `bits` is not specified, then the minimum number of bits required to represent the number is used.

See Also

`binvec2dec`

daq.createSession

Create data acquisition session for specific vendor hardware

Syntax

```
session = daq.createSession(vendor)
```

Description

`session = daq.createSession(vendor)` creates a session object that you can configure to perform operations using a CompactDAQ device.

Input Arguments

`vendor` — Vendor name

character string

Vendor name for the device you want to create a session for, specified as a string. Valid vendors are:

- `ni`
- `digilent`
- `directsound`

Output Arguments

`session` — Session object

character string

Session object created using `daq.createSession`, specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Properties

Session acquisition and generation properties:

Examples

Create a session object `s`:

```
s = daq.createSession('ni')

s =

Data acquisition session using National Instruments hardware:
   Will run for 1 second (1000 scans) at 1000 scans/second.
   No channels have been added.
```

More About

- "Hardware Discovery and Session Setup"

See Also

`| addAnalogInputChannel | addAnalogOutputChannel | addDigitalChannel | addAudioInputChannel | addAudioOutputChannel | addCounterInputChannel | addCounterOutputChannel | daq.getDevices | daq.getVendors`

daq.getDevices

Display available National Instruments devices

Syntax

```
daq.getDevices
device = daq.getDevices
```

Description

`daq.getDevices` lists devices available to your system.

`device = daq.getDevices` stores this list in the variable *`device`*.

Output Arguments

`device` — Device list handle

character string

Device list handle variable that you want to store a list of devices available to your system, specified as a string.

Examples

Get a list of devices

Get a list of all devices available to your system and store it in the variable `d`.

```
 d = daq.getDevices
```

```
d =

index   Vendor    Device ID                            Description
----- ---------- --------- ------------------------------------------------------------
1     directsound Audio0    DirectSound Primary Sound Capture Driver
2     directsound Audio1    DirectSound Digital Audio (S/PDIF) (High Definition Audio D
3     directsound Audio3    DirectSound HP 4120 (2- HP 4120)
```

```
4     ni          cDAQ1Mod1 National Instruments NI 9205
5     ni          cDAQ1Mod2 National Instruments NI 9263
6     ni          cDAQ1Mod3 National Instruments NI 9234
7     ni          cDAQ2Mod1 National Instruments NI 9402
8     ni          cDAQ2Mod2 National Instruments NI 9205
9     ni          cDAQ2Mod3 National Instruments NI 9375
10    ni          Dev1      National Instruments USB-6211
11    ni          Dev2      National Instruments USB-6218
12    ni          Dev3      National Instruments PCI-6255
13    ni          PXI1Slot2 National Instruments PXI-4461
14    ni          PXI1Slot3 National Instruments PXI-4461
```

To get detailed information about a module on the chassis, type `d(index)`. For example, to get information about NI 9265, which has the index 13, type:

```
d(13)

ans =

ni: National Instruments NI 9402 (Device ID: 'cDAQ1Mod5')
   Counter input subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      4 channels ('ctr0','ctr1','ctr2','ctr3')
      'EdgeCount','PulseWidth','Frequency','Position' measurement types

   Counter output subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      4 channels ('ctr0','ctr1','ctr2','ctr3')
      'PulseGeneration' measurement type

This module is in slot 5 of the 'cDAQ-9178' chassis with the name 'cDAQ1'.
```

You can also click on the name of the device in the list. You can now access detailed device information which includes:

- subsystem type
- rate
- number of available channels
- measurement type

More About

Tips

Devices not supported by the toolbox are denoted with an `*`. For a complete list of supported CompactDAQ devices, see http://www.mathworks.com/hardware-support/data-acquistion-software.html.

- “Hardware Discovery and Session Setup”

See Also

`daq.getVendors` | `daq.createSession`

daq.getVendors

Display available vendors

Syntax

```
daq.getVendors
vendor = daq.getVendors
```

Description

`daq.getVendors` lists vendors available to your machine and MATLAB®.

`vendor = daq.getVendors` stores this list in the variable *`vendor`*.

Output Arguments

`vendor` — Vendor information
character string

Vendor information available to your system, stored in a variable.

Data Acquisition Toolbox currently supports

- National Instruments, including CompactDAQ devices, denoted with the abbreviation `'ni'`.
- Digilent Analog Discovery™ devices denoted with `'digilent'`. To use this device use the Support Package Installer to download necessary drivers. For more information see “Digilent Waveform Function Generation Channels”.
- DirectSound Windows sound cards. To use devices with DirectSound sound cards use the Support Package Installer to download necessary drivers. For more information see “Multichannel Audio Input and Output”.

Examples

Get a list of vendors

Get a list of all vendors available to your machine and MATLAB and store it in the variable `v`.

```
v = daq.getVendors
```

```
v =

Number of vendors: 3

index     ID      Operational       Comment
----- ----------- ----------- --------------------
1     digilent    true        Digilent Inc.
2     ni          true        National Instruments
3     directsound true        DirectSound

Properties, Methods, Events

Additional data acquisition vendors may be available as downloadable support packages.
Open the Support Package Installer to install additional vendors.
```

More About

- "Hardware Discovery and Session Setup"

See Also

`daq.getDevices` | `daq.createSession`

addAnalogInputChannel

Add analog input channel

Syntax

```
addAnalogInputChannel(s,deviceID,channelID,measurementType)
ch = addAnalogInputChannel(s,deviceID,channelID,measurementType)
[ch,idx] = addAnalogInputChannel(s,deviceID,channelID,
measurementType)
```

Description

`addAnalogInputChannel(s,deviceID,channelID,measurementType)` adds a channel on the device represented by `deviceID`, with the specified `channelID`, and channel measurement type, represented by `measurementType`, to the session `s`. Measurement types are vendor specific.

`ch = addAnalogInputChannel(s,deviceID,channelID,measurementType)` creates and displays the object `ch`.

`[ch,idx] = addAnalogInputChannel(s,deviceID,channelID,measurementType)` creates and displays the object `ch`, representing the channel that was added and the index, `idx`, which is an index into the array of the session object's `Channels` property.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceID` — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID

numeric value

Channel ID, or the physical location of the channel on the device, added to the session, specified as numeric value. You can also add a range of channels. The index for this channel displayed in the session indicates this channels position in the session. If you add a channel with channel ID `1` as the first channel in a session, the session index is `1`.

`measurementType` — Channel measurement type

character string

Channel measurement type specified as a string. `measurementType` represents a vendor-defined measurement type. Measurement types include:

- `'Voltage'`
- `'Thermocouple'`
- `'Current'`
- `'Accelerometer'`
- `'RTD'`
- `'Bridge'`
- `'Microphone'`
- `'IEPE'`

Output Arguments

`ch` — Analog input channel object

1xn array

Analog input channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add an analog input current channel

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'cDAQ1Mod3','ai0', 'Current');
```

Create analog input channel and index objects

```
s = daq.createSession('ni')
[ch, idx] = addAnalogInputChannel(s,'cDAQ2Mod6', 'ai0', 'Thermocouple')
```

Add a range of analog input channels

```
s = daq.createSession('ni')
ch = addAnalogInputChannel(s,'cDAQ1Mod1',[0 2 4], 'Voltage');
```

More About

Tips

- Use `daq.createSession` to create a session object before you use this method.
- To use counter channels, see `addCounterInputChannel`.
- "Hardware Discovery and Session Setup"

See Also

`daq.createSession` | `startBackground` | `startForeground` | `inputSingleScan` | `addAnalogOutputChannel` | `removeChannel`

addAnalogOutputChannel

Add analog output channel

Syntax

```
addAnalogOutputChannel(s,deviceName,channelID,measurementType)
ch = addAnalogOutputChannel(s,deviceName,channelID,measurementType)
[ch,idx] = addAnalogOutputChannel(s,deviceName,channelID,
measurementType)
```

Description

`addAnalogOutputChannel(s,deviceName,channelID,measurementType)` adds an analog output channel on the device represented by `deviceID`, with the specified `channelID`, and channel measurement type, defined by `measurementType`, on the session object, `s`. Measurement types are vendor specific.

`ch = addAnalogOutputChannel(s,deviceName,channelID,measurementType)` creates and displays the object `ch`, representing the channel that was added.

`[ch,idx] = addAnalogOutputChannel(s,deviceName,channelID,measurementType)` creates and displays the object `ch`, representing the channel that was added and the object `idx`, representing the index into the array of the session object's `Channels` property.

Tips

- Use `daq.createSession` to create a session object before you use this method.
- To use counter channels, see `addCounterInputChannel`.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceName` — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID

numeric value

Channel ID, or the physical location of the channel on the device, added to the session, specified as numeric value. You can also add a range of channels. The index for this channel displayed in the session indicates this channels position in the session. If you add a channel with channel ID `1` as the first channel in a session, the session index is `1`.

`measurementType` — Channel measurement type

character string

Channel measurement type specified as a string. `measurementType` represents a vendor-defined measurement type. Measurement types include:

- `'Voltage'`
- `'Current'`

Output Arguments

`ch` — Analog output channel object

1xn array

Analog output channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add an analog output voltage channel

```
s = daq.createSession('ni')
addAnalogOutputChannel(s,'cDAQ1Mod2','ao0', 'Voltage');
```

Create analog output channel and index objects

```
s = daq.createSession('ni')
[ch,idx] = addAnalogOutputChannel(s,'cDAQ1Mod2','ao0', 'Voltage');
```

Add a range of analog output channels

```
s = daq.createSession('ni')
ch = addAnalogOutputChannel(s,'cDAQ1Mod8',0:3, 'Current');
```

More About

- "Hardware Discovery and Session Setup"

See Also

`daq.createSession` | `startBackground` | `startForeground` | `outputSingleScan` | `addAnalogInputChannel` | `removeChannel`

removeChannel

Remove channel from session object

Syntax

```
removeChannel(s,idx);
```

Description

`removeChannel(s,idx);` removes the channel specified by `idx` from the session object `s`.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`idx` — Index of channel

numeric

Channel index, specified as a numeric value. Use the index of the channel that you wan to remove from the session.

Examples

Remove Channels From a Session

Start with a session `s`, with two analog input and two analog output voltage channels and display channel information.

```
s
```

```
s =

Data acquisition session using National Instruments hardware:
   No data queued.  Will run at 1000 scans/second.
   Operation starts immediately.
      Number of channels: 4
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
      1     ai   cDAQ1Mod4 ai0     SingleEnd -10 to +10 Volts
      2     ai   cDAQ1Mod4 ai1     SingleEnd -10 to +10 Volts
      3     ao   cDAQ1Mod2 ao0     n/a       -10 to +10 Volts
      4     ao   cDAQ1Mod2 ao1     n/a       -10 to +10 Volts
```

Remove channel `'ai0'` currently with the index `1` from the session:

```
removeChannel(s,1)
```

To see how the indexes shift after you remove a channel, type:

```
s
```

```
s =

Data acquisition session using National Instruments hardware:
   No data queued.  Will run at 1000 scans/second.
   All devices synchronized using cDAQ1 CompactDAQ chassis backplane. (Details)
      Number of channels: 3
      index Type  Device   Channel InputType      Range       Name
      ----- ---- --------- ------- --------- ---------------- ----
      1     ai   cDAQ1Mod4 ai1     SingleEnd -10 to +10 Volts
      2     ao   cDAQ1Mod2 ao0     n/a       -10 to +10 Volts
      3     ao   cDAQ1Mod2 ao1     n/a       -10 to +10 Volts
```

Remove the first output channel `'ao0'` currently at index 2:

```
removeChannel(s,2)
```

The session displays one input and one output channel:

```
s.Channels
```

```
ans =

Number of channels: 2
   index Type  Device   Channel InputType      Range       Name
   ----- ---- --------- ------- --------- ---------------- ----
   1     ai   cDAQ1Mod4 ai1     SingleEnd -10 to +10 Volts
   2     ao   cDAQ1Mod2 ao1     n/a       -10 to +10 Volts
```

See Also

addAnalogInputChannel | addAnalogOutputChannel | addDigitalChannel | addCounterInputChannel | addCounterOutputChannel | addAudioInputChannel | addAudioOutputChannel

startBackground

Start background operations

Syntax

```
startBackground(s);
```

Description

`startBackground(s);` starts the operation of the session object, `s`, without blocking MATLAB command line and other code. To block MATLAB execution, use `startForeground`.

When you use `startBackground(s)` with analog input channels, the operation uses the `DataAvailable` event to deliver the acquired data. This event is fired periodically while an acquisition is in progress. For more information, see “Event and Listener Concepts”.

When you add analog output channels to the session, you must call `queueOutputData()` before calling `startBackground()`.

During a continuous generation, the `DataRequired` event is fired periodically to request additional data to be queued to the session. See `DataRequired` for more information.

By default, the `IsContinuous` property is set to `false` and the operation stops automatically. If you have set it to `true`, use `stop` to stop background operations explicitly.

Use `wait` to block MATLAB execution until a background operation is complete.

Tip

- If your session has analog input channels, you must use a `DataAvailable` event to receive the acquired data in a background acquisition.
- If your session has analog output channels and is continuous, you can use a `DataRequired` event to queue additional data during background generations.

- Create an acquisition session and add a channel before you use this method. See `daq.createSession` for more information.
- Call `prepare` to reduce the latency associated with startup and to preallocate resources.
- Use an `ErrorOccurred` event to display errors during an operation.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Examples

Acquire Data in the Background

Create a session and adding a listener to access the acquired data using a callback function.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 'ai0', 'Voltage');
lh = addlistener(s,'DataAvailable', @plotData);

function plotData(src,event)
     plot(event.TimeStamps, event.Data)
end
```

Start the session and perform other MATLAB operations.

```
startBackground(s);
```

Perform other MATLAB operations.

Generate Data Continuously

For a continuous background generation, add a listener event to queue additional data to be output.

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 0, 'Voltage');
s.IsContinuous = true;
s.Rate=10000;
data=linspace(-1, 1, 5000)';
lh = addlistener(s,'DataRequired', ...
        @(src,event) src.queueOutputData(data));
queueOutputData(s,data)
startBackground(s);
```

Perform other MATLAB operations during the generation.

- “Acquire Data in the Background”
- “Generate Signals in the Background”
- “Generate Signals in the Background Continuously”

See Also

`addAnalogInputChannel` | `addAnalogOutputChannel` | `addAudioInputChannel` | `addDigitalChannel` | `addlistener` | `daq.createSession` | `DataAvailable` | `DataRequired` | `ErrorOccurred` | `startForeground`

startForeground

Start foreground operations

Syntax

```
startForeground(s);
data = startForeground(s);
[data,timeStamps,triggerTime] = startForeground(s);
```

Description

`startForeground(s);` starts operations of the session object, `s`, and blocks MATLAB command line and other code until the session operation is complete.

`data = startForeground(s);` returns the data acquired in the output parameter, `data`.

`[data,timeStamps,triggerTime] = startForeground(s);` returns the data acquired, timestamps relative to the time the operation is triggered, and a trigger time indicating the absolute time the operation was triggered.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Output Arguments

`data` — Value from acquired data

numeric array

Value from acquired data, returned as a `mxn` array of doubles. `m` is the number of scans acquired, and `n` is the number of input channels in the session.

`timeStamps` — Recorded time stamp

numeric

Recorded time stamp relative to the time the operation is triggered in an `mx1` array where `m` is the number of scans.

`triggerTime` — Time stamp of acquired data

numeric

Time stamp of acquired data which is a MATLAB serial date time stamp representing the absolute time when `timeStamps = 0`.

Examples

Acquire Analog Data

Acquire data by creating a session with an analog input channel.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','Voltage');
```

Start the acquisition and save the acquired data into the variable `data`:

```
 data = startForeground(s);
```

Generate Analog Data

Generate a signal by creating a session with an analog output channel.

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2','ao0','Voltage')
```

Create and queue an output signal and start the generation:

```
outputSignal = linspace(-1,1,1000)';
queueOutputData(s,outputSignal);
startForeground(s);
```

Acquire Analog Input Data and Time Stamps

```
s = daq.createSession('ni');
```

```
addAnalogInputChannel(s,'cDAQ1Mod1','ai0','Voltage');
```

Start the acquisition and save the acquired data in the variable `data`, the acquisition time stamp in `timestamps` and the trigger time in `triggerTime`:

```
[data,timestamps,triggerTime] = startForeground(s);
```

- "Acquire Data in the Foreground"
- "Generate Data on a Counter Channel"

More About

- "Session-Based Interface and Data Acquisition Toolbox"

See Also

`addAnalogInputChannel` | `addAnalogOutputChannel` | `addDigitalChannel` | `daq.createSession` | `startBackground`

addlistener

Create event listener

Syntax

```
lh = addlistener(s, eventName,@callback)
lh = addlistener(s, eventName, @(src, event) expr)
```

Description

`lh = addlistener(s, eventName,@callback)` creates a listener for the specified event, `eventName`, and fires the callback function, `callback`. *`lh`* is the variable in which the listener handle is stored. Create a callback function that executes when the listener detects the specified event. The callback can be any MATLAB function.

`lh = addlistener(s, eventName, @(src, event) expr)` creates a listener for the specified event, `eventName`, and fires an anonymous callback function. The anonymous function uses the specified input arguments and executes the operation specified in the expression `expr`. Anonymous functions provide a quick means of creating simple functions without storing them to a file. For more information, see Anonymous Functions.

Tip You must delete the listener once the operation is complete.

```
delete (lh)
```

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. The session object is the source of the event. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`eventName` — Event name

character string

Name of the event to listen for, specified as a string. Available events include:

- `DataAvailable`
- `DataRequired`
- `ErrorOccurred`

`callback` — Callback function name

character string

Name of the function to execute when the specified event occurs, specified as a string.

`src` — Session object

character string

The session object, where the event occurred, specified as a string.

`event` — Event object

character string

Event object, specified as a string.

`expr` — Body of function

Expression that represents the body of the function.

Output Arguments

`lh` — Listener event handle

character string

Handle to the event listener returned by `addlistener`, specified as a string. Delete the listener once the operation completes.

Examples

Add a listener to an acquisition session

Creating a session and add an analog input channel.

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 'ai0', 'Voltage');
```

Add a listener for the `DataAvailable` event:

```
lh = addlistener(s,'DataAvailable', @plotData);
```

Create the `plotData` callback function and save it as `plotData.m`:

```
function plotData(src,event)
         plot(event.TimeStamps, event.Data)
end
```

Acquire data in the background:

```
startBackground(s);
```

Wait for the operation to complete and delete the listener:

```
delete (lh)
```

Add a listener using an anonymous function to a signal generation

Create a session and set the `IsContinuous` property to `true`.

```
s = daq.createSession('ni');
s.IsContinuous = true;
```

Add two analog output channel and create output data for the two channels.

```
addAnalogOutputChannel(s,'cDAQ1Mod2', 0:1, 'Voltage');
outputData0 = linspace(-1, 1, 1000)';
outputData1 = linspace(-2, 2, 1000)';
```

Queue the output data.

```
queueOutputData(s,[outputData0 outputData1]);
```

Add an anonymous listener and generate the signal in the background.

```
lh = addlistener(s,'DataRequired', @(src,event)...
     src.queueOutputData([outputData0 outputData1]));
```

Generate signals in the background.

```
startBackground(s);
```

Perform other MATLAB operations, and then stop the session.

```
stop(s)
```

Delete the listener:

```
delete(lh)
```

More About

- "Session Creation Workflow"

See Also

`daq.createSession` | `addAnalogInputChannel` | `addAnalogOutputChannel` | `startBackground` | `DataAvailable` | `DataRequired` | `ErrorOccurred`

prepare

Prepare session for operation

Syntax

```
prepare(s)
```

Description

`prepare(s)` configures and allocates hardware resources for the session `s` and reduces the latency of `startBackground` and `startForeground` functions. This function is optional and is automatically called as needed.

Inputs

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

See Also

`addAnalogInputChannel` | `addAnalogInputChannel` | `release`

wait

Block MATLAB until background operation completes

Syntax

```
wait(s)
wait(s,timeout)
```

Description

`wait(s)` blocks MATLAB until the background operation completes. Press **Ctrl+C** to abort the wait.

`wait(s,timeout)` blocks MATLAB until the operation completes or the specified time-out occurs.

Tips

- You cannot call `wait` if you have set the session's `IsContinuous` property to `true`.
- To terminate the operation, use `stop`.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`timeout` — Session timeout value

numeric

Session timeout value, or the maximum time in seconds before the wait throws an error, specified as a number.

Examples

Wait to acquire data

Create a session and add an analog output channel.

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 'ao0', 'Voltage');
```

Queue some output data.

```
queueOutputData(s,zeros(10000,1));
```

Start the session and issue a wait. This blocks MATLAB until all data is output.

```
startBackground(s);
% perform other MATLAB operations.
wait(s)
```

Queue more data and wait for up to 15 seconds.

```
queueOutputData(s,zeros(10000,1));
startBackground(s);
% perform other MATLAB operations.
wait(s,15)
```

See Also

`startBackground` | `stop`

stop

Stop background operation

Syntax

```
stop(s);
```

Description

`stop(s);` stops the session and all associated hardware operations in progress. Stopping the session will flush all undelivered data that is below the threshold defined by `NotifyWhenDataAvailableExceeds` and will not fire any more `DataAvailable` events.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

See Also

`startBackground` | `startForeground` | `wait`

release

Release session resources

Syntax

```
release(s)
```

Description

`release(s)` releases all reserved hardware resources.

When you associate hardware with a session using the Data Acquisition Toolbox, the session reserves exclusive access to the data acquisition hardware.

Hardware resources associated with a session are automatically released when you delete the session object, or you assign a different value to the variable containing your session object. Optionally, you can use `s.release` to release reserved hardware resources if you need to use it in another session or to use applications other than MATLAB to access the hardware.

Inputs

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Examples

Release session hardware

Create a session and add an analog input voltage channel and acquire data in the foreground:

```
s1 = daq.createSession('ni');
addAnalogInputChannel(s1,'cDAQ3Mod1','ai0','Voltage');
startForeground(s1)
```

Release the session hardware and create another session object with an analog input voltage channel on the same device as the previous session. Acquire in the foreground:

```
release(s1);
s2 = daq.createSession('ni');
addAnalogInputChannel(s2,'cDAQ3Mod1','ai2','Voltage');
startForeground(s2);
```

See Also

prepare | startForeground | startBackground |

inputSingleScan

Acquire single scan from all input channels

Syntax

```
data = inputSingleScan(s);
[data,triggerTime] = inputSingleScan(s);
```

Description

`data = inputSingleScan(s);` returns an immediately acquired single scan from each input channel in the session as a `1xn` array of doubles. The value is stored in `data`, where `n` is the number of input channels in the session.

`[data,triggerTime] = inputSingleScan(s);` returns an immediately acquired single scan from each input channel in the session as a `1xn` array of doubles. The value is stored in `data`, where `n` is the number of input channels in the session and the MATLAB serial date time stamp representing the time the data is acquired is returned in `triggerTime`.

Tip To acquire more than a single input, use `startForeground`.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Output Arguments

`data` — Value from acquired data

numeric array

Value from acquired data, returned as a 1xn array of doubles.

`triggerTime` — Time stamp of acquired data

numeric

Time stamp of acquired data which is a MATLAB serial date time stamp representing the absolute time when `timeStamps = 0`.

Examples

Acquire Single Analog Input Scan

Acquire a single input from an analog channel.

Create a session and add two analog input channels:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 1:2, 'Voltage');
```

Input a single scan:

```
 data = inputSingleScan(s)
```

```
data =

   -0.1495    0.8643
```

Acquire Single Digital Input Scan

Acquire a single input from a digital channel and get data and the trigger time of the acquisition.

Create a session and add two digital channels with `InputOnly` measurement type:

```
s = daq.createSession('ni');
addDigitalChannel(s,'dev1', 'Port0/Line0:1', 'InputOnly');
```

Input a single scan:

```
[data,triggerTime] = inputSingleScan(s)
```

Acquire Single Counter Input Scan

Acquire a single input from a counter channel.

Create a session and add a counter input channel with `EdgeCount` measurement type:

```
s = daq.createSession('ni');
addCounterInputChannel(s,'Dev1',0,'EdgeCount');
```

Input a single edge count:

```
data = inputSingleScan(s)
```

- "Acquire Non-Clocked Digital Data"
- "Acquire Counter Input Data"

See Also

`addAnalogInputChannel` | `addCounterInputChannel` | `addDigitalChannel` | `daq.createSession` | `startForeground`

queueOutputData

Queue data to be output

Syntax

```
queueOutputData(s,data)
```

Description

`queueOutputData(s,data)` queues data to be output. When using analog output channels, you must queue data before you call `startForeground` or `startBackground`.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`data` — Data object

doubles

Data object specified as an `mxn` matrix of doubles where `m` is the number of scans to generate, and `n` is the number of output channels in the session.

Examples

Queue output data for a single channel

Create a session, add an analog output channel, and queue some data to output.

```
s = daq.createSession('ni');
```

```
addAnalogOutputChannel(s,'cDAQ1Mod2', 'ao0', 'Voltage');
queueOutputData(s,linspace(-1, 1, 1000)');
startForeground(s)
```

Queue output data for multiple channels

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 0:1, 'Voltage');
data0 = linspace(-1, 1, 1000)';
data1 = linspace(-2, 2, 1000)';
queueOutputData(s,[data0 data1]);
startBackground(s);
```

See Also

daq.createSession | | startForeground | addAnalogOutputChannel | startBackground | startForeground

outputSingleScan

Generate single scan on all output channels

Syntax

```
outputSingleScan(s,data)
```

Description

`outputSingleScan(s,data)` outputs a single scan of data on one or more analog output channels.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`data` — Data to output

doubles

Data to output, represented as a `1xn` matrix of doubles where `n` is the number of output channels in the session.

Examples

Analog Output

Output a single scan on two analog output voltage channels

Create a session and add two analog output channels.

```
s = daq.createSession('ni');
addAnalogOutputChannel(s,'cDAQ1Mod2', 0:1, 'Voltage');
```

Create an output value and output a single scan for each channel added.

```
outputSingleScan(s,[1.5 4]);
```

Digital Output

Output one value each on 2 lines on a digital channel

Create a session and add two digital channels from port 0 that measures output only:

```
s = daq.createSession('ni');
addDigitalChannel(s,'dev1', 'Port0/Line0:1', 'OutputOnly')
```

Output one value each on the two lines:

```
outputSingleScan(s,[0 1])
```

See Also

`daq.createSession` | `addAnalogOutputChannel` | `addDigitalChannel` | `inputSingleScan`

DataAvailable

Notify when acquired data is available to process

Syntax

```
lh = addlistener(session,'DataAvailable',callback);
lh = addlistener(session,'DataAvailable', @(src, event), expr)
```

Description

`lh = addlistener(session,'DataAvailable',callback);` creates a listener for the `DataAvailable` event. When data is available to process, the callback is executed. The callback can be any MATLAB function with the `(src, event)` signature.

`lh = addlistener(session,'DataAvailable', @(src, event), expr)` creates a listener for the `DataAvailable` event and fires an anonymous callback function. The anonymous function requires the specified input arguments and executes the operation specified in the expression `expr`. Anonymous functions provide a quick means of creating simple functions without storing your function to a file. For more information see Anonymous Functions.

The callback has two required parameters: `src` and `event`. `src` is the session object for the listener and `event` is a `daq.DataAvailableInfo` object containing the data associated and timing information. Properties of `daq.DataAvailableInfo` are:

Data

An `mxn` matrix of doubles where `m` is the number of scans acquired, and `n` is the number of input channels in the session.

TimeStamps

The timestamps relative to `TriggerTime` in an `mx1` array where `m` is the number of scans acquired.

TriggerTime

A MATLAB serial date time stamp representing the absolute time the acquisition trigger occurs.

Tip Frequency with which the `DataAvailable` event is fired, is controlled by `NotifyWhenDataAvailableExceeds`

Examples

Create DataAvailable Function

This example shows how to create an event that plots data when triggered using a callback function.

Create a session, add an analog input channel, and change the duration of the acquisition:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 'ai0', 'Voltage');
s.DurationInSeconds=5;
```

Add a listener for the `DataAvailable` event to plot the data:

```
lh = addlistener(s,'DataAvailable', @plotData);
```

Create a function that plots the data when the event occurs:

```
 function plotData(src,event)
     plot(event.TimeStamps, event.Data)
end
```

Start the acquisition and wait:

```
startBackground(s);
wait(s);
```

Delete the listener:

```
delete(lh)
```

Create Anonymous DataAvailable Function

This example shows how to create an event using an anonymous function call to plot data when an event occurs.

Create a session, add an analog input channel, and change the duration of the acquisition:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 'ai0', 'Voltage');
s.DurationInSeconds=5;
```

Add a listen with an anonymous function call:

```
lh = s.addlistener('DataAvailable', ...
          @(src,event) plot(event.TimeStamps, event.Data));
```

Acquire data.

```
s.startBackground();
```

Delete the listener:

```
delete(lh)
```

- "Acquire Data in the Background"

See Also

| addlistener | IsNotifyWhenDataAvailableExceedsAuto | NotifyWhenDataAvailableExceeds | startBackground

DataRequired Event

Notify when additional data is required for output on continuous generation

Syntax

```
lh = addlistener(session,DataRequired,callback);
lh = addlistener(session,DataRequired,@(src,event),expr);
```

Description

`lh = addlistener(session,DataRequired,callback);` creates a listener for the `DataRequired` event. When more data is required, the callback is executed. The callback can be any MATLAB function with the `(src, event)` signature.

`lh = addlistener(session,DataRequired,@(src,event),expr);` creates a listener for the `DataRequired` event and fires an anonymous function. The anonymous function requires the specified input arguments and executes the operation specified in the expression `expr`. Anonymous functions provide a quick means of creating simple functions without storing your function to a file. For more information see Anonymous Functions.

The callback has two required parameters, `src` and `event`. `src` is the session object for the listener and `event` is a `daq.DataRequiredInfo` object.

Tips

- The callback is typically used to queue more data to the device.
- Frequency is controlled by `NotifyWhenScansQueuedBelow`.

Examples

Add an anonymous listener to a signal generation session

Create a session and add two analog output channels.

```
s = daq.createSession('ni');
s.IsContinuous=true
addAnalogOutputChannel(s,'cDAQ1Mod2', 0:1, 'Voltage');
```

Create output data for the two channels :

```
outputData0 = (linspace(-1, 1, 1000))';
outputData1 = (linspace(-2, 2, 1000))';
```

Queue the output data and add an anonymous listener and generate the signal in the background:

```
queueOutputData(s,[outputData0, outputData1]);
lh=addlistener(s,'DataRequired', ...
    @(src,event) src.queueOutputData([outputData0, outputData1]));
```

Generate data and pause for up to 15 seconds:

```
startBackground(s);
pause(15)
```

Delete the listener:

```
delete(lh)
```

See Also

`addlistener` | `startBackground` | `IsContinuous` | | `NotifyWhenScansQueuedBelow` | `IsNotifyWhenScansQueuedBelowAuto`

ErrorOccurred Event

Notify when device-related errors occur

Syntax

```
lh = addlistener(session,'ErrorOccurred', callback);
lh = addlistener(session,'ErrorOccurred',@(src,event)expr);
```

Description

`lh = addlistener(session,'ErrorOccurred', callback);` creates a listener for the `ErrorOccurred` event. When an error occurs, the call back is executed. The callback can be any MATLAB function with the `(src, event)` signature.

`lh = addlistener(session,'ErrorOccurred',@(src,event)expr);` creates a listener for the `ErrorOccurred` event and fires an anonymous function. The anonymous function requires the specified input arguments and executes the operation specified in the expression `expr`. Anonymous functions provide a quick means of creating simple functions without storing your function to a file. For more information, see Anonymous Functions.

The callback has two required parameters: `src` and `event`. `src` is the session object for the listener and `event` is a `daq.ErrorOccurredInfo` object. The `daq.ErrorOccurredInfo` object contains the `Error` property, which is the `MException` associated with the error. You could use the MException.getReport method to return a formatted message string that uses the same format as errors thrown by internal MATLAB code.

Note: In background mode errors and exceptions are not displayed by default. Use the `ErrorOccurred` event listener to display the errors.

Examples

Create a session, and add an analog input channel:

```
s = daq.createSession('ni');
addAnalogInputChannel(s,'cDAQ1Mod1', 'ai0', 'Voltage');
```

To get a formatted report of the error, type:

```
lh = addlistener(s,'ErrorOccurred' @(src,event), disp(getReport(event.Error)));
```

Acquire data, wait and delete the listener:

```
startBackground(s);
wait(s)
delete(lh)
```

See Also

`addlistener` | `startBackground` | MException

addCounterInputChannel

Add counter input channel

Syntax

```
addCounterInputChannel(s,deviceID,channelID)
ch = addCounterInputChannel(s,deviceID,channelID,measurementType)
[ch,idx] = addCounterInputChannel(s,deviceID,channelID,
measurementType)
```

Description

`addCounterInputChannel(s,deviceID,channelID)` adds a counter channel on the device represented by `deviceID` with the specified `channelID`, and channel measurement type, represented by `measurementType`, to the session `s`. Measurement types are vendor specific.

`ch = addCounterInputChannel(s,deviceID,channelID,measurementType)` returns the object *`ch`*.

`[ch,idx] = addCounterInputChannel(s,deviceID,channelID, measurementType)` returns the object *`ch`*, representing the channel that was added and the index, *`idx`*, which is an index into the array of the session object's `Channels` property.

Tip Use `daq.createSession` to create a session object before you use this method.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceID` — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID

numeric value or character string

Channel ID specified as a numeric value or character string, corresponding to the specific counter channel on the device added to the session. Channel ID `0` corresponds to the device counter `'ctr0'`, Channel ID `1` to `'ctr1'`, and so on. For the related device signal names and physical pins, see the pinout for your particular device.

You can add a range of channels by specifying the channel ID with a numeric array or cell array of strings.

The index for a channel displayed in the session indicates the channel's position in the session. The first channel you add in a session has session index `1`, and so on.

`measurementType` — Channel measurement type

character string

Channel measurement type specified as a string. `measurementType` represents a vendor-defined measurement type. Measurement types include:

- `'EdgeCount'`
- `'PulseWidth'`
- `'Frequency'`
- `'Position'`

Output Arguments

`ch` — Counter input channel object

1xn array

Counter input channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add a counter input EdgeCount channel

```
s = daq.createSession('ni')
ch = addCounterInputChannel(s,'cDAQ1Mod5','ctr0','EdgeCount');
ch.Terminal  % View device signal name for pin mapping.
```

Add a counter input Frequency channel

Specify output arguments to represent the channel object and the index.

```
s = daq.createSession('ni')
[ch,idx] = addCounterInputChannel(s,'cDAQ1Mod5',1,'Frequency');
ch.Terminal  % View device signal name for pin mapping.
```

Add multiple counter input channels

```
s = daq.createSession ('ni')
ch = addCounterInputChannel(s,'cDAQ1Mod5',[0 1 2],'EdgeCount');
```

- "Acquire Counter Input Data"

See Also

Functions

`addCounterOutputChannel` | `inputSingleScan` | `removeChannel` | `startBackground` | `startForeground`

Properties

`Terminal`

addCounterOutputChannel

Add counter output channel

Syntax

```
addCounterOutputChannel(s,deviceID,channelID)
ch = addCounterOutputChannel(s,deviceID,channelID,measurementType)
[ch,idx] = addCounterOutputChannel(s,deviceID,channelID,
measurementType)
```

Description

`addCounterOutputChannel(s,deviceID,channelID)` adds a counter channel on the device represented by `deviceID` with the specified `channelID`, and channel measurement type, represented by `measurementType`, to the session `s`. Measurement types are vendor specific.

`ch = addCounterOutputChannel(s,deviceID,channelID,measurementType)` returns the object *`ch`*.

`[ch,idx] = addCounterOutputChannel(s,deviceID,channelID, measurementType)` returns the object *`ch`*, representing the channel that was added and the index, *`idx`*, which is an index into the array of the session object's `Channels` property.

Tip Use `daq.createSession` to create a session object before you use this method.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceID` — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID

numeric value or character string

Channel ID specified as a numeric value or character string, corresponding to the specific counter channel on the device added to the session. Channel ID `0` corresponds to the device counter `'ctr0'`, Channel ID `1` to `'ctr1'`, and so on. For the related device signal names and physical pins, see the pinout for your particular device.

You can add a range of channels by specifying the channel ID with a numeric array or cell array of strings.

The index for a channel displayed in the session indicates the channel's position in the session. The first channel you add in a session has session index `1`, and so on.

`measurementType` — Channel measurement type

character string

Channel measurement type specified as a string. `measurementType` represents a vendor-defined measurement type. A valid output measurement type is `'PulseGeneration'`.

Output Arguments

`ch` — Counter output channel object

1xn array

Counter output channel that you add, returned as an object containing a `1xn` array of vendor specific channel information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add a counter output PulseGeneration channel

```
s = daq.createSession('ni');
ch = addCounterOutputChannel(s,'cDAQ1Mod3','ctr0','PulseGeneration');
ch.Terminal  % View device signal name for pin mapping.
```

Add two counter output PulseGeneration channels

```
s = daq.createSession('ni')
ch = addCounterOutputChannel(s,'cDAQ1Mod3',0:1,'PulseGeneration')
```

- "Generate Pulses on a Counter Output Channel"

See Also

Functions

`addCounterInputChannel` | `removeChannel` | `startBackground` | `startForeground`

Properties

`Terminal`

resetCounters

Reset counter channel to initial count

Syntax

```
resetCounters(s)
```

Description

`resetCounters(s)` restarts the current value of counter channels configured in the session object, `s` to the specified `InitialCount` property on each channel.

Tips

- Reset counters only if you are performing on-demand operations using or
- Create an acquisition session and add a channel before you use this method. See `daq.createSession` for more information.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

Examples

Reset Counters

Create a session with a counter channel with an `'EdgeCount'` measurement type:

```
s = daq.createSession ('ni');
addCounterInputChannel(s,'cDAQ1Mod5', 0, 'EdgeCount');
```

Acquire data.

```
inputSingleScan(s)
```

```
ans =

   756
```

Reset the counter to the default value, 0, and acquire again.

```
resetCounters(s)
```

```
inputSingleScan(s)
```

```
ans =

   303
```

- “Acquire Counter Input Data”
- “Generate Data on a Counter Channel”

More About

- “Acquire Counter Input Data”
- “Acquire Counter Input Data”

See Also

`daq.createSession` | `addCounterInputChannel` | `inputSingleScan`

addTriggerConnection

Add trigger connection

Syntax

```
addTriggerConnection(s,source,destination,type)
tc = addTriggerConnection(s,source,destination,type)
[tc,idx] = addTriggerConnection(s,source,destination,type)
```

Description

`addTriggerConnection(s,source,destination,type)` establishes a trigger connection from the specified source device and terminal to the specified destination device and terminal, of the specified connection type.

`tc = addTriggerConnection(s,source,destination,type)` establishes a trigger connection from the specified source and terminal to the specified destination device and terminal, of the specified connection type and displays it in the variable `tc`.

`[tc,idx] = addTriggerConnection(s,source,destination,type)` establishes a trigger connection from the specified source device and terminal to the specified destination device and terminal of the specified connection type and displays the connection in the variable `tc` and the connection index, `idx`.

Note: You cannot use triggers with audio devices.

Tip Before adding trigger connections, create a session using `daq.createSession`, and add channels to the session.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`source` — Source of trigger connection

character string

Source for the trigger connection, specified as a character string. Valid values are:

`'external'`

When your trigger is based on an external event.

`'deviceID/terminal'`

When your trigger source is on a specific terminal on a device in your session. For example, `'Dev1/PFI1'`, for more information on device ID see `Device`. For more information on terminal see `Terminals`.

`'chassisId/terminal'`

When your trigger source is on a specific terminal on a chassis in your session, for example, `'cDAQ1/PFI1'`. For more information on terminal see `Terminals`.

You can have only one trigger source in a session.

`destination` — Destination of trigger connection

character string

Destination for the trigger connection, specified as a character string. Valid values are:

`'external'`

When your trigger source is connected to an external device.

`'deviceID/terminal'`

When your trigger source is connected to another device in your session, for example, `'Dev1/PFI1'`. For more information on device ID see `Device`. For more information on terminal see `Terminals`.

`'chassisId/terminal'`

When your trigger source is connected to a chassis in your session, for example, `'cDAQ1/PFI1'`. For more information on terminal see `Terminals`.

You can also specify multiple destination devices as an array, for example, `{'Dev1/PFI1','Dev2/PFI1'}`.

`type` — Trigger connection type

character string

The trigger connection type, specified as a string. `StartTrigger` is the only connection type available for trigger connections at this time.

Output Arguments

`tc` — Trigger connection object

1xn array

The trigger connection that you add, returned as an object containing a `1xn` array trigger connection information.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add External Start Trigger Connection

Create a session and add an analog input channel from `Dev1` to the session.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1','ai0','Voltage');
```

Add a trigger connection from an external device to terminal PFI1 on Dev1 using the `'StartTrigger'` connection type:

```
addTriggerConnection(s,'external','Dev1/PFI1','StartTrigger')
```

Export Trigger to External Device

To Add trigger connection going to an external destination, create a session and add an analog input channel from `Dev1` to the session.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1','ai0','Voltage');
```

Add a trigger from terminal `PFI1` on `Dev1` to an external device using the `'StartTrigger'` connection type:

```
addTriggerConnection(s,'Dev1/PFI1','external','StartTrigger')
```

Save Trigger Connection

Add a trigger connection from terminal `PFI1` on `Dev1` to terminal `PFI0` on `Dev2` using the `'StartTrigger'` connection type and store it in `tc`

To display a trigger connection in a variable, create a session and add an analog input channel from `Dev1` and `Dev2` to the session.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1','ai0','Voltage');
addAnalogInputChannel(s,'Dev2','ai1','Voltage');
```

Save the trigger connection in `tc`.

```
tc = addTriggerConnection(s,'Dev1/PFI1','Dev2/PFI0','StartTrigger');
```

- "Acquire Voltage Data Using a Digital Trigger"
- "Multiple-Device Synchronization"
- "Multiple-Chassis Synchronization"

More About

- "Trigger Connections"
- "Synchronization"

See Also

`addClockConnection` | `daq.createSession` | `removeConnection`

addClockConnection

Add clock connection

Syntax

```
addClockConnection(s,source,destination,type)
cc = addClockConnection(s,source,destination,type)
[cc,idx] = addClockConnection(s,source,destination,type)
```

Description

`addClockConnection(s,source,destination,type)` adds a clock connection from the specified source device and terminal to the specified destination device and terminal, of the specified connection type.

`cc = addClockConnection(s,source,destination,type)` adds a clock connection from the specified source device and terminal to the specified destination device and terminal, of the specified connection type and displays it in the variable `cc`.

`[cc,idx] = addClockConnection(s,source,destination,type)` adds a clock connection from the specified source device and terminal to the specified destination device and terminal, of the specified connection type and displays the connection in the variable `cc` and the connection index, `idx`.

Tip Before adding clock connections, create a session using `daq.createSession`, and add channels to the session.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`source` — Source of clock connection

character string

Source for the clock connection, specified as a string. Valid values are:

`'external'`

When your clock is based on an external event.

`'deviceID/terminal'`

When your clock source is on a specific terminal on a device in your session, for example, `'Dev1/PFI1'`. For more information on device ID see `Device`. For more information on terminal see `Terminals`.

`'chassisId/terminal'`

When your clock source is on a specific terminal on a chassis in your session, for example, `'cDAQ1/PFI1'`. For more information on terminal see `Terminals`.

You can have only one clock source in a session.

`destination` — Destination of clock connection

character string

Destination for the clock connection, specified as a character string. Valid values are:

`'external'`

When your clock source is connected to an external device.

`'deviceID/terminal'`

When your clock source is connected to another device in your session, for example, `'Dev1/PFI1'`. For more information on device ID see `Device`. For more information on terminal see `Terminals`.

`'chassisId/terminal'`

When your clock source is connected to a chassis in your session, for example, `'cDAQ1/PFI1'`. For more information on terminal see `Terminals`.

You can also specify multiple destination devices as an array, for example, `{'Dev1/PFI1','Dev2/PFI1'}`.

`type` — Clock connection type

character string

The clock connection type, specified as a string. `ScanClock` is the only connection type available for clock connections at this time.

Output Arguments

`cc` — Clock connection object

1xn array

The clock connection that you add, returned as an object containing a `1xn` array clock connection information.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add External Scan Clock

Create a session and add an analog input channel from `Dev1` to the session.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1','ai0', 'Voltage');
```

Add a clock connection from an external device to terminal `PFI1` on `Dev1` using the `'ScanClock'` connection type and save the connection settings to a variable:

```
cc = addClockConnection(s,'external','Dev1/PFI1','ScanClock');
```

Export Scan Clock to External Device

To add clock connection going to an external destination, create a session and add an analog input channel from `Dev1` to the session.

```
s = daq.createSession('ni')
addAnalogInputChannel(s,'Dev1','ai0', 'Voltage');
```

Add a clock from terminal `PFI0` on `Dev1` to an external device using the `'ScanClock'` connection type:

```
addClockConnection(s,'Dev1/PFI1','external','ScanClock');
```

More About

- "Clock Connections"
- "Synchronization"

See Also

`addTriggerConnection` | `daq.createSession` | `removeConnection`

removeConnection

Remove clock or trigger connection

Syntax

```
removeConnection(s,idx);
```

Description

`removeConnection(s,idx);` remove the specified clock or trigger with the index, `idx`, from the ion. The connected device remains in the session, but no longer synchronize with other connected devices in the session.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition ion for acquisition and generation operation Create one session per vendor and use that vendor session to perform all data acquisition operation

`idx`

Index of the connection you want to remove.

Examples

Remove a Clock and Trigger Connection

Create clock and trigger connection in the session `s`.

```
s = daq.createSeion('ni');
addAnalogInputChannel(s,'Dev1','ai0','Voltage')
```

```
addAnalogInputChannel(s,'Dev2','ai0','Voltage')
addAnalogInputChannel('Dev3','ai0','Voltage')
addTriggerConnection(s,'Dev1/PFI0',{'Dev2/PFI0','Dev3/PFI0'}','StartTrigger');
addClockConnection(s,'Dev1/PFI1',{'Dev2/PFI1','Dev3/PFI1'},'ScanClock');
```

View existing synchronization connection .

```
s.Connections
```

```
ans=


Start Trigger is provided by 'Dev1' at 'PFI0' and will be received by:
         'Dev2' at terminal 'PFI0'
         'Dev3' at terminal 'PFI0'
Scan Clock is provided by 'Dev1' at 'PFI1' and will be received by:
         'Dev2' at terminal 'PFI1'
         'Dev3' at terminal 'PFI1'

   index     Type      Source   Deination
   ----- ------------ --------- -----------
   1     StartTrigger Dev1/PFI0 Dev2/PFI0
   2     StartTrigger Dev1/PFI0 Dev3/PFI0
   3     ScanClock    Dev1/PFI1 Dev2/PFI1
   4     ScanClock    Dev1/PFI1 Dev3/PFI1
```

Remove the trigger connection with the index 2 from `Dev3/PFI0` to `Dev1/PFI0`:

```
removeConnection(s,2);
```

View updated connection

```
s.Connections
```

```
an=


Start Trigger is provided by 'Dev1' at 'PFI0' and will be received by 'Dev2' at termina
Scan Clock is provided by 'Dev1' at 'PFI1' and will be received by:
         'Dev2' at terminal 'PFI1'
         'Dev3' at terminal 'PFI1'

   index     Type      Source   Deination
   ----- ------------ --------- -----------
   1     StartTrigger Dev1/PFI0 Dev2/PFI0
   2     ScanClock    Dev1/PFI1 Dev2/PFI1
```

```
   3     ScanClock    Dev1/PFI1 Dev3/PFI1
```

More About

- “Trigger Connections”
- “Clock Connections”
- “Synchronization”

See Also

`addClockConnection` | `addTriggerConnection` | `daq.createSession`

addDigitalChannel

Add digital channel

Syntax

```
addDigitalChannel(s,deviceID,channelID,measurementType)
ch = addDigitalChannel(s,deviceID,channelID,measurementType)
[ch,idx] = addDigitalChannel(s,deviceID,channelID,measurementType)
```

Description

`addDigitalChannel(s,deviceID,channelID,measurementType)` adds a digital channel to the session, on the device represented by `deviceID`, with the specified port and single-line combination and the channel measurement type to the session, `s`.

`ch = addDigitalChannel(s,deviceID,channelID,measurementType)` creates and displays the digital channel `ch`.

`[ch,idx] = addDigitalChannel(s,deviceID,channelID,measurementType)` additionally creates and displays `idx`, which is an index into the array of the session object's Channels property.

Note: To input and output decimal values, use the conversion functions:

- `decimalToBinaryVector`
- `binaryVectorToDecimal`
- `hexToBinaryVector`
- `binaryVectorToHex`

Tips

- Create a session using `daq.createSession` before adding digital channels.

- Change the Direction property of a bidirectional channel before you read or write digital data.

Input Arguments

s — Data acquisition session

session object

Data acquisition session specified as a session object created using `daq.createSession`. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

deviceID — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

Data Types: `string`

channelID — Channel ID

character string

Channel ID, or the physical location of the channel on the device, specified as a character string. You can add a range of channels using colon syntax or a cell array of strings. The index for this channel in the session display indicates this channel's position in the session. If you add a channel with channel ID `'Dev1'` as the first channel in a session, its session index is `1`.

Data Types: `cell | string`

measurementType — Channel measurement type

character string

Channel measurement type specified as a character string. `measurementType` represents a vendor-defined measurement type. Measurement types include:

- `InputOnly`

- `OutputOnly`
- `Bidirectional`

Data Types: `string`

Output Arguments

`ch` — Analog input channel object

1-by-n array

Analog input channel that you add, returned as an object containing a 1-by-n array of vendor-specific channel information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session's `Channels` property.

Properties

Examples

Add Digital Channels

Discover available digital devices on your system, then create a session with digital channels.

Find all installed devices.

```
d = daq.getDevices
```

```
d =

Data acquisition devices:

index Vendor Device ID          Description
```

```
----- ------ --------- ----------------------------
1     ni     Dev1      National Instruments USB-6255
2     ni     Dev2      National Instruments USB-6363
```

Get detailed subsystem information for NI USB-6255:

```
d(1)

ans =

ni: National Instruments USB-6255 (Device ID: 'Dev1')
   Analog input subsystem supports:
      7 ranges supported
      Rates from 0.1 to 1250000.0 scans/sec
      80 channels ('ai0' - 'ai79')
      'Voltage' measurement type

   Analog output subsystem supports:
      -5.0 to +5.0 Volts,-10 to +10 Volts ranges
      Rates from 0.1 to 2857142.9 scans/sec
      2 channels ('ao0','ao1')
      'Voltage' measurement type

   Digital subsystem supports:
      24 channels ('port0/line0' - 'port2/line7')
      'InputOnly','OutputOnly','Bidirectional' measurement types

   Counter input subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      2 channels ('ctr0','ctr1')
      'EdgeCount','PulseWidth','Frequency','Position' measurement types

   Counter output subsystem supports:
      Rates from 0.1 to 80000000.0 scans/sec
      2 channels ('ctr0','ctr1')
      'PulseGeneration' measurement type
```

Create a session with input, output, and bidirectional channels using `'Dev1'`:

```
s = daq.createSession('ni');
addDigitalChannel(s,'dev1', 'Port0/Line0:1', 'InputOnly');
ch = addDigitalChannel(s,'dev1', 'Port0/Line2:3', 'OutputOnly');
[ch,idx] = addDigitalChannel(s,'dev1', 'Port2/Line0:1', 'Bidirectional')

ans =
```

```
Data acquisition session using National Instruments hardware:
   Clocked operations using startForeground and startBackground are disabled.
   Only on-demand operations using inputSingleScan and outputSingleScan can be done.
   Number of channels: 6
      index Type Device   Channel       MeasurementType     Range Name
      ----- ---- ------ ----------- ----------------------- ----- ----
      1     dio  Dev1   port0/line0 InputOnly               n/a
      2     dio  Dev1   port0/line1 InputOnly               n/a
      3     dio  Dev1   port0/line2 OutputOnly              n/a
      4     dio  Dev1   port0/line3 OutputOnly              n/a
      5     dio  Dev1   port2/line0 Bidirectional (Unknown) n/a
      6     dio  Dev1   port2/line1 Bidirectional (Unknown) n/a
```

- “Acquire Non-Clocked Digital Data”
- “Generate Non-Clocked Digital Data”
- “Acquire Clocked Digital Data with Imported Clock”
- “Acquire Clocked Digital Data with Shared Clock”
- “Acquire Digital Data Using Counter Channels”

More About

- “Digital Subsystem Channels”

See Also

`binaryVectorToDecimal` | `binaryVectorToHex` | `daq.createSession` | `decimalToBinaryVector` | `hexToBinaryVector` | `inputSingleScan` | `outputSingleScan` | `startBackground` | `startForeground`

decimalToBinaryVector

Convert decimal value to binary vector

Syntax

```
decimalToBinaryVector(decimalNumber)
decimalToBinaryVector(decimalNumber,numberOfBits)
decimalToBinaryVector(decimalNumber,numberOfBits,bitOrder)
decimalToBinaryVector(decimalNumber,[],bitOrder)
```

Description

`decimalToBinaryVector(decimalNumber)` converts a positive decimal number to a binary vector, represented using the minimum number of bits.

`decimalToBinaryVector(decimalNumber,numberOfBits)` converts a decimal number to a binary vector with the specified number of bits.

`decimalToBinaryVector(decimalNumber,numberOfBits,bitOrder)` converts a decimal number to a binary vector with the specified number of bits in the specified bit ordering.

`decimalToBinaryVector(decimalNumber,[],bitOrder)` converts a decimal number to a binary vector with default number of bits in the specified bit ordering.

Examples

Convert a Decimal to a Binary Vector

```
decimalToBinaryVector(6)
```

```
ans =

     1     1     0
```

Convert an Array of Decimals to a Binary Vector Array

```
decimalToBinaryVector(0:4)
```

```
ans =

     0     0     0
     0     0     1
     0     1     0
     0     1     1
     1     0     0
```

Convert a Decimal into a Binary Vector of Specific Bits

```
decimalToBinaryVector(6, 8, 'MSBFirst')
```

```
ans =

     0     0     0     0     0     1     1     0
```

Convert a Decimal into a Binary Vector with LSB First

```
decimalToBinaryVector(6, [], 'LSBFirst')
```

```
ans =

     0     1     1
```

Convert an Array of Decimals into a Binary Vector Array with LSB First

```
decimalToBinaryVector(0:4, 4, 'LSBFirst')
```

```
ans =

     0     0     0     0
     1     0     0     0
     0     1     0     0
     1     1     0     0
     0     0     1     0
```

- “Generate Signals Using Decimal Data Across Multiple Lines”

Input Arguments

`decimalNumber` — Number to convert to binary vector

numeric

The number to convert to a binary vector specified as a positive integer scalar.

Data Types: `single` | `double` | `int8` | `int16` | `int32` | `int64` | `uint8` | `uint16` | `uint32` | `uint64`

`numberOfBits` — Number of bits required to correctly represent the decimal number

numeric

The number of bits required to correctly represent the decimal. This is an optional argument. If you do not specify the number of bits, the number is represented using the minimum number of bits needed. By default minimum number of bits needed to represent the value is specified, unless you specify a value

`bitOrder` — Bit order for binary vector representation

MSBFirst (default) | LSBFirst

Bit order for the binary vector representation specified as:

- `MSBFirst` if you want the first element of the output to contain the most significant bit of the decimal number.
- `LSBFirst` if you want the first element of the output to contain the least significant bit of the decimal number.

See Also

Functions

`binaryVectorToDecimal` | `binaryVectorToHex` | `hexToBinaryVector`

binaryVectorToDecimal

Convert binary vector value to decimal value

Syntax

```
binaryVectorToDecimal(binaryVector)
binaryVectorToDecimal(binaryVector,bitOrder)
```

Description

`binaryVectorToDecimal(binaryVector)` converts a binary vector to a decimal.

`binaryVectorToDecimal(binaryVector,bitOrder)` converts a binary vector with the specified bit orientation to a decimal .

Examples

Convert Binary Vector to a Decimal Value

```
binaryVectorToDecimal([1 1 0])
```

```
ans =

     6
```

Convert a Binary Vector Array to a Decimal Value

```
binaryVectorToDecimal([1 0 0 0; 0 1 0 0])
```

```
ans =

     8
     4
```

Convert a Binary Vector with LSB First

```
binaryVectorToDecimal([1 0 0 0; 0 1 0 0],'LSBFirst')
```

```
ans =

     1
     2
```

Convert a Binary Vector Array with LSB First

```
binaryVectorToDecimal([1 1 0],'LSBFirst')
```

```
ans =

     6
```

- "Generate Signals Using Decimal Data Across Multiple Lines"

Input Arguments

`binaryVector` — Binary vector to convert to decimal

binary Vectors

Binary vector to convert to a decimal specified as a single binary vector or a row or column-based array of binary vectors.

`bitOrder` — Bit order for binary vector representation

MSBFirst (default) | LSBFirst

Bit order for the binary vector representation specified as:

- `MSBFirst` if you want the first element of the output to contain the most significant bit of the decimal number.
- `LSBFirst` if you want the first element of the output to contain the least significant bit of the decimal number.

See Also

Functions

`binaryVectorToHex` | `decimalToBinaryVector` | `hexToBinaryVector`

hexToBinaryVector

Convert hexadecimal value to binary vector

Syntax

```
hexToBinaryVector(hexNumber)
hexToBinaryVector(hexNumber,numberOfBits)
hexToBinaryVector(hexNumber,numberOfBits,bitOrder)
```

Description

`hexToBinaryVector(hexNumber)` converts hexadecimal numbers to a binary vector.

`hexToBinaryVector(hexNumber,numberOfBits)` converts hexadecimal numbers to a binary vector with the specified number of bits.

`hexToBinaryVector(hexNumber,numberOfBits,bitOrder)` converts hexadecimal numbers to a binary vector with the specified number of bits in the specified bit ordering.

Examples

Convert a hexadecimal to a binary vector

```
hexToBinaryVector('A1')
```

```
ans=

     1     0     1     0     0     0     0     1
```

Convert a hexadecimal with a leading 0 to a binary Vector

```
hexToBinaryVector('0xA')
```

```
ans=
```

```
     1     0     1     0
```

Convert an array hexadecimal numbers to a binary vector

```
hexToBinaryVector(['A1'; 'B1'])
```

```
ans=

     1     0     1     0     0     0     0     1
     1     0     1     1     0     0     0     1
```

Convert a hexadecimal number into a binary vector of specific bits

```
hexToBinaryVector('A1',12, 'MSBFirst')
```

```
ans=

     0     0     0     0     1     0     1     0     0     0     0     1
```

Convert a cell array of hexadecimal numbers into a binary vector of specific bits

```
hexToBinaryVector({'A1';'B1'},8)
```

```
ans=

     1     0     1     0     0     0     0     1
     1     0     1     1     0     0     0     1
```

Convert a hexadecimal into a binary vector with LSB first

```
hexToBinaryVector('A1', [], 'LSBFirst')
```

```
ans=

     1     0     0     0     0     1     0     1
```

- “Acquire Digital Data in Hexadecimal Values”

Input Arguments

`hexNumber` — Hexadecimal to convert to binary vector

hexadecimal

Hexadecimal number to convert to a binary vector specified as a character or an array.

`numberOfBits` — Number of bits required to correctly represent the decimal number

numeric

This is an optional argument. If you do not specify the number of bits, the number is represented using the minimum number of bits needed.

`bitOrder` — Bit order for binary vector representation

MSBFirst (default) | LSBFirst

Bit order for the binary vector representation specified as:

- `MSBFirst` if you want the first element of the output to contain the most significant bit of the decimal number.
- `LSBFirst` if you want the first element of the output to contain the least significant bit of the decimal number.

See Also

Functions

`binaryVectorToDecimal` | `binaryVectorToHex` | `decimalToBinaryVector`

binaryVectorToHex

Convert binary vector value to hexadecimal

Syntax

```
binaryVectorToHex(binaryVector)
binaryVectorToHex(binaryVector,bitOrder)
```

Description

`binaryVectorToHex(binaryVector)` converts the input binary vector to a hexadecimal.

`binaryVectorToHex(binaryVector,bitOrder)` converts the input binary vector using the specified bit orientation.

Examples

Convert a Binary Vector to a Hexadecimal

```
binaryVectorToHex([0 0 1 1 1 1 0 1])
```

```
ans =

     3D
```

Convert an Array of Binary Vectors to a Hexadecimal

```
binaryVectorToHex([1 1 0 0 0 1 0 0 ; 0 0 0 0 1 0 1 0])
```

```
ans =

    'C4'
    '0A'
```

The output is appended with 0s to make all hex values same length strings.

Convert a Binary Vector with LSB First

```
binaryVectorToHex([0 0 1 1 1 1 0 1], 'LSBFirst')
```

```
ans =

     BC
```

Convert a Binary Vector Array with LSB First

```
binaryVectorToHex([1 1 0 0 0 1 0 0 ; 0 0 0 0 1 0 1 0], 'LSBFirst')

ans =

    '23'
    '50'
```

The output is appended with 0s to make all hex values same length strings.

Note: The binary vector array is converted to a cell array of hexadecimal numbers. If you input a single binary vector, it is converted to a hexadecimal string.

- "Acquire Digital Data in Hexadecimal Values"

Input Arguments

`binaryVector` — Binary vector to convert to hexadecimal

binary vector

The binary vector to convert to hexadecimal specified as a row vector with 0s and 1s. It can also be a column-based array of binary vectors

`bitOrder` — Bit order for binary vector representation

MSBFirst (default) | LSBFirst

Bit order for the binary vector representation specified as:

- `MSBFirst` if you want the first element of the output to contain the most significant bit of the decimal number.
- `LSBFirst` if you want the first element of the output to contain the least significant bit of the decimal number.

See Also

Functions

`binaryVectorToDecimal` | `decimalToBinaryVector` | `hexToBinaryVector`

addAudioInputChannel

Add audio input channel

Syntax

```
ch = addAudioInputChannel(s,deviceName,channelID)
[ch,idx] = addAudioInputChannel(s,deviceName,channelID)
```

Description

`ch = addAudioInputChannel(s,deviceName,channelID)` creates and displays the object `ch` representing a channel added to the session `s` using the device represented by `deviceName`, with the specified `channelID`. The channel is stored in the variable `ch`.

`[ch,idx] = addAudioInputChannel(s,deviceName,channelID)` additionally creates and displays the object `idx`, which is an index into the array of the session object's `Channels` property.

Tips

- Use `daq.createSession` to create a session object before you use this method.
- To use analog channels, see `addAnalogInputChannel`.

Input Arguments

`s` — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceName` — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID
numeric value

Channel ID, or the physical location of the channel on the device, added to the session, specified as numeric value. You can also add a range of channels. The index for this channel displayed in the session indicates this channels position in the session. If you add a channel with channel ID `1` as the first channel in a session, the session index is `1`.

Output Arguments

`ch` — Audio input channel object
1xn array

Audio input channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index
numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add an audio input channel

```
s = daq.createSession('directsound')
addAudioInputChannel(s,'Audio1',1);
```

Add multiple audio input channels

Add two audio input channels and specify output arguments to represent the channel object and the index.

```
s = daq.createSession('directsound')
[ch, idx] = addAudioInputChannel(s,'Audio1',1:2);
```

More About

- “Hardware Discovery and Session Setup”

See Also

`addAudioOutputChannel` | `daq.createSession` | `startForeground` | `startBackground` | `removeChannel`

addAudioOutputChannel

Add audio output channel

Syntax

```
ch = addAudioOutputChannel(s,deviceName,channelID)
[ch,idx] = addAudioOutputChannel(s,deviceName,channelID)
```

Description

`ch = addAudioOutputChannel(s,deviceName,channelID)` creates and displays the object `ch` representing a channel added to the session `s` using the device represented by `deviceName`, with the specified `channelID`. The channel is stored in the variable `ch`.

`[ch,idx] = addAudioOutputChannel(s,deviceName,channelID)` additionally creates and displays the object `idx`, which is an index into the array of the session object's `Channels` property.

Tips

- Use `daq.createSession` to create a session object before you use this method.
- To use analog channels, see `addAnalogInputChannel`.

Input Arguments

s — Session object

character string

Session object created using `daq.createSession` specified as a string variable. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

deviceName — Device ID

character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID

numeric value

Channel ID, or the physical location of the channel on the device, added to the session, specified as numeric value. You can also add a range of channels. The index for this channel displayed in the session indicates this channels position in the session. If you add a channel with channel ID `1` as the first channel in a session, the session index is `1`.

Output Arguments

`ch` — Audio output channel object

1xn array

Analog input channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

Properties

Examples

Add an audio output channel

```
s = daq.createSession ('directsound')
ch = addAudioOutputChannel(s,'Audio1',1);
```

Add multiple audio output channels

Add five audio input channels and specify output arguments to represent the channel object and the index.

```
s = daq.createSession ('directsound')
[ch, idx] = addAudioOutputChannel(s,'Audio1',1);
```

More About

- “Hardware Discovery and Session Setup”

See Also

`addAudioInputChannel` | `daq.createSession` | `startForeground` | `startBackground` | `removeChannel`

addFunctionGeneratorChannel

Add function generator channel

“Install Digilent Device Support” and “Create a Session ” before you work with function generator channels.

Syntax

```
addFunctionGeneratorChannel(s,deviceID,channelID,waveformType)
[ch,idx] = addFunctionGeneratorChannel(s,deviceID,channelID,
waveformType)
```

Description

`addFunctionGeneratorChannel(s,deviceID,channelID,waveformType)` adds a channel on the device represented by `deviceID`, with the specified `channelID` and `waveformType` to the session `s`.

`[ch,idx] = addFunctionGeneratorChannel(s,deviceID,channelID, waveformType)` creates and displays the object `ch`, representing the channel that was added and the index, `idx`, which is an index into the array of the session object’s `Channels` property.

Examples

Add a Function Generator Channel

Add a channel on a Digilent device with a sine waveform type.

Create a session for Digilent devices.

```
s = daq.createSession('digilent');
```

Add a channel with a sine waveform type.

```
addFunctionGeneratorChannel(s,'AD1', 1, 'Sine')
```

```
ans =

Data acquisition sine waveform generator '1' on device 'AD1':

          Phase: 0
          Range: -5.0 to +5.0 Volts
 TerminalConfig: SingleEnded
           Gain: 1
         Offset: 0
     SampleRate: 4096
   WaveformType: Sine
           Name: ''
             ID: '1'
         Device: [1x1 daq.di.DeviceInfo]
MeasurementType: 'Voltage'
```

Save the Channel Information and the Channel Index of a Function Generator Channel

Create a session for Digilent devices.

```
s = daq.createSession('digilent');
```

Add a channel with a sine waveform type.

```
[ch,idx] = addFunctionGeneratorChannel(s,'AD1', 1, 'Sine')
```

```
ch =

Data acquisition sine waveform generator '1' on device 'AD1':

          Phase: 0
          Range: -5.0 to +5.0 Volts
 TerminalConfig: SingleEnded
           Gain: 1
         Offset: 0
     SampleRate: 4096
   WaveformType: Sine
           Name: ''
             ID: '1'
         Device: [1x1 daq.di.DeviceInfo]
MeasurementType: 'Voltage'


Properties, Methods, Events
```

```
idx =

     1
```

- "Generate a Standard Waveform Using Waveform Function Generation Channels"

Input Arguments

`s` — Session object
character string

Session object created using `daq.createSession` specified as a character string. Use the data acquisition session for acquisition and generation operations. Create one session per vendor and use that vendor session to perform all data acquisition operations.

`deviceID` — Device ID
character string

Device ID as defined by the device vendor specified as a character string. Obtain the device ID by calling `daq.getDevices`. The channel specified for this device is created for the session object.

`channelID` — Channel ID
numeric value

Channel ID, or the physical location of the channel on the device, added to the session, specified as numeric value. You can also add a range of channels. The index for this channel displayed in the session indicates this channel's position in the session. If you add a channel with channel ID `1` as the first channel in a session, the session index is `1`.

`waveformType` — Function generator waveform type
character string

Function generator waveform type specified as a string. Waveform types include:

- `'Sine'`
- `'Square'`
- `'Triangle'`
- `'RampUp'`

- `'RampDown'`
- `'DC'`
- `'Arbitrary'`

Output Arguments

`ch` — Analog input channel object

1-by-n array

Analog input channel that you add, returned as an object containing a `1xn` array of vendor specific channel specific information. Use this channel object to access device and channel properties.

`idx` — Channel index

numeric value

Channel index returned as a numeric value. Through the index you can access the array of the session object's `Channels` property.

More About

- "Digilent Analog Discovery Devices"
- "Digilent Waveform Function Generation Channels"
- "Waveform Types"

See Also

Functions

`addAnalogInputChannel` | `daq.createSession` | `startForeground`