
# IVI-4.7: IviPwrMeter Class Specification

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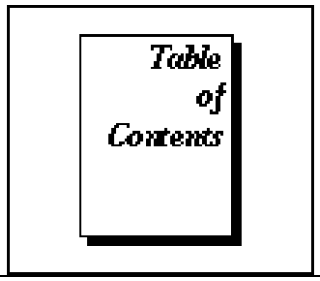

# IviPwrMeter Class Specification

## IviPwrMeter Revision History

This section is an overview of the revision history of the IviPwrMeter specification.

**Table 1.** IviPwrMeter Class Specification Revisions

| Revision Number | Date of Revision | Revision Notes |
|---|---|---|
| Revision 1.0 | February 2002 | First Approved Version. |
| Revision 1.0 | April 2008 | Editorial change to update the IVI Foundation contact information in the Important Information section to remove obsolete address information and refer only to the IVI Foundation web site. |
| Revision 1.0 | April 2009 | Editorial change to update repeated capabilities section to include both qualified and unqualified repeated capability names. |
| Revision 2.0 | June 9, 2010 | Incorporated IVI.NET |
| Revision 2.0 | August 25, 2011 | Editorial IVI.NET change.<br>Change references to process-wide locking to AppDomain-wide locking.<br>Add an overload to the Create factory method that takes locking related parameters. |
| Revision 2.0 | June 21, 2013 | Editorial IVI.NET change.<br>Change the .NET MeasurementState property (section 4.2.6) to a method named GetMeasurementComplete (insert section 4.3.10). Modify all related sections (16, 17, 19.1) and renumber sections as needed. |
| Revision 2.0 | September 24, 2015 | Editorial Change – Clarified the use of one-based index for COM, and zero-based index for .NET for repeated capabilities in section 4.2.4. |

### API Versions

| Architecture | Drivers that comply with version 2.0 comply with all of the versions below |
|---|---|
| C | 1.0, 2.0 |
| COM | 1.0, 2.0 |

| | |
|---|---|
| .NET | 2.0 |

Drivers that comply with this version of the specification also comply with earlier, compatible, versions of the specification as shown in the table above. The driver may benefit by advertising that it supports all the API versions listed in the table above.

# 1. Overview of the IviPwrMeter Specification

## 1.1 Introduction

This section introduces the *IviPwrMeter Class Specification*. This section summarizes the *IviPwrMeter Class Specification* itself and contains general information that the reader may need in order to understand, interpret, and implement aspects of this specification. These aspects include the following:

- IviPwrMeter Class Overview
- References
- The definitions of terms and acronyms

## 1.2 IviPwrMeter Class Overview

This specification defines the IVI class for RF power meters. The IviPwrMeter class is designed to support the typical power meter as well as common extended functionality found in more complex instruments. The IviPwrMeter class conceptualizes a power meter as an instrument that can measure the average RF power of an input signal and can be applied to several different instruments.

The IviPwrMeter class is divided into a base capability group and several extension capability groups. The base capability group is used to configure a power meter for a typical measurement (this includes setting the units, the auto range mode, the auto averaging mode, and the correction frequency), initiating a measurement, and returning a measured value. The base capability group supports both single and dual channel measurements. The IviPwrMeter base capability group is described in Section 4, *IviPwrMeterBase Capability Group*.

The IviPwrMeter class also contains extension groups that configure the advanced trigger settings, the manual range, the averaging count, and the reference oscillator of the power meter. The class also contains extension groups that perform zero correction and calibration.

## 1.3 References

Several other documents and specifications are related to this specification. These other related documents are the following:

- IVI-3.1: Driver Architecture Specification
- IVI-3.2: Inherent Capabilities Specification
- IVI-3.3: Standard Cross Class Capabilities Specification
- IVI-3.4: API Style Guide
- IVI-3.18: IVI.NET Utility Classes and Interfaces Specification
- IVI- 5.0: Glossary

## 1.4 Definitions of Terms and Acronyms

Refer to *IVI-5: Glossary* for a description of the terms and acronyms used in this specification. This specification does not define any additional terms.

# 2. IviPwrMeter Class Capabilities

## 2.1 Introduction

The IviPwrMeter specification divides generic power meter capabilities into a base capability group and several extension capability groups. Each capability group will be discussed in a separate section. This section defines names for each capability group and gives an overview of the information presented for each capability group.

## 2.2 IviPwrMeter Group Names

The capability group names for the IviPwrMeter class are defined below. The Group Name is used to represent a particular capability group and is returned as one of the possible group names from the Class Group Capabilities attribute. Refer to *IVI-3.2: Inherent Capabilities Specification* for a description of the Class Group Capabilities attribute.

**Table 2-1.** IviPwrMeter Group Names

| Capability Group Name | Description |
|---|---|
| `IviPwrMeterBase` | Base Capability Group: Power Meter that complies with the IviPwrMeterBase capability group. |
| `IviPwrMeterChannelAcquisition` | Channel Acquisition Extension Group: Power Meter that can acquire a measurement from a specified channel. |
| `IviPwrMeterManualRange` | Manual Range Extension Group: Power Meter that can manually set the measurement range. |
| `IviPwrMeterTriggerSource` | Trigger Source Extension Group: Power Meter that is able to specify a trigger source. |
| `IviPwrMeterInternalTrigger` | Internal Trigger Extension Group: Power Meter that can trigger internally on the measurement signal. |
| `IviPwrMeterSoftwareTrigger` | Software Trigger Extension Group: Power Meter that can trigger on a software trigger signal. |
| `IviPwrMeterAveragingCount` | Averaging Count Extension Group: Power Meter that can specify an averaging count in manual averaging mode. |
| `IviPwrMeterZeroCorrection` | Zero Correction Extension Group: Power Meter that can perform zero correction on an input channel for a given power sensor. |
| `IviPwrMeterDutyCycleCorrection` | Duty Cycle Correction Extension Group: Power Meter that can perform a duty cycle correction. |
| `IviPwrMeterCalibration` | Calibration Extension Group: Power Meter that can perform calibration for a given power sensor. |
| `IviPwrMeterReferenceOscillator` | Reference Oscillator Extension Group: Power Meter that can enable and configure an internal reference oscillator. |

Refer to Section 16, *Class Specification Layout*, in *IVI-3.4: API Style Guide* for a description of the Capability Group Section Layout.

## 2.3 Repeated Capability Names

The IviPwrMeter Class Specification defines one repeated capability. Refer to the sections of *IVI-3.1: Driver Architecture Specification* that deal with repeated capabilities. The relevant sections are Section 2.7, *Repeated Capabilities*, Section 4.1.9, *Repeated Capabilities*, Section 4.2.5, *Repeated Capabilities*, Section 4.3.9, *Repeated Capabilities*, and Section 5.9, *Repeated Capability Identifiers and Selectors*.

- Channel

### 2.3.1 Channel

In the configuration store, the repeated capability name for the channel repeated capability shall be exactly one of "Channel" or "IviPwrMeterChannel". Drivers that implement multiple repeated capabilities with the name "channel" shall use the latter form to disambiguate the names.

## 2.4 Boolean Attribute and Parameter Values

This specification uses True and False as the values for Boolean attributes and parameters. The following table defines the identifiers that are used for True and False in the IVI.NET, IVI-COM, and IVI-C architectures.

| Boolean Value | IVI.NET Identifier | IVI-COM Identifier | IVI-C Identifier |
|---|---|---|---|
| True | `true` | `VARIANT_TRUE` | `VI_TRUE` |
| False | `false` | `VARIANT_FALSE` | `VI_FALSE` |

## 2.5 .NET Namespace

The .NET namespace for the IviPwrMeter class is `Ivi.PwrMeter`.

## 2.6 .NET IviPwrMeter Session Factory

The IviPwrMeter .NET assembly contains a factory method called Create for creating instances of IviPwrMeter class-compliant IVI.NET drivers from driver sessions and logical names. Create is a static method accessible from the static IviPwrMeter class.

Refer to *IVI-3.5: Configuration Server Specification* for a description of how logical names and session names are defined in the configuration store.

Refer to Section 8, *IVI.NET Specific Driver Constructor*, of *IVI-3.2: Inherent Capabilities Specification*, for more details on how the `idQuery`, `reset`, and `options` parameters affect the instantiation of the driver.

Refer to Section 4.3.11, *Multithread Safety*, of *IVI-3.1: Driver Architecture Specification* for a complete description of IVI.NET driver locking. Refer to Section 8, Table 8.2 *Required Lock Type Behavior for Drivers With the Same Access Key*, of *IVI-3.2, Inherent Capability Specification*, for an explanation of how the values for `lockType` and `accessKey` are used to determine the kind of multithreaded lock to use for the driver instance.

#### .NET Method Prototype

```
IIviPwrMeter Ivi.PwrMeter.Create(String name);
```

```
IIviPwrMeter Ivi.PwrMeter.Create(String name,
                                 Boolean idQuery,
                                 Boolean reset);
IIviPwrMeter Ivi.PwrMeter.Create(String name,
                                 Boolean idQuery,
                                 Boolean reset,
                                 String options);

IIviPwrMeter Ivi.PwrMeter.Create(String resourceName,
                                 Boolean idQuery,
                                 Boolean reset,
                                 LockType lockType,
                                 String accessKey,
                                 String options);
```

### Parameters

| Inputs | Description | Base Type |
|---|---|---|
| `name` | A session name or a logical name that points to a session that uses an IVI.NET IviPwrMeter class-compliant driver. | `String` |
| `idQuery` | Specifies whether to verify the ID of the instrument. The default is False. | `Boolean` |
| `reset` | Specifies whether to reset the instrument. The default is False. | `Boolean` |
| `lockType` | Specifies whether to use AppDomain-wide locking or machine-wide locking. | `Ivi.Driver.LockType` |
| `accessKey` | Specifies a user-selectable access key to identify the lock. Driver instances that are created with the same accessKey will be protected from simultaneous access by multiple threads within an AppDomain or across AppDomains, depending upon the value of the lockType parameter. | `String` |
| `options` | A string that allows the user to specify the initial values of certain inherent attributes. The default is an empty string. | `String` |

| Outputs | Description | Base Type |
|---|---|---|
| `Return Value` | Interface pointer to the IIviPwrMeter interface of the driver referenced by `session`. | `IIviPwrMeter` |

### Defined Values

| ***Name*** | ***Description*** | | |
|---|---|---|---|
| | | ***Language*** | ***Identifier*** |
| AppDomain | The lock is AppDomain-wide. | | |
| | | .NET | `Ivi.Driver.LockType.AppDomain` |
| Machine | The lock is machine-wide. | | |
| | | .NET | `Ivi.Driver.LockType.Machine` |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

### Usage

To create a driver that implements the IviPwrMeter instrument class API from the logical name "My LogicalName" use the following:

```
IIviPwrMeter pwrMeter = IviPwrMeter.Create("MyLogicalName");
```

In this case, the ID of the instrument will not be verified, the instrument will not be reset, and options will be supplied from the configuration store and/or driver defaults.

# 3. General Requirements

This section describes the general requirements a specific instrument driver must meet in order to be compliant with this specification. In addition, it provides general requirements that specific drivers must meet in order to comply with a capability group, attribute, or function.

## *3.1 Minimum Class Compliance*

To be compliant with the IviPwrMeter Class Specification, an IVI specific driver shall conform to all of the requirements for an IVI class-compliant specific driver as specified in *IVI-3.1: Driver Architecture Specification*, implement the inherent capabilities that *IVI-3.2: Inherent IVI Capabilities Specification* defines, and implements the IviPwrMeterBase capability group.

### 3.1.1 Disable

Refer to *IVI-3.2: Inherent Capabilities Specification* for the prototype of this function. The IviPwrMeter specification does not define additional requirements on the Disable function.

## *3.2 Capability Group Compliance*

*IVI-3.1: Driver Architecture Specification* defines the general rules for a specific driver to be compliant with a capability group.

# 4. IviPwrMeterBase Capability Group

## 4.1 Overview

The IviPwrMeterBase capability group supports power meters that take a single measurement on one channel as well as instruments that can take synchronous measurements on two channels.

The IviPwrMeterBase capability group defines attributes and their values to configure the type of measurement and how the measurement is to be performed. These attributes include the units, the auto-range mode, the auto-averaging mode, the correction frequency, and the offset. The IviPwrMeterBase capability group also includes functions for configuring the power meter and for initiating and retrieving measurements.

## 4.2 IviPwrMeterBase Attributes

The IviPwrMeterBase capability group defines the following attributes:

- Averaging Auto Enabled
- Channel Count
- Channel Item (IVI-COM & IVI.NET Only)
- Channel Name (IVI-COM & IVI.NET Only)
- Measurement State
- Correction Frequency
- Offset
- Range Auto Enabled
- Units

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 4.2.1 Averaging Auto Enabled

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViBoolean | R/W | Channel | None | Configure Averaging Auto Enabled |

#### .NET Property Name

Channels[].Averaging.CountAuto

#### COM Property Name

Channels.Item().Averaging.AutoEnabled

#### C Constant Name

IVIPWRMETER_ATTR_AVERAGING_AUTO_ENABLED

#### Description

Specifies the auto-averaging mode used by the instrument for the specified input channel.

If this attribute is True, the instrument determines the best value for the averaging count automatically. The averaging count specifies the number of samples that the instrument takes before the measurement is complete.

If this attribute is False, the user specifies the averaging count explicitly by setting the Averaging Count attribute. Refer to Section 11.2.1, *Averaging Count* for more information.

If the driver implements the IviPwrMeterAveragingCount extension group, the actual averaging count the Power Meter is currently using can be determined from the Averaging Count attribute. If the driver does not implement the IviPwrMeterAveragingCount extension group, the driver shall return a Value Not Supported error (C/COM) or throw a Value Not Supported Exception (.NET) if the calling program attempts to set Auto Averaging Enabled to False.

For C and COM, if the Averaging Count attribute is set, the state of auto-averaging is indeterminate. For.NET, if the Averaging Count attribute is set, auto-averaging is disabled.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

#### Compliance Notes

1. If a specific driver implements the False value for this attribute, it shall also implement the IviPwrMeterAveragingCount extension group.

### 4.2.2 Channel Count

| Data Type | Access | Applies to | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | RO | IIviPwrMeterChannel | None | None |

#### .NET Property Name

```
Channels.Count;
```

This property is inherited from `IIviRepeatedCapabilityCollection`.

#### COM Property Name

```
Channels.Count
```

#### C Constant Name

```
IVIPWRMETER_ATTR_CHANNEL_COUNT
```

#### Description

Returns the number of currently available channels. The count returned includes any of the supported reserved repeated capability names defined in Section 2.3, *Repeated Capability Names* as well as any custom repeated capability identifiers.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

#### Compliance Note

The attribute ID value for this attribute shall be `IVI_INHERENT_ATTR_BASE + 203`.

### 4.2.3 Channel Item (IVI-COM & IVI.NET Only)

| Data Type | Access | Applies to | Coercion | High Level Functions |
|---|---|---|---|---|
| IIviPwrMeterChannel* | RO | Channel | None | None |

#### .NET Property Name

```
Channels[String name];
```

This indexer is inherited from `IIviRepeatedCapabilityCollection`. The name parameter uniquely identifies a particular channel in the Channel collection.

#### COM Property Name

```
Channels.Item ([in] BSTR ChannelName);
```

#### C Constant Name

N/A

#### Description

Channel Item uniquely identifies a channel in the channels collection. It returns an interface pointer which can be used to control the attributes and other functionality of that channel.

The Item property takes a channel name. If the user passes an invalid value for the `ChannelName` parameter, the property returns an error.

Valid Names include physical repeated capability identifiers and virtual repeated capability identifiers.

#### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| name (.NET)<br>ChannelName (COM) | Specifies the name of the channel to retrieve. | ViConstString |
| index | Specifies the 0-based index of the channel to retrieve. | ViInt32 |

#### Return Values (C/COM)

If the IVI-COM driver cannot recognize the `Name` parameter, it returns an Unknown Name in Selector completion code as described in *IVI-3.2: Inherent Capabilities Specification*, Section 9.3.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### 4.2.4 Channel Name (IVI-COM & IVI.NET Only)

| Data Type | Access | Applies to | Coercion | High Level Functions |
|---|---|---|---|---|
| ViString | RO | N/A | None | None |

#### .NET Property Name

```
Channels[].Name
```

This property is inherited from `IIviRepeatedCapabilityIdentification`.

#### COM Property Name

```
HRESULT Channels.Name ([in] LONG ChannelIndex);
```

#### C Constant Name

N/A.

Use the Get Channel Name function.

#### Description

Returns the physical repeated capability identifier defined by the specific driver for the channel that corresponds to the index that the user specifies. If the driver defines a qualified channel name, this property returns the qualified name.

In COM, the index is one-based. In .NET, the index is zero-based.

For C and COM, valid values for the `ChannelIndex` parameter are between one and the value of the Channel Count attribute, inclusive. If the user passes an invalid value for the `ChannelIndex` parameter, the value of this attribute is an empty string.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### 4.2.5 Correction Frequency

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | Channel | None | Configure Correction Frequency |

#### .NET Property Name

```
Channels[].CorrectionFrequency
```

#### COM Property Name

```
Channels.Item().CorrectionFrequency
```

#### C Constant Name

```
IVIPWRMETER_ATTR_CORRECTION_FREQUENCY
```

#### Description

Specifies the frequency of the input signal in Hertz. The instrument uses this value to determine the appropriate correction factor for the sensor.

In order to obtain the most accurate measurement, the user should specify the correction frequency as close as possible to the actual frequency of the input signal.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 4.2.6 Offset

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | Channel | None | Configure Offset |

### .NET Property Name

```
Channels[].Offset
```

### COM Property Name

```
Channels.Item().Offset
```

### C Constant Name

```
IVIPWRMETER_ATTR_OFFSET
```

### Description

Specifies an offset to be added to the measured value in units of dB. This attribute can be used to compensate for system losses or gains between the unit under test and the sensor of the power meter.

A positive value shall be used for loss compensation whereas a negative value shall be used for gain compensation. For example, a cable loss of 2 dB could be compensated for by setting this attribute to +2. Similarly, a gain stage of 10 dB could be accounted for by setting the value of this attribute to –10. In both cases, the reading from the power meter will indicate the power at the unit under test rather than power at the power meter's sensor.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 4.2.7 Range Auto Enabled

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViBoolean (C/COM) | R/W | Channel | None | Configure Range Auto Enabled |
| ViBoolean (.NET) | R/W | Channel | None | Configure Range |

### .NET Property Name

```
Channels[].Range.Auto
```

### COM Property Name

```
Channels.Item().Range.AutoEnabled
```

### C Constant Name

```
IVIPWRMETER_ATTR_RANGE_AUTO_ENABLED
```

### Description

If this attribute is set to True, the instrument automatically determines the best range for the measurement That is, the instrument selects values for both the Range Lower and Range Upper attributes.

If this attribute is set to False, the user specifies the lower and upper limits of the measurement range by explicitly setting the Range Lower and Range Upper attributes. Refer to Section 6, *IviPwrMeterManualRange Extension Group* for more information.

If the driver implements the IviPwrMeterManualRange extension group, the actual range the power meter is currently using can be determined from the Range Lower and Range Upper attributes. If the driver does not implement the IviPwrMeterManualRange extension group, the driver shall return a Value Not Supported error (C/COM) or throw a Value Not Supported Exception (.NET) if the calling program attempts to set Range Auto Enabled to False.

For C and COM, if either the Range Lower or Range Upper attribute is set, the state of auto-range is indeterminate. For .NET, if either the Range Lower or Range Upper attribute is set, auto-range is disabled.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### Compliance Notes

1. If a specific driver implements the False value for this attribute, it shall also implement the IviPwrMeterManualRange extension capability group.

## 4.2.8 Units

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | R/W | N/A | None | Configure Units |

### .NET Property Name

Channels.Units

### .NET Enumeration Name

Ivi.PwrMeter.UnitsEnum

### COM Property Name

Channels.Units

### COM Enumeration Name

IviPwrMeterUnitsEnum

### C Constant Name

IVIPWRMETER_ATTR_UNITS

### Description

Specifies the unit to which the RF power is converted after measurement.

The actual RF power of the signal on a channel is always measured in Watts. The value of this attribute is used to determine the units in which the Range Upper and Range Lower attributes are specified. The unit of the measurement result returned by the Read and Fetch functions also depends on the value of this attribute.

### Defined Values

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| dBm | Sets the units to dBm. | | |
| | | .NET | Units.dBm |
| | | C | IVIPWRMETER_VAL_DBM |
| | | COM | IviPwrMeterUnitsdBm |
| dBmV | Sets the units to dB millivolts. | | |
| | | .NET | Units.dBmV |
| | | C | IVIPWRMETER_VAL_DBMV |
| | | COM | IviPwrMeterUnitsdBmV |
| dBuV | Sets the units to dB microvolts. | | |
| | | .NET | Units.dBuV |
| | | C | IVIPWRMETER_VAL_DBUV |

| | | | |
|---|---|---|---|
| | | COM | IviPwrMeterUnitsdBuV |
| Watts | Sets the units to Watts. | | |
| | | .NET | Units.Watts |
| | | C | IVIPWRMETER_VAL_WATTS |
| | | COM | IviPwrMeterUnitsWatts |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### Compliance Notes

1. If an IVI-C specific driver defines additional values for this attribute, the actual values shall be greater than or equal to IVIPWRMETER_VAL_UNITS_SPECIFIC_EXT_BASE.
2. If an IVI-C class driver defines additional values for this attribute, the actual values shall be greater than or equal to IVIPWRMETER_VAL_UNITS_CLASS_EXT_BASE and less than IVIPWRMETER_VAL_UNITS_SPECIFIC_EXT_BASE.
3. When an IVI-COM specific driver implements this attribute with additional elements in its instrument specific interfaces, it is recommended that the actual values of the additional elements be greater than or equal to Units Specific Extension Base.

   See Section 16, Attribute Value Definitions, for the definitions of Units Specific Exention Base, IVIPWRMETER_VAL_UNITS_SPECIFIC_EXT_BASE and IVIPWRMETER_VAL_UNITS_CLASS_EXT_BASE.

## 4.3 IviPwrMeterBase Functions

The IviPwrMeterBase capability group defines the following functions:

- Abort
- Configure Averaging Auto Enabled (IVI-C Only)
- Configure Correction Frequency (IVI-C Only)
- Configure Measurement
- Configure Offset (IVI-C Only)
- Configure Range Auto Enabled (IVI-C Only)
- Configure Units (IVI-C Only)
- Fetch
- Get Channel Name (IVI-C Only)
- Initiate
- Is Measurement Complete (IVI-C & IVI-COM Only)
- Query Result Range Type
- Read

This section describes the behavior and requirements of each function.

### 4.3.1 Abort

#### Description

This function aborts all previously initiated measurements and returns the power meter to the *Idle* state.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

#### .NET Method Prototype

```
void Measurement.Abort ();
```

#### COM Method Prototype

```
HRESULT Measurement.Abort ();
```

#### C Prototype

```
ViStatus IviPwrMeter_Abort (ViSession Vi);
```

#### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |

#### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

#### .NET Exceptions

The IVI-3.2: *Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 4.3.2 Configure Averaging Auto Enabled (IVI-C Only)

### Description

This function enables or disables the auto-averaging mode.

### .NET Method Prototype

N/A

(Use the `Channels[].Averaging.AutoEnabled` property)

### COM Method Prototype

N/A

(Use the `Channels.Item().Averaging.AutoEnabled` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureAveragingAutoEnabled (ViSession Vi,
                                                    ViConstString Channel,
                                                    ViBoolean AveragingAutoEnabled);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel to be configured. | `ViConstString` |
| `AveragingAutoEnabled` | The auto-averaging mode. Pass True to turn auto-averaging on. Pass False to turn auto-averaging off. The value of this parameter is used to set the Auto Averaging Enabled attribute. See the attribute description for more information. | `ViBoolean` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.3 Configure Correction Frequency (IVI-C Only)

### Description

This function specifies the frequency of the input signal in Hertz. The instrument uses this value to determine the appropriate correction factor for the sensor.

### .NET Method Prototype

`N/A`

(Use the `Channels[].CorrectionFrequency` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Item().CorrectionFrequency` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureCorrectionFrequency (ViSession Vi,
                                                   ViConstString Channel,
                                                   ViReal64 CorrectionFrequency);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel to configure. | `ViConstString` |
| `CorrectionFrequency` | The frequency of the input signal. The value of this parameter is used to set the Correction Frequency attribute. See the attribute description for more information. | `ViReal64` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.4 Configure Measurement

### Description

This function configures the instrument to take single or dual channel measurements.

To configure the power meter to take single channel measurements, pass None as the value of the `Operator` parameter. To configure the power meter to take simultaneous dual channel measurements, pass one of the defined math operators as the value of the `Operator` parameter.

If the user passes None as the value of the `Operator` parameter, this function enables the channel specified by the `Operand1` parameter and disables all other channels. The value of the `Operand2` parameter is ignored. The result returned by the Fetch or Read functions is the measurement taken at the channel specified by the `Operand1` parameter.

If the user does not pass None as the value of the `Operator` parameter, this function enables the channels specified by the `Operand1` and `Operand2` parameters and disables all other channels. The result returned by the Fetch or Read functions is the result of the math operation specified by the `Operator` parameter applied to the measurements on the channels specified by the `Operand1` and `Operand2` parameters.

The driver always measures the power on both channels in Watts. For single channel measurements, the result is converted to the same unit as the value of the Units attribute. For dual channel measurements, the math operation is performed on the measured values in Watts and the result is converted to the appropriate unit depending on the value of the Units attribute and the value of the `Operator` parameter as shown in the following table.

**Table 4-1.** Operator parameter and Result Units

| Units | Operator | Result Units |
|---|---|---|
| dBm | Difference | dBm |
| | Quotient | dB |
| | Sum | dBm |
| dBmV | Difference | dBmV |
| | Quotient | dB |
| | Sum | dBmV |
| dBuV | Difference | dBuV |
| | Quotient | dB |
| | Sum | dBuV |
| Watts | Difference | Watts |
| | Quotient | No Unit |
| | Sum | Watts |

### .NET Method Prototype

```
void Measurement.Configure (Ivi.PwrMeter.MeasurementOperator measurementOperator,
                            String operand1,
                            String operand2);
```

### COM Method Prototype

```
HRESULT Measurement.Configure ([in] IviPwrMeterMeasurementOperatorEnum Operator,
                               [in] BSTR Operand1,
                               [in] BSTR Operand2);
```

### C Prototype

```
ViStatus IviPwrMeter_ConfigureMeasurement (ViSession Vi,
                                           ViInt32 Operator
                                           ViConstString Operand1,
                                           ViConstString Operand2);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle. | ViSession |
| Operator C/COM<br>measurementOperator .NET | The math function applied to the operands. | ViInt32 |
| Operand1 | The name of the channel from which the value for the first operand of the math function is measured. | ViConstString |
| Operand2 | The name of the channel from which the value for the second operand of the math function is measured. | ViConstString |

### Defined Values for the Operator Parameter

| ***Name*** | ***Description*** | | |
|---|---|---|---|
| | | ***Language*** | ***Identifier*** |
| Difference | Operand1 – Operand2 | | |
| | | .NET | Ivi.PwrMeter.MeasurementOperator.Difference |
| | | C | IVIPWRMETER_VAL_DIFFERENCE |
| | | COM | IviPwrMeterMeasurementOperatorDifference |
| Sum | Operand1 + Operand2 | | |
| | | .NET | Ivi.PwrMeter.MeasurementOperator.Sum |
| | | C | IVIPWRMETER_VAL_SUM |
| | | COM | IviPwrMeterMeasurementOperatorSum |
| Quotient | Operand1 / Operand2 | | |
| | | .NET | Ivi.PwrMeter.MeasurementOperator.Quotient |
| | | C | IVIPWRMETER_VAL_QUOTIENT |
| | | COM | IviPwrMeterMeasurementOperatorQuotient |
| None | Operand1 | | |
| | | .NET | Ivi.PwrMeter.MeasurementOperator.None |
| | | C | IVIPWRMETER_VAL_NONE |
| | | COM | IviPwrMeterMeasurementOperatorNone |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

### Compliance Notes

1. If an IVI-C specific driver defines additional values for the `Operator` parameter, the magnitude of the actual values shall be greater than or equal to `IVIPWRMETER_VAL_OPERATOR_SPECIFIC_EXT_BASE`.
2. If an IVI-C class driver defines additional values for the `Operator` parameter, the magnitude of the actual values shall be greater than or equal to `IVIPWRMETER_VAL_OPERATOR_CLASS_EXT_BASE` and less than `IVIPWRMETER_VAL_OPERATOR_SPECIFIC_EXT_BASE`.
3. When an IVI-COM specific driver implements the `Operator` parameter with additional elements in its instrument specific interfaces, it is recommended that the actual values of the additional elements be greater than or equal to Operator Specific Extension Base.

   See Section 17, Function Parameter Value Definitions, for the definitions of Operator Specific Extension Base, `IVIPWRMETER_VAL_OPERATOR_SPECIFIC_EXT_BASE` and `IVIPWRMETER_VAL_OPERATOR_CLASS_EXT_BASE`.

## 4.3.5 Configure Offset (IVI-C Only)

### Description

This function specifies the offset to be added to the measured value in units of dB.

### .NET Method Prototype

`N/A`

(Use the `Channels[].Offset` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Item().Offset` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureOffset (ViSession Vi,
                                      ViConstString Channel,
                                      ViReal64 Offset);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel for which to set the Offset. | `ViConstString` |
| `Offset` | The offset for the measured value. The value of this parameter is used to set the Offset attribute. See the attribute description for more information. | `ViReal64` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.6 Configure Range Auto Enabled (IVI-C Only)

### Description

This function configures the auto range mode for a given channel.

### .NET Method Prototype

`N/A`

(Use the `Channels[].Range.AutoEnabled` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Item().Range.AutoEnabled` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureRangeAutoEnabled (ViSession Vi,
                                                ViConstString Channel,
                                                ViBoolean RangeAutoEnabled);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel to configure. | `ViConstString` |
| `RangeAutoEnabled` | The auto range mode. Pass True to turn auto ranging on. Pass False to turn auto ranging off. The value of this parameter is used to set the Range Auto Enabled attribute. See the attribute description for more information. | `ViBoolean` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.7 Configure Units (IVI-C Only)

### Description

This function configures the unit to which the RF power is converted after measurement.

### .NET Method Prototype

`N/A`

(Use the `Channels.Units` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Units` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureUnits (ViSession Vi,
                                     ViInt32 Units);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Units` | The unit of the measurement result. The value of this parameter is used to set the Units attribute. See the attribute description for more information. | `ViInt32` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.8 Fetch

### Description

This function returns the result from a previously initiated single or dual channel measurement. Call the Initiate function to initiate a measurement before calling this function.

After this function executes, the value of the `Result` parameter depends on the math operation that the user specifies in the Configure Measurement function.

For single channel measurements, the `Result` parameter contains an actual reading on the channel specified by the Configure Measurement function. The unit of the result is the same as the value of the Units attribute.

For dual channel measurements, the `Result` parameter contains the result of the math operation applied to the channels specified in the Configure Measurement function. The unit of the result depends on the value of the Units attribute and the value of the `Operator` parameter passed to the Configure Measurement function. Refer to Table 4-1 in Section 4.3.4, *Configure Measurement* for more details.

The behavior is different for IVI-C/IVI-COM and IVI.NET as follows:

> IVI-C & IVI-COM: If an out of range condition occurs on one or more enabled channels, the result is a value indicating that an out of range condition occurred. In such a case, the `Result` parameter contains an IEEE 754 defined -Inf (Negative Infinity) or +Inf (Positive Infinity) value and the function returns the Over Range or Under Range warning. Test if the measurement value is out of range with the Query Result Range Type function.
>
> IVI.NET: The reading is the return value of the method. If an overrange condition occurs, the result will be Double.PositiveInfinity or Double.NegativeInfinity. No exception shall be thrown. The end user may test the measurement value for overrange with Double.IsInfinity(), Double.IsPositiveInfinity() or Double.IsNegativeInfinity() methods.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

```
Double Measurement.Fetch ();
Double Measurement.Fetch (out Boolean sampleOutOfRange);
```

### COM Method Prototype

```
HRESULT Measurement.Fetch ([out, retval] DOUBLE* Result);
```

### C Prototype

```
ViStatus IviPwrMeter_Fetch (ViSession Vi,
                            ViReal64 *Result);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |

| Outputs | Description | Datatype |
|---|---|---|
| sampleOutOfRange | True if any of the values are under or over range, otherwise false. | ViBoolean |
| Result (C/COM) | Measured value | ViReal64* |
| Return value (.NET) | Measured value | ViReal64 |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return. The table below specifies additional class-defined status codes for this function.

| Completion Code | Description |
|---|---|
| Over Range | Measurement is over range. |
| Under Range | Measurement is under range. |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

.NET does not have over and under range warnings. Instead, the method returns Double.PositiveInfinity or Double.NegativeInfinity respectively.

## 4.3.9 Get Channel Name (IVI-C Only)

### Description

This function returns the physical channel identifier that corresponds to the one-based index that the user specifies. If the driver defines a qualified channel name, this property returns the qualified name. If the value that the user passes for the `ChannelIndex` parameter is less than one or greater than the value of the Channel Count attribute, the function returns an empty string in the `ChannelName` parameter and returns an error.

### .NET Method Prototype

`N/A`

(Use the `Channels[].Name` property instead)

### COM Method Prototype

`N/A`

(Use the `Channels.Name()` method instead)

### C Prototype

```
ViStatus IviPwrMeter_GetChannelName (ViSession Vi,
                                     ViInt32 ChannelIndex,
                                     ViInt32 ChannelNameBufferSize,
                                     ViChar ChannelName[]);
```

### Parameters

| Inputs | Description | Base Type |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |
| `ChannelIndex` | A one-based index that defines which name to return. | `ViInt32` |
| `ChannelName BufferSize` | The number of bytes in the ViChar array that the user specifies for the `ChannelName` parameter. | `ViInt32` |

| Outputs | Description | Base Type |
|---|---|---|
| `ChannelName` | The buffer into which the function returns the channel name that corresponds to the index the user specifies.<br>The caller may pass `VI_NULL` for this parameter if the `ChannelNameBufferSize` parameter is 0. | `ViChar[]` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.10 Initiate

### Description

This function initiates a measurement on all enabled channels. When this function executes, the power meter leaves the *Idle* state and takes a measurement on all enabled channels. Use the Fetch or Fetch Channel function to obtain the result of the measurements.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

```
void Measurement.Initiate();
```

### COM Method Prototype

```
HRESULT Measurement.Initiate();
```

### C Prototype

```
ViStatus IviPwrMeter_Initiate (ViSession Vi);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle | ViSession |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 4.3.11 Is Measurement Complete

### Description

This function queries the instrument to determine the status of the measurement initiated by the Initiate function. This function returns the Measurement Complete value only when measurements are complete on all enabled channels.

If some measurements are still in progress on one or more channels, the driver returns the Measurement In Progress value. If the driver cannot query the instrument to determine its state, the driver returns the Measurement Status Unknown value.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

```
Ivi.PwrMeter.OperationState Measurement.GetMeasurementComplete ();
```

### COM Method Prototype

```
HRESULT Measurement.IsMeasurementComplete ([out, retval]
                                    IviPwrMeterMeasurementStatusEnum* Status);
```

### C Prototype

```
ViStatus IviPwrMeter_IsMeasurementComplete (ViSession Vi,
                                            ViInt32 *Status);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |

| Outputs | Description | Datatype |
|---|---|---|
| `Status (C, COM)`<br>`Return value (.NET)` | Returns the status of the measurement. | `ViInt32*` |

### Defined Values for Status Parameter (C, COM) or Return Value (.NET)

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Measurement Complete | The power meter has completed the measurement on all enabled channels. | | |
| | | .NET | `Ivi.PwrMeter.OperationState.Complete` |
| | | C | `IVIPWRMETER_VAL_MEAS_COMPLETE` |
| | | COM | `IviPwrMeterMeasurementStatusComplete` |
| Measurement In Progress | The power meter is still taking a measurement on one or more enabled channels. | | |

| | | | |
|---|---|---|---|
| | | .NET | `Ivi.PwrMeter.OperationState.InProgress` |
| | | C | `IVIPWRMETER_VAL_MEAS_IN_PROGRESS` |
| | | COM | `IviPwrMeterMeasurementStatusInProgress` |
| Measurement Status Unknown | The power meter cannot determine the status of the measurement. | | |
| | | .NET | `Ivi.PwrMeter.OperationState.Unknown` |
| | | C | `IVIPWRMETER_VAL_MEAS_STATUS_UNKNOWN` |
| | | COM | `IviPwrMeterMeasurementStatusUnknown` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 4.3.12 Query Result Range Type

### Description

This function takes a measurement value that is returned from one of the Fetch, Fetch Channel, Read, or Read Channel functions and determines if the value is a valid measurement value or a value indicating that an out-of-range condition occurred.

### .NET Method Prototype

N/A

(See the documentation for the Read and Fetch methods for information about determining whether an out of range condition exists.)

### COM Method Prototype

```
HRESULT Measurement.QueryResultRangeType([in] DOUBLE MeasurementValue,
                            [out, retval] IviPwrMeterResultRangeEnum* RangeType);
```

### C Prototype

```
ViStatus IviPwrMeter_QueryResultRangeType (ViSession Vi,
                                           ViReal64 MeasurementValue,
                                           ViInt32 *RangeType);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle | ViSession |
| MeasurementValue | The measurement value returned by one of the Fetch or Read functions. | ViReal64 |

| Outputs | Description | Datatype |
|---|---|---|
| RangeType | Returns whether the MeasurementValue is a valid measurement or a value indicating that the power meter encountered an out-of-range condition. | ViInt32* |

### Defined Values for the RangeType Parameter

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| In Range | The measurement is within the current range limits. | | |
| | | C | IVIPWRMETER_VAL_IN_RANGE |
| | | COM | IviPwrMeterResultRangeInRange |
| Under Range | The measurement is below the current lower range limit. | | |
| | | C | IVIPWRMETER_VAL_UNDER_RANGE |
| | | COM | IviPwrMeterResultRangeUnderRange |
| Over Range | The measurement is above the current upper range limit. | | |
| | | C | IVIPWRMETER_VAL_OVER_RANGE |

| | | | |
|---|---|---|---|
| | | COM | IviPwrMeterResultRangeOverRange |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 4.3.13 Read

### Description

This function initiates a measurement, waits until the power meter has returned to the *Idle* state, and returns the result of the measurement.

After this function executes, the value of the `Result` parameter depends on the math operation that the user specifies in the Configure Measurement function.

For single channel measurements, the `Result` parameter contains an actual reading on the channel specified by the Configure Measurement function. The unit of the result is the same as the value of the Units attribute.

For dual channel measurements, the `Result` parameter contains the result of the math operation applied to the channels specified in the Configure Measurement function. The unit of the result depends on the value of the Units attribute and the math function. Refer to Table 4-1 in Section 4.3.4, *Configure Measurement* for more details.

The behavior is different for IVI-C/IVI-COM and IVI.NET as follows:

IVI-C & IVI-COM: If an out of range condition occurs on one or more enabled channels, the result is a value indicating that an out of range condition occurred. In such a case, the `Result` parameter contains an IEEE 754 defined -Inf (Negative Infinity) or +Inf (Positive Infinity) value and the function returns the Over Range or Under Range warning. Test if the measurement value is out of range with the Query Result Range Type function.

IVI.NET: The reading is the return value of the method. If an overrange condition occurs, the result will be Double.PositiveInfinity or Double.NegativeInfinity. No exception shall be thrown. The end user may test the measurement value for overrange with Double.IsInfinity(), Double.IsPositiveInfinity() or Double.IsNegativeInfinity() methods.

For .NET a maximumTime of PrecisionTimeSpan.Zero indicates that the measurement should only be returned if it is already available. A maximumTime of PrecisionTimeSpan.MaxValue indicates that the measurement should wait until a measurement is available, with no timeout.

### .NET Method Prototype

```
Double Measurement.Read (PrecisionTimeSpan maximumTime);
Double Measurement.Read (PrecisionTimeSpan maximumTime, out Boolean
                         sampleOutOfRange);
```

### COM Method Prototype

```
HRESULT Measurement.Read ([in] LONG MaxTimeMilliseconds,
                          [out, retval] DOUBLE* Result);
```

### C Prototype

```
ViStatus IviPwrMeter_Read (ViSession Vi,
                           ViInt32 MaxTimeMilliseconds,
                           ViReal64 *Result);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |

| | | |
|---|---|---|
| MaxTimeMilliseconds (C/COM) | Specifies the maximum time in milliseconds to wait for a return value. | ViInt32 |
| maximumTime (.NET) | Specifies the maximum time to wait for a return value. | PrecisionTimeSpan |

| Outputs | Description | Datatype |
|---|---|---|
| sampleOutOfRange | True if any of the values are under or over range, otherwise false. | ViBoolean |
| Result (C/COM) | Measured value. | ViReal64* |
| Return value (.NET) | Measured value. | ViReal64 |

**Defined Values for the MaxTimeMilliseconds Parameter (C/COM)**

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Immediate Timeout | The function returns immediately. If no valid measurement value exists, the function returns an error. | | |
| | | C | `IVIPWRMETER_VAL_MAX_TIME_IMMEDIATE` |
| | | COM | `IviPwrMeterTimeOutImmediate` |
| Infinite Timeout | The function waits indefinitely for the measurement to complete. | | |
| | | C | `IVIPWRMETER_VAL_MAX_TIME_INFINITE` |
| | | COM | `IviPwrMeterTimeOutInfinite` |

### Defined Values for the MaximumTime Parameter (.NET)

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Zero | The function returns immediately. If no valid measurement value exists, the function returns an error. | | |
| | | .NET | `PrecisionTimeSpan.Zero` |
| Max Value | The function waits indefinitely for the measurement to complete. | | |
| | | .NET | `PrecisionTimeSpan.MaxValue` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return. The table below specifies additional class-defined status codes for this function.

| Completion Code | Description |
|---|---|
| Over Range | Measurement is over range. |
| Under Range | Measurement is under range. |
| Max Time Exceeded | Maximum timeout exceeded before operation could complete. |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

.NET does not have over and under range warnings. Instead, the method returns Double.PositiveInfinity or Double.NegativeInfinity respectively.

Note that the .NET MaxTimeExceededException is defined in *IVI-3.2: Inherent Capabilities Specification*.

### Compliance Notes

1. A specific driver is not required to implement the Immediate Timeout or the Infinite Timeout defined values for the `MaxTimeMilliseconds` parameter to be compliant with the IviPwrMeterBase capability group.

## 4.4 IviPwrMeterBase Behavior Model

The following state diagram shows relationships between the IviPwrMeterBase capability group and power meter behavior.

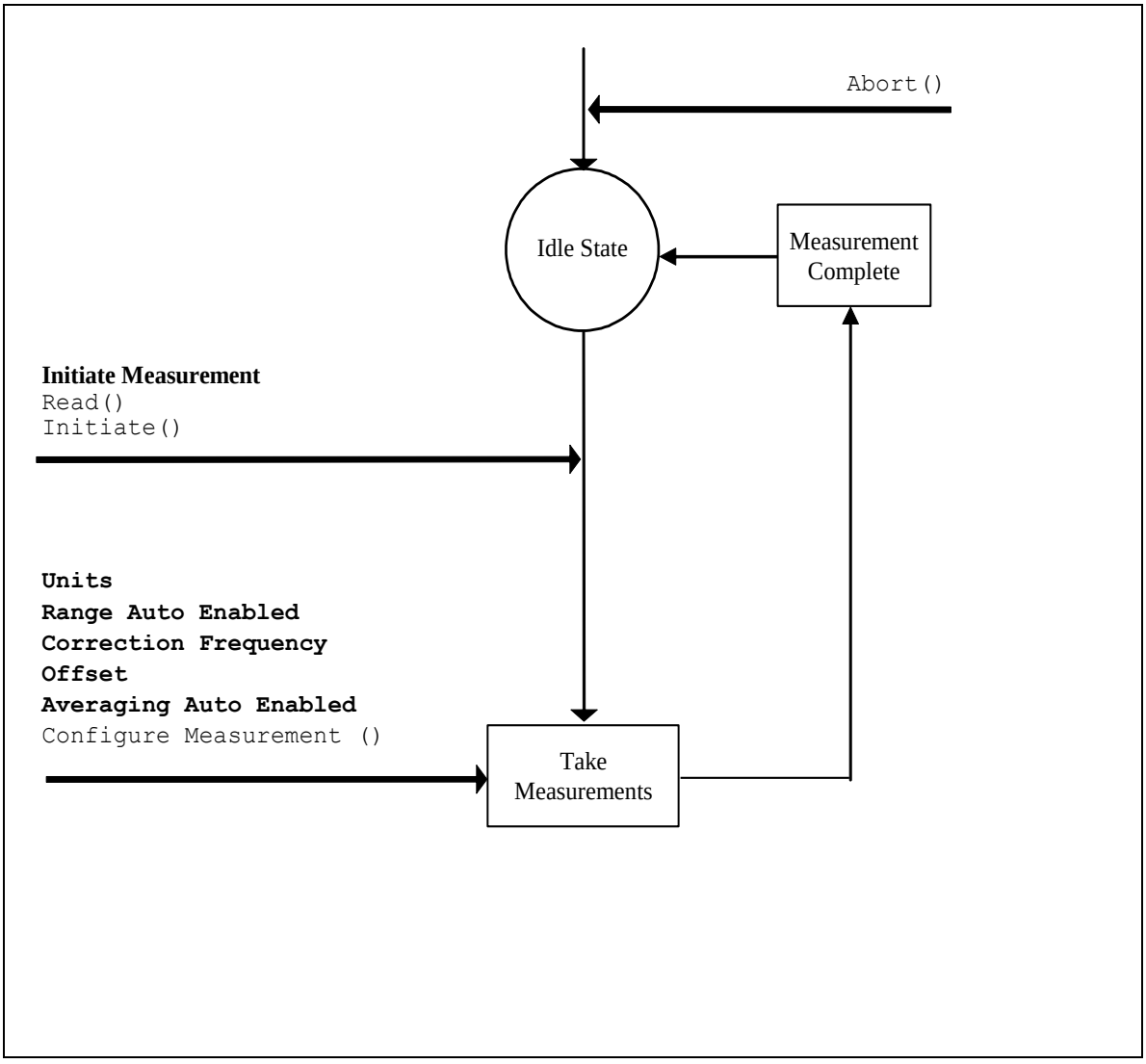


**Figure 1.** IviPwrMeterBase Behavior Model

The main state in the IviPwrMeter Class is the *Idle* state. The power meter enters the *Idle* state as the result of being "powered-on", successfully completing a measurement, or by being aborted from a previous measurement by the user with the Abort function. Typically, the user configures the power meter while it is in the *Idle* state. IviPwrMeter attributes can be configured individually with the Set Attribute function or with the high-level configuration functions defined in the IviPwrMeterBase capability group.

The Read and Initiate functions cause the power meter to leave the *Idle* state and take a measurement on all enabled channels. The Read function does not return until the measurement process is complete and the power meter has returned to the *Idle* state. The Initiate function returns as soon as the power meter leaves the *Idle* state. The Fetch function is used to retrieve measurements that were initiated by the Initiate function.

As soon as the power meter leaves the *Idle* state, it immediately takes a measurement on all enabled channels.You enable channels by calling the Configure Measurement function before initiating the measurement. The power meter takes a measurement on the channels specified in the Configure Measurement function and performs the specified math operation on the results.

After all measurements have been taken, the power meter (if it is capable of doing so) generates the Measurement Complete signal and returns to the *Idle* state. The IviPwrMeterBase capability group does not require that a power meter be able to generate a Measurement Complete signal. The IviPwrMeterBase capability group does not define how a Measurement Complete signal is configured. The Measurement Complete signal is presented in the IviPwrMeter behavior model diagram to define when the signal is generated as most power meters generate this signal but may not be able to configure it.

# 5. IviPwrMeterChannelAcquisition Extension Group

## 5.1 Overview

The IviPwrMeterChannelAcquisition extension capability group supports power meters that can perform simultaneous measurements on two or more channels and fetch the measurement from each specified channel. The IviPwrMeterChannelAcquisition extension capability also includes attributes for enabling a channel for measurement and functions for acquiring measurements on a specified channel.

## 5.2 IviPwrMeterChannelAcquisition Attributes

The IviPwrMeterChannelAcquisition capability group defines the following attributes:

- Channel Enabled

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 5.2.1 Channel Enabled

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViBoolean | R/W | Channel | None | Configure Channel Enabled |

#### .NET Property Name

```
Channels[].Enabled
```

#### COM Property Name

```
Channels.Item().Enabled
```

#### C Constant Name

```
IVIPWRMETER_ATTR_CHANNEL_ENABLED
```

#### Description

If set to True, enables the specified channel. If set to False, disables the specified channel. The power meter will take a measurement on a channel only if that channel is enabled.

Channels are also enabled when the user calls the Configure Measurement function. See the function description for more information.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 5.3 IviPwrMeterChannelAcquisition Functions

The IviPwrMeterChannelAcquisition extension capability group defines the following functions:

- Configure Channel Enabled (IVI-C Only)
- Fetch Channel
- Read Channel

This section describes the behavior and requirements of each function.

## 5.3.1 Configure Channel Enabled (IVI-C Only)

### Description

This function enables or disables a specified channel for measurement.

### .NET Method Prototype

`N/A`

(Use the `Channels[].Enabled` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Item().Enabled` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureChannelEnabled (ViSession Vi,
                                              ViConstString Channel,
                                              ViBoolean ChannelEnabled);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel. | `ViConstString` |
| `ChannelEnabled` | Pass True to enable the channel. Pass False to disable the channel. The value of this parameter is used to set the Channel Enabled attribute. See the attribute description for more information. | `ViBoolean` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 5.3.2 Fetch Channel

### Description

This function returns the result from a previously initiated measurement on a specified channel. Call the Initiate function to initiate a measurement before calling this function.

After this function executes, the `Result` parameter contains an actual reading on the channel specified by the `Channel` parameter. If the specified channel is not enabled for measurement, this function returns the Channel Not Enabled error. The result is in the same unit as the value of the Units attribute.

The behavior is different for IVI-C/IVI-COM and IVI.NET as follows:

IVI-C & IVI-COM: If an out of range condition occurs, the result is a value indicating that an out of range condition occurred. In such a case, the `Result` parameter contains an IEEE 754 defined -Inf (Negative Infinity) or +Inf (Positive Infinity) value and the function returns the Over Range or Under Range warning. Test if the measurement value is out of range with the Query Result Range Type function.

IVI.NET: The reading is the return value of the method. If an overrange condition occurs, the result will be Double.PositiveInfinity or Double.NegativeInfinity. No exception shall be thrown. The end user may test the measurement value for overrange with Double.IsInfinity(), Double.IsPositiveInfinity() or Double.IsNegativeInfinity() methods.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

```
Double Measurement.FetchChannel (String channelName);
Double Measurement.FetchChannel (String channelName,
                                 out Boolean sampleOutOfRange);
```

### COM Method Prototype

```
HRESULT Measurement.FetchChannel ([in] BSTR ChannelName,
                                  [out, retval] DOUBLE* Result);
```

### C Prototype

```
ViStatus IviPwrMeter_FetchChannel (ViSession Vi,
                                   ViConstString Channel,
                                   ViReal64 *Result);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |
| `Channel` | The name of the channel from which to fetch the measurement. | `ViConstString` |

| Outputs | Description | Datatype |
|---|---|---|

| | | |
|---|---|---|
| `sampleOutOfRange` | True if any of the values are under or over range, otherwise false. | `ViBoolean` |
| `Result` (C/COM) | Measured value | `ViReal64*` |
| `Return value (.NET)` | Measured value | `ViReal64` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return. The table below specifies additional class-defined status codes for this function.

| Completion Code | Description |
|---|---|
| Over Range | Measurement is over range. |
| Under Range | Measurement is under range. |
| Channel Not Enabled | The specified channel is not enabled for measurement. |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

The table below specifies additional class-defined exceptions for this method.

| Exception Class | Description |
|---|---|
| ChannelNotEnabledException | The specified channel is not enabled for measurement. |

.NET does not have over and under range warnings. Instead, the method returns Double.PositiveInfinity or Double.NegativeInfinity respectively.

## 5.3.3 Read Channel

### Description

This function initiates a measurement, waits until the power meter has returned to the *Idle* state, and returns the result of the measurement on the specified channel.

After this function executes, the `Result` parameter contains an actual reading on the channel specified by the `Channel` parameter. If the specified channel is not enabled for measurement, this function returns the Channel Not Enabled error. The result is in the same unit as the value of the Units attribute.

The behavior is different for IVI-C/IVI-COM and IVI.NET as follows:

IVI-C & IVI-COM: If an out of range condition occurs, the result is a value indicating that an out of range condition occurred. In such a case, the `Result` parameter contains an IEEE 754 defined -Inf (Negative Infinity) or +Inf (Positive Infinity) value and the function returns the Over Range or Under Range warning. Test if the measurement value is out of range with the Query Result Range Type function.

IVI.NET: The reading is the return value of the method. If an overrange condition occurs, the result will be Double.PositiveInfinity or Double.NegativeInfinity. No exception shall be thrown. The end user may test the measurement value for overrange with Double.IsInfinity(), Double.IsPositiveInfinity() or Double.IsNegativeInfinity() methods.

For .NET a maximumTime of PrecisionTimeSpan.Zero indicates that the measurement should only be returned if it is already available. A maximumTime of PrecisionTimeSpan.MaxValue indicates that the measurement should wait until a measurement is available, with no timeout.

### .NET Method Prototype

```
Double Measurement.ReadChannel(String channelName,
                               PrecisionTimeSpan maximumTime);
Double Measurement.ReadChannel(String channelName,
                               PrecisionTimeSpan maximumTime,
                               out Boolean sampleOutOfRange);
```

### COM Method Prototype

```
HRESULT Measurement.ReadChannel([in] BSTR ChannelName,
                                [in] LONG MaxTimeMilliseconds,
                                [out, retval] DOUBLE* Result);
```

### C Prototype

```
ViStatus IviPwrMeter_ReadChannel (ViSession Vi,
                                  ViConstString Channel,
                                  ViInt32 MaxTimeMilliseconds,
                                  ViReal64 *Result);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle | `ViSession` |
| `Channel` | The name of the channel from which to take the measurement. | `ViConstString` |

| | | |
|---|---|---|
| MaxTimeMilliseconds (C/COM) | Specifies the maximum time in milliseconds to wait for a return value. | ViInt32 |
| maximumTime (.NET) | Specifies the maximum time to wait for a return value | PrecisionTimeSpan |

| Outputs | Description | Datatype |
|---|---|---|
| sampleOutOfRange | True if any of the values are under or over range, otherwise false. | ViBoolean |
| Result (C/COM) | Measured value. | ViReal64* |
| Return value (.NET) | Measured value. | ViReal64 |

**Defined Values for the MaxTimeMilliseconds Parameter (C/COM)**

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Immediate Timeout | The function returns immediately. If no valid measurement value exists, the function returns an error. | | |
| | | C | `IVIPWRMETER_VAL_MAX_TIME_IMMEDIATE` |
| | | COM | `IviPwrMeterTimeOutImmediate` |
| Infinite Timeout | The function waits indefinitely for the measurement to complete. | | |
| | | C | `IVIPWRMETER_VAL_MAX_TIME_INFINITE` |
| | | COM | `IviPwrMeterTimeOutInfinite` |

### Defined Values for the MaximumTime Parameter (.NET)

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Zero | The function returns immediately. If no valid measurement value exists, the function returns an error. | | |
| | | .NET | `PrecisionTimeSpan.Zero` |
| Max Value | The function waits indefinitely for the measurement to complete. | | |
| | | .NET | `PrecisionTimeSpan.MaxValue` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return. The table below specifies additional class-defined status codes for this function.

| Completion Code | Description |
|---|---|
| Over Range | Measurement is over range. |
| Under Range | Measurement is under range. |
| Channel Not Enabled | The specified channel is not enabled for measurement. |
| Max Time Exceeded | Maximum timeout exceeded before operation could complete. |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

The table below specifies additional class-defined exceptions for this method.

| Exception Class | Description |
|---|---|
| ChannelNotEnabledException | The specified channel is not enabled for measurement. |

.NET does not have over and under range warnings. Instead, the method returns Double.PositiveInfinity or Double.NegativeInfinity respectively.

Note that the .NET MaxTimeExceededException is defined in *IVI-3.2: Inherent Capabilities Specification*.

### Compliance Notes

1. A specific driver is not required to implement the Immediate Timeout or the Infinite Timeout defined values for the `MaxTimeMilliseconds` parameter to be compliant with the IviPwrMeterChannelAcquisition extension group.

## 5.4 IviPwrMeterChannelAcquisition Behavior Model

The IviPwrMeterChannelAcquisition behavior model leverages the behavior model of the IviPwrMeterBase capability group.

# 6. IviPwrMeterManualRange Extension Group

## 6.1 Overview

The IviPwrMeterManualRange extension capability group supports power meters that can manually specify the upper and lower limits of the measurement range. The IviPwrMeterManualRange extension capability also includes functions for configuring the measurement range.

## 6.2 IviPwrMeterManualRange Attributes

The IviPwrMeterManualRange capability group defines the following attributes:

- Range Lower
- Range Upper

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 6.2.1 Range Lower

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | Channel | Down | Configure Range |

#### .NET Property Name

```
Channels[].Range.Lower
```

#### COM Property Name

```
Channels.Item().Range.Lower
```

#### C Constant Name

```
IVIPWRMETER_ATTR_RANGE_LOWER
```

#### Description

Specifies the lower limit (minimum) of the expected value of the measurement. The specific driver is expected to coerce this value to the appropriate range for the instrument. The value of this attribute is specified in the same units as the value of the Units attribute.

This attribute affects the behavior of the instrument only when the Range Auto Enabled attribute is set to False. For C and COM, if this attribute is set, the state of auto-range is indeterminate. For.NET, if this attribute is set, auto-range is disabled.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 6.2.2 Range Upper

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | Channel | Up | Configure Range |

### .NET Property Name

```
Channels[].Range.Upper
```

### COM Property Name

```
Channels.Item().Range.Upper
```

### C Constant Name

```
IVIPWRMETER_ATTR_RANGE_UPPER
```

### Description

Specifies the upper limit (maximum) of the expected value of the measurement. The specific driver is expected to coerce this value to the appropriate range for the instrument. The value of this attribute is specified in the same units as the value of the Units attribute.

This attribute affects the behavior of the instrument only when the Range Auto Enabled attribute is set to False. For C and COM, if this attribute is set, the state of auto-range is indeterminate. For.NET, if this attribute is set, auto-range is disabled.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 6.3 IviPwrMeterManualRange Functions

The IviPwrMeterManualRange extension capability group defines the following functions:

- Configure Range

This section describes the behavior and requirements of each function.

## 6.3.1 Configure Range

### Description

This function configures the lower and upper range values for a given channel.

For C and COM, if this function is executed, the state of auto-range is indeterminate.

For.NET, if the function overload that takes two doubles, lower and upper, is executed, the Range Upper and Range Lower attributes are explicitly set and auto-range is disabled. If the function overload that takes a Boolean is executed, and rangeAuto is set to true, auto-range is enabled. If rangeAuto is set to false, auto-range is disabled.

### .NET Method Prototype

```
void Channels[].Range.Configure(Double lower,
                                Double upper);

void Channels[].Range.Configure(Boolean rangeAuto);
```

### COM Method Prototype

```
HRESULT Channels.Item().Range.Configure([in] DOUBLE Lower,
                                        [in] DOUBLE Upper);
```

### C Prototype

```
ViStatus IviPwrMeter_ConfigureRange (ViSession Vi,
                                     ViConstString Channel,
                                     ViReal64 RangeLower,
                                     ViReal64 RangeUpper);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle. | ViSession |
| Channel | The name of the channel to configure. | ViConstString |
| RangeLower | The lower limit of the expected value of the measurement. The value of this parameter is used to set the Range Lower attribute. See the attribute description for more information. | ViReal64 |
| RangeUpper | The upper limit of the expected value of the measurement. The value of this parameter is used to set the Range Upper attribute. See the attribute description for more information. | ViReal64 |
| rangeAuto (.NET) | Specifies if the power meter should automatically determine the best range for the measurement.<br>The value of this parameter is used to set the Range Auto Enabled attribute. See the attribute description for more information. | Boolean |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 6.4 IviPwrMeterManualRange Behavior Model

The IviPwrMeterManualRange behavior model leverages the behavior model of the IviPwrMeterBase capability group.

## 6.5 IviPwrMeterManualRange Compliance Notes

1. Specific drivers that implement this extension group shall implement the False value for the Range Auto Enabled attribute.

# 7. IviPwrMeterTriggerSource Extension Group

## 7.1 Overview

The IviPwrMeterTriggerSource extension capability group supports power meters that can specify a trigger source and a trigger event on which to trigger a measurement. The IviPwrMeterTriggerSource extension capability also includes functions for configuring the trigger source.

## 7.2 IviPwrMeterTriggerSource Attributes

The IviPwrMeterTriggerSource capability group defines the following attributes:

- Trigger Source

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

## 7.2.1 Trigger Source

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 (C/COM) | R/W | N/A | None | Configure Trigger Source |
| ViString (.NET) | R/W | N/A | None | N/A |

### .NET Property Name

Trigger.Source

### COM Property Name

Trigger.Source

### COM Enumeration Name

IviPwrMeterTriggerSourceEnum

### C Constant Name

IVIPWRMETER_ATTR_TRIGGER_SOURCE

### Description

Specifies the trigger source the power meter monitors for the trigger event.

When the trigger event occurs on the source specified by this attribute, the power meter leaves the *Wait-For-Trigger* state and takes a measurement on all enabled channels. See Section 7.4, *IviPwrMeterTriggerSource Behavior Model* for more information.

If this attribute is set to the Internal defined value, the power meter uses the channel specified by the Internal Trigger Source Event attribute to monitor the internal trigger event.

In IVI.NET the trigger source is a string. If an IVI driver supports a trigger source and the trigger source is listed in IVI-3.3 *Cross Class Capabilities Specification*, Section 3 then the IVI driver shall accept the standard string for that trigger source. This attribute is case insensitive, but case preserving. That is the setting is case insensitive but when reading it back the programmed case is returned. IVI specific drivers may define new trigger source strings for trigger sources that are not defined by IVI-3.3 *Cross Class Capabilities Specification* if needed.

### Defined Values

| ***Name*** | ***Description*** | | |
|---|---|---|---|
| | | ***Language*** | ***Identifier*** |
| Immediate | The power meter exits the Wait-For-Trigger state immediately after entering. It does not wait for a trigger of any kind. | | |
| | | C | IVIPWRMETER_VAL_IMMEDIATE |
| | | COM | IviPwrMeterTriggerSourceImmediate |
| External | The power meter exits the Wait-For-Trigger state when a trigger occurs on the external trigger input. | | |
| | | C | IVIPWRMETER_VAL_EXTERNAL |
| | | COM | IviPwrMeterTriggerSourceExternal |

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Internal | The power meter exits the Wait-For-Trigger state when an internal trigger event occurs on the measurement signal. | | |
| | | C | IVIPWRMETER_VAL_INTERNAL |
| | | COM | IviPwrMeterTriggerSourceInternal |
| Software | The power meter exits the Wait-For-Trigger state when it receives a software trigger. | | |
| | | C | IVIPWRMETER_VAL_SOFTWARE_TRIG |
| | | COM | IviPwrMeterTriggerSourceSoftware |
| TTL0 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL0. | | |
| | | C | IVIPWRMETER_VAL_TTL0 |
| | | COM | IviPwrMeterTriggerSourceTTL0 |
| TTL1 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL1. | | |
| | | C | IVIPWRMETER_VAL_TTL1 |
| | | COM | IviPwrMeterTriggerSourceTTL1 |
| TTL2 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL2. | | |
| | | C | IVIPWRMETER_VAL_TTL2 |
| | | COM | IviPwrMeterTriggerSourceTTL2 |
| TTL3 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL3. | | |
| | | C | IVIPWRMETER_VAL_TTL3 |
| | | COM | IviPwrMeterTriggerSourceTTL3 |
| TTL4 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL4. | | |
| | | C | IVIPWRMETER_VAL_TTL4 |
| | | COM | IviPwrMeterTriggerSourceTTL4 |
| TTL5 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL5. | | |
| | | C | IVIPWRMETER_VAL_TTL5 |
| | | COM | IviPwrMeterTriggerSourceTTL5 |
| TTL6 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL6. | | |
| | | C | IVIPWRMETER_VAL_TTL6 |
| | | COM | IviPwrMeterTriggerSourceTTL6 |
| TTL7 | The power meter exits the Wait-For-Trigger state when it receives a trigger on TTL7. | | |
| | | C | IVIPWRMETER_VAL_TTL7 |

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| | | COM | IviPwrMeterTriggerSourceTTL7 |
| ECL0 | The power meter exits the Wait-For-Trigger state when it receives a trigger on ECL0. | | |
| | | C | IVIPWRMETER_VAL_ECL0 |
| | | COM | IviPwrMeterTriggerSourceECL0 |
| ECL1 | The power meter exits the Wait-For-Trigger state when it receives a trigger on ECL1. | | |
| | | C | IVIPWRMETER_VAL_ECL1 |
| | | COM | IviPwrMeterTriggerSourceECL1 |
| PXI STAR | The power meter exits the Wait-For-Trigger state when it receives a trigger on PXI Star trigger bus. | | |
| | | C | IVIPWRMETER_VAL_PXI_STAR |
| | | COM | IviPwrMeterTriggerSourcePXIStar |
| RTSI0 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI0 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_0 |
| | | COM | IviPwrMeterTriggerSourceRTSI0 |
| RTSI1 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI1 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_1 |
| | | COM | IviPwrMeterTriggerSourceRTSI1 |
| RTSI2 | The power meter exits the Wait-For-Trigger state when it receives a trigger on RTSI2 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_2 |
| | | COM | IviPwrMeterTriggerSourceRTSI2 |
| RTSI3 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI3 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_3 |
| | | COM | IviPwrMeterTriggerSourceRTSI3 |
| RTSI4 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI4 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_4 |
| | | COM | IviPwrMeterTriggerSourceRTSI4 |
| RTSI5 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI5 line. | | |
| | | C | IVIPWRMETER_VAL_RTSI_5 |
| | | COM | IviPwrMeterTriggerSourceRTSI5 |
| RTSI6 | The power meter exits the Wait-For-Trigger state when it receives a trigger on the RTSI6 line. | | |

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| | | C | IVIPWRMETER_VAL_RTSI_6 |
| | | COM | IviPwrMeterTriggerSourceRTSI6 |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### Compliance Notes

1. All specific drivers shall implement the Immediate defined value for this attribute.
2. If a specific driver implements any of the defined values in the following table, it shall also implement the corresponding extension capability group:

| Value | Required Capability Group |
|---|---|
| Internal | IviPwrMeterInternalTrigger |
| Software | IviPwrMeterSoftwareTrigger |

3. If an IVI-C specific driver defines additional values for this attribute, the actual values shall be greater than or equal to IVIPWRMETER_VAL_TRIGGER_SOURCE_SPECIFIC_EXT_BASE.
4. If an IVI-C class driver defines additional values for this attribute, the actual values shall be greater than or equal to IVIPWRMETER_VAL_TRIGGER_SOURCE_CLASS_EXT_BASE and less than IVIPWRMETER_VAL_TRIGGER_SOURCE_SPECIFIC_EXT_BASE.
5. When an IVI-COM specific driver implements this attribute with additional elements in its instrument specific interfaces, it is recommended that the actual values of the additional elements be greater than or equal to Trigger Source Specific Extension Base.

   See Section 16, Attribute Value Definitions, for the definitions of Trigger Source Specific Extension Base, IVIPWRMETER_VAL_TRIGGER_SOURCE_SPECIFIC_EXT_BASE and IVIPWRMETER_VAL_TRIGGER_SOURCE_CLASS_EXT_BASE.

## 7.3 IviPwrMeterTriggerSource Functions

The IviPwrMeterTriggerSource extension capability group defines the following functions:

- Configure Trigger Source (IVI-C Only)

This section describes the behavior and requirements of each function.

## 7.3.1 Configure Trigger Source (IVI-C Only)

### Description

This function sets the trigger source of the power meter.

### .NET Method Prototype

`N/A`

(Use the `Trigger.Source` property)

### COM Method Prototype

`N/A`

(Use the `Trigger.Source` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureTriggerSource (ViSession Vi,
                                             ViInt32 TriggerSource);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `TriggerSource` | Specifies the trigger source. The value of this parameter is used to set the Trigger Source attribute. See the attribute description for more information. | `ViInt32` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 7.4 IviPwrMeterTriggerSource Behavior Model

The IviPwrMeterTriggerSource behavior model leverages the behavior model of the IviPwrMeterBase capability group. Furthermore, it defines an additional *Wait-For-Trigger* state after the *Idle* state. The following state diagram shows the relationship between IviPwrMeterTriggerSource capabilities and the IviPwrMeterBase capability behavior model.

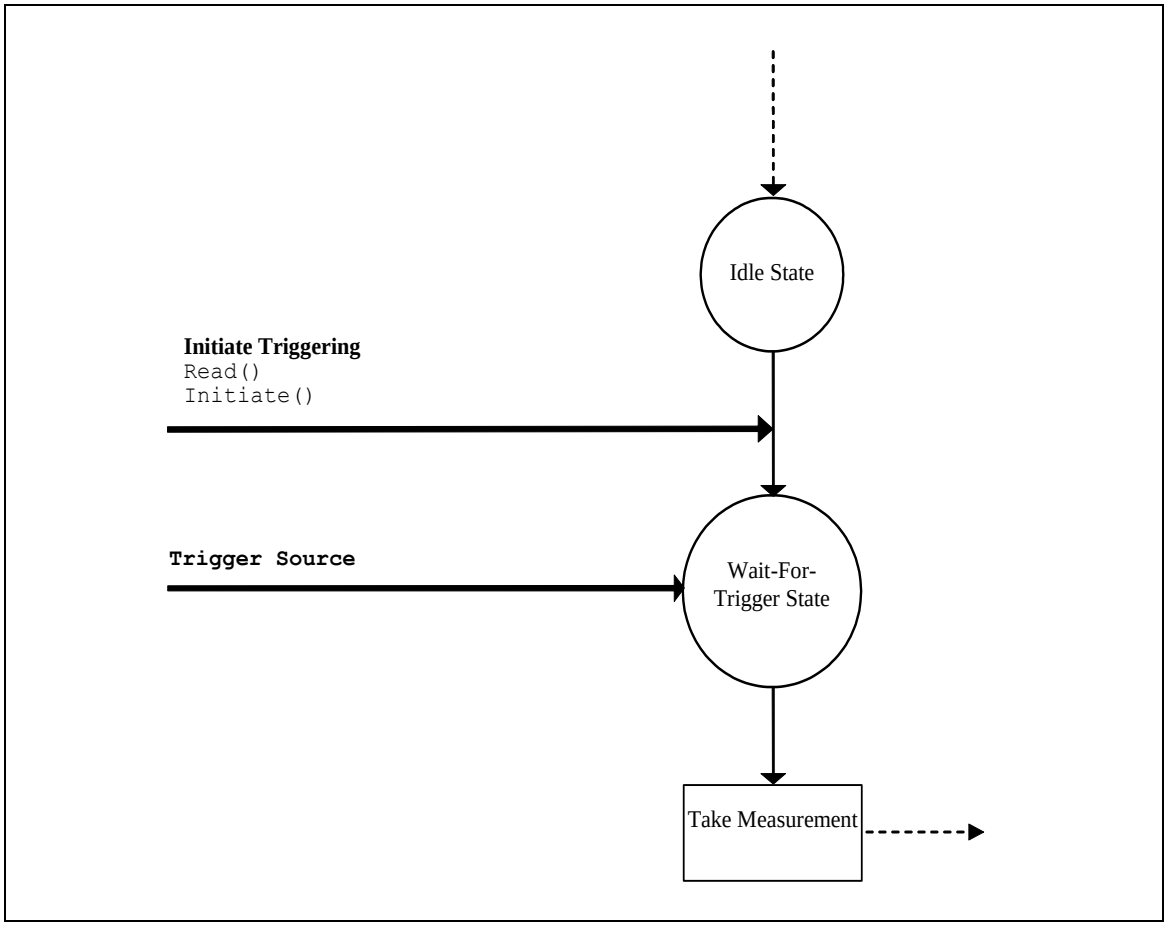


**Figure 2.** IviPwrMeterTriggerSource Behavior Model

The Initiate and Read functions cause the power meter to leave the *Idle* state and transition to the *Wait-For-Trigger* state. The Read function does not return until the measurement process is complete and the power meter returns to the *Idle* state. The Initiate function returns as soon as the power meter leaves the *Idle* state.

In the Wait-For-Trigger state, the power meter waits for a trigger event. The type of trigger event is specified by the Trigger Source attribute. When the specified trigger event occurs, the power meter leaves the Wait-For-Trigger state and takes a measurement on all enabled channels.

# 8. IviPwrMeterInternalTrigger Extension Group

## 8.1 Overview

The IviPwrMeterInternalTrigger extension capability group supports power meters that can trigger internally on the measurement signal. It specifies attributes to configure the internal trigger event source, trigger level, and the trigger slope. The IviPwrMeterInternalTrigger extension capability group also includes functions for configuring these attributes.

## 8.2 IviPwrMeterInternalTrigger Attributes

The IviPwrMeterInternalTrigger capability group defines the following attributes:

- Internal Trigger Event Source
- Internal Trigger Level
- Internal Trigger Slope

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 8.2.1 Internal Trigger Event Source

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViString | R/W | N/A | None | Configure Internal Trigger |

#### .NET Property Name

```
Trigger.Internal.EventSource
```

#### COM Property Name

```
Trigger.Internal.EventSource
```

#### C Constant Name

```
IVIPWRMETER_ATTR_INTERNAL_TRIGGER_EVENT_SOURCE
```

#### Description

Specifies the channel that the power meter uses to monitor the internal trigger event. The power meter leaves the *Idle* state when the measurement signal on this channel meets the conditions set by the Internal Trigger Level and the Internal Trigger Slope attributes.

This attribute affects the behavior of the instrument only if the Trigger Source attribute is set to Internal.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 8.2.2 Internal Trigger Level

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | N/A | None | Configure Internal Trigger Level |

### .NET Property Name

```
Trigger.Internal.Level
```

### COM Property Name

```
Trigger.Internal.Level
```

### C Constant Name

```
IVIPWRMETER_ATTR_INTERNAL_TRIGGER_LEVEL
```

### Description

Specifies the trigger level for the measurement signal. The power meter leaves the *Idle* state when the measurement signal on the channel specified by the Internal Trigger Source Event attribute crosses the value specified by this attribute. The value of this attribute is specified in the same unit as the value of the Units attribute.

This attribute affects the behavior of the instrument only if the Trigger Source attribute is set to Internal.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 8.2.3 Internal Trigger Slope

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | R/W | N/A | None | Configure Internal Trigger |

### .NET Property Name

Trigger.Internal.Slope

### .NET Enumeration Name

Slope

### COM Property Name

Trigger.Internal.Slope

### COM Enumeration Name

IviPwrMeterInternalTriggerSlopeEnum

### C Constant Name

IVIPWRMETER_ATTR_INTERNAL_TRIGGER_SLOPE

### Description

Specifies the polarity of the internal trigger slope. The power meter triggers on the rising or falling edge of the internal trigger source depending on the value of this attribute.

This attribute affects the behavior of the instrument only if the Trigger Source attribute is set to Internal.

### Defined Values

| ***Name*** | ***Description*** | | |
|---|---|---|---|
| | | ***Language*** | ***Identifier*** |
| Positive | Sets the trigger event to occur on the rising edge of the trigger pulse. | | |
| | | .NET | Slope.Positive |
| | | C | IVIPWRMETER_VAL_POSITIVE |
| | | COM | IviPwrMeterInternalTriggerSlopePositive |
| Negative | Sets the trigger event to occur on the falling edge of the trigger pulse. | | |
| | | .NET | Slope.Negative |
| | | C | IVIPWRMETER_VAL_NEGATIVE |
| | | COM | IviPwrMeterInternalTriggerSlopeNegative |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

### Compliance Notes

1. If an IVI-C specific driver defines additional values for this attribute, the magnitude of the actual values shall be greater than or equal to IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_SPECIFIC_EXT_BASE.
2. If an IVI-C class driver defines additional values for this attribute, the magnitude of the actual values shall be greater than or equal to IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_CLASS_EXT_BASE and less than IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_SPECIFIC_EXT_BASE.
3. When an IVI-COM specific driver implements this attribute with additional elements in its instrument specific interfaces, it is recommended that the actual values of the additional elements be greater than or equal to Internal Trigger Slope Specific Extension Base.

   See Section 16, Attribute Value Definitions, for the definitions of Internal Trigger Slope Specific Extension Base, IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_SPECIFIC_EXT_BASE and IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_CLASS_EXT_BASE.

## 8.3 IviPwrMeterInternalTrigger Functions

The IviPwrMeterInternalTrigger extension capability group defines the following functions:

- Configure Internal Trigger
- Configure Internal Trigger Level (IVI-C Only)

This section describes the behavior and requirements of each function.

## 8.3.1 Configure Internal Trigger

### Description

This function configures the internal trigger event source and the internal trigger slope of the power meter.

### .NET Method Prototype

```
void Trigger.Internal.Configure (String eventSource, Slope slope);
```

### COM Method Prototype

```
HRESULT Trigger.Internal.Configure ([in] BSTR EventSource,
                                    [in] IviPwrMeterInternalTriggerSlopeEnum
                                    Slope);
```

### C Prototype

```
ViStatus IviPwrMeter_ConfigureInternalTrigger (ViSession Vi,
                                               ViConstString EventSource,
                                               ViInt32 Slope);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument hcndle. | `ViSession` |
| `EventSource` | The name of the channel to use as the internal trigger event source. The driver uses this value to set the Internal Trigger Event Source attribute. See the attribute description for more information. | `ViConstString` |
| `Slope` | The internal trigger slope. The driver uses this value to set the Internal Trigger Slope attribute. See the attribute description for more information. | `ViInt32` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 8.3.2 Configure Internal Trigger Level (IVI-C Only)

### Description

This function configures the internal trigger level of the power meter.

### .NET Method Prototype

`N/A`

(Use the `Trigger.Internal.Level` property)

### COM Method Prototype

`N/A`

(Use the `Trigger.Internal.Level` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureInternalTriggerLevel (ViSession Vi,
                                                    ViReal64 TriggerLevel);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `TriggerLevel` | The signal trigger level. The driver uses this value to set the Internal Trigger Level attribute. See the attribute description for more information. | `ViReal64` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 8.4 IviPwrMeterInternalTrigger Behavior Model

The IviPwrMeterInternalTrigger behavior model leverages the behavior model of the IviPwrMeterBase capability group and the IviPwrMeterTriggerSource extension group. Furthermore, it defines an additional trigger event for the trigger source.

The power meter leaves the Wait-For-Trigger state when it receives an internal trigger event. When the Trigger Source attribute is set to the Internal defined value, and the measurement signal on the channel specified by the Internal Trigger Event Source attribute crosses the level specified by the Internal Trigger Level attribute in the direction specified by the Internal Trigger Slope attribute, the power meter leaves the Wait-For-Trigger state and takes a measurement on all enabled channels.

## 8.5 IviPwrMeterInternalTrigger Compliance Notes

1. Specific drivers that implement this extension group shall implement the Internal defined value for the Trigger Source attribute in the IviPwrMeterTriggerSource extension group.

# 9. IviPwrMeterSoftwareTrigger Extension Group

## *9.1 IviPwrMeterSoftwareTrigger Extension Group Overview*

The IviPwrMeterSoftwareTrigger extension group supports power meters that can initiate a measurement based on a software trigger signal. The user can send a software trigger to cause the power meter to trigger a measurement.

## *9.2 IviPwrMeterSoftwareTrigger Functions*

The IviPwrMeterSoftwareTrigger extension group defines the following function:

- Send Software Trigger

This section describes the behavior and requirements of this function.

### 9.2.1 Send Software Trigger

Refer to *IVI-3.3: Standard Cross Class Capabilities Specification* for the prototype and complete description of this function.

## *9.3 IviPwrMeterSoftwareTrigger Behavior Model*

The IviPwrMeterSoftwareTrigger behavior model leverages the behavior model of the IviPwrMeterBase capability group and the IviPwrMeterTriggerSource extension group. Furthermore, it defines an additional trigger event for the trigger source.

The power meter leaves the Wait-For-Trigger state when it receives a trigger event specified by the Trigger Source attribute. When the trigger source is set to Software, the Send Software Trigger function is used to generate the trigger event. Calling this function causes the power meter to leave the Wait-For-Trigger state and take a measurement on all enabled channels.

## *9.4 IviPwrMeterSoftwareTrigger Compliance Notes*

1. Specific drivers that implement this extension group shall implement the Software defined value for the Trigger Source attribute in the IviPwrMeterTriggerSource extension group.

# 10. IviPwrMeterDutyCycleCorrection Extension Group

## *10.1 Overview*

The IviPwrMeterDutyCycleCorrection extension capability group supports power meters that perform a duty cycle correction. The IviPwrMeterDutyCycleCorrection extension capability also includes functions for enabling and configuring the duty cycle correction.

## *10.2 IviPwrMeterDutyCycleCorrection Attributes*

The IviPwrMeterDutyCycleCorrection capability group defines the following attributes:

- Duty Cycle Correction
- Duty Cycle Correction Enabled

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 10.2.1 Duty Cycle Correction

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | Channel | Up | Configure Duty Cycle Correction |

#### .NET Property Name

```
Channels[].DutyCycle.Value
```

#### COM Property Name

```
Channels.Item().DutyCycle.Value
```

#### C Constant Name

```
IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION
```

#### Description

Specifies the duty cycle correction the power meter uses to calculate the pulse power of a pulse-modulated signal. The power meter measures the average power of the pulsed input signal and then divides the result by the value specified for this attribute to obtain a pulse power reading.

The value of this attribute is specified as a percentage.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 10.2.2 Duty Cycle Correction Enabled

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViBoolean | R/W | Channel | None | Configure Duty Cycle Correction |

### .NET Property Name

```
Channels[].DutyCycle.Enabled
```

### COM Property Name

```
Channels.Item().DutyCycle.Enabled
```

### C Constant Name

```
IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION_ENABLED
```

### Description

Specifies if the power meter performs a duty cycle correction on the specified channel. If set to True, enables the duty cycle correction. If set to False, disables the duty cycle correction.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 10.3 IviPwrMeterDutyCycleCorrection Functions

The IviPwrMeterDutyCycleCorrection extension capability group defines the following functions:

- Configure Duty Cycle Correction

This section describes the behavior and requirements of each function.

## 10.3.1 Configure Duty Cycle Correction

### Description

This function enables or disables the duty cycle correction and sets the duty cycle correction for pulse power measurements.

### .NET Method Prototype

```
void Channels[].DutyCycle.Configure (Boolean enabled,
                                     Double correction);
```

### COM Method Prototype

```
HRESULT Channels.Item().DutyCycle.Configure ([in] VARIANT_BOOL Enabled,
                                             [in] DOUBLE Value);
```

### C Prototype

```
ViStatus IviPwrMeter_ConfigureDutyCycleCorrection (ViSession Vi,
                                                   ViConstString Channel,
                                                   ViBoolean CorrectionEnabled,
                                                   ViReal64 Correction);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel for which to specify the duty cycle correction. | `ViConstString` |
| `CorrectionEnabled` | Enables or disables the duty cycle correction. The value of this parameter is used to set the Duty Cycle Correction Enabled attribute. | `ViBoolean` |
| `Correction` | Specifies the expected value of the duty cycle correction. The value of this parameter is used to set the Duty Cycle Correction attribute. | `ViReal64` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 10.4 IviPwrMeterDutyCycleCorrection Behavior Model

The IviPwrMeterDutyCycleCorrection extension group follows the same behavior model as the IviPwrMeterBase capability group described in Section 4.4, *IviPwrMeterBase Behavior Model.*

# 11. IviPwrMeterAveragingCount Extension Group

## *11.1 Overview*

The IviPwrMeterAveragingCount extension capability group supports power meters that can filter a signal by averaging it a specified number of times in manual averaging mode. The IviPwrMeterAveragingCount group defines an attribute and function to specify the averaging count.

## *11.2 IviPwrMeterAveragingCount Attributes*

The IviPwrMeterAveragingCount capability group defines the following attributes:

- Averaging Count

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 11.2.1 Averaging Count

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | R/W | Channel | Up | Configure Averaging Count |

#### .NET Property Name

```
Channels[].Averaging.Count
```

#### COM Property Name

```
Channels.Item().Averaging.Count
```

#### C Constant Name

```
IVIPWRMETER_ATTR_AVERAGING_COUNT
```

#### Description

Specifies the average count that the instrument uses in manual averaging mode. When the Auto Averaging Enabled attribute is set to False, the driver filters the input signal by averaging it the number of times specified by this attribute. For C and COM, if this attribute is set, the state of auto-averaging is indeterminate. For .NET, when this attribute is set, auto-averaging is disabled.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 11.3 IviPwrMeterAveragingCount Functions

The IviPwrMeterAveragingCount extension capability group defines the following functions:

- Configure Averaging Count (IVI-C Only)

This section describes the behavior and requirements of each function.

## 11.3.1 Configure Averaging Count (IVI-C Only)

### Description

This function sets the average count that the instrument uses in manual averaging mode. The averaging count specifies the number of samples that the instrument takes before the measurement is complete. For C, the impact of this function on the Averaging Auto Enabled property is undefined.

### .NET Method Prototype

`N/A`

(Use the `Channels[].Averaging.Count` property)

### COM Method Prototype

`N/A`

(Use the `Channels.Item().Averaging.Count` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureAveragingCount (ViSession Vi,
                                              ViConstString Channel,
                                              ViInt32 Count);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Channel` | The name of the channel to configure. | `ViConstString` |
| `Count` | The averaging count. The value of this parameter is used to set the Averaging Count attribute. | `ViInt32` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 11.4 IviPwrMeterAveragingCount Behavior Model

The IviPwrMeterAveragingCount extension group follows the same behavior model as the IviPwrMeterBase capability group described in Section 4.4, *IviPwrMeterBase Behavior Model*.

# 12. IviPwrMeterZeroCorrection Extension Group

## 12.1 Overview

The IviPwrMeterZeroCorrection extension capability group supports power meters that can perform a zero correction on an input channel. The IviPwrMeterZeroCorrection capability group defines functions to perform the zero correction.

## 12.2 IviPwrMeterZeroCorrection Attributes

The IviPwrMeterZeroCorrection capability group defines the following attributes:

- Zero State (IVI.NET Only)

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

## 12.2.1 Zero State (IVI.NET Only)

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | R/O | Channel | None | N/A |

### .NET Property Name

Channels.ZeroState

### .NET Enumeration Name

Ivi.PwrMeter.OperationState

### COM Property Name

N/A

(Use the Is Zero Complete function.)

### C Constant Name

N/A

(Use the Is Zero Complete function.)

### Description

This property returns the results of a query to the instrument to determine the status of all zero correction operations initiated by the Zero or Zero All Channel functions. The driver returns Complete only when zero corrections are complete on all enabled channels.

If some zero correction operations are still in progress on one or more channels, the driver returns In Progress.

If the driver cannot query the instrument to determine its state, the driver returns State Unknown.

The driver does not check the instrument status to determine the measurement state. Typically, the end-user accesses this property only in a sequence of other driver calls. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### Defined Values

| ***Name*** | ***Description*** | | |
|---|---|---|---|
| | | ***Language*** | ***Identifier*** |
| Complete | The power meter has completed all zero correction operations. | | |
| | | .NET | Ivi.PwrMeter.OperationState.Complete |
| In Progress | The power meter is still performing zero correction on one or more channels. | | |
| | | .NET | Ivi.PwrMeter.OperationState.InProgress |
| State Unknown | The power meter cannot determine the status of zero correction operations. | | |
| | | .NET | Ivi.PwrMeter.OperationState.Unknown |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## *12.3 IviPwrMeterZeroCorrection Functions*

The IviPwrMeterZeroCorrection extension capability group defines the following functions:

- Is Zero Complete
- Zero
- Zero All Channels

This section describes the behavior and requirements of each function.

## 12.3.1 Is Zero Complete (IVI-C & IVI-COM Only)

### Description

This function queries the instrument to determine the status of all zero correction operations initiated by the Zero or Zero All Channel functions. This function returns the Zero Complete value in the `Status` parameter only when zero corrections are complete on all enabled channels.

If some zero correction operations are still in progress on one or more channels, the driver returns the Zero In Progress value. If the driver cannot query the instrument to determine its state, the driver returns the Zero Status Unknown value.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

`N/A`

(Use the Zero State attribute.)

### COM Method Prototype

```
HRESULT Channels.IsZeroComplete ([out, retval] IviPwrMeterZeroStatusEnum*
                                                Status);
```

### C Prototype

```
ViStatus IviPwrMeter_IsZeroComplete (ViSession Vi,
                                     ViInt32 *Status);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |

| Outputs | Description | Datatype |
|---|---|---|
| `Status` | Returns the status of the measurement. | `ViInt32*` |

### Defined Values for Status Parameter

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Zero Complete | The power meter has completed all zero correction operations. | | |
| | | C | `IVIPWRMETER_VAL_ZERO_COMPLETE` |
| | | COM | `IviPwrMeterZeroStatusComplete` |
| Zero In Progress | The power meter is still performing zero correction on one or more channels. | | |
| | | C | `IVIPWRMETER_VAL_ZERO_IN_PROGRESS` |
| | | COM | `IviPwrMeterZeroStatusInProgress` |

| | | | |
|---|---|---|---|
| Zero Status Unknown | The power meter cannot determine the status of zero correction operations. | | |
| | | C | IVIPWRMETER_VAL_ZERO_STATUS_UNKNOWN |
| | | COM | IviPwrMeterZeroStatusUnknown |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 12.3.2 Zero

### Description

This function performs a zero correction on the specified channel. The user may use the Is Zero Complete function to determine when the zero correction is complete.

### .NET Method Prototype

```
void Channels[].Zero ();
```

### COM Method Prototype

```
HRESULT Channels.Item().Zero ();
```

### C Prototype

```
ViStatus IviPwrMeter_Zero (ViSession Vi,
                           ViConstString Channel);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle. | ViSession |
| Channel | The name for the channel for which to perform the zero correction | ViConstString |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 12.3.3 Zero All Channels

### Description

This function performs a zero correction on all enabled channels. The user may use the Is Zero Complete function to determine when the zero correction is complete.

### .NET Method Prototype

```
void Channels.Zero ();
```

### COM Method Prototype

```
HRESULT Channels.Zero ();
```

### C Prototype

```
ViStatus IviPwrMeter_ZeroAllChannels (ViSession Vi);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle. | ViSession |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 12.4 IviPwrMeterZeroCorrection Behavior Model

The IviPwrMeterZeroCorrection extension group follows the same behavior model as the IviPwrMeterBase capability group described in Section 4.4, *IviPwrMeterBase Behavior Model*.

# 13. IviPwrMeterCalibration Extension Group

## 13.1 Overview

The IviPwrMeterCalibration extension capability group supports power meters that can perform calibration for a given power sensor. The IviPwrMeterCalibration capability group defines functions to perform the calibration.

## 13.2 IviPwrMeterCalibration Attributes

The IviPwrMeterCalibration capability group defines the following attributes:

- Calibration State (IVI.NET Only)

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 13.2.1 Calibration State (IVI.NET Only)

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViInt32 | R/O | Channel | None | N/A |

#### .NET Property Name

Channels.CalibrationState

#### .NET Enumeration Name

Ivi.PwrMeter.OperationState

#### COM Property Name

N/A

(Use the Is Calibration Complete function.)

#### C Constant Name

N/A

(Use the Is Calibration Complete function.)

#### Description

This property returns the results of a query to the instrument to determine the status of all calibration operations initiated by the Calibrate function. The driver returns Complete only when calibration is complete on all enabled channels.

If some calibration operations are still in progress on one or more channels, the driver returns In Progress.

If the driver cannot query the instrument to determine its state, the driver returns State Unknown.

The driver does not check the instrument status to determine the measurement state. Typically, the end-user accesses this property only in a sequence of other driver calls. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

#### Defined Values

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Complete | The power meter has completed all calibration operations. | | |
| | | .NET | Ivi.PwrMeter.OperationState.Complete |
| In Progress | The power meter is still performing calibration on one or more channels. | | |
| | | .NET | Ivi.PwrMeter.OperationState.InProgress |
| State Unknown | The power meter cannot determine the status of calibration operations. | | |
| | | .NET | Ivi.PwrMeter.OperationState.Unknown |

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## *13.3 IviPwrMeterCalibration Functions*

The IviPwrMeterCalibration extension capability group defines the following functions:

- Calibrate
- Is Calibration Complete

This section describes the behavior and requirements of each function.

### 13.3.1 Calibrate

#### Description

This function performs calibration on the specified sensor. The user may use the Is Calibration Complete function to determine when the calibration is complete.

#### .NET Method Prototype

```
void Channels[].Calibrate ();
```

#### COM Method Prototype

```
HRESULT Channels.Item().Calibrate ();
```

#### C Prototype

```
ViStatus IviPwrMeter_Calibrate (ViSession Vi,
                                ViConstString Channel);
```

#### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| Vi | Instrument handle. | ViSession |
| Channel | The name of the channel to calibrate. | ViConstString |

#### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 13.3.2 Is Calibration Complete (IVI-C & IVI-COM Only)

### Description

This function queries the instrument to determine the status of all calibration operations initiated by the Calibrate function. This function returns the Calibration Complete value in the `Status` parameter only when calibration is complete on all channels.

If some calibration operations are still in progress on one or more channels, the driver returns the Calibration In Progress value. If the driver cannot query the instrument to determine its state, the driver returns the Calibration Status Unknown value.

This function does not check the instrument status. Typically, the end-user calls this function only in a sequence of calls to other low-level driver functions. The sequence performs one operation. The end-user uses the low-level functions to optimize one or more aspects of interaction with the instrument. To check the instrument status, call the Error Query function at the conclusion of the sequence.

### .NET Method Prototype

`N/A`

(Use the Calibration State attribute.)

### COM Method Prototype

```
HRESULT Channels.IsCalibrationComplete ([out, retval]
                                        IviPwrMeterCalibrationStatusEnum*
                                        Status);
```

### C Prototype

```
ViStatus IviPwrMeter_IsCalibrationComplete (ViSession Vi,
                                            ViInt32 *Status);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |

| Outputs | Description | Datatype |
|---|---|---|
| `Status` | Returns the status of the measurement. | `ViInt32*` |

### Defined Values for Status Parameter

| *Name* | *Description* | | |
|---|---|---|---|
| | | *Language* | *Identifier* |
| Calibration Complete | The power meter has completed the calibration. | | |
| | | C | `IVIPWRMETER_VAL_CALIBRATION_COMPLETE` |
| | | COM | `IviPwrMeterCalibrationStatusComplete` |
| Calibration In Progress | The power meter is still performing calibration. | | |
| | | C | `IVIPWRMETER_VAL_CALIBRATION_IN_PROGRESS` |
| | | COM | `IviPwrMeterCalibrationStatusInProgress` |

| | | | |
|---|---|---|---|
| Calibration Status Unknown | The power meter cannot determine the status of the calibration. | | |
| | | C | IVIPWRMETER_VAL_CALIBRATION_STATUS_UNKNOWN |
| | | COM | IviPwrMeterCalibrationStatusUnknown |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 13.4 IviPwrMeterCalibration Behavior Model

The IviPwrMeterCalibration extension group follows the same behavior model as the IviPwrMeterBase capability group described in Section 4.4, *IviPwrMeterBase Behavior Model*.

# 14. IviPwrMeterReferenceOscillator Extension Group

## *14.1 Overview*

The IviPwrMeterReferenceOscillator extension capability group supports power meters that can enable an internal reference oscillator. The IviPwrMeterReferenceOscillator capability group defines attributes that configure the reference oscillator. It also defines functions to set these attributes.

## *14.2 IviPwrMeterReferenceOscillator Attributes*

The IviPwrMeterReferenceOscillator capability group defines the following attributes:

- Reference Oscillator Enabled
- Reference Oscillator Frequency
- Reference Oscillator Level

This section describes the behavior and requirements of each attribute. The actual value for each attribute ID is defined in Section 15, *IviPwrMeter Attribute ID Definitions.*

### 14.2.1 Reference Oscillator Enabled

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViBoolean | R/W | N/A | None | Configure Reference Oscillator Enabled |

#### .NET Property Name

ReferenceOscillator.Enabled

#### COM Property Name

ReferenceOscillator.Enabled

#### C Constant Name

IVIPWRMETER_ATTR_REF_OSCILLATOR_ENABLED

#### Description

If set to True, enables the internal reference oscillator. If set to False, disables the internal reference oscillator.

#### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 14.2.2 Reference Oscillator Frequency

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | N/A | None | Configure Reference Oscillator |

### .NET Property Name

ReferenceOscillator.Frequency

### COM Property Name

ReferenceOscillator.Frequency

### C Constant Name

IVIPWRMETER_ATTR_REF_OSCILLATOR_FREQUENCY

### Description

Specifies the frequency of the signal generated by the reference oscillator in Hertz. This attribute affects the behavior of the instrument only if the Reference Oscillator Enabled attribute is set to True.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 14.2.3 Reference Oscillator Level

| Data Type | Access | Applies To | Coercion | High Level Functions |
|---|---|---|---|---|
| ViReal64 | R/W | N/A | None | Configure Reference Oscillator |

### .NET Property Name

ReferenceOscillator.Level

### COM Property Name

ReferenceOscillator.Level

### C Constant Name

IVIPWRMETER_ATTR_REF_OSCILLATOR_LEVEL

### Description

Specifies the power level of the signal generated by the reference oscillator in dBm. This attribute affects the behavior of the instrument only if the Reference Oscillator Enabled attribute is set to True.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this property.

## 14.3 IviPwrMeterReferenceOscillator Functions

The IviPwrMeterReferenceOscillator extension capability group defines the following functions:

- Configure Reference Oscillator
- Configure Reference Oscillator Enabled (IVI-C Only)

This section describes the behavior and requirements of each function.

## 14.3.1 Configure Reference Oscillator

### Description

This function sets the frequency and power level of the signal generated by the reference oscillator.

### .NET Method Prototype

```
void ReferenceOscillator.Configure (Double frequency,
                                    Double level);
```

### COM Method Prototype

```
HRESULT ReferenceOscillator.Configure ([in] DOUBLE Frequency,
                                       [in] DOUBLE Level);
```

### C Prototype

```
ViStatus IviPwrMeter_ConfigureRefOscillator (ViSession Vi,
                                             ViReal64 Frequency,
                                             ViReal64 Level);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `Frequency` | The frequency of the reference oscillator. The value of this parameter is used to set the Reference Oscillator Frequency attribute. | `ViReal64` |
| `Level` | The power level of the reference oscillator. The value of this parameter is used to set the Reference Oscillator Level attribute. | `ViReal64` |

### Return Values (C/COM)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

### .NET Exceptions

The *IVI-3.2: Inherent Capabilities Specification* defines general exceptions that may be thrown, and warning events that may be raised, by this method.

## 14.3.2 Configure Reference Oscillator Enabled (IVI-C Only)

### Description

This function enables or disables the reference oscillator.

### .NET Method Prototype

```
N/A
```

(Use the `ReferenceOscillator.Enabled` property)

### COM Method Prototype

```
N/A
```

(Use the `ReferenceOscillator.Enabled` property)

### C Prototype

```
ViStatus IviPwrMeter_ConfigureRefOscillatorEnabled (ViSession Vi,
                                                    ViBoolean RefOscillatorEnabled);
```

### Parameters

| Inputs | Description | Datatype |
|---|---|---|
| `Vi` | Instrument handle. | `ViSession` |
| `RefOscillatorEnabled` | Pass True to enable the reference oscillator. Pass False to disable the reference oscillator. The value of this parameter is used to set the Reference Oscillator Enabled attribute. See the attribute description for more information. | `ViBoolean` |

### Return Values (C)

The *IVI-3.2: Inherent Capabilities Specification* defines general status codes that this function can return.

## 14.4 IviPwrMeterReferenceOscillator Behavior Model

The IviPwrMeterReferenceOscillator extension group follows the same behavior model as the IviPwrMeterBase capability group described in Section 4.4, *IviPwrMeterBase Behavior Model.*

# 15. IviPwrMeter Attribute ID Definitions

The following table defines the ID value for all IviPwrMeter class attributes.

**Table 15-1.** IviPwrMeter Attributes ID Values

| Attribute Name | ID Definition |
|---|---|
| IVIPWRMETER_ATTR_UNITS | IVI_CLASS_ATTR_BASE + 1 |
| IVIPWRMETER_ATTR_RANGE_AUTO_ENABLED | IVI_CLASS_ATTR_BASE + 2 |
| IVIPWRMETER_ATTR_AVERAGING_AUTO_ENABLED | IVI_CLASS_ATTR_BASE + 3 |
| IVIPWRMETER_ATTR_CORRECTION_FREQUENCY | IVI_CLASS_ATTR_BASE + 4 |
| IVIPWRMETER_ATTR_OFFSET | IVI_CLASS_ATTR_BASE + 5 |
| IVIPWRMETER_ATTR_CHANNEL_COUNT | IVI_INHERENT_ATTR_BASE + 203 |
| IVIPWRMETER_ATTR_CHANNEL_ENABLED | IVI_CLASS_ATTR_BASE + 51 |
| IVIPWRMETER_ATTR_RANGE_LOWER | IVI_CLASS_ATTR_BASE + 101 |
| IVIPWRMETER_ATTR_RANGE_UPPER | IVI_CLASS_ATTR_BASE + 102 |
| IVIPWRMETER_ATTR_TRIGGER_SOURCE | IVI_CLASS_ATTR_BASE + 201 |
| IVIPWRMETER_ATTR_INTERNAL_TRIGGER_EVENT_SOURCE | IVI_CLASS_ATTR_BASE + 251 |
| IVIPWRMETER_ATTR_INTERNAL_TRIGGER_LEVEL | IVI_CLASS_ATTR_BASE + 252 |
| IVIPWRMETER_ATTR_INTERNAL_TRIGGER_SLOPE | IVI_CLASS_ATTR_BASE + 253 |
| IVIPWRMETER_ATTR_AVERAGING_COUNT | IVI_CLASS_ATTR_BASE + 301 |
| IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION_ENABLED | IVI_CLASS_ATTR_BASE + 401 |
| IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION | IVI_CLASS_ATTR_BASE + 402 |
| IVIPWRMETER_ATTR_REF_OSCILLATOR_ENABLED | IVI_CLASS_ATTR_BASE + 501 |
| IVIPWRMETER_ATTR_REF_OSCILLATOR_FREQUENCY | IVI_CLASS_ATTR_BASE + 502 |
| IVIPWRMETER_ATTR_REF_OSCILLATOR_LEVEL | IVI_CLASS_ATTR_BASE + 503 |

# 16. IviPwrMeter Attribute Value Definitions

This section specifies the actual value for each defined attribute value.

### Internal Trigger Slope

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Negative | .NET | `Slope.Negative` | `1` |
| | C | `IVIPWRMETER_VAL_NEGATIVE` | `0` |
| | COM | `IviPwrMeterInternalTriggerSlopeNegative` | `0` |
| Positive | .NET | `Slope.Positive` | `0` |
| | C | `IVIPWRMETER_VAL_POSITIVE` | `1` |
| | COM | `IviPwrMeterInternalTriggerSlopePositive` | `1` |
| Internal Trigger Slope Class Extension Base | C | `IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_CLASS_EXT_BASE` | `500` |
| Internal Trigger Slope Specific Extension Base | C | `IVIPWRMETER_VAL_INTERNAL_TRIGGER_SLOPE_SPECIFIC_EXT_BASE` | `1000` |
| | COM | `N/A` | |

### Trigger Source (IVI-C & IVI-COM Only)

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Immediate | C | `IVIPWRMETER_VAL_IMMEDIATE` | `1` |
| | COM | `IviPwrMeterTriggerSourceImmediate` | `1` |
| External | C | `IVIPWRMETER_VAL_EXTERNAL` | `2` |
| | COM | `IviPwrMeterTriggerSourceExternal` | `2` |
| Internal | C | `IVIPWRMETER_VAL_INTERNAL` | `3` |
| | COM | `IviPwrMeterTriggerSourceInternal` | `3` |
| Software | C | `IVIPWRMETER_VAL_SOFTWARE_TRIG` | `4` |
| | COM | `IviPwrMeterTriggerSourceSoftware` | `4` |
| TTL0 | C | `IVIPWRMETER_VAL_TTL0` | `100` |
| | COM | `IviPwrMeterTriggerSourceTTL0` | `100` |
| TTL1 | C | `IVIPWRMETER_VAL_TTL1` | `101` |
| | COM | `IviPwrMeterTriggerSourceTTL1` | `101` |
| TTL2 | C | `IVIPWRMETER_VAL_TTL2` | `102` |
| | COM | `IviPwrMeterTriggerSourceTTL2` | `102` |
| TTL3 | C | `IVIPWRMETER_VAL_TTL3` | `103` |
| | COM | `IviPwrMeterTriggerSourceTTL3` | `103` |
| TTL4 | C | `IVIPWRMETER_VAL_TTL4` | `104` |
| | COM | `IviPwrMeterTriggerSourceTTL4` | `104` |

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| TTL5 | C | IVIPWRMETER_VAL_TTL5 | 105 |
| | COM | IviPwrMeterTriggerSourceTTL5 | 105 |
| TTL6 | C | IVIPWRMETER_VAL_TTL6 | 106 |
| | COM | IviPwrMeterTriggerSourceTTL6 | 106 |
| TTL7 | C | IVIPWRMETER_VAL_TTL7 | 107 |
| | COM | IviPwrMeterTriggerSourceTTL7 | 107 |
| ECL0 | C | IVIPWRMETER_VAL_ECL0 | 200 |
| | COM | IviPwrMeterTriggerSourceECL0 | 200 |
| ECL1 | C | IVIPWRMETER_VAL_ECL1 | 201 |
| | COM | IviPwrMeterTriggerSourceECL1 | 201 |
| PXI STAR | C | IVIPWRMETER_VAL_PXI_STAR | 300 |
| | COM | IviPwrMeterTriggerSourcePXIStar | 300 |
| RTSI0 | C | IVIPWRMETER_VAL_RTSI_0 | 400 |
| | COM | IviPwrMeterTriggerSourceRTSI0 | 400 |
| RTSI1 | C | IVIPWRMETER_VAL_RTSI_1 | 401 |
| | COM | IviPwrMeterTriggerSourceRTSI1 | 401 |
| RTSI2 | C | IVIPWRMETER_VAL_RTSI_2 | 402 |
| | COM | IviPwrMeterTriggerSourceRTSI2 | 402 |
| RTSI3 | C | IVIPWRMETER_VAL_RTSI_3 | 403 |
| | COM | IviPwrMeterTriggerSourceRTSI3 | 403 |
| RTSI4 | C | IVIPWRMETER_VAL_RTSI_4 | 404 |
| | COM | IviPwrMeterTriggerSourceRTSI4 | 404 |
| RTSI5 | C | IVIPWRMETER_VAL_RTSI_5 | 405 |
| | COM | IviPwrMeterTriggerSourceRTSI5 | 405 |
| RTSI6 | C | IVIPWRMETER_VAL_RTSI_6 | 406 |
| | COM | IviPwrMeterTriggerSourceRTSI6 | 406 |
| Trigger Source Class Extension Base | C | IVIPWRMETER_VAL_TRIGGER_SOURCE_CLASS_EXT_BASE | 500 |
| Trigger Source Specific Extension Base | C | IVIPWRMETER_VAL_TRIGGER_SOURCE_SPECIFIC_EXT_BASE | 1000 |
| | COM | N/A | |

### Units

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| dBm | .NET | Units.dBm | 0 |
| | C | IVIPWRMETER_VAL_DBM | 1 |
| | COM | IviPwrMeterUnitsdBm | 1 |
| dBmV | .NET | Units.dBmV | 1 |
| | C | IVIPWRMETER_VAL_DBMV | 2 |
| | COM | IviPwrMeterUnitsdBmV | 2 |
| dBuV | .NET | Units.dBuV | 2 |
| | C | IVIPWRMETER_VAL_DBUV | 3 |
| | COM | IviPwrMeterUnitsdBuV | 3 |
| Watts | .NET | Units.Watts | 3 |
| | C | IVIPWRMETER_VAL_WATTS | 4 |
| | COM | IviPwrMeterUnitsWatts | 4 |
| Units Class Extension Base | C | IVIPWRMETER_VAL_UNITS_CLASS_EXT_BASE | 500 |
| Units Specific Extension Base | C | IVIPWRMETER_VAL_UNITS_SPECIFIC_EXT_BASE | 1000 |
| | COM | N/A | |

# 17. IviPwrMeter Function Parameter Value Definitions

This section specifies the actual values for each function parameter that defines values.

### Configure Measurement

**Parameter:** `Operator`

**COM Enumeration Name:** `IviPwrMeterMeasurementOperatorEnum`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| None | .NET | `MeasurementOperator.None` | `0` |
| | C | `IVIPWRMETER_VAL_NONE` | `0` |
| | COM | `IviPwrMeterMeasurementOperatorNone` | `0` |
| Difference | .NET | `MeasurementOperator.Difference` | `1` |
| | C | `IVIPWRMETER_VAL_DIFFERENCE` | `1` |
| | COM | `IviPwrMeterMeasurementOperatorDifference` | `1` |
| Sum | .NET | `MeasurementOperator.Sum` | `2` |
| | C | `IVIPWRMETER_VAL_SUM` | `2` |
| | COM | `IviPwrMeterMeasurementOperatorSum` | `2` |
| Quotient | .NET | `MeasurementOperator.Quotient` | `3` |
| | C | `IVIPWRMETER_VAL_QUOTIENT` | `3` |
| | COM | `IviPwrMeterMeasurementOperatorQuotient` | `3` |
| Operator Class Extension Base | C | `IVIPWRMETER_VAL_OPERATOR_CLASS_EXT_BASE` | `500` |
| Operator Specific Extension Base | C | `IVIPWRMETER_VAL_OPERATOR_SPECIFIC_EXT_BASE` | `1000` |
| | COM | `N/A` | |

### Is Calibration Complete (IVI-C & IVI-COM Only)

**Parameter:** `Status`

**COM Enumerator Name:** `IviPwrMeterCalibrationStatusEnum`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Calibration Complete | C | `IVIPWRMETER_VAL_CALIBRATION_COMPLETE` | `1` |
| | COM | `IviPwrMeterCalibrationStatusComplete` | `1` |
| Calibration In Progress | C | `IVIPWRMETER_VAL_CALIBRATION_IN_PROGRESS` | `0` |
| | COM | `IviPwrMeterCalibrationStatusInProgress` | `0` |
| Calibration Status Unknown | C | `IVIPWRMETER_VAL_CALIBRATION_STATUS_UNKNOWN` | `-1` |
| | COM | `IviPwrMeterCalibrationStatusUnknown` | `-1` |

### Is Measurement Complete (IVI-C & IVI-COM Only)

**Parameter:** `Status`

**COM Enumeration Name:** `IviPwrMeterMeasurementStatusEnum`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Measurement Complete | C | `IVIPWRMETER_VAL_MEAS_COMPLETE` | `1` |
| | COM | `IviPwrMeterMeasurementStatusComplete` | `1` |
| Measurement In Progress | C | `IVIPWRMETER_VAL_MEAS_IN_PROGRESS` | `0` |
| | COM | `IviPwrMeterMeasurementStatusInProgress` | `0` |
| Measurement Status Unknown | C | `IVIPWRMETER_VAL_MEAS_STATUS_UNKNOWN` | `-1` |
| | COM | `IviPwrMeterMeasurementStatusUnknown` | `-1` |

### Is Zero Complete (IVI-C & IVI-COM Only)

**Parameter:** `Status`

**COM Enumeration Name:** `IviPwrMeterZeroStatusEnum`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Zero Complete | C | `IVIPWRMETER_VAL_ZERO_COMPLETE` | `1` |
| | COM | `IviPwrMeterZeroStatusComplete` | `1` |
| Zero In Progress | C | `IVIPWRMETER_VAL_ZERO_IN_PROGRESS` | `0` |
| | COM | `IviPwrMeterZeroStatusInProgress` | `0` |
| Zero Status Unknown | C | `IVIPWRMETER_VAL_ZERO_STATUS_UNKNOWN` | `-1` |
| | COM | `IviPwrMeterZeroStatusUnknown` | `-1` |

### Operation State (IVI.NET Only)

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Complete | .NET | `OperationState.Complete` | `0` |
| In Progress | .NET | `OperationState.InProgress` | `1` |
| State Unknown | .NET | `OperationState.Unknown` | `2` |

### Query Result Range Type

**Parameter:** `RangeType`

**COM Enumeration Name:** `IviPwrMeterResultRangeEnum`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| In Range | .NET | `ResultRange.InRange` | `0` |

| | | | |
|---|---|---|---|
| | C | IVIPWRMETER_VAL_IN_RANGE | 0 |
| | COM | IviPwrMeterResultRangeInRange | 0 |
| Under Range | .NET | ResultRange.UnderRange | 1 |
| | C | IVIPWRMETER_VAL_UNDER_RANGE | -1 |
| | COM | IviPwrMeterResultRangeUnderRange | -1 |
| Over Range | .NET | ResultRange.OverRange | 2 |
| | C | IVIPWRMETER_VAL_OVER_RANGE | 1 |
| | COM | IviPwrMeterResultRangeOverRange | 1 |

**Read**

**Parameter:** MaxTimeMilliseconds (C/COM)

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Immediate Timeout | C | IVIPWRMETER_VAL_MAX_TIME_IMMEDIATE | 0 |
| | COM | IviPwrMeterTimeOutImmediate | 0 |
| Infinite Timeout | C | IVIPWRMETER_VAL_MAX_TIME_INFINITE | 0xFFFFFFFFUL |
| | COM | IviPwrMeterTimeOutInfinite | 0xFFFFFFFFUL |

**Parameter:** maximumTime (.NET)

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Zero | .NET | PrecisionTimeSpan.Zero | PrecisionTimeSpan.Zero |
| Max Value | .NET | PrecisionTimeSpan.MaxValue | PrecisionTimeSpan.MaxValue |

### Read Channel

**Parameter:** MaxTimeMilliseconds (C/COM)

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Immediate Timeout | C | IVIPWRMETER_VAL_MAX_TIME_IMMEDIATE | 0 |
| | COM | IviPwrMeterTimeOutImmediate | 0 |
| Infinite Timeout | C | IVIPWRMETER_VAL_MAX_TIME_INFINITE | 0xFFFFFFFFUL |
| | COM | IviPwrMeterTimeOutInfinite | 0xFFFFFFFFUL |

**Parameter:** `maximumTime (.NET)`

| *Value Name* | *Language* | *Identifier* | *Actual Value* |
|---|---|---|---|
| Zero | .NET | `PrecisionTimeSpan.Zero` | `PrecisionTimeSpan.Zero` |
| MaxValue | .NET | `PrecisionTimeSpan.MaxValue` | `PrecisionTimeSpan.MaxValue` |

# 18. IviPwrMeter Error, Completion Code, and Exception Class Definitions

The IviPwrMeter class defines the following error codes in addition to the IVI defined error codes

**Table 18-1.** IviPwrMeter Completion Codes

| *Error Name* | *Description* | | | |
|---|---|---|---|---|
| | | *Language* | *Identifier* | *Value(hex)* |
| Under Range | Measurement is under range. | | | |
| | | .NET | | N/A |
| | | C | IVIPWRMETER_WARN_UNDER_RANGE | 0x3FFA2001 |
| | | COM | S_IVIPWRMETER_UNDER_RANGE | 0x00042001 |
| Over Range | Measurement is over range. | | | |
| | | .NET | | N/A |
| | | C | IVIPWRMETER_WARN_OVER_RANGE | 0x3FFA2002 |
| | | COM | S_IVIPWRMETER_OVER_RANGE | 0x00042002 |
| Channel Not Enabled | The specified channel is not enabled for measurement. | | | |
| | | .NET | Ivi.PwrMeter.ChannelNotEnabledException | N/A |
| | | C | IVIPWRMETER_ERROR_CHANNEL_NOT_ENABLED | 0xBFFA2001 |
| | | COM | E_IVIPWRMETER_CHANNEL_NOT_ENABLED | 0x80042001 |
| Max Time Exceeded | Maximum timeout exceeded before operation could complete. | | | |
| | | .NET | Ivi.Driver.MaxTimeExceededException | IVI Defined Exception (See IVI-3.2) |
| | | C | IVIPWRMETER_ERROR_MAX_TIME_EXCEEDED | 0xBFFA2020 |
| | | COM | E_IVIPWRMETER_MAX_TIME_EXCEEDED | 0x80042020 |
| Trigger Not Software | The trigger source is not set to software trigger. | | | |
| | | .NET | Ivi.Driver.TriggerNotSoftwareException | IVI Defined Exception (See IVI-3.2) |
| | | C | IVIPWRMETER_ERROR_TRIGGER_NOT_SOFTWARE | 0xBFFA1001 |
| | | COM | E_IVIPWRMETER_TRIGGER_NOT_SOFTWARE | 0x80041001 |

Table 17-2 defines the recommended format of the message string associated with the error. In C, these strings are returned by the Get Error function. In COM, these strings are the description contained in the

ErrorInfo object. In .NET these strings are the *Message* property of the exception class thrown by the method or property.

**Note:** In the description string table entries listed below, **%s** is always used to represent the component name.

**Table 18-2.** IviPwrMeter Error Message Strings

| Name | Message String |
|---|---|
| Under Range | "%s: Measurement is under range" |
| Over Range | "%s: Measurement is over range" |
| Channel Not Enabled | "%s: The channel %s1 is not enabled for measurement"<br>%s1 = Channel Name |
| Max Time Exceeded | "%s: Maximum timeout exceeded before operation could complete" |
| Trigger Not Software | "%s: The trigger source is not set to software trigger" |

## *18.1 IVI.NET IviPwrMeter Exceptions and Warnings*

This section defines the list of IVI.NET exceptions and warnings that are specific to the IviPwrMeter class. For general information on IVI.NET exceptions and warnings, refer to *IVI-3.1: Driver Architecture Specification* and section 12, *Common IVI.NET Exceptions and Warnings*, of *IVI-3.2: Inherent Capabilities Specification*.

The IVI.NET exceptions defined in this specification are declared in the Ivi.PwrMeter namespace.

- ChannelNotEnabledException

### 18.1.1 ChannelNotEnabledException

#### Description

This exception is used when the driver finds that a channel is not enabled for measurement.

#### Constructors

```
Ivi.PwrMeter.ChannelNotEnabledException(String message,
                                        String channelName);

Ivi.PwrMeter.ChannelNotEnabledException();

Ivi.PwrMeter.ChannelNotEnabledException(String message);

Ivi.PwrMeter.ChannelNotEnabledException(String message,
                                        System.Exception innerException);
```

#### Message String

```
The channel is not enabled for measurement.
Channel name: <channelName>
```

#### Parameters

| Inputs | Description | Base Type |
|---|---|---|
| `ChannelName` | The name of the channel that is not enabled. | `String` |

#### Usage

If driver developers use constructors that take a message string, they are responsible for message string localization.

# 19. IviPwrMeter Hierarchies

## *19.1 IviPwrMeter .NET Hierarchy*

The full IviPwrMeter .NET Hierarchy includes the Inherent Capabilities Hierarchy as defined in Section 4.1, *.NET Inherent Capabilities*, of IVI-3.2, *Inherent Capabilities Specification*. To avoid redundancy, it is omitted from Table 19.1 IviPwrMeter .NET Hierarchy.

**Table 19-1.** IviPwrMeter .NET Hierarchy

| .NET Interface Hierarchy | Generic Name | Type |
|---|---|---|
| **Channels** | | |
| Count | Channel Count | P |
| Units | Units | P |
| **[]** | Item | |
| Name | Channel Name | P |
| Enabled | Channel Enabled | P |
| CorrectionFrequency | Correction Frequency | P |
| Offset | Offset | P |
| **Averaging** | | |
| CountAuto | Averaging Auto Enabled | P |
| Count | Averaging Count | P |
| **Range** | | |
| Auto | Range Auto Enabled | P |
| Lower | Range Lower | P |
| Upper | Range Upper | P |
| Configure | Configure Range | M |
| **DutyCycle** | | |
| Enabled | Duty Cycle Correction Enabled | P |
| Value | Duty Cycle Correction | P |
| Configure | Configure Duty Cycle Correction | M |
| Zero | Zero | M |
| Calibrate | Calibrate | M |
| Zero | Zero All Channels | M |
| ZeroState | Zero State | P |
| CalibrationState | Calibration State | P |
| **Trigger** | | |
| Source | Trigger Source | P |
| **Internal** | | |
| Configure | Configure Internal Trigger | M |
| EventSource | Internal Trigger Event Source | P |
| Slope | Internal Trigger Slope | P |

**Table 19-1.** IviPwrMeter .NET Hierarchy

| .NET Interface Hierarchy | Generic Name | Type |
|---|---|---|
| Level | Internal Trigger Level | P |
| **Measurement** | | |
| Configure | Configure Measurement | M |
| Read | Read | M |
| ReadChannel | Read Channel | M |
| Initiate | Initiate | M |
| Fetch | Fetch | M |
| FetchChannel | Fetch Channel | M |
| Abort | Abort | M |
| GetMeasurementComplete | Is Measurement Complete | M |
| SendSoftwareTrigger | Send Software Trigger | M |
| QueryResultRangeType | Query Result Range Type | M |
| **ReferenceOscillator** | | |
| Enabled | Reference Oscillator Enabled | P |
| Configure | Configure Reference Oscillator | M |
| Frequency | Reference Oscillator Frequency | P |
| Level | Reference Oscillator Level | P |

### 19.1.1 IviPwrMeter .NET Interfaces

In addition to implementing IVI inherent capabilities interfaces, IviPwrMeter-interfaces contain interface reference properties for accessing the following IviPwrMeter interfaces:

- IIviPwrMeterChannels
- IIviPwrMeterMeasurement
- IIviPwrMeterReferenceOscillator
- IIviPwrMeterTrigger

The IIviPwrMeterChannels interface contains methods and properties for accessing a collection of objects that implement the IIviPwrMeterChannel interface.

The IIviPwrMeterChannel interface contains interface reference properties for accessing additional the following IviPwrMeter interfaces:

- IIviPwrMeterAveraging
- IIviPwrMeterDutyCycleCorrection
- IIviPwrMeterRange

### 19.1.2 Interface Reference Properties

Interface reference properties are used to navigate the IviDmm .NET hierarchy. This section describes the interface reference properties that the IviPwrMeter, IIviPwrMeterChannels, and IIviPwrMeterChannel interfaces define. All interface reference properties are read-only.

| Data Type | Access |
|---|---|
| IIviPwrMeterReferenceOscillator | ReferenceOscillator |
| IIviPwrMeterMeasurement | Measurement |
| IIviPwrMeterChannels | Channels |
| IIviPwrMeterChannel | Channels[] |
| IIviPwrMeterTrigger | Trigger |
| IIviPwrMeterInternalTrigger | InternalTrigger |
| IIviPwrMeterAveraging | Channels[].Averaging |
| IIviPwrMeterRange | Channels[].Range |
| IIviPwrMeterDutyCycleCorrection | Channels[].DutyCycleCorrection |

## *19.2 IviPwrMeter COM Hierarchy*

**Table 19-1.** IviPwrMeter COM Hierarchy

| COM Interface Hierarchy | Generic Name | Type |
|---|---|---|
| **Channels** | | |
| Count | Channel Count | P |
| Name | Channel Name | P |
| Units | Units | P |
| **Item** | | |
| Enabled | Channel Enabled | P |

**Table 19-1.** IviPwrMeter COM Hierarchy

| COM Interface Hierarchy | Generic Name | Type |
|---|---|---|
| CorrectionFrequency | Correction Frequency | P |
| Offset | Offset | P |
| **Averaging** | | |
| AutoEnabled | Averaging Auto Enabled | P |
| Count | Averaging Count | P |
| **Range** | | |
| AutoEnabled | Range Auto Enabled | P |
| Lower | Range Lower | P |
| Upper | Range Upper | P |
| Configure | Configure Range | M |
| **DutyCycle** | | |
| Enabled | Duty Cycle Correction Enabled | P |
| Value | Duty Cycle Correction | P |
| Configure | Configure Duty Cycle Correction | M |
| Zero | Zero | M |
| Calibrate | Calibrate | M |
| Zero | Zero All Channels | M |
| IsZeroComplete | Is Zero Complete | M |
| IsCalibrationComplete | Is Calibration Complete | M |
| **Trigger** | | |
| Source | Trigger Source | P |
| **Internal** | | |
| Configure | Configure Internal Trigger | M |
| EventSource | Internal Trigger Event Source | P |
| Slope | Internal Trigger Slope | P |
| Level | Internal Trigger Level | P |
| **Measurement** | | |
| Configure | Configure Measurement | M |
| Read | Read | M |
| ReadChannel | Read Channel | M |
| Initiate | Initiate | M |
| Fetch | Fetch | M |
| FetchChannel | Fetch Channel | M |
| Abort | Abort | M |
| IsMeasurementComplete | Is Measurement Complete | M |
| SendSoftwareTrigger | Send Software Trigger | M |
| QueryResultRangeType | Query Result Range Type | M |
| **ReferenceOscillator** | | |

**Table 19-1.** IviPwrMeter COM Hierarchy

| COM Interface Hierarchy | Generic Name | Type |
|---|---|---|
| `Enabled` | Reference Oscillator Enabled | P |
| `Configure` | Configure Reference Oscillator | M |
| `Frequency` | Reference Oscillator Frequency | P |
| `Level` | Reference Oscillator Level | P |

## 19.2.1 IviPwrMeter COM Interfaces

In addition to implementing IVI inherent capabilities interfaces, IviPwrMeter-interfaces contain interface reference properties for accessing the following IviPwrMeter interfaces:

- IIviPwrMeterChannels
- IIviPwrMeterMeasurement
- IIviPwrMeterReferenceOscillator
- IIviPwrMeterTrigger

The IIviPwrMeterChannels interface contains methods and properties for accessing a collection of objects that implement the IIviPwrMeterChannel interface.

The IIviPwrMeterChannel interface contains interface reference properties for accessing additional the following IviPwrMeter interfaces:

- IIviPwrMeterAveraging
- IIviPwrMeterDutyCycleCorrection
- IIviPwrMeterRange

*Table 19-1.1. IviPwrMeter* lists the interfaces that this specification defines and their GUIDs.

**Table 19-1.1.** IviPwrMeter Interface GUIDs

| Interface | GUID |
|---|---|
| IIviPwrMeter | {47ed5314-a398-11d4-ba58-000064657374} |
| IIviPwrMeterAveraging | {47ed5315-a398-11d4-ba58-000064657374} |
| IIviPwrMeterChannel | {47ed5316-a398-11d4-ba58-000064657374} |
| IIviPwrMeterChannels | {47ed5317-a398-11d4-ba58-000064657374} |
| IIviPwrMeterDutyCycleCorrection | {47ed5318-a398-11d4-ba58-000064657374} |
| IIviPwrMeterMeasurement | {47ed5319-a398-11d4-ba58-000064657374} |
| IIviPwrMeterRange | {47ed531a-a398-11d4-ba58-000064657374} |
| IIviPwrMeterReferenceOscillator | {47ed531b-a398-11d4-ba58-000064657374} |
| IIviPwrMeterTrigger | {47ed531c-a398-11d4-ba58-000064657374} |

## 19.2.1 Interface Reference Properties

Interface reference properties are used to navigate the IviPwrMeter .NET hierarchy. This section describes the interface reference properties that the IviPwrMeter, IIviPwrMeterChannels, and IIviPwrMeterChannel interfaces define. All interface reference properties are read-only.

| Data Type | Access |
|---|---|
| IIviPwrMeterReferenceOscillator* | ReferenceOscillator |
| IIviPwrMeterMeasurement* | Measurement |
| IIviPwrMeterChannels* | Channels |
| IIviPwrMeterChannel* | Channel |
| IIviPwrMeterTrigger* | Trigger |
| IIviPwrMeterInternalTrigger* | InternalTrigger |

| Data Type | Access |
|---|---|
| IIviPwrMeterAveraging* | Averaging |
| IIviPwrMeterRange* | Range |
| IIviPwrMeterDutyCycleCorrection* | DutyCycleCorrection |

### 19.2.2 IviPwrMeter COM Category

The IviPwrMeter class COM Category shall be “IviPwrMeter”, and the Category ID (CATID) shall be {47ed515a-a398-11d4-ba58-000064657374}.

## 19.3 IviPwrMeter C Function Hierarchy

The IviPwrMeter class function hierarchy is shown in the following table.

**Table 19-2.** IviPwrMeter C Function Hierarchy

| Name or Class | Function Name |
|---|---|
| **Configuration…** | |
| Configure Units | IviPwrMeter_ConfigureUnits |
| Configure Measurement | IviPwrMeter_ConfigureMeasurement |
| Configure Range Auto Enabled | IviPwrMeter_ConfigureRangeAutoEnabled |
| Configure Averaging Auto Enabled | IviPwrMeter_ConfigureAveragingAutoEnabled |
| Configure Correction Frequency | IviPwrMeter_ConfigureCorrectionFrequency |
| Configure Offset | IviPwrMeter_ConfigureOffset |
| **Range…** | |
| Configure Range | IviPwrMeter_ConfigureRange |
| **Trigger…** | |
| Configure Trigger Source | IviPwrMeter_ConfigureTriggerSource |
| **Internal Trigger…** | |
| Configure Internal Trigger | IviPwrMeter_ConfigureInternalTrigger |
| Configure Internal Trigger Level | IviPwrMeter_ConfigureInternalTriggerLevel |
| **Averaging…** | |
| Configure Averaging Count | IviPwrMeter_ConfigureAveragingCount |
| **Duty Cycle…** | |
| Configure Duty Cycle Correction | IviPwrMeter_ConfigureDutyCycleCorrection |
| **Reference Oscillator…** | |
| Configure Reference Oscillator Enabled | IviPwrMeter_ConfigureRefOscillatorEnabled |
| Configure Reference Oscillator | IviPwrMeter_ConfigureRefOscillator |
| **Channel…** | |
| Get Channel Name | IviPwrMeter_GetChannelName |
| **Channel Acquisition…** | |
| Configure Channel Enabled | IviPwrMeter_ConfigureChannelEnabled |
| **Zeroing…** | |
| Zero | IviPwrMeter_Zero |
| Zero All Channels | IviPwrMeter_ZeroAllChannels |
| Is Zero Complete | IviPwrMeter_IsZeroComplete |
| **Calibration…** | |
| Calibrate | IviPwrMeter_Calibrate |
| Is Calibration Complete | IviPwrMeter_IsCalibrationComplete |
| **Measurement…** | |

**Table 19-2.** IviPwrMeter C Function Hierarchy

| Name or Class | Function Name |
|---|---|
| Read | IviPwrMeter_Read |
| Read Channel | IviPwrMeter_ReadChannel |
| **Low-Level Measurement…** | |
| Initiate | IviPwrMeter_Initiate |
| Is Measurement Complete | IviPwrMeter_IsMeasurementComplete |
| Fetch | IviPwrMeter_Fetch |
| Fetch Channel | IviPwrMeter_FetchChannel |
| Query Result Range Type | IviPwrMeter_QueryResultRangeType |
| Abort | IviPwrMeter_Abort |
| Send Software Trigger | IviPwrMeter_SendSoftwareTrigger |

## 19.4 IviPwrMeter C Attribute Hierarchy

The IviPwrMeter class attribute hierarchy is shown below.

**Table 19-3**. IviPwrMeter C Attributes Hierarchy

| Category or Generic Attribute Name | C Defined Constant |
|---|---|
| *Basic Operation* | |
| Units | IVIPWRMETER_ATTR_UNITS |
| Range Auto Enabled | IVIPWRMETER_ATTR_RANGE_AUTO_ENABLED |
| Averaging Auto Enabled | IVIPWRMETER_ATTR_AVERAGING_AUTO_ENABLED |
| Correction Frequency | IVIPWRMETER_ATTR_CORRECTION_FREQUENCY |
| Offset | IVIPWRMETER_ATTR_OFFSET |
| Channel Count | IVIPWRMETER_ATTR_CHANNEL_COUNT |
| *Channel Acquisition* | |
| Channel Enabled | IVIPWRMETER_ATTR_CHANNEL_ENABLED |
| *Manual Range* | |
| Range Lower | IVIPWRMETER_ATTR_RANGE_LOWER |
| Range Upper | IVIPWRMETER_ATTR_RANGE_UPPER |
| *Trigger* | |
| Trigger Source | IVIPWRMETER_ATTR_TRIGGER_SOURCE |
| *Internal Trigger* | |
| Internal Trigger Event Source | IVIPWRMETER_ATTR_INTERNAL_TRIGGER_EVENT_SOURCE |
| Internal Trigger Level | IVIPWRMETER_ATTR_INTERNAL_TRIGGER_LEVEL |
| Internal Trigger Slope | IVIPWRMETER_ATTR_INTERNAL_TRIGGER_SLOPE |
| *Averaging Count* | |
| Averaging Count | IVIPWRMETER_ATTR_AVERAGING_COUNT |
| *Duty Cycle* | |
| Duty Cycle Correction Enabled | IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION_ENABLED |
| Duty Cycle Correction | IVIPWRMETER_ATTR_DUTY_CYCLE_CORRECTION |
| *Reference Oscillator* | |
| Reference Oscillator Enabled | IVIPWRMETER_ATTR_REF_OSCILLATOR_ENABLED |
| Reference Oscillator Frequency | IVIPWRMETER_ATTR_REF_OSCILLATOR_FREQUENCY |
| Reference Oscillator Level | IVIPWRMETER_ATTR_REF_OSCILLATOR_LEVEL |

# Specific Driver Development Guidelines

## *A.1 Introduction*

This section describes situations driver developers should be aware of when developing a specific instrument driver that complies with the IviPwrMeter class.

## *A.2 Disabling Unused Extensions*

Specific drivers are required to disable extension capability groups that an application program does not explicitly use. The specific driver can do so by setting the attributes of an extension capability group to the values that this section recommends. A specific driver can set these values for all extension capability groups when the *<prefix>*_init, *<prefix>*_InitWithOptions, or *<prefix>*_reset functions execute. This assumes that the extension capability groups remain disabled until the application program explicitly uses them. For the large majority of instruments, this assumption is true.

Under certain conditions, a specific driver might have to implement a more complex approach. For some instruments, configuring a capability group might affect instrument settings that correspond to an unused extension capability group. If these instrument settings affect the behavior of the instrument, then this might result in an interchangeability problem. If this can occur, the specific driver shall take appropriate action so that the instrument settings that correspond to the unused extension capability group do not affect the behavior of the instrument when the application program performs an operation that might be affected by those settings.

The remainder of this section recommends attribute values that effectively disable each extension capability group.

### Disabling the IviPwrMeterChannelAcquisition Extension Group

Setting the Channel Enabled attribute to False for all channels effectively disables the IviPwrMeterChannelAcquisition extension group.

### Disabling the IviPwrMeterManualRange Extension Group

The IviPwrMeterManualRange extension group affects the instrument behavior only when the Range Auto Enabled attribute is set to False. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterManualRange extension group.

### Disabling the IviPwrMeterTriggerSource Extension Group

Setting the Trigger Source attribute to Immediate effectively disables the IviPwrMeterTriggerSource extension group.

### Disabling the IviPwrMeterInternalTrigger Extension Group

The IviPwrMeterInternalTrigger extension group affects the instrument behavior only when the Trigger Source attribute is set to the Internal defined value. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterInternalTrigger extension group.

### Disabling the IviPwrMeterSoftwareTrigger Extension Group

The IviPwrMeterSoftwareTrigger extension group affects the instrument behavior only when the Trigger Source attribute is set to the Software defined value. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterSoftwareTrigger extension group.

### Disabling the IviPwrMeterDutyCycleCorrection Extension Group

Setting the Duty Cycle Correction Enabled attribute to False for all channels effectively disables the IviPwrMeterDutyCycleCorrection extension group.

### Disabling the IviPwrMeterAveragingCount Extension Group

The IviPwrMeterAveragingCount extension group affects the instrument behavior only when the Auto Averaging Enabled attribute is set to False. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterAveragingCount extension group.

### Disabling the IviPwrMeterZeroCorrection Extension Group

The IviPwrMeterZeroCorrection extension group does not define any attributes. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterZeroCorrection extension group.

### Disabling the IviPwrMeterCalibration Extension Group

The IviPwrMeterCalibration extension group does not define any attributes. Therefore, this specification does not recommend attribute values that disable the IviPwrMeterCalibration extension group.

### Disabling the IviPwrMeterReferenceOscillator Extension Group

Setting the Reference Oscillator Enabled attribute to False effectively disables the IviPwrMeterReferenceOscillator extension group.

## *A.3 Query Instrument Status*

Based on the value of the Query Instrument Status attribute, a specific driver may check the status of the instrument to see if it has encountered an error. In specific driver functions, the status check should not occur in the lowest-level signal generation functions Initiate, Abort, and Send Software Trigger. These functions are intended to give the application developer low-level control over signal generation. When calling these functions, the application developer is responsible for checking the status of the instrument. Checking status in every function at this level would also add unnecessary overhead to the specific instrument driver.

# Interchangeability Checking Rules

## B.1 Introduction

IVI drivers might implement a feature called interchangeability checking. Interchangeability checking returns a warning when it encounters a situation were the application program might not produce the same behavior when the user attempts to use a different instrument.

## B.2 When to Perform Interchangeability Checking

Interchangeability checking occurs when all of the following conditions are met:

- The Interchange Check attribute is set to True
- The user calls one of the following functions.
  - Initiate
  - Read
  - Read Channel

## B.3 Interchangeability Checking Rules

Interchangeability checking is performed on a capability group basis. When enabled, interchangeability checking is always performed on the base capability group. In addition, interchangeability checking is performed on each extension capability group that the application program uses. An extension capability group is considered to be used by the application program after any of the following occur:

- The application program calls a function that belongs to the extension capability group.
- The application program accesses an attribute that belongs to the extension capability group.
- The application program sets an attribute in another capability group to a value that requires the presence of the extension capability group.

If the user has never set any attributes of an extension capability group, interchangeability checking is not performed on that group. In general interchangeability warnings are generated if the following conditions are encountered:

- An attribute that affects the behavior of the instrument is not in a state that the user specifies.
- The user sets a class driver defined attribute to an instrument-specific value.
- The user configures the value of an attribute that the class defines as read-only. In a few cases the class drivers define read-only attributes that specific drivers might implement as read/write.

### IviPwrMeterBase Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterBase capability group.

### IviPwrMeterChannelAcquisition Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterChannelAcquisition capability group.

### IviPwrMeterManualRange Capability Group

The driver performs interchangeability checking on the IviPwrMeterManualRange group only if the application sets the Range Auto Enabled attribute to False.

### IviPwrMeterTriggerSource Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterTriggerSource capability group.

### IviPwrMeterInternalTrigger Capability Group

The driver performs interchangeability checking on the IviPwrMeterInternalTrigger group only if the application sets the Trigger Source attribute to Internal.

### IviPwrMeterSoftwareTrigger Capability Group

The driver performs interchangeability checking on the IviPwrMeterSoftwareTrigger group only if the application sets the Trigger Source attribute to Software.

### IviPwrMeterDutyCycleCorrection Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterDutyCycleCorrection capability group.

### IviPwrMeterAveragingCount Capability Group

The driver performs interchangeability checking on the IviPwrMeterAveragingCount group only if the application sets the Averaging Auto Enabled attribute to False.

### IviPwrMeterZeroCorrection Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterZeroCorrection capability group.

### IviPwrMeterCalibration Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterCalibration capability group.

### IviPwrMeterReferenceOscillator Capability Group

No additional interchangeability rules or exceptions are defined for the IviPwrMeterReferenceOscillator capability group.